# It is illegal to post this copyrighted PDF on any website. Psychological and Coping Responses of Health Care Workers Toward Emerging Infectious Disease Outbreaks: A Rapid Review and Practical Implications for the COVID-19 Pandemic

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## ABSTRACT

**Objective:** In light of the current evolving coronavirus disease 2019 (COVID-19) pandemic, and the need to learn from past infectious disease outbreaks to provide better psychological support for our frontline health care workers (HCW), we conducted a rapid review of extant studies that have reported on both psychological and coping responses in HCW during recent outbreaks.

**Data Sources:** We performed a systematic search of the available literature using PubMed, MEDLINE (Ovid), and Web of Science, combining key terms regarding recent infectious disease outbreaks and psychological and coping responses. Papers published from database inception to April 20, 2020, were considered for inclusion. Only studies in the English language and papers from peer-reviewed journals were included.

**Study Selection:** We identified 95 (PubMed) and 49 papers (Web of Science) from the database search, of which 23 papers were eventually included in the review.

**Data Extraction:** The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were used for data extraction. The McMaster University critical appraisal tool was used to appraise quantitative studies. Guidelines by Higginbotham and colleagues were used to appraise qualitative studies. Only studies exploring the combined psychological and coping responses of HCW amid infectious diseases were included.

**Results:** Salient psychological responses that can persist beyond the outbreaks included anxiety/fears, stigmatization, depression, posttraumatic stress, anger/frustration, grief, and burnout, but also positive growth and transformation. Personal coping methods (such as problem solving, seeking social support, and positive thinking) alongside workplace measures (including infection control and safety, staff support and recognition, and clear communication) were reported to be helpful.

**Conclusions:** Psychological support for HCW in the current COVID-19 pandemic and future outbreaks should focus on both individual (eg, psychoeducation on possible psychological responses, self-care) and institutional (eg, clear communication, providing access to resources for help, recognition of efforts of HCW) measures.

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he severity and spread of emerging infectious disease outbreaks can potentially cause a severe strain on the health care system, including the health care workers (HCW) at the forefront, especially if they are sustained over a prolonged period of time. Previous studies examining psychological responses within various emerging infectious disease outbreaks have demonstrated relatively high psychological morbidity among HCW.<sup>1-4</sup> This morbidity can be attributed to various stressors such as the fear of becoming infected and dying, a loss of control of the spread of the virus, and passing the virus on to their family and friends.<sup>3</sup> These psychosocial issues can persist long after the outbreak is over<sup>4-7</sup> and can affect job performance<sup>1</sup> and the ability to cope or willingness to respond to subsequent outbreaks.<sup>8</sup> As of September 11, 2020, coronavirus disease 2019 (COVID-19) has affected more than 28 million people across 213 countries and territories. More than 915,000 people have died of the disease, and over 20 million have recovered.<sup>9</sup> In light of the rapidity of the spread of the COVID-19 pandemic globally, there is a need to synthesize extant data on the psychological and coping responses of HCW toward previous infectious disease outbreaks, which would allow us to better provide psychological support for them and ensure that their efforts to manage the current COVID-19 pandemic can be sustained over time. A recent review of the psychological effects of COVID-19 revealed that HCW, together with those with existing physical and mental health conditions, were most severely affected.<sup>10</sup> This raises concerns about the toll that an unprecedented pandemic can take on HCW serving on the frontlines, as well as its interaction with personal factors such as one's preexisting health conditions or family stressors. The ways in which HCW have learned to cope with these stressors during previous outbreaks could shed light on protective and risk factors that should be taken into consideration during the current pandemic.

There are several knowledge gaps at present. First, few studies have examined the common or unique psychological responses of HCW across different infectious disease outbreaks with specific illness profiles. The current COVID-19 pathogen is characterized by early shedding, and transmission may

- The psychological effects of an infectious disease outbreak and their interactions with coping strategies are complex and multifaceted. There is a need to understand the nature and range of psychological sequelae and interrelationships with coping responses within health care workers (HCW) to better support them during the current and future outbreaks.
- Amid the varied psychological responses, individual coping and institutional support measures were equally important and helpful for HCW during infectious disease outbreaks. Practical measures that can be considered for the current COVID-19 pandemic should focus on understanding of the person and emphasis on individual and institutional approaches to foster better resilience.

occur while the individual is asymptomatic, which is unlike the severe acute respiratory syndrome (SARS), characterized by late shedding when the individual is unwell.<sup>11</sup> In addition, COVID-19 infection has a higher fatality rate than H1N1 but a lower rate than SARS, Middle East respiratory syndrome (MERS), and Ebola.<sup>12,13</sup> Clarification about factors related to the different psychological responses is needed so that the level of psychological support can be tailored accordingly. Second, a better understanding of the coping mechanisms adopted that have helped or have not helped can guide measures to promote adaptive coping in the current and future outbreaks.

The aim of our study was to conduct a rapid review of the combined psychological and coping responses among HCW who were deployed for work during the various infectious disease outbreaks. We compared the psychological responses across groups of HCW within the different infectious disease outbreaks and examined personal coping and measures adopted by health care institutions that have been helpful for HCW. Based on the extant data, we then suggest practical implications for better psychological support of our HCW in the current COVID-19 pandemic.

#### **METHODS**

We performed a systematic search of the available literature using PubMed/MEDLINE and Web of Science. The following search strategy was used ((psychiatric OR psychological) AND coping) AND (H5N1 OR Nipah OR Ebola OR SARS OR "severe acute respiratory syndrome" OR H1N1 OR MERS OR "Middle East respiratory syndrome" OR H7N9)), with papers published from database inception to April 20, 2020, being considered for inclusion. Only studies in the English language and papers from peerreviewed journals exploring the combined psychological and coping responses of HCW amid infectious disease outbreaks were included. Editorials, commentaries, perspectives, case studies, reviews, and dissertations were excluded. No additional articles were discovered from our check of the reference lists of reviews emerging from the search.

It is illegal to post this copyrighted PDE on any works and Figure 1. PRISMA Flowchart of the Literature Search and **Study Selection Process** 



We assessed the quality of articles included in our review using critical appraisal tools for quantitative<sup>14</sup> and qualitative<sup>15</sup> studies. The McMaster University critical appraisal tool<sup>14</sup> was used to appraise quantitative studies, with a score of 1 or 0 given to each of the 11 components. The guidelines by Higginbotham and colleagues<sup>15</sup> were used to appraise the qualitative studies, with a score of 1 or 0 given to each of the 10 components. Authors Q.H.C. and K.S. performed the search and quality ratings independently, and any disagreements were resolved by consensus-based discussion among all authors.

### RESULTS

We identified 95 (PubMed) and 49 (Web of Science) papers from the database search, of which 23 papers were eventually included in the review. A PRISMA flow diagram depicting how articles were selected is shown in Figure 1. Of the 23 included articles, 15 were quantitative studies and 8 were qualitative studies. Overall, 17 studies examined the SARS epidemic, 5 focused on the Ebola epidemic, and 1 study covered the MERS epidemic (Table 1).

#### **Quality Appraisal of the Studies**

Of the 15 quantitative studies evaluated, all studies scored at least 10 out of a maximum possible of 12 (Table 2). Several studies failed to adequately report on dropouts, exclusions, or response rates<sup>2,21</sup>; gaps in literature<sup>28</sup>; or the validity or

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ERS-CoV,	Type of Stu	Cross- sectional, observatio	Cross- sectional, observatio	(continuec
kers (HCW) Among Emerging Infectious Disease (Ebola, M	Results	<ul> <li>Psychological responses:</li> <li>Stigmatized by public</li> <li>Stress due to being unable to secure accommodation, family rejected them upon return</li> <li>Some avoided them even beyond quarantine period</li> <li>Frustration, disappointment, depression, and anger</li> <li>Preoccupation with dealing with stigma and hostility superseded concerns about their own health</li> <li>Self-adopted coping responses:</li> <li>Rationalizing and empathizing with others' reactions</li> <li>Educating family, friends, and the public about virus</li> <li>Avoiding others as they had internalized the stigma</li> </ul>	<ul> <li>Psychological responses: <ul> <li>Fear of the unknown</li> <li>Frustration and stress due to lack of information</li> <li>Stress due to language barrier</li> <li>Stress due to inability to help/policy restrictions</li> <li>Difficulty balancing concern about personal risk and providing higher standard of care</li> <li>Institution-adopted coping responses:</li> <li>Inclusive team approach ensured staff were well-equipped, attentive to needs of personnel, open to feedback</li> <li>Individual support to staff who needed help to overcome anxieties</li> <li>Peer/colleague support system</li> <li>Group activities organized</li> <li>Self-adopted coping responses:</li> <li>Pacing confidence in training and safety culture</li> <li>Mutual respect between nurses and doctors</li> </ul> </li> </ul>	
esponses in Health Care Work	Measures	Qualitative study	Qualitative study	
d Psychological and Coping Re	No. of Subjects	<ol> <li>If frontline international staff:</li> <li>6 nurses</li> <li>4 doctors/clinical officer</li> <li>1 public health specialist 9 females, 2 males</li> <li>Mean age: 35 years</li> </ol>	<ul> <li>14 multidisciplinary team members:</li> <li>4 doctors</li> <li>4 ducros</li> <li>6 allied health professionals and support professionals and support personel</li> <li>7 females and 7 males Age: 24-48 years Age: 24-48 years and 7 males</li> <li>7 females and 7 males</li> <li>9 females</li> <l< td=""><td></td></l<></ul>	
ıgs of 23 Studies of Combine	Population	International HCW who responded to the 2014 to 2016 West African Ebola outbreak	Multidisciplinary team (Defense Medical Services/ military personnel) from the UK Armed Forces deployed to respond to the Ebola outbreak in Sierra Leone	
Main Findir Itbreaks	Infectious Disease	Ebola	Ebola	
Table 1. I SARS) Ou	Authors (Year)	Gee and Skovdal (2018) <sup>8</sup>	(2018) <sup>16</sup>	

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vpe of S	ross- ectional bbservat	Toss- ectional bbservat continue
Results	<ul> <li>Psychological responses: <ul> <li>Fear of disease due to lack of knowledge and misconceptions about Ebola</li> <li>Fear due to uncertainty about how to protect themselves and care for patients</li> <li>Breakdown of trust—community feared HCW dressed in protective gear</li> <li>Stigmatization of HCW</li> <li>HCW felt isolated due to stigmatization and personal choice to stay away from family during outbreak truthfully report symptoms</li> <li>Family of HCW worried for them, some faced pressure from families to quit their job</li> <li>Trauma from watching colleagues die</li> <li>Economic hardship</li> <li>Distrust between staff from different departments</li> <li>Hypervigilance, self-checking for Ebola symptoms</li> <li>Distrust between staff from different departments</li> <li>Hypervigilance, self-checking for Ebola symptoms</li> <li>Distrust between staff from different departments</li> <li>Distrust between staff from different departments</li> <li>Bistrust between staff from different departments</li> <li>Distrust between staff from different departments</li> <li>Bistrust bet</li></ul></li></ul>	<ul> <li>Psychological responses: <ul> <li>Fear of putting themselves or others around them at risk</li> <li>Stigmatized by family, friends, and property owners</li> <li>Helplessness at being unable to intervene for Ebola virus disease-positive women in labor</li> <li>Frustration about lack of information about disease and care specific to pregnant women</li> <li>Eelf-adpted coping responses: <ul> <li>Keeping their occupation a secret</li> <li>Infection control measures</li> <li>Moving to a place with less stigma during the outbreak</li> <li>Social support from colleagues</li> <li>Used creativity and competency to deal with lack of information, provide advice to other colleagues and proligmates</li> <li>Trusting infection control measures in Ebola centers and feeling safer working there than outside</li> </ul> </li> </ul></li></ul>
Measures	Qualitative study	Semistructured interviews
No. of Subjects	Members of the District Health Management Teams and local councils, health facility managers, and inte rnational partners (n = 19): 13 males, 6 females Health workers working in public health facilities and international health workers involved with the treatment of Ebola patients (n = 25): 10 males, 15 females	11 midwives (Sierra Leoneans and expatriates) who worked for 3 different humanitarian organizations in Sierra Leone during the Ebola outbreak in 2014–2016 Average age: 43 years
Population	Members of local councils, health facilities, and international partners HCW 4 districts in Sierra Leone (Western Area, Kenema District, Bonthe District, Koinadugu District)	Midwives who provided care for pregnant women in 8 different Ebola centers in Sierra Leone during the Ebola outbreak in 2014–2016
ntinued). nfectious Disease	Ebola	Ebola
Table 1 (con Authors I. (Year)	Raven et al (2018) <sup>17</sup>	Erland and Dahl (2017) <sup>18</sup>

_			Health Care \	Norkers' Responses in Infectious Disea	ase Outbreaks
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	Type of Stu	Cross- sectional, observatior	Cross- sectional, observatior	Cross- sectional, observatior	(continued)
	Results	<ul> <li>Psychological responses:</li> <li>Stress after returning home (14%)</li> <li>Reactions from others when returning home from deployment: negative (35.7%), positive (26.2%), mixed and polar reactions (38.1%)</li> <li>Self-adopted coping responses:</li> <li>Mental preparation and knowledge acquisition through meeting up with nurses who had returned from the area cseking mental hsupport during and after deployment</li> <li>Peer support and communication</li> <li>Hiding their occupation from others</li> <li>Pride in their role</li> </ul>	<ul> <li>Psychological responses:</li> <li>96% felt nervous and scared</li> <li>95% tried to reduce contact with MERS-CoV patients</li> <li>82% felt that other colleagues were avoiding them</li> <li>70% felt angry at workload increase compared to colleagues in other departments</li> <li>15% called in sick at least once</li> <li>Stress about seeing colleagues getting infected</li> <li>Stress due to lack of information about disease and outbreak control</li> <li>Self-adopted coping responses:</li> <li>94% saw it as their ethical and professional duty</li> <li>Pollowing strict infection control procedures</li> <li>Avoidance by calling in sick (only 15% of respondents did this)</li> </ul>	<ul> <li>Psychological responses:</li> <li>Posttraumatic stress (10.1%)</li> <li>Depression (22.8%)</li> <li>Self-adopted coping response:</li> <li>Substance use</li> </ul>	
	Measures	Self-administered questionnaire (10 questions) covering aspects of clinical training, personal health and stress management, leadership styles and knowledge transfer, sociocultural exposure, and attitudes of others when returning home	MERS-CoV staff questionnaire evaluating emotions, perceived stressors, factors that reduced stress, coping strategies, and motivators to work during future outbreaks. Rated on a Likert scale from 0 (not at all) to 3 (very much)	National Household Survey on Drug Abuse Impact of Event Scale-Revised (IES-R) Center for Epidemiologic Studies Depression Scale Direct exposure to SARS outbreak Coping strategies used	
	No. of Subjects	44 nurses (88%) responded to the questionnaire 36 women (81.8%), 8 men (18.2%) Mean age: 44.9±10.4 years	150 HCW who worked in high risk areas during the April-May 2014 MERS-CoV outbreak 117 (78%) of participants completed the questionnaire 89 nurses (76%), 16 physicians (14%), 12 respiratory therapists (10%) 89 female (76%), 28 male (24%) Mean age: 38.55 ± 8.01 years	<ul> <li>549 hospital employees</li> <li>(83% response rate)</li> <li>21% doctors</li> <li>38% nurses</li> <li>38% nurses</li> <li>22% technicians</li> <li>22% technicians</li> <li>20% administrative and others</li> <li>76% female</li> <li>69% had used alcohol in the year prior to the study</li> <li>19% had been quarantined during the outbreak</li> <li>25% worked in locations where contact with SARS patients was common</li> </ul>	
	Population	Nurses who worked for the Red Cross at an Ebola Treatment Center in Kenema, West Africa, during the outbreak between March 1, 2014, and September 30, 2015	/ HCW in Jeddah, Saudi Arabia	Hospital employees from a major hospital in Beijing, China, that had been affected by the 2003 SARS outbreak	
ontinued).	Infectious Disease	Ebola	MERS-Cov	SARS	
Table 1 (d	Authors (Year)	Von Strauss et al (2017) <sup>6</sup>	Khalid et al (2016) <sup>19</sup>	Wu et al (2008) <sup>7</sup>	

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	Type	Cross- sectic obser	Cross- sectic obser	(over mont obser	(conti
	Results	<ul> <li>Psychological response:</li> <li>Concern about personal and family health</li> <li>Concern about personal and family health</li> <li>Staying away from SARS work areas</li> <li>Staying away from SARS work areas</li> <li>Hiding profession to prevent stigmatization</li> <li>Thinking about caregiving in a new light, ethical love</li> <li>Thinking about caregiving in a new light, ethical love</li> <li>Thinking about caregiving in a new light, ethical love</li> <li>Self-transcendence — transforming distress into compassion, empathy for patients and staff who stigmatized them</li> </ul>	<ul> <li>Psychological responses:</li> <li>Emotional exhaustion</li> <li>Anger</li> <li>Anger</li> <li>Vigor</li> <li>Vigor</li> <li>Vigor</li> <li>Institution-adopted coping strategy:</li> <li>Organizational support</li> <li>Organizational support</li> <li>Self-adopted coping strategies:</li> <li>Avoidance</li> <li>Trusting in equipment/infection control initiatives</li> </ul>	<ul> <li>Psychological responses:</li> <li>Depression (BD1≥ 10 for more than 2 weeks) (27.5%)</li> <li>Depression symptoms decreased over time as outbreak situation improved</li> <li>Anxiety</li> <li>Anxiety</li> <li>Anxiety</li> <li>Reduction in anxiety over time</li> <li>Postfraumatic stress symptoms (DTS-C≥ 23) (33% for SARS units)</li> <li>Reduction in posttraumatic stress symptoms over time</li> <li>Sleep disturbances (37.1% for SARS units vs 9.4% for non-SARS units)</li> <li>Reduction in posttraumatic stress symptoms over time</li> <li>Sleep disturbances (37.1% for SARS units vs 9.4% for non-SARS units)</li> <li>Poorer sleep quality that did not improve over time</li> <li>11% were diagnosed with hepression based on Mini-International Neuropsychiatric Interview</li> <li>Relapse for those with history of depression</li> <li>Self-adopted coping responses:</li> <li>Changes in attitude toward SARS with improved knowledge over time</li> <li>Positive attitudes toward SARS patients</li> <li>Reducing family and work-related stress</li> <li>Increasing social and leisure activity</li> </ul>	
	Measures	Four focus group sessions Asked about: • Experiences in caring for patients with SARS • Issues linked to fear about SARS • How SARS affected their home lives • Perceptions of their working environment and coping	Maslach Burnout Inventory-General Survey State-Trait Anger Expression Inventory Avoidance behavior (scale developed by authors) Vigor while working during SARS outbreak Survey of Perceived Organizational Support Trust in equipment/Infection control (developed by authors) Single item measuring quarantine time	Beck Depression Inventory (BDI) Spielberger Trait Anxiety Inventory Chinese version of Davidson Trauma Scale (DT5-C) Presence of insomnia Pittsburgh Sleep Quality Index 13-Item self-designed questionnaire to evaluate attitude toward SARS outbreak Sheehan Disability Scale Family APGAR index	
	No. of Subjects	21 nurses (15 ER nurses, 6 from respiratory ICUs) Age: 21–43 years	333 nurses (315 women, 18 men) who worked in health care facilities during the SARS crisis of 2003 Mean age: 43.79±9.97 years	<ul> <li>102 female nurses</li> <li>26 from SARS ICU; age: 31.5 ± 6.2 years</li> <li>44 from SARS regular</li> <li>units; age: 29.8 ± 7.6 years</li> <li>17 from cardiac care unit; mean age: 25.4 ± 3.7 years</li> <li>mean age: 25.4 ± 3.7 years</li> </ul>	
	Population	Nurses caring for patients with SARS during the outbreak in Taipei. One nurse had been identified as contagious and probably suffering from SARS; 6 had been suspected of having SARS	Nurses in Canada	Nurses from SARS units, non- SARS units, and the neurology unit in Taiwan	
pntinued).	Infectious Disease	SARS	SARS	SARS	
Table 1 (c	Authors Year)	Chiang et al (2007) <sup>20</sup>	darjanovic et al 2007) <sup>21</sup>	2007) <sup>4</sup>	

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		Type of Stu	Cross- sectional, observatior	Cross- sectional, observation	'continued)
		Results	Psychological responses:         • Emotional exhaustion         • Job tension         • Job tension         • Social interaction and trust	<ul> <li>Psychological responses: <ul> <li>Burnout</li> <li>Distress</li> <li>Posttraumatic stress</li> <li>Posttraumatic stress</li> </ul> </li> <li>Posttraumatic stress</li> <li>Institution-adopted coping strategies: <ul> <li>Adequate training, protection, and support</li> </ul> </li> <li>Self-adopted coping strategies: <ul> <li>Taking days off work</li> </ul> </li> </ul>	
		Measures	Social capital (social interaction and trust) Emotional exhaustion Job tension	<ul> <li>Survey A: adverse outcomes</li> <li>Demographic data</li> <li>IES (15-item)</li> <li>Kessler Psychological Distress Scale</li> <li>Emotional exhaustion scale of the Maslach Burnout Inventory</li> <li>Changes since the SARS outbreak in health care work hours and amount of face-to-face contact with patients</li> <li>Increases since the SARS outbreak in smoking, drinking alcohol</li> <li>No. of work shifts missed in the past 4 months due to stress/illness/fatigue</li> <li>SarS-related perception of stigma and interpersonal avoidance</li> <li>SARS-related perception of stigma and interpersonal avoidance</li> <li>SarS-related perception of stigma and interpersonal avoidance</li> <li>Mays of Coping Questionnaire</li> <li>Close Relationships-Revised Questionnaire</li> </ul>	
		No. of Subjects	<ul> <li>244 respondents (61% response rate)</li> <li>46% from Taipei</li> <li>30% from Taichung</li> <li>24% from Kaohsiung</li> <li>24% from Kaohsiung</li> <li>75% female</li> <li>67% registered nurses</li> <li>33% resident doctors</li> <li>51% had some temporary</li> <li>contract with SARS patients</li> <li>33% had no contact with SARS</li> </ul>	<ul> <li>13 participating sites</li> <li>(9 Toronto, 4 Hamilton) and</li> <li>55 clinical units (Toronto 44, Hamilton 15)</li> <li>Nurses in medical and surgical inpatient units</li> <li>All staff of ICUs, emergency departments, and SARS isolation units (n = 1,934)</li> <li>73.5% nurses</li> <li>8.3% clerical staff</li> <li>2.3% respiratory therapists</li> <li>1.2.9% others</li> <li>Completed survey B (n = 187)</li> </ul>	
		Population	Medical professionals working for hospitals in the 3 largest metropolitan areas in Taiwan during the SARS outbreak	HCW from hospitals in Toronto and Hamilton in Ontario, Canada All Toronto sites treated SARS patients, while none of the Hamilton sites had SARS patients	
	ntinued).	Infectious Disease	SARS	SARS	
	Table 1 (co	Authors (Year)	Chang et al (2006) <sup>22</sup>	Maunder et al (2006) <sup>23</sup>	

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	Type of Study	observational, observational	Cross- sectional, observational	(continued)
	Results	<ul> <li>Psychological responses: <ul> <li>Powerlessness due to lack of information</li> <li>Stress</li> <li>Frustration when others did not follow infection control measures</li> <li>Vulnerability and threat when colleagues fell victim to SARS</li> <li>Vulnerability due to changes in context of care Uncfamiliarity due to changes in context of care Uncfamiliarity due to changes in context of care</li> <li>Uncfamiliarity due to changes in context of care</li> <li>Developing greater awareness of disease and gaining confidence</li> <li>Self-adopted coping responses:</li> <li>Self-adopted coping responses:</li> <li>Developing greater awareness of disease and gaining confidence</li> <li>Self-adopted coping responses:</li> <li>Self-adopted coping responses:</li> <li>Settermination and commitment to nursing</li> <li>Optimism in taking care of patients and colleagues who fell ill</li> <li>Greater awareness for the need to be sensitive and present for patients</li> <li>Felt their lives were enriched through the experience, received encouragement from patients</li> </ul> </li> </ul>	<ul> <li>Psychological responses:</li> <li>Felt at great risk of exposure to SARS (66%)</li> <li>Accepted that risk came with the job (69.5%)</li> <li>Fear of falling ill with SARS (76%)</li> <li>Posttraumatic stress symptoms</li> <li>Posttraumatic stress symptoms</li> <li>Concerned about spreading disease to others (82%)</li> <li>Stigmatization (49%)</li> <li>Stress at work (56%)</li> <li>Institution-adopted coping responses:</li> <li>Effective and swift implementation of infection control measures</li> <li>Clear explanation of these measures</li> <li>Ensuring compliance</li> </ul>	
	Measures	Qualitative study	Demographics Perception of exposure to SARS, perceived risk of infection, and impact of SARS outbreak on personal and work lives IES	
	No. of Subjects	8 registered nurses Age: between 21 and 40 years	10,511 responses (70% response rate) 82% female Mean age: 36.6±11.3 years	
	Population	Registered nurses who cared for SARS patients in 3 regional hospitals in Hong Kong	HCW in Singapore from 9 major health care institutions	
ntinued).	Infectious Disease	SARS	SARS	
Table 1 (co	Authors (Year)	chung et al (2005) <sup>24</sup>	(2005) <sup>25</sup>	

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	e of Stu	ss- ional, ervatio <i>itinued</i>
	Type	cross sect observation observation (con
	Results	<ul> <li>Psychological responses:</li> <li>Positive attitude toward role (65%–69%)</li> <li>12%-31% reported negative feelings</li> <li>Anxiety</li> <li>Ear</li> <li>Depression</li> <li>Loss of control</li> <li>Worries about colleagues (92%), patients (89%), and family (89%)</li> <li>Stress due to frequent changes in infection control measures (92%) and documentation process (81%), inadequate protection equipment (81%)</li> <li>Stress due to lack of knowledge about disease (81%), inadequate protection equipment (81%)</li> <li>Conflict between one's duty and safety (65%)</li> <li>Death of colleagues (77%)</li> <li>Conflict between one's duty and safety (65%)</li> <li>Peer support (100%)</li> <li>Peer support (100%)</li> <li>Stef-care, rest (96%)</li> <li>Training (85%) and mentoring (92%)</li> <li>Self-care, rest (96%)</li> <li>Training (85%) and mentoring (92%)</li> <li>Hercaning about disease (96%)</li> <li>Personal protective measures (96%)</li> <li>Personal protective measures (96%)</li> <li>Recreational activities (85%)</li> <li>Avoiding news about SARS (62%)</li> <li>Avoiding news about SARS (62%)</li> </ul>
	Measures	Self-designed SARS Team Questionnaire 72 items assessing 6 areas on a 4-point Likert scale: • Immediate reactions to the mission • Major stressors inherent in caring for SARS patients • Coping strategies • Coping strategies
	No. of Subjects	26 female nurses of the SARS team Mean age: 29.6±4.34 years
	Population	Nurses working during the 2003 SARS outbreak in Taiwan
	continued). Infectious Disease	SARS
	Authors (Year)	(2005) <sup>5</sup>

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is illega	Type of Stud	Cross- sectional, observationad observationad	d PDF on an observational observational	y website.
	Results	<ul> <li>Psychological responses: <ul> <li>Denial of early symptoms of SARS</li> <li>Distress due to lack of information regarding disease, treatment efficacy, and side effects</li> <li>Distress due to dramatic occupation role change</li> <li>Distress due to dramatic occupation role change</li> <li>Powerlessness</li> <li>Anger</li> <li>Loss of control</li> <li>Anger</li> <li>Guilt at possibly infecting colleagues and family</li> <li>Fear of death</li> <li>Stress due to isolation</li> <li>Feelings of abandonment, lasted even after discharge</li> <li>Self-adopted coping responses:</li> <li>Communication with family, colleagues, friends</li> <li>Presence of empathetic HCW</li> <li>Support from fellow patients</li> <li>Religion</li> <li>Reflect on role of nursing</li> </ul> </li> </ul>	<ul> <li>Psychological responses:</li> <li>Posttraumatic morbidity (17.7%), with nurses having higher scores than physicians</li> <li>Psychiatric morbidity (18.8%)</li> <li>Self-adopted coping responses:</li> <li>Emotion-focused</li> <li>Problem-focused</li> <li>Denial</li> <li>Behavioral disengagement</li> <li>Humor</li> <li>Planning</li> </ul>	
	Measures	Qualitative study	<ul> <li>Self-administered questionnaire:</li> <li>Demographics</li> <li>Coping Orientation to Problems</li> <li>Experienced (COPE)</li> <li>IES</li> <li>General Health Questionnaire 28 (GHQ-28)</li> </ul>	
	No. of Subjects	10 nurses (2 males, 8 females)	<ul> <li>38 (92.7%) of 41 physicians responded:</li> <li>25 males (65.79%)</li> <li>26 mean age: 31.58 years</li> <li>58 (69.9%) of 83 nurses</li> <li>58 (69.9%) of 83 nurses</li> <li>5 males (8.62%)</li> <li>6 males (8.2%)</li> </ul>	
	Population	Nurses who had contracted SARS in Hong Kong	Physicians and nurses working in the national SARS screening center in Singapore during the SARS outbreak in 2003	
ontinued).	Infectious Disease	SARS	SARS	
Table 1 (cc	Authors (Year)	(2005) <sup>26</sup>	Phua et al (2005) <sup>27</sup>	

Mutuality         Montania	Table 1 (co	ntinued).						k
Mong et al (200) <sup>14</sup> 260         Construction and match sequences of point.         Construction and security services (2000) <sup>14</sup> Construction and securesecuret (2000) <sup>14</sup> Consol security se	Authors (Year)	Infectious Disease	Population	No. of Subjects	Measures	Results	Type of Study	- ic
Othon         S4Rs         Doctors and nurses who host first in ergonal general brank in singpore during the 2003 SARs outbreak         Group A.HCW who were first in segming general direct contact with suppert.         Ser-epoint measures: (- R-range in fire priorities - heath and relationship with in the family, with fired sand ordelagues, work, and spinula direct contact with suppert.         Consectional (- R-range in fire priorities - heath and relationship with in the family, with fired sand ordelagues, work, and spinula direct contact with suppert.         Consectional (- R-range in fire priorities - heath and relationship with in the family, with fired sand ordelagues, work, and spinula direct contact with suppert.         Consectional (- R-range in fired sand ordelagues, work, and spinula accounts; far unsea)         Consectional (- R-range in fired sand ordelagues, work, and spinula accounts; far unsea)         Consection (- R-range in fired sand ordelagues, work, and spinula accounts; far unsea)         Consectional (- R-range in fired sand ordelagues, work, and spinula accounts; far unsea)         Consectional (- R-range in fired sand ordelagons)         Consectional (- R-range in fired sand accounts; far unsea)         Consectional (- R-range in fired sand accounts;	(2005) <sup>28</sup> (2005) <sup>28</sup>	SARS	Doctors, nurses, and health care assistants (HCA) working in the emergency departments of all public hospitals in Hong Kong during the 2003 SARS outbreak	466/1,260 questionnaires completed (37% response rate) • 123 (26.6%) doctors • 257 (55.6%) nurses • 82 (17.8%) HCA • 157 (34.3%) males • 301 (65.7%) females • 301 (65.7%) females Response rate of HCA (45%) higher than for nurses (37%) and doctors (32%)	Degree of mental distress (single-item 11-point Likert scale) Source of distress (18-item self-designed questionnaire, 4-point Likert scale): • Health of self • Virus spread • Vulnerability/loss of control • Unarability/loss of control • Changes in work • Being isolated Chinese version of Brief COPE questionnaire (28 items, 4-point Likert scale)	<ul> <li>Psychological responses:</li> <li>Distress higher for nurses than HCA</li> <li>Mean distress levels among hospitals ranged from 4.60 to 7.10 out of 10</li> <li>Worried about health of family</li> <li>Uulnerability/loss of control</li> <li>Worry about spread of virus</li> <li>Distress due to changes in work</li> <li>Distress due to isolation</li> <li>Self-adopted coping responses:</li> <li>Planning</li> <li>Behavioral disengagement</li> <li>Self-distraction</li> <li>Venting</li> <li>Instrumental support</li> <li>Morty export</li> <li>Denial</li> <li>Substance use</li> </ul>	observational, observational	illogal to post this co
Cheng et       SARS       SARS survivors after 1-month       100 SARS survivors       GHQ-28       Psychological responses:       Cross-         al (2004) <sup>1</sup> recovery (includes HCW) in       (37.2% response rate)       Rosenberg Self-Esteem Scale       • Psychological responses:       or Psychological responses:       sectional,         al (2004) <sup>1</sup> recovery (includes HCW) in       (37.2% response rate)       Rosenberg Self-Esteem Scale       • Psychiatric morbidity (68%)       observation         18 common 3       measure Abbreviated version       • Bistress       • Ouality of Life       • Distress       sectional,         9 measure 4       Measure 4       Neasure 4bbreviated version       • Cuality of life affected       observation         9 munity subjects       Pevel of social support       • Quality of life affected       • Social support         111 women, 73 men       • 111 women, 73 men       • Social support       • Social support         • Mean age: 34.51 ± 8.71       • Mean age: 34.51 ± 8.71       • Social support       • Social support	Chan and Huak (2004) <sup>29</sup>	SARS	Doctors and nurses who worked in a regional general hospital in Singapore during the 2003 SARS outbreak the 2003 SARS outbreak	Group A: HCW who were first- generation contacts or had direct contact with suspect/ probable SARS patients (32 doctors, 74 nurses) Group B: HCW who did not have direct contact with any suspected or probable SARS patients (81 doctors, 474 nurses)	Self-report measures: • Demographics • GHQ-28 • IES • Changes in life priorities due to SARS • Circumstances that helped with coping	<ul> <li>Psychological responses:</li> <li>Changes in life priorities—health and relationship with the family, with friends and colleagues, work, and spiritual beliefs</li> <li>Psychiatric morbidity with GHQ-28 ≥ 5 (27%)—doctors 1.6 times more likely to experience symptoms than nurses</li> <li>Posttraumatic morbidity with IES ≥ 30 (20%)</li> <li>Institution-adopted coping responses:</li> <li>Managerial support</li> <li>Self-adopted coping responses:</li> <li>Self-adopted coping responses:</li> <li>Support from colleagues</li> <li>Communicating with others</li> <li>Religion</li> <li>Placing importance on work</li> </ul>	cross- sectional, observational	Health Care Workers' Response
	Cheng et al (2004) <sup>1</sup>	SARS	SARS survivors after 1-month recovery (includes HCW) in Hong Kong	<ul> <li>100 SARS survivors</li> <li>(37.2% response rate)</li> <li>66 women, 34 men</li> <li>18% HCW</li> <li>18% HCW</li> <li>Mean age: 37.14±12.09</li> <li>years</li> <li>184 community subjects</li> <li>(92% response rate)</li> <li>111 women, 73 men</li> <li>10.9% HCW</li> <li>Mean age: 34.51±8.71</li> <li>years</li> </ul>	GHQ-28 Rosenberg Self-Esteem Scale World Health Organization Quality of Life Measure Abbreviated version Severity of SARS symptoms Level of social support Demographic and clinical characteristics	Psychological responses:         • Psychiatric morbidity (68%)         • Distress         • Distress         • Self-esteem affected         • Quality of life affected         • Quality of life affected         • Social support	Cross- sectional, observational	es in Infectious Disease Outbreal

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lt is il	leg	Type of Study	l to post this copyri opservational	ghted PDF on any we observational	ebsite.
		Results	<ul> <li>Psychological responses:</li> <li>Posttraumatic stress symptoms (IES≥ 20): 561 subjects (36.0%)</li> <li>Worry about passing on infection</li> <li>Concern about stigma that family members may experience</li> <li>Worry about how children would be cared for if the health care worker-parent were to be hospitalized</li> <li>Social isolation due to PFE</li> <li>Perception of being stigmatized by others</li> <li>Tension within family over their absence during public holidays</li> <li>Concern for personal health</li> <li>Stress at being deployed to areas outside job scope</li> <li>Stress due to conflict between colleagues</li> <li>Burden of responsibility toward staff</li> <li>Self-adopted coping responses:</li> <li>Anxious hyperviailance of one's own symptoms</li> </ul>	<ul> <li>Psychological responses: <ul> <li>Loss of freedom</li> <li>Anxiety, fear</li> <li>Psychological and physical isolation</li> <li>Difficulty explaining to children without causing more fear</li> <li>Anger and hurt at being stigmatized</li> <li>Anger and hurt at being stigmatized</li> <li>Acutely aware of others' negative responses even after outbreak</li> <li>Somatic symptoms (sleeping problems, shortness of breath, headaches)</li> <li>Fear of contracting SARS or infecting family and friends</li> <li>Conflict between colleagues assigned to high-risk areas and those who were not</li> <li>Anger about SARS, lack of information or conflicting information about SARS</li> <li>Frustration at lack of communication</li> </ul> </li> <li>Self-adopted coping responses:<ul> <li>Camaraderie with others in same situation</li> </ul> </li> </ul>	
		Measures	Survey instrument: IES-R Study of Health Care Workers' Perception of Risk and Preventive Measures	<ul> <li>Semistructured interviews focused on 3 main areas:</li> <li>Quarantine experience and its effect</li> <li>Perceptions of contracting and spreading SARS</li> <li>Effect of SARS on participants' work</li> </ul>	
		No. of Subjects	Survey of 1,557 HCW at 3 Toronto hospitals Observations of the psychological impact of SARS on HCW made by other researchers	10 HCW	
		Population	HCW at hospitals in Toronto during the SARS outbreak	HCW from Toronto hospitals who were quarantined because of exposure to SARS	
	ontinued). Infectious	Disease	SARS	SARS	
	Table 1 (cd Authors	(Year)	(2004) <sup>2</sup>	Robertson et al (2004) <sup>30</sup>	

Health Care Workers' Responses in Infectious Disease Outbreaks It is illegal to post this copyrighted PDF on any website.

Authors Year)	Infectious Disease	Population	No. of Subjects	Measures	Results	Type of Study
(2004) <sup>3</sup>	SARS	Medical staff within a primary health care setting in Singapore	277 respondents 91 doctors • 40 (44%) males • 51 (56%) females • Mean ± SD age: 35.2 ± 10.6 years • 16.5%) male • 185 (99.5%) female • 185 (99.5%) female • Mean ± SD age: 40.7 ± 13.3 years	Structured questionnaire comprising: 3 main outcome rating scales (GHQ-28, IES-R, Brief COPE) Direct exposure indicated by responses to questions addressing: • Contact with suspected SARS • Previous or current work in fever rooms or tentages during SARS outbreak	<ul> <li>Psychological responses:</li> <li>Psychiatric morbidity (GHQ-28 ≥ 5) reported in 57 staff (20.6%)</li> <li>Posttraumatic morbidity found in 26 respondents (9.4%)</li> <li>Fear of losing control of spread of SARS</li> <li>Fear of losing control of spread of SARS</li> <li>Fear of death</li> <li>Fear of death</li> <li>Fear of assing on disease to family and friends</li> <li>Seeking social support (emotional and instrumental)</li> <li>Religion</li> <li>Religion</li> <li>Venting</li> <li>Problem solving</li> <li>Religion</li> <li>Settive thinking</li> <li>Positive reframing</li> <li>Positive reframing</li> <li>Behaviored disengagement</li> <li>Substance use</li> <li>Self-blame</li> </ul>	observational, observational
Abbreviatio	ns: ER = emer	gency room, ICU = intensive care	unit, MERS-CoV = Middle East respira	atory syndrome coronavirus, SARS= severe a	icute respiratory syndrome.	,

least 9 out of a maximum possible of 10 (Table 3). **Psychological Responses** Anxiety, stress, and somatic symptoms. The presence of anxiety, stress, and somatic symptoms as a result of the outbreak was commonly reported by HCW, with rates ranging from 12% to 96% across 18 studies: 13 SARS-related studies, 1-5,20,23-26,28-30 4 Ebola-related studies,<sup>6,16-18</sup> and a MERS-related study.19 Up to 96% of HCW working in high-risk areas during the MERS outbreak reported feeling nervous and scared.<sup>19</sup> About 12%-31% of nurses working during the 2003 SARS outbreak in Taiwan reported negative feelings, which included anxiety and fear.<sup>5</sup> Reasons cited for anxiety, fear, and stress related to issues involving vulnerability, uncertainty, and occupational factors. First, HCW felt vulnerable when they saw their own colleagues falling ill<sup>5,19,24</sup> and were worried about the recovery of their colleagues.<sup>5</sup> They were also concerned about infecting family and friends whom they considered vulnerable<sup>2,5,17,19,20,25,28,30</sup> and felt a heightened sense of vulnerability when thinking about the possibility of death.<sup>3,26</sup> Second, the uncertainty due to a lack of information contributed significantly to anxiety and fear. There was uncertainty about when the outbreak would be under control<sup>19</sup> and whether there might be a loss of control over the spread.<sup>3</sup> There was also a lack of knowledge, or conflicting information given, about the virus<sup>5,17,24,26,30</sup> and how HCW could best protect themselves,<sup>17,30</sup> resulting in unfamiliarity with or frequent changes regarding daily work procedures.<sup>5,24</sup> Given that the infectious disease outbreaks studied were unprecedented for most countries and communities, no information or guidelines were available for providing care to specific groups of patients (eg, pregnant women) who had been

infected.<sup>18</sup> Some HCW experienced fear and anxiety when patients were untruthful about their symptoms<sup>17</sup> or in practical matters such as worries about childcare arrangements should they fall

ill.<sup>2</sup> Third, occupational factors were also a major contributor to the anxiety and fears experienced by HCW. Failure of management to adequately supervise infection control measures<sup>18,24</sup> and provide adequate protective equipment,<sup>5</sup> conflict among staff or between staff and patients,<sup>5</sup> increase in workload,<sup>25</sup> having to perform duties outside their usual job scope,<sup>2,25</sup> and lack of information

pertaining to work arrangements<sup>16,30</sup> were reasons

cited for stress and anxiety.

design that did not include the use of comparisons and reporting of statistical significance.<sup>5,19</sup> Of the 8 qualitative studies evaluated, all studies scored at

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Table 2. Qu	uality Ap	praisal of	Quantita	ative Studie	S							
Quantitative Study	Study Purpose	Literature Review	Research Design	Sample (Size and Description)	Outcome Measures (Valid and Reliable)	Data Analysis	Results and Statistical Significance	Dropouts/ Exclusions/ Response Rate	Clinical Importance	Conclusion	Limitations	Score (out of 12)
Chan and Huak (2004) <sup>29</sup>	1	$\checkmark$	$\checkmark$	1	$\checkmark$	$\checkmark$	1	$\checkmark$	1	$\checkmark$	$\checkmark$	12
Chang et al (2006) <sup>22</sup>	1	1	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	1	$\checkmark$	12
Cheng et al (2004) <sup>1</sup>	1	1	1	1	1	1	$\checkmark$	$\checkmark$	$\checkmark$	1	1	12
Khalid et al (2016) <sup>19</sup>	1	1	$\checkmark$	$\checkmark$	1	$\checkmark$		$\checkmark$	$\checkmark$	1	$\checkmark$	11
Koh et al (2005) <sup>25</sup>	1	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	1		10
Lee et al (2005) <sup>5</sup>	1	1	$\checkmark$	1	1	1		$\checkmark$	$\checkmark$	1	1	11
Marjanovic et al (2007) <sup>21</sup>	$\checkmark$	$\checkmark$	$\checkmark$	1	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$	11
Maunder (2004) <sup>2</sup>	1	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$	11
Maunder et al (2006) <sup>23</sup>	1	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	12
Phua et al (2005) <sup>27</sup>	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	12
Sim et al (2004) <sup>3</sup>	1	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	12
Su et al (2007) <sup>4</sup>	1	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	12
Von Strauss et al (2017) <sup>6</sup>	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	12
Wong et al (2005) <sup>28</sup>	$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	11
Wu et al (2008) <sup>7</sup>	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	12
Symbol: =	not availal	ole.										

Table 3. Quality Appraisal of Qualitative Studies											
Qualitative Study	Purpose of the Study	Rationale	Conceptual Framework	Ethical Considerations	Sampling Strategy	Data Collection	Data Management Procedure	Data Analysis Method	Threat to Reliability and Validity	Conclusion	Score (out of 10)
Chiang et al (2007) <sup>20</sup>	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	10
Chung et al (2005) <sup>24</sup>	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	10
Erland and Dahl (2017) <sup>18</sup>	1	1	$\checkmark$	$\checkmark$	1	1	$\checkmark$	1	$\checkmark$	$\checkmark$	10
Gee and Skovdal (2018) <sup>8</sup>	$\checkmark$	$\checkmark$	1	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	1	1	10
Lamb (2018) <sup>16</sup>	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	10
Mok et al (2005) <sup>26</sup>	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	10
Raven et al (2018) <sup>17</sup>	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	10
Robertson et al (2004) <sup>30</sup>	$\checkmark$	$\checkmark$	$\checkmark$	1	$\checkmark$	$\checkmark$	1	$\checkmark$		$\checkmark$	9
Symbol: =	not availa	ble.									

**It is illegal to post this copy** Somatic symptoms such as sleep problems, headaches, and shortness of breath were experienced by HCW.<sup>4,30</sup> The rate of insomnia was 4 times higher among nurses working in the SARS unit (37.1%) compared to those who were working in non-SARS units (9.4%).<sup>4</sup> Sleep quality of nurses in the SARS unit was poorer than that of their colleagues in non-SARS units at the start of the outbreak and did not return to normal at the end of the study.<sup>4</sup>

Stigmatization, isolation, and abandonment. Many HCW had perceived or actual experiences of stigmatization and feelings of abandonment. Feelings of isolation also arose following infection control measures. This theme was reported in 11 studies: 6 SARS-related studies, 2,5,25,26,28,30 4 Ebola-related studies,<sup>8,16–18</sup> and a MERS-related study.<sup>19</sup> The main sources of stigma were from fellow colleagues, followed by the general public. Up to 82% of HCW in Khalid and colleagues' study<sup>19</sup> felt that employees who were not directly exposed to MERS avoided them. Nurses who took care of SARS patients, some of whom later were infected, reported rejection and stigmatization from other staff nurses.<sup>20</sup> HCW who felt stigmatized had a higher stress response and greater concern about their personal health.<sup>2</sup> This heightened awareness of others' negative responses persisted even after the outbreak was under control.<sup>30</sup>

Midwives were stigmatized by rental property owners and authorities in their home countries, as well as their own family and friends.<sup>8,18</sup> In a study by Koh and colleagues,<sup>25</sup> 69% of HCW felt that "people close to me were worried that they might get infected through me," and 49% thought that people avoided them because of their job. For international HCW deployed abroad, this situation was further compounded by misrepresentations and exaggerations by the Western media regarding the situation in West Africa, causing greater public fear.<sup>8</sup> HCW in their home country were also not spared the negative effects that arose as a result of their local media's portrayal of the outbreak.<sup>2</sup> Many community members believed Ebola was spread through contact with HCW and hence actively avoided them.<sup>17</sup> This stigma extended to family members of the HCW, with 31% agreeing to the statement that "people avoid my family members because of my job"<sup>25</sup> and some reporting concerns about the possible stigma that may be experienced by their family members.<sup>2</sup>

As a result of stigma, HCW reported feeling isolated and ostracized.<sup>17</sup> Some HCW made the personal decision to keep away from their families to prevent any transmission of the virus, but then felt socially isolated.<sup>17</sup> Feelings of isolation and barriers between patients and HCW were also attributed to the use of personal protective equipment (PPE),<sup>2,16</sup> with up to 73% of HCW reporting that it impaired the quality of care they could provide.<sup>5</sup> Some HCW had to be quarantined after exposure to SARS patients or when they contracted SARS and experienced both physical and psychological isolation as a result.<sup>30</sup> These feelings of abandonment and isolation persisted even after their discharge.<sup>26</sup>

**Depressive symptoms.** Depressive symptoms, along with feelings of helplessness and hopelessness, were reported in 9 studies: 7 SARS-related studies<sup>1,3,4,7,24,26,29</sup> and 2 Ebola-related

studies.<sup>8,18</sup> In a sample of nurses from Taiwan, 12%–31% reported negative feelings, which included depression.<sup>5</sup> Nonetheless, depression symptoms decreased over time.<sup>4</sup> A history of mood disorders and younger age were risk factors for the development of depressive disorder in HCW during an outbreak.<sup>4</sup> For some, depressive symptoms were also a result of stigma and rejection from family, friends, and the general public.<sup>8</sup> High levels of depressive symptoms were correlated with serious negative outcomes such as alcohol abuse and dependence.<sup>7</sup>

Midwives who were unable to intervene for women in labor who had Ebola due to lack of knowledge and infection control measures felt helpless.<sup>18</sup> Feelings of powerlessness due to lack of knowledge were also reported in 2 other studies.<sup>24,26</sup> HCW who later contracted the virus experienced a major role change from that of a health care provider to that of a patient, which resulted in feelings of powerlessness. In addition, the lack of information supplied to their health care team (who was also isolated from authorities) added to their distress and depression.<sup>26</sup>

**Posttraumatic stress symptoms.** Rates of posttraumatic stress symptoms ranged from 9.4% to 36% and were reported in 10 studies: 8 SARS-related studies<sup>2–4,7,23,25,29,30</sup> and 2 Ebola-related studies.<sup>6,17</sup> HCW reported trauma from watching their fellow colleagues die.<sup>17</sup> These symptoms often did not occur until several weeks post-deployment.<sup>6</sup> High levels of posttraumatic stress symptoms, especially the domain of hyperarousal, were associated with negative outcomes such as alcohol abuse or dependence.<sup>7</sup>

Anger, frustration, and irritability. Feelings of anger, frustration, and irritability were reported in 8 studies: 4 SARS-related studies,<sup>21,24,26,30</sup> 3 Ebola-related studies,<sup>8,16,18</sup> and a MERS-related study.<sup>19</sup> Factors contributing to anger and frustration originated from the occupational as well as the personal spheres of life. HCW felt angry that their workload increased during the outbreak as compared with employees who were not exposed to infected patients.<sup>19</sup> In addition, lack of, or conflicting, information given by management and public health authorities was a source of anger and frustration.<sup>16,18,30</sup> Some HCW had to find out about their need to be quarantined indirectly through the media and expressed their frustration at the lack of communication via the workplace.<sup>30</sup> Poor implementation or adherence to infection control guidelines by colleagues and management was also a significant source of frustration.<sup>23,24,26</sup> In their personal sphere of life, feelings of anger often arose from the rejection and stigma that they experienced from their family, friends, and the general public.<sup>8,30</sup> Less time spent in quarantine, higher levels of organizational support, more vigor, and greater trust in equipment/infection control measures were predictive of lower levels of anger and frustration within HCW.<sup>21</sup>

*Grief, loss, and guilt.* Four SARS-related studies covered the themes of grief, loss, and guilt.<sup>5,7,26,28</sup> HCW experienced guilt and grief as a result of losing colleagues and patients and being unable to do more to help them.<sup>17,18</sup> In Lee and colleagues' study,<sup>5</sup> 12%–31% of the nurses surveyed reported

**It is illegal to post this copyr** negative feelings, which included a loss of control. This experience was significantly correlated to distress.<sup>28</sup> HCW who later became patients also experienced a loss of control due to lack of information about the treatment process.<sup>26</sup> In addition, they felt guilty when thinking about the possibility that they may have passed the virus on to colleagues and loved ones, as well as the additional work their colleagues had to take on in their absence.<sup>26</sup>

**Burnout.** HCW exposed to infected patients reported significantly higher levels of burnout than their colleagues who were not.<sup>23</sup> Burnout, and specifically emotional exhaustion, was predicted by having more contact with infected patients, lower levels of vigor, and less trust in infection control initiatives.<sup>21</sup>

Positive changes. HCW also reported positive changes as a result of their experiences during the outbreak. This theme was mentioned in 5 SARS-related studies.<sup>4,20,24,26,29</sup> Some felt that their work had become more important over the course of the outbreak.<sup>29</sup> Their knowledge of SARS had improved over time, and they had less negative perceptions of the disease.<sup>4</sup> Their positive attitudes and empathy toward SARS patients<sup>4</sup> and even their own colleagues who stigmatized them<sup>20</sup> were also enhanced over time. Nurses reported a greater commitment to their profession and awareness of the need for holistic patient care, taking into account the needs of both the patient and the family.<sup>20,24,26</sup> They also learned the importance of having timely information delivered in a sensitive manner to patients through the uncertainty they experienced firsthand as a result of lack of information during the outbreak. Nonetheless, they took it as a learning opportunity to grow, and they developed more confidence<sup>24</sup> and redefined their priorities in life.<sup>26</sup>

#### **Individual Coping Responses**

Seeking social support. Seeking or obtaining social support from others was a commonly reported coping response that was helpful in HCW as reported in 10 SARS-related studies<sup>1,3–5,22,26–30</sup> and 3 Ebola-related studies.<sup>6,17,18</sup> This took the form of colleagues caring for and encouraging each other,<sup>16–18,26,29</sup> with a greater sense of camaraderie that prevailed amid the crisis.<sup>30</sup> Support from family and friends<sup>3,5,17,26,29</sup> helped them to cope with their work, which sometimes included the loss of colleagues.<sup>17</sup> Another source of social support came in the form of religion,<sup>3,26,29</sup> with some HCW praying together before starting work.<sup>17</sup>

**Positive thinking.** Positive attitudes and thoughts were also reported to be a helpful coping strategy, within 10 SARS-related studies,<sup>3–5,20–22,24,25,27,29</sup> 4 Ebola-related studies,<sup>8,16–18</sup> and a MERS-related study<sup>19</sup> among HCW. Some HCW thought of it as their ethical and professional duty<sup>17,19</sup> and felt privileged to work in an infectious disease treatment unit.<sup>18</sup> Those who felt that their work had become more important over the course of the outbreak were less likely to develop psychiatric symptoms as well.<sup>29</sup> HCW tried to face work positively<sup>5</sup> with the use of humor,<sup>27</sup> placing trust in the level of care offered in their health care facility.<sup>16,21</sup> Some demonstrated acceptance of the risks that came with

the job.<sup>25</sup> Positive attitudes about the virus and patients they were caring for also increased over time,<sup>24</sup> and this was associated with less psychological distress.<sup>4</sup> Some chose to re-channel and transform their distress into compassion and collaboration with others<sup>20</sup> and attempted to adopt the perspective of the general public in rationalizing the reasons behind stigma.<sup>8</sup>

**Problem solving.** HCW found various ways to cope with the limitations faced during the outbreak, as was noted in 4 SARS-related studies,<sup>3,5,16,27</sup> 3 Ebola-related studies,<sup>8,16,18</sup> and a MERS-related study.<sup>19</sup> For example, HCW chose to keep separate clothes for work<sup>19</sup> and ensured that they showered and changed before entering their homes.<sup>18</sup> Some also chose to keep their occupation a secret from their family in order to continue serving patients during the outbreak.<sup>18</sup> Despite the limitations experienced, some HCW used their competency and creativity to adapt to the situation.<sup>18</sup> They compensated for language barriers through demonstrative compassion toward their patients (eg, holding a patient's hand)<sup>16</sup> and took active steps to learn more about the disease.<sup>5</sup> In response to stigma, HCW also took to educating their family, friends, and the general public.<sup>8</sup>

Avoidance. Avoidance was also a coping strategy often used alone or in conjunction with other coping strategies. It was documented in 10 SARS-related studies, <sup>2,3,5,7,20,21,23,26-28</sup> 2 Ebola-related studies,<sup>6,8</sup> and a MERS-related study.<sup>19</sup> Some HCW attempted to avoid contact with infected patients, <sup>19,20,23</sup> crowds, or fellow colleagues<sup>2</sup> and avoided watching news regarding the outbreak.<sup>5</sup> Other HCW were focused on the mission at hand and may have neglected their emotions, only realizing the stress they were under some time after their deployment period was over.<sup>6</sup> This denial even extended to a rejection of a possible diagnosis of SARS even when they started to feel unwell.<sup>26</sup> Substance abuse is one such avoidance coping strategy and was reported in 4 studies.<sup>3,7,23.28</sup> HCW with psychiatric morbidity,<sup>3</sup> higher distress levels,<sup>23,28</sup> higher posttraumatic stress symptom levels, experience of being quarantined, and having worked at a high-risk location<sup>7</sup> adopted substance use as a coping strategy more frequently than those who did not.

#### Institution-Adopted Measures

HCW found training provided by their health care institutions to be important and helpful in managing the psychological consequences of the outbreak. Two SARS-related studies,<sup>5,23</sup> 3 Ebola-related studies,<sup>6,16,17</sup> and a MERS-related study<sup>19</sup> reported positive responses by HCW regarding training. Guidance on infection control measures and use of equipment, in particular, were helpful for the staff.<sup>19</sup> It served to help them to be more confident in providing care to patients.<sup>16,17</sup> Training was particularly effective when coupled with adequate provision of PPE<sup>5,17,19</sup> and strict enforcement of infection control measures.<sup>5,25</sup>

Leadership support at the workplace<sup>29</sup> was essential in reducing psychological distress experienced by HCW, and helping them to cope in an outbreak. This took the form of special recognition by the hospital administration<sup>19</sup> and

**It is illegal to post this copy** patients, <sup>18</sup> financial compensation, <sup>7,19</sup> provision of avenues to relieve stress and boredom (eg, social media platforms, group activities), <sup>16,17</sup> and appropriate work shifts to ensure sufficient rest and time off for the HCW.<sup>5</sup> Institutional support helped to boost the confidence of HCW,<sup>17</sup> lower rates of PTSD<sup>29</sup> and emotional exhaustion that could lead to burnout.<sup>21</sup> A leadership that was open to feedback<sup>6,16,29</sup> and attentive to the needs of staff<sup>16</sup> and that clearly communicated the measures adopted was considered most helpful during an outbreak.

Various studies have pointed out the importance of psychosocial support, psychiatric help, mentoring or clinical supervision, or a buddy system among staff that was set up or provided by the hospital administration. HCW reported that psychosocial support provided in workshops during the middle and later stages of the outbreak helped them to cope with stigma.<sup>17</sup> Up to 89% of HCW reported that psychiatric services were a great form of support and helped them to reduce stress.<sup>5</sup> Psychosocial support was still needed several weeks after HCW who were deployed overseas returned to their home country, or after the outbreak was contained.<sup>5,6</sup> A buddy system implemented for HCW helped them to stay vigilant and take care of each other,<sup>16</sup> and the mentoring of junior nurses by senior nurses was also helpful in reducing stress for 92% of HCW surveyed in a study.<sup>5</sup>

#### DISCUSSION

Overall, we identified several salient psychological responses among HCW across past infectious disease outbreaks (including stress/anxiety, stigmatization, depression, traumatic stress, anger/frustration, grief and loss, burnout but also positive growth), which are related to various underlying reasons associated with the outbreaks. In addition, specific individual coping strategies such as seeking social support, positive thinking, problem solving, and institutional measures were helpful in mitigating the psychological impact of the infectious disease outbreaks within our HCW, which highlights practical considerations for psychological support of our HCW in the current COVID-19 pandemic.

Across the previous infectious disease outbreaks, there are several prominent psychological responses observed within HCW with underlying stressors, which can be interactive and interrelated and can often persist even after the outbreak. Stress and anxiety often arise from a conflict between a desire to be in control of the situation and a fear of losing charge related to a constellation of uncertainties especially at the outset (such as information about the nature of pathogen, mode of transmission, infectivity, fatality rate, adequacy of infection control measures and protection at work),<sup>26,30</sup> risk perception, and sense of own vulnerability (such as falling ill, succumbing to the illness, infecting loved ones and others),<sup>30</sup> as well as evolving adjustments at work (such as deployment outside one's usual job scope, increased workload, donning PPE during clinical care).<sup>25</sup> The anxiety can present as physical (such as insomnia, tension headache, palpitations)

hted PDF on any website. well as psychological symptoms of restlessness, feeling on edge, and irritability, and it is important to recognize such symptoms to minimize factors that can compound the distress. Lack of understanding about the biology of the outbreak can contribute to stigmatization not only from the general public but also from fellow medical colleagues, as was noted in this review.<sup>20,30</sup> This can increase the sense of isolation or abandonment amid infection control measures that further segregates individuals.<sup>17</sup> Anxiety, isolation, and loss of normalcy can trigger a sense of helplessness or powerlessness,<sup>24</sup> especially in the presence of risk factors such as history of affective disorders.<sup>4</sup> Over time, with the rise in numbers of infected individuals and mortality, including the loss of fellow HCW, this can influence the onset of traumatic stress with symptoms of constant intrusive memories of the workplace, negative feelings about the outbreak, irritability, frustration, and even avoidance of certain areas of the workplace.<sup>20</sup> In addition, the symptoms of detachment, emotional exhaustion, and lowered sense of satisfaction can signify the onslaught of occupational burnout.<sup>23</sup> Our findings suggest that the causes of negative psychological reactions following an infectious disease outbreak are multifactorial and often not due to reasons that can be attributed to the severity of the outbreak alone. Studies examined in this review have consistently cited many sources of anxiety and stress that are amenable to change such as stigmatizing attitudes,<sup>2,5,8,16-19,25,26,28,30</sup> lack of communication within organizations,<sup>16,18,30</sup> and lack of training and manpower.<sup>19,24,26</sup> Given that there appears to be several sources of anxiety and stress that are amenable to change, this signifies that potential targets of intervention exist and that lessons learned from past experiences can, hopefully, contribute significantly to present and future efforts to reduce negative mental health repercussions from infectious disease outbreaks. The potential to reduce negative mental health outcomes in spite of such a crisis is further evidenced by the fact that amid the myriad psychological responses across the outbreaks, there were encouraging observations of "posttraumatic growth"31 in terms of greater empathy, compassion, and confidence in their work and relationship with the patients under their care.<sup>20</sup>

Individual coping responses as well as institutional measures work in concert to mitigate the repercussions of the outbreak for HCW. Despite the limitations faced during an unprecedented infectious disease outbreak, many HCW attempted to cope through the use of problem solving. These findings suggest that the uncontrollable aspects of an outbreak and its associations with feelings of helplessness and fear could be attenuated with the help of adaptive coping responses. HCW utilized their expertise and knowledge to implement alternative solutions<sup>20</sup> and sought to continually educate themselves about the disease.<sup>5</sup> Positive attitudes and thoughts helped them to focus on their sense of duty as HCW and demonstrate empathy and acceptance toward others.<sup>20</sup> Of note, there were also HCW who used avoidance strategies to cope with their distress. Avoidance was often used in conjunction with other coping strategies, and more

It is illegal to post this, copyrighted PDF on any website. often in HCW who were under greater distress.<sup>3,27</sup> Strategies<sup>2</sup>. The importance of adequate sleep and rest in

included the use of alcohol to cope with unpleasant feelings,<sup>7</sup> avoidance of crowds and colleagues,<sup>2</sup> and avoidance of news related to the outbreak.<sup>5</sup> Although such responses may help in coping during the acute phase of the outbreak, they could be predictive of negative outcomes in the long run, such as development of alcohol abuse or dependence.<sup>7</sup> This possibility of poor outcomes highlights the importance of early identification of HCW under significant distress through the periodic use of screening tools, as well as the importance of psychoeducation for the HCW on the use of adaptive coping strategies. In terms of institutional measures, training was essential for bridging the knowledge gap during novel infectious disease outbreaks,<sup>5,23</sup> while provision of PPE and strict enforcement of infection control measures served to reassure HCW that their safety and well-being were significant priorities at work.<sup>5,17,19,25</sup> Both tangible (such as appropriate work shifts with adequate rest)<sup>16,17,19</sup> and psychological support (such as recognition of efforts, openness to feedback)<sup>5,16,19,29</sup> from supervisors and the institution for HCW were crucial in their sustained work during the outbreaks. HCW rated these institutional support measures as being equally or more helpful than individual coping measures.<sup>5</sup> This demonstrates that the prevention of negative psychological outcomes should not be the responsibility of the individual alone, but that social and organizational support is particularly crucial in times such as these when increased social isolation and workload are to be expected.

#### Practical Considerations for the Current COVID-19 Pandemic

The nature of the current COVID-19 pandemic in terms of rapid transmission, infectivity while pre- or asymptomatic, and higher morbidity and mortality among the elderly has led to public health infection control measures involving isolation, segregation, and physical distancing but has also spurred the rise of use of virtual platforms for connectivity.<sup>32</sup> Our findings suggest that interventions to better support HCW during a pandemic such as COVID-19 will require a multipronged approach, which can be considered at the individual and institutional fronts along 10 aspects.

#### Individual-based approaches to intervention.

At the individual front, it is crucial to remember to seek to understand the unique psychosocial response of each individual HCW in the appropriate context first and not be presumptuous about the possible underlying reasons and ways to help.<sup>33</sup>

1. **Psychoeducation** is needed to raise awareness of the features of different psychological responses, coping methods, and avenues to seek help whenever appropriate. A recent systematic review evaluating the effects of psychological interventions to foster resilience in HCW suggested that resilience training could improve resilience and reduce symptoms of depression and stress.<sup>34</sup>

between workplace duties and shifts should be emphasized, and **maintaining social relationships** with family, friends, and colleagues either through phone or via social media platforms would allow the support of loved ones and reduce the sense of isolation and burnout.<sup>17</sup>

- 3. A variety of personal interests and activities can allow for a good balance between work, recreation, and reflection for positive coping even amid an evolving pandemic.<sup>5</sup>
- 4. Listing priorities as part of problem-solving coping can reduce stress, anxiety, and the sense of loss of control over time and routines.
- 5. Finding purpose and perspective in what we do in daily clinical care involving COVID-19–related cases or otherwise can help to assuage the anxiety, fears, and frustration and is an active way of facilitating posttraumatic growth in the context of a disrupted work environment.<sup>24</sup>

Nonetheless, interventions targeted at the individual may not be sufficient or equally effective at preventing different types of negative psychological outcomes,<sup>34</sup> particularly in unprecedented circumstances such as a pandemic. Our findings have also demonstrated the importance of organizational support and HCW appreciation of measures taken by their institution.

#### Institution-based approaches to intervention.

At the institutional front, the focus is on better care of each individual HCW.

- 1. **Clear communication of changes** in work arrangements, protocols for infection control, and commitment for the long haul toward the well-being of each individual HCW as part of the community can bolster confidence and reduce uncertainty and confusion.<sup>16</sup>
- 2. **Maintaining access to resources for psychological support** such as helplines, online self-help programs, or even psychological counseling can reduce stigma for the HCW when such help is needed.<sup>35</sup>
- 3. Empowerment of self-help groups such as peer support and buddies between senior and junior staff<sup>5,17</sup> can allow validation and normalization of psychological responses and reduce doubt and guilt over one's psychosocial responses.
- 4. Early identification of "at-risk" individuals who may need early intervention, such as those with changes in the level of social interaction (eg, prolonged avoidance or drop in occupational functioning), would be crucial.
- 5. Responsivity in the review of staff feedback in order to refine the processes (related to work, training, and personal support) is needed, as well as recognition of ongoing staff efforts, which can further enhance psychological support for the staff.

#### It is illegal to post this copyr Limitations and Implications for Research

The study has several limitations. There is a general lack of longitudinal studies of changes of psychological or coping responses over time, which would be relevant for the current pandemic as it is projected to last for months to come. This limits our ability to draw conclusions about the chronicity of negative psychological responses or the extent to which coping responses are able to attenuate effects on mental health of HCW in the long run. The lack of pre-post studies also limits the examination of the extent of change in HCW psychological well-being relative to their baseline. The use of self-reported scales in most studies raised the possibility of response bias. In addition, most studies do not take into account preexisting or intercurrent stressors, which can compound and complicate the psychological impact of infectious disease outbreaks among HCW. In view of the timeliness of this rapid clinical review early in the midst of the pandemic, there was no formal registration of the review protocol.

Future research efforts can focus on several areas. First, assessment of changes in psychosocial responses over time at different phases of an infectious disease outbreak and the relationship to variables such as risk perception would proffer insights into longitudinal psychological responses and adaptive or maladaptive coping, which can be useful foci for customized support and intervention. Second, examination of the impact of social media and its relationship to psychosocial responses would be useful, as these information-sharing platforms were less prevalent in previous infectious disease outbreaks. Third, the effectiveness of e-health interventions needs to be better evaluated. A better understanding of the relationship between design and outcomes of different e-health programs during such outbreaks can shed light on factors influencing more effective delivery and content of these e-health interventions.

In conclusion, our review found that HCW manifested a range of possible psychological responses in the context of emerging infectious disease outbreaks. These responses can persist beyond the span of the outbreaks and are managed by specific individual coping strategies (such as seeking social support, positive thinking, and problem solving) and institutional measures. Practical measures that can be considered for the current COVID-19 pandemic should focus on understanding the person and emphasize individual (psychological awareness, self-care, social support, ensuring balance and variety, listing priorities, finding purpose and meaning at work) and institutional (clear communication, long-term commitment for psychological well-being of staff, providing access to resources for help, responsivity to and recognition of efforts of HCW, early identification of those needing help, and empowerment of peer support groups) approaches. These measures can help to foster a more resilient health care workforce that is better psychologically prepared for current and future outbreaks.

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