BMJ Open

How can we build and maintain the resilience of our health care professionals during COVID-19? Recommendations based on a scoping review

Anja Rieckert ,[1,2] Ewoud Schuit,[3,4] Nienke Bleijenberg,[1,2] Debbie ten Cate,[1,2] Wendela de Lange,[3] Janneke M de Man-van Ginkel,[1,2] Elke Mathijssen,[3] Linda C Smit ,[2] Dewi Stalpers,[1,5] Lisette Schoonhoven,[1,6] Jessica D Veldhuizen ,[2] Jaap CA Trappenburg[1]

To cite: Rieckert A, Schuit E, Bleijenberg N, *et al*. How can we build and maintain the resilience of our health care professionals during COVID-19? Recommendations based on a scoping review. *BMJ Open* 2021;**11**:e043718. doi:10.1136/bmjopen-2020-043718

► Prepublication history and additional material for this paper is available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2020-043718).

Received 15 August 2020
Revised 19 November 2020
Accepted 27 November 2020

For numbered affiliations see end of article.

Correspondence to
Dr Anja Rieckert;
a.rieckert@umcutrecht.nl

ABSTRACT

Objective To explore how to build and maintain the resilience of frontline healthcare professionals exposed to COVID-19 outbreak working conditions.

Design Scoping review supplemented with expert interviews to validate the findings.

Setting Hospitals.

Methods We searched PubMed, Embase, PsycINFO, CINAHL, bioRxiv and medRxiv systematically and grey literature for articles focusing on the impact of COVID-19-like working conditions on the physical and/or mental health of healthcare professionals in a hospital setting. Articles using an empirical design about determinants or causes of physical and/or mental health and about interventions, measures and policies to preserve physical and/or mental health were included. Four experts were interviewed to reflect on the results from the scoping review.

Results In total, 4471 records were screened leading to an inclusion of 73 articles. Recommendations prior to the outbreak fostering resilience included optimal provision of education and training, resilience training and interventions to create a feeling of being prepared. Recommendations during the outbreak consisted of (1) enhancing resilience by proper provision of information, psychosocial support and treatment (eg, create enabling conditions such as forming a psychosocial support team), monitoring the health status of professionals and using various forms and content of psychosocial support (eg, encouraging peer support, sharing and celebrating successes), (2) tasks and responsibilities, in which attention should be paid to kind of tasks, task mix and responsibilities as well as the intensity and weight of these tasks and (3) work patterns and working conditions. Findings of the review were validated by experts.

Conclusions Recommendations were developed on how to build and maintain resilience of frontline healthcare professionals exposed to COVID-19 outbreak working conditions. These practical and easy to implement recommendations can be used by hospitals and other healthcare organisations to foster and preserve short-term and long-term physical and mental health and employability of their professionals.

Strengths and limitations of this study

- Combination of a scoping review based on a systematic literature search with expert interviews to foster evidence-based recommendations about how to keep healthcare professionals healthy and resilient during COVID-19 working conditions.
- An extensive overview of the current body of knowledge was provided by the extended search strategy, the inclusion of preprints and grey literature.
- The review process followed a universally agreed protocol (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews 2018) to ensure the quality of reporting.
- This study did not critically appraise the included articles and we cannot make conclusions regarding the quality of the evidence.
- Each outbreak has its own dimensions and each culture acts differently, which should be considered when interpreting the results.

INTRODUCTION

Since it was first recognised in China in late 2019, COVID-19 has become a pandemic that continues to spread quickly around the world. By 17 November 2020, it has infected more than 55 million people worldwide and caused more than 11 327 253 deaths.[1]

The sudden massive outbreak of COVID-19 overwhelmed healthcare systems. Even the most resilient healthcare systems face insufficient treatment capacities due to the unexpected increase of often very ill patients with COVID-19.[2 3] Besides insufficient resources,

this pandemic poses extreme pressures on healthcare professionals.[3]

Experiences from previous similar outbreaks of infectious diseases, such as severe acute respiratory syndrome (SARS) (2003), middle east respiratory syndrome (MERS) (2013–2016) and Ebola (2014–2016) show that healthcare professionals are pushed to their limits in such situations. Each outbreak has its own dynamics, but they are all characterised by exposure to high workload, a shift in tasks and responsibilities, risk of infection, more difficult working conditions due to protective clothing and procedures, in addition to intense exposure to emotional events and trauma.[4] Studies after the SARS, MERS and Ebola outbreaks show that, in the short term, persistent exposure to stress, anxiety, trauma/emotional events, sleep deprivation and fatigue lead to errors and decreased employability among healthcare professionals. Long-term effects include burn-out, depression and anxiety disorders as well as post-traumatic stress disorder.[5–9] A variety of social and occupational factors affected the mental well-being, implying that it is important to take measures as early as possible to minimise harm.[10]

Early studies of and experiences with COVID-19 from China and Italy[11–15] indicate that healthcare professionals face similar situations as encountered in previous outbreaks. The demand for care is increasing rapidly and care must be provided in stressful and uncertain circumstances causing emotional and physical exhaustion.[16]

A recent meta-analysis found a pooled prevalence of 23.2% for anxiety, 22.8% for depression and 38.9% for insomnia among healthcare professionals during the COVID-19 outbreak.[17] As healthcare professionals are considered to be the 'most valuable resource', maintaining mental and physical health for the short and long term, and hence the employability of healthcare professionals, is essential in coping with what is expected to be a long-term COVID-19 outbreak. Several international organisations, such as the WHO, have developed documents providing recommendations to improve mental well-being of healthcare professionals during this COVID-19 outbreak.[18–20]

Furthermore, two systematic reviews investigated the psychological well-being of healthcare professionals involved in SARS. Brooks *et al*[10] concluded the importance of preparing healthcare professionals for the potential psychological impact, to stimulate a supportive working environment and to ensure provision of support for those who need it. Koh *et al*[21] advise to empower healthcare professionals through education and training, to provide safe environments and to offer incentives to those who are exposed to extra high risks.

However, to our knowledge, there has been no attempt to systematically summarise the evidence on improving and maintaining healthcare professionals' resilience generated from several similar outbreaks. As COVID-19 is a new disease, we decided to have a broad scope and also explored what we can learn from previous similar virus outbreaks in the 21st century such as SARS, MERS and Ebola. These viruses have in common that they all are fast-spreading viruses impacting entire communities.[22] Given the urgency of the COVID-19 outbreak, we felt the need to rapidly synthesise the evidence and to produce practical recommendations, which can be implemented in a quick and easy way.

METHODS

In this study, a scoping review was conducted and filled with information provided by expert interviews. Given the broad scope of the research aim, expected heterogeneity of the body of evidence and urgency to get results,[23–27] a scoping review was conducted without the use of a formal protocol. The scoping review is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).[28]

Identification of articles

The databases PubMed, Embase, PsycINFO, CINAHL, bioRxiv and medRxiv were systematically searched for (prepublished) literature on interventions and measures for the preservation of short-term and long-term physical and/or mental health and employability of healthcare professionals exposed to epidemic/pandemic outbreak working conditions, published between January 2003 and March 2020. Epidemic/pandemic outbreaks of interest include SARS (2003), MERS (2013–2016), Ebola (2014–2016) and COVID-19. Because the SARS outbreak took place in 2003, we used this year as a starting point for our search. The full search strategies were developed in collaboration with a medical librarian from Utrecht University and further refined through team discussion (see online supplemental appendix 1). Additionally, the grey literature was searched with a focus on leading organisations with expertise in outbreak situations, including the WHO, Médecins Sans Frontières, The International Committee of the Red Cross, United Nations, International Council of Nurses and the Dutch Ministry of Defense. Healthcare professionals were defined as 'a person associated with either a specialty or a discipline and who is qualified and allowed by regulatory bodies to provide a healthcare service to a patient'.[29] Resilience is typically defined as the 'successful adaptation to adversity', entailing the concept of recovery, that is, 'how well do people bounce back and recover fully from challenge' and sustainability, that is, 'the capacity to continue forward in the face of adversity'.[30] We chose a multifaceted approach to resilience,[31] not only recognising the role of the individual but also personal, social and workplace features.[32 33]

Selection of articles and data extraction

Peer-reviewed and preprint articles were included when they concerned empirical research (both original articles and reviews) and focused on COVID-19 and other outbreak-related working conditions on the short-term and long-term physical and/or mental health and

employability of healthcare professionals. Research on predictors or causes of physical and/or mental health as well as research into interventions, measures and policies to preserve physical and/or mental health were included. Articles written in a language other than English or Dutch were excluded. Articles were screened on title and abstract by pairs of independent reviewers (AR, DS, DtC, EM, ES, JCAT, JDV, LCS, NB, WdL). Discrepancies were resolved by a third reviewer (LCS, WdL).

The full-text assessment and data extraction were performed by one reviewer per article (AR, DS, DtC, EM, JMdM-vG, JDV, LCS, NB, JCAT, WdL) and subsequently checked for accuracy by a second reviewer (AR, DtC, EM, JMdM-vG, JDV, LCS). Data extraction was performed using a standardised form with which data were extracted regarding the first author, year of publication, location, target population, type of disease outbreak, type of study, method(s) of data collection, interventions/measures, recommendations regarding the use of the intervention/measure, timing of the intervention/measure (before or during the outbreak) and purpose of the intervention/measure. The process of data extraction with the standardised form was piloted on four studies, by two reviewers (DtC and LCS).

Data extraction and development of recommendations

A matrix was drawn up for data extraction that would allow for summarising recommendations based on the timing of the interventions/measures (before or during the outbreak) and the specific topics: resilience, tasks and responsibilities and working conditions.

The matrix was constructed based on a rough exploration of the literature and was further refined through team discussion, interviewing experts (see below) and was adapted iteratively based on the findings of the included studies. Per article, one reviewer (ES, EM, DS, DtC, JMdM-vG, JDV, LCS, NB) narratively synthesised data regarding interventions/measures for each topic. This synthesis was then checked by a second reviewer. The findings of the scoping review were triangulated with the findings of the expert interviews (see next paragraph) and subsequently practical recommendations regarding the preservation of short-term and long-term physical and/or mental health and employability of healthcare professionals exposed to COVID-19 and other outbreak-related working conditions were formulated. The quality of evidence was not considered when formulating recommendations. Two reviewers (JCAT, LS) checked the recommendations for accuracy. The recommendations turned out to be on environmental, individual and organisational levels. Thus, when presenting the results, we indicate the level.

Expert interviews

Parallel to the scoping review, four experts were recruited for a semistructured interview based on a purposive sampling method. Two experts were selected based on their expertise (psychological trauma and prevention and treatment of psychological disorders following trauma). One of the experts recommended another expert based on her expertise with supporting healthcare professionals after traumatic events or difficult work situations. The fourth expert was recommended by one of the researchers (JCAT) based on her expertise (integrity and resilience in law enforcement training and practice). The experts were asked to evaluate the data synthesis matrix (completeness and importance of the topics, additions based on their expertise). The interviews were conducted by telephone, audio-recorded and subsequently summarised. In addition to the interviews, the experts received a draft of the recommendations once the data synthesis was completed. Some content-related additions were made accordingly.

Patient and public involvement

This study was planned in collaboration with the University Medical Hospital Utrecht. This study was conducted for and by healthcare professionals (mostly nurses). Some of them worked in a COVID-19 ward or intensive care unit during the COVID-19 outbreak. Additionally, various experts were involved in the validation of the findings. Two frontline nurses, working at the COVID-19 unit or the intensive care unit, were asked to review our recommendations and comment on the fit of the recommendations with their daily work circumstances.

RESULTS

Scoping review

Study selection

The literature search identified 6054 articles. After removing duplicates, 4471 articles remained. Based on the screening of title and abstract, 4318 articles were excluded. The full texts of the remaining 158 articles were assessed for eligibility, which resulted in the inclusion of 73 articles reporting on 71 unique studies (see figure 1 for the selection process). Two studies were both reported in two articles.[5 34–36] In addition, we considered five articles from the grey literature as relevant. These articles were reports by international organisations rather than empirical studies.

Study characteristics

Studies were conducted in a variety of countries between 2003 and 2020 (see table 1). They referred to an outbreak of MERS (n=11), SARS (n=36), Ebola (n=13) or COVID-19 (n=9). Two studies did not refer to a specific disease outbreak or referred to various disease outbreaks. Studies used qualitative methods (n=21), quantitative methods (n=43) or mixed-methods (n=4). Two were systematic reviews and one a focused review. See table 2 for detailed study characteristics.

Expert interviews

Interviews were conducted in March 2020 with four experts: a professor and chair of psychological trauma, a senior researcher in the field of prevention and treatment of psychological disorders following trauma, a

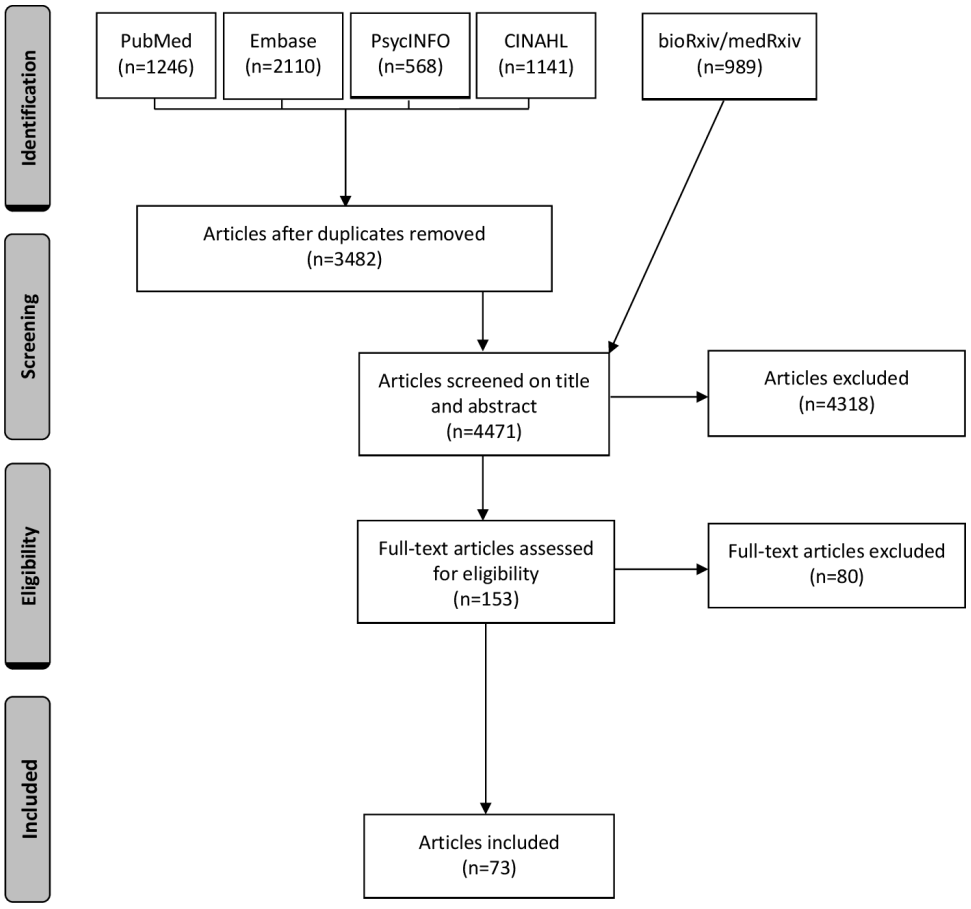

Figure 1 Flow diagram of the selection process.

senior researcher in the field of integrity and resilience in law enforcement training and practice and a trauma coordinator at a general hospital. Interviews lasted between half an hour and 45 min.

Table 1 Countries in which studies were conducted

Country	Number of studies
Canada	13
China	16
Congo-Kinshasa, Congo-Brazzaville and Uganda	1
Germany	1
Japan	1
Liberia	2
Saudi Arabia	5
Sierra Leone	3
Singapore	4
South Korea	6
Spain	1
Taiwan	10
The Netherlands	1
USA	4
Various	3

Practical recommendations

Results of the data extraction are presented in online supplemental appendix 1. Below a range of the developed practical recommendations are depicted.

Before the outbreak

Resilience

Three intervention components prior to or in the run-up to the outbreak were found regarding the concept of resilience: (1) education and training, (2) resilience training and (3) perception of preparedness.

Education and training—organisational level

Several studies recommended to provide information and education to healthcare professionals about the virus, method of transmission, symptoms and protective measures. This information should be up to date and be clearly communicated.[34 35 37 38] Furthermore, many studies found it essential to train professionals in recognising symptoms, in preventing transmission and in using protective measures and associated procedures.[10 10 34 35 39–43]

Resilience training—organisational level

Resilience training, moral and psychological support to healthcare professionals from outside and within the healthcare teams that provide direct (daily) patient care should be provided.[44–47] Professionals should be

Table 2 Study characteristics

First author (publication year)	Year	Study location(s)	Population	Disease outbreak	Study type	Method(s) of data collection	Centre(s) (number)
Abolfotouh *et al*[44]	2015	Saudi Arabia	Various	MERS	Quantitative	Survey	Multicentre (3)
Al-Dorzi *et al*[55]	2015	Saudi Arabia	Various	MERS	Mixed-methods	Registry data, individual interview(s), open discussions	Monocentre
Al Ghobain *et al* [51]	2015	Saudi Arabia	Physicians	MERS	Quantitative	Survey	Multicentre (4)
Andertun *et al*[48]	2014–2015	Sierra Leone	Various	Ebola	Qualitative	Individual interview(s), focus group(s)	**Unknown**
Bai *et al*[61]	2003	Taiwan	Various	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
Belfroid *et al*[39]	2016	The Netherlands	Various	Ebola	Qualitative	Individual interview(s)	Unknown
Bell *et al*[40]	2016	Liberia	Various	Ebola	Qualitative	Individual interview(s)	Multicentre (unknown)
[113]	2020	Various	Various	COVID-19	Quantitative	Survey	Worldwide
Bournes *et al*[78]	2003	Canada	Various	SARS (non-COVID-19)	Qualitative	Individual interview(s)	Monocentre
Brooks *et al*[10]	Various	Various	Various	Various	Systematic review	NA	NA
[114]	2014	Saudi Arabia	Nurses	MERS	Quantitative	Survey	Monocentre
Carvalho *et al*[41]	2014–2015	Spain	Various	Ebola	Quantitative	Survey	Monocentre
Chan *et al*[62]	2003	Singapore	Various	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
Chan *et al*[56]	2003	China	Nurses	SARS (non-COVID-19)	Quantitative	Survey	Multicentre (8)
Chen *et al*[42]	2003	Taiwan	Nurses	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
Chen *et al*[77]	2003	Taiwan	Various	SARS (non-COVID-19)	Quantitative	Survey, antibody test	Monocentre
Chen *et al*[75]	2003	Taiwan	Nurses	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
Chua *et al*[62]	2003	China	Various	SARS (non-COVID-19)	Quantitative	Survey	Multicentre (2)
Dai *et al*[74]	2020	China	Various	COVID-19	Quantitative	Survey	Nationwide
[113]	2004	Canada	Nurses	SARS (non-COVID-19)	Quantitative	Survey	Unknown
Gearing *et al*[83]	2003	Canada	Various	SARS (non-COVID-19)	Qualitative	Focus group(s)	Monocentre
[115]	1995, 2000–2001, 2002–2003	Congo-Kinshasa, Congo-Brazzaville, Uganda	Nurses	Ebola	Qualitative	Individual interview(s), focus group(s)	Unknown
Huang *et al*[86]	2020	China	Nurses	COVID-19	Quantitative	Survey	Nationwide
Grace *et al*[82]	2003	Canada	Physicians	SARS (non-COVID-19)	Mixed-methods	Survey, open-ended survey questions	Multicentre (3)
[116]	2003	Japan	Various	SARS (non-COVID-19)	Quantitative	Survey	Multicentre (7)
Jeong-Sil *et al*[87]	2015	South Korea	Nurses	MERS	Quantitative	Survey	Multicentre (6)

Continued

Table 2 Continued

First author (publication year)	Year	Study location(s)	Population	Disease outbreak	Study type	Method(s) of data collection	Centre(s) (number)
Kang *et al*[57]	2015	South Korea	Nurses	MERS	Qualitative	Individual interview(s), focus group(s)	Multicentre (9)
Khalid *et al* [69]	2014	Saudi Arabia	Various	MERS	Quantitative	Survey	Monocentre
Khee *et al*[90]	2003	Singapore	Various	SARS (non-COVID-19)	Qualitative	Observations	Monocentre
Kim *et al*[63]	2015	South Korea	Nurses	MERS	Quantitative	Survey	Multicentre (15)
Kim *et al*[84]	2016–2017	South Korea	Nurses	MERS	Qualitative	Individual interview(s)	Multicentre (4)
Koh *et al*[6]	2003	Singapore	Various	SARS (non-COVID-19)	Quantitative	Survey	Multicentre (9)
[117]	Various	Various	Various	SARS (non-COVID-19)	Systematic review	NA	NA
Lai *et al*[14]	2019	China	Various	COVID-19	Quantitative	Survey	Multicentre (34)
Lee *et al*[64]	2003	Taiwan	Nurses	SARS (non-COVID-19)	Qualitative	Individual interview(s)	Monocentre
Lehmann *et al*[54]	Unknown	Germany	Various	Ebola	Quantitative	Survey	Multicentre(2)
Li *et al*[45]	2015–2016	Liberia	Various	Ebola	Qualitative	Individual interview(s)	Monocentre
Li *et al*[12]	2020	China	Nurses	COVID-19	Quantitative	Survey	Nationwide
Lin *et al*[70]	2003	Taiwan	Various	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
Liu *et al*[71]	Unknown	China	Nurses	Ebola	Qualitative	Individual interview(s)	Monocentre
[118]	2006	China	Various	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
Liu *et al*[12]	2020	China	Various	COVID-19	Quantitative	Survey	Nationwide
Lu *et al*[65]	2003–2004	Taiwan	Various	SARS (non-COVID-19)	Mixed-methods	Survey, open-ended survey questions	Monocentre
Marjanovic *et al*[66]	2004	Canada	Nurses	SARS (non-COVID-19)	Quantitative	Survey	Nationwide
Marrs *et al*[49]	Unknown	USA	Various	Ebola	Quantitative	Survey	Monocentre
Maunder *et al*[79]	Unknown	Canada	Various	SARS (non-COVID-19)	Focused Review	NA	NA
Maunder *et al*[79]	2003	Canada	Various	SARS (non-COVID-19)	Quantitative	Survey	Multicentre (3)
Maunder *et al*[46]	2004–2005	Canada	Various	SARS (non-COVID-19)	Quantitative	Survey	Multicentre (13)
Maunder *et al*[7]	2003	Canada	Various	SARS (non-COVID-19)	Qualitative	Individual interview(s), observations	Monocentre
O'Boyle *et al*[80]	2003	USA	Nurses	Public health emergencies	Qualitative	Focus group(s)	Multicentre (3)
O'Sullivan *et al*[52]	Unknown	Canada	Nurses	SARS (non-COVID-19)	Qualitative	Focus group(s)	Nationwide
Poon *et al*[67]	2003	China	Various	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
Qi *et al*[76]	2020	China	Various	COVID-19	Quantitative	Survey	Nationwide
[119]	2003	Canada	Physicians	SARS (non-COVID-19)	Qualitative	Individual interview(s)	Multicentre (4)

Continued

Table 2 Continued

First author (publication year)	Year	Study location(s)	Population	Disease outbreak	Study type	Method(s) of data collection	Centre(s) (number)
Raven *et al*[58]	2015	Sierra Leone	Various	Ebola	Qualitative	Individual interview(s)	Nationwide
[120]	2003	Taiwan	Nurses	SARS (non-COVID-19)	Qualitative	Focus groups, open-ended survey questions	Multicentre (unknown)
Shih *et al*[91]	2003	Taiwan	Nurses	SARS (non-COVID-19)	Qualitative	Individual interview(s)	Multicentre (4)
Sin *et al*[81]	2003	Singapore	Paramedics	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
Smith *et al*[85]	2016	USA	Various	Ebola	Qualitative	Individual interview(s)	Monocentre
Son *et al*[9]	2015	South Korea	Various	MERS	Qualitative	Written notes	Monocentre
Son *et al*[68]	2015	South Korea	Various	MERS	Quantitative	Survey	Monocentre
Speroni *et al*[34]*	2014	USA	Nurses	Ebola	Quantitative	Survey	Nationwide
Speroni *et al*[35]*	2014	USA	Nurses	Ebola	Qualitative	Open-ended survey questions	Nationwide
Styra *et al*[59]	2003	Canada	Various	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
Su *et al*[73]	2003	Taiwan	Nurses	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
Tam *et al*[72]	2003	China	Various	SARS (non-COVID-19)	Quantitative	Survey	Multicentre (3)
Tolomiczenko *et al*[60]	2003	Canada	Various	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
von Strauss *et al*[43]	2014–2015	Sierra Leone	Nurses	Ebola	Quantitative	Survey, open-ended survey questions	Monocentre
Wong *et al*[47]	2003	China	Various	SARS (non-COVID-19)	Quantitative	Survey	Multicentre (14)
Wu *et al*[36]†	2006	China	Various	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
Wu *et al*[5]†	2006	China	Various	SARS (non-COVID-19)	Quantitative	Survey	Monocentre
Xiao *et al*[11]	2020	China	Various	COVID-19	Quantitative	Survey	Multicentre (unknown)
Zhu *et al*[13]	2020	China	Various	COVID-19	Quantitative	Survey	Monocentre

*Articles reporting the same study.
†Articles reporting the same study.
MERS, middle east respiratory syndrome; NA, not applicable.

informed about the psychosocial risks of working in outbreak situations and be trained on how to deal with isolation, stigmatisation, fatigue, stress and feelings of depression.[10 37 48 49] The expert interviews added that this training should also be targeted at managers. Besides, Marrs *et al*[49] recommended training on interprofessional teamwork.

Perception of preparedness—organisational level

To maximise perception of preparedness, protocols should be up to date, a clear action plan should be made and effective communication strategies be implemented. The hospital or organisation must ensure that sufficient staff and materials are available to handle the outbreak. A safe work environment should be promoted, for example, minimal movements of heavy materials, enough space to work and keep distance and locks between high-risk and low-risk patients.[50] Besides, involving the staff in the preparations for the planning of the upcoming demand of care is recommended.[40 46 51] Attention should be paid to potential ethical dilemmas in healthcare and the intensity of care. These dilemmas can for instance include not being able to provide good care or feeling obliged to do the job even if it is not possible.[5 36 43 46 52]

During the outbreak

Resilience

During the outbreak, some interventions were also related to the concept of resilience: (1) communication, (2) psychosocial support and treatment, (3) monitoring health status.

Communication—organisational, individual and environmental level

One person within each healthcare team should be responsible for grouping information.[38 50 53 54] Realistic scenarios or actual scenarios should be discussed within a healthcare team that provides direct (daily) patient care.[50 53 54] It is recommended to create a blame-free environment in which frontline professionals are provided the ability to report incidents, ethical or emergency issues, challenges and advice for management.[37 50 55] A platform on which healthcare professionals can share information, experiences and good practices for communication among peers and with collaborating parties should be offered.[56–59] Furthermore, involving nursing staff in the decision-making processes (also at management level) has been recommended as this group is often neglected. Having short communication lines between professionals is important.[9 60]

Psychosocial support and treatment: create enabling conditions—organisational level

It is important to create enabling conditions early on in the outbreak for optimal professional psychosocial support for healthcare professionals both within regular care and in acute situations.[11 12 14 53] These facilities should be accessible for all healthcare professionals and this should be clearly communicated. Furthermore, there should be sufficient resources/capacity for a multidisciplinary psychosocial support team consisting of peer support, psychologists, spiritual counsellors, social professionals, occupational health and safety physicians.[53] It is recommended to create a simple and agile organisational structure for the psychosocial support team. There should be a clear functional and hierarchical management of and communication towards as well as within the operational core. For example, making a 24/7 telephone number by members of the psychosocial support team available to professionals who are in need to talk to someone.[7] Furthermore, it is recommended to create an efficient referral system for professionals with physical or psychological problems so that they can obtain a diagnosis quickly and professional treatment if indicated.[42] Sufficient professional psychosocial capacity during the peak of the outbreak is needed and financial compensation for the treatment needs to be ensured.[9 46 61–68] It is beneficial to identify professionals who are at high risk of psychosocial problems early. Special attention should be paid to frontline professionals, professionals in quarantine, women, young/inexperienced and conversely older professionals.[5 46 47]

Form and content of psychosocial support—organisational and environmental level

Many of the included studies encouraged communication between professionals in the workplace, even during busy periods and create time for non-binding discussion of positive and negative aspects of the situation.[38 47 50 62 67 69–71] Communication should make use of natural coping strategies (acceptance, active coping, positive framing) rather than the broad use of psychological interventions such as therapy.[5 7 36 38 46 47 52 64] When professionals suffer from complaints in acute situations, it is recommended to offer evidence-based interventions following a formal diagnosis and treatment process by professionals who are not involved in the workplace.[9 46 61–68] Furthermore, hospitals should offer professionals the opportunity to quickly withdraw from an emotionally stressful situation[37] by creating a safe area where professionals can catch their breath or blow off steam and get peer support. Opportunities to stay in direct or indirect contact with family and friends should be created.[52 63 71 72]

Monitoring health status of professionals—organisational level

It is important to constantly be aware of the mental or physical health of professionals and to scale up monitoring when problems increase and/or the outbreak persists.[13] Besides, frequent but casual monitoring of the physical and mental health status aiming at early identification of the problems is needed. A daily check-in/check-out is an excellent low-threshold method to gauge how someone is doing, whether there are concerns, and if something is bothering someone.[13 73]

Tasks and responsibilities

Intensity of tasks and responsibilities—organisational level

A good care provider–patient ratio is crucial meaning that the care-related workload is in proportion to the care providers' capacity since it safeguards safety and quality of care.[55]

Work pattern and working conditions

Work pattern—organisational level

Limiting shifts to a maximum of 12 hours shifts with light tasks[50] or 8–10 hours for shifts within intense tasks[42] are recommended. For evening and night shifts 8 hours are indicated.[50] A series of shifts should be followed by days off,[37 50 54] which should be scheduled often enough (which also applies for breaks).[50 74 75] More specifically, after a series of 8–10-hour shifts, at least 1 or 2 days off should be scheduled.[50] Days off and vacation should also be planned during an outbreak[38 56 75] and healthcare professionals should not be approached with work-related information and/or questions when not at work.

Working on the frontline should be limited to 6–8 weeks. These frontline shifts should be alternated with non-frontline shifts.[38] To ensure healthy work patterns, it is recommended to deploy managers as role models[7] and review and evaluate the division of labour and planning and the strict adherence to the working hours.[56 57 71 76 77]

Team composition—organisational and individual level

Deploying full-time professionals wherever possible enhances the continuity of care.[78] Shifting professionals who held non-essential positions before the outbreak to essential positions should be done only after adequate training.[50] Several studies highlighted the benefits of setting up a buddy system in which two professionals are linked together during a shift.[37–39 46 50 53 59 64 79 80] Furthermore, it is recommended that there is always someone with whom professionals can talk before, during and after their shift and with whom they can unload.[11 57 62 81 82]

Team building—organisational and individual level

Many of the included studies recommended to improve the atmosphere in the department by creating a sense of togetherness and positivity. Everyone should feel that their voice is heard.[7 9 10 43 57 68 74 78 82–86]

Respect the autonomy—organisational level

It is widely agreed that the autonomy of healthcare professionals should be respected. They should have a choice of whether or not to work with patients with COVID-19 and should not be judged on their choice.[34 35 52 54 64 72 87] If healthcare professionals develop complaints while working, they should be given the choice to perform other activities elsewhere (expert interview).

Rooms and facilities—environmental level

Ideally, each department should have a separate room available for professionals to retreat, rest or sleep.[7 38 50 53 70 71 76 80 88 89] Time, space and opportunities should be offered to let professionals exercise individually or jointly and/or perform (relaxing) activities. Exercise can serve as an outlet to reduce stress.[38 50 89]

Availability of materials—organisational level

It is essential to provide healthcare professionals, especially those on the frontline, with adequate materials[7 9 34 35 52 64 68 74 79 80]. Besides, training in and supervision of correct use of personal protective equipment are needed.[9 37 67 68 73 80 86 87 90] It is recommended not to share concerns about lack of materials with all professionals in the department.[72 80] The expert interviews added that one person should be assigned the responsibility to further inventor the availability and to take any action to resolve shortages.

Compensation—organisational level

It is recommended to offer (frontline) professionals' compensation for practical support, in relation to extraordinary tasks, responsibilities and risks.[42 58 64 72 80 84 91] Additionally, social services such as child or animal care or care for the elderly should be provided to the next of kin/family of the (frontline) professionals.[79] It should be ensured that staff have a good living environment at home, so that sufficient relaxation and sleep can be achieved.[38 50 61]

Possibility to eat and drink—organisational level

It is recommended to offer professionals, especially those in the frontline, sufficient and easy accessible high nutritional food and drinks during every shift.[38 42 50 64 80] Working in protective clothing considerably reduces the possibility of eating. As frontline professionals should take as much rest as possible during their time off, they should not be worried about preparing a balanced diet at home and to work.[7 42 71]

DISCUSSION

This study presents practical recommendations on how to build and maintain the resilience among frontline healthcare professionals exposed to COVID-19 and other outbreak-related working conditions based on a scoping review and expert interviews. These recommendations encompass a variety of small and large interventions prior to the outbreak as well as during the outbreak. Recommendations prior to the outbreak fostering resilience included optimal provision of education and training, resilience training and interventions to create a feeling of being prepared. Recommendations during the outbreak consisted of (1) enhancing resilience by proper provision of information, psychosocial support and treatment, monitoring the health status of professionals and using various forms and contents of psychosocial support, (2) tasks and responsibilities, in which attention should be paid to kind of tasks, task mix and responsibilities as well as the intensity and weight of these tasks and (3) work patterns and working conditions.

Strengths and limitations

To our knowledge, this is the first study that combined a scoping review based on a systematic literature search with expert interviews to foster evidence-based recommendations about how to keep healthcare professionals healthy and resilient during COVID-19 working conditions. Due to the COVID-19 outbreak and the urgent need for scientific research, no study protocol was published in advance. However, the unpublished protocol is available from the corresponding author on request. Yet, an extensive overview of the current body of knowledge was provided by the extended search strategy, the consideration of preprints and grey literature.

The review process followed a universally agreed protocol (PRISMA Extension for Scoping Reviews 2018) to ensure the quality of reporting.[28] However, this study did not critically appraise the included articles and we cannot make conclusions regarding the quality of the evidence.[92 93] The data collection and data management processes were thorough as all phases of the scoping review were checked by a second reviewer and when necessary a third reviewer. The synthesis of the results was approved by all 12 authors to ensure the validity of the findings. Additionally, the expert interviews increased the trustworthiness of the data.

Most studies included in this review were conducted during or after previous outbreaks that were similar to COVID-19. However, each outbreak has its own dimensions and each culture acts differently. This holds especially true for the Ebola outbreak in Africa, which was included in this review. Hence, care might have been carried out in other ways, due to differences in disease transmission, culture and the healthcare system. Though we consider this literature to be relevant, this should be considered when interpreting the results.

Comparison with other studies

The literature of the impact of the COVID-19 outbreak on healthcare professionals is currently expanding rapidly especially on the impact of changed patient care on the involved healthcare professionals.[94–96] Furthermore, predictors for mental health problems of healthcare professionals during the COVID-19 outbreak accompanied by suggestions of global and small interventions to implement rapidly.[97–100] In most studies, only a particular aspect of mental health problems was explored such as anxiety, burnout and fatigue or psychological (dis) stress.[101–103]

Enhancement of resilience by proper provision and receiving of information and by providing psychosocial support and treatment embedded in a safe and blame-free (working) environment is also emphasised by De Brier *et al*'s[99] rapid systematic review on mental health support during outbreaks. Reducing other tasks to allow healthcare professionals to focus on the immediate needs[3] is in line with our findings. Research prior to the COVID-19 outbreak showed that occupational factors such as shift work, hours worked and job strain led to depression and burnout.[104–106] Work conditions as a lack of breaks during shifts have been associated with nurses' fatigue. Fatigue can directly affect the physical health of professionals by increasing risk of injuries.[107 108] Breaks to rest are important for managing fatigue and improving short-term performance.[109–112] The sudden massive outbreak of COVID-19 that overwhelmed healthcare systems will further magnify these occupational factors if no attention is paid to healthcare professionals.[3]

COVID-19 is a new disease outbreak, we so far have only limited knowledge about. Some of our recommendations as providing good information and clarity were at the begin of the outbreak rather difficult to put into practice. Especially the shortage of protective material in many countries caused great unrest. In a second wave, it should be ensured that this will be better regulated.

Implications

These practical recommendations provide an overview of possible interventions that can be implemented in clinical practice to reduce the burden of healthcare professionals exposed to COVID-19 working conditions and may prevent and reduce possible negative consequences. Government should provide healthcare organisations with sufficient resources to implement these recommendations that fit their needs and adapt them to their context. Recommendations were targeted at various levels: from senior management to healthcare professionals. Even though the recommendations were primarily developed for hospitals, many are transferable to other settings as well. To enhance the evidence base of the recommendations, evaluating the effectiveness of the above-mentioned recommendations during COVID-19 working conditions should be stimulated.

CONCLUSION

Healthcare professionals should be supported in various ways during the extreme COVID-19 working conditions to prevent and reduce possible negative consequences. Many practical and easy to implement recommendations were created to foster physical and mental health of healthcare professionals. Hospitals (and other healthcare organisations) should stimulate the implementation of interventions mentioned in these recommendations at various levels in their organisations.

Author affiliations
[1]Nursing Science, Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht University, Utrecht, The Netherlands
[2]Research Group Chronically Ill, Research Centre for Healthy and Sustainable Living, University of Applied Sciences Utrecht, Utrecht, The Netherlands
[3]Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht University, Utrecht, The Netherlands
[4]Cochrane Netherlands, University Medical Center Utrecht, Utrecht University, Utrecht, Netherlands
[5]Dutch Hospital Association, Utrecht, Netherlands
[6]School of Health Sciences, Faculty of Environmental and Life Sciences, University of Southampton, Southampton, UK

Twitter Jessica D Veldhuizen @jdpoortv

Acknowledgements We would like to express our gratitude to all experts participating in the interviews.

Contributors JCAT, LS, JDV, AR, NB, WdL, EM, JMdM-vG and ES conceptualised this study. AR, DS, DtC, EM, ES, JMdM-vG, JCAT, JDV, LS, NB and WdL conducted the scoping review. WdL conducted the expert interviews. LS checked the recommendations and provided overall guidance. AR, EM, ES, LS and NB conceptualised this manuscript. All authors critically read and approved the final manuscript. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. The corresponding author acts as the guarantor.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Transparency declaration The lead author (the manuscript's guarantor) affirms that the manuscript is an honest, accurate and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval No ethical approval was needed. All experts participating at the interviews provided prior verbal informed consent.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data sharing not applicable as no datasets generated and/or analysed for this study. Data are available upon reasonable request. All data of this study will be provided upon reasonable request from the corresponding author at a.rieckert@umcutrecht.nl.

ORCID iDs
Anja Rieckert http://orcid.org/0000-0002-9735-378X
Linda C Smit http://orcid.org/0000-0001-5488-2967
Jessica D Veldhuizen http://orcid.org/0000-0002-7761-5690

REFERENCES

1 John Hopkins University. COVID-19 dashboard by the center for systems science and engineering [Internet]. Global map coronavirus resource center, 2020. Available: https://coronavirus.jhu.edu/map.html
2 World Health Organization. Strategic preparedness and response plan for the new coronavirus, 2020. Available: https://www.who.int/publications-detail/strategic-preparedness-and-response-plan-for-the-new-coronavirus
3 Adams JG, Walls RM. Supporting the health care workforce during the COVID-19 global epidemic. *JAMA* 2020;323:1439–40.
4 Maunder RG, Leszcz M, Savage D, *et al*. Applying the lessons of SARS to pandemic influenza. *Can J Public Health* 2008;99:486–8.
5 Wu P, Fang Y, Guan Z, *et al*. The psychological impact of the SARS epidemic on hospital employees in China: exposure, risk perception, and altruistic acceptance of risk. *Can J Psychiatry* 2009;54:302–11.
6 Koh D, Lim MK, Chia SE, *et al*. Risk perception and impact of severe acute respiratory syndrome (SARS) on work and personal lives of healthcare workers in Singapore. *Med Care* 2005;43:676–82.
7 Maunder R, Hunter J, Vincent L, *et al*. The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. *CMAJ* 2003;168:1245–51.
8 McAlonan GM, Lee AM, Cheung V, *et al*. Immediate and sustained psychological impact of an emerging infectious disease outbreak on health care workers. *Can J Psychiatry* 2007;52:241–7.
9 Son H, Lee WJ, Kim HS, *et al*. Examination of hospital workers' emotional responses to an infectious disease outbreak: lessons from the 2015 MERS Co-V outbreak in South Korea. *Disaster Med Public Health Prep* 2019;13:504–10.
10 Brooks SK, Dunn R, Amlôt R, AmlA't R, *et al*. A systematic, thematic review of social and occupational factors associated with psychological outcomes in healthcare employees during an infectious disease outbreak. *J Occup Environ Med* 2018;60:248–57.
11 Xiao H, Zhang Y, Kong D, *et al*. The effects of social support on sleep quality of medical staff treating patients with coronavirus disease 2019 (COVID-19) in January and February 2020 in China. *Med Sci Monit* 2020;26:e923549.
12 Liu C-Y, Yang Y-Z, Zhang X-M, *et al*. The prevalence and influencing factors in anxiety in medical workers fighting COVID-19 in China: a cross-sectional survey. *Epidemiol Infect* 2020;148:e98.
13 Zhu Z, Xu S, Wang H, *et al*. COVID-19 in Wuhan: sociodemographic characteristics and hospital support measures associated with the immediate psychological impact on healthcare workers. *EClinicalMedicine* 2020;24:100443.
14 Lai J, Ma S, Wang Y, *et al*. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Netw Open* 2020;3:e203976.
15 Gomez S, Anderson BJ, Yu H, *et al*. Benchmarking critical care well-being: before and after the coronavirus disease 2019 pandemic. *Critical Care Explorations* 2020;2:e0233.
16 Greenberg N, Docherty M, Gnanapragasam S, *et al*. Managing mental health challenges faced by healthcare workers during covid-19 pandemic. *BMJ* 2020;368:m1211.
17 Pappa S, Ntella V, Giannakas T, *et al*. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: a systematic review and meta-analysis. *Brain Behav Immun* 2020;88:901–7.
18 World Health Organization, others. *Mental health and psychosocial considerations during the COVID-19 outbreak, 18 March 2020*. 2020. Geneva: World Health Organization, 2020.
19 Inter-Agency Standing Committee, others. Briefing note on addressing mental health and psychosocial aspects of COVID-19 OutbreakVersion 1.1 2020.
20 International Federation of Red Cross and Red Crescent Societies. Mental health and psychosocial support for staff, volunteers and communities in an outbreak of novel coronavirus 2020.
21 Koh Y, Hegney DG, Drury V. Comprehensive systematic review of healthcare workers' perceptions of risk and use of coping strategies towards emerging respiratory infectious diseases. *Int J Evid Based Healthc* 2011;9:403–19.
22 Robertson L, O'Toole J, Evans N. Historical context: SARS, MERS, and Ebola [Internet]. COVID-19 pandemic: a world in turmoil, 2020. Available: https://www.atrainceu.com/content/8-historical-context-sars-mers-and-ebola
23 Munn Z, Peters MDJ, Stern C, *et al*. Systematic review or scoping review? guidance for authors when choosing between a systematic or scoping review approach. *BMC Med Res Methodol* 2018;18:143.
24 Peters MDJ, Godfrey CM, Khalil H, *et al*. Guidance for conducting systematic scoping reviews. *Int J Evid Based Healthc* 2015;13:141–6.
25 Peters MDJ, Godfrey C, McInerney P. *Chapter 11: Scoping reviews (2020 version). In: JBI manual for evidence synthesis*. Adelaide: JBI, 2020. https://synthesismanual.jbi.global
26 Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* 2005;8:19–32.
27 Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. *Implementation Science* 2010;5:69.
28 Tricco AC, Lillie E, Zarin W, *et al*. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 2018;169:467–73.
29 Segen's Medical Dictionary. Healthcare professional. The free dictionary, 2011. Available: https://medical-dictionary.thefreedictionary.com/healthcare+professional
30 Zautra AJ, Hall JS, Murray KE. Resilience: a new definition of health for people and communities. In: Reich JW, Zautra AJ, Hall JS, eds. *Handbook of adult resilience*. New York: The Guilford Press, 2010: 3–29.

31 Foster K, Roche M, Delgado C, *et al*. Resilience and mental health nursing: an integrative review of international literature. *Int J Ment Health Nurs* 2019;28:71–85.
32 Robertson HD, Elliott AM, Burton C, *et al*. Resilience of primary healthcare professionals: a systematic review. *Br J Gen Pract* 2016;66:e423–33.
33 Matheson C, Robertson HD, Elliott AM, *et al*. Resilience of primary healthcare professionals working in challenging environments: a focus group study. *Br J Gen Pract* 2016;66:e507–15.
34 Speroni KG, Seibert DJ, Mallinson RK. Us nurses' perceptions regarding caring for suspected, probable, and confirmed Ebola virus disease patients, part 1: a quantitative analysis. *J Nurs Adm* 2015;45:477–84.
35 Speroni KG, Seibert DJ, Mallinson RK. Nurses' perceptions on Ebola care in the United States, part 2: a qualitative analysis. *J Nurs Adm* 2015;45:544–50.
36 Wu P, Liu X, Fang Y, *et al*. Alcohol abuse/dependence symptoms among hospital employees exposed to a SARS outbreak. *Alcohol Alcohol* 2008;43:706–12.
37 World Health Organization, others. Coronavirus disease (COVID-19) outbreak: rights, roles and responsibilities of health workers, including key considerations for occupational safety and health. World Health Organization, interim guidance, 2020. Available: https://www.who.int/publications/i/item/coronavirus-disease-(covid-19)-outbreak-rights-roles-and-responsibilities-of-health-workers-including-key-considerations-for-occupational-safety-and-health
38 Medecins sans Frontieres. Stress and psychosocial well-being 2006.
39 Belfroid E, van Steenbergen J, Timen A, *et al*. Preparedness and the importance of meeting the needs of healthcare workers: a qualitative study on Ebola. *J Hosp Infect* 2018;98:212–8.
40 Bell SA, Munro-Kramer ML, Eisenberg MC, *et al*. "Ebola kills generations": Qualitative discussions with Liberian healthcare providers. *Midwifery* 2017;45:44–9.
41 Carvalho E, Castro P, León E, *et al*. Multi-professional simulation and risk perception of health care workers caring for Ebola-infected patients. *Nurs Crit Care* 2019;24:256–62.
42 Chen C-S, Wu H-Y, Yang P, *et al*. Psychological distress of nurses in Taiwan who worked during the outbreak of SARS. *Psychiatric Services* 2005;56:76–9.
43 von Strauss E, Paillard-Borg S, Holmgren J, *et al*. Global nursing in an Ebola viral haemorrhagic fever outbreak: before, during and after deployment. *Glob Health Action* 2017;10:1371427.
44 Abolfotouh MA, AlQarni AA, Al-Ghamdi SM, *et al*. An assessment of the level of concern among hospital-based health-care workers regarding MERS outbreaks in Saudi Arabia. *BMC Infect Dis* 2017;17:4.
45 Li Y, Wang H, Jin X-R, *et al*. Experiences and challenges in the health protection of medical teams in the Chinese Ebola treatment center, Liberia: a qualitative study. *Infect Dis Poverty* 2018;7:92.
46 Maunder R, Lancee W, Balderson K, *et al*. Long-term psychological and occupational effects of providing Hospital healthcare during SARS outbreak. *Emerg Infect Dis* 2006;12:1924–32.
47 Wong TW, Yau JKY, Chan CLW, *et al*. The psychological impact of severe acute respiratory syndrome outbreak on healthcare workers in emergency departments and how they cope. *Eur J Emerg Med* 2005;12:13–18.
48 Andertun S, Hörnsten Åsa, Hajdarevic S. Ebola virus disease: caring for patients in Sierra Leone - a qualitative study. *J Adv Nurs* 2017;73:643–52.
49 Marrs R, Horsley TL, Hackbarth D, *et al*. High consequence infectious diseases training using interprofessional simulation and TeamSTEPPS. *Am J Infect Control* 2020;48:615–20.
50 World Health Organization, others. *Occupational safety and health in public health emergencies: a manual for protecting health workers and responders*. Geneva: ILO, 2018.
51 Al Ghobain M, Aldrees T, Alenezi A, *et al*. Perception and attitude of emergency room resident physicians toward middle East respiratory syndrome outbreak. *Emerg Med Int* 2017;2017:1–4.
52 O'Sullivan TL, Amaratunga C, Phillips KP, *et al*. If schools are closed, who will watch our kids? family caregiving and other sources of role conflict among nurses during large-scale outbreaks. *Prehosp Disaster Med* 2009;24:321–5.
53 Ministerie van Defensie. Militaire Geestelijke Gezondheidszorg. Tips & adviezen voor de mentale gezondheid van zorgprofessionals, 2020. Available: https://www.defensie.nl/downloads/publicaties/2020/03/23/tips-en-adviezen-voor-mentale-gezondheid-zorgprofessionals
54 Lehmann M, Bruenahl CA, Addo MM, *et al*. Acute Ebola virus disease patient treatment and health-related quality of life in health care professionals: a controlled study. *J Psychosom Res* 2016;83:69–74.
55 Al-Dorzi HM, Aldawood AS, Khan R, *et al*. The critical care response to a hospital outbreak of middle East respiratory syndrome coronavirus (MERS-CoV) infection: an observational study. *Ann Intensive Care* 2016;6.
56 Chan SSC, Leung GM, Tiwari AFY, *et al*. The impact of work-related risk on nurses during the SARS outbreak in Hong Kong. *Fam Community Health* 2005;28:274–87.
57 Kang HS, Son YD, Chae S-M, *et al*. Working experiences of nurses during the middle East respiratory syndrome outbreak. *Int J Nurs Pract* 2018;24:e12664–8.
58 Raven J, Wurie H, Witter S. Health workers' experiences of coping with the Ebola epidemic in Sierra Leone's health system: a qualitative study. *BMC Health Serv Res* 2018;18:251.
59 Styra R, Hawryluck L, Robinson S, *et al*. Impact on health care workers employed in high-risk areas during the Toronto SARS outbreak. *J Psychosom Res* 2008;64:177–83.
60 Tolomiczenko GS, Kahan M, Ricci M, *et al*. Sars: coping with the impact at a community hospital. *J Adv Nurs* 2005;50:101–10.
61 Bai Y, Lin C-C, Lin C-Y, *et al*. Survey of stress reactions among health care workers involved with the SARS outbreak. *Psychiatric Services* 2004;55:1055–7.
62 Chan AOM, Huak CY. Psychological impact of the 2003 severe acute respiratory syndrome outbreak on health care workers in a medium size regional General Hospital in Singapore. *Occup Med* 2004;54:190–6.
63 Kim JS, Choi JS. Factors influencing emergency nurses' burnout during an outbreak of middle east respiratory syndrome coronavirus in Korea. *Asian Nurs Res* 2016;10:295–9.
64 Lee S-H, Juang Y-Y, Su Y-J, *et al*. Facing SARS: psychological impacts on SARS team nurses and psychiatric services in a Taiwan General Hospital. *Gen Hosp Psychiatry* 2005;27:352–8.
65 Lu Y-C, Shu B-C, Chang Y-Y, *et al*. The mental health of hospital workers dealing with severe acute respiratory syndrome. *Psychother Psychosom* 2006;75:370–5.
66 Marjanovic Z, Greenglass ER, Coffey S. The relevance of psychosocial variables and working conditions in predicting nurses' coping strategies during the SARS crisis: An online questionnaire survey. *Int J Nurs Stud* 2007;44:991–8.
67 Poon E, Liu KS, Cheong DL, *et al*. Impact of severe respiratory syndrome on anxiety levels of front-line health care workers. *Hong Kong Med J* 2004;10:325–30.
68 Son H, Lee WJ, Kim HS. Hospital workers's psychological resilience after the 2015 middle East respiratory syndrome outbreak. *Social Behavior and Personality: An International Journal* 2019;47:1–13.
69 Khalid I, Khalid TJ, Qabajah MR, *et al*. Healthcare workers emotions, perceived stressors and coping strategies during a MERS-CoV outbreak. *Clin Med Res* 2016;14:7–14.
70 Lin C-Y, Peng Y-C, Wu Y-H, *et al*. The psychological effect of severe acute respiratory syndrome on emergency department staff. *Emerg Med J* 2007;24:12–17.
71 Liu C, Wang H, Zhou L, *et al*. Sources and symptoms of stress among nurses in the first Chinese anti-Ebola medical team during the Sierra Leone aid mission: a qualitative study. *Int J Nurs Sci* 2019;6:187–91.
72 Tam CWC, Pang EPF, Lam LCW, CWC T, LCW L, *et al*. Severe acute respiratory syndrome (SARS) in Hong Kong in 2003: stress and psychological impact among frontline healthcare workers. *Psychol Med* 2004;34:1197–204.
73 Su T-P, Lien T-C, Yang C-Y, *et al*. Prevalence of psychiatric morbidity and psychological adaptation of the nurses in a structured SARS caring unit during outbreak: a prospective and periodic assessment study in Taiwan. *J Psychiatr Res* 2007;41:119–30.
74 Dai Y, Hu G, Xiong H. Psychological impact of the coronavirus disease 2019 (COVID-19) outbreak on healthcare workers in China. *medRxiv* 2020.
75 Chen R, Chou K-R, Huang Y-J, *et al*. Effects of a SARS prevention programme in Taiwan on nursing staff's anxiety, depression and sleep quality: A longitudinal survey. *Int J Nurs Stud* 2006;43:215–25.
76 Qi J, Xu J, Li B-Z, *et al*. The evaluation of sleep disturbances for Chinese frontline medical workers under the outbreak of COVID-19. *Sleep Med* 2020;72:1–4.
77 Chen N-H, Wang P-C, Hsieh M-J, *et al*. Impact of severe acute respiratory syndrome care on the general health status of healthcare workers in Taiwan. *Infect Control Hosp Epidemiol* 2007;28:75–9.
78 Bournes DA, Ferguson-Paré M. Persevering through a difficult time during the SARS outbreak in Toronto. *Nurs Sci Q* 2005;18:324–33.
79 Maunder R. The experience of the 2003 SARS outbreak as a traumatic stress among frontline healthcare workers in Toronto: lessons learned. *Phil Trans R Soc Lond B* 2004;359:1117–25.

80 O'Boyle C, Robertson C, Secor-Turner M. Public health emergencies: nurses' recommendations for effective actions. *Aaohn J* 2006;54:347–53.
81 Sin SS, Huak CY. Psychological impact of the SARS outbreak on a Singaporean rehabilitation department.including commentary by Leong I, Thompson DR 2004;11:417–24.
82 Grace SL, Hershenfield K, Robertson E, *et al*. The occupational and psychosocial impact of SARS on academic physicians in three affected hospitals. *Psychosomatics* 2005;46:385–91.
83 Gearing RE, Saini M, McNeill T. Experiences and implications of social workers practicing in a pediatric hospital environment affected by SARS. *Health Soc Work* 2007;32:17–27.
84 Kim Y. Nurses' experiences of care for patients with Middle East respiratory syndrome-coronavirus in South Korea. *Am J Infect Control* 2018;46:781–7.
85 Smith MW, Smith PW, Kratochvil CJ, *et al*. The psychosocial challenges of caring for patients with Ebola virus disease. *Health Secur* 2017;15:104–9.
86 Huang L, Lei W, Xu F, *et al*. Emotional responses and coping strategies in nurses and nursing students during Covid-19 outbreak: a comparative study.. *PLoS One* 2020;15.
87 Jeong-Sil C, Ji-Soo K. Factors influencing emergency nurse's ethical problems during the outbreak of MERS-CoV. *Nursing Ethics* 2018;25:335–45.
88 Tomczyk D, Alvarez D, Borgman P, *et al*. Caring for those who care: the role of the occupational health nurse in disasters. *AAOHN J* 2008;56:243–50.
89 Chen Q, Liang M, Li Y, *et al*. Mental health care for medical staff in China during the COVID-19 outbreak. *Lancet Psychiatry* 2020;7:e15–16.
90 Khee KS, Lee LB, Chai OT, *et al*. The psychological impact of SARS on health care providers 2004.
91 Shih F-J, Turale S, Lin Y-S, *et al*. Surviving a life-threatening crisis: Taiwan's nurse leaders' reflections and difficulties fighting the SARS epidemic. *J Clin Nurs* 2009;18:3391–400.
92 Hand C, Letts L. *Occupational therapy research and practice involving adults with chronic diseases: a scoping review and Internet scan*. Ottawa: Canadian Association of Occupational Therapists, 2009.
93 Brien SE, Lorenzetti DL, Lewis S, *et al*. Overview of a formal scoping review on health system report cards. *Implement Sci* 2010;5:2.
94 Liang H, Acharya G. Novel corona virus disease (COVID-19) in pregnancy: what clinical recommendations to follow? *Acta Obstet Gynecol Scand* 2020;99:439–42.
95 Petrovski Beáta Éva, Lumi X, Znaor L, *et al*. Reorganize and survive-a recommendation for healthcare services affected by COVID-19-the ophthalmology experience. *Eye* 2020;34:1–3.
96 Poon LC, Yang H, Lee JCS, *et al*. ISUOG Interim Guidance on 2019 novel coronavirus infection during pregnancy and puerperium: information for healthcare professionals. *Ultrasound Obstet Gynecol* 2020;55:700–8.
97 Ornell F, Halpern SC, Kessler FHP, *et al*. The impact of the COVID-19 pandemic on the mental health of healthcare professionals. *Cadernos de Saúde Pública* 2020;36:e00063520.
98 Plomecka MB, Gobbi S, Neckels R. Mental health impact of COVID-19: a global study of risk and resilience factors. *medRxiv* 2020.
99 De Brier N, Stroobants S, Vandekerckhove P, *et al*. Factors affecting mental health of health care workers during coronavirus disease outbreaks (SARS, MERS & COVID-19): a rapid systematic review. *PLoS One* 2020;15:e0244052.
100 Chew NWS, Lee GKH, Tan BYQ, *et al*. A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID-19 outbreak. *Brain Behav Immun* 2020;88:559–65.
101 Orrù G, Ciacchini R, Gemignani A, *et al*. Psychological intervention measures during the COVID-19 pandemic. *Clinical Neuropsychiatry* 2020;17:76–9.
102 Shanafelt T, Ripp J, Trockel M. Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA* 2020;323:2133–4.
103 Sasangohar F, Jones SL, Masud FN, *et al*. Provider burnout and fatigue during the COVID-19 pandemic: lessons learned from a high-volume intensive care unit. *Anesth Analg* 2020;131:106–11.
104 Brandford AA, Reed DB. Depression in registered nurses: a state of the science. *Workplace Health Saf* 2016;64:488–511.
105 Letvak S, Ruhm CJ, McCoy T. Depression in Hospital-Employed nurses. *Clinical Nurse Specialist* 2012;26:177–82.
106 Theorell T, Hammarström A, Aronsson G, *et al*. A systematic review including meta-analysis of work environment and depressive symptoms. *BMC Public Health* 2015;15:738.
107 Witkoski A, Dickson VV. Hospital staff nurses' work hours, meal periods, and rest breaks. A review from an occupational health nurse perspective. *Aaohn J* 2010;58:489–97.
108 Trinkoff AM, Le R, Geiger-Brown J, *et al*. Work schedule, needle use, and needlestick injuries among registered nurses. *Infect Control Hosp Epidemiol* 2007;28:156–64.
109 Dababneh AJ, Swanson N, Shell RL. Impact of added rest breaks on the productivity and well being of workers. *Ergonomics* 2001;44:164–74.
110 Faucett J, Meyers J, Miles J, *et al*. Rest break interventions in stoop labor tasks. *Appl Ergon* 2007;38:219–26.
111 Galinsky TL, Swanson NG, Sauter SL, *et al*. A field study of supplementary rest breaks for data-entry operators. *Ergonomics* 2000;43:622–38.
112 Tucker P, Folkard S, Macdonald I. Rest breaks and accident risk. *The Lancet* 2003;361:680.
113 Fiksenbaum L, Marjanovic Z, Greenglass ER, *et al*. Emotional exhaustion and state anger in nurses who worked during the SARS outbreak: the role of perceived threat and organizational support. *Can J Commun Ment Health* 2006;25:89–103.
114 Bukhari EE, Temsah MH, Aleyadhy AA, *et al*. Middle East respiratory syndrome coronavirus (MERS-CoV) outbreak perceptions of risk and stress evaluation in nurses. *J Infect Dev Ctries* 2016;10:845–50.
115 Hewlett BL, Hewlett BS. Providing care and facing death: nursing during Ebola outbreaks in central Africa. *J Transcult Nurs* 2005;16:289–97.
116 Imai T, Takahashi K, Hasegawa N, *et al*. Sars risk perceptions in healthcare workers, Japan. *Emerg Infect Dis* 2005;11:404–14.
117 Yiwen K, Hegney D, Drury V. A comprehensive systematic review of healthcare workers' perceptions of risk from exposure to emerging acute respiratory infectious diseases and the perceived effectiveness of strategies used to facilitate healthy coping in acute hospital and community healthcare settings. *JBI Libr Syst Rev*;8:917–71.
118 Liu X, Kakade M, Fuller CJ, *et al*. Depression after exposure to stressful events: lessons learned from the severe acute respiratory syndrome epidemic. *Compr Psychiatry* 2012;53:15–23.
119 Rambaldini G, Wilson K, Rath D, *et al*. The impact of severe acute respiratory syndrome on medical house staff: a qualitative study. *J Gen Intern Med* 2005;20:381–5.
120 Shih F-J, Gau M-L, Kao C-C, *et al*. Dying and caring on the edge: Taiwan's surviving nurses' reflections on taking care of patients with severe acute respiratory syndrome. *Appl Nurs Res* 2007;20:171–80.

Online Appendix

Table of contents

Search strategies

PubMed (January 1, 2003 through March 26, 2020)

#	Search terms
1	Medical Staff [MeSH] OR Physicians [MeSH] OR Nursing Staff [MeSH] OR Nurses [MeSH] OR Medical Staff [tiab] OR Physician* [tiab] OR Doctor* [tiab] OR Clinician* [tiab] OR Nursing Staff [tiab] OR Nurse* [tiab] OR Health care Worker*[tiab] OR Health Care Worker* [tiab] OR Health Worker* [tiab] OR Health care Professional* [tiab] OR Health Care Professional* [tiab] OR Health Professional* [tiab] OR Health care Provider* [tiab] OR Health Care Provider* [tiab] OR Health Provider* [tiab] OR Hospital worker* [tiab] OR Hospital Employee* [tiab] OR Medical House Staff [tiab]
2	Disease Outbreaks [MeSH] OR Communicable Diseases, Emerging [MeSH] OR Severe Acute Respiratory Syndrome[MeSH] OR SARS Virus [MeSH] OR Middle East Respiratory Syndrome Coronavirus [MeSH] OR Ebolavirus [MeSH] OR Disease Outbreak* [tiab] OR Pandemic [tiab] OR Epidemic [tiab] OR Emerging Communicable Disease* [tiab] OR Emerging Infectious Disease* [tiab] OR Severe Acute Respiratory Syndrome [tiab] OR SARS [tiab] OR Middle East Respiratory Syndrome [tiab] OR MERS [tiab] OR Ebola* [tiab] OR Corona [tiab] OR Coronavirus [tiab] OR COVID-19 [tiab] OR 2019-nCoV [tiab] OR SARS-CoV [tiab] OR MERS-CoV [tiab] OR Sars-Cov-2 [tiab]
3	Resilience, Psychological [MeSH] OR Fatigue [MeSH] OR Workload [MeSH] OR Mental Health [MeSH] OR Burnout, Professional [MesH] OR Occupational Health [MeSH] OR Occupational Stress [MeSH] OR Professionalism [MeSH] OR Psychological Trauma [MeSH] OR Fear [MeSH] OR Anxiety [MeSH] OR Adaptation, Psychological [MeSH] OR Resilience [tiab] OR Persever* [tiab] OR Physical Health [tiab] OR Physical Impact [tiab] OR Physical Effect* [tiab] OR Physical Outcome* [tiab] OR Physical Workload [tiab] OR Fatigue [tiab] OR Mental Health [tiab] OR Psychological Health [tiab] OR Emotional Health [tiab] OR Mental Impact [tiab] OR Psychological Impact [tiab] OR Emotional Impact [tiab] OR Mental Effect* [tiab] OR Psychological Effect* [tiab] OR Emotional Effect* [tiab] OR Mental Outcome* [tiab] OR Psychological Outcome* [tiab] OR Emotional Outcome* [tiab] OR Mental Workload [tiab] OR Psychological Workload [tiab] OR Emotional Workload [tiab] OR Wellbeing [tiab] OR Burnout [tiab] OR Burn-out [tiab] OR Occupational Health [tiab] OR Occupational Stress [tiab] OR Occupational Injury [tiab] OR Occupational Disability [tiab] OR Occupational Effect* [tiab] OR Professionalism [tiab] OR Trauma [tiab] OR Traumatic [tiab] OR Fear [tiab] OR Anxiety [tiab] OR Anxious [tiab] OR Stress [tiab] OR Distress [tiab] OR Adaptation [tiab] OR Coping [tiab] OR Stigma [tiab]
4	#1 AND #2 AND #3

Embase (January 1, 2003 through March 26, 2020)

#	Search terms
1	'medical personnel'/exp OR 'medical staff'/exp OR 'hospital physician'/exp OR 'resident'/exp OR 'nurse'/exp OR 'medical staff':ab,ti OR Physician*:ab,ti OR Doctor*:ab,ti OR Clinician*:ab,ti OR 'Nursing Staff':ab,ti OR Nurse*:ab,ti OR 'Health care Worker*':ab,ti OR 'Health Care Worker*':ab,ti OR 'Health Worker*':ab,ti OR 'Health care Professional*':ab,ti OR 'Health Care Professional*':ab,ti OR 'Health Professional*':ab,ti OR 'Health care Provider*':ab,ti OR 'Health Care Provider*':ab,ti OR 'Health Provider*':ab,ti OR 'Hospital worker*':ab,ti OR 'Hospital Employee*':ab,ti OR 'Medical House Staff':ab,ti
2	'epidemic'/exp OR 'pandemic'/exp OR 'emerging infectious disease'/exp OR 'severe acute respiratory syndrome'/exp OR 'SARS-related coronavirus'/exp OR 'Middle East respiratory syndrome coronavirus'/exp OR 'Ebolavirus'/exp OR 'Disease Outbreak*':ab,ti OR Pandemic:ab,ti OR Epidemic:ab,ti OR 'Emerging Communicable Disease*':ab,ti OR 'Emerging Infectious Disease*':ab,ti OR 'Severe Acute Respiratory Syndrome':ab,ti OR SARS:ab,ti OR 'Middle East Respiratory Syndrome':ab,ti OR MERS:ab,ti OR Ebola*:ab,ti OR Corona:ab,ti OR Coronavirus:ab,ti OR 'COVID-19':ab,ti OR '2019-nCoV':ab,ti OR 'SARS-CoV':ab,ti OR 'MERS-CoV':ab,ti OR 'Sars-Cov-2':ab,ti
3	'resilience'/exp OR 'fatigue'/exp OR 'workload'/exp OR 'mental health'/exp OR 'psychological health'/exp OR 'emotional stability'/exp OR 'professional burnout'/exp OR 'occupational health'/exp OR 'job stress'/exp OR 'work capacity'/exp OR 'professionalism'/exp OR 'psychotrauma'/exp OR 'fear'/exp OR 'anxiety'/exp OR Resilience:ab,ti OR Persever*:ab,ti OR 'Physical Health':ab,ti OR 'Physical Impact':ab,ti OR 'Physical Effect*':ab,ti OR 'Physical Outcome*':ab,ti OR 'Physical Workload':ab,ti OR Fatigue:ab,ti OR 'Mental Health':ab,ti OR 'Psychological Health':ab,ti OR 'Emotional Health':ab,ti OR 'Mental Impact':ab,ti OR 'Psychological Impact':ab,ti OR 'Emotional Impact':ab,ti OR 'Mental Effect*':ab,ti OR 'Psychological Effect*':ab,ti OR 'Emotional Effect*':ab,ti OR 'Mental Outcome*':ab,ti OR 'Psychological Outcome*':ab,ti OR 'Emotional Outcome*':ab,ti OR 'Mental Workload':ab,ti OR 'Psychological Workload':ab,ti OR 'Emotional Workload':ab,ti OR Wellbeing:ab,ti OR Burnout:ab,ti OR Burn-out:ab,ti OR 'Occupational Health':ab,ti OR 'Occupational Stress':ab,ti OR 'Occupational Injury':ab,ti OR 'Occupational Disability':ab,ti OR 'Occupational Effect*':ab,ti OR Professionalism:ab,ti OR Trauma:ab,ti OR Traumatic:ab,ti OR Fear:ab,ti OR Anxiety:ab,ti OR Anxious:ab,ti OR Stress:ab,ti OR Distress:ab,ti OR Adaptation:ab,ti OR Coping:ab,ti OR Stigma:ab,ti
4	#1 AND #2 AND #3

PsycINFO (January 1, 2003 through March 26, 2020)

#	Search terms
1	DE "Medical Personnel" OR DE "Nurses" OR DE "Physicians" OR DE "Psychiatric Hospital Staff" OR DE "Clinicians" OR TI “medical staff” OR TI “Physician” OR TI “Doctors” OR TI “Doctor” OR TI “Clinicians” OR TI “Clinician” OR TI “Nursing Staff” OR TI “Nurses” OR TI “Nurse” OR TI “Health care Professionals” OR TI “Health care Worker” OR TI “Health Care Professionals” OR TI “Health Care Worker” OR TI “Health Professionals” OR TI “Health Worker” OR TI “Health care Professionals” OR TI “Health care Professional” OR TI “Health Care Professionals” OR TI “Health Care Professional” OR TI “Health Professionals” OR TI “Health Professional” OR TI “Health care Providers” OR TI “Health care Provider” OR TI “Health Care Providers” OR TI “Health Care Provider” OR TI “Health Providers” OR TI “Health Provider” OR TI “Hospital professionals” OR TI “Hospital worker” OR TI “Hospital Employees” OR TI “Hospital Employee” OR TI “Medical House Staff” OR AB “medical staff” OR AB “Physician” OR AB “Doctors” OR AB “Doctor” OR AB “Clinicians” OR AB “Clinician” OR AB “Nursing Staff” OR AB “Nurses” OR AB “Nurse” OR AB “Health care Professionals” OR AB “Health care Worker” OR AB “Health Care Professionals” OR AB “Health Care Worker” OR AB “Health Professionals” OR AB “Health Worker” OR AB “Health care Professionals” OR AB “Health care Professional” OR AB “Health Care Professionals” OR AB “Health Care Professional” OR AB “Health Professionals” OR AB “Health Professional” OR AB “Health care Providers” OR AB “Health care Provider” OR AB “Health Care Providers” OR AB “Health Care Provider” OR AB “Health Providers” OR AB “Health Provider” OR AB “Hospital professionals” OR AB “Hospital worker” OR AB “Hospital Employees” OR AB “Hospital Employee” OR AB “Medical House Staff”
2	DE "Epidemics" OR DE "Pandemics" OR TI “Disease Outbreaks” OR TI “Pandemic” OR TI “Epidemic” OR TI “Emerging Communicable Diseases” OR TI “Emerging Infectious Diseases” OR TI “Severe Acute Respiratory Syndrome” OR TI “SARS” OR TI “Middle East Respiratory Syndrome” OR TI “MERS” OR TI “Ebola*” OR TI “Corona” OR TI “Coronavirus” OR TI “COVID-19” OR TI “2019-nCoV” OR TI “SARS-CoV” OR TI “MERS-CoV” OR TI “Sars-Cov-2” OR AB “Disease Outbreaks” OR AB “Pandemic” OR AB “Epidemic” OR AB “Emerging Communicable Diseases” OR AB “Emerging Infectious Diseases” OR AB “Severe Acute Respiratory Syndrome” OR AB “SARS” OR AB “Middle East Respiratory Syndrome” OR AB “MERS” OR AB “Ebola*” OR AB “Corona” OR AB “Coronavirus” OR AB “COVID-19” OR AB “2019-nCoV” OR AB “SARS-CoV” OR AB “MERS-CoV” OR AB “Sars-Cov-2”
3	DE "Resilience (Psychological)" OR DE "Health Anxiety" OR DE "Mental Health" OR DE "Mental Status" OR DE "Occupational Health" OR DE "Work Related Illnesses" OR DE "Physical Health" OR DE "Well Being" OR DE "Compassion Fatigue" OR DE "Fatigue" DE "Health Outcomes" OR DE "Psychological Needs" OR DE "Physical Health" OR DE "Physical Strength" OR DE "Professionalism" OR DE "Trauma" OR DE "Emotional Trauma" OR DE "Injuries" OR DE "Post-Traumatic Stress" OR DE "Traumatic Loss" OR DE "Fear" OR DE "Anxiety" OR DE "Stress" OR DE "Environmental Stress" OR DE "Occupational Stress" OR DE "Physiological Stress" OR DE "Post-Traumatic Stress" OR DE "Psychological Stress" OR DE "Distress" OR

	DE "Coping Behavior" OR DE "Adaptive Behavior" OR DE "Stigma" OR DE "Self-Stigma" OR TI “Resilience” OR TI “Persever*” OR TI “Physical Health” OR TI “Physical Impact” OR TI “Physical Effects” OR TI “Physical Outcomes” OR TI “Physical Workload” OR TI “Fatigue” OR TI “Mental Health” OR TI “Psychological Health” OR TI “Emotional Health” OR TI “Mental Impact” OR TI “Psychological Impact” OR TI “Emotional Impact” OR TI “Mental Effects” OR TI “Psychological Effects” OR TI “Emotional Effects” OR TI “Mental Outcomes” OR TI “Psychological Outcomes” OR TI “Emotional Outcomes” OR TI “Mental Workload” OR TI “Psychological Workload” OR TI “Emotional Workload” OR TI “Wellbeing” OR TI “Burnout” OR TI “Burn-out” OR TI “Occupational Health” OR TI “Occupational Injury” OR TI “Occupational Disability” OR TI “Occupational Effects” OR TI “Professionalism” OR TI “Trauma” OR TI “Traumatic” OR TI “Fear*” OR TI “Anxi*” OR TI “Stress” OR TI “Distress” OR TI “Adaptation” OR TI “Coping” OR TI “Stigma” OR AB “Resilience” OR AB “Persever*” OR AB “Physical Health” OR AB “Physical Impact” OR AB “Physical Effects” OR AB “Physical Outcomes” OR AB “Physical Workload” OR AB “Fatigue” OR AB “Mental Health” OR AB “Psychological Health” OR AB “Emotional Health” OR AB “Mental Impact” OR AB “Psychological Impact” OR AB “Emotional Impact” OR AB “Mental Effects” OR AB “Psychological Effects” OR AB “Emotional Effects” OR AB “Mental Outcomes” OR AB “Psychological Outcomes” OR AB “Emotional Outcomes” OR AB “Mental Workload” OR AB “Psychological Workload” OR AB “Emotional Workload” OR AB “Wellbeing” OR AB “Burnout” OR AB “Burn-out” OR AB “Occupational Health” OR AB “Occupational Injury” OR AB “Occupational Disability” OR AB “Occupational Effects” OR AB “Professionalism” OR AB “Trauma” OR AB “Traumatic” OR AB “Fear*” OR AB “Anxi*” OR AB “Stress” OR AB “Distress” OR AB “Adaptation” OR AB “Coping” OR AB “Stigma”
4	#1 AND #2 AND #3

CINAHL (January 1, 2003 through March 26, 2020)

#	Search terms
1	MH "Medical Staff+" OR MH "Medical Staff, Hospital+" OR MH "Nursing Staff, Hospital" OR MH "Nurses+" OR MH "Physicians+" OR MH "Health Personnel" OR TI “medical staff” OR TI “Physician” OR TI “Doctors” OR TI “Doctor” OR TI “Clinicians” OR TI “Clinician” OR TI “Nursing Staff” OR TI “Nurses” OR TI “Nurse” OR TI “Health care Professionals” OR TI “Health care Worker” OR TI “Health Care Professionals” OR TI “Health Care Worker” OR TI “Health Professionals” OR TI “Health Worker” OR TI “Health care Professionals” OR TI “Health care Professional” OR TI “Health Care Professionals” OR TI “Health Care Professional” OR TI “Health Professionals” OR TI “Health Professional” OR TI “Health care Providers” OR TI “Health care Provider” OR TI “Health Care Providers” OR TI “Health Care Provider” OR TI “Health Providers” OR TI “Health Provider” OR TI “Hospital professionals” OR TI “Hospital worker” OR TI “Hospital Employees” OR TI “Hospital Employee” OR TI “Medical House Staff” OR AB “medical staff” OR AB “Physician” OR AB “Doctors” OR AB “Doctor” OR AB “Clinicians” OR AB “Clinician” OR AB “Nursing Staff” OR AB “Nurses” OR AB “Nurse” OR AB “Health care Professionals” OR AB “Health care Worker” OR AB “Health Care Professionals” OR AB “Health Care Worker” OR AB “Health Professionals” OR AB “Health Worker” OR AB “Health care Professionals” OR AB “Health care Professional” OR AB “Health Care Professionals” OR AB “Health Care Professional” OR AB “Health Professionals” OR AB “Health Professional” OR AB “Health care Providers” OR AB “Health care Provider” OR AB “Health Care Providers” OR AB “Health Care Provider” OR AB “Health Providers” OR AB “Health Provider” OR AB “Hospital professionals” OR AB “Hospital worker” OR AB “Hospital Employees” OR AB “Hospital Employee” OR AB “Medical House Staff”
2	MH "Disease Outbreaks" OR MH "Severe Acute Respiratory Syndrome" OR MH "SARS Virus" OR MH "Middle East Respiratory Syndrome" OR MH "Middle East Respiratory Syndrome Coronavirus" OR MH "Ebola Virus" OR TI “Disease Outbreaks” OR TI “Pandemic” OR TI “Epidemic” OR TI “Emerging Communicable Disease*” OR TI “Emerging Infectious Disease*” OR TI “Severe Acute Respiratory Syndrome” OR TI “SARS” OR TI “Middle East Respiratory Syndrome” OR TI “MERS” OR TI “Ebola*” OR TI “Corona” OR TI “Coronavirus” OR TI “COVID-19” OR TI “2019-nCoV” OR TI “SARS-CoV” OR TI “MERS-CoV” OR TI “Sars-Cov-2” OR AB “Disease Outbreak*” OR AB “Pandemic” OR AB “Epidemic” OR AB “Emerging Communicable Disease*” OR AB “Emerging Infectious Disease*” OR AB “Severe Acute Respiratory Syndrome” OR AB “SARS” OR AB “Middle East Respiratory Syndrome” OR AB “MERS” OR AB “Ebola*” OR AB “Corona” OR AB “Coronavirus” OR AB “COVID-19” OR AB “2019-nCoV” OR AB “SARS-CoV” OR AB “MERS-CoV” OR AB “Sars-Cov-2”
3	MH "Fatigue+" OR MH "Burnout, Professional+" OR MH "Mental Health" OR MH "Occupational Health+" OR MH "Mental Status" OR MH "Occupational-Related Injuries" OR MH "Psychological Well-Being" OR MH "Stress, Occupational+" OR MH "Professionalism" OR MH "Trauma+" OR MH "Stress Disorders, Post-Traumatic+" OR MH "Anxiety+" OR MH "Stress" OR MH "Adaptation, Occupational" OR MH "Adaptation, Physiological+" OR MH "Coping+" OR MH "Stigma" OR TI “Resilience” OR TI “Persever*” OR TI “Physical Health” OR TI “Physical Impact” OR TI “Physical

	Effect*" OR TI "Physical Outcome*" OR TI "Physical Workload" OR TI "Fatigue" OR TI "Mental Health" OR TI "Psychological Health" OR TI "Emotional Health" OR TI "Mental Impact" OR TI "Psychological Impact" OR TI "Emotional Impact" OR TI "Mental Effect*" OR TI "Psychological Effect*" OR TI "Emotional Effect*" OR TI "Mental Outcome*" OR TI "Psychological Outcome*" OR TI "Emotional Outcome*" OR TI "Mental Workload" OR TI "Psychological Workload" OR TI "Emotional Workload" OR TI "Wellbeing" OR TI "Burnout" OR TI "Burn-out" OR TI "Occupational Health" OR TI "Occupational Injury" OR TI "Occupational Disability" OR TI "Occupational Effect*" OR TI "Professionalism" OR TI "Trauma" OR TI "Traumatic" OR TI "Fear*" OR TI "Anxiety" OR TI "Anxious" OR TI "Stress" OR TI "Distress" OR TI "Adaptation" OR TI "Coping" OR TI "Stigma" OR AB "Resilience" OR AB "Persever*" OR AB "Physical Health" OR AB "Physical Impact" OR AB "Physical Effect*" OR AB "Physical Outcome*" OR AB "Physical Workload" OR AB "Fatigue" OR AB "Mental Health" OR AB "Psychological Health" OR AB "Emotional Health" OR AB "Mental Impact" OR AB "Psychological Impact" OR AB "Emotional Impact" OR AB "Mental Effect*" OR AB "Psychological Effect*" OR AB "Emotional Effect*" OR AB "Mental Outcome*" OR AB "Psychological Outcome*" OR AB "Emotional Outcome*" OR AB "Mental Workload" OR AB "Psychological Workload" OR AB "Emotional Workload" OR AB "Wellbeing" OR AB "Burnout" OR AB "Burn-out" OR AB "Occupational Health" OR AB "Occupational Injury" OR AB "Occupational Disability" OR AB "Occupational Effect*" OR AB "Professionalism" OR AB "Trauma" OR AB "Traumatic" OR AB "Fear*" OR AB "Anxiety" OR AB "Anxious" OR AB "Stress" OR AB "Distress" OR AB "Adaptation" OR AB "Coping" OR AB "Stigma"
4	#1 AND #2 AND #3

bioRxiv & medRxiv (January 3, 2020 through March 26, 2020)

The possibilities of using search terms in bioRxiv and medRxiv are limited. For now, focus was on COVID-19-related terms in line with a COVID-19 Living Systematic Review (https://ispmbern.github.io/covid-19/living-review/collectingdata.html):

ncov OR corona OR wuhan OR COVID OR SARS-CoV-2

A direct link to the search strategy and results (Note: as a result of publication in peer-reviewed journals, studies will disappear from the archive, so the numbers found today may differ from the numbers presented in the current study):
https://www.biorxiv.org/search/ncov%252Bor%252Bcorona%252Bor%252Bwuhan%252Bor%252BCOVID%252Bor%252BSARS-CoV-2%20jcode%3Amedrxiv%7C%7Cbiorxiv%20limit_from%3A2020-01-03%20limit_to%3A2020-03-26%20numresults%3A75%20sort%3Apublication-date%20direction%3Adescending%20format_result%3Astandard

Table 1: Interventions/ recommendations prior to/ in run-up to the crisis: resilience

	INTERVENTIONS / RECOMMENDATIONS PRIOR TO / IN RUN-UP TO THE CRISIS		
First author, year	**RESILIENCE**		
	Education and training	**Resilience training**	**Perceptions of preparedness**
Abolfotouh, 2017		Counselling and incentives to boost morale and maintain levels of service.	Compliance with the recommendations of the WHO; provisions to protect them through infection-control measures, personal-protection practices and anti-viral medications.
Al Ghobain, 2017	Infection control training.		Perception that there is adequate staff in the workplace to handle the increased demand. A clear plan to handle a MERS outbreak (e.g. cancellation of outpatient clinics, visitor restrictions, mandatory wearing of protective measures, etc.).
Andertun, 2017		Training (preparedness / development of strategies) is crucial for safety, managing risks. Feelings of meaningfulness essential to be prepared.	Reliance in a safe, organized effort. Trust in personal protection equipment (PPE) quality.
Belfroid, 2018	Training / simulation provided a feeling of being prepared		Increase feeling of safety when protocols with clear tasks are available and when these are continuously reviewed and improved
Bell, 2017	Lack of training increases feelings of fear		Resource constraints increased feelings of fear and stress
Brooks, 2018	Provide appropriate specialized training to equip workers with skills, knowledge and confidence - i.e. infection control training.	Provide appropriate specialized training to equip workers with skills, knowledge and confidence	
Carvalho, 2019	Multi-professional simulation-based training (5 days, principles of Ebola care, biosafety, high fidelity simulations of procedures,)could reduce anxiety and fear (training: high satisfaction and perceptions of safety)		
Chen, 2005	Give nurses extensive training (infection control and self-protection)		
Lehmann, 2016	preparation and training (lead to high level of health related quality of life): Biweekly mandatory training including decontamination procedures, technical aspects and emergency training.		
Li, 2018		*strengthen psychical exercise	
Liu, 2019	safety training		Targeted measures, proper responses, and good community support can effectively lower stress to ensure the nurses' physical and mental health, (and enable them to play better roles during international aid missions)

	INTERVENTIONS / RECOMMENDATIONS PRIOR TO / IN RUN-UP TO THE CRISIS		
First author, year	**RESILIENCE**		
	Education and training	**Resilience training**	**Perceptions of preparedness**
Lu, 2006	Training in preventing infection; learn how to cope with stress		
Marjanovic, 2007	Teaching nurses new working strategies that could help them		
Marrs, 2019	Simulation-based exercises and Team STEPPS (e.g. inter-professional teamwork) could directly address this deficiency and enhance existing high consequence infectious diseases training plans by increasing health care worker self-efficacy and decreasing anxiety A simulated environment used in this program allowed subjects to practice clinical skills while donned in first responder PPE without harming actual patients, team members, or oneself		
Maunder, 2004a	Established trust in a source of information prior to a crisis increases that source's credibility during crisis.		
Maunder, 2006		Effective staff support may be a primary target to bolster the resilience of healthcare workers who will face future outbreaks. Effective moral or psychological support typically occurs in the context of trusted professional and institutional relationships, which should ideally be established before the outbreak situation.	- Effective support benefits from careful planning and preparation before an outbreak. - Engaging staff in collaborative planning for future outbreaks may reduce the tendency to cope by means of avoidant strategies and may enhance coping through problem-solving and peer-support. - Reducing patient-to-nurse ratios (pre-pandemic). - Increasing organizational characteristics that increase nurses' autonomy, flexibility, control over practice, and perceived empowerment. - Anger and blame directed toward others (hostile confrontation) or oneself (self-blame) may be reduced in a working environment that fosters positive working relationships through effective leadership.
Maunder, 2003			Strong pre-existing relationships among psychiatrists, administrators, nurses and social workers > helpful in crafting flexible and responsive solutions to changing demands and stresses on staff, patients and families.
O'Boyle, 2006	adequate training, drills, order and structure amidst chaos		Develop emergency prepared plans. Preparations for emergencies should include assessments of nurses' and other stakeholders' concern. hospital leadership
Smith, 2017			personal protective equipment (PPE) protocols

	INTERVENTIONS / RECOMMENDATIONS PRIOR TO / IN RUN-UP TO THE CRISIS		
First author, year	**RESILIENCE**		
	Education and training	**Resilience training**	**Perceptions of preparedness**
Speroni, 2015a	training of nurses and ancillary service staff to safely provide care for confirmed and/or PUI EVD patients		
Speroni, 2015b	Education, training, needed to ensure safe donning/doffing		the structures and processes (i.e. in protocols) should be grounded by effective, evidence-informed communication strategies
Tam, 2004			Healthcare workers needed to be "altruistic and brave" (public pressure)
Wong, 2005		Health authorities should plan ahead of time to provide proactive psychological support for staff *psycho-educational programmes in emergency preparedness training. programme should help staff deal with issues of isolation and stigmatization, adopt proactive approaches to manage work fatigue and workload stress, help staff to deal with anxiety and depression, and develop good coping skills.	
Bhagavathula, 2020			Relying on authentic sources is a key factor in believing transparent information about

Table 2: Interventions/ recommendations during the crisis: resilience

	INTERVENTIONS/ RECOMMENDATIONS DURING THE CRISIS				
First author, year	**RESILIENCE**				
	Information (receiving for professionals)	**Information (providing by professionals)**	**Psychosocial support and treatment**	**Monitoring health status of professionals**	**Form and content of (psychosocial) support**
Bai, 2004	Timely SARS information to reduce uncertainty and minimize stigmatization		Despite informal support and education, there is a need for professional psychosocial support		
Belfroid, 2018					Use team- members as an outlet for emotions / feelings to reduce stress levels
Bournes, 2005	Focused communication mechanisms using a variety of media increases persevering through difficult times		Solid personal and professional support increases persevering through difficult times		Continuously cultivate colleagueship and teamwork to increase persevering through difficult times
Brooks, 2018	Provide web-based support and information to equip workers with skills, knowledge and confidence - i.e. infection control training. This also reduces feelings of social isolation Also emphasize the positive things of working in a crisis: personal growth.		Develop occupational health policies and support systems to promote psychological wellbeing. Evaluate and address psychological distress during the crisis.		Try to do everything to enhance camaraderie and team cohesion - this also reduces feelings of social isolation
Bukhari, 2016			Provide professional psychosocial support interventions to reduce worries and fear		
Chan, 2004			Stress management programmes, critical incident stress management and peer support programmes.		Support services are essential; these should be flexible, collegial and varied in form.
Chan, 2005	Education for nurses about infection, control and crisis management.	Provide a communication system between management and frontline workers.	Counselling services (mange stress and anxiety)		
Chen, 2005				Screening at-risk nurses for distress so that psychological intervention can be provided	
Chen, 2007				Psychological counselling for long-term follow-up (more than 1 month) of employee mental status.	Support social functioning (friends) after shifts.
Chen, 2006	In-service training including nursing care; information daily update				

	INTERVENTIONS/ RECOMMENDATIONS DURING THE CRISIS				
First author, year	**RESILIENCE**				
	Information (receiving for professionals)	**Information (providing by professionals)**	**Psychosocial support and treatment**	**Monitoring health status of professionals**	**Form and content of (psychosocial) support**
Chua, 2004	100% attendance infection-control training necessary				
Fiksenbaum, 2006			Organizations should create and maintain strong support networks to reduce the influence of stressors		
Gearing, 2007					
Hewlett, 2005	biomedical training and knowledge about the disease	providing knowledge (biomedical and traditional) to common people because with knowledge, stigmatization decreased and cooperation increased			
Grace, 2005	Timely information sharing; staying informed about SARS		psycho-social support to help physicians cope with their fear of infectivity and the risks to their families		
Imai, 2005	adequately training healthcare workers in the use of personal protective equipment is an important				
Jeong-Sil, 2018	On outbreak of disease: establish a protocol/guidelines and equipment (by gov./hosp.) Educate nurses				
Kang, 2018	burden: frequent changing guidelines and protocols beneficial: share experience and good examples of care	provide information quick and easily, using e.g. app-systems	concerns for safety and discomfort of wearing protection materials are causes of burden		urgent need for (peer) support, share experiences of good and bad care situations
Khalid, 2016			Fear of being infected among healthcare workers reduced by positive attitudes in the workplace, clinical improvement of infected colleagues, and stoppage of disease transmission among healthcare workers after adopting strict protective measures		stress among healthcare workers is alleviated by strict infection control practice guidance and provision of personal protective equipment.

	INTERVENTIONS/ RECOMMENDATIONS DURING THE CRISIS				
First author, year	**RESILIENCE**				
	Information (receiving for professionals)	**Information (providing by professionals)**	**Psychosocial support and treatment**	**Monitoring health status of professionals**	**Form and content of (psychosocial) support**
Kim, 2016			Job-related Stress was the most important determinant of burnout		personal protective equipment in alleviating their stress
Kim, 2018	Constant executive and societal rewards are important to persevere during the crisis.				Comradery and good teamwork was of great support
Lai, 2020			Interventions to promote mental well-being in health care workers need to be immediately implemented, with women, nurses, and frontline workers requiring particular attention.		
Lee, 2005	Offer a regular education program (without frequent changes in infection control measures and the documentation process).	Provide briefing sessions after a work day (in safe, quiet, independent meeting place)			Psychiatric service helped to manage stress.
Lehmann, 2016	*knowledge should be given to staff who are & who are not directly involved in treatment of infected patients *provide proper communication with public to reduce fear and anxiety (by gov).				
Li, 2018			To give professional psychological counselling and health care for team member if necessary; provide mental health support to relieve anxiety		
Li, 2020	transparent announcement of epidemic information can facilitate psychological treatment			the society and psychotherapists should actively pay more attention to the psychological problems of FLNs	
Lin, 2007	Offering prompt and authoritative information at the beginning of the outbreak		Flexible and non-intrusive psychiatric intervention; psychological support, sufficient resources and definite procedures should be available immediately; providing support and education		Comfortable environment to share their reactions to tremendous stress
Liu, 2019	reliable and timely scientific evidence can help the medical staff to lower their feelings of unsafety, face the risks, and relieve unnecessary stress.;	Full cooperation bet ween the medical team and local	This medical team had a psychological counsellor and the nurses were encouraged to confide and seek timely, positive help		Before the team was dispatched, the hospital arranged counselling, sleep guidance, social etiquette training, and verbal English

	INTERVENTIONS/ RECOMMENDATIONS DURING THE CRISIS				
First author, year	**RESILIENCE**				
	Information (receiving for professionals)	**Information (providing by professionals)**	**Psychosocial support and treatment**	**Monitoring health status of professionals**	**Form and content of (psychosocial) support**
	The medical team members can obtain updates about the disease and ensure smooth information flow so that all involved can properly understand the risks.	hospital in both the front- and rear lines; close communication			training for the nurses to reduce possible sources of stress; The hospital also provided sleep aids and improved food to help the nurses relieve stress symptoms; the support from family and the hospital helped them feel relaxed.
Liu, 2012			Altruistic acceptance of risk was found to decrease the odds of having a high current level of depressive symptoms. Spend time in quarantine, may be at elevated risk for depression, even over the long term.		
Marjanovic, 2007					Making organizational supports congruent with nurses' specific needs, and by helping nurses reduce feelings of uncertainty and fear when these crises occur
Maunder, 2004a	Adequate training. Clearly communicating risk information; acknowledge substantially different levels of awareness of knowledge among expert investigators, clinicians, public officials and the lay public.			The costs of interpersonal isolation need to be borne in mind when widespread infection control procedures are implemented (isolation increases stress).	- Positive influence on the well-being of healthcare workers through contact with the popular media (e.g. description of nurses as heroes). - Measures to increase communication and interpersonal support to mitigate the inevitable stress of the situation; enhanced use of email and hospital intranet and Internet facilities, telephone messaging, 'buddying' of healthcare workers in higher risk areas, formal and informal telephone and fax networks (especially for quarantined workers), and telephone helplines.

	INTERVENTIONS/ RECOMMENDATIONS DURING THE CRISIS				
First author, year	**RESILIENCE**				
	Information (receiving for professionals)	**Information (providing by professionals)**	**Psychosocial support and treatment**	**Monitoring health status of professionals**	**Form and content of (psychosocial) support**
Maunder, 2006	Responsive communication.		- Enhanced support and training may reduce burnout and posttraumatic stress. - Interventions that reduce maladaptive coping may decrease prolonged suffering.		- Opportunities for facilitated reflection on normal emotional responses to extraordinary stress. - Opportunities for mentorship or "buddying" with more experienced colleagues may be useful.
Maunder, 2003	- Immediate clear information in repeated, succinct messages. - A pamphlet identifying signs of anxiety and stress and information about support resources, which was distributed to every nursing unit and program area. - Modification of infection control procedures and public health recommendations day by day, and sometimes hour by hour, increased uncertainty (= negative). - The perception of personal danger was heightened by the known lethality of the syndrome and intense media coverage of the outbreak and its effects (= negative).		- Psychiatric staff who were on the units to see patients lingered to chat with staff. - Informal individual contacts between psychiatric staff and colleagues in medicine, surgery and administration in which simple gestures of support and advice (+ also another psychiatrist with whom they had no working relationship). - A confidential telephone support line staffed by inpatient psychiatric nurses for all hospital staff .	- Conflict between their roles as health care provider and parent (= negative). - Quarantine > concerns about personal safety, transmitting to family members, stigmatization, interpersonal isolation (= negative).	- Leadership by example, when leaders advocate and use peer support. - Aggressive attempts to educate staff and patients about the impairment that results from sleep deprivation and to treat insomnia. - Staff members were discouraged from interacting outside the hospital with colleagues and staff meetings were discouraged, at a time at which people wished to seek each other out for support (= negative).
O'Boyle, 2006	accessible information and content experts should be available		Emotional and physical support to improve coping abilities during emergency	specific measures to improve safely, reduce anxiety, and increase trust in hospitals	communication with nurses' families
Poon, 2004			Mean anxiety levels were higher among workmen, health care assistants, and nurses than among administrative staff controls or doctors. Anxiety scores were correlated with burnout scores, with contact with patients who had SARS, and with discomfort from wearing protective gear.		
Rambaldini, 2005	effective communication needs to focus among others		the restriction in social interaction easily result in isolation, need for optimal communication		

	INTERVENTIONS/ RECOMMENDATIONS DURING THE CRISIS				
First author, year	**RESILIENCE**				
	Information (receiving for professionals)	**Information (providing by professionals)**	**Psychosocial support and treatment**	**Monitoring health status of professionals**	**Form and content of (psychosocial) support**
	on risk of infection and related anxiety, specific topic that are relevant for the specific care for patients with SARS , protocols, use various forms		and support that are tailored to the social isolation or quarantine.		
Raven, 2018	open communication between held care workers, using social media platforms like WhatsApp, is helpful to cope with the impact of Ebola. it serves like kind of peer support		supportive supervision is an important source of being able to continue providing care		Several important coping strategies based upon existing mechanisms included: being sustained by religion; a sense of serving their country and community; and peer and family support. Externally derived strategies included: training which built health worker confidence in providing care; provision of equipment to do their job safely; a social media platform which helped health workers deal with challenges; workshops that provided ways to deal with the stigma associated with being a health worker; and the risk allowance, which motivated staff to work in facilities and provided an additional income source
Shih, 2009	Clear communication pathways are essential. Nurse leads need to be media say, distinguish adverse and supportive media fast. Provide tangible rewards				
Sin, 2004	Executive/directive information important to help professionals to cope with the situation				Availability of someone to talk to (ventilating concerns): supervisors or colleagues helps professionals to cope with the situation.
Son, 2019a		Clear, accurate, and timely	special program for their employees to share what they were emotionally experiencing and		

	INTERVENTIONS/ RECOMMENDATIONS DURING THE CRISIS				
First author, year	**RESILIENCE**				
	Information (receiving for professionals)	**Information (providing by professionals)**	**Psychosocial support and treatment**	**Monitoring health status of professionals**	**Form and content of (psychosocial) support**
		communication is known to enable informed decision-making and cooperation within the hospital (on all levels)	issues that troubled them organised by center for empathy		
Son, 2019b			resilience-building programs with debriefing sessions and interdisciplinary effective communication that are focused on facilitating individuals' ability to cope with crises, relieving the intensity of the negative emotions adjusting the perceived level of risk and maintaining positivity (although better for non-healthcare workers, but also good for healthcare workers).		
Speroni, 2015a	training of nurses and ancillary service staff to safely provide care for confirmed and/or PUI EVD patients				
Speroni, 2015b	Education, training, needed to ensure safe donning/doffing				
Styra, 2008	Implementing systems for communication between healthcare workers and administration; confidence in the information provided		Involvement of occupational health experts		
Tam, 2004	Professionals needed clear guidelines.		Psychological support from employers.	Monitor in order to detect symptoms early (sleep disturbance to reflect difficulties in adjusting with stress) to be able to act promptly	Professional counselling for frontline Healthcare workers should be promoted.
von Strauss, 2017	information adapted to the mission, to do lists, acts; in-depth information to give to family and colleagues		Professional counselling for frontline healthcare workers should be promoted.		
Wong, 2005			the more frequently adopted coping strategies were acceptance, active coping, and positive framing		staff should be prepared psychologically to deal with potential stress by group

	INTERVENTIONS/ RECOMMENDATIONS DURING THE CRISIS				
First author, year	**RESILIENCE**				
	Information (receiving for professionals)	**Information (providing by professionals)**	**Psychosocial support and treatment**	**Monitoring health status of professionals**	**Form and content of (psychosocial) support**
					interviews before going into SARS wards
Wu, 2008	Too much exposure to media coverage during crisis increase risk for alcohol abuse				
Wu, 2009			Altruistic acceptance of risk is negatively related to PTSS.		
Xiao, 2020			Establish psychotherapy teams as early as possible: Pro-actively evaluate anxiety, stress and sleep quality and provide individually targeted interventions		Social support from medical staff and family /friends reduces anxiety and stress through improvement of self-efficacy (understanding, respect, encouragement, courage and feeling of professional achievement)
Bhagavathula, 2020	Updates posted online by official government health authorities had positive implications for improving healthcare workers' knowledge levels; Social media as a source of information with unverified malicious information, can spread quickly and can misguide healthcare workers. Healthcare workers should carefully evaluate COVID-19-related information and should use scientific and authentic content as information sources. Educational campaigns that target healthcare workers and the wider population are necessary.				
Zhu, 2020			Online relaxation techniques. 5.0 % of Health care workers joined in suggesting more psychosocial interventions and follow-up programs are needed. The risk of anxiety, depression, and acute stress tended to		

	INTERVENTIONS/ RECOMMENDATIONS DURING THE CRISIS				
First author, year	**RESILIENCE**				
	Information (receiving for professionals)	**Information (providing by professionals)**	**Psychosocial support and treatment**	**Monitoring health status of professionals**	**Form and content of (psychosocial) support**
			increase with increasing years of work; Psychological intervention strategies according to different risk levels of HWs. Keep track of the mental status of those HWs who were confirmed or suspected patients themselves or suspected patients in their family; the exercise habit was associated with a lower risk of anxiety symptoms, suggesting that physical activity helps alleviate psychological impact. HWs in isolation wards have a more pronounced risk of stress.		
Huang, 2020			Women have significantly higher levels of depression, anxiety, and loneliness than men (related to gender traits); Hospitals should focus on providing psychological support to nurses; providing timely psychological assistance; training in coping strategies; providing adequate medical protective equipment.		Taking a variety of interventions to block the spread of infectious diseases to form a medical environment where COVID-19 stops spreading in hospitals. Create an optimistic environment and guarantees for personal safety for nurses.
Liu, 2020			Compliment medical personnel for their dedication in fighting COVID-19, which could encourage medical workers and make them feel honoured and proud to participate in this difficult mission, authorities should also focus on implementing measures to target workers' mental health; government and healthcare authorities should proactively implement appropriate measures, such as providing psychological counselling services, to prevent, alleviate or treat increased anxiety among medical staff during the COVID-19 epidemic	Governments should focus on potential psychological problems among suspect cases in medical staff, and provide effective mental health measures to alleviate suffering	
Qi, 2020			Interventions should be administrated for frontline medical workers aiming to maintain their healthy condition and guarantee their professional performance. Exposure to long working hours and irregular work shifts may attribute to stress, fatigue and chronic diseases		
Khee, 2004					Group sessions seemed helpful; they brought upon a

	INTERVENTIONS/ RECOMMENDATIONS DURING THE CRISIS				
First author, year	**RESILIENCE**				
	Information (receiving for professionals)	**Information (providing by professionals)**	**Psychosocial support and treatment**	**Monitoring health status of professionals**	**Form and content of (psychosocial) support**
					source of mutual support and also understanding among all which greatly impacted the overall strategies utilized in the battle against SARS.
WHO, 2019		A blame-free environment in which health workers can report on incidents; repor t to their immediate supervisor any situation which they have reasonable justification to believe presents an imminent and serious danger to life or health; advise management if health workers are experiencing signs of undue stress or mental health challenges that require supportive interventions.	Allow health workers to exercise the right to remove themselves from a work situation that they have reasonable justification to believe presents an imminent and serious danger to their life or health and protect health workers exercising this right from any undue consequences; access to mental health and counselling resources		

Table 3: Interventions/ recommendations during the crisis: tasks and responsibilities & working conditions

	INTERVENTIONS / RECOMMENDATIONS DURING THE CRISIS									
First author, year	**TASKS AND RESPONSIBILITIES**		**WORKING CONDITIONS**							
	Tasks / responsibilities / task mix	**Intensity / weigh of tasks and responsibilities**	**Work pattern**	**Team composition**	**Team building**	**Open and safe work culture**	**Rooms and facilities**	**Availability of materials**	**Compensation**	**Possibility to eat and drink**
Al-Dorzi, 2016	A nurse was assigned to screen all staff and visitors on symptoms.	The nurse-to-patient ratio was mostly 1:1, except for one patient on ECMO (2:1). Also, 1–2 additional nurses were deployed in each unit to assist in procedures.		Rotating residents were not allowed to work in the ICU (only attending staff). Two pregnant ICU nurses were redeployed to low-risk units.						
Bai, 2004							Provide suitable accommodation to health professionals who are concerned about infecting loved ones. Yet, staff in quarantine has a higher risk on acute stress and early termination of working in healthcare			
Belfroid, 2018				Use of buddies to put on and check protective						

	INTERVENTIONS / RECOMMENDATIONS DURING THE CRISIS									
First author, year	**TASKS AND RESPONSIBILITIES**		**WORKING CONDITIONS**							
	Tasks / responsibilities / task mix	**Intensity / weigh of tasks and responsibilities**	**Work pattern**	**Team composition**	**Team building**	**Open and safe work culture**	**Rooms and facilities**	**Availability of materials**	**Compensation**	**Possibility to eat and drink**
				equipment are highly appreciated						
Chan, 2005		Work allocation and scheduling should be reviewed to relieve nurses' stress.	Vacation leave may have to be granted to some needy nurses.							
Chen, 2005									Adequate compensation (for work and risk)	
Chen, 2007		Total number of hours of care might be a significant predictor of mental health (reasonable duty schedules needed)	Shifts: 1-2 week of care; 2 weeks of self-quarantine and 2 weeks of duty.			Discrimination against Healthcare workers (because of their work with SARS patients)				
Chen, 2006			Rescheduling holidays for sufficient rest time							
Gearing, 2007	Significant/leading role of social workers in interdisciplinary teams to support hospital staff, and patients and their families (positive)									
Grace, 2005					support or discussion group through the use of web-based technology; talking to others/increased collegiality and					

	INTERVENTIONS / RECOMMENDATIONS DURING THE CRISIS									
First author, year	**TASKS AND RESPONSIBILITIES**		**WORKING CONDITIONS**							
	Tasks / responsibilities / task mix	**Intensity / weigh of tasks and responsibilities**	**Work pattern**	**Team composition**	**Team building**	**Open and safe work culture**	**Rooms and facilities**	**Availability of materials**	**Compensation**	**Possibility to eat and drink**
					teamwork→ camaraderie, courage, professionalism, dedication to patient care, altruism, cooperation, mutual support, unity in a common cause, the spirit of pulling together through a crisis					
Jeong-Sil, 2018						need for social support to encourage healthcare workers to stay committed to patient care while struggling with infectious diseases → provide accurate information (by gov.) to prevent vague public fear which could lead to misunderstanding and prejudice against healthcare workers. In terms of stigmatization regarding medical staff: social phenomenon of people avoiding not only hospital healthcare workers but also their families in fear of infection		Respect the autonomy of nurses: provide sufficient compensation and safety mechanisms to facilitate their participation in patient care		

	INTERVENTIONS / RECOMMENDATIONS DURING THE CRISIS									
First author, year	**TASKS AND RESPONSIBILITIES**		**WORKING CONDITIONS**							
	Tasks / responsibilities / task mix	**Intensity / weigh of tasks and responsibilities**	**Work pattern**	**Team composition**	**Team building**	**Open and safe work culture**	**Rooms and facilities**	**Availability of materials**	**Compensation**	**Possibility to eat and drink**
Kang, 2018		Be aware of burnout over time because of the heavy workload								
Lai, 2020	Pressure on nurses when they were assigned to join the SARS team (negative)									
Lee, 2005	Senior nurses mentoring the junior nurses.		Reasonable staffing/shift	Pressure on (some) nurses when they were assigned to join the SARS team.	Importance of meetings to improve teamwork and reduce conflict between doctors and nurses	Conflict between their duty and their own safety in the workplace; Nurses suffered from stresses related to worries about colleagues, patients and family members. Death of the head nurse as a major stressor. (GRIEF)	Tension (because of limited availability of rooms/bed etc.) between doctors and nurses hurting the relationship.	Having adequate and sufficient protective equipment is most important.	Bonus pay for dangerous work	Engaged health promoting behaviours (more rest, exercise and balanced diet). Part of coping strategies of nurses.
Lehmann, 2016			Shorter shift durations (<12 hours) may entail lower levels of fatigue							
Li, 2020	Adopt various levels of interventions for frontline nurses during the diverse stages of medical support for patients (positive)									
Liu, 2019			Reasonable shift arrangements were adopted to avoid							

	INTERVENTIONS / RECOMMENDATIONS DURING THE CRISIS									
First author, year	**TASKS AND RESPONSIBILITIES**		**WORKING CONDITIONS**							
	Tasks / responsibilities / task mix	**Intensity / weigh of tasks and responsibilities**	**Work pattern**	**Team composition**	**Team building**	**Open and safe work culture**	**Rooms and facilities**	**Availability of materials**	**Compensation**	**Possibility to eat and drink**
			fatigue at work							
Maunder, 2004a						Reassurance of healthcare workers that their livelihood is not at risk if they are not able to work owing to illness or infection control precautions.		Adequate supplies of personal protection equipment.		
Maunder, 2004b	Being assigned to unfamiliar tasks (negative). Doing work within usual area of competence and expertise (positive).				Perceived stigma and disrupted contact with colleagues (negative).			Positive view on protective equipment and hospital procedures and resources (positive).		
Maunder, 2006	Opportunities for healthcare workers to contribute to decision-making in the workplace.									
Maunder, 2003	Staff members not involved in patient care were deemed non-essential and asked to stay at home > felt isolated and ineffective (= negative). Rather redeployed roles, felt more satisfying.			Blurred line between staff and patients> caring for colleagues increased anxiety of competences and skills (= negative).	- Senior staff acting as role models by making use of support services and bringing others with them. - Efforts to overcome interpersonal isolation, from sharing jokes on the nursing station to conference calls.		A drop-in lounge in an open setting with soothing music, comfortable chairs and snacks.	Being well-equipped, maximally protected by isolation precautions. Provision of appropriate equipment and supplies.	Staff were prevented by provincial directives from working in multiple institutions, which imposed a financial burden on staff whose income depends on working in several	Eating and drinking, which require removing a mask, were done alone or outside the hospital (= negative).

	INTERVENTIONS / RECOMMENDATIONS DURING THE CRISIS									
First author, year	**TASKS AND RESPONSIBILITIES**		**WORKING CONDITIONS**							
	Tasks / responsibilities / task mix	**Intensity / weigh of tasks and responsibilities**	**Work pattern**	**Team composition**	**Team building**	**Open and safe work culture**	**Rooms and facilities**	**Availability of materials**	**Compensation**	**Possibility to eat and drink**
									institutions (= negative).	
O'Boyle, 2006		Triage system to process patients based on acuity and ethical principles (positive)		novice nurses work with senior nurse to enhance safety		increased security to protect nurses and commitment from institutions to take care of ill or injured nurses.	a quite area as respite from the clinical environment and a place to sleep	methods to protect themselves, their families and patients is crucial	a system to prepare and compensate for potentially loss of staff	Food and water necessary for continued functioning
O'Sullivan, 2009		Awareness of feelings of guilt due to personal (e.g. fear to infect others) and professional (e.g. obligation to work) dilemmas (positive)								
Smith, 2017	Successful patient care (positive)				behavioural health worker available for counselling services and informal conversations/positive team environment/Discussion on mental health focused on compassion fatigue; personal interest; group training activities; informal conversations					
Son, 2019a								For a safe environment: providing appropriate protection measures for		

	INTERVENTIONS / RECOMMENDATIONS DURING THE CRISIS									
First author, year	**TASKS AND RESPONSIBILITIES**		**WORKING CONDITIONS**							
	Tasks / responsibilities / task mix	**Intensity / weigh of tasks and responsibilities**	**Work pattern**	**Team composition**	**Team building**	**Open and safe work culture**	**Rooms and facilities**	**Availability of materials**	**Compensation**	**Possibility to eat and drink**
								hospital workers and their families		
Son, 2019b								providing protection (e.g., vaccines, protective clothing), especially healthcare workers to build resilience		
Speroni, 2015b						space for voluntarily caring for patients with external ventricular drains; possibility to opt out		Specialized teams/trained staff with proper techniques and equipment		
Styra, 2008				buddy system (pairing an experienced healthcare workers with a less experienced healthcare worker); opportunities for healthcare workers to exchange and address concerns,						

	INTERVENTIONS / RECOMMENDATIONS DURING THE CRISIS									
First author, year	**TASKS AND RESPONSIBILITIES**		**WORKING CONDITIONS**							
	Tasks / responsibilities / task mix	**Intensity / weigh of tasks and responsibilities**	**Work pattern**	**Team composition**	**Team building**	**Open and safe work culture**	**Rooms and facilities**	**Availability of materials**	**Compensation**	**Possibility to eat and drink**
				share strategies						
Tam, 2004	Willingness to work on SARS units might prepare healthcare workers better to cope with psychological stress.				Adequate effective team communication and feedback.	Avoiding close social contact (transmitting infection) was increasing stress of healthcare workers. Providing a safe and well-structured work environment will minimize the acute stress effect & will foster resilience of health care workers' mental status		Worries that protective measures were inadequate (more than worries about direct exposure to SARS patients).	Adequate practical support: insurance, compensation	
von Strauss, 2017	need for practical exercises specific for the task	Reduction of workload (positive)				Healthcare worker needed to be "altruistic and brave"				
Wu, 2008		Awareness of long lasting mental health consequences, such as alcohol abuse (positive)				Being quarantined during the crisis increased the risk for alcohol abuse				
Wu, 2009		Awareness of long lasting mental health consequences, such as alcohol abuse (positive)				Being quarantined during the crisis increased the risk for post-traumatic stress syndrome				
WHO, 2018	Advanced task planning (positive)									

	INTERVENTIONS / RECOMMENDATIONS DURING THE CRISIS									
First author, year	**TASKS AND RESPONSIBILITIES**		**WORKING CONDITIONS**							
	Tasks / responsibilities / task mix	**Intensity / weigh of tasks and responsibilities**	**Work pattern**	**Team composition**	**Team building**	**Open and safe work culture**	**Rooms and facilities**	**Availability of materials**	**Compensation**	**Possibility to eat and drink**
WHO, 2019			maintain appropriate working hours with breaks					An adequate supply of protective gear.	Medical coverage for all medical personnel and their families was imperative.	Sufficient food.