

Supporting firefighter mental health during COVID-19: A scoping review

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Introduction

Firefighters as front-line workers responding during COVID-19, are often “first on scene” during public emergency calls and are required to provide immediate, often life-saving services that increases their exposure to transferable diseases. While providing emergency services, firefighters are exposed to a confluence of factors that increase their risk for mental illness including post-traumatic stress injury (PTSI) (1–3) depression, alcohol abuse and chronic fatigue (4). Furthermore, although firefighters reported the lowest score for PTSI compared to all public safety personnel, they reported the highest score on the Alcohol Abuse disorder (AUDIT) scale (4) suggesting that although specific reports of PTSI may be low, maladaptive coping mechanisms may be adopted in response to work demands.

In addition to the inherent risk factors linked to PTSI and potential exposure to other mental health co-morbidities (i.e., depression and alcohol abuse), COVID-19 has created a unique and challenging environment; first responders’ individual risk for acquiring COVID-19 is also increased through public interactions, an essential component of their regular job duties. Exposure to inherent risk factors linked to mental illness and PTSI compounded with potential exposure to COVID-19 has unknown impacts on first responders’ mental health.

Clear stipulations have been mandated with respect to creating physical barriers to disease exposure but less clear is the implementation and best practice strategies to assist firefighters with exposure to cumulative mental health trauma associated with working in a pandemic. During periods of heightened risk, there is known adverse impacts on individual mental health. For example, following the severe acute respiratory syndrome (SARS) outbreak in 2003, SARS was identified as a traumatic experience among healthcare workers (5). Furthermore, emergency department staff reported more PTSI symptoms than those located in other wards where interaction with potential SARS patients was less likely (5). Less information exists on

impacts on first responders including firefighters however it seems likely that firefighters would experience the same trauma particularly when interacting with public members where COVID-19 exposure is uncertain.

Consequently, the primary objective was to conduct review, appraisal and synthesis of scientific literature that informs management of firefighters' mental health particularly during COVID-19.

Methods

A scoping review of the literature was conducted using an adapted six-phase approach developed by Levac et al (2010) (6) and originally published by Arkey and O'Malley (2005) (7). The six phases include: i.) identify the research question, ii.) search strategy, iii.) study selection for inclusion, iv.) data extraction and appraisal, v.) synthesis and vi.) stakeholder consultation.

i.) Identify the Research Question

The scoping review founding research question was formed as "What is known about managing firefighter mental health generally and during periods of heightened exposure?" Core concepts that were considered in developing the research question and search strategy included mental health among firefighters, treatment of firefighter mental health and firefighter mental health following periods of heightened exposure where heightened exposure included response following terrorist attacks (i.e., 9/11, Paris attacks, mass shootings), natural and human-made disasters, and viral outbreaks (i.e., SARS, Ebola, HINI).

ii.) Identifying Relevant Studies / Search Strategy

A literature search focused on the academic literature was conducted to identify studies that investigated strategies to manage firefighter mental health generally and those studies that discussed management of firefighter mental health during COVID-19. A limited number of

studies were identified specific to firefighter mental health during COVID-19, consequently the search strategy was broadened to include studies that included first responders (i.e., paramedics, police) generally and front-line health workers (i.e., nurses, physicians). Five bibliographic databases were searched using standard medical subject headings (MeSH) and text words (detailed search strategy is included in Appendix 1). Databases searched included: PubMed, LitCovid / National Institutes of Health – National Library of Medicine, PsycINFO, Web of Science and Google Scholar. No limits were placed on dates or timeline. The literature search was designed by researchers with expertise in firefighter mental health research (KES, JCM, SS), graduate student (ET) and verified with local firefighters (RB, local firefighter union president) as primary knowledge users. A university librarian was consulted for development and application of the search strategy.

iii.) Study Selection for Inclusion.

Studies related to management of firefighter mental health were eligible for inclusion in review and appraisal if the following criteria were met:

- a.) Participant sample was career firefighters or other first responder (i.e., paramedics)
- b.) Intervention related to management of mental health among first responders including career firefighters or paramedics.
- c.) Mental health included various disorders but was focused towards post-traumatic stress injury, anxiety and substance abuse as common sequelae in firefighting (8).
- d.) Studies were written in English.

The above criteria were also applied to studies specifically related to mental health during COVID-19 however, because of the limited number of studies available, the participant group was expanded to include front-line health care workers in addition to first responders.

Studies were excluded if they included populations beyond first responder or front-line health care workers and / or if they did not specifically address mental health management. See Figure 1 for the study selection process for scoping review.

iv.) Data extraction and appraisal

A structured data extraction form developed by the research team, was applied to each of the included studies. Extracted information included study type, participant characteristics, sample size, intervention relative to mental health, primary outcome measure, results and country of study. A customized risk of bias assessment tool (9) (Appendix 2) was included to enable quality appraisal. The tool is comprised of 25 items that address reporting of participant characteristics, statistical approach, treatment benefits, use of a comparator group and whether the conclusions and / or clinical recommendations were supported by the study methodological design. Each question was ranked from on a scale (0-2) where 2 was associated with the highest ranking and 0 the lowest ranking. Study authors (SS and ET) independently performed study selection, appraisal and data extraction. Disagreements between raters were resolved by discussion and where necessary, a third reviewer (KES).

Although a summative score was considered, we felt that important information may be missed on independent items (10); consequently, the main quality domain scores are reported versus the overall score. Furthermore, administering quality appraisal to studies related to mental health and COVID-19 was deemed not appropriate as the studies were primarily narrative opinion articles and subsequently, would not qualify for review of scientific rigor.

v.) Synthesis

Study findings were synthesized in a table that also highlighted study design and participant characteristics. A qualitative content analysis approach (11) was used to identify study

components that informed management of firefighter mental health and management of mental health in response to COVID-19. Text was reviewed critically and open coded to identify categories and subcategories of firefighter mental health management.

vi.) Stakeholder Consultation

Integrating knowledge users in knowledge synthesis ensures that outcomes are relevant to context and ready for uptake. In the current version of the synthesis, researchers included primary knowledge users (RB and local firefighter union president) from the beginning of the process including identification of the review as a need, review of the search strategy and discussion of resulting themes. Additionally, members of the research team (KES, SS, ET) met to review results of the synthesis to ensure consensus.

Results

The initial search strategy yielded a total 5 148 documents after duplicates were removed. Subsequent to applying inclusion and exclusion criteria, we identified a total of 24 documents to be included in the review. Following review of the 24 articles and thematic analysis, studies and articles were synthesized into two overarching themes: i.) Strategies to manage firefighter mental health and ii.) Mental health during COVID-19. Fifteen studies described strategies and interventions to manage firefighter and first responder mental health; nine articles related to mental health during COVID-19. Figure 1 illustrates the data selection process.

Strategies to manage firefighter mental health

Studies and articles that related to strategies implement to manage firefighter mental health are reviewed in Table 1. Although the focus of our search was mental health strategies specific for firefighters, we expanded our search to include other relevant first responder groups as intervention strategies developed by other public safety personnel (i.e., Road to Mental

Readiness) are often adopted by firefighters. Furthermore, there is a paucity of research on appropriate treatment to manage mental health disorders including post-traumatic stress injury among firefighters. Table 1 provides description of the selected studies and articles including year of publication, study location, study design, characteristics of study population and primary outcome and findings of studies that discussed management of first responder including firefighter mental health.

Overall, studies regarding general strategies to manage firefighter mental health were conducted in North America, Australia, the United Kingdom. Two studies (12,13) identified the impact of a mental health management intervention specifically on firefighter mental health; all other studies were conducted with other emergency response personnel. Three studies (12–14) were conducted as intervention / quasi-randomized control trial, where only one study (13) was specific to firefighting context; all other studies included identified the impact of an intervention (i.e., mindfulness) over time or were a narrative / qualitative review. The overall quality of studies related to effectiveness of interventions specifically targeting firefighter mental health is lacking (see Table 2). The following three themes relate to synthesis of the wider scope of literature reflected in this analysis. Although studies include implementation of health management strategies in other emergency personnel and public safety personnel groups, there is anticipated occupational cross-over to the application of managing mental health among firefighters.

i.) Formal programs to manage firefighter mental health

Formal programs are those that have clearly defined protocols and training programs in which participants must gain expertise in delivering or facilitating the intervention. Studies or articles that reviewed the effectiveness of formal mental health management programs provided

minimal to no evidence of effectiveness (8,12–25). One study analyzed the impact of REACT (Recognize, Evaluate, Advocate, Coordinate and Track) (12) on various first responder groups, including firefighters', knowledge about the psychological impact of potentially traumatic events and found some positive impact. Two studies implemented the R2MR (Road to Mental Readiness) (8,14) program and neither study found any impact on mental health management including symptoms, work engagement, resiliency mental health knowledge or stigma. R2MR impacts have only been determined in military and police contexts; no studies have been completed in the firefighting sector. One study implemented MAPS (Mental Agility and Psychological Strength training) (13) program with firefighter recruits' and found no impact on primary prevention of mental health issues, social support and coping strategies. One study (15) that considered the impact of critical incident stress debriefing (CISD) in firefighting was largely descriptive and suggested caution with implementation. Firefighters identified CISD as being “intrusive” and suggested experiencing higher distress following the intervention compared to prior (15).

Overall, studies that considered the impact of REACT (12), R2MR (8,14) and MAPS (13) on firefighter mental health lacked control over participant allocation and introduced observer bias due to blinding. Furthermore, only one study included a comparator group. Studies that reflected on impacts of CISD in firefighting were largely descriptive.

ii.) Informal strategies to support firefighter mental health

Studies that considered the impact of informal strategies found some impact on symptoms associated with post-traumatic stress disorder and other mental health conditions. Informal strategies were identified as those where clearly defined program parameters were not identified and formal training was not required. Two studies (22,23) conducted with career firefighters

identified that engaging in mindfulness reduced symptoms associated with post-traumatic stress disorder, depression, alcohol problems and suicide risk; however, the general quality of the studies was poor (see Table 2). Study design was generally cohort study or cross-sectional, consequently, the lack of a control group or comparator precludes interpretation of effectiveness. One study (21) identified a preference among paramedics for using a smartphone application to facilitate mental health interventions. One opinion paper suggested (17) benefits associated with pharmacological treatment and trauma-focused therapies as well, identified little evidence supporting impacts of pre-employment screening or standalone psychoeducation on first responder wellbeing or resilience. Two studies (16,19) identified multi-modal approaches for managing first responder mental health trauma and identified concepts including “meaning making”, “identifying and challenging strategies to avoid discussion of trauma”. One study (24) identified level of intervention required was based on incident exposure severity; firefighters identified increased need for formal intervention as exposure increased. As well, firefighters identified preference towards individualized debriefing versus formal CISD in low to moderate severity exposures. This study was descriptive cross-sectional and did not include a formal intervention to identify effectiveness of strategies. One study identified the importance of social integration and supervisor support as a way to mitigate stress that leads to post-traumatic stress injury in a sample of career firefighters.

Overall, studies identified various informal strategies that suggest effect on measures associated with poor mental health (i.e., stress, post-traumatic stress injury, substance abuse) however, study quality was generally poor largely because of study design and lack of comparator group. Consequently, the effectiveness of these strategies is unknown until further empirical evidence can identify true intervention effects.

iii.) Need for Evidence-Based Strategies

Inconsistency of evidence-based findings to support the efficacy of current tools and programs developed for the treatment and management of firefighter mental health was clearly identified across studies. There was an identified need by both researchers and firefighters for solutions that are feasible and efficacious in managing the unique, cumulative trauma exposure experienced by firefighters. It is likely that other first responder groups (i.e., paramedics, police) and public safety personnel (i.e., military, corrections officers) experience similar challenge when developing appropriate mental health and safety programs. The need for empirically based solutions that have been evaluated in the firefighting context is urgently required.

Mental Health Management during COVID-19

All literature related to managing mental health during COVID-19 was based on personal experience or opinion of approach. Although some reviewed specific to firefighters, most responses were inclusive of all first responders as well, front-line health care workers.

i.) First responders' mental health is at heightened risk during COVID-19

Articles included in this section of review identified that mental health of first responders and frontline health care workers must urgently be prioritized during COVID-19 response to prevent psychopathological changes (26–34). Two articles discussed that front-line health care workers' increased exposure to COVID-19 resulted in increased risk of mental health disorders including risk of post-traumatic stress disorder, chronic psychological stress and a fear of attending work where potential exposure is high and transference to family members is a critical concern (27,34).

ii.) Prioritize first responder mental health during COVID-19

Several opinion articles discussed the important of prioritizing development of evidence-based solutions to support first responder and front-line health worker mental health during COVID-19 (26) and should be an integral component to healthcare policy and practice during COVID-19 (32). It was also discussed that maintaining mental health is critical to providing effective patient intervention (35). Furthermore, discussion suggested that the mental health of medical personnel has been poorly managed including lacking timely diagnosis and poor treatment follow-up (30).

iii.) *Embed mental health care in future emergency response planning*

Two review articles (28,31) identified the importance of developing and integrating evidence-based mental health management strategies for first responders and front-line health care workers that inform future crisis management and intervention. These articles speak to the need for short- and long-term mental health treatment that address important constructs associated with mental health trauma including anxiety, anger and grief (28).

Discussion

We found a paucity of high-quality studies which is a requirement during development of evidence-base strategies to mitigate adverse events that impact firefighter mental health. Consequently, based on the current review, it is not possible to identify an empirically based intervention that will effectively manage firefighter mental health. Firefighters experience a unique mental health trauma profile where both the range in exposure severity compounded by the inherent cumulative exposures present a confluence of constructs that result in increased risk of various mental health disorders including post-traumatic stress injury, anxiety and substance abuse (4). Study findings suggest that a variety of formal and informal strategies have been implemented with firefighters however, the empirical effectiveness of these strategies is

compromised by poor study design including lack of a comparator group. The heterogeneity in participant sample across studies reflects the need for research specific to firefighting to ensure contextual relevancy and readiness for uptake.

Strategies to manage firefighter mental health

Study purpose and results were thematically coded into three themes towards identifying appropriate strategies to manage firefighter mental health: i.) Formal programs to manage firefighter mental health, ii.) informal strategies to support firefighter mental health, and iii.) need for evidence-based strategies. This review was intended to identify strategies that were frequently adopted by fire services as reflected in the literature to assess fidelity. We anticipated that reflecting themes and strategies might inform analysis of themes related to mental health management during COVID-19. However, study quality was lacking, limiting ability for comparison. Furthermore, research was directed towards identifying strategies for police, military and health care workers specifically and first responders generally, but fewer involved firefighters specifically. Although there may be contextual overlap, firefighting remains a unique occupational context that differs from other first responder groups. Firefighters are often first on-scene in emergency situations and in addition to fire suppression, are also required to perform challenging patient extrications and complex rescues; consequently, they are often the first responder to witness details associated with a traumatic event. Additionally, the environment that firefighters perform their duties is variable and may occur in a victim's personal space (i.e., home, vehicle); this context may increase the personal attachment associated with the trauma, and further enhance exposure to factors associated with increased risk of mental health disorders. Additionally, firefighters work in small teams where peer support is inherent. However, the effectiveness of peer support to support mental health during and following periods of

heightened trauma is less clear where peer support is foundational in the reviewed intervention studies (12–14). Critical incident stress debriefing (CISD) has been widely adopted by fire services through-out North America however, our review suggests the efficacy of its effect remains widely uncertain where some firefighters report experiencing increased distress following a CISD session. The fidelity of this research requires some mediation in interpretation regardless, findings reflect firefighters’ personal experience with CISD.

Informal strategies, in particular, mindfulness was the most common strategy implemented in the firefighting context. Findings suggest a positive effect on managing symptoms associated with mental health in particular, post-traumatic stress injury, symptoms associated with increased suicide risk and substance abuse (22,23). However, the quality of these studies was poor in particular, study design including lack of a comparator group to determine effectiveness. One study identified the importance of feelings of worth and social integration support from supervisors had a strong effect on mitigating stress (25). This is consistent with the Job Control Model (36) that identifies a combination of high psychological demand and low control at work results in increased psychological stress and physical distress and where perceived organization support can mediate this relationship. However, the methodological quality of the study is weak and empirical effectiveness of these strategies cannot be inferred.

Overall, our review identified that formal and informal strategies adopted by firefighter communities as well as first responder communities have largely demonstrated little to no effect on mitigating risk factors associated with poor mental health among firefighters. There is an urgent need for empirically sound studies that are able to identify effective strategies for managing the unique trauma exposure profile experienced by firefighters. The limited research in this domain may be the result of available partnerships that might facilitate this work and the

history of stigma around mental health in firefighting and other first responder communities. Building trust with a community-based research partnership is critical to establishing an effective program of research particularly to address high profile issues such as mental health (37). Firefighter communities are increasingly partnering with academic institutions towards establishing effective, evidence-based solutions to improve health and wellbeing. As partnerships develop, it is anticipated that quality and timeliness of research that also enables uptake, will improve.

Mental Health Management during COVID-19

Studies were primarily anecdotal reviews of personal experience and recommendations to support first responder and front-line health care worker mental health during COVID-19. Consequently, there is no empirical validity to findings however, the insights are useful and relevant. Study findings were coded into three sub-themes: i.) first responders' mental health is at heightened risk during COVID-19, ii.) prioritize first responder mental health during COVID-19, and iii.) embed mental health care in future emergency response planning. Overall, studies recognized that first responder and front-line health care workers are at increased exposure for COVID-19 and identified the pandemic itself as a "trauma event" for these workers (26,27,34). Notable was the narrative account of a front-line physician who was fearful of work due to COVID-19 exposure and subsequent transference to family members (34). This pandemic has created a unique context that has expanded definition of exposures that will be associated with mental health disorders experienced by front-line health care workers and first responders.

Firefighters as first responders are at higher risk for experiencing mental health disorders including post-traumatic stress disorder, anxiety and substance abuse. Identification of COVID-19 as a trauma event compounds the existing trauma exposures experienced by firefighters

increasing their likelihood of mental health disorders. Consequently, there is an urgent need to prioritize development of evidence-based strategies to support firefighters increased risk of experiencing mental health conditions during and following the COVID-19 pandemic.

In addition to recognition of the mental health burden associated with COVID-19, there was an urgent call for mental health prevention strategies to be embedded both in current management of COVID-19 and in future emergency response planning strategies (28,31,32). Articles included in this review suggest that mental health protections for first responders and front-line health care workers have not been prioritized which will result in increased trauma and mental health disorders both during and following the COVID-19 pandemic. In addition to improving firefighter wellbeing, developing effective mental health management strategies to support first responders including firefighters will improve patient care delivery and general service (35). When workers including firefighters are mentally and physically healthy, they will deliver improved care and public supports during times of heightened trauma including pandemics. Consequently, there is a call for evidence based mental health supports that respond to the unique trauma profile experienced by first responders including firefighters, to be developed and embedded as standard operating procedures in future emergency response planning.

Limitations

The primary limitation of this review is the limited number of studies conducted to identify the effectiveness of strategies to manage firefighter mental health generally and more specifically, during COVID-19. Consequently, heterogeneity of occupational contexts and intervention as well study quality precludes meta-analysis or quantitative synthesis of effect. Our review attempted to contrast and compare findings related to generally managing mental health

among first responders to strategies implemented to in response to COVID-19. This was not possible due to the limited number of studies and study quality. Our search was limited to studies written in English and to the academic literature. Further research will further contextualize this synthesis with grey literature, web-based resources provided by firefighter associations and other formal guidelines for managing firefighter mental health.

Conclusion

Overall, our study findings suggest that there is weak evidence supporting that programs traditionally adopted by fire services to support mental health (i.e., Road to Mental Readiness, Critical Incident Stress Debriefing) have minimal effect in reducing risk factors and symptoms associated with post-traumatic stress injury, anxiety and alcohol abuse (8,14,15). There is very weak evidence suggesting some effect of informal strategies such as mindfulness in managing firefighter mental health including post-traumatic stress disorder (22,23). Results should be taken with caution due to the low study sample and weaknesses in study design.

Articles regarding managing mental health during COVID-19 are anecdotal reviews that emphasize the heightened exposure to mental health conditions experienced by first responders during a pandemic where the pandemic itself is identified as a trauma event (26,27,33). The reviewed articles identified a critical gap in mental health management during COVID-19 which led to a universal call to embed evidence-based solutions to support first responder mental health in current and future emergency response planning policy (26,28,31,32).

Our study findings identify an urgent and critical need for high quality studies to identify effectiveness of mental health strategies to support firefighter mental health. Firefighters as first responders are uniquely exposed to a confluence of factors that increase their risk for mental health disorder yet current evidence does not clearly identify an effective solution. Firefighters

are urged to consider that some strategies (i.e., Critical Incident Stress Debriefing) may result in negative effects on mental health particularly following high exposure events (15); implementation protocols should be closely reviewed prior to supporting this strategy. Future research should consider evidence-based strategies (i.e., formal psychotherapy treatment) and potential effectiveness in the firefighting context.

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References

1. Bos J, Mol E, Visser B, Frings-Dresen M. Risk of health complaints and disabilities among Dutch firefighters. *Int Arch Occup Environ Heal*. 2004 Aug;77(6):373–82.
2. Elliot DL, Goldberg L, Duncan TE, Kuehl KS, Moe EL, Breger RKR, et al. The PHLAME Firefighters' Study: Feasibility and Findings. *Am J Health Behav*. 2004;28(1):13–23.
3. Guidotti TL. Human Factors in Firefighting: Ergonomic-, cardiopulmonary-, and psychogenic stress-related issues. *Int Arch Occup Environ Heal*. 1992 Jan;64(1):1–12.
4. Carleton RN, Afifi TO, Turner S, Taillieu T, Duranceau S, LeBouthillier DM, et al. Mental Disorder Symptoms among Public Safety Personnel in Canada. *Can J Psychiatry*. 2018;63:54-64.
5. Lin CY, Peng YC, Wu YH, Chang J, Chan CH, Yang DY. The psychological effect of severe acute respiratory syndrome on emergency department staff. *Emerg Med J*. 2007;24(1):12–7.
6. Levac D, Colquhoun H, O'Brien KK. Scoping studies: Advancing the methodology. *Implement Sci*. 2010;5(1):1–9.
7. Arksey H, O'Malley L. Scoping studies: Towards a methodological framework. *Int J Soc Res Methodol Theory Pract*. 2005;8(1):19–32.
8. Carleton RN, Korol S, Mason JE, Hozempa K, Anderson GS, Jones NA, et al. A longitudinal assessment of the road to mental readiness training among municipal police. *Cogn Behav Ther*. 2018;47(6):508–28.
9. MacDermid JC, Law M. Evidence-based Rehabilitation. In: *Evaluating the Evidence*. Slack Publishing; 2014. p. 129–57.

10. Greenland S. Invited commentary: A critical look at some popular meta-analytic methods. *Am J Epidemiol.* 1994;140(3):290–6.
11. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res.* 2005 Nov;15(9):1277–88.
12. Marks MR, Bowers C, DePesa NS, Trachik B, Deavers FE, James NT. REACT: A paraprofessional training program for first responders-a pilot study. *Bull Menninger Clin.* 2017;81(2):150–66.
13. Skeffington PM, Rees CS, Mazzucchelli TG, Kane RT. The primary prevention of PTSD in firefighters: Preliminary results of an RCT with 12-month follow-up. *PLoS One.* 2016;11(7):1–22.
14. Fikretoglu D, Liu A, Nazarov A, Blackler K. A group randomized control trial to test the efficacy of the Road to Mental Readiness (R2MR) program among Canadian military recruits. *BMC Psychiatry.* 2019;19(1):1–14.
15. Jahnke SA, Gist R, Poston WSC, Haddock CK. Behavioral Health Interventions in the Fire Service: Stories from the Firehouse. *J Workplace Behav Health.* 2014;29(2):113–26.
16. Haugen PT, Splaun AK, Evces MR, Weiss DS. Integrative approach for the treatment of posttraumatic stress disorder in 9/11 first responders: Three core techniques. *Psychotherapy.* 2013;50(3):336–40.
17. Ellis J, Zaretsky A. Assessment and Management of Posttraumatic Stress Disorder. *Contin Lifelong Learn Neurol.* 2018;24:873–92.
18. Wild J, Greenberg N, Moulds ML, Sharp M-L, Fear N, Harvey S, et al. Pre-incident Training to Build Resilience in First Responders: Recommendations on What to and What Not to Do. *Psychiatry.* 2020;00(00):1–15.

19. Flannery RB. Treating Psychological Trauma in First Responders: A Multi-Modal Paradigm. *Psychiatr Q.* 2015;86(2):261–7.
20. Drury J, Kemp V, Newman J, Novelli D, Doyle C, Walter D, et al. Psychosocial care for persons affected by emergencies and major incidents: A Delphi study to determine the needs of professional first responders for education, training and support. *Emerg Med J.* 2013;30(10):831–6.
21. Deady M, Peters D, Lang H, Calvo R, Glozier N, Christensen H, et al. Designing smartphone mental health applications for emergency service workers. *Occup Med (Lond).* 2017;67(6):425–8.
22. Smith BW, Ortiz JA, Steffen LE, Tooley EM, Wiggins KT, Yeater EA, et al. Mindfulness is associated with fewer PTSD symptoms, depressive symptoms, physical symptoms, and alcohol problems in urban firefighters. *J Consult Clin Psychol.* 2011;79(5):613–7.
23. Stanley IH, Boffa JW, Tran JK, Schmidt NB, Thomas E, Vujanovic AA. Posttraumatic stress disorder symptoms and mindfulness facets in relations to suicide risk among firefighters. 2019;75(4):696–709.
24. Jeannette JM, Scoboria A. Firefighter preferences regarding post-incident intervention. *Work Stress.* 2008;22(4):314–26.
25. Varvel SJ, He Y, Shannon JK, Tager D, Bledman RA, Chaichanasakul A, et al. Multidimensional, Threshold Effects of Social Support in Firefighters: Is More Support Invariably Better? *J Couns Psychol.* 2007;54(4):458–65.
26. Horesh D, Brown AD. Covid-19 response: Traumatic stress in the age of Covid-19: A call to close critical gaps and adapt to new realities. *Psychol Trauma Theory, Res Pract Policy.* 2020;12(4):331–5.

27. Boyraz G, Legros DN. Coronavirus Disease (COVID-19) and Traumatic Stress: Probable Risk Factors and Correlates of Posttraumatic Stress Disorder. *J Loss Trauma*. 2020;0(0):1–20.
28. DePierro J, Lowe S, Katz C. Lessons learned from 9/11: Mental health perspectives on the COVID-19 pandemic. *Psychiatry Res*. 2020;288(April):113024.
29. Bai Y, Yao L, Wei T, Tian F, Jin DY, Chen L, et al. Presumed Asymptomatic Carrier Transmission of COVID-19. *JAMA - J Am Med Assoc*. 2020;323(14):1406–7.
30. Duan L, Zhu G. Psychological interventions for people affected by the COVID-19 epidemic. *The Lancet Psychiatry*. 2020;7(4):300–2.
31. Kang L, Li Y, Hu S, Chen M, Yang C, Yang BX, et al. The mental health of medical workers in Wuhan, China dealing with the 2019 novel coronavirus. *The Lancet Psychiatry*. 2020;7(3):e14.
32. Kaufman KR, Petkova E, Bhui KS, Schulze TG. A global needs assessment in times of a global crisis: world psychiatry response to the COVID-19 pandemic. *BJPsych Open*. 2020;6(3):1–3.
33. Orrù G, Ciacchini R, Gemignani A, Conversano C. Perspective article Psychological intervention measures during the COVID-19 pandemic Graziella Orrù, Rebecca Ciacchini, Angelo Gemignani, Ciro Conversano. *Clin Neuropsychiatry*. 2020;76–9.
34. Jiang L, Flores S. Suffocating in the eye of the storm: attempting to breathe at the epicentre of New York’s COVID-19 pandemic. *Emerg Med J*. 2020;37(6):330–1.
35. Chen Q, Liang M, Li Y, Guo J, Fei D, Wang L, et al. Mental health care for medical staff in China during the COVID-19 outbreak. *The Lancet Psychiatry*. 2020;7(4):e15–6.
36. Karasek R. Job demands, Job decision latitude, and Mental Strain: Implications for job

redesign. *Administration Sci Q.* 1979;24:285–307.

37. Sinden K, Macdermid JC. The Evolution of FIRE-WELL: Improving Firefighters' Health through Research and Partnership. In: *CIHR Institute of Musculoskeletal Health and Arthritis Casebook: Celebrating the Impact of Health Research: Success Stories in Arthritis, Bone, Muscle, Musculoskeletal Rehabilitation, Oral Health, and Skin.* 2013. p. 42–6.

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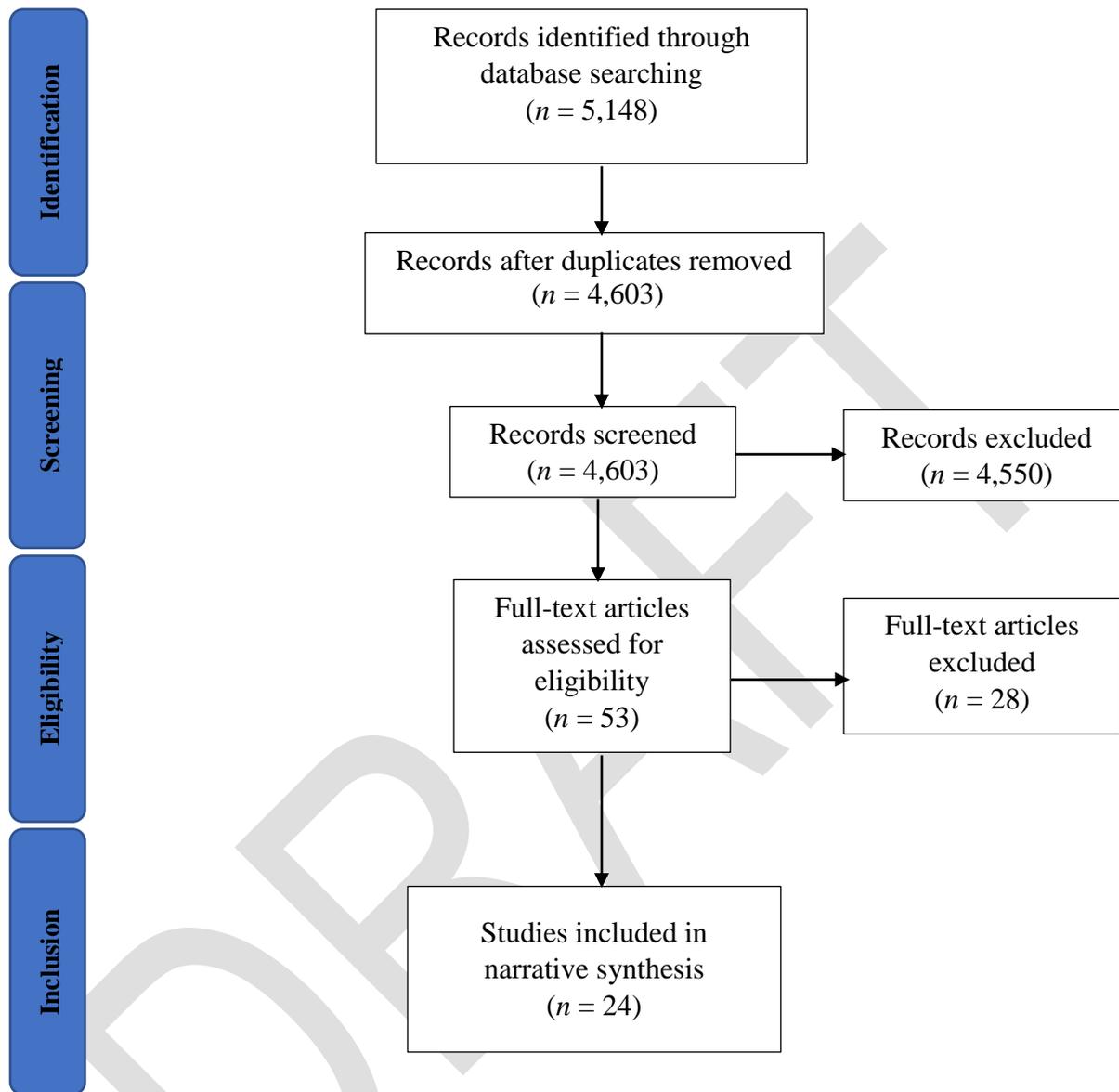


Figure 1. Study Selection process for Scoping Review.

**APPENDIX 1:
Search Strategy**

Database	Subject Headings & Keywords
Pubmed	<p>1 "Mental Health" [MeSH Terms] AND ((wuhan[All Fields] AND ("coronavirus"[MeSH Terms] OR "coronavirus"[All Fields])) AND 2019/12[PDAT] : 2030[PDAT]) OR 2019-nCoV[All Fields] OR 2019nCoV[All Fields] OR COVID-19[All Fields] OR SARS-CoV-2[All Fields]</p> <p>2 ((wuhan[All Fields] AND ("coronavirus"[MeSH Terms] OR "coronavirus"[All Fields])) AND 2019/12[PDAT] : 2030[PDAT]) OR 2019-nCoV[All Fields] OR 2019nCoV[All Fields] OR COVID-19[All Fields] OR SARS-CoV-2[All Fields]</p> <p>3 (("COVID-19" [Supplementary Concept] OR "severe acute respiratory syndrome coronavirus 2" [Supplementary Concept]) OR "Coronavirus"[Mesh]) AND ("Emergency Responders"[Mesh] OR "Firefighters"[Mesh])</p> <p>4 (emergency responders) AND (pandemic)</p> <p>5 (first responders) AND (covid-19)</p> <p>6 ((wuhan[tw] AND (coronavirus[tw] OR corona virus[tw])) OR nCov[tw] OR 2019 ncov[tw] OR novel coronavirus[tw] OR novel corona virus[tw] OR covid-19[tw] OR SARS-COV-2[tw] OR Severe Acute Respiratory Syndrome Coronavirus 2[tw] OR coronavirus disease 2019[tw] OR corona virus disease 2019[tw] OR new coronavirus[tw] OR new corona virus[tw] OR new coronaviruses[all] OR novel coronaviruses[all] OR "Severe Acute Respiratory Syndrome Coronavirus 2"[nm] OR 2019 ncov[tw] OR nCov 2019[tw] OR SARS Coronavirus 2[all])</p> <p>7 ("Trauma and Stressor Related Disorders"[Mesh] OR "Psychological Trauma"[Mesh]) AND "Firefighters"[Mesh]</p>
LitCovid	<p>1 First Responder</p> <p>2 Firefighter</p>
Psycinfo	<p>1 (MAINSUBJECT.EXACT("Emergency Personnel") OR MAINSUBJECT.EXACT("First Responders") AND (MAINSUBJECT.EXACT("Post-Traumatic Stress") OR MAINSUBJECT.EXACT("Posttraumatic Stress Disorder") OR MAINSUBJECT.EXACT("Trauma") OR MAINSUBJECT.EXACT("Stress and Trauma Related Disorders"))) AND PEER(yes)</p> <p>2 (MAINSUBJECT.EXACT("Emergency Personnel") OR MAINSUBJECT.EXACT("First Responders") AND MAINSUBJECT.EXACT("Pandemics") AND (MAINSUBJECT.EXACT("Post-Traumatic Stress") OR MAINSUBJECT.EXACT("Posttraumatic Stress Disorder") OR MAINSUBJECT.EXACT("Stress and Coping Measures") OR MAINSUBJECT.EXACT("Occupational Stress") OR MAINSUBJECT.EXACT("Stress and Trauma Related Disorders") OR MAINSUBJECT.EXACT("Stress") OR MAINSUBJECT.EXACT("Stress Management") OR MAINSUBJECT.EXACT("Psychological Stress"))) AND PEER(yes)</p> <p>3 (first responder* OR emergency personnel OR fire*figther*) AND (Mental health) AND PEER(yes)</p> <p>4 (COVID-19 OR coronavirus) AND PEER(yes)</p> <p>5 ((first responder* OR emergency personnel OR fire*figther*) AND (Mental health) AND PEER(yes)) AND ((COVID-19 OR coronavirus) AND PEER(yes))</p>
Web of Science	#1 First Responder* AND Mental Health

	#2 First Responder* AND COVID-19 #3 Fire*fighter* AND Mental Health #4 COVID-19 OR coronavirus #1 AND #4
Google Scholar	Coronavirus Stress Healthcare providers COVID-19 Global pandemic

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APPENDIX 2: Quality Appraisal Tool

Evaluation Criteria	Score		
	2	1	0
Study question			
1. Was there relevant and sufficient background work cited that led to a clear research question?			
Study design			
2. Was a comparison group used?			
3. Was patient status at more than 1 time point considered?			
4. Was data collection performed prospectively?			
5. Were patients randomized to groups?			
6. Was allocation concealed?			
7. Were patients blinded to the extent possible?			
8. Were treatment providers blinded to the extent possible?			
9. Was an independent evaluator used to administer outcome measures?			
Subjects			
10. Did sampling procedures minimize sample/selection biases?			
11. Were inclusion/exclusion criteria defined?			
12. Was an appropriate enrollment obtained?			
13. Was appropriate retention/follow-up obtained?			
Intervention			
14. Was the intervention applied according to established principles?			
15. Were biases due to the treatment provider minimized (i.e. attention, training)?			
16. Was the intervention compared to an appropriate comparator?			
Outcomes			
17. Was an appropriate primary outcome defined?			
18. Were appropriate secondary outcomes considered?			
19. Was an appropriate follow-up period incorporated?			
Analysis			
20. Was an appropriate statistical test(s) performed to indicate differences related to the intervention?			

21. Was it established that the study had significant power to identify treatment effects?			
22. Was the the size and clinical importance of the treatment group differences reported?			
23. Were missing data accounted for and considered in analyses?			
24. Were treatment benefits, adverse events and costs/implementation considerations addressed?			
Recommendations			
25. Were the conclusions/clinical recommendations supported by the study objectives, analysis and results?			
Total Quality Score (Sum of above) =			
The total score can be reported out of 100% -- total sum/25 x 100%			

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Table 1.

Characteristics of studies (n=15) that identified management of mental health in first responders including firefighters.

Author (year)	Study location	Study Design	Sample	Intervention	Findings
Marks (2017)	United States	Intervention	First responders (firefighters, emergency communication centre member)	REACT Program	REACT Program demonstrated ability to increase participant knowledge to manage psychological impact of potentially traumatic events.
Fikretoglu (2019)	Canada	Intervention (RCT)	Military recruits	R2MR	No evidence of effectiveness in managing mental health.
Skeffington (2016)	Australia	Intervention	Career fire recruits	MAPS program	No evidence of effectiveness in managing mental health.
Drury (2013)	United Kingdom	Prospective Cohort	Paramedics	n/a	Identified need for ongoing education in psychosocial training and support.
Carleton (2018)	Canada	Prospective Cohort	Police	R2MR	No significant change in mental health symptoms, resilience or work engagement.
Deady (2017)	Australia	Cross-sectional	Emergency service workers	Smartphone application	Emergency service workers identified interest in using smartphone application to facilitate mental health interventions.
Smith (2011)	United States	Cross sectional	Career Firefighters	n/a	Mindfulness associated with reduced PTSD, depression and physical symptoms, and alcohol problems
Stanley (2019)	United States	Cross-sectional	Career Firefighters	n/a	PTSD symptoms associated with increased suicide risk; mindfulness mediated relationship
Jeanette (2008)	Canada	Cross-sectional	Career Firefighters	n/a	As critical incident exposure increased, firefighters identified increased need for formal intervention. Individual debriefings were preferred to critical incident debriefing (CISD) in low to moderate severity exposure.
Varvel (2007)	United States	Cross Sectional	Career Firefighters	n/a	Reassurance of worth and social integration support from supervisors had strongest negative association with stress.
Jahnke (2014)	United States	Qualitative	Career Firefighters	n/a	Critical incident debriefing (CISD) was found to be intrusive and associated with higher distress than prior to intervention; benefits reported from peer support and using crew bonding.

Haugen (2013)	United States	Opinion/Review	9/11 First Responders	n/a	Treatment of PTSD includes 3 core techniques: i.) meaning making, ii.) focus on most affect-laden components of trauma exposure and iii.) identifying and challenging strategies used to avoid discussion of trauma
Ellis (2018)	Canada	Opinion / Review	Health care workers	n/a	Evidence suggests benefits of pharmacologic agents and trauma-focused therapies
Wild (2020)	United Kingdom	Opinion / Review	First Responders	n/a	Limited evidence supporting use of pre-employment screening, improving wellbeing or resilience; no evidence supporting standalone psychoeducation
Flannery (2014)	United States	Opinion / Review	First Responders	n/a	First responder mental health management is complex; identify 3 disrupted health domains (mastery, caring attachments, meaningful purpose)

Table 2.

Description of quality assessment of studies (n=15) identified management of mental health in first responders including firefighters.

Author (year)	Question	Study Design									Participants				Intervention			Outcome			Analysis					Recs
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Marks (2017)	2	0	2	2	0	0	0	0	0	0	2	1	2	1	0	0	2	2	2	2	1	2	1	0	2	
Fikretoglu (2019)	2	2	2	2	2	2	2	2	1	1	0	2	2	2	2	2	2	2	1	2	2	2	2	1	2	
Skeffington (2016)	1	2	2	1	2	0	1	0	0	1	2	2	2	2	1	1	1	2	2	2	2	2	0	0	2	
Drury (2013)	1	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	1	2	
Carleton (2018)	2	0	2	2	0	0	0	0	0	0	0	1	0	2	0	1	2	2	2	2	0	0	1	2	2	
Deady (2017)	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	2	0	0	0	1	2	
Smith (2011)	2	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	2	0	0	0	2	0	2	2	

Stanley (2019)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	0	0	2	0	2
Jeanette (2008)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	2	2
Varvel (2007)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	0	0	0	0	2	
Jahnke (2014)	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	1	0	0	0	0	0	2	2
Haugen (2013)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Ellis (2018)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Wild (2020)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Flannery (2014)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Table 3.

Characteristics of studies (n=9) that identified management of mental health among first responders including firefighters during COVID-19.

Author (year)	Study location	Study Design	Sample	Findings
Horesch (2020)	United States	Opinion / Review	Emergency physicians (frontline)	Mental health needs to be prioritized and mobilize research in diagnostics, prevention, public outreach/communication, working with medical personnel and COVID19 specific research.
Boyratz (2020)	United States	Opinion / Review	General population	Frontline workers likely to experience increased risk of PTSD and chronic psychological stress
DePierro (2020)	United States	Opinion / Review	Health care workers	Need for short and long term mental health treatment needs for anxiety, anger and grief.
Chen (2020)	China	Opinion / Review	Health care workers	Maintaining mental health is essential to control infectious diseases.
Duan (2020)	China	Opinion / Review	Health care / front line workers	Mental health needs of medical personnel have been poorly managed; lack of timely diagnosis and poor treatment follow-up.

Kang (2020)	China	Opinion / Review	Health care workers	Multifaceted psychological protection of mental health of medical works should inform future crisis management and intervention.
Kaufman (2020)	United Kingdom	Opinion / Review	First responders and general population	Mental health should be an integral component to healthcare policy and practice during COVID-19.
Orru (2020)	Italy	Opinion / Review	Health care workers / General population	Prompt response needed to prevent psychopathological changes, resulting in maladaptive behaviours and broad range of emotional disorders.
Jiang (2020)	United States	Opinion / Review	Health care workers	Increased risk of exposure increases health workers' fear of work and family's safety