

Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:

Robins-Browne, K;Lewis, M;Burchill, LJ;Gilbert, C;Johnson, C;O'Donnell, M;Kotevski, A;Poonian, J;Palmer, VJ

Title:

Interventions to support the mental health and well-being of front-line healthcare workers in hospitals during pandemics: an evidence review and synthesis

Date:

2022-11-07

Citation:

Robins-Browne, K., Lewis, M., Burchill, L. J., Gilbert, C., Johnson, C., O'Donnell, M., Kotevski, A., Poonian, J. & Palmer, V. J. (2022). Interventions to support the mental health and well-being of front-line healthcare workers in hospitals during pandemics: an evidence review and synthesis. *BMJ Open*, 12 (11), <https://doi.org/10.1136/bmjopen-2022-061317>.




Persistent Link:

<https://hdl.handle.net/11343/333716>

License:

[CC BY-NC](#)

# BMJ Open Interventions to support the mental health and well-being of front-line healthcare workers in hospitals during pandemics: an evidence review and synthesis

Kate Robins-Browne,<sup>1</sup> Matthew Lewis ,<sup>1,2</sup> Luke James Burchill,<sup>2,3,4</sup> Cecily Gilbert,<sup>5</sup> Caroline Johnson ,<sup>1,2</sup> Meaghan O'Donnell,<sup>6</sup> Aneta Kotevski,<sup>3</sup> Jasmine Poonian,<sup>7</sup> Victoria J Palmer <sup>1,2</sup>

**To cite:** Robins-Browne K, Lewis M, Burchill LJ, *et al*. Interventions to support the mental health and well-being of front-line healthcare workers in hospitals during pandemics: an evidence review and synthesis. *BMJ Open* 2022;**12**:e061317. doi:10.1136/bmjopen-2022-061317

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-061317>).

KR-B and ML are joint first authors.

Received 31 January 2022  
Accepted 24 October 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

## Correspondence to

Professor Victoria J Palmer; [v.palmer@unimelb.edu.au](mailto:v.palmer@unimelb.edu.au)

## ABSTRACT

**Objective** Pandemics negatively impact healthcare workers' (HCW's) mental health and well-being causing additional feelings of anxiety, depression, moral distress and post-traumatic stress. A comprehensive review and evidence synthesis of HCW's mental health and well-being interventions through pandemics reporting mental health outcomes was conducted addressing two questions: (1) What mental health support interventions have been reported in recent pandemics, and have they been effective in improving the mental health and well-being of HCWs? (2) Have any mobile apps been designed and implemented to support HCWs' mental health and well-being during pandemics?

**Design** A narrative evidence synthesis was conducted using Cochrane criteria for synthesising and presenting findings when systematic review and pooling data for statistical analysis are not suitable due to the heterogeneity of the studies.

**Data sources** Evidence summary resources, bibliographic databases, grey literature sources, clinical trial registries and protocol registries were searched.

**Eligibility criteria** Subject heading terms and keywords covering three key concepts were searched: SARS-CoV-2 coronavirus (or similar infectious diseases) epidemics, health workforce and mental health support interventions. Searches were limited to English-language items published from 1 January 2000 to 14 June 2022. No publication-type limit was used.

**Data extraction and synthesis** Two authors determined eligibility and extracted data from identified manuscripts. Data was synthesised into tables and refined by coauthors.

**Results** 2694 studies were identified and 27 papers were included. Interventions were directed at individuals and/or organisations and most were COVID-19 focused. Interventions had some positive impacts on HCW's mental health and well-being, but variable study quality, low sample sizes and lack of control conditions were limitations. Two mobile apps were identified with mixed outcomes.

**Conclusion** HCW interventions were rapidly designed and implemented with few comprehensively described or

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This is the most comprehensive review of interventions to support healthcare worker's (HCW's) mental health and well-being through pandemics that has been conducted to date.
- ⇒ The review explored a wide range of sources including key bibliographic databases, the Evidence for Policy Practice Information (EPPI)-Centre's Living Systematic Map of the Evidence, preprint servers, clinical trial registers and grey literature from reputable health sources.
- ⇒ The review outcomes were limited by heterogeneous designs and research outcomes that were largely descriptive, lacked appropriate outcome measures or used single-group designs.
- ⇒ A large number of studies were excluded as they describe mental health-focused interventions for HCWs, but did not report outcomes or impact.

evaluated. Tailored interventions that respond to HCWs' needs using experience co-design for mental health and well-being are required with process and outcome evaluation.

## INTRODUCTION

Healthcare workers (HCWs) experience high levels of mental distress,<sup>1</sup> which increases through pandemics. Pandemic-related mental health and well-being impacts have been reported,<sup>2 3</sup> but as increased rates of anxiety, depression, moral distress and post-traumatic stress disorders<sup>4</sup> and occupational stress are identified as a consequence of COVID-19, mental health and well-being supports for HCWs are becoming paramount.<sup>5</sup> Early in the pandemic, emotional distress and cumulative load were being driven by increased risk of COVID-19 infection,<sup>6</sup> radically altered healthcare systems and practices and the impact

of physical distancing on professional team interactions and patient relationships.<sup>5</sup> Now, almost 3 years into the pandemic, distress and burnout are driven by the continued impacts of staff shortages and absenteeism/presenteeism, increased workload attributable to treating and preventing COVID-19 and successive waves of infection.<sup>7,8</sup> Morally complex decision-making in the allocation of scant health resources increased emotional distress and cumulative load and HCWs needed to evaluate risks to their own health and for loved ones.<sup>9,10</sup> Australian HCWs described intense stress associated with pandemic preparedness and the emotional costs of working in an environment where human contact was, and remains, restricted.<sup>11,12</sup> Despite these concerns, and a plethora of rapidly produced research and literature, there is a lack of clear, evidence-based HCW focused mental health and well-being interventions and supports that have been evaluated and reported on even outside of the pandemic setting.<sup>4,5</sup>

Since 2003, pandemics have become frequent with SARS, middle eastern respiratory virus, influenza H1N1 and H7N9, Ebola and now SARS-CoV-2, causing COVID-19, emerging. Pandemic preparedness has become a feature of healthcare system planning and several reviews published early in the pandemic examined the mental health of HCWs and potential interventions that could support HCW's mental health and well-being.<sup>2,13,14</sup> While significant mental health impacts on HCWs working within pandemics are recognised, there is a mismatch between the interventions offered, focusing on relieving individual symptoms, versus HCWs' expressed preferences for social support.<sup>3</sup> The COVID-19 pandemic has highlighted that few evidence-based interventions exist to address the short-term and long-term mental health needs of HCWs both within and outside pandemics and that these are urgently required.<sup>14-17</sup> Reviews have indicated an increased need for technological innovation and digital interventions following the COVID-19 pandemic.<sup>18,19</sup> Digital mental health interventions and mobile apps are available, but there remains a paucity of evidence about HCW-specific digital interventions and the uptake, acceptability and feasibility both inside and outside of pandemics.<sup>18,20</sup>

This evidence review and synthesis informed a larger project that involved the development, design, implementation and evaluation of a mobile app to support HCWs' mental health and well-being during pandemics (in this case COVID-19).<sup>21</sup> The project used experienced-based codesign (EBCD<sup>22</sup>), which employs narrative and story-telling approaches alongside facilitated codesign to centre the lived experience of people who are directly impacted by a topic or issue at hand.<sup>21</sup> EBCD typically involves two interconnected stages (1) information/experience gathering and (2) engaging people with lived experience as content cocreators, in partnership with designers and codevelopers of collaborative solutions through a codesign process.<sup>22,23</sup>

We used the Cochrane approach to evidence synthesis where meta-analysis is not appropriate and applied

a narrative evidence synthesis method.<sup>24</sup> The review addressed two questions:

1. What mental health support interventions have been reported in recent pandemics, and have they been effective in improving the mental health and well-being of HCWs?
2. Have any mobile apps have been designed and implemented to support HCWs' mental health and well-being during pandemics?

## METHOD

Following the narrative evidence synthesis method,<sup>24</sup> the following combinations of resources were searched to identify relevant publications (table 1). A Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 Checklist is included as online supplemental file 1.

Evidence summaries and guidelines were searched using a combination of thesaurus terms (where available) and keyword searches. Database search strategies used subject heading terms and keyword searches for three key concepts: SARS-CoV-2 coronavirus (or similar infectious diseases) epidemics, health workforce and mental health support interventions. Searches were limited to English-language items published from 2000. No publication-type limit was used. The detailed search strategy is included in online supplemental file 2.

Reference lists of relevant items were checked, and forward citation searches were conducted to discover related items. Grey literature sources and the websites of key health organisations were also checked. COVID-19 subsets of three clinical trials registers were examined to identify randomised controlled trials (RCTs) in progress at the time of conducting the search.

From 2694 publications identified, comprised of reviews and single studies, 2603 papers were screened for inclusion using the criteria shown in table 2.

Four authors (KR-B, CG, ML and VJP) independently assessed each item to determine eligibility, using Covidence to manage this workflow.<sup>25</sup> Each manuscript was independently assessed by four authors (KR-B, CG, ML and VJP). Discrepancies were resolved through discussion between the authors. Where required, a third author made the final determination.

Quantitative and qualitative data from eligible studies were extracted into tables. Studies that did not examine a specific intervention or include mental health outcomes were excluded. Intervention details were charted by type of intervention and mental health-related outcome data and reviewed and refined at research meetings by coauthors (KR-B, CG, VJP, LJB, ML and AK). A formal quality appraisal tool was not applied, but the limitations of each study were considered in presenting the results.

## Patient and public involvement

No patients were involved.

**Table 1** Databases included in search strategy

Resource type	Titles searched	Latest search date
Cochrane library resources	Cochrane Reviews, Cochrane Protocols, Cochrane Trials	6 June 2022
Evidence summaries and guidelines	Cochrane Living Guidelines; Epistemonikos; Oxford Covid-19 Evidence; NICE Rapid guidelines on COVID-19; VA Evidence Synthesis Project COVID-19 Reviews	18 September 2020
Literature databases	Medline (Ovid, 1946 -)	6 June 2022
	Web of Science Core Collection	14 June 2022
	Scopus	17 August 2020
	PsycInfo (Ovid)	14 March 2021
	Embase Classic+Embase (Ovid)	14 March 2021
	CINAHL Complete (EBSCOhost)	14 March 2021
	LitCovid	17 August 2020
EPPI-Centre Register	EPPI-Centre Living Systematic Map of the Evidence - Provided an extract of their mental health impacts references (n=468 with the last update (published on 30 July)	30 July 2020
Preprint servers	ArXiv; MedRxiv (COVID-19 SARS-CoV-2 preprints subsets)	18 August 2020
Clinical trials registers	Australian New Zealand Clinical Trials registry COVID-19 Studies; ClinicalTrials.gov COVID-19 subset; Cochrane COVID-19 Trials register	20 August 2020
Systematic reviews protocols	PROSPERO International prospective register of systematic reviews	7 June 2022
Grey literature	Agency for Healthcare Research and Quality; Australian Commission on Safety and Quality in Health Care; Canadian Agency for Drugs and Technologies in Health; Health Quality Ontario; National Institute for Health and Care Excellence; World Health Organisation	18 September 2020

EPPI-Centre, The Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre); NICE, National Institute for Clinical Excellence; VA, Veteran Affairs.

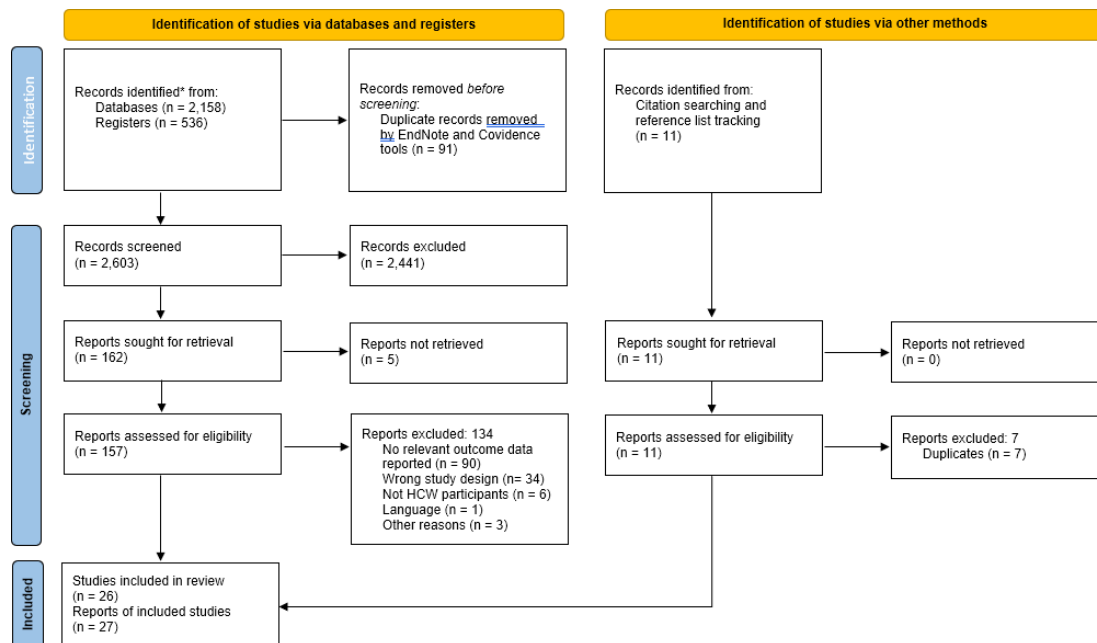
## RESULTS

Figure 1 presents the PRISMA flow diagram of the study review and selection process. Overall, 27 papers from 26 studies (2 papers reported aspects of the same study) met the inclusion criteria.<sup>26–52</sup> Heterogeneity of study designs and the outcomes reported meant that it was not possible to synthesise the effects of each outcome.

Most studies (22/26) related to the COVID-19 pandemic,<sup>29–33 35–52</sup> 2 related to influenza<sup>26 27</sup> and 1 study to SARS<sup>28</sup> and 1 to Ebola.<sup>34</sup> A substantive number of interventions were premised on mitigating acute stress to prevent or minimise longer-term mental health problems. Overall, 3 studies described pandemic preparedness interventions,<sup>26 27 38</sup> 23 described interventions delivered

**Table 2** Manuscript inclusion and exclusion criteria for evidence synthesis

Inclusion	Exclusion
Pandemic or epidemics: SARS, middle eastern respiratory virus, H1N1 H7N9, COVID-19, Ebola.	Pandemics prior to 1 January 2000.
Clinical and non-clinical health workers in hospitals.	Paramedic, disaster and retrieval staff. Primary care and community healthcare workers.
Intervention that had been implemented in a hospital setting in any country at any time after 1 January 2000 with the intention to improve HCWs' mental health and well-being in the pandemic setting.	Interventions that had been proposed or recommended without having been implemented. Educational materials intended to inform the institution's workforce.
E-learning and web-based interactive programmes were included as general interventions. Only mobile apps, specifically developed to address HCWs' mental health in pandemics, were included to address the second question.	Mobile app used only as a platform of communication.
Reported mental health outcomes.	Did not report mental health outcomes.



**Figure 1** Study Selection Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 flow diagram. HCW, healthcare worker.

during pandemics<sup>28–33 35–37 39–52</sup> and 1 described a post-pandemic intervention.<sup>34</sup> These can be broadly classified into preparedness and responsiveness to pandemics.

Broadly, the interventions described in the literature were targeted at organisations, aiming to improve working conditions, communication and staff support, or directed at individuals with a focus on clinical education, mental health and well-being, stress management and coping, or directed counselling and psychological support. Table 3 includes a summary of included studies. The aims and methods of each study presented in more detail in online supplemental table 1, and the mental health assessments and outcomes in online supplemental table 2.

#### Preparedness: interventions delivered pre pandemic

Three papers examined programmes to prepare HCWs for pandemics. Two papers reported on elements of an organisational approach to pandemic preparedness focused on building resilience in a Toronto-based hospital based on the hospital's 2003 experience with SARS. An interprofessional psychological pandemic committee developed interventions to reduce HCW stress and facilitate adaptation as a primary prevention, aiming to support staff and reduce absenteeism through future pandemics. A computer-based educational intervention, intended as a 'pandemic influenza stress vaccine', delivered audio and video lectures on pandemics and working outside comfort zones as well as relaxation skills and self-assessment modules.<sup>27</sup> Three course durations were offered: 1.75 hours, 3 hours and 4 hours. All course durations were reported to improve pandemic self-efficacy, confidence in training and support. There was, however, a non-significant trend toward higher dropout rates for the longer course duration. In the second study, Aiello

*et al*<sup>26</sup> reported findings from an in-person education intervention focused on coping principles and organisational and personal resilience. Postsession questionnaire data indicated that 35% of participants felt prepared to deal confidently with a pandemic before the session and this increased to 76% of participants after the session. The absence of pretraining session comparative data regarding perceived ability to cope is a notable limitation of this study.

Zingela *et al*<sup>88</sup> reported that a 60–90 min in-person group education session to improve the psychological preparedness of HCWs in the COVID-19 pandemic, covering mind care, relaxation techniques and team care, improved coping and the ability to manage stress in others and their own anxiety.

It is unclear whether facilitating HCWs' increased confidence in their abilities improved mental health outcomes during, or following, a pandemic in the same way as could be expected of mental health-focused interventions.<sup>53–56</sup>

#### Responsiveness: interventions delivered in response to a pandemic

Twenty-four studies reported mental health outcomes for interventions delivered during or after a pandemic.<sup>28–37 39–52</sup> Most studies (18/24) were individually directed with diverse aims that included: improving sleep, or decreasing stress, anxiety, depression, burnout and Post Traumatic Stress Disorder (PTSD). Interventions were commonly selected based on findings from studies conducted outside the pandemic setting and with non-HCW populations. Importantly, the five studies that described organisational-level changes often incorporated interventions targeted at individuals and included additional elements.

**Table 3** Interventions to improve healthcare workers' mental health during pandemics

Reference	Pandemic	Design	Aim	Intervention	Population	Intervention impacts
Aiello <i>et al</i> <sup>26</sup>	Influenza	Post evaluation	↑ resilience	Education session	HCWs	↑ coping
Amsalem <i>et al</i> <sup>33</sup>	COVID-19	RCT	↑ help-seeking	3 min video	HCWs with anxiety, depression or PTSD	↑ intention to seek treatment
Beverly <i>et al</i> <sup>39</sup>	COVID-19	Pre-post	↓ stress	3 min virtual reality	HCWs	↓ perceived stress
Blake <i>et al</i> <sup>29,49</sup>	COVID-19	Postevaluation survey ('20) Interviews ('21)	Support psychological well-being	Drop-in well-being centres	HCWs	↑ well-being and work place engagement/ positive view of centres
Chan <i>et al</i> <sup>42</sup>	COVID-19	Post evaluation	Support mental health	Virtual continuing medical education	Obstetric and gynaecology trainees	↑ coping
Chen <i>et al</i> <sup>28</sup>	SARS	Pre-post	↓ anxiety and depression, improve sleep	Multifactorial education, support and mental health	Nurses	↓ depression, anxiety; ↑ sleep quality
Cheng <i>et al</i> <sup>32</sup>	COVID-19	Validation	↑ positive emotions, team work; ↓ burnout	Mental health support	HCWs	mood 7–9/10. ↑ gains and ↓ challenges
Cole <i>et al</i> <sup>34</sup>	Ebola	Pre-post	↓ anxiety and depression	Small group cognitive-behavioural therapy	Past Ebola treatment staff with anxiety/ depression.	↓ anxiety, depression, functional impairment
De Kock <i>et al</i> <sup>44</sup>	COVID-19	RCT	↑ psychological health	Two different digital apps	HCWs	Both apps: ↓ anxiety and depression; one app: ↑ mental toughness
Dincer and Inangil <sup>46</sup>	COVID-19	RCT	↓ stress, anxiety and burnout	Emotional freedom technique	Nurses	↓ stress, anxiety and burnout
Fiol-DeRoque <i>et al</i> <sup>43</sup>	COVID-19	RCT	↓ depression, anxiety, stress, PTSD, burnout and insomnia, ↑ self-efficacy	Digital app	HCWs	No difference in primary or secondary outcomes
Giordano <i>et al</i> <sup>52</sup>	COVID-19	Pre-post	↓ stress and ↑ well-being	Music therapy and guided imagery	HCWs	↓ tiredness, sadness, fear and worry
Ha <i>et al</i> <sup>50</sup>	COVID-19	Cluster RCT	↑ physical activity and sleep quality	Mobile wellness: online exercise classes, weekly health coaching	Nurses	↑ sleep quality, intrinsic motivation to exercise and wellness
Hong <i>et al</i> <sup>31</sup>	COVID-19	Mixed methods	↑ stress management and psychological well-being	Practical support; clinical education; mental health support	HCWs	6% met cut-off for high level of distress

Continued

Table 3 Continued

Reference	Pandemic	Design	Aim	Intervention	Population	Intervention impacts
Kameno <i>et al</i> <sup>30</sup>	COVID-19	Pre-post	Support high-risk staff	Individual psychotherapy	Nurses	↓ psychological distress; ↑ anxiety sleep and appetite
Mauder <i>et al</i> <sup>27</sup>	Influenza	Pre-post	↑ support and training satisfaction, coping, pandemic-related self-efficacy; ↓ interpersonal problems	Computer assisted clinical education and relaxation training	HCWs	↑ pandemic perceived self-efficacy, confidence pandemic preparedness; ↓ interpersonal problems
Nourian <i>et al</i> <sup>48</sup>	COVID-19	RCT	↑ sleep quality	Mindfulness-based stress reduction	Nurses	No difference ↑ sleep subscales
Osman <i>et al</i> <sup>37</sup>	COVID-19	Mixed methods, pre-post	↓ stress, burnout and mindful awareness	Mindfulness sessions	HCWs and healthcare students	↓ stress; ↑ burnout, subscales
Sun <sup>40</sup>	COVID-19	RCT	↑ time management	Time management training; Balint group	Nurses	↓ Symptom Checklist Score and work stress; ↑ well-being
Thimmapuram <i>et al</i> <sup>47</sup>	COVID-19	RCT	↑ sleep and perceptions of loneliness	Heartfulness meditation practice	HCWs	↓ Loneliness; ↑ sleep quality
Trottier <i>et al</i> <sup>51</sup>	COVID-19	Uncontrolled trial	↓ anxiety, depression, and PTSD	Online-guided intervention	HCWs	↓ anxiety, depression, and PTSD
Wu and Wei <sup>35</sup>	COVID-19	Between-group observational	↓ stress and ↑ sleep	Exercise prescription	HCWs	↑ psychological stress and sleep
Yildirim and Çiriş Yildiz <sup>45</sup>	COVID-19	RCT	↓ stress, work-related strain and ↑ psychological well-being	Mindfulness-based breathing and music	Nurses	↓ stress-related and work-related strain ↑ psychological well-being
Zhan <i>et al</i> <sup>36</sup>	COVID-19	RCT	↓ anxiety and ↑ sleep	Tai Chi	HCWs	↑ sleep ↓ anxiety
Zhou <i>et al</i> <sup>41</sup>	COVID-19	Pre-post	↓ anxiety and depression	Mindfulness; Education; psychological support	Nurses	↓ anxiety
Zingela <i>et al</i> <sup>38</sup>	COVID-19	Descriptive	↑ coping, stress management	Education on mind care; relaxation; team care	HCWs	↑ coping, stress and anxiety management

HCW, healthcare worker; PTSD, Post Traumatic Stress Disorder; RCT, randomised controlled trial.

One intervention to improve mental health treatment seeking rather than mental health outcomes was assessed in a three-arm RCT.<sup>33</sup> Group 1 watched an intervention video two times (baseline; +14 days), group 2 watched it once (baseline) and the control group did not watch it. The intervention increased treatment-seeking intentions from pre viewing to 30 days post in both intervention groups with group 1 showing an increased intention to seek treatment. No data was presented that linked intention to seek treatment with translation into treatment seeking.

A range of interventions to directly improve mental health outcomes were studied. Seven studies explored elements of relaxation, mindfulness and meditation.<sup>37 39 45–48 52</sup> Three studies examined exercise-based interventions,<sup>35 36 50</sup> two each focused on cognitive-behavioural therapy (CBT)-based interventions<sup>34 51</sup> or mobile apps<sup>43 44</sup> and three explored other interventions.<sup>29 30 40 49</sup>

Four studies reported on mindfulness interventions with three involving multiweek interventions.<sup>37 47 48</sup> A 7-week RCT tested an online mindfulness-based stress reduction programme (weekly mindfulness-based exercise and mindfulness education), did not demonstrate any difference in sleep quality on the Pittsburgh Sleep Quality Index (PSQI<sup>57</sup>) total score, but some PSQI subscales showed improvement.<sup>48</sup> Osman *et al*<sup>37</sup> reported statistically significant improvements on the emotional exhaustion and personal accomplishment elements of the Maslach Burnout Inventory (MBI<sup>58</sup>) and in mean perceived stress, following 4 weekly, hour-long online mindfulness sessions. In a multisite RCT, online meditation, with participants listening to 6 min audio meditations two times daily for 4 weeks, improved sleep quality on the PSQI while remaining above the threshold for poor quality sleep and decreased loneliness on the University of California Los Angeles Loneliness Scale.<sup>47</sup> Yildirim and Çirış Yıldız<sup>45</sup> reported that a single 30 min, online, mindfulness-based breathing session decreased work-related strain and anxiety and improved psychological well-being.

Beverly *et al*<sup>49</sup> reported decreased HCWs stress on a visual analogue scale after viewing a 3 min immersive virtual reality nature scene using a pre–post design. Dincer and Inangil<sup>46</sup> showed that a 20 min online education session about the emotional freedom technique, where points on the skin are tapped to send activating and deactivating signals to the brain decreased stress (Subjective Units of Distress Scale), anxiety (State Anxiety Scale (SAS)) and burnout (Burnout Inventory) in an RCT.

Giordano *et al*<sup>52</sup> trialled a 5-week music therapy intervention with three 15–20 min playlists (breathing, tranquil and energy). In week 1, participants received generic playlists and at week's end they spoke with a music therapist who tailored a playlist. This process was repeated weekly over 4 weeks. The pre–post analysis showed statistically significant changes in tiredness, sadness, fear and worry using a bespoke instrument. Participants indicated

the presence of the music therapist was of greater help than the playlists however.

Three studies described exercise-based interventions.<sup>35 36 50</sup> Ha *et al*<sup>50</sup> described a 12-week fitness programme aiming to increase physical activity and improve sleep quality. In this RCT, the intervention group had access to online exercise classes, health coaching and were given step count targets, which significantly increased daily step counts but did not change sleep quality on the PSQI. Wu and Wei<sup>35</sup> reported on an exercise prescription where the intervention group were HCWs at a COVID-19-designated hospital and the control group were HCWs at a non-COVID-19-designated hospital. The authors did not provide any details regarding the nature of the exercise prescription or numerical outcome data. They stated that those who followed the exercise prescription had better sleep and stress than those that did not, but no measurement data was presented.

Zhan *et al*<sup>36</sup> reported in their RCT that 30 min of online Tai Chi, daily for 2 weeks, significantly improved sleep on the PSQI at day 14, compared against 30 min of free exercise, but did not alter anxiety outcomes on the Beck Anxiety Inventory.

Two studies investigated CBT-based interventions.<sup>34 51</sup> Cole *et al*<sup>34</sup> described a small group, post-pandemic, CBT-based intervention that involved six, 3-hour weekly, in-person small group CBT sessions supplemented by a workbook, for former Ebola Treatment Centre workers with evidence of anxiety, depression and/or PTSD. The intervention decreased depression on the Patient Health Questionnaire-9 (PHQ-9), functional impairment on the Work and Social Adjustment Scale and anxiety on the Generalised Anxiety Disorder-7 (GAD-7) in their non-randomised pre–post study. Trottier *et al*<sup>51</sup> reported preliminary findings from a self-directed online intervention in which participants completed eight, CBT-based modules over a maximum of 8 weeks. The 30-day outcomes, based on intention to intervene, showed improvements to anxiety on the GAD-7; depression on the PHQ-9; and Post Traumatic Stress Disorder PTSD on the Post Traumatic Stress Disorder Checklist (PCL-5), with large pre–post effect sizes reported (0.84–1.58). The sample was small and was not randomised, and it is unclear if these findings would be observed in a larger randomised sample.

Two studies reported on the use of digital apps.<sup>43 44</sup> De Kock *et al*<sup>44</sup> described a three-arm RCT comparing an existing digital app for HCWs psychological health called My Possible Self (MPS<sup>59</sup>); an app designed specifically for HCWs during the pandemic, called the National Health Service Highland Wellbeing Project (NHSWBP) app; and a wait list control. In the first 2 weeks, the NHSWBP app focused on happiness, resilience and well-being, and in the final 2 weeks focused on low mood and anxiety. The study was not appropriately powered for efficacy and there was substantial attrition (36.7%). Nonetheless, depression, on the PHQ-9, decreased in both the MPS (M: 6.76 SD: 5.04 to M: 5.18 SD: 3.27) and NHSWBP groups (M:



7.60 SD: 4.31 to M: 5.68 SD: 4.39), anxiety, on the GAD-7, decreased in only the NHSWBP group (M: 7.77 SD: 4.87 to M: 5.85 SD: 3.66) and mental toughness on the Mental Toughness Index, improved in the NHSWBP (M: 39.3 SD: 6.84 to M: 41.3 SD: 8.33) and control groups. All three groups showed improvements in mental well-being, on the Warwick-England Mental Well-Being Scale, and in gratitude, on the Gratitude Questionnaire.

An RCT evaluated the impact of 2 weeks of access to the PsyCovidApp on Depression, Anxiety and Stress Scale-21<sup>60</sup>, PTSD (Davidson Trauma Scale<sup>61</sup>), burnout (MBI<sup>58</sup>), insomnia (Insomnia Severity Index<sup>62</sup>) and self-efficacy (General Self-Efficacy Scale<sup>63</sup>).<sup>43</sup> PsyCovidApp is a CBT and mindfulness-based intervention over four content areas (emotional skills, healthy lifestyle, work stress and burnout, and social supports). The control group accessed an app with brief information about HCW's mental health during pandemics. No between-group differences were observed post intervention on primary outcomes.

Three studies used other interventions. One group<sup>29 49</sup> evaluated well-being centres designed to be relaxing spaces allowing quiet time and social interaction for employees, bank staff and volunteers in two UK acute hospital trusts. The centres were staffed by buddies, volunteers whose usual workload had decreased due to the pandemic, who were trained in psychological first-aid and able to provide mental health support information. The centres were evaluated via survey<sup>29</sup> and qualitative interviews.<sup>49</sup>

Using a non-randomised sample, the survey compared centre users to non-users, and of 819 respondents, 94% were aware of the centres and 55.2% had accessed a centre. Users and non-users reported similar job stressfulness, job satisfaction, turnover intention or presenteeism. Those who accessed the centres had higher well-being (Warwick Edinburgh Mental Wellbeing Scale, M: 47.04 (SD: 9.49) vs M: 45.11 (SD: 9.35)) and higher workplace engagement (Utrecht Work Engagement Scale (M: 5.02 (SD: 1.14) vs M: 4.83 (SD: 1.15))), although it cannot be determined if this reflects the intervention impact or pre-existing characteristics. Respondents appreciated the centres and described them as having a positive impact on their well-being. There was a strong desire for the centres to be retained post pandemic.

In the qualitative analysis<sup>49</sup> drawn from 24 interviews with centres users and operational staff, including managers and buddies, the centres were seen as an essential support and a source of pride in the NHS that addressed an unmet need. Staff described pre-pandemic well-being initiatives as focussing on healthy lifestyle changes rather than addressing the core issues that impact staff. Buddies described their role as an opportunity to contribute to the pandemic response when their usual role had decreased. Users appreciated the information buddies offered, being able to offload their worries and talking through coping strategies.

Kameno *et al*<sup>50</sup> reported that individual psychotherapy for nurses who were experiencing high levels

of psychological distress, decreased in distress over the following 2 months. Of 31 nurses screened, 8 met the inclusion criteria and 3 accepted psychotherapy. While the authors reported efficacy, the numbers were extremely small and reasons for refusing the intervention were not specified.

An RCT reported that a 16-week time management intervention involving 1-hour Balint groups that ran 1–2 times a week and weekly 40 min time management training over 8 weeks improved mental health, subjective well-being and stress response.<sup>40</sup> The intervention was poorly described, and the findings were presented using a paired t-test of the difference between the intervention and control group, with no data regarding the mean pre-post scores for each group.

Five studies reported interventions that included changes beyond the individual level.<sup>28 31 32 41 42</sup> Four of these involved multicomponent interventions. Chen *et al*<sup>28</sup> described an intervention for nursing staff in a Taiwanese SARS-designated hospital that included an epidemic prevention plan with in-service training to minimise transmission risk when caring for patients with SARS, staff allocation to ensure appropriate shift lengths and time away from work, adequate personal protection equipment (PPE) supplies, and the establishment of a mental health team to provide direct staff support. Participant's mental health was assessed using Zung's Self-Rating Anxiety Scale (SAS<sup>64</sup>) and Self-Rating Depression Scale (SDS<sup>65</sup>) and the PSQI<sup>57</sup> at four time points: pre intervention (T1), 2 weeks post intervention (T2), 1 month post intervention (T3) and 1 month after the hospital was no longer a designated SARS hospital (T4). Of 120 nurses surveyed, 116 completed questionnaires at all 4 time points. At T1, the mean scores on the SAS (M: 60 (SD: 9.28)) and SDS (M: 61 (SD: 12.62)) indicated moderate anxiety and depression, which reduced to mild anxiety and depression at T2 (SAS M: 51 (SD: 10.32); SDS (M: 51 (SD: 11.94)) and T3 (SAS M: 50 (SD: 9.84); SDS (M: 50 (SD: 10.60)) and to no anxiety or depression at T4 (SAS M: 46 (SD: 7.48); SDS (M: 48 (SD: 10.76))). Progressive improvements in sleep quality were observed at each follow-up time, but sleep quality remained above the threshold indicating poor quality sleep at all time points. There was no control condition making it difficult to determine the full impact of the intervention on outcomes.

Cheng *et al*<sup>32</sup> described a 5-module intervention including self-rate mood, positive self-feedback training, psychological peer-support, weekly psychiatry-led Balint group and active monitoring of well-being by a support team, for 155 HCWs from a Shanghai hospital who were sent to work in a COVID-19-designated hospital in Wuhan team. In the week after leaving Wuhan, while in quarantine, 125 HCWs completed follow-up questionnaires. Daily mood reports across the 6 weeks showed improvements, while daily challenges decreased. However, the number of HCWs who completed the daily self-reported mood ratings was low (median: 16). The authors concluded that the whole team maintained a positive outlook. There was no control condition.

A multifaceted intervention to improve stress management and protect the physiological and psychological well-being of HCWs was delivered to 105 staff in a Beijing tertiary hospital COVID-19 fever clinic.<sup>31 66</sup> To address concerns regarding SARS-CoV-2 transmission to family members, HCWs were provided with accommodation during their rostered workdays at the fever clinic and quarantine period. Families were supported where necessary. Personal protective equipment (PPE) and training to minimise transmission risk were provided, along with adjustments to the work roster, and a telephone hotline, staffed by psychiatrists and psychologists, was available from 9:00 to 21:00, 7 days a week. Feedback from the first 37 HCWs who participated was used to modify the intervention for the following 68 participants. The Impact of Events Scale-Revised<sup>67</sup> and a source of distress scale developed for use during the SARS outbreak in Hong Kong.<sup>31</sup> Source of distress scores were significantly higher for the first 37 HCWs (median: 0.50, IQR: 0.30–1.00 vs median: 0.33, IQR: 0.17–0.78). Decreased source of distress score for the second group may have reflected programme modifications but could have related to improved COVID-19 knowledge and clinic activity; without a control sample and appropriately powered study, this is difficult to establish.

Zhou *et al*<sup>41</sup> delivered an online and in-person training programme covering diagnosis, infection prevention and psychological support including mindfulness decompression for nurses designated to a COVID-19 ward which significantly decreased anxiety (SAS,<sup>64</sup> M: -3.06, SD: 10.54,  $p=0.019$ ) and non-significantly decreased depression (SDS,<sup>65</sup> M: -1.99, SD: 16.21,  $p=0.306$ ) from pre-post. The authors concluded that knowledge regarding infection prevention and psychological support decreased anxiety, but that not enough time had elapsed to decrease depression. The lack of a control condition makes it difficult to determine the observed outcomes to the intervention.

One intervention delivered virtual continuing medical education for 44 obstetrics and gynaecology trainees in Singapore to support trainee mental health to allow trainees to continue training and maintain skills when elective surgeries were cancelled.<sup>42</sup> Twenty-eight trainees completed a programme audit including three questions about well-being. The authors reported on only one question, with 75% of respondents indicating that the sessions helped them cope with the difficulties of team segregation.

Across the 26 studies, 41 mental health-focused outcome measures were reported with 30 only being used in 1 study each, 6 in 2 studies, 2 in 3 studies (Zung's Self-rating Anxiety Scale, Zung's Self-rating Depression Scale<sup>64 65</sup>), 2 in 4 studies (GAD-7, PHQ-9<sup>68 69</sup>) and 1 in 5 studies (PSQI<sup>57</sup>). Some studies used well recognised and validated instruments, whereas other studies used modified versions of existing instruments or developed their own instruments, with little presentation of how these instruments were developed or validated, if at all.

Trends can be seen in the outcomes across all of the included studies. Six studies demonstrated improvements in sleep,<sup>28 35 36 47 48 50</sup> three in well-being,<sup>29 40 45 49</sup> and two in coping<sup>38 42</sup> and in confidence.<sup>26 27</sup> Seven studies demonstrated decreased anxiety,<sup>28 34 36 41 44 46 51</sup> five decreased stress,<sup>35 37 39 45 46</sup> four decreased depression,<sup>28 34 44 51</sup> two decreased burnout<sup>37 46</sup> and one each decreased PTSD<sup>51</sup> and functional impairment.<sup>34</sup> The conclusions that can be drawn from these findings are limited, however, by the wide range of instruments used, variability in interventions and approaches, contextual factors, frequent lack of control data and the limited or incomplete data reported within papers.

## DISCUSSION

The COVID-19 pandemic has impacted all HCWs across the world, and this was most acutely experienced in hospital settings with the pandemic exacerbating the existing, and known, well-being and mental health challenges facing HCWs during their prepandemic work life. As successive waves of COVID-19 continue, it is essential that research evidence be rapidly distilled and updated to effectively support HCWs' mental health and well-being as the pandemic evolves and the challenges to HCWs mental health and well-being shift. Early pandemic well-being challenges were driven by the lack of information regarding infection prevention and effective treatment pathways, personal protective equipment (PPE) availability, no vaccines, infection risk and rapidly changing guidelines and protocols. HCWs experienced uncertainty regarding how to protect themselves and their loved ones, while caring for patients. Almost three years later, vaccination has significantly decreased the risk of severe disease and evidence regarding infection prevention and treatment is increasing. HCWs' well-being and mental health remain increasingly challenged on prepandemic conditions as they are still required to navigate uncertainty and the challenges of contested knowledge, against a background of high workloads, ongoing waves of COVID-19 infections and staffing shortages due to COVID-19 exposure and staff leaving the profession. This has all occurred in the context of high rates of prepandemic mental health challenges and high rates of burnout.<sup>1 70</sup>

This evidence review and synthesis has reported on a wide range of HCW's mental health and well-being interventions. It is encouraging that there is such a focus on supporting HCW's mental health, and most studies reported some positive impact of their interventions. The full impact on the psychological health and well-being of HCWs and promising approaches, however, are difficult to determine from the included studies as many were limited by pre-post study designs, small samples, a highly localised context and presented limited baseline or comparative data. Most interventions focused on individual behaviour and psychological change by fostering resilience to increase coping skills and offering additional support to those in crisis, rather than addressing the

factors HCWs identified as important such as adequate personal protective equipment (PPE), family and social supports and clear communication.<sup>2 14</sup> While some of the interventions have been developed by staff and colleagues, we did not observe any that had been co-developed for subsequent co-design with HCWs.

The evidence synthesis draws attention to two interconnected problems regarding work in this area: the gap between what HCWs want and the supports that are offered; and the variable quality of the reported research. Literature reviews on the mental health impacts of pandemics have concluded that social and practical support are important mechanisms for alleviating psychological distress and may be preferred to professional psychological support.<sup>2 3</sup> This was reported early in the pandemic by Chen *et al*<sup>71</sup> who interviewed HCWs and found that the psychological support intervention they offered did not address HCWs' self-identified concerns. Interviews with HCWs and social care workers in the UK found they valued practical support from their organisations during the COVID-19 pandemic including the provision of food, flexibility around work, clear communications and being consulted regarding their needs.<sup>7</sup> Direct psychological support was valued but was only one element in what was needed to support their mental health. Most included interventions focused on individual behaviour, fostering resilience to increase coping skills or offering psychological support to those in crisis.

This misalignment likely reflects complexity, and time and cost constraints organisations face especially if interventions require cultural change or reorganisation of existing systems. The COVID-19 pandemic forced healthcare systems to make rapid large-scale systemic and environmental changes including increased use of telehealth, social distancing measures, the wearing of personal protective equipment (PPE) and the cancellation of elective procedures. It is conceivable that systems, and people within these systems, would have struggled to accommodate further complex reorganisation at that time to fully respond to mental health needs. Second, many mental health and well-being interventions were locally driven by departments, groups and individuals within hospitals that the pandemic impacted and were developed with limited resourcing and with a sense of urgency. Many of the implemented interventions were developed pre pandemic and had existing gaps in the reported development, uptake, acceptability and efficacy.

Generating evidence within pandemics is understandably complex<sup>17</sup> as interventions are rapidly developed and deployed, participants are already burdened and the system is under strain. Our review excluded many papers describing interventions that did not present efficacy data. The included studies had variable design quality. Most studies had small samples and no indication of power, and only 10/26 studies included control data. Long-term follow-up was infrequent. There was significant heterogeneity in the interventions, reported outcomes, dosage description and rigour of the evaluations. The use

of proxy outcome measurements was common such that confidence was used as a proxy for resilience<sup>26 27</sup> and sleep quality as a proxy for mental health and well-being.<sup>48 50</sup>

Our search identified two HCW mobile mental health app studies designed specifically in response to the COVID-19.<sup>43 44</sup> Despite a good retention rate and being adequately powered, Fiol-DeRoque *et al*<sup>43</sup> demonstrated no difference in any of the primary or secondary outcomes aside from prespecified subgroup analysis. Given that participants only had access to the app for 2 weeks and no data was reported on app usage, the lack of impact could reflect low dosage both in terms of engagement and usage, and time to see a change. De Kock *et al*<sup>44</sup> showed their COVID-19-specific app was of greater benefit than a non-specific mental health app; however, there was a high attrition rate (36.7%) and the study was not powered for efficacy. Sample attrition is a concern in pandemic situations where high demands on HCWs are understandably likely to impact on research participation. These mixed findings indicate that there is some potential for HCW focused mental health mobile applications to be developed and implemented through pandemics; however, the app design needs to centre HCWs needs and use case to overcome pre-existing reluctance to access mental health and well-being supports<sup>1</sup> and time limitations in pandemic conditions. Methods such as experience-based codesign become highly relevant and central to the development of support interventions.<sup>22 23</sup>

The strength of this evidence synthesis is the breadth of search terms and the focus on studies only reporting HCWs mental health outcomes. Existing reviews of interventions<sup>2 7 13 18</sup> cited useful studies, and we acknowledge lessons learnt from their work. The use of digital techniques in responding to the COVID-19 pandemic provided an additional focus for the current review, as it aligned with the wider research being undertaken by our team.<sup>21</sup> We were also able to extend the date range for the literature search through to June 2022, to capture the range of initiatives applied in light of accrued knowledge about the virus, vaccine efficacy and HCWs' support preferences. Unlike previous reviews, the search extended to other pandemics apart from COVID-19 pandemic<sup>3 18</sup> and was solely focused on HCWs mental health.<sup>14</sup> A wide range of sources were searched including the Evidence for Policy and Practice Information Coordinating Centre (EPPI-Centre's) Living Systematic Map of the Evidence,<sup>72</sup> preprint servers, clinical trial registers and grey literature from reputable health sources. Outcomes were limited by the heterogeneity of and quality of the evidence, and we elected not to use a formal quality appraisal tool.

Reviews of interventions to improve HCW resilience<sup>4</sup> and decrease occupational stress<sup>5</sup> outside pandemics reported limited evidence with many studies lacking adequate numbers and longitudinal data, which is mirrored in this review. In future, researchers should better report population and intervention details (including the design components), ensure the studies are adequately powered and have a control condition.

Our findings reflect concerns raised previously regarding waste in research and, particularly, COVID-19 research that have been raised elsewhere.<sup>73 74</sup> While large-scale RCTs of HCW's mental health support interventions may be unfeasible in a pandemic context, other study designs, such as the adaptive trial design used by Chen *et al*,<sup>28</sup> would offer valuable information. In addition, real-time data collection methods and monitoring using remote methods should be further evaluated for application in pandemics.

## CONCLUSION

HCW's mental health support needs are clearly of increased prominence with 22 of the included studies conducted through COVID-19 and health organisations taking steps to address this challenge internationally. The next step is to develop proactive organisational responses that better align with HCWs' self-identified preferences for support particularly around social aspects. While individually focused supports are intuitively valuable, it can be counterintuitive to ignore potential systemic factors in HCW well-being, and place increased responsibility for mental health and well-being on an already burdened individual, with the unintended consequence of blame for a failure to maintain well-being. HCWs are highly time pressured, facing huge workloads and could struggle to incorporate activities such as exercise or mindfulness. In this context, the importance of experience-based co-design methods to support HCW's mental health and well-being must be emphasised as it seeks to understand the needs of end users and coproduce methods and modalities to best address identified needs. Through deep engagement with HCWs, we can gain an understanding of the work and life challenges they face through the pandemic and beyond in their lives, the challenges to their mental health and well-being and the best ways to provide access to mental health and well-being support.

## Author affiliations

<sup>1</sup>Primary Care Mental Health Research Program, Department of General Practice, Melbourne Medical School, The University of Melbourne Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne, Victoria, Australia

<sup>2</sup>The ALIVE National Centre for Mental Health Research Translation, Department of General Practice, Melbourne Medical School, The University of Melbourne Faculty of Medicine, Dentistry and Health Sciences, Melbourne, Victoria, Australia

<sup>3</sup>Department of Medicine, University of Melbourne, Melbourne, Victoria, Australia

<sup>4</sup>Department of Cardiology, The Royal Melbourne Hospital, Parkville, Victoria, Australia

<sup>5</sup>The Centre for Digital Transformation of Health Faculty of Medicine, Dentistry and Health Sciences, The University of Melbourne, Parkville, Vic, Australia

<sup>6</sup>The Department of Psychiatry, Melbourne Medical School, Faculty of Medicine, Dentistry and Health Sciences, The University of Melbourne, Parkville, Vic, Australia

<sup>7</sup>Emergency Medicine, The Royal Melbourne Hospital, Melbourne, Victoria, Australia

**Twitter** Victoria J Palmer @VictoriaJPalmer

**Contributors** VJP and LJB conceptualised the evidence review and synthesis. VJP, LJB, KR-B and CG developed the search criteria. KR-B and CG performed the searches. CG performed the updated search and wrote the literature synthesis search strategies. KR-B, CG, VJP and ML screened abstracts and manuscripts and extracted the data using Covidence. JP supported data extraction. KR-B analysed

the data, with input from CG, VJP, LJB, ML and AK. KR-B drafted the manuscript with ML and input from CG, VJP, LJB, AK, JP, MO and CJ. All authors (KR-B, CG, VJP, LJB, ML, AK, JP, MO and CJ) read and revised the whole manuscript. VJP is the gaurantor of the data.

**Funding** This research was funded by a grant from the Australian Government Department of Health, the Peter Doherty Philanthropic Trust Fund, the Royal Melbourne Hospital and the University of Melbourne.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not applicable.

**Ethics approval** Institutional ethics was not required as this project did not involve human or animal participants.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** No data are available.

**Supplemental material** This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

## ORCID iDs

Matthew Lewis <http://orcid.org/0000-0001-7973-0716>

Caroline Johnson <http://orcid.org/0000-0002-4755-7514>

Victoria J Palmer <http://orcid.org/0000-0001-7212-932X>

## REFERENCES

- Petrie K, Crawford J, Baker STE, *et al*. Interventions to reduce symptoms of common mental disorders and suicidal ideation in physicians: a systematic review and meta-analysis. *Lancet Psychiatry* 2019;6:225–34.
- Kisely S, Warren N, McMahon L, *et al*. Occurrence, prevention, and management of the psychological effects of emerging virus outbreaks on healthcare workers: rapid review and meta-analysis. *BMJ* 2020;369:m1642.
- Muller AE, Hafstad EV, Himmels JPW, *et al*. The mental health impact of the covid-19 pandemic on healthcare workers, and interventions to help them: a rapid systematic review. *Psychiatry Res* 2020;293:113441.
- Kunzler AM, Helmreich I, Chmitorz A, *et al*. Psychological interventions to foster resilience in healthcare professionals. *Cochrane Database of Systematic Reviews* 2020, 2020. Available: <https://search.ebscohost.com/login.aspx?direct=true&AuthType=ss&o&db=edspsc&AN=000568666400016&site=eds-live&scope=site&custid=s2775460> [Accessed 05 Aug 2020].
- Ruotsalainen JH, Verbeek JH, Mariné A, *et al*. Preventing occupational stress in healthcare workers. *Cochrane Database Syst Rev* 2015;2015:4.
- Nguyen LH, Drew DA, Graham MS, *et al*. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. *Lancet Public Health* 2020;5:e475–83.
- Billings J, Ching BCF, Gkofa V, *et al*. Experiences of frontline healthcare workers and their views about support during COVID-19 and previous pandemics: a systematic review and qualitative meta-synthesis. *BMC Health Serv Res* 2021;21:923.
- Sharifi M, Asadi-Pooya AA, Mousavi-Roknabadi RS. Burnout among healthcare providers of COVID-19: a systematic review of epidemiology and recommendations. *Arch Acad Emerg Med* 2021;9:e7.

- 9 Greenberg N, Docherty M, Gnanapragasam S, *et al.* Managing mental health challenges faced by healthcare workers during covid-19 pandemic. *BMJ* 2020;368:m1211.
- 10 Tomlin J, Dalgleish-Warburton B, Lamph G. Psychosocial support for healthcare workers during the COVID-19 pandemic. *Front Psychol* 2020;11:1960.
- 11 Lokuge A. *Racing Against the Virus from Inside Australia's Healthcare System.* The New York Times, 2020.
- 12 Lokuge A. *A doctor asks: is Covid Scaring us away from our humanity?* The New York Times, 2020.
- 13 Pollock A, Campbell P, Cheyne J, *et al.* Interventions to support the resilience and mental health of frontline health and social care professionals during and after a disease outbreak, epidemic or pandemic: a mixed methods systematic review. *Cochrane Database Syst Rev* 2020;11:CD013779.
- 14 Yue J-L, Yan W, Sun Y-K, *et al.* Mental health services for infectious disease outbreaks including COVID-19: a rapid systematic review. *Psychol Med* 2020;50:2498–513.
- 15 American Medical A. Caring for our caregivers during COVID-19, 2020. Available: <https://www.ama-assn.org/delivering-care/public-health/caring-our-caregivers-during-covid-19> [Accessed 03 Nov 2020].
- 16 World Health Organization. Mental health and psychosocial considerations during the COVID-19 outbreak, 2020. Available: [https://www.who.int/docs/default-source/coronaviruse/mental-health-considerations.pdf?sfvrsn=6d3578af\\_2](https://www.who.int/docs/default-source/coronaviruse/mental-health-considerations.pdf?sfvrsn=6d3578af_2)
- 17 Yang L, Yin J, Wang D, *et al.* Urgent need to develop evidence-based self-help interventions for mental health of healthcare workers in COVID-19 pandemic. *Psychol Med* 2021;51:1775–6.
- 18 Drissi N, Ouhbi S, Marques G, *et al.* A systematic literature review on e-Mental health solutions to assist health care workers during COVID-19. *Telemed J E Health* 2021;27:594–602.
- 19 Moreno C, Wykes T, Galderisi S, *et al.* How mental health care should change as a consequence of the COVID-19 pandemic. *Lancet Psychiatry* 2020;7:813–24.
- 20 Chang BP, Kessler RC, Pincus HA, *et al.* Digital approaches for mental health in the age of covid-19. *BMJ* 2020;369:m2541.
- 21 Lewis M, Palmer VJ, Kotevski A, *et al.* Rapid design and delivery of an experience-based Co-designed mobile APP to support the mental health needs of health care workers affected by the COVID-19 pandemic: impact evaluation protocol. *JMIR Res Protoc* 2021;10:e26168.
- 22 Bate P, Robert G. Experience-Based design: from redesigning the system around the patient to co-designing services with the patient. *Qual Saf Health Care* 2006;15:307–10.
- 23 Dimopoulos-Bick T, Dawda P, Verma R, *et al.* Experience-Based Co-Design: tackling common challenges. *The Journal of Health Design* 2018;3:86–93.
- 24 McKenzie JE, Brennan SE. Chapter 12: Synthesizing and presenting findings using other methods. In: Higgins JPT, Thomas J, Chandler J, *et al.*, eds. *Cochrane Handbook for systematic reviews of interventions version 6-2.* Cochrane, 2021.
- 25 Veritas Health Innovation. Covidence systematic review software: Melbourne, Australia, 2022. Available: [www.covidence.org](http://www.covidence.org) [Accessed Aug 2022].
- 26 Aiello A, Khayeri MY-E, Raja S, *et al.* Resilience training for hospital workers in anticipation of an influenza pandemic. *J Contin Educ Health Prof* 2011;31:15–20.
- 27 Maunder RG, Lancee WJ, Mae R, *et al.* Computer-Assisted resilience training to prepare healthcare workers for pandemic influenza: a randomized trial of the optimal dose of training. *BMC Health Serv Res* 2010;10:72.
- 28 Chen R, Chou K-R, Huang Y-J, *et al.* Effects of a SARS prevention programme in Taiwan on nursing staff's anxiety, depression and sleep quality: a longitudinal survey. *Int J Nurs Stud* 2006;43:215–25.
- 29 Blake H, Yildirim M, Wood B, *et al.* COVID-Well: evaluation of the implementation of supported wellbeing centres for hospital employees during the COVID-19 pandemic. *Int J Environ Res Public Health* 2020;17:9401.
- 30 Kamenoy Y, Hanada A, Asai D, *et al.* Individual psychotherapy using psychological first aid for frontline nurses at high risk of psychological distress during the COVID-19 pandemic. *Psychiatry Clin Neurosci* 2021;75:25–7.
- 31 Hong X, Cao J, Wei J, *et al.* Stress and psychological impact of the COVID-19 outbreak on the healthcare staff at the fever clinic of a tertiary General Hospital in Beijing: a cross-sectional study. *BJPsych Open* 2021;7:e76.
- 32 Cheng W, Zhang F, Liu Z, *et al.* A psychological health support scheme for medical teams in COVID-19 outbreak and its effectiveness. *Gen Psychiatr* 2020;33:e100288.
- 33 Amsalem D, Lazarov A, Markowitz JC, *et al.* Video intervention to increase treatment-seeking by healthcare workers during the COVID-19 pandemic: randomised controlled trial. *Br J Psychiatry* 2022;220:14–20.
- 34 Cole CL, Waterman S, Hunter ECM, *et al.* Effectiveness of small group cognitive behavioural therapy for anxiety and depression in Ebola treatment centre staff in Sierra Leone. *Int Rev Psychiatry* 2021;33:189–97.
- 35 Wu K, Wei X. Analysis of psychological and sleep status and exercise rehabilitation of front-line clinical staff in the fight against COVID-19 in China. *Med Sci Monit Basic Res* 2020;26:e924085.
- 36 Zhan J, Yang K, Sun Z, *et al.* The sleep quality of the frontline healthcare workers and the improving effect of tai chi. *Front Psychiatry* 2022;13:883590.
- 37 Osman I, Hamid S, Singaram VS. Efficacy of a brief online mindfulness-based intervention on the psychological well-being of health care professionals and trainees during the COVID-19 pandemic: a mixed method design. *Health SA* 2021;26:1682.
- 38 Zingela Z, van Wyk S, Bronkhorst A, *et al.* Developing a healthcare worker psychological preparedness support programme for the COVID-19 outbreak. *S Afr J Psychiatr* 2022;28:1665.
- 39 Beverly E, Hommemma L, Coates K, *et al.* A tranquil virtual reality experience to reduce subjective stress among COVID-19 frontline healthcare workers. *PLoS One* 2022;17:e0262703.
- 40 Sun L. Intervention effect of time management training on nurses' mental health during the COVID-19 epidemic. *Psychiatr Danub* 2021;33:626–33.
- 41 Zhou M, Yuan F, Zhao X, *et al.* Research on the individualized short-term training model of nurses in emergency isolation wards during the outbreak of COVID-19. *Nurs Open* 2020;7:1902–8.
- 42 Chan GMF, Kanneganti A, Yasin N, *et al.* Well-Being, obstetrics and gynaecology and COVID-19: leaving no trainee behind. *Aust N Z J Obstet Gynaecol* 2020;60:983–6.
- 43 Fiol-DeRoque MA, Serrano-Ripoll MJ, Jiménez R, *et al.* A mobile Phone-Based intervention to reduce mental health problems in health care workers during the COVID-19 pandemic (PsyCovidApp): randomized controlled trial. *JMIR Mhealth Uhealth* 2021;9:e27039.
- 44 De Kock JH, Latham HA, Cowden RG, *et al.* Brief digital interventions to support the psychological well-being of NHS staff during the COVID-19 pandemic: 3-Arm pilot randomized controlled trial. *JMIR Ment Health* 2022;9:e34002.
- 45 Yıldırım D, Çirış Yıldız C. The effect of Mindfulness-Based breathing and music therapy practice on nurses' stress, work-related strain, and psychological well-being during the COVID-19 pandemic: a randomized controlled trial. *Holist Nurs Pract* 2022;36:156–65.
- 46 Dincer B, Inangil D. The effect of Emotional Freedom Techniques on nurses' stress, anxiety, and burnout levels during the COVID-19 pandemic: A randomized controlled trial. *EXPLORE* 2021;17:109–14.
- 47 Thimmapuram J, Pargament R, Bell T, *et al.* Heartfulness meditation improves loneliness and sleep in physicians and advance practice providers during COVID-19 pandemic. *Hosp Pract* 2021;49:194–202.
- 48 Nourian M, Nikfarid L, Khavari AM, *et al.* The impact of an online Mindfulness-Based stress reduction program on sleep quality of nurses working in COVID-19 care units: a clinical trial. *Holist Nurs Pract* 2021;35:257–63.
- 49 Blake H, Gupta A, Javed M, *et al.* COVID-Well study: qualitative evaluation of supported wellbeing centres and psychological first aid for healthcare workers during the COVID-19 pandemic. *Int J Environ Res Public Health* 2021;18:27.
- 50 Ha Y, Lee S-H, Lee D-H, *et al.* Effectiveness of a mobile wellness program for nurses with rotating shifts during COVID-19 pandemic: a pilot cluster-randomized trial. *Int J Environ Res Public Health* 2022;19:11.
- 51 Trottier K, Monson CM, Kaysen D, *et al.* Initial findings on restore for healthcare workers: an internet-delivered intervention for COVID-19-related mental health symptoms. *Transl Psychiatry* 2022;12:7.
- 52 Giordano F, Scarlata E, Baroni M, *et al.* Receptive music therapy to reduce stress and improve wellbeing in Italian clinical staff involved in COVID-19 pandemic: a preliminary study. *Arts Psychother* 2020;70:101688.
- 53 Brooks SK, Dunn R, Amlôt R, *et al.* A systematic, thematic review of social and occupational factors associated with psychological outcomes in healthcare employees during an infectious disease outbreak. *J Occup Environ Med* 2018;60:248–57.
- 54 De Brier N, Stroobants S, Vandekerckhove P, *et al.* Factors affecting mental health of health care workers during coronavirus disease outbreaks (SARS, MERS & COVID-19): A rapid systematic review. *PLoS One* 2020;15:e0244052.
- 55 Preti E, Di Mattei V, Perego G, *et al.* The psychological impact of epidemic and pandemic outbreaks on healthcare workers: rapid review of the evidence. *Curr Psychiatry Rep* 2020;22:43.

- 56 Serrano-Ripoll MJ, Meneses-Echavez JF, Ricci-Cabello I, *et al.* Impact of viral epidemic outbreaks on mental health of healthcare workers: a rapid systematic review and meta-analysis. *J Affect Disord* 2020;277:347–57.
- 57 Buysse DJ, Reynolds CF, Monk TH, *et al.* The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research. *Psychiatry Res* 1989;28:193–213.
- 58 Maslach C, Jackson SE. The measurement of experienced burnout. *J Organ Behav* 1981;2:99–113.
- 59 Proudfoot J, Clarke J, Birch M-R, *et al.* Impact of a mobile phone and web program on symptom and functional outcomes for people with mild-to-moderate depression, anxiety and stress: a randomised controlled trial. *BMC Psychiatry* 2013;13:312.
- 60 Lovibond SH, Lovibond PF. *Manual for the depression anxiety stress scales*. 2nd. ed. Sydney: Psychology Foundation, 1995.
- 61 Davidson J. *Davidson Trauma scale*. Multi-Health Systems, Inc, 1996.
- 62 Morin CM, Belleville G, Bélanger L, *et al.* The insomnia severity index: psychometric indicators to detect insomnia cases and evaluate treatment response. *Sleep* 2011;34:601–8.
- 63 Herrero R, Espinoza M, Molinari G, *et al.* Psychometric properties of the general self Efficacy-12 scale in Spanish: general and clinical population samples. *Compr Psychiatry* 2014;55:1738–43.
- 64 Zung WW. A rating instrument for anxiety disorders. *Psychosomatics* 1971;12:371–9.
- 65 Zung WW. A self-rating depression scale. *Arch Gen Psychiatry* 1965;12:63–70.
- 66 Cao J, Wei J, Zhu H, *et al.* A study of basic needs and psychological wellbeing of medical workers in the fever clinic of a tertiary General Hospital in Beijing during the COVID-19 outbreak. *Psychother Psychosom* 2020;89:252–4.
- 67 Weiss DS, Marmar CR. The Impact of Event Scale-Revised. In: Wilson JP, Keane TM, eds. *Assessing Psychological Trauma and PTSD: A Practitioner's Handbook*. New York: Guilford Press, 1997: 399–411.
- 68 Spitzer RL, Kroenke K, Williams JBW, *et al.* A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med* 2006;166:1092–7.
- 69 Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med* 2001;16:606–13.
- 70 Milner AJ, Maheen H, Bismark MM, *et al.* Suicide by health professionals: a retrospective mortality study in Australia, 2001–2012. *Med J Aust* 2016;205:260–5.
- 71 Chen Q, Liang M, Li Y, *et al.* Mental health care for medical staff in China during the COVID-19 outbreak. *Lancet Psychiatry* 2020;7:e15–16.
- 72 EPPI Centre. *COVID-19: a living systematic map of the evidence*. United Kingdom: EPPI Centre, 2020. <http://eppi.ioe.ac.uk/cms/Projects/DepartmentofHealthandSocialCare/Publishedreviews/COVID-19LivingSystematicMapoftheEvidence/tabid/3765/Default.aspx>
- 73 Glasziou PP, Sanders S, Hoffmann T. Waste in covid-19 research. *BMJ* 2020;369:m1847.
- 74 Janiaud P, Axfors C, Van't Hooft J, *et al.* The worldwide clinical trial research response to the COVID-19 pandemic - the first 100 days. *F1000Res* 2020;9:1193.