Psychological Impact of an Epidemic/Pandemic on the Mental Health of Healthcare Professionals: A Rapid Review

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Abstract

Background: Epidemics or pandemics, such as the current Coronavirus Disease 2019 (COVID-19) crisis, pose unique challenges to healthcare professionals (HCPs). Caring for patients during an epidemic/pandemic may impact negatively on the mental health of HCPs. There is a lack of evidence-based advice on what would be effective in mitigating this impact. Objectives: This rapid review synthesizes the evidence on the psychological impact of pandemics/epidemics on the mental health of HCPs, what factors predict this impact, and the evidence of prevention/intervention strategies to reduce this impact. Method: According to rapid review guidelines, systematic searches were carried out in Embase.com, PubMed, APA PsycINFO-Ovid SP, and Web of Science (core collection). Searches were restricted to the years 2003 or later to ensure inclusion of the most recent epidemic/pandemics, such as Severe Acute Respiratory Syndrome (SARS). Papers written in French or English, published in peer-reviewed journals, and of quantitative design using validated measures of mental health outcomes were included. Of 1308 papers found, 48 were included. The full protocol for this rapid review was registered with Prospero (reg.no.CRD42020175985). Results: Results show that exposed HCPs working with patients during an epidemic/pandemic are at heightened risk of mental health problems in the short and longer term, particularly: psychological distress, insomnia, alcohol/drug misuse, and symptoms of posttraumatic stress disorder (PTSD), depression, anxiety, burnout, anger, and higher perceived stress. These mental health problems are predicted by organizational, social, personal, and psychological factors and may interfere with the quality of patient care. Few evidence-based early interventions exist so far. Discussion: Several recommendations relevant during and after an epidemic/pandemic, such as COVID-19, and in preparation for a future outbreak, are proposed.

Background

Epidemics or pandemics, such as the current COVID-19 crisis, pose a significant threat to public health. This sudden outbreak of a novel, highly contagious disease, is unpredictable and associated with high morbidity and mortality rates [1]. An epidemic (or outbreak) is the "occurrence in a community or region of cases of an illness... clearly in excess of normal expectancy" [2, p. 3], and a pandemic (or large scale outbreak) is "a large epidemic", "best reserved for infectious diseases." [3, p. 1020]. Compared to other large-scale disasters, epidemics/pandemics pose unique challenges to HCPs, as the treatment course is often yet unknown, social isolation is required following presentation of first symptoms, and frontline HCPs not only fear for the safety of their patients, but also for their own health, and that of their close family members. Furthermore, many HCPs are suddenly required to carry out unfamiliar tasks in an unfamiliar area of care, such as high-risk, high-intensity units, all of which are likely to be associated with elevated levels of psychological distress [4]. These characteristics of an outbreak reduce the availability of social support, including support from their colleagues and their family, which is known to buffer the negative impact of stress [4].

Why is this review needed?

Caring for patients during an epidemic/pandemic may impact negatively on the mental health of HCPs [5, 6]. While studies on this impact exist, this literature has yet to be updated and fully synthesized alongside a review of potential risk and protective factors. Understanding this mental health impact would sensitize policy makers and governance bodies about the importance of considering the mental health needs of HCPs in the preparations for, during, and in the aftermath of such outbreaks. Furthermore, there is a lack of evidence-based advice on what would be effective in mitigating this impact, calling for a synthesis of the evidence on prevention/intervention strategies.

We therefore conducted a rapid review on the psychological impact of pandemics/epidemics on the mental health of HCPs, what factors may protect or increase the risk of this impact and what evidence there is for prevention/intervention strategies to reduce this impact.

Methods

The full protocol for this rapid review was registered with Prospero (reg.no.CRD42020175985). A rapid review is defined as a form of synthesis that streamlines or omits methods for a systematic review in order to produce evidence for stakeholders [7]. Therefore, the number of reviewers conducting each phase of the screening differed from that of a traditional systematic review and no formal study quality evaluation took place (see [7] for guidelines). However, a rapid review was deemed the method of choice in order to support decision makers in a timely manner on how the mental health of their HCPs during the current COVID-19 crisis can be protected.

Search Strategy and Selection Criteria

Following rapid review guidelines [7], systematic searches were carried out on the 22nd March 2020 on the databases Embase.com, PubMed, APA PsycINFO - Ovid SP, Web of Science (core collection). An additional search was performed in Google Scholar, followed by citation tracking of included studies. Searches were restricted to the years 2003 or later, ensuring inclusion of the most recent epidemic/pandemics, such as SARS. The search was based on a combination of terms related to "healthcare professional" (e.g., "healthcare provider"), "disease outbreak" (e.g., "pandemic") and "mental health" (e.g., "depression"). It included (but was not limited to) the following epidemics/pandemics that occurred from 2003 onwards: COVID-19, severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), influenza pandemic (H1N1), avian influenza (H5N1), and West Nile Fever (see Supplementary Materials: Appendix 1 for the full search algorithms).

For inclusion, papers had to be written in French or English, published in peer-reviewed journals, and present quantitative data including validated measures of mental health outcomes. Measures were judged to be valid if there was psychometric information available confirming their validity and reliability. Modified versions of validated measures were accepted if the modification entailed adapted instructions for a specific scenario/trauma/population. Intervention studies were included if the design allowed the assessment of the effectiveness of the intervention on mental health outcomes. Studies were included when HCPs
worked directly with infected/suspected patients in hospitals or in communities during the outbreak (exposed). Mixed methods studies were included if quantitative data could be separated from qualitative data. Studies did not have to contain a control group for inclusion. Conference abstracts, opinion pieces, editorials, and letters were excluded, as were (reviews of) qualitative studies. Titles, abstracts and then full texts were screened by one researcher. Where the researcher was unsure of eligibility, the paper was passed through to the next phase of screening to allow further scrutiny. For each accepted article after full-text screening, two researchers carried out data extraction at different times, and a third one checked for and resolved any discrepancies. All journals of accepted papers were verified as being peer-reviewed journals through Ulrich's Global Serials Directory, or on the website of the journal by a specialist librarian. To provide an idea of quality, one researcher applied an informal grading system to all accepted primary studies: 1a longitudinal study with diagnostic interviews, 1b longitudinal study with self-report measures, 2a cross-sectional with diagnostic interviews, 2b cross-sectional with self-report measures (See Table 1).

Results

Figure 1 depicts the screening and eligibility checking process and details the numbers of papers included and excluded at each phase, including reasons for exclusion for the full-text screening phase. As can be seen in Fig. 1, of 1308 papers found, 48 were included in this review. The characteristics of studies that met our inclusion criteria are presented in Table 1. Across the manuscript, as in Table 1, long-term effects are those reported in study as measured 6 months or longer after the outbreak. Seven primary studies were graded as “1b”, one primary study was graded as “2a”, and 31 primary studies were graded as “2b” (see Table 1).
| First author (year)         | Country (disease outbreak) | Timepoint | Sample                                                                 | Mental health outcomes                                                                 | Measures                          | Study design |
|-----------------------------|---------------------------|-----------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------|--------------|
| Chan and Huak (2004)        | Singapore (SARS)          | Concurrent| 661 HCPs (106 SARS exposed HCPs and 555 non exposed HCPs)              | PTSD; Psychological Distress; Psychological distress                                    | IES; GHQ-28                      | Cross-sectional |
| Chan et al. (2005)          | Hong Kong (SARS)          | Concurrent| 1470 nurses                                                             | Psychological health                                                                  | SARS NSQ                          | Cross-sectional |
| Chen, Wu, Yang, and Yen (2005) | Taiwan (SARS)              | Concurrent| 128 nurses (42 control, 21 conscripted and 65 high-risk nurses)        | PTSD; Psychological symptoms                                                           | IES; SCL-90-R                     | Cross-sectional |
| Chen et al. (2007)          | Taiwan (SARS)              | Concurrent| 172 (90 SARS exposed HCPs and 82 non HCPs)                             | Social support                                                                        | MOS SF-36                         | Longitudinal |
| Chong et al. (2004)         | Taiwan (SARS)              | Concurrent| 1257 HCPs                                                              | PTSD; Psychological Morbidity                                                          | IES; CHQ                          | Cross-sectional |
| Chua et al. (2004)          | Hong Kong (SARS)          | Concurrent| 613 (271 HCPs from SARS units and 342 healthy control subjects)       | Perceived stress                                                                     | PSS-10                            | Cross-sectional |
| Fiksenbaum et al. (2006)    | Canada (SARS)              | Concurrent| 333 nurses                                                              | Burnout (emotional exhaustion); State anger                                           | MB-EE STAXI                       | Cross-sectional |
| Goulia, Mantas, Dimitroula, Mantis, and Hyphantis (2010) | Greece (A/H1N1)          | Concurrent| 469 HCPs                                                                | Psychological distress                                                                 | GHQ-28;                           | Cross-sectional |
| Ji et al. (2017)            | Sierra Leone (Ebola)       | Concurrent| 161 (59 local medical staff; 21 local logistic staff; 22 local medical students; 41 Chinese medical staff and 18 Ebola survivors) | Psychological symptoms (Global severity index, obsession-compulsion)                   | SCL-90-R                          | Longitudinal |
| Kim and Choi (2016)         | South Korea (MERS)         | Concurrent| 215 nurses from emergency department (119 MERS-exposed nurses and 96 MERS non-exposed nurses) | Burnout; Job stress                                                                  | OLBI Parker and DeCotiis scale    | Cross-sectional |
| Koh et al. (2005)           | Singapore (SARS)           | Concurrent| 10 511 HCPs                                                             | PTSD                                                                                  | IES                               | Cross-sectional |
| Lancee et al. (2008)        | Canada (SARS)              | Long      | 139 HWCs                                                                | Axis I diagnosis; excluding the psychosis and PTSD;PTSD; Burnout (Emotional exhaustion) | SCID CAPS and IES; MBI-EE         | Cross-sectional |
| Lee, Kang, Cho, Kim, and Park (2018) | South Korea (MERS)   | Concurrent| 358 hospital staff (185 doing MERS-related tasks and 173 not doing MERS-related tasks) | PTSD                                                                                  | IES-R                             | Longitudinal |
| Lehmann et al. (2016)       | Germany (Ebola)            | Concurrent| 86 (42 internal medicine staff; 32 Ebola patient treatment staff and 12 research laboratory staff) | Health-related quality of life; Generalized anxiety disorder; Depression Fatigue        | SF-12; GAD-7; PHQ-9; FACIT         | Cross-sectional |
| Li et al. (2015)            | Liberia (Ebola)            | Concurrent| 52 HCPs                                                                 | Psychological health (Obsessive compulsive symptoms)                                 | SCL-90-R (obsessive-compulsive dimension) | Cross-sectional |
| Study                        | Location (Outbreak) | Study Design       | Sample Size/Characteristics                                                                 | Outcomes                        | Measures                      | Design                        |
|-----------------------------|---------------------|--------------------|-----------------------------------------------------------------------------------------------|---------------------------------|-------------------------------|-------------------------------|
| Lin et al. (2007)           | Taiwan (SARS)       | Concurrent         | 92 HCPs (66 emergency department staff and 26 psychiatric ward staff)                        | PTSD, Psychiatric morbidity    | DTS-C, CHQ-12                 | Cross-sectional[2b]           |
| Liu et al. (2012)           | China (SARS)        | Long               | 549 hospital workers                                                                       | Depressive symptoms, PTS symptoms | CES-D, IES-R                  | Cross-sectional[2b]           |
| Lu, Shu, Chang, and Lung (2006) | Taiwan (SARS)   | Concurrent         | 127 HCPs (24 physicians, 49 nurses and 54 other HCPs)                                       | Psychiatric morbidity          | CHQ                           | Cross-sectional[2b]           |
| Lung, Lu, Chang, and Shu (2009) | Taiwan (SARS) | Concurrent, Long    | 127 HCPs (24 physicians, 49 nurses and 54 other HCPs) (this is a follow-up of Lu et al., 2006) | Psychiatric morbidity          | CHQ                           | Longitudinal                  |
| Mak et al. (2009)           | Hong Kong (SARS)    | Long               | 90 SARS survivors among which 27 HCPs and 63 non-HCPs                                        | PTSD                            | IES-R                         | Cross-sectional[2b]           |
| Marjanovic et al. (2007)    | Canada (SARS)       | Concurrent         | 333 nurses                                                                                  | Burnout (Emotional exhaustion) state anger | MBI-EE, STAXI                | Cross-sectional[2b]           |
| Matsuishi et al. (2012)     | Japan (H1N1)        | Concurrent         | 1625 hospital staff (218 medical doctors, 864 nurses, and 543 others)                       | PTSD                            | IES                           | Cross-sectional[2b]           |
| Maunder et al. (2006)       | Canada (SARS)       | Long               | Survey A : 769 HCPs (587 SARS exposed HCPs and 182 SARS non exposed HCPs)                  | PTSD                           | IES, MBI-EE, WCQ – (escape-avoidance, self-blame, confrontative coping subscales) | Longitudinal                  |
| McAlonan et al. (2007)      | Hong Kong (SARS)    | Concurrent, Long    | 176 HCPs (106 high risk HCPs and 70 low risk HCPs)                                          | Perceived stress, Anxiety, depression and stress, PTS symptoms          | PSS-10, DASS-21, IES-R              | Longitudinal                  |
| Nickell et al. (2004)       | Canada (SARS)       | Concurrent         | 510 HCPs                                                                                    | Emotional distress             | GHQ-12                    | Cross-sectional[2b]           |
| Park et al. (2018)          | South Korea (MERS)  | Concurrent         | 187 nurses                                                                                  | Mental health Perceived stress | SF-36 form (mental health subscale), PSS-10 | Cross-sectional[2b]           |
| Phua, Tang, and Tham (2005) | Singapore (SARS)    | Long               | 96 HCPs (38 doctors and 58 nurses) (from the method looks like the same sample as Tham et al. (2004). However, this is not stated in the study.) | Psychiatric morbidity, PTSD (psychological reactions), Coping strategies | GHQ-28, IES, COPE            | Cross-sectional[2b]           |
| Poon et al. (2004)          | Hong Kong (SARS)    | Concurrent         | 1926 hospital staff (534 high risk hospital staff and 1392 low risk hospital staff)        | Burnout (emotional exhaustion) Anxiety                                  | MBI-EE, C-STAI              | Cross-sectional[2b]           |
| Sim et al. (2004)           | Singapore (SARS)    | Concurrent         | 277 HCPs (97 high risk HCPs and 180 low risk HCPs)                                          | PTS symptoms, Psychiatric morbidity Coping                                | IES-R, GHQ-28, Brief COPE questionnaire | Cross-sectional[2b]           |
| Son et al. (2019)           | South Korea (MERS)  | Concurrent         | 280 hospital staff (153 HCPs and 127 non-HCPs)                                              | Coping ability, PTS            | K-CD-RISC, IES-R              | Cross-sectional[2b]           |
| Styra et al. (2008)         | Canada (SARS)       | Concurrent         | 248 HCPs (160 high risk HCPs and 88 low risk HCPs)                                          | PTS symptoms                   | IES-R                        | Cross-sectional[2b]           |
### Primary Studies

| Study                        | Country       | Sample Size | Study Design | Brief Description of Intervention                                                                 | Impact on Mental Health (yes/no) | Which MH outcome? | Format of intervention | Timing of Intervention |
|------------------------------|---------------|-------------|--------------|---------------------------------------------------------------------------------------------------|---------------------------------|-------------------|------------------------|------------------------|
| Su et al. (2007)             | Taiwan/ SARS  | Concurrent  | 102 nurses (70 nurses from SARS units and 32 nurses from non-SARS units) | Anxiety, Depression, PTS symptoms, Sleep disturbance (insomnia) | STAI, BDI, DTS-C, DSM IV and PSQI |                   | Longitudinal           | Before first patient with SARS was seen |
| Sun and Ren (2004)           | China (SARS)  | During the outbreak | 73 HCPs (35 infected HCPs and 38 uninfected HCPs) | Mental health | SCL-90 Chinese version |                   | Cross-sectional        |                        |
| Tam, Pang, Lam, and Chiu (2004) | Hong Kong (SARS) | Concurrent  | 652 frontline HCPs | Psychological morbidity | GHQ-12 Chinese version |                   | Cross-sectional        |                        |
| Tham et al. (2004)           | Singapore (SARS) | Long       | 96 HCPs (38 doctors and 58 nurses) (from the method looks like the same sample as Phua et al. (2005). However, this is not stated in the study.) | Psychiatry morbidity, PTS symptoms | GHQ-28, IES |                   | Cross-sectional        |                        |
| Verma et al. (2004)          | Singapore (SARS) | Concurrent  | 1050 HCPs (721 GPs and 329 TCMPs) | Psychological distress, PTS symptoms | GHQ-28, IES |                   | Cross-sectional        |                        |
| Wong et al. (2005)           | Hong Kong (SARS) | Concurrent  | 462 HCPs (123 doctors, 257 nurses and 82 healthcare assistants) | Coping strategies | Brief COPE questionnaire |                   | Cross-sectional        |                        |
| Wu et al. (2009)             | China (SARS)  | Long        | 549 HCPs (183 doctors, 183 nurses, and 183 administrative and/or other hospital staff) | PTS symptoms | IES-R |                   | Cross-sectional        |                        |
| Xiao et al. (2020)           | China (COVID-19) | Concurrent  | 180 exposed HCPs | Anxiety, Sleep (quality), Stress | SAS, PSQI, SASR |                   | Cross-sectional        |                        |

### Intervention Studies

| Author and Year | Sample Size | Country | Study Design | Brief Description of Intervention                                                                 | Impact on Mental Health (yes/no) | Which MH outcome? | Format of Intervention | Timing of Intervention |
|-----------------|-------------|---------|--------------|---------------------------------------------------------------------------------------------------|---------------------------------|-------------------|------------------------|------------------------|
| Chen et al. (2006)* | 116 | Taiwan | Pre-and post-test design (with two follow-ups) | SARS prevention programme (based on information provided by WHO and CDC): In-service training, manpower allocation, gathering sufficient protective equipment, and establishment of a mental health team for patients and professionals | yes | Anxiety, Depression, Sleep quality | No information | Before first patient with SARS was seen |
| Study                 | N   | Country       | Study Design | Intervention                                                                 | Evaluation | Outcome Measures                                                                 | Intervention Timing                                      |
|----------------------|-----|---------------|--------------|-----------------------------------------------------------------------------|------------|--------------------------------------------------------------------------------|----------------------------------------------------------|
| Marrs et al. (2019)  | 31  | USA           | Pre-and post-test design | High consequence infectious diseases training using interprofessional simulation and TeamSTEPPS (based on Jeffries Simulation Theory); simulation of real life events such as patients vomiting, bleeding, having diarrheaa, or respirator battery dying when caring for patients with a highly infectious disease | yes        | State anxiety                                                                    | 2 computerised simulation sessions including interprofessional TeamSTEPPS training | Before disease outbreak                                    |
| Maunder et al. (2010)| 158 | Canada        | Pilot RCT (random allocation to one of three course "dose" arms: 1.75 hr, 3 hr and 4.5 hr) | Computer-assisted resilience training (interactive reflective exercises) | yes        | Coping strategies: problem-solving and seeking support | Computer-assisted interactive reflective exercises of varying length: 1.75 hr, 3 hr and 4.5 hr | Before disease outbreak                                    |
| Sijbrandij et al. (2020)| 408 | Sierra Leone  | Cluster RCT   | One-day PFA training: (1) explaining important terms (mental health, mental disorder, psychosocial support and psychosocial disorder); (2) understanding reactions to traumatic and stressful events; (3) understanding PFA; (4) understanding sources and signs of stress; (5) self-care; (6) providing PFA; prepare for your role, look, listen and link; (7) ending your assistance; (8) practicing PFA with role-play | no         | Professional quality of life: burnout and compassion fatigue | One-day training                                         | Acute aftermath of disease outbreak                       |
From the included papers, two systematic reviews were identified that directly contributed to the research questions. One reviewed the evidence of the impact of past outbreaks on the mental health of HCPs [5] and one reviewed the evidence for organizational and social predictors of the impact of past outbreaks on the mental health of HCPS [6]. Therefore, a summary of these systematic reviews are a focal part of this rapid review. Of the 48 accepted papers for this rapid review, 21 were included in the review of Vyas et al. [5] and 16 were included in the review of Brooks et al. [6], nine appeared in both (see Table 1). Beyond the systematic reviews, data extracted from primary studies are included in this rapid review if they are more recent than the search dates of the systematic
reviews, report on mental health outcomes not covered by the first systematic review, or investigated predictors of mental health outcomes not included in the second systematic review.

The Psychological Impact of an Epidemic/Pandemic on the Mental Health of Healthcare Professionals

A systematic review and meta-analysis [5] (including studies from 2000–2014) showed a impact of an epidemic/pandemic on the mental health of HCPs. This review included studies using both diagnostic tools and self-report measures with clinical cut-offs to assess mental health outcomes. Therefore, percentage prevalence's are best interpreted as 'probable' percentage of cases. Effect sizes (standardised mean difference) reflect the difference between an exposed HCPs group and a control group. Thus, where a positive effect is reported, the exposed group showed higher symptom scores than the control group. In this review, psychological distress was assessed in 13 studies, with an average rate among exposed HCPs of approximately 40% (range: 11%-75%). Insomnia was assessed in four studies, with an average rate among exposed HCPs of approximately 39% (range: 30%-52%). Alcohol and drug misuse were assessed in five studies, with an average rate of approximately 13% (range: 6%-21%). Posttraumatic stress disorder (PTSD) symptoms were assessed in 19 studies, with an average rate of approximately 21% (range: 10%-33%), of whom 40% reported persistently high PTSD symptoms 3 years after exposure. Meta-analytic results showed effects were small, (SMD = 0.12, 95% CI = −0.23 to 0.47) but not significant. Depression symptoms were measured in eight studies, with an average rate of approximately 46% (range: 23%-74%), of whom up to 9% reported severe levels. 11% were clinically diagnosed 1 month after the disease outbreak. Meta-analytic results showed effects were moderate (SMD = 0.40, 95% CI = 0.24–0.51) and significant. Anxiety symptoms were assessed in fourteen studies. The average rate was approximately 45% (range: 19%-77%). Meta-analytic results showed effects were small, (SMD = 0.08, 95% CI = −0.09 to 0.25) and not significant.

Further mental health outcomes were reviewed that had not been included in Vyasa et al. [5] or more recent papers (2015–2020) containing more data on the same outcomes. Table 2 contains all data related to the mentioned relationships. Burnout symptoms were assessed by five studies [8–12]. It should be noted that the sample of Z Marjanovic, ER Greenglass and S Coffey [11] is the same sample as L Fiksenbaum, Z Marjanovic, ER Greenglass and S Coffey [10]. Burnout symptoms during the outbreak were shown to be correlated with exposure [10], were significantly higher in HCPs exposed to the outbreak than in non-exposed HCPs [9, 12], and were predicted by exposure (vs non-exposure) [11]. The difference between exposed and non-exposed groups were significant over a year after the outbreak [8] and also impacted on HCPs' ability to work. Indeed, exposed HCPs were more likely than non-exposed HCPs to work reduced hours and have more sickness absence [8], but also to show avoidant behaviour toward patients [11]. Across these five studies, there is thus accumulating evidence of the impact of an epidemic/pandemic on burnout symptoms during the outbreak, with some evidence of a long-term effects, and detrimental patient care-related behaviours during and after the outbreak.
Table 2

Table of results of accepted studies referred to in the manuscript, which provide evidence for the impact of pandemics/epidemics on the mental health of healthcare professionals beyond the systematic review of KJ Vyas, EM Delaney, JA Webb-Murphy and SL Johnston [5].

| First author (year) | Statistical approach | Results |
|---------------------|----------------------|---------|
| SE Chua, V Cheung, C Cheung, GM McAlonan, JW Wong, EP Cheung, MT Chan, MM Wong, SW Tang, KM Choy, et al. [16] | Difference between HCPs and healthy controls on stress levels (no inferential test) | Stress levels for HCPs ($M = 18.6, SD = 4.9$) were similar to healthy control subjects ($M = 18.3, SD = 5.6$), but 50% higher than the normative value for the PSS-10. |
| Fiksenbaum et al. (2006) | Correlations between contact with SARS patients, and emotional exhaustion and state anger. | Perceived stress levels of high-risk HCPs ($M = 18.6, SD = 4.9$) were significantly correlated with emotional exhaustion ($r = -.21; p < .001$) and state anger ($r = -.18; p < .001$). |
| D Ji, YJ Ji, XZ Duan, WG Li, ZQ Sun, XX Song, YH Meng, HM Tang, F Chu, XX Niu, et al. [23] | Difference in the psychological dimensions of the SCL-90-R between 1 week after arrival of Chinese medical staff in an outbreak zone (Sierra Leone) and 1 week after withdrawal (either Man Whitney U or t-test) | Obsessive compulsion ($M = 1.39, SD = 1.8$ vs $M = 1.23, SD = .36; p = 1.421$), depression ($M = 1.22, SD = .31$ vs $M = 1.18, SD = .29; p = .548$), hostility ($M = 1.09, SD = .19$ vs $M = 1.11, SD = .24; p = .000$) and psychosomatic ($M = 1.14, SD = .24$ vs $M = 1.08, SD = .14; p = 1.706$). |
| JS Kim and JS Choi [9] | Group differences between MERS exposed vs not exposed nurses on MERS-related burnout (t-test) | Nurses exposed to infected/suspected patients had higher MERS-related burnout scores ($M = 3.09, SD = 0.48$) than non-exposed nurses ($M = 2.93, SD = 0.42, p = .013$). |
| WJ Lancee, RG Maundra and DS Goldblum [21] | Group differences between HCPs with vs. without history of mental illness on mental disorder development (Fischer test). | A year after the outbreak, HCPs with a history of mental illness before the outbreak had higher risk of developing a new mental DSM-IV axis 1 mental disorder (18%), compared to healthcare workers without (2%), $p = .03$. |
| M Lehmann, CA Bruenah, MM Addo, S Becker, S Schmiedel, AW Lohse, C Schramm and B Löwe [22] | Group differences between internal medicine staff, Ebola patient treatment staff and research laboratory staff on anxiety levels (Test unspecified). | Internal medicine staff, Ebola patient treatment staff and research laboratory staff did not significantly differ levels of anxiety. |
| Mak et al., 2009. | Group differences between infected HCPs and infected non HCPs on PTSD prevalence (Test unspecified). | Thirty months after SARS outbreak, PTSD prevalence was higher among infected HCPs (40.7%) than among infected non HCPs (19%), $p = .031$. |
| Z Marjanovic, ER Greenglass and S Coffey [11] | Correlation between contact with SARS patients, and emotional exhaustion and state anger in nurses. | Contact with SARS patients was significantly correlated with emotional exhaustion ($r = -.21; p < .001$) and state anger ($r = -.18; p < .001$). Contact with SARS patients significantly predicted emotional exhaustion ($β = .15, p = .003$) but did not predict state anger ($β = .09, p = .068$). Avoidance behavior was significantly correlated with emotional exhaustion ($r = .26; p < .001$) and state anger ($r = .33; p < .001$). |
| RG Maundra, WJ Lancee, KE Balderson, JP Bennett, B Borqundvaag, S Evans, CM Fernandes, DS Goldblum, M Gupta, JJ Hunter, et al. [8] | Group differences between SARS exposed vs not exposed HCPs on burnout prevalence ($X^2$). | Burnout prevalence is higher in exposed HCPs (30.4%) than HCPS not exposed (19.2), $p = .003$. Exposed HCPs had significantly higher burnout scores ($Md = 19, IQR = 10–29$) compared to those who were not exposed (8.3%, $p = .007$). Since SARS outbreak, significantly less face-to-face patient contact was reported by exposed HCPs (16.5%) compared to those who were not exposed (8.3%, $p = .007$). Since SARS outbreak, significantly less work hours was reported by exposed HCPs (8.6%) compared non exposed HCPs (2.2%, $p = .003$). |
| GM McAlonan, AM Lee, V Cheung, C Cheung, KW Tsang, PC Sham, SE Chua and JG Wong [14] | During outbreak: Group differences between high vs low risk HCPs on perceived stress (t-test). Comparison of symptom scores to norm (no inferential test) | Perceived stress levels did not significantly differ between high vs low risk HCPs ($F(164) = 1.36, p = 0.176$) although they were higher than the normative value (13). Perceived stress levels of high-risk HCPs ($M = 18.6, SD = 4.9$) were significantly higher than the low-risk HCPs ($M = 14.8, SD = 5, p < .05$). Change in perceived stress from 2003 to 2004 was significantly different for the 2 groups ($F(1,336) = 4.61, P < 0.05$), with a general trend toward a decrease over time for low-risk HCPs and an increase for high-risk HCPs. |

Note. HCPs = Healthcare professionals; MERS = Middle East Respiratory Syndrome ; SARS = Severe Acute Respiratory Syndrome; PSS-10 = 10-Item Perceived Stress Scale; PTSD = Post traumatic stress disorder
Table

| First author (year) | Statistical approach | Results |
|---------------------|----------------------|---------|
| JS Park, EH Lee, NR Park and YH Choi [15] | Mediation analysis of the relationship between hardiness and mental health by perceived stress  
Mediation analysis of the relationship between stigma and mental health by perceived stress | The relationship between hardiness and mental health was partially mediated by perceived stress (indirect effect 0.251, Boot SE = 0.638). Where increased hardiness led to decrease stress ($B = -31, SE = 0.05, p < .001$), which subsequently led to better mental health symptoms ($B = -0.81, SE = 0.13, p < .01$). The relationship between stigma and mental health was mediated by perceived stress (indirect effect = -0.061, Boot SE = 0.020). Where increased stigma led to increase stress ($B = 0.075, SE = 0.023, p < .002$), which subsequently led to better mental health symptoms ($B = -0.81, SE = 0.13, p < .01$). |
| E Poon, KS Liu, DL Cheong, CK Lee, LY Yam and WN Tang [12] | Group differences between hospital workers who had contact with SARS patients vs no contact with SARS patients on burnout symptoms (t-test). | Hospital workers who had contact with SARS patients had significantly higher burnout symptoms ($M = 7.3, SD = 5.3$) than those who did not have contact with SARS patients ($M = 5.1, SD = 4.7, p < .001$). |
| K Sim, PN Chong, YH Chan and WS Soon [17] | Group differences between doctors and nurses with versus without psychiatric morbidities on effort coping, in context of SARS outbreak (Mann-Whitney U Test)  
Group differences between doctors and nurses with versus without posttraumatic morbidities on effort coping, in context of SARS outbreak (Mann-Whitney U Test).  
Group differences were examined between exposed and non exposed medical staff on psychiatric symptoms (Mann-Whitney test) and posttraumatic symptoms ($X^2$), in the context of a SARS outbreak. | Doctors and nurses with psychiatric morbidities had higher scores on effort coping ($M = 49.7, SD = 13.2$) than doctors and nurses without psychiatric morbidity ($M = 39.7, SD = 10.4, p < .001$).  
Doctors and nurses with psychiatric morbidities had higher scores on effort coping ($M = 53.4, SD = 13.1$) than doctors and nurses without psychiatric morbidity ($M = 40.6, SD = 10.9, p < .001$).  
Exposed medical staff showed no difference to non-exposed staff in psychiatric symptoms ($M = 2.6, SD = 4.2$ vs. $M = 2.3, SD = 4.4, p = .28$) or presence of posttraumatic symptoms (7.2% vs.10.6%, $p = .40$). |
| TW Wong, JK Yau, CL Chan, RS Kwong, SM Ho, CC Lau, FL Lau and CH Lit [18] | Group differences between doctors, nurses and healthcare assistants on coping strategies, in context of SARS outbreak (ANOVA with post hoc analyses). | Planning was more likely to be used by doctors ($M = 5.33, SD = 1.44$) compared to nurses ($M = 4.85, SD = 1.44, p < .05$) and healthcare assistants ($M = 4.42, SD = 1.56, p < .01$). Behavioral disengagement was more likely to be used by nurses ($M = 2.96, SD = 1.26$) than doctors ($M = 2.56, SD = 0.91, p < .01$). Self-distraction was more likely to be used by healthcare assistants ($M = 4.58, SD = 1.92$) than doctors ($M = 4.11, SD = 1.42, p < .05$). |
| H Xiao, Y Zhang, D Kong, S Li and N Yang [13] | Assessment of the indirect pathway from social support to sleep quality via perceived stress. | The relationship between social support and sleep quality was mediated by perceived stress ($B = -0.06, SE = 0.01, p < .002$). Where a lack of social support ($B = 0.57, SE = 0.09, p < .001$) led to an increase in perceived stress, which subsequently led to lower sleep quality ($B = 0.26, SE = 0.01, p < .001$). |

Note. HCPs = Healthcare professionals; MERS = Middle East Respiratory Syndrome ; SARS = Severe Acute Respiratory Syndrome; PSS-10 = 10-item Perceived Stress Scale; PTSD = Post traumatic stress disorder

Two studies [10, 11] investigated state anger within the same sample. L Fiksenbaum, Z Marjanovic, ER Greenglass and S Coffey [10] showed that caring for infected patients was correlated with increased levels of state anger in HCPs during the outbreak. Z Marjanovic, ER Greenglass and S Coffey [11] found that exposure (vs non-exposure) did not predict state anger but the latter was correlated with avoided behaviour towards patients during the outbreak. As results pertain to the same sample, evidence for an impact on state anger is weak.

Four studies [13–16] investigated levels of perceived stress. Two studies found that during the outbreak, perceived stress levels of exposed HCPs were higher than a normative value [14, 16], whereas one study showed perceived stress was no different between exposed and non-exposed HCPs [14]. However, a year following the outbreak, perceived stress was higher amongst exposed vs non-exposed HCPs and had increased over time [14]. Evidence also indicates that during a pandemic, perceived stress was a mediator between social support and sleep quality [13] and between hardiness (resilience) and stigma, respectively, and mental health [15].

Two studies [17, 18] investigated coping strategies during an epidemic/pandemic. One showed that, during an outbreak, HCPs with psychiatric or PTSD symptoms used maladaptive coping strategies compared with those without symptoms [17]. It should be noted that there was no difference between exposed vs non-exposed HCPs on psychiatric or PTSD symptoms [17]. Furthermore, without a pre-outbreak measure, it is unclear whether all staff were equally affected and there is thus no evidence of the effect of the outbreak. However, the size of the non-exposed sample was double that of the exposed group, raising questions of power for that test. The second study showed that during an outbreak, different groups of HCPs used different coping strategies (see Table 2) [19]. Authors stated that the sample had been exposed to the infection; however, without a comparison group or ‘pre-outbreak’ measure, it is unclear whether the use of coping strategies was affected by the outbreak. These two studies suggest that during an outbreak, HCPs may engage in maladaptive coping strategies, however, it is unclear whether use of these strategies increased due to an outbreak.

One study [20] investigating the long-term effects of an outbreak on PTSD symptoms found that infected HCPs had significantly higher rates of chronic PTSD (30 months post SARS) than infected non-HCPs.

One further small study found that 2% of healthcare professionals with no psychiatric history before the outbreak had a new DSM-IV axis 1 mental disorder within one year after the outbreak [21]. Further research found no differences in symptoms of generalised anxiety disorder assessed during the outbreak between internal medicine staff, Ebola patient treatment staff, and research laboratory staff [22]. Another study found Chinese HCPs’ symptoms of obsession-compulsion, depression, hostility, paranoid ideation, and psychosis did not change from one week after arrival in an infected zone in Sierra Leone to one...
week after leaving. This may perhaps be explained by the fact that these HCPs were not in their own country and thus perhaps not subject to the same worries of going home and infecting families, as local staff [23]. Furthermore, when considering symptoms of obsessive compulsion, it should be noted that many of the behaviours considered symptoms may be 'normal' in times of an epidemic/pandemic, e.g., frequent washing of hands.

In conclusion, healthcare professionals exposed to working with patients during the COVID-19 outbreak may be at heightened risk of mental health problems, particularly, psychological distress, insomnia, alcohol/drug misuse, and symptoms of PTSD, depression, anxiety, burnout, anger, higher perceived stress, and are more likely to engage in maladaptive coping strategies.

Predictors of Psychological Impact of an Epidemic/Pandemic on the Mental Health of Healthcare Professionals

The next section of this rapid review focuses on synthesizing the evidence on protective or risk factors with a view to informing recommendations for prevention and intervention. One systematic review synthesizing the social and occupational factors affecting the mental health of HCPs covered the literature up to 2015 and included 22 studies [6], all of which had investigated the SARS epidemic. Brooks et al. [6] identified six organizational and four social factors as showing an influence on mental health outcomes. For this rapid review, no further evidence of social and organizational factors published after 2015 was identified amongst our accepted papers. Below is a brief summary of the organizational and social factors found by Brooks et al. [6] and associated data can be found in [6]. Further predictors, beyond organizational and social factors, may also influence the impact of epidemics/pandemics on mental health. Therefore, evidence for further protective and risk factors was extracted from other primary studies accepted for this rapid review. Thirty papers were identified. Further predictors were classified as Psychological factors or Personal factors.
risk factor, with long-term predictive effects found on symptoms of burnout ($\beta = 0.29, t = 3.34, p = 0.001$), PTSD ($\beta = 0.31, t = 3.78, p < 0.001$), and psychological distress ($\beta = 0.37, t = 4.39, p < 0.001$) [8]. Fatigue (physical and mental) predicted symptoms of poor mental ($B = 0.30, SE = 0.12, p = .012$) and physical ($B = -0.53, SE = 0.11, p < .001$) health during an outbreak, alongside perceived lack of knowledge of the infection [22]. Furthermore, having a negative emotional experience of the outbreak predicted an increased likelihood of PTSD amongst HCPs ($\beta = .17, p < .01$). In this study, authors state negative emotional experience influenced PTSD symptoms of non-HCPs more than HCPs, while perceived risk (of infection) affected HCPs more than non-HCPs. However, how the statistical difference in magnitude of the coefficient was carried out was unclear [28]. More HCPs showing a new onset psychiatric disorder in the long term following an outbreak had a psychiatric disorder before the outbreak (18%) than those without a new onset (2%; $p = .03$) [21].

Evidence for the psychological and personal factors identified in this review comes from one or two studies, suggesting preliminary rather than strong evidence. It is also not yet clear which of these factors is the most important. This preliminary evidence points towards identifying those at risk, who may benefit from prevention/intervention programs, and what interventions/intervention may wish to target to influence mental health of HCPs.

- What can be done to Prevent or Reduce the Impact of an Epidemic/Pandemic on the Mental Health of Healthcare Professionals?

**Intervention programs**

Five studies [29–33] investigating the effect of preventative programs or interventions addressing mental health outcomes in HCPs were included (see Table 1 for more details about the content of the intervention and the study design). Regarding the preventative programs, the SARS prevention program addressed organizational, patient-care and psychological issues before HCPs saw the first infected patients and lead to an improvement in anxiety and depression symptoms, as well as sleep quality [29]. In another study, two computerised simulation sessions of real-life events linked to caring for infected patients resulted in lower state anxiety symptoms [30]. A pilot randomized controlled trial (RCT) testing varying lengths (1.75 hr, 3 hr and 4.5 hr) of computer-assisted resilience training (interactive reflective exercises) before the disease outbreak resulted in improved coping strategies (problem-solving and seeking support), with the medium length being optimal [31].

Regarding early intervention programs in the acute aftermath of the outbreak, a one-day psychological first aid training did not lead to improved professional quality of life (burnout and compassion fatigue) [32]. However, a stepped intervention introduced towards the end of the outbreak led to a decrease in symptoms of PTSD, depression, anxiety, anger, as well as perceived stress and relationship problems, and an improvement in sleep [33]. This early intervention program consisted firstly, of a two-hour workshop on psychological first aid, after which improvement in mental health symptoms was assessed. If individuals needed more, a two-hour workshop on psychoeducation was offered and again, improvement in their symptoms was evaluated. If more help was needed, then six weekly sessions of a brief cognitive behavioral therapy (CBT) group program were offered. Of note: HCPs were trained by mental health experts to carry out this stepped approach for their peers.

**Recommendations**

Please note that the following recommendations are based on the evidence of risk and protective factors, as well as intervention studies identified by this review. It is worth noting, that those based on risk and protective factors have not yet been tested for effectiveness.

**Before The Disease Outbreak**

An infectious disease prevention program should be put into place by individual health services but coordinated at an international level. Important elements of the program are training of HCPs, planning and allocation of staff, provision of sufficient protective equipment, and establishment of a mental health team for professionals [29]. This may also include computerized simulation training of patient care during an outbreak [30] and a computer-assisted resilience training consisting of interactive reflective exercises [31].

**During The Disease Outbreak**

Given the likely increase of mental health problems among HCPs, widespread screening to identify those in need of support should be carried out, as the increased stress and burden, as well as stigma experienced by HCPs may make it hard for them to actively seek help [15]. Based on the evidence of risk factors, the following groups may be in particular need of psychological support: HCPs having direct contact with infected patients [6], those that are involuntary deployed to work with infected patients [5], those with less healthcare work experience [5, 8], individuals who are single, or do not currently live with family [25, 26], of younger age [5, 8], and those with a lower household income [5]. Comparing different groups of HCPs, those who spent time in quarantine should be prioritized [6, 25].

A widespread educational campaign alerting HCPs to the possibility of experiencing mental health problems may also help to make those in need come forward for help, as well as fight the potential stigma often associated with mental health problems [15]. Assessment of a wide range of mental health outcomes and psychological distress linked to the disease outbreak [6] is recommended, particularly symptoms of insomnia, alcohol/drug misuse, PTSD, depression, anxiety, burnout, anger, and perceived stress [5, 8, 14]. For those reporting mental health problems, a three-phased stepped intervention consisting of a workshop on psychological first aid, a workshop on psychoeducation, and a brief CBT group program may be helpful [33]. In order to increase access, this intervention could be carried out by generic healthcare professionals (peers) trained by mental health specialists [33].

With regards to organizational factors, managers should increase organizational support and foster peer support [6]. HCPs should be encouraged to volunteer for working with infected patients [6], rather than be deployed. Managers should regularly provide updated information about the epidemic/pandemic and how
HCPs can best protect themselves [6]. Adequate specialized training should be made available [6, 8], with personal infection control as a priority [6, 27].

**After The Disease Outbreak**

HCPs’ perceived risk should be screened within a few months after the disease outbreak, as this is a risk factor for mental health and occupational problems over one year after the outbreak [8].

**Discussion**

By conducting this rapid review, we have brought together into one place: the evidence on the impact of pandemics/epidemics on the mental health of HCPs, the evidence of influencing factors on the impact pandemics/epidemics on the mental health of HCPs, and evidence on prevention/interventions to mitigate this impact. Furthermore, we have updated a previous review [5] and broadened the set of mental health outcomes. Previously, evidence on social and organizational risk factors had been synthesized [6] and this rapid review adds evidence on psychological and personal risk factors.

Results from this rapid review suggest that HCPs may experience an adverse impact on their mental health during an outbreak, and in the short and long term. However, there remain questions about what consequences the impact on HCPs’ mental health will have on levels broader than the individual. Firstly, it seems likely that the mental health issues evidenced here would impact patient care. However, what is not clear from the evidence available so far is whether there is something unique about an epidemic/pandemic that would compromise professional functioning, including patient care, or whether this is due to a more general impact of mental health problems in professionals (that also occurs outside the context of an epidemic/pandemic). Secondly, there may be costs at the organizational and societal levels, as HCPs suffering from the psychological impact of the epidemic/pandemic struggle to maintain their previous working hours, thus affecting staffing levels within the health system [8] and patient care [11]. What none of the reviewed studies sufficiently addresses is the issue that part of the challenge for HCPs is the increased professional demand at a time when both family stress and personal threat (to health) are also elevated.

This rapid review makes recommendations to reduce the negative impact on HCPs’ mental health from the evidence of risk and protective factors. However, there remains a lack of evidence-based interventions/preventions that can be recommended for implementation with confidence. Evaluation of these recommendations as part of their implementation would assist future preparations for disease outbreaks to reduce and prevent the impact on the mental health of HCPs.

When considering the findings and recommendations of this rapid review, several elements should be noted. The majority of the evidence from accepted primary studies is heavily reliant on cross-sectional studies assessing self-reported symptoms. No accepted study used a longitudinal design with diagnostics. While it is appreciated that this type of data is collected rapidly in a reactive fashion, researchers should consider the importance of gathering high-quality evidence of true prevalence and risk factors. There were not enough studies or details within these studies to distinguish between specific professional groups or health contexts. Consequently, we took a broad-brush approach across professions and contexts when reporting our findings. Furthermore, not all studies had a control group of a non-exposed group but only reported prevalence's during an epidemic/pandemic. We could also consider if the risk and protective factors for HCPs identified here may apply to other key worker professions currently at risk of contact with infected members of the public e.g., teachers.

Moreover, most of the studies were conducted in Asian countries, with only two coming from Europe, eight from Canada/USA, and four from Africa. It is likely that cultural differences between these countries are associated with different nuances in the expression of psychological outcomes. Currently, studies/reviews are being published on a daily basis related to COVID-19 and by the time of publication, there will likely be a small body of papers that we were not able to include. Finally, we would like to acknowledge that solid evidence and practice guidelines about psychosocial interventions following other large-scale disasters exist, although they do not specifically target HCPs, e.g., [34]. However, it is still unknown to what extent these would also be effective in response to an epidemic/pandemic and future research should investigate whether the mental health impact of (and therefore the intervention required following) an epidemic/pandemic is unique or comparable to that of other large-scale disasters.

A rapid review has some limitations [7], as discussed above. The number of databases searched, languages included, and dates searched were limited. No qualitative studies or grey literature (unpublished or non-commercial material e.g., policy statements or government reports) was included, which may have created a potential (publication) bias. Strengths of the study included an informal grading the quality of the study design, we had strict inclusion/exclusion criteria and only accepted peer-reviewed studies that used validated measures of mental health. Further strengths of this review are that the search terms and strategies were developed in collaboration with specialist librarians and that hand searches of references from accepted full texts were conducted. Additionally, was that multiple researchers cross-checked data extraction to reinforce rigor of the extraction procedures.

**Conclusion**

Healthcare professionals exposed to working with patients during an epidemic/pandemic are at heightened risk of mental health problems in the short and longer term. These mental health problems may interfere with the quality of patient care, although further evidence is needed. Few evidence-based prevention or early intervention programs exist so far. Several recommendations based on risk and protective factors of this review, as well as on additional primary studies are proposed.

**Abbreviations**

HCPs
healthcare professionals
Declarations

Ethics approval
Not applicable.

Consent for publication
Not applicable.

Data Availability Statement
The selection of papers and data used to conduct this rapid review will be made available by the authors on request.

Competing Interests
The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contributions
CJ, JE, SS, AH, CD and VS designed the research strategy. The literature search was carried out by JE, CJ, VS and CTS. CD, CTS, AH and VS did the paper screening and data extraction. CTS, CD, VS and SS did the data checking. SS, AH, VS and CD drafted the manuscript. All authors critically revised the manuscript and approved the final version of the manuscript.

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**Figures**
Figure 1
Prisma flowchart of Study Selection

Supplementary Files
This is a list of supplementary files associated with this preprint. Click to download.

- Appendix1.docx
- PRISMA2009checklistAH.doc