

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 a 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: a.) generally and b.) during periods of heightened exposure?” Core concepts that were considered in developing the research question and search strategy included: i.) mental health among firefighters, ii.) management and treatment of firefighter mental health and iii.) 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 conducted in multiple phases; the first phase was conducted in May 2020 – June 2020; a secondary analysis was conducted in July 2020 – August 2020. The initial 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 and local firefighter union president) as primary knowledge users. A university librarian was consulted for development and application of the search strategy. The secondary literature search was informed by local firefighter primary knowledge user (RB) to include more specific search terms which reflected the scope of mental health support services commonly accessed by firefighters (i.e., resiliency training, debriefing, defusing, Road-to-Mental Readiness).

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, police)
- b.) Intervention or assessment of strategy related to management of mental health among first responders including career firefighters, volunteer firefighters, paramedics or police.

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 and public safety personnel 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.

Systematic reviews, guideline development and grey literature review were also excluded. See Figure 1 for the study selection process for the 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 (see Table 2). 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 (see Tables 1 and 3). 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. Primary knowledge user (RB) contributed significantly to developing the secondary search as well as document review and data extraction. 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; the secondary search yielded 351 documents resulting in 5499 total documents. Subsequent to applying inclusion and exclusion criteria, we identified a total of 34 documents to be included in the review. Following review of the 34 articles and thematic analysis, studies and articles were synthesized into two overarching themes: i.) General strategies to manage firefighter mental health and ii.) Mental health during COVID-19. Twenty-five studies described strategies and interventions or strategies designed 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 and first responder mental health

Studies and articles that related to strategies implemented to manage firefighter and first responder mental health are reviewed in Table 1. There is a paucity of research on appropriate treatment to manage mental health disorders including post-traumatic stress injury aimed specifically towards firefighters. Consequently, 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. 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. Four studies (12–15) identified the

impact of a mental health management intervention specifically on career or volunteer firefighter mental health; all other studies were conducted with other emergency response personnel. Eight studies (12–19) were conducted as intervention / quasi-randomized control trial with various public safety personnel groups (i.e. firefighters, paramedics, military) where only three of those studies (13–15) were specific to firefighting context; other included studies (n=10) (20–29) identified the relationship between an intervention aimed to improve individual mental health (i.e., mindfulness, peer support, debriefing) and a construct of mental health (i.e., post-traumatic stress disorder) or individual preference towards the intervention or strategy. Remaining studies (n=7) (30–36) were a narrative / qualitative review of firefighters and /or first responder preferences for managing mental health or a review of strategies associated with effective management of mental health among first responders or front-line workers.

The overall quality of studies related to effectiveness of interventions *specifically targeting firefighter mental health* is lacking (see Table 2). 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. The following three themes were identified as reflecting the types of programs being implemented by firefighters and other first responder groups and associated evidence for effectiveness.

i.) *Formal programs designed to manage firefighter and / or first responder mental health*

Formal programs were categorized as those having clearly defined protocols and training programs in which those delivering the protocol must gain expertise in delivering or facilitating the intervention (i.e., Road-to-Mental Readiness – R2MR); have been identified as evidence-

based strategies for managing mental health disorders (i.e., cognitive behavioural therapy) and / or have been widely adopted in the first responder community as a strategy to manage mental health (i.e., critical incident debriefing). Studies or articles that measured the effectiveness of mental health management programs developed by first responder groups in response to the burden associated with mental health disorders (i.e., critical incident debriefing, R2MR) provided minimal to no evidence of effectiveness on outcomes measuring mental health disorders although some impact was noted on secondary outcomes (12–19).

Road-to-Mental Readiness (R2MR): Three studies were identified which considered the impact of R2MR on various mental health outcomes in police and military (8,16,31). Two studies (16,21) directly measured impacts of implementing R2MR on associated mental health outcomes found minimal to no impact on symptoms, work engagement, resiliency mental health knowledge or stigma. One study identified that work culture including organizational readiness, leadership and the credibility of the trainers impacts successful uptake of R2MR in police (31). R2MR impacts have only been determined in military and police contexts; no studies have been completed specifically in the firefighting sector although it is likely that effects between first responder groups are transferable.

Critical Incident Stress Debriefing (CISD): Four studies (15,24,28,30) considered the impact of critical incident stress debriefing (CISD) among firefighters; one study involved volunteer firefighters (15) and three with career firefighters (24,28,37). An intervention with sample randomization identified that although CISD was associated with less alcohol use and greater quality of life, no effects were identified on mental health disorders including post-traumatic stress disorder and / or psychological distress (15). Studies that identified firefighters perceptions of CISD following a traumatic event identified the process as being “intrusive” and suggested

experiencing higher distress following the intervention compared to prior intervention (28,30). Furthermore, firefighters diagnosed with post-traumatic stress disorder identified dissatisfaction with CISD where debriefing was associated with avoidance and numbing (28). Conversely, one study modelled varying levels of critical incident exposure and identified that firefighters indicated need for debriefing increased as critical incident exposure increased (24). 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. Overall, studies recommended caution when considering implementation of CISD particularly following a high exposure incident (28,30).

Cognitive Behavioural Therapy (CBT): Cognitive behavioural therapy (CBT), delivered by regulated health care professionals, is one evidence-based approach having demonstrated effectiveness in managing various mental health disorders including post-traumatic stress disorder in patient population (38). One study was identified that isolated CBT intervention among various emergency response personnel (17). The study was conducted as a robust randomized control trial identified that both long-term and brief intervention CBT demonstrated large baseline to follow-up effect size on measures associated with post-traumatic stress disorder and secondary measures associated with mental health (17). Although 80% of study participants were police, it is likely that effects would transfer to other emergency response personnel including firefighters.

Study Quality: Overall, studies that considered the impact of R2MR (8,16,31), on first responder mental health lacked control over participant allocation and introduced observer bias due to blinding (see Table 2). Two studies (21,31) lacked a comparator group or were largely

descriptive consequently, although findings provide important insights into use and general impact of R2MR, findings cannot be used to assume clinical impacts on mental health; furthermore the target sample of the studies was police. Studies that identified impacts of critical incident stress debriefing (15,24,28,30) vary in study quality; one high quality study (15) identified no impact of CISD on post-traumatic stress or psychological distress among volunteer firefighters although some benefit was found on secondary health outcomes (i.e., alcohol use, quality of life) (see Table 2). Other studies lacked a comparator group (24,28) or were qualitative reviews of firefighters' experiences with CISD (30). These studies provided important insights into limitations and firefighter preferences related to CISD however conclusions regarding clinical impact are not possible. One high quality study identified positive impacts of cognitive behavioural therapy on mitigating post-traumatic stress injury among first responders including firefighters (17).

ii.) *Informal strategies to support firefighter mental health*

Studies that considered the impact of informal strategies implemented mental health management strategies are those developed in direct response to first responder community need and / or where clearly defined program parameters were not identified and / or formal training was not required to implement the program. Strategies were classified into three categories: i.) peer support, ii.) resiliency, iii.) mindfulness.

Peer Support: Three studies (22,23,26) conducted with public safety personnel and career firefighters identified a preference among firefighters and PSP to seek peer support when managing their mental health. One study identified that 75% of PSP prefer to seek care from their spouse to discuss mental health concerns and 43-60% of respondent indicated that they would never or as a last resort seek professional support for treatment (22).

Resiliency: Several studies considered the impacts of strategies aimed to improve first responder mental health through improving resiliency (13,19,27,39). The MAPS (Mental Agility and Psychological Strength training) (13) program was implemented among firefighter recruits' and found no impact on primary prevention of mental health issues, social support and coping strategies. Two studies implemented digital applications to facilitate first responder mental health (19,27); benefits of implementing smartphone applications were noted including improved resiliency however long term impacts on mental health disorders was not evident. One study implemented a mindfulness and relaxation training strategy for firefighters and found improved psychological resilience from baseline to post-training compared to the no-training group (14). The overall quality of studies was generally good including comparator groups and controlling for biases (see Table 2) suggesting positive impacts of resiliency training on first responder psychological resiliency.

Mindfulness: Several studies considered the impact of mindfulness on first responder mental health. One study analyzed the impact of REACT (Recognize, Evaluate, Advocate, Coordinate and Track) (12) on various first responder groups, including firefighters'; the REACT program was associated with increasing knowledge about the psychological impact of potentially traumatic events and found positive impacts on mental health. Two studies identified that mindfulness and relaxation among firefighters was associated with greater increases in psychological resilience and reduction of post-traumatic stress disorder (14,25) Engaging in mindfulness reduced symptoms associated with post-traumatic stress disorder, depression, alcohol problems and suicide risk; the general quality of the studies was moderate (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 however one higher quality study

included a comparator group that also suggested benefits of mindfulness on first responder psychological resilience (14).

Overall, studies identified various informal strategies that suggest positive 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.

Several articles were included that provided authors reflections of approaches and / or that were deemed foundational in managing first responder mental health. One opinion paper suggested (34) 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 (33,36) 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 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. These studies are largely descriptive consequently adapting approaches for implementation is challenging however the comments and reflections provide important foundational components to consider in mental health program design.

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 challenges 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 (40–48). 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 (41,48).

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 (40) and should be an integral component to healthcare policy and practice during COVID-19 (46). It was also discussed that maintaining mental health is critical to providing effective patient intervention (49). Furthermore, discussion suggested that the mental health of

medical personnel has been poorly managed including lacking timely diagnosis and poor treatment follow-up (44).

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

Two review articles (42,45) 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 (42).

Discussion

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). We found a paucity of high-quality studies that would inform development of evidence-base strategies and / or recommendations to mitigate adverse events that impact firefighter mental health. Furthermore, no studies were identified that measured effectiveness of interventions designed to support firefighter mental health specifically in response to COVID-19. However, we anticipate that strategies identified to manage firefighter mental health generally could be extrapolated to the context of COVID19. Study findings suggest that a variety of formal and informal strategies have been implemented specifically with firefighters; high quality studies have been implemented to determine impacts of critical incident debriefing (15), cognitive behavioural therapy (17) and mindfulness training (18). Overall, the empirical effectiveness of formal and informal strategies is challenged 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 (12,15). 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 (28,30). 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 (14,18,19,25). The overall quality of these studies was very good (14,18) suggesting that mindfulness may be effective however, further high quality studies are required to confirm efficacy.

One study identified the importance of feelings of worth and social integration support from supervisors had a strong effect on mitigating stress (23). This is consistent with the Job Control Model (50) 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 commonly adopted 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 (15,16,21,30) although study quality is variable. Our review further identified that firefighters and other first responder groups prefer peer support models (22,26) over treatment delivered by a health professional, with some evidence suggesting preference towards critical incident debriefing

(CISD) (24). However CISD is found to have no effects on post-traumatic stress disorder (15) and furthermore, can be detrimental to firefighter mental health and wellbeing (28,30). Several higher quality studies demonstrated that resiliency and mindfulness training has moderate effects on firefighter and first responder mental health (13,14,18,19). Furthermore, short and long-term cognitive behavioural therapy demonstrated large effects on post-traumatic stress disorder among first responders including firefighters (17). Although there is an urgent need for empirically strong studies that are able to identify effective strategies for managing the unique trauma exposure profile experienced by firefighters, our review provides early evidence suggesting that resiliency training, with mindfulness and evidence-based strategies including cognitive behavioural therapy may be most effective in managing first responder mental health.

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 (51). 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 (40,41,48). 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 (48). 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 (42,45,46). 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 (49). 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 (8,15,16,28,30). There is moderate evidence suggesting some effect of informal strategies such as mindfulness in managing firefighter mental health including post-traumatic stress disorder (12,14,18,25,29).

Although firefighters and first responders prefer to access peers and family to support their mental health rather than health care providers (22,24,26) strong evidence supports mental health treatment strategies implemented by health care professions (17). Results should be taken with caution due to the low study sample and heterogeneity in sample.

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 (40,41,47). 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 (40,42,45,46).

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 (28,30); 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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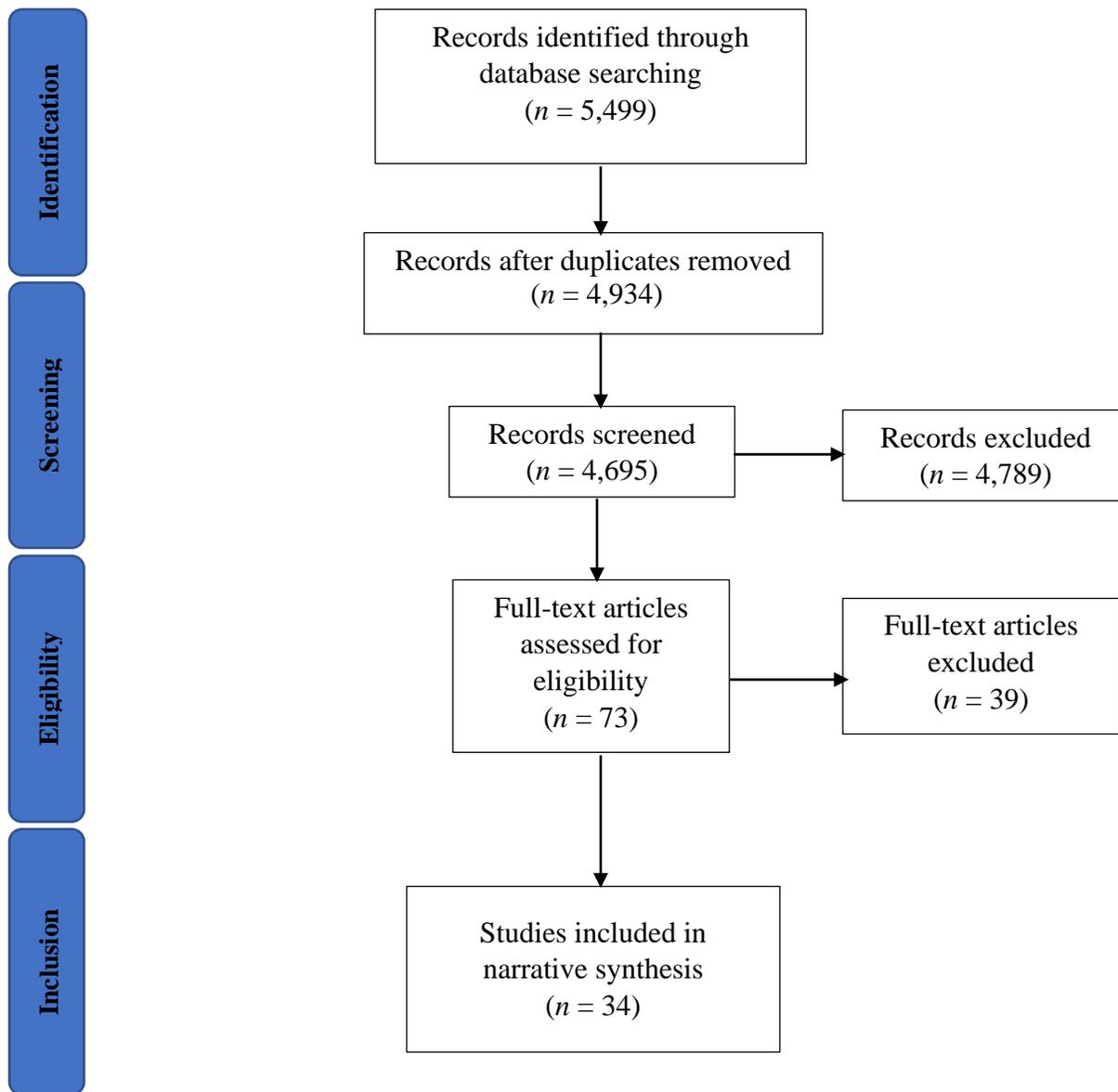


Figure 1. Study Selection process for Scoping Review.

APPENDIX 1:
Search Strategy

Database	Subject Headings & Keywords
Pubmed	<p>1 ("firefight*[All Fields] OR (("first"[All Fields] OR "firsts"[All Fields]) AND "responder*[All Fields])) AND ("peer"[All Fields] AND ("support"[All Fields] OR "support s"[All Fields] OR "supported"[All Fields] OR "supporter"[All Fields] OR "supporter s"[All Fields] OR "supporters"[All Fields] OR "supporting"[All Fields] OR "supportive"[All Fields] OR "supportiveness"[All Fields] OR "supports"[All Fields]))</p> <p>2 ("firefight*[All Fields] OR (("first"[All Fields] OR "firsts"[All Fields]) AND "responder*[All Fields])) AND ("debrief"[All Fields] OR "debriefed"[All Fields] OR "debriefe*[All Fields] OR "debriefers"[All Fields] OR "debriefing"[All Fields] OR "debriefings"[All Fields] OR "debriefs"[All Fields])</p> <p>3 ("firefighter*[All Fields] OR (("first"[All Fields] OR "firsts"[All Fields]) AND "responder*[All Fields])) AND (("critical"[All Fields] OR "critically"[All Fields]) AND ("epidemiology"[MeSH Subheading] OR "epidemiology"[All Fields] OR "incidence"[All Fields] OR "incidence"[MeSH Terms] OR "incidences"[All Fields] OR "incident"[All Fields] OR "incidents"[All Fields]) AND ("manage"[All Fields] OR "managed"[All Fields] OR "management s"[All Fields] OR "managements"[All Fields] OR "manager"[All Fields] OR "managers s"[All Fields] OR "managers"[All Fields] OR "manages"[All Fields] OR "managing"[All Fields] OR "managment"[All Fields] OR "organization and administration"[MeSH Terms] OR ("organization"[All Fields] AND "administration"[All Fields]) OR "organization and administration"[All Fields] OR "management"[All Fields] OR "disease management"[MeSH Terms] OR ("disease"[All Fields] AND "management"[All Fields]) OR "disease management"[All Fields]))</p> <p>4 ("firefighter*[All Fields] OR (("first"[All Fields] OR "firsts"[All Fields]) AND "responder*[All Fields])) AND (("resilience"[All Fields] OR "resiliences"[All Fields] OR "resiliencies"[All Fields] OR "resiliency"[All Fields] OR "resilient"[All Fields] OR "resilients"[All Fields]) AND ("mind s"[All Fields] OR "minded"[All Fields] OR "mindful"[All Fields] OR "mindfulness"[MeSH Terms] OR "mindfulness"[All Fields] OR "minding"[All Fields] OR "minds"[All Fields]))</p> <p>5 ("firefighter*[All Fields] OR (("first"[All Fields] OR "firsts"[All Fields]) AND "responder*[All Fields])) AND "R2MR"[All Fields]</p> <p>6 ("firefighter*[All Fields] OR (("first"[All Fields] OR "firsts"[All Fields]) AND "responder*[All Fields])) AND ("resilience"[All Fields] OR "resiliences"[All Fields] OR "resiliencies"[All Fields] OR "resiliency"[All Fields] OR "resilient"[All Fields] OR "resilients"[All Fields])</p> <p>7 ("firefighter*[All Fields] OR (("first"[All Fields] OR "firsts"[All Fields]) AND "responder*[All Fields])) AND ("mental health"[MeSH Terms] OR ("mental"[All Fields] AND "health"[All Fields]) OR "mental health"[All Fields]) AND ("exercise"[MeSH Terms] OR "exercise"[All Fields] OR "exercises"[All Fields] OR "exercise therapy"[MeSH Terms] OR ("exercise"[All Fields] AND "therapy"[All Fields]) OR "exercise therapy"[All Fields] OR "exercise s"[All</p>

	Fields] OR "exercised"[All Fields] OR "exerciser"[All Fields] OR "exercisers"[All Fields] OR "exercising"[All Fields])
Psycinfo	1 (Firefight* OR (First responders) AND Peer*) AND PEER(yes) 2 (Firefight* OR (First responders) AND Debriefing AND Peer* AND (critical incident management) AND (resilient minds) AND R2MR AND resiliency) AND PEER(yes) 3 ((Firefight* OR (First responders)) AND (Exercise OR (Physical activity)) AND (Mental health)) AND PEER(yes)

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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