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

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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, healthcare 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 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.

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.

INTRODUCTION

Healthcare workers (HCWs) experience high levels of mental distress, which increases through pandemics. Pandemic-related mental health and well-being impacts have been reported, but as increased rates of anxiety, depression, moral distress and post-traumatic stress disorders and occupational stress are identified as a consequence of COVID-19, mental health and well-being supports for HCWs are becoming paramount.

Early in the pandemic, emotional distress and cumulative load were being driven by increased risk of COVID-19 infection, radically altered healthcare systems and practices and the impact
of physical distancing on professional team interactions and patient relationships. 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. 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. 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. 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.

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. 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. 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. Reviews have indicated an increased need for technological innovation and digital interventions following the COVID-19 pandemic. 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.

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). The project used experience-based codesign (EBCD), 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. 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.

We used the Cochrane approach to evidence synthesis where meta-analysis is not appropriate and applied a narrative evidence synthesis method. 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 been designed and implemented to support HCWs’ mental health and well-being during pandemics?

**METHOD**

Following the narrative evidence synthesis method, 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, 2605 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. 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.
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. 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, related to influenza, and 1 study to SARS and 1 to Ebola. 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, 23 described interventions delivered...
during pandemics and I described a post-pandemic intervention. These can be broadly be 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. 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 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 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.

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

Twenty-four studies reported mental health outcomes for interventions delivered during or after a pandemic. 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.
| Reference         | Pandemic | Design                      | Aim                        | Intervention                                      | Population                      | Intervention impacts                      |
|-------------------|----------|-----------------------------|----------------------------|--------------------------------------------------|---------------------------------|-------------------------------------------|
| Aiello et al      | Influenza| Post evaluation             | ↑ resilience               | Education session                                | HCWs                            | ↑ coping                                  |
| Amsalem et al     | COVID-19 | RCT                         | ↑ help-seeking             | 3 min video                                      | HCWs with anxiety, depression or PTSD | ↑ intention to seek treatment             |
| Beverly et al     | COVID-19 | Pre–post                    | ↓ stress                   | 3 min virtual reality                            | HCWs                            | ↓ perceived stress                        |
| Blake et al       | COVID-19 | Postevaluation survey        | Support psychological well-being | Drop-in well-being centres Cel  | HCWs                            | ↑ well-being and workplace engagement/ positive view of centres |
|                   |          | ('20) Interviews ('21)      |                            |                                                  |                                 |                                          |
| Chan et al        | COVID-19 | Post evaluation             | Support mental health      | Virtual continuing medical education            | Obstetric and gynaecology trainees | ↑ coping                                  |
| Chen et al        | SARS     | Pre–post                    | ↓ anxiety and depression, improve sleep | Multifactorial education, support and mental health | Nurses                          | ↓ depression, anxiety; ↑ sleep quality    |
| Cheng et al       | COVID-19 | Validation                  | ↑ positive emotions, teamwork; ↓ burnout | Mental health support                            | HCWs                            | mood 7–9/10. ↑ gains and ↓ challenges    |
| Cole et al        | Ebola    | Pre–post                    | ↓ anxiety and depression   | Small group cognitive–behavioural therapy         | Past Ebola treatment staff with anxiety/depression. | ↓ anxiety, depression, functional impairment |
| De Kock et al     | COVID-19 | RCT                         | ↑ psychological health     | Two different digital apps                      | HCWs                            | Both apps: ↓ anxiety and depression; one app: ↑ mental toughness |
| Dincer and Inangil| COVID-19 | RCT                         | ↓ stress, anxiety and burnout | Emotional freedom technique                     | Nurses                          | ↓ stress, anxiety and burnout            |
| Fiol-DeRoque et al| COVID-19 | RCT                         | ↓ depression, anxiety, stress, PTSD, burnout and insomnia, ↑ self-efficacy | Digital app                                 | HCWs                            | No difference in primary or secondary outcomes |
| Giordano et al    | COVID-19 | Pre–post                    | ↓ stress and ↑ well-being | Music therapy and guided imagery                 | HCWs                            | ↓ tiredness, sadness, fear and worry     |
| Ha et al          | 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 et al        | 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
| Reference         | Pandemic | Design          | Aim                                            | Intervention                                                                 | Population                  | Intervention impacts                                                                 |
|-------------------|----------|-----------------|------------------------------------------------|-------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------|
| Kameno et al      | COVID-19 | Pre–post        | Support high-risk staff                        | Individual psychotherapy                                                       | Nurses                     | ↓ psychological distress; ↑ anxiety sleep and appetite                                |
| Maunder et al     | Influenza| Pre–post        | ↑ support and training satisfaction, coping,   | Computer assisted clinical education and relaxation training                   | HCWs                      | ↑ pandemic perceived self-efficacy, confidence pandemic preparedness; ↓ interpersonal problems |
| Nourian et al     | COVID-19 | RCT             | ↑ sleep quality                                | Mindfulness-based stress reduction                                            | Nurses                     | No difference ↑ sleep subscales                                                      |
| Osman et al       | COVID-19 | Mixed methods,  | ↓ stress, burnout and mindful awareness        | Mindfulness sessions                                                           | HCWs and healthcare students| ↓ stress; ↑ burnout, subscales                                                       |
| Sun               | COVID-19 | RCT             | ↑ time management                              | Time management training; Balint group                                         | Nurses                     | ↓ Symptom Checklist Score and work stress; ↑ well-being                               |
| Thimmapuram et al | COVID-19 | RCT             | ↑ sleep and perceptions of loneliness          | Heartfulness meditation practice                                               | HCWs                      | ↓ Loneliness; ↑ sleep quality                                                       |
| Trottier et al    | COVID-19 | Uncontrolled    | ↓ anxiety, depression, and PTSD                | Online-guided intervention                                                     | HCWs                      | ↓ anxiety, depression, and PTSD                                                       |
| Wu and Wei        | COVID-19 | Between-group   | ↓ stress and ↑ sleep                           | Exercise prescription                                                          | HCWs                      | ↑ psychological stress and sleep                                                      |
| Yıldırım and Çirış| 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 et al        | COVID-19 | RCT             | ↓ anxiety and ↑ sleep                          | Tai Chi                                                                       | HCWs                      | ↑ sleep ↓ anxiety                                                                    |
| Zhou et al        | COVID-19 | Pre–post        | ↓ anxiety and depression                       | Mindfulness; Education; psychological support                                 | Nurses                     | ↓ anxiety                                                                            |
| Zingela et al     | 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.35 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.37 39 45–48 52 Three studies examined exercise-based interventions,35 36 50 two each focused on cognitive–behavioural therapy (CBT)-based interventions34 51 or mobile apps43 44 and three explored other interventions.29 30 40 49

Four studies reported on mindfulness interventions with three involving multiweek interventions.37 47 49 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)45 total score, but some PSQI subscales showed improvement.48 Osman et al47 reported statistically significant improvements on the emotional exhaustion and personal accomplishment elements of the Maslach Burnout Inventory (MBI)46 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.47 Yıldırım and Çiriş Yıldız45 reported that a single 30 min, online, mindfulness-based breathing session decreased work-related strain and anxiety and improved psychological well-being.

Beverly et al46 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 İnançı45 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 the Skin) and burnout (Burnout Inventory) in an RCT.

Giordano et al52 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.35 36 50 Ha et al60 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 Wei35 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 al56 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.34 51 Cole et al44 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 al41 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.43 44 De Kock et al44 described a three-arm RCT comparing an existing digital app for HCWs psychological health called My Possible Self (MPS39); 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, PTSD (Davidson Trauma Scale), burnout (MBI), insomnia (Insomnia Severity Index) and self-efficacy (General Self-Efficacy Scale). 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 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 and qualitative interviews.

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, drawn from 24 interviews with centre 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 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 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. 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. Four of these involved multicomponent interventions. Chen et al 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) and Self-Rating Depression Scale (SDS) and the PSQI 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 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. \textsuperscript{31} 66 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\textsuperscript{37} and a source of distress scale developed for use during the SARS outbreak in Hong Kong\textsuperscript{31} 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\textsuperscript{41} 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,\textsuperscript{64} M: −3.06, SD: 10.54, p=0.019) and non-significantly decreased depression (SDS,\textsuperscript{65} 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.\textsuperscript{12} 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\textsuperscript{64 65}, 2 in 4 studies (GAD-7, PHQ-9\textsuperscript{68 69}) and 1 in 5 studies (PSQI\textsuperscript{37})). 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,\textsuperscript{28 35 36 47 48 50} three in well-being,\textsuperscript{29 40 45 46} and two in coping.\textsuperscript{38 42} Seven studies demonstrated decreased anxiety,\textsuperscript{28 34 36 41 44 46 51} five decreased stress,\textsuperscript{33 37 39 45 46} four decreased depression,\textsuperscript{28 34 44 51} two decreased burnout,\textsuperscript{37 46} and one each decreased PTSD\textsuperscript{31} and functional impairment.\textsuperscript{34} 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.\textsuperscript{170} 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. 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 inter-connected 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. This was reported early in the pandemic by Chen et al. 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. 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 intervention 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 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 and sleep quality as a proxy for mental health and well-being.

Our search identified two HCW mobile mental health app studies designed specifically in response to the COVID-19. Despite a good retention rate and being adequately powered, Fiol-DeRoque et al. 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. 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 though 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 and time limitations in pandemic conditions. Methods such as experience-based codesign become highly relevant and central to the development of support interventions.

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 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. 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 and was solely focused on HCWs mental health. A wide range of sources were searched including the Evidence for Policy and Practice Information Coordinating Centre’s (EPPi-Centre’s) Living Systematic Map of the Evidence, 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 and decrease occupational stress 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. 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, 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 codeign 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.

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