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Review Article

Synthesis of Evidence to Support EMS Personnel's Mental Health During Disease Outbreaks: A Scoping Review

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ABSTRACT

Emergency medical services (EMS) personnel are at high risk for adverse mental health outcomes during disease outbreaks. To support the development of evidence-informed mitigation strategies, we conducted a scoping review to identify the extent of research pertaining to EMS personnel's mental health during disease outbreaks and summarized key factors associated with mental health outcomes. We systematically searched three databases for articles containing keywords within three concepts: EMS personnel, disease outbreaks, and mental health. We screened and retained original peer-reviewed articles that discussed, in English, EMS personnel's mental health during disease outbreaks. Where inferential statistics were reported, the associations between individual and work-related factors and mental health outcomes were synthesized. Twenty-five articles were eligible for data extraction. Our findings suggest that many of the contributing factors for adverse mental health outcomes are related to inadequacies in fulfilling EMS personnel's basic safety and informational needs. In preparation for future disease outbreaks, resources should be prioritized toward ensuring adequate provisions of personal protective equipment and infection prevention and control training. This scoping review serves as a launching pad for further research and intervention development.

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1. Introduction

Paramedics, emergency medical technicians, ambulance drivers, and others who work in emergency medical services (EMS) (henceforth, broadly referred to as EMS personnel), are a high risk occupation group for developing adverse mental health outcomes [1–3]. These adverse mental health outcomes may include clinically diagnosable mental disorders (e.g., anxiety disorders, depressive disorders, and posttraumatic stress disorder

(PTSD)), as well as conditions that may not fit a diagnostic criterion but still interfere with daily functioning and/or work performance (e.g., moral injury, compassion fatigue, and stress). Globally, compared to the general population, EMS personnel are two times more likely to develop PTSD, over three times more likely to be affected by anxiety, and over four times more likely to suffer from depression [3,4].

When considering the nature of EMS work, the elevated rates of adverse mental health outcomes may not be surprising. Regardless

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of where they work, EMS personnel are commonly exposed to potentially psychologically traumatic events (PPTe), shiftwork, overtime, and upholding a “higher public image” [5,6]. The association between some of these stressors, such as exposures to PPTe, and the development of adverse mental health outcomes has been well established [7–9]. Inadequate resources, inconsistent leadership styles, bureaucratic red tape, and staff shortages within EMS organizations have also been shown to be significantly associated with adverse mental health outcomes [3,7,10].

Disease outbreaks (e.g., severe acute respiratory syndrome, pandemic influenza, Ebola virus disease, and the 2019 coronavirus disease (COVID-19)) can add significant stress to the provision of EMS for both EMS organizations and EMS personnel [11]. During disease outbreaks, organizational factors (i.e., workload, practical support, and organizational communication processes) were found to have the strongest relationships with the mental health and well-being of staff [12]. Poor organizational response to the crises may further exacerbate existing work-related stressors and increase the risks of adverse mental health outcomes and limit service capacity [13–17].

Since WHO’s declaration of the COVID-19 pandemic on March 11th, 2020, there have been numerous studies pertaining to the predictive and protective factors associated with adverse mental health outcomes among frontline healthcare workers (i.e., nurses, physicians, and EMS personnel) and first responders (i.e., firefighters, law enforcement, and EMS personnel). Although EMS work is found at the intersection of both healthcare and first response [18], it is important to note that their stressors and mental health outcomes may differ from the broader frontline healthcare and first responder groups. Studies that have stratified and analyzed their data based on occupation have found significant differences in exposures to infectious diseases, willingness to report for duty, and fear of infection. For example, among first responders, those in EMS positions were more likely to be exposed to COVID-19 compared to non-EMS-related positions [19]; and among healthcare professionals, EMS personnel were 33% more likely to contract COVID-19 relative to attending physicians [20]. Fear of infection and fear of transmitting the infection from work to private sphere were also most frequently reported among EMS personnel compared to other frontline personnel working within eldercare, hospital/rehabilitation, psychiatry, and childcare [21]. Understanding the unique factors that are relevant to EMS personnel’s mental health during disease outbreaks will allow EMS organizations and policymakers to take a more tailored approach in supporting EMS personnel.

EMS organizations and policymakers recognize the high level of stress among EMS personnel and are acutely aware that organizational-level strategies are needed to manage the risk of adverse mental health outcomes. However, there are limited EMS-specific evidence-informed guidelines to support EMS agencies and policymakers during disease outbreaks [22]. To the best of our knowledge, no published reviews to date have examined the literature on factors affecting EMS personnel’s mental health during disease outbreaks. As a first step to developing evidence-informed strategies to support EMS personnel’s mental health during disease outbreaks, we conducted a scoping review to (1) identify the extent of research available in this area and (2) systematically map out the evidence available on the key factors that are associated with mental health outcomes. We also aimed to identify existing knowledge gaps for future research. Our review is inclusive of research related to disease outbreaks prior to the COVID-19 pandemic as well as the ongoing emerging evidence during COVID-19.

2. Methods

We adopted the scoping review methodology set out by Arksey and O’Malley (2005) and the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Extension for Scoping Reviews (PRISMA-ScR) [23,24]. Although scoping reviews do not assess the effectiveness of an intervention or the quality of the literature, they are useful in examining the extent, range, and nature of research activity on a topic, summarizing the evidence, and identifying knowledge gaps through a systematic approach. The framework for scoping reviews consists of five stages: (1) identify the research questions; (2) search for relevant studies; (3) select relevant studies; (4) chart the data; and (5) collate, summarize, and report the results [23].

2.1. Identify the research questions

Our scoping review aimed to answer the following questions:

1. What is the extent of the research related to EMS personnel’s mental health during disease outbreaks?
2. What factors, as identified in the literature, are associated with *favorable* mental health outcomes among EMS personnel during disease outbreaks?
3. What factors, as identified in the literature, are associated with *adverse* mental health outcomes among EMS personnel during disease outbreaks?

Factors associated with *favorable* mental health outcomes were defined as those that are positively associated with well-being, quality of life, life satisfaction, sleep quality, or willingness to work, or are negatively associated with depressive symptoms, anxiety symptoms, posttraumatic stress symptoms, psychological distress, perceived risks, or stress; the contrary would be true for the factors associated with *adverse* mental health outcomes.

2.2. Search for relevant studies

We systematically searched three databases (PsycInfo, Embase, and PubMed/MEDLINE) using three core concepts: EMS personnel, disease outbreak, and mental health. For each concept, we generated a list of search terms, including subject headings for their respective databases (Table 1). We used Boolean operators “AND” between concepts, and “OR” between the search terms within a concept. The search was conducted on November 30th, 2021, over 20 months after WHO classified COVID-19 as a pandemic. Filters for *human species*, *full-text article availability*, and *English language* were applied to the search results in each database. After removing duplicates, 1271 records remained for screening (Fig. 1).

2.3. Select relevant studies

We selected and retained original peer-reviewed articles that discussed, in English, EMS personnel’s mental health during disease outbreaks. We excluded articles that focused on healthcare workers or first responders without a separate discussion or analysis of EMS personnel. Articles that referred to paramedical staff (e.g., physiotherapists, radiologist, etc.) as paramedics were also excluded. In addition, we excluded articles that discussed EMS operations or organizational preparedness in response to disease outbreaks without relating the topics back to aspects of mental health; examples include articles that only examined EMS personnel’s knowledge of infection prevention and control,

Table 1
Search terms identified within each of the core concepts

Core concept	Search terms
EMS personnel	((“emergency medical” OR EMS OR ambulance) AND (rescuer* OR technician* OR responder* OR worker* OR officer* OR personnel OR professional* OR staff OR provider*)) OR “emergency medical service*” OR prehospital OR pre-hospital OR paramedic* OR “medical first responder*”
Disease outbreaks	“disease outbreak*” OR pandemic* OR “infectious outbreak*” OR “public health crisis” OR coronavirus OR “corona virus” OR COVID-19 OR COVID OR “2019 nCoV” OR 2019-nCoV OR “Wuhan pneumonia” OR nCoV OR Betacoronavirus OR “SARSCov 2” OR SARSCov2 OR SARS-CoV-2 OR Cov2 OR influenza OR H1N1 OR “Middle East Respiratory Syndrome” OR MERS OR SARS OR “Severe Acute Respiratory Syndrome” OR “Swine Influenza” OR epidemic*
Mental health	((psychological OR mental) AND (health OR injur* OR disorder* OR stress OR trauma)) OR “post-traumatic stress” OR “posttraumatic stress” OR PTSD OR PTSD OR PTSS OR resilience OR resiliency OR stress OR distress OR “social isolation” OR loneliness OR psychology OR stigma OR fear OR anxiety OR “panic attack*” OR self-blame OR delirium OR psychosis OR suicidal* OR suicide OR shame OR resent* OR depression OR anger OR irritable OR grief OR griev* OR burnout OR fatigue OR “moral injury” OR distrust OR emotion* OR helpless* OR paranoia OR hysteria OR attitude* OR perception* OR prepar*

organizational readiness, trends of EMS calls during disease outbreaks, and triage and treatment protocols. Case studies, case series, dissertations, commentaries, reviews, editorials, and conference abstracts were also excluded.

Relevant studies were selected over two rounds of screening: a preliminary title and abstract screen and a full-text review. For the preliminary screen, two reviewers (coauthors BD and SR) independently screened titles and abstracts for potentially relevant articles using a screening tool developed a priori. Rayyan QCRI (Ar-Rayyan, Qatar), a publicly accessible web application for systematic reviews, was used for the preliminary screen [25]. The reviewers convened after screening every 100 articles to discuss any articles that they were unsure about. Discrepancies about the inclusion/exclusion of an article were discussed, based on the screening tool, until consensus was reached. If no consensus was reached, the article was retained for independent full-text review by coauthors BD and SR. If no consensus was reached after full-text review, the final decision for inclusion was made by the lead investigators.

2.4. Chart the data

During the full-text review, 78 articles did not meet the inclusion criteria (Fig. 1). From the 25 retained articles, key data were extracted and charted using Microsoft Excel (version 16.51). Where applicable, we extracted general information and study characteristics, metrics and measurement tools used, and key study findings. Where original articles reported empirical data and inferential statistics, findings were documented to create an evidence map of the relationships between the various factors studied and mental health outcomes. We documented both statistically significant ($p < 0.05$) and non-significant ($p > 0.05$) findings. In articles where multiple occupations were included, only data pertaining to EMS personnel were extracted; thus, findings were not extracted or

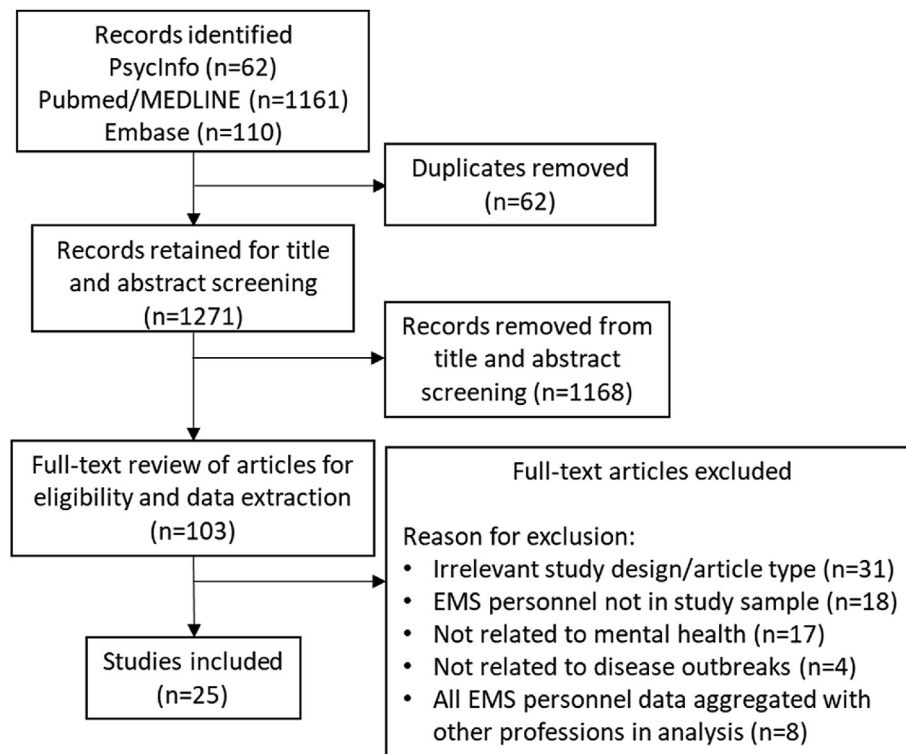


Fig. 1. Flow diagram of the process of retrieving relevant articles.

Table 2
Retained articles categorized by study population and time period of publication

Study population	Studies published <i>prior</i> to COVID 19 (author, year (country) [Reference])	Studies published <i>during</i> COVID 19 (author, year (country) [Reference])
EMS personnel only	Mackler et al, 2007 (United States) [30] Watt et al, 2010 (Australia) [33] Tippett et al, 2010 (Australia) [15] Barnett et al, 2010 (United States) [34] Smith et al, 2011 (Australia) [31] Alwidyan et al, 2020 (Jordan) [13] Rebmann et al, 2020 (United States) [35]	Vatan et al, 2020 (Turkey) [32] Usul et al, 2020 (Turkey) [37] Munawar et al, 2021 (Pakistan) [26] Dreher et al, 2021 (Germany) [42] Rees et al, 2021 (United Kingdom) [27] Choi, 2021 (South Korea) [44] Mohammadi et al, 2021 (Iran) [29]
EMS personnel and other healthcare workers		Vanhaecht et al, 2020 (Belgium) [38] Ilczak et al, 2021 (Poland) [39] Pazmiño Erazo et al, 2021 (Ecuador) [40] Warchol-Biedermann et al, 2021 (Poland) [41] Martínez-Caballero et al, 2021 (Spain) [43] Li et al, 2021 (Australia) [45]
EMS personnel and other first responders	Noble et al, 2014 (United States) [14]	Vujanovic et al, 2021 (United States) [19]
EMS personnel and others	Smith et al, 2018 (Australia) [28]	Skoda et al, 2020 (Germany) [36] Nabe-Nielsen et al, 2021 (Denmark) [21]

charted if EMS personnel data were aggregated and analyzed as part of a broader occupational group.

2.5. Collate, summarize, and report the results

Results were collated, summarized, and reported based on the research questions. First, we presented the extent of the research related to EMS personnel's mental health during disease outbreaks based on country and year of publication, study design, and measured mental health-related outcomes. Next, we summarized the findings of various studied factors as it relates to favorable or adverse mental health outcomes. The factors were categorized as work-related or personal factors, and further organized by whether the factor was contextual (e.g., sex and *actual* knowledge that was assessed) or perceived (e.g., feel burdened by childcare situation and feel sufficiently prepared).

3. Results

3.1. Research related to EMS personnel's mental health during disease outbreaks

Twenty-five articles were retained after full-text review. All study designs were cross-sectional. Four studies used exploratory qualitative methods [26–29], four used quantitative descriptive techniques [14,30–32], 16 used correlational/analysis techniques [13,15,19,21,33–44], and one used mixed methods [45]. In terms of study population, EMS personnel were studied independently in 14 articles. EMS personnel were studied alongside other healthcare workers in six studies, studied alongside other traditional first responders in two studies, and with other populations (i.e., the local community, community-based workers, and non-healthcare workers) in three studies (Table 2). For most of the studies where EMS personnel data were collected with other occupations, the data were aggregated into a broader occupational group for statistical analysis, and only descriptive data specific to the EMS personnel population could be extracted. Detailed study characteristics and key findings for each of the retained articles are available in the Appendix (Table A1).

All studies that were conducted prior to the WHO declaration of the COVID-19 pandemic aimed to understand EMS personnel's perceived anxiety, perceived risk, overall concern, and willingness to work in anticipation of a potential future disease outbreak. In contrast, studies conducted during and after the official declaration

of the pandemic (March 2020 to present) generally focused more on the EMS personnel's mental health, attitudes, and experiences in working during the COVID-19 pandemic. We did not identify any studies that collected data on EMS personnel's mental health while working during any of the previous disease outbreaks. Based on the year of publication, over 70% of the publications on EMS personnel's mental health during disease outbreaks were published 2020 onward.

Specific mental health outcomes that have been measured included posttraumatic stress symptoms, depressive symptoms, anxiety symptoms, psychological distress, stress, perceived risk, overall concern, sleep quality, well-being, life satisfaction, quality of life, and willingness to work. EMS personnel's willingness to work and perceived anxiety levels during and in anticipation of disease outbreaks were most frequently assessed ($n = 6$) (Fig. 2). The prevalence for each of the mental health outcomes, as reported in our retained articles, is available in the Appendix (Table A2).

3.2. Relationship between various factors and mental health outcomes

Our synthesis identified numerous factors that were empirically associated with mental health outcomes, as well as those that

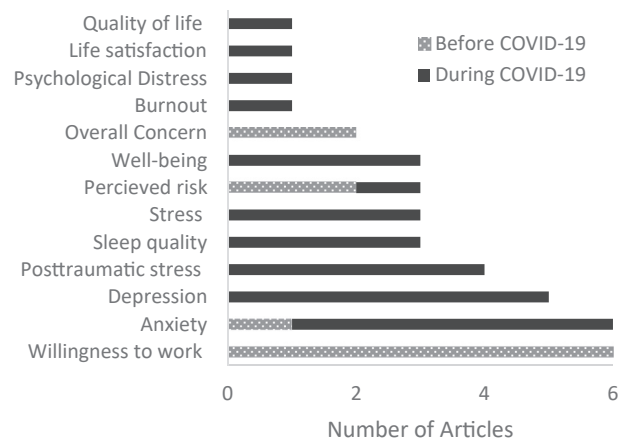


Fig. 2. Frequency of emergency medical service personnel's mental health outcomes collected and reported before and during the COVID-19 pandemic. Note that one study can collect multiple mental health outcomes.

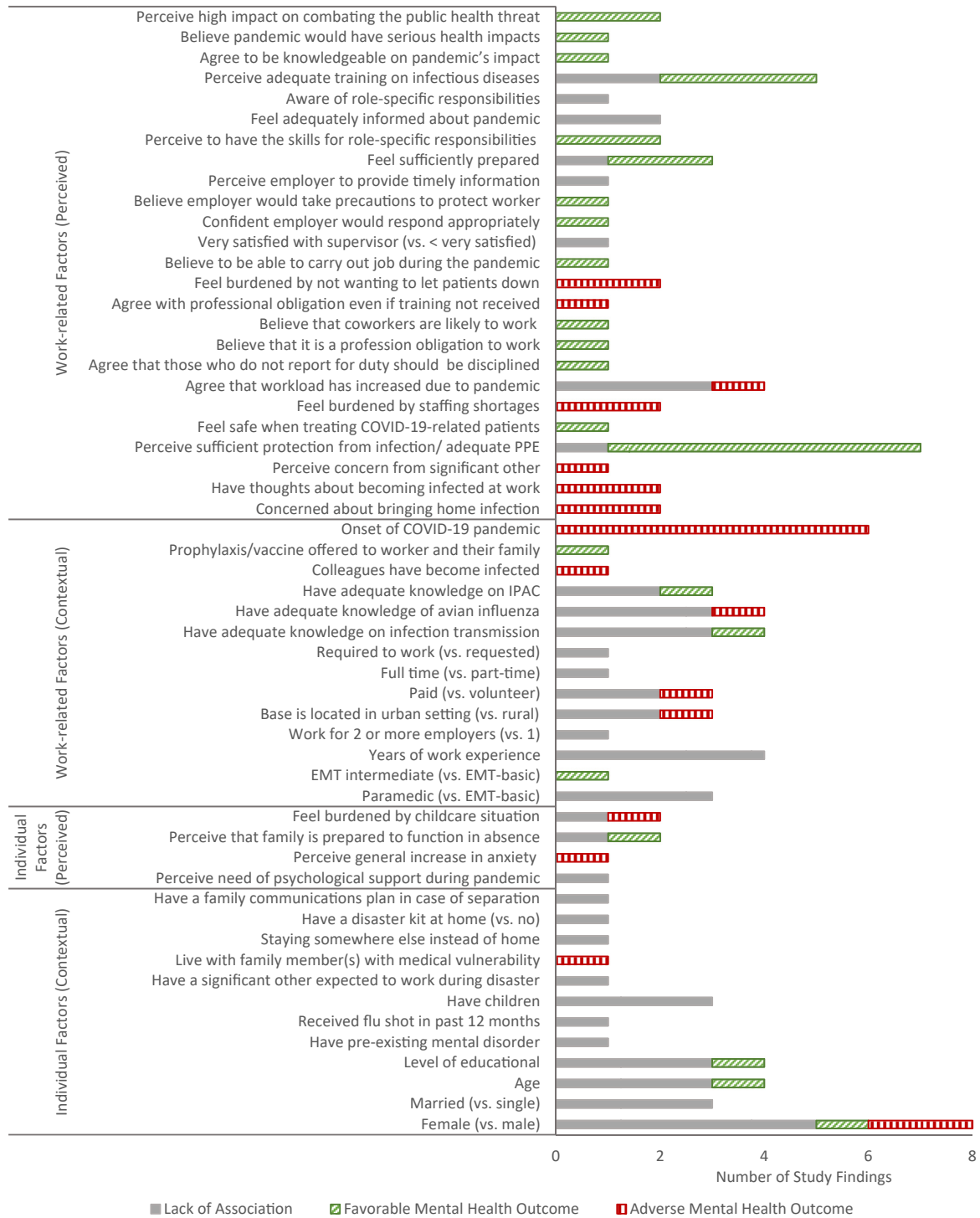


Fig. 3. Association between emergency medical services personnel's mental health outcomes under disease outbreak conditions and various factors that have been studied.

lacked an association (Fig. 3); we focused on the factors that had two or more consistent significant findings. Detailed results of how each factor is related to a specific mental health outcome are available in the Appendix (Table A.3).

Factors that had two or more consistent study findings associated with favorable mental health outcomes included perceiving sufficient protection from infection and adequate personal

protective equipment (PPE) [13,34,35,37,42], perceiving adequate training and education on infectious diseases [13,15,33], feeling sufficiently prepared [42], perceiving to have the skills for role-specific responsibilities [34,35], and perceiving high impact on combatting the public health threat [34,35]. Consistent factors that were associated with adverse mental health outcomes included the onset of the COVID-19 pandemic [38], feeling concerned about

bringing home the infection [13,37], feeling concerned about the contraction and transmission of infection at work [42], feeling burdened by staff shortages [42], and feeling burdened by not wanting to let patients down [42]. Many of these factors are related to EMS personnel's perception toward work-related factors, such as their sense of personal and family safety, competence, capacity, and impact in working during the disease outbreak.

Of equal importance are factors that were consistently found to lack an association with a mental health outcome and showed no evidence of a significant association. Prioritization into these factors may lead to inefficient use of resources in mitigating adverse mental health outcomes. These factors included years of work experience [13,15,35,37], marital status [13,35,37], having children [13,35,37], and feeling adequately informed about the disease [34,36]. Also noteworthy is that gender had varying relationships with the mental health outcomes. There is evidence suggesting that, in anticipation of a disease outbreak, more men perceived that they would have high levels of anxiety [33], while women EMS personnel reported higher levels of stress [39] and anxiety [37] during a disease outbreak (COVID-19).

4. Discussion

Through this scoping review, we identified the extent of research pertaining to EMS personnel's mental health during disease outbreaks, and we synthesized the available evidence to support decision-makers in developing and implementing evidence-informed programs and policies. Our results indicate that studies on the mental health of EMS personnel during disease outbreaks were sparse prior to COVID-19. A 2017 scoping review of the physical, mental, and social health impacts of disease outbreaks on EMS personnel supports this finding. Thomas et al (2017) reported that, of their eight retained articles, "no studies mention the mental or social well-being of paramedics." The increased number of relevant literature since the onset of the COVID-19 pandemic may help build the foundation for developing evidence-informed EMS-specific strategies to reduce the risk of adverse mental health outcomes during the ongoing COVID-19 pandemic and future disease outbreaks.

The onset of the COVID-19 pandemic has brought on several new stressors to an occupation that is already riddled with stressors, and it may be challenging for decision-makers to prioritize which factors to address. Examining the potential risk and protective factors for adverse mental health outcomes among EMS personnel offer opportunities to enhance and integrate specific policies and strategies into operations. Consistently, it was found that EMS personnel who perceived sufficient PPE and protection from infection were also more likely to report favorable mental health outcomes [13,34,35,37,42], whereas EMS personnel who were concerned about becoming infected and transmitting the disease to household members were more likely to report adverse mental health outcomes [13,37,42]. This suggests that organizations should prioritize resources for infection prevention and control (IPAC), such as stocking adequate PPE, to ensure that EMS personnel have the basic requirements to protect themselves, as well as their colleagues, family, and patients. Similar risk and protective factors have been seen in healthcare. In Franklin and Gkiouleka's (2021) scoping review of psychosocial risk factors of health workers during the COVID-19 pandemic, they found that scarcity/inadequacy of PPE was frequently mentioned as a psychosocial risk factor for triggering fears of infection and transmission [46]. Healthcare workers who perceived that their PPE and infection control procedural needs were met had significantly lower odds of anxiety and major depression [47]. EMS organizations should financially prioritize IPAC-related resources to support

their EMS personnel's mental health and physical safety in preparation for future disease outbreaks.

Based on our study findings, IPAC training may be another strategy to help reduce adverse mental health outcomes through increasing EMS personnel's perception of being adequately trained and educated on infectious diseases, being sufficiently prepared, having the skills for role-specific responsibilities, and having a high impact in combatting the public health threat. Effective IPAC training may also reduce fears of infection and transmission at the workplace and staff shortages due to quarantine. Gershon et al (2019) found that a 30-min pandemic preparedness training intervention, consisting of a standardized lecture, demonstrations, and hands-on training to correctly don, doff, and check the fit of N95 respirators, significantly increased EMS personnel's confidence in their ability to protect themselves from infection [48]. The use of standardized patient scenarios also showed promising results in identifying potentially infected patients and the proper donning and doffing of PPE [49]. IPAC training has the potential to modify many of the factors identified to have an impact on EMS personnel's mental health during disease outbreaks.

Although the provision of PPE and IPAC training and education may not be perceived as traditional psychological interventions (i.e., peer support, post-incident intervention, employee and family assistance programs, and access to mental health professionals), we hypothesize that these provisions may help moderate many of the identified factors that are associated with mental health outcomes. Disease outbreaks threaten the fundamental functions of EMS organizations in their ability to provide EMS to the public and establish a safe work environment for their workforce. Our findings support organizations in adopting the *Stepped Psychological Response Approach to Supporting Mental Health* [50]. This approach suggests that practical supports that address basic physical (e.g., personal and family safety and adequate time for deep rest) and informational needs (e.g., training and communication) must be met first before higher needs for more traditional mental health-related support programs and services [14,50,51].

We identified gaps in the literature and provide direction for future research. First, there were very few articles related to traditional psychological interventions for EMS personnel during disease outbreaks. The need for research into improving these psychological interventions is supported by our retained articles. Barnett et al (2010) found that over 70% of EMS personnel agreed that there was a need for psychological support during and after a disease outbreak [34]; however, despite the need for psychological support, these services are often underutilized, and of those who have accessed the service, only 13% found it to be "slightly to moderately useful" [45]. Research should be devoted to understanding how existing psychological interventions can be improved/modified during disease outbreaks to better support EMS personnel. Second, we did not find any studies related to EMS-specific resilience or mental health training programs during disease outbreaks. In one case series that did not meet eligibility for this review, Schreiber et al (2019) described the implementation of the *Anticipate, Plan, and Deter Responder Risk and Resilience* model intervention, which consists of a resiliency and mental health training component, during the 2014–2015 Ebola response. The training intervention received positive feedback for psychologically preparing EMS personnel for disease-specific stressors, such as the inability to return home [52]. Research and development related to disease-specific resiliency and mental health training are also needed. Third, all studies thus far are cross-sectional which will not allow us to determine the directionality of the relationships between the factors studied and mental health outcomes. Interventional and longitudinal studies are needed to better understand the efficacy of organizational responses to disease outbreaks and the

potential long-term impacts of disease outbreaks on EMS personnel's mental health.

4.1. Study implications

Findings from this scoping review provide insights toward the potential risk and protective factors for adverse mental health outcomes during disease outbreaks; many of these risk factors are work-related and are modifiable through the provision of PPE and IPAC training. Organizations should prioritize the necessary resources to ensure that their workforce is prepared and can thrive in any dire circumstances. Absent of proper resources, the health and safety of EMS personnel, their colleagues, and the public they serve are all at risk. This research, in combination with key informant interviews during regular operations [53] and during the COVID-19 pandemic, and an environmental scan of recommended practices identified in the grey literature [17] were used to inform the development of a guideline for Canadian EMS organizations to address adverse mental health outcomes during infectious disease outbreaks [54].

4.2. Study strengths and limitations

Strengths of this scoping review include, firstly, the use of systematic methods to identify, extract, and report the literature on EMS personnel's mental health during disease outbreaks; secondly, the systematic search was completed 20.5 months after WHO had declared the COVID-19 pandemic, allowing sufficient time for several studies related to the most recent disease outbreak to be conducted, published, and incorporated into our review; and thirdly, all reported empirical data between mental health outcomes and the investigated factors among EMS personnel have been synthesized to support EMS organizations and policymakers in decision-making. Limitations of this scoping review are that the findings of the potential risk and protective factors for adverse mental health outcomes may be limited to the research performed and published in the peer-reviewed literature. Therefore, critical protective and risk factors that have not been researched and published may have been missed (i.e., psychological interventions, resiliency and mental health training). Similarly, a quality assessment of the research articles was not performed in this scoping review. This means that papers of lower quality could have been included; however, the factors that are consistently associated with mental health outcomes across multiple studies were considered. Lastly, the review was limited to studies published in English.

4.3. Conclusion

To the best of the authors' knowledge, this is the first scoping review that has systematically identified the extent of research pertaining to EMS personnel's mental health during disease outbreaks and synthesized the available evidence to support decision-makers in developing evidence-informed programs and policies. Our results suggest that data related to EMS personnel's mental health during previous disease outbreaks were sparse; however, this research area has increased drastically since the COVID-19 pandemic. Our findings also suggest that many of the contributing factors for adverse mental health outcomes are related to inadequacies in fulfilling EMS personnel's basic safety and informational needs. In preparation for future disease outbreaks, EMS organizations should prioritize resources for the provision of PPE and IPAC training. This scoping review serves as a launching pad for further research and intervention development.

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Conflict of interest

The authors declare no conflict of interest relating to the material presented in this article. Its contents, including any opinions and/or conclusions expressed, are solely those of the authors.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.shaw.2022.08.006>.

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