

REVIEW

OCCUPATIONAL FACTORS INFLUENCING PARAMEDIC HEALTH AND WELLBEING: A SCOPING REVIEW

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ABSTRACT

Introduction: Health and wellbeing is essential to perform professionally and personally. The demanding workload and high-pressure nature of the paramedic profession undoubtedly have an influence on health and wellbeing; however, the individual variance and factors associated with this are poorly understood. The objective of this review is to identify what is known about the occupational factors that influence paramedic health and wellbeing and to make recommendations on how to improve working conditions and promote the health and wellbeing of the paramedic workforce.

Methods: The Joanna Briggs Institute (JBI) approach was used to perform a scoping review to assess the availability of literature dating from January 2003 to January 2023. Keywords including paramedic*, emergency medical technician*, first responder*, influence* OR perception*, health, wellbeing were input into the OVID, PsycINFO, and PubMed databases. Titles and abstracts were reviewed by two independent authors, and inclusion and exclusion criteria were applied. The remaining articles were reviewed in full text by two authors, and conflicts were managed by the primary author.

Results: The search of the electronic databases identified 314 articles. Of these, 33 informed the results of the review. The search highlighted paramedics' poor reportable levels of health compared to other occupations. An analysis identified key themes emerging from the literature including (1) shift work, (2) mental health issues, (3) exposure to critical incidents, and (4) the influence of the profession on physical activity and ailment.

Conclusion: A paramedic's occupation significantly influences the individual's health and is associated with an increased incidence of reportable illness and injury. The review concluded insufficient data to identify the paramedic's personal perception of the influences on their health and wellbeing. There is little understanding of why the paramedic has poor reportable levels of health, which would be invaluable forming preventative and supportive approaches

INTRODUCTION

Health and wellbeing are essential for effective functioning both in the workplace and in everyday life. The occupational stressors faced by paramedics in their day-to-day work have been shown to negatively impact on their health and wellbeing (Wheeler &

Dippenaar, 2020). Paramedics are often required to work extensive hours in challenging conditions, impacting on their health and wellbeing and potentially impacting patient care (Meadley et al., 2020). Exploring these influences is vital to ensure paramedics are supported to carry out their duties and provide high patient care standards, without compromising their health and wellbeing (Meadley et al., 2020; Wheeler & Dippenaar, 2020).

Lawn et al. (2020) share the concern that paramedics are often a forgotten profession whose work in the healthcare system is concealed by more dominating areas, including emergency departments and acute care. A study conducted by Petrie, Smallwood, Pascoe, and Willis (2022) reporting on the working environments and mental health symptoms of Australian paramedics shared that the recent COVID-19 pandemic posed a significant threat to the wellbeing of paramedics, and during this time, only 66.3% of paramedics in this study believed that their wellbeing was being actively supported by their workplace leaving 33.6% stating they neither agree or disagree; or disagree/strongly disagree to the fact. These statistics are in addition to isolation from friends and family during this time, which was also seen to negatively effect on paramedic wellbeing (Petrie et al., 2022).

Lawn et al. (2020) further explain a high prevalence of physical and psychological ailments experienced by the paramedic workforce ultimately negatively impacting their wellbeing with a very limited understanding in the literature of the key elements within the profession that contribute to the issue.

Potential areas of concern are expressed by Heath, Wankhade, and Murphy (2021), who noted that 29% of ambulance staff report bullying, harassment, or abuse from other members within the workplace. The same study also highlighted that paramedics are placed unnecessarily under stressors through public perception and depiction of paramedics as heroes and masculine, which may put more pressure on the workforce to risk their wellbeing in trying to uphold this image (Heath et al., 2021).

A significant amount of the responsibility in ensuring the wellbeing of paramedics falls on the organization. Research shows that when this is carried out, a positive wellbeing outcome can be achieved (Wheeler & Dippenaar, 2020). Some strategies are provided in the literature addressing the health and wellbeing of paramedics, such as Lawn et al. (2020) approach of program specific interventions to address the psychological impact of attending a stressful case in addition to programs designed to address organisational issues and constructs.

However, while it is of benefit to identify the statistics of paramedic wellbeing and strategies which are in place to mitigate challenges to health and wellbeing, there is not enough evidence to demonstrate that generalizing these strategies across different services will address the broader population of paramedics (Lawn et al., 2020). To ensure that paramedic wellbeing is genuinely being addressed, we seek to understand the extent to which working in the paramedic profession influences health and wellbeing as individual variances are unknown. Meadley et al. (2020) argue that focusing on this will optimise paramedics' health and wellbeing, allowing ambulance services to meet their duty of care in establishing a safe and healthy workplace. This review aims to identify what is known regarding the occupational factors that influence paramedic wellbeing

and to make recommendations on how services can improve working conditions and promote the health and wellbeing of their employees.

METHODS

METHODOLOGICAL FRAMEWORK AND REPORTING

This scoping review adheres to the Joanna Briggs Institute (JBI) methodology and the preferred reporting items for systematic reviews and meta-analyses extension for scoping reviews (PRISMA-ScR). The search was registered through the OSF register DOI 10.17605/OSF.IO/6JF4R.

INCLUSION CRITERIA

For evidence to be included within the scoping review, articles must have met a pre-determined set of inclusion and exclusion criteria outlined in Table 1. These were developed in line with the agreed PCC (population, concept, context) to examine the question of what occupational factors influence paramedic health and wellbeing? The criteria were discussed and unanimously agreed upon by all authors.

SEARCH STRATEGY

A comprehensive three-step search strategy was undertaken to identify relevant published studies for the review. An initial limited search was undertaken to identify articles relating to the topic. The text words contained in the titles and abstracts of relevant articles, as well as the index items used to describe the articles were used to develop a full search strategy for MEDLINE ALL, Scopus, and OVID. These databases were selected as they are archives of pre-hospital and paramedic literature. This was important as the extent of the existing literature on the topic was unknown.

The search utilized a combination of the following key terms: Paramedic*, emergency medical technician*, influence*, perception*, health*, wellbeing*. Other key terms included ambulance*, occupation*, first responder*, EMS, EMT, prehospital, attitude*, impression*, health*, effect* and welfare. Search terms were combined with appropriate Boolean terms and truncation symbols. The search strategy, including all identified keywords and index terms, was adapted for each database and/or information source. All reference lists of sources included were reviewed to identify further publications. Only studies published in English were included, and the date of publication was limited to studies published since January 2003 to determine the contemporary evidence base.

Criteria for Inclusion	Criteria for Exclusion
Population – Paramedics	Other healthcare workers and allied health professionals
Context – Paramedic health and wellbeing	Relating to in-hospital health care or healthcare professionals within tertiary facilities
Context – comparable health systems	Literature reviews, systematic reviews, meta-analysis
Concept – pertaining to the identification of influences on health and wellbeing	Studies predating 2003
Concept – the identification of incidence and prevalence of disease within the paramedic cohort	Grey literature including unpublished studies
Concept – identification of patient or organisational stressors	Not in the English language

Table 1. Inclusion and exclusion criteria.

EVIDENCE SCREENING AND SELECTION

Following the search, all identified citations were collated and uploaded into EndNote, and duplicates were removed. The initial search of OVID, Scopus, and MEDLINE ALL identified 446 results following limiting and restricting data from the last twenty years (2003-2023). Following the removal of duplicates, 314 articles remained for screening. Following a pilot test, titles and abstracts were then screened by two independent reviewers for assessment against the inclusion criteria for the review. Relevant sources were reviewed in full, of which there were 65, and citation details were imported into the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI) (JBI, Adelaide, Australia). Two independent reviewers assessed the full text of selected citations in detail against the inclusion criteria. Reasons for the exclusion of sources in full text were recorded and reported. Any disagreements between reviewers at each stage of the selection process were resolved through discussion with all authors. Of the 65 results screened in full, 33 were included in the scoping review. The search results and the study inclusion process were reported in the final scoping review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review (PRISMA-ScR) flow diagram (see appendix 1).

DATA EXTRACTION

Data was extracted from papers included in the scoping review by two independent reviewers using a data extraction tool developed by the reviewers (see Appendix 2). The data extracted included specific details about the population, concept, context, study methods, and key findings relevant to the review objective. Any disagreements between reviewers were resolved through discussion with an additional reviewer.

DATA ANALYSIS AND PRESENTATION OF RESULTS

In keeping with Arksey and O'Malley's fourth stage of performing a review, the data was analyzed and charted. This refers to the process of extracting and summarising data logically and descriptively from which further narrative can be written. Six criteria were used to analyze and present the results of each article, which included: author(s), date of publication, origin, aim, study design, and key findings. Refer to Appendix 2 for the summary of included articles, which provides an overview of the 34 included articles.

RESULTS

The above search strategy retrieved 314 results, of which 65 appeared potentially relevant. The full-text review identified 33 papers that informed the the scoping review results. An analysis of the included publications identified four recurrent themes in the literature which addressed the question of what occupational stressors influence paramedic health and wellbeing, including (1) shift work, (2) mental health issues, (3) exposure to critical incidents, and (4) the professions influence on physical activity and ailment.

SHIFT WORK

Due to the nature of paramedic work, shift work and rotating shift patterns are unavoidable. Shift work was found to result in fatigue and sleep disturbance in several articles reviewed in this study (Aasa et al., 2005; Betson, Kirkcaldie, Zosky, & Ross, 2022; Blau,

2011; Courtney, Francis, & Paxton, 2013). A field investigation by Khan, Jackson, Kennedy, and Conduit (2021) assessed the rotating shifts and the relationship of shift work to sleep, mental health, and physical activity in Australian paramedics. It was found that night shifts were associated with higher levels of fatigue, sleepiness, and stress. This was in addition to the finding that rotational shifts caused the participants to experience sleep restriction (Khan et al., 2021). Fatigue and sleep disturbances were identified as key indicators of paramedic perception of their health in an earlier study (Aasa et al., 2005), and paramedics with poor sleep quality were particularly at risk of increased levels of fatigue, most notably in the rural population (Courtney et al., 2013). Self-reported poor sleep patterns had a significantly poor effect on the perceived general health and retention intent of American paramedics (Blau, 2011). More contemporarily, in an Australian study highlighted that poor sleep quality increased by 35.4% (n=28) in the first five months of a paramedic's career (Betson et al., 2022). The impact of shift work creating fatigue and sleep disturbances, which influence paramedic health, is significantly reported in the literature identified in this review, as is the effect of paramedic shift work on the individual's mental health and thus, wellbeing.

MENTAL HEALTH ISSUES

Several studies examined the overall mental health of paramedics (Bennett, et al., 2004; Iranmanesh, Tirgari, & Bardsiri, 2013; Jonsson, Segesten, & Mattsson, 2003; Roberts, Sim, Black, & Smith, 2015). Jonsson highlighted that one-third of their 362 survey participants indicated high levels of psychopathology, burnout, and posttraumatic symptoms (Jonsson et al., 2003). More contemporarily, Roberts et al. identified that paramedics have the highest rates of mental injury in comparison with other healthcare workers. This was approximately 13 times higher than nurses (Roberts et al., 2015). Similarly, Iranmanesh et al. (2013) found 94% of Iranian paramedics and hospital emergency personnel (n=400) reported moderate posttraumatic stress disorder (Iranmanesh et al., 2013). This was significantly more than an earlier study by Bennett, where 22% of 617 paramedics in the United Kingdom had posttraumatic stress disorder, and one in ten reported "probable" clinical depression (Bennett et al., 2004). However, it is important to note that their working environments may have differed significantly. In comparison to the general population of Australia and Western countries, Khan, Conduit, Kennedy, and Jackson (2020), reported findings in paramedics of significantly higher levels of fatigue, anxiety, depression, and PTSD (all $p < .05$) (Khan et al., 2020).

Further studies (Crampton, 2014; Petrie et al., 2018) identify the link between paramedic mental health and organizational behavior. Petrie et al. identified that the manager psychosocial safety climate accounted for a significant amount of variance in levels of mental health disorders in the workforce but only identified 7.6% of their 1622 participants as having a mental health disorder, which is significantly less than other studies (Petrie et al., 2018). This study was completed in Australia and highlighted the perceived importance of managerial behavior as a protective effect on employee mental health (Petrie et al., 2018). Crampton (2014), in the United States of America identified that a lack of support by the employing organization. No rural paramedics within the population sampled felt that the organization offered any significant support, while their metropolitan counterparts found that 18% were offered significant support (Crampton, 2014). Lack of organizational support, including social aspects of the working environment, most

poignantly the lack of support from supervisors, were a significant risk factor for stressors in the workforce and resultant wellbeing effects (van der Ploeg & Kleber, 2003).

There is evidence of post-traumatic stress disorder being reported at a rate of 14.6% in paramedics (n=668) compared to 1.3–3.5% in the general population of Switzerland; however, factors which contributed to this were unknown (Streb, HŠller, & Michael, 2014). Rates of depression and anxiety amongst paramedics are reported as statistically significant, along with rates of obesity, cardiovascular disease, and sleep disorders (Courtney et al., 2013). In an Australian study comparing the resilience of working paramedics (n=146) to student paramedics (n=73), it was found that working paramedics were more resilient; however, this resilience began to decline after five years of work experience (Gayton & Lovell, 2012). Another study in Norway found that paramedics had a higher prevalence of post-traumatic stress disorder than the general population. Interestingly, 77% (n=370) of respondents reported personal growth due to their working experiences (Reid et al., 2022). Paramedics were also assessed following exposure to a significant airplane crash, a critical incident. It was highlighted that there were more significant rates of acute stress disorder, PTSD, and depression at 13 months post-exposure than comparison participants. Acute stress disorder rates were 25.6% (n = 53), whereas comparison participant rates were 2.4% (n=10). Similarly, PTSD rates at 13 months were reported at 16.7% (n = 19) compared to 1.9% (n = 4), highlighting the deleterious effects of the work which they are required to do (Fullerton, Ursano, & Wang, 2004). While paramedic perception of their health is poorly understood, there appears to be a consensus across research that the paramedic understands the link between their career and their level of health and wellbeing, albeit their state of mental health (Sofianopoulos, Williams, Archer, & Thompson, 2011).

EXPOSURE TO CRITICAL INCIDENTS

Avraham, Goldblatt, and Yafe (2014) highlighted through interviews the overwhelming deleterious effect that exposure to critical incidents has on paramedic mental health (Avraham et al., 2014). Aasa et al. (2005), identified that 25% (n=60) of female and 20% (n=240) of male paramedics identified two or more significant health complaints associated with psychological demands of critical incidents (Aasa et al., 2005). In the trainee workforce of paramedics, Fjeldheim et al. (2014) noted 94% (n=131) had directly experienced trauma, with a high number meeting post-traumatic stress disorder criteria along with depression, alcohol abuse, and chronic perceived stress (Fjeldheim et al., 2014). Furthermore, Hansen, Rasmussen, Kyed, Nielsen, and Andersen (2012) identified that the paramedic workforce was exposed to an emotional demand that was statistically significant and that the nature of the work, most notably critical incident exposure, served as a barrier to improving the psychosocial working environment for this occupation (Hansen et al., 2012). Pyper and Paterson (2016) supported this more contemporarily in their study of paramedics (n=134) where treating critically ill patients was identified as a key component of stress linked with emotional trauma (Pyper & Paterson, 2016). In a New Zealand study comparing the effect of critical incidents and the health of ambulance, fire, and police personnel, the average reported level of trauma reactions was similar across services (Brough, 2004). However, in a later study, Gist and Taylor (2008) found that paramedics endure significantly greater stress than other emergency workers (Gist & Taylor, 2008).

Maunder, Halpern, Schwartz, and Gurevich (2012) investigated the responses of paramedics to critical incidents and identified that those who had experienced childhood abuse or neglect more frequently experienced signs of acute stress immediately following critical incidents and during the two weeks following. Childhood abuse and neglect were associated with significantly higher levels of burnout and interestingly had a higher prevalence of *Ôcases'* scoring above the threshold for clinical significance (Maunder et al., 2012). This finding related to a subgroup within the workforce highlighting the impact of critical incidents. Back et al. (2009), explored salivary cortisol in paramedics during their shifts, concluding that paramedics appeared to build a tolerance to critical situations. However, when comparing cortisol levels in patient transport officers and paramedics, paramedics had significantly higher cortisol levels ($p<0.5$) at the commencement of the shift than those in patient transport, suggesting an adjustment to forthcoming demand (Back et al., 2009). This confirmed the findings of an earlier study by Aasa, Kalezic, Lyskov, ngquist, and Barnekow-bergkvist (2006), which found that the highest levels of cortisol stress markers were observed at the commencement of shift (Aasa et al., 2006).

PROFESSIONS INFLUENCE ON PHYSICAL ACTIVITY AND AILMENT

Aasa et al. (2005), highlighted that headache and stomach issues were frequent in paramedics and significantly associated with work conditions (Aasa et al., 2005). Similarly, Courtney et al. (2013) highlighted that low levels of physical activity were reported by paramedics. They attributed these to the lifestyle that limits the opportunity for regular exercise and a commitment to team-oriented sporting activities (Courtney et al., 2013). Sofianopoulos et al. (2011), also identified significantly reduced levels of physical activity, which led to physical fatigue in the paramedic population (Sofianopoulos et al., 2011). A Hungarian study identified that physical activity during personal time played a protective role and improved the perception of paramedic physical health (Pek et al., 2015). In Sweden, Karlsson identified that ambulance personnel were at higher risk of being affected by musculoskeletal disorders and atrial fibrillation than other occupational groups (Karlsson, Nasic, Lundberg, MCertensson, & Jonsson, 2022). Another smaller study ($n=25$) that highlighted poor cardiovascular health was that of Tremblay, Albert, Fischer, Beirsto, and Johnson (2020), who explored the health status of experienced New Brunswick Paramedics. They found that only two-fifths of the population were considered *Ôhealthy'* (Tremblay et al., 2020). An additional study also conducted in America identified that paramedics who had optimal cardiovascular health tended to be younger, female, and more highly educated. They also found that a large proportion of paramedics were classified as obese, which is a known cardiovascular risk factor (Cash, Crowe, Bower, Foraker, & Panchal, 2019). The current evidence base links the influence of the paramedic's job to their poor levels of health and wellbeing, by physical activity and ailments.

While there is a clear emergent theme on the profession's effect on paramedic's physical health, one study did identify a disparity in health metrics between different levels of paramedics. An Australian longitudinal cohort study found that intensive care flight paramedics had metabolic health markers within normal reference ranges. This was despite prolonged exposure to shift work patterns and is thought to be largely due to increased physical activity levels compared to the general paramedic population (Meadley, Perraton, Smith, Bonham, & Bowles, 2022). Additionally important to note are the

results of a contemporary study completed in Australia where graduate paramedics were assessed and monitored over the first twelve months of their career, and changes to cardiometabolic, dietary, and physical health were tracked. They identified that baseline BMI, physical activity levels, and dietary behaviors were suboptimal for recruitment into the ambulance service (Meadley, Wolkow, et al., 2022). This alludes to the potential that the paramedic professional cohort has risk factors present prior to joining the industry, which may be deleterious due to the profession's exacerbation of these. This is further supported by Tsismenakis et al. (2009), they identified in a study of 370 emergency responder candidates in America that 77% had a body mass index in excess of 25kg/m² and 33% were classified as obese. Thus, excess weight is highly prevalent and associated with elevated cardiovascular risk among the future workforce in a population expected to perform physically demanding duties (Tsismenakis et al., 2009).

DISCUSSION

Shift work has been identified as hurting sleep quality resulting in increased levels of fatigue and on perceived wellbeing, mental health, and job satisfaction (Dawson, Ferguson, & Vincent, 2021; E. A. Donnelly et al., 2019; Kirby, Moreland, & Pollard, 2016; Nguyen et al., 2023; Ramey et al., 2019; Sofianopoulos et al., 2011; Yung, Du, Gruber, & Yazdani, 2021). The impact of shift work on sleep and fatigue have been widely reported among professionals across multiple occupations, with negative effects often more pronounced in those working in high-pressure, cognitively demanding occupations such as healthcare and emergency services roles (Courtney et al., 2013; Okechukwu et al., 2023; Sofianopoulos et al., 2011). The inherent unpredictability of these occupations, which may result in peak demand, affecting opportunities for breaks and resulting in end of shift overtime further compounds the existing challenges associated with shift work (Courtney et al., 2013; Kirby et al., 2016). Shift work disorder (SWD) characterized by insomnia and excessive sleepiness, can result in increased levels of depression, anxiety and reduced quality of life. It may result in impaired performance and increased risk of occupational accidents and workplace violence (Eldevik, Flo, Moen, Pallesen, & Bjorvatn, 2013).

Fatigue has been shown to have negative impacts on physical health, contributing to increased rates of chronic illness, cardiovascular conditions, obesity, chronic sleep deprivation, and poor general health (Barth, Greene, Goldstein, & Sibley, 2022; Nguyen et al., 2023). There are several studies reporting high levels of fatigue among shift workers (Dawson et al., 2021; Kirby et al., 2016; Shriane, Russell, Ferguson, Rigney, & Vincent, 2023) with Richter, Acker, Adam, and Niklewski (2016) reporting almost 90% of shift workers suffering from fatigue and sleepiness at work. Sofianopoulos et al. (2011) reporting similar figures. Shift work can result in circadian misalignment and sleep loss, which impact the safety of clinicians (increased risk of driving accidents) and patients (increased risk of medication errors), with night shifts being the most high-risk shift (E. A. Donnelly et al., 2019; Ganesan et al., 2019; Pyper & Paterson, 2016; Sofianopoulos et al., 2011). The circadian misalignment associated with shift work, especially night shifts, results in physiologic changes, further impacting the risk of illness and chronic disease among shift workers (Barger et al., 2018).

Given the negative impact of shift work and fatigue on paramedics and other emergency service workers and the increased risks of adverse events which may result in harm

to the individual or their patients, research into the impact of different shift patterns to mitigate fatigue should be prioritized, and there should be an increased focus on implementing fatigue management programs for emergency service workers (Barger et al., 2018; Cheng, Roach, & Petrilli, 2014; Patterson et al., 2018).

The impact of occupational stressors on the mental health and wellbeing of paramedics and other first responders has been well-studied, and there is consensus among the literature surrounding the negative impact of the occupation on mental health and wellbeing. Paramedics and emergency service workers have been reported to have higher rates of depression, anxiety, PTSD, and associated psychological morbidities, as well as a higher risk of burnout and higher risk of mortality (Blau, 2011; Clompus & Albarran, 2016; McIntosh et al., 2016; Sterud, Ekeberg, & Hem, 2006). These high rates of morbidity in the profession highlight the need for research to identify individual factors that paramedics perceive to influence their health and wellbeing (Hegg-Deloye et al., 2014); R. Roberts et al. (2021), noted the impact of COVID-19 in further increasing the rates of depression, anxiety, and burnout among Australian paramedics and other first responders (R. Roberts et al., 2021). UK statistics reported that 87-93% of first responders experienced mental health problems at some point during their career (Mind, 2014), and paramedics and first responders have been found to have higher levels of suicidal ideation, with one study reporting up to one-third of paramedics had considered suicide (Newland, Barber, Rose, & Young, 2015).

One significant contributing factor is exposure to critical incidents and the cumulative impact. The literature suggests exposure to critical incidents is common among paramedics, with one study reporting 64% of paramedics were exposed to two or more critical incidents over five years and a further study reporting 72-97% of paramedics had been exposed to at least one critical incident (E. Donnelly & Siebert, 2009; Oginska-Bulik & Kobylarczyk, 2015; Skeffington, Rees, & Mazzucchelli, 2017; Whiting, Costello, & Williams, 2019). Exposure to critical incidents is linked to an increased risk of mental health problems, notably PTSD and burnout, and this risk increases further with cumulative exposure to critical incidents (Alexander & Klein, 2001; Boland et al., 2018). In a New Zealand study comparing the effect of critical incidents and health between police, fire, paramedics, and emergency department personnel the average reported level of trauma reactions was similar across services (Brough, 2004).

There is limited literature concerning the mental health impacts of exposure to critical incidents among student paramedics (Lowery & Stokes, 2005) and a lack of data on the mental health of early career paramedics, although several studies are underway, including the International Paramedic Anxiety and Wellbeing Study (IPAWS), the first longitudinal study to investigate the mental wellbeing of paramedic graduates in the first five years of their careers (Asbury et al., 2018). While it is acknowledged that exposure to critical incidents cannot be avoided due to the inherent nature of the occupation, there are opportunities to develop strategies to mitigate the impact of exposure to critical incidents on paramedic's mental health and to proactively equip them to better manage the associated stressors.

Paramedics are reported to have poor levels of physical health with an increased risk of shift work disorder (Barth et al., 2022; Nguyen et al., 2023; Pallesen et al., 2010), chronic illness, cardiovascular conditions and hypertension (MacQuarrie et al., 2018; Torquati,

et al., 2018), and obesity and cancer (Gan et al., 2018; Pahwa, Labr che, & Demers, 2018). As shift workers, paramedics are also at higher risk of other health problems such as metabolic disease, disorders of the immune system, and depression (Wolkow, Ferguson, Aisbett, & Main, 2015). Other symptoms can manifest following chronic exposure to stress and common occupational challenges (extended shift times), such as fatigue, headaches, and gastrointestinal disturbances (E. Donnelly & Siebert, 2009; Halpern, Gurevich, Schwartz, & Brazeau, 2009; Klimley, Van Hasselt, & Stripling, 2018; Knutsson & Beggild, 2010; Rice, Glass, Ogle, & Parsian, 2014; Sterud et al., 2006).

Paramedics have higher rates of musculoskeletal and back injuries due to the manual handling requirements associated with operating in hostile and unpredictable environments (Karlsson et al., 2022). The risk of musculoskeletal injuries is increased further due to the prevalence of obesity, and the lack of physical fitness compounded by fatigue of shift work (Gallagher & McGiloway, 2008; Hegg-Deloye et al., 2014; MacQuarrie et al., 2018; Rice et al., 2014; Tsismenakis et al., 2009). Paramedics are also at increased risk of other workplace incidents such as needlestick injuries (Flannery, 2015; Larsson, Berglund, & Ohlsson, 2016; Rice et al., 2014).

Paramedics acknowledge the importance of physical fitness but highlight the difficulties of maintaining an active lifestyle due to the challenges of shift work and the impact of fatigue. The physical and cognitive demands of emergency work often prevent adequate rest in between shifts and paramedics may struggle to maintain a healthy work-life balance (Hegg-Deloye et al., 2014; Larsson et al., 2016; Regehr & Millar, 2007). The literature shows poor levels of health and fitness among paramedics with the exception being those who operate in more specialized roles such as flight medics (Meadley, Perraton, et al., 2022). Organizational support is vital in supporting staff to manage or maintain their fitness, to remove barriers to good health, and to actively promote the importance of maintaining a healthy work-life balance (MacQuarrie et al., 2018; Rice et al., 2014)

LIMITATIONS

Notwithstanding the strengths of the scoping review, there are apparent limitations. The search terms in the strategy, while broad, did not capture all relevant literature. Additionally, while international findings were reviewed, only studies published in English were included, potentially limiting results.

CONCLUSION

Paramedics are front-line emergency service workers who see a diverse range of patients daily. The workforce is often constrained to the inside of their ambulance for significantly lengthy hours, with limited time for breaks (Meadley et al., 2020). A comprehensive search of the literature was undertaken to find relevant information regarding the influence of the paramedic profession on the health and wellbeing of paramedics. Results found shift work to significantly influence fatigue, leading to poor sleep patterns for paramedics. Research into strategies to mitigate fatigue, such as evaluating the impact of different shift patterns should be prioritized, and fatigue management programs should be implemented and evaluated for effectiveness (Barger et al., 2018; Cheng, Roach, & Petrilli, 2014; Patterson et al., 2018). The profession was also seen to be a catalyst for developing mental illnesses, including burnout and post-traumatic stress disorder, which can be exacerbated by exposure to critical incidents and can impact paramedics' physical

health. Further research is recommended into strategies to mitigate the impact of exposure to critical incidents and to enhance the mental preparedness of paramedics to cope with occupational stressors. A further research priority concerns the impact of leadership in promoting psychologically safe workplaces and how organizations can better support employee health by removing barriers and supporting positive health behaviors (MacQuarrie et al., 2018; Rice et al., 2014).

There is insufficient data in the literature to identify the paramedics perception of the key influences on their health and wellbeing resulting in a lack of understanding of the reasons for paramedic's poor levels of self-reported health. Further research is recommended to fully comprehend the paramedics personal perception of their health and wellbeing, as the benefits of these perceptions could assist organizations to develop tailored support and prevention strategies to improve paramedics' overall health and wellbeing. This may also assist in alleviating the economic burden of death and disability within the workforce and the discontinuation of support services with no proven benefit to the individual clinician.

ETHICAL APPROVAL

Ethical approval was not required as only available published data was analysed and the review results were informed.

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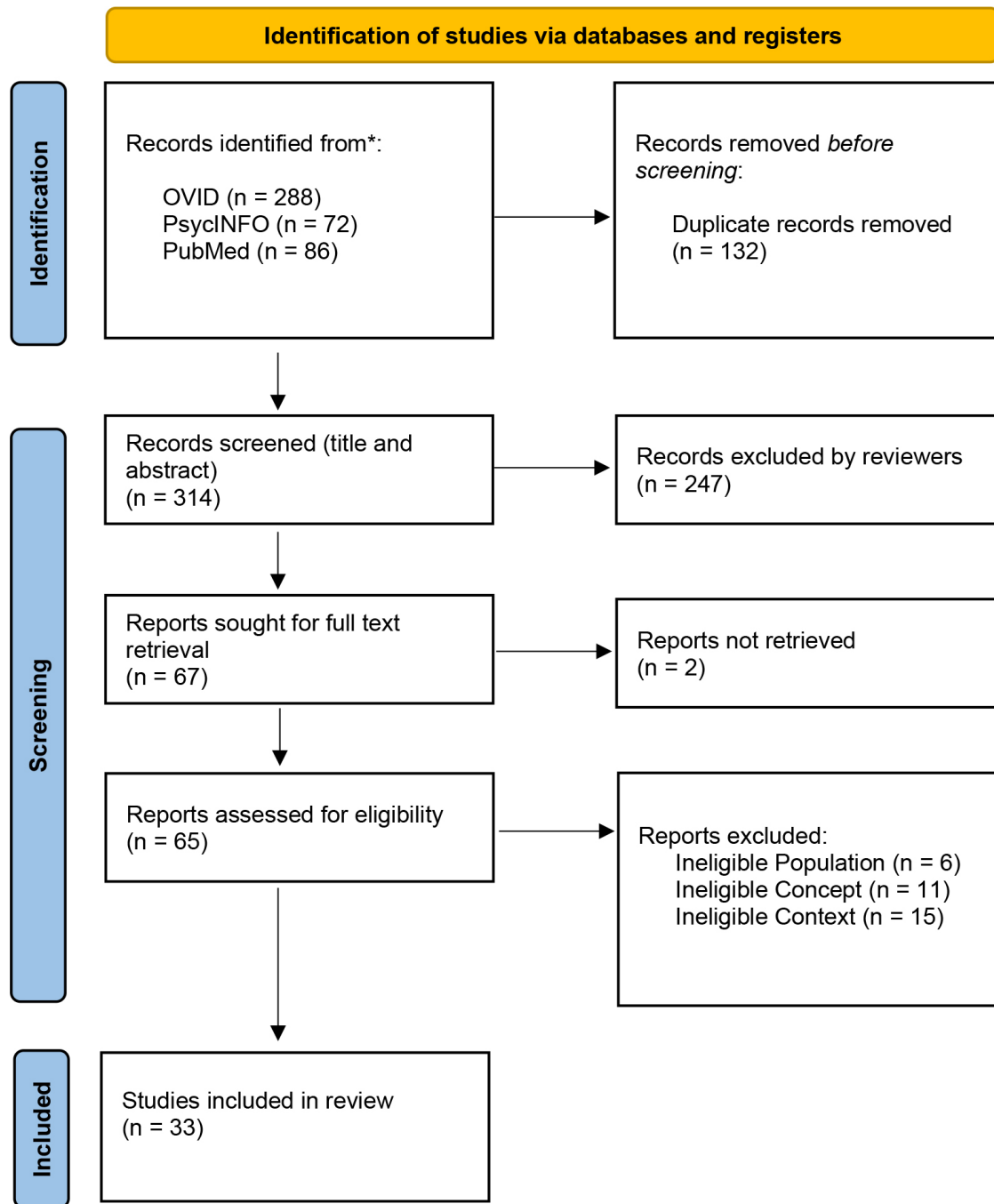
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APPENDIX



Appendix 1. Fig. PRISMA-ScR

*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers).

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: <http://www.prisma-statement.org/>

Author(s) & year of publication	Aim	Methods & Participant Characteristics	Relevant Findings
Karlsson, K., Nasic, S., Lundberg, L., Martensson, J. & Jonsson, A. 2022. Sweden	To compare the occurrence of health problems between Swedish ambulance personnel and other occupational groups.	Longitudinal study involving two cohorts of ambulance staff from 2001 (1778 individuals) and 2008 (2753 individuals).	Paramedics have an increased risk of cardiovascular disease most notably atrial fibrillation. They also report increased of knee arthritis and back problems than other occupational groups.
Betson, J., Kirkaldie, M., Zosky, G. & Ross, R. 2022. Australia	To measure the health activity and sleep quality of graduate paramedics in their first 5 months or work on road.	Quantitative study of 28 recently graduated paramedics in Victoria.	Poor sleep quality increased by 35.4%, sedentary behaviour increased by 4.8% and nil changes were recorded in physical activity, fasting blood glucose levels, blood pressure, weight, or waist circumference.
Reid, B., Naess-Pleym, L., Bakkelund, Dale, Uleber, O. & Nordstrand, A. 2022. Norway	To report the prevalence of mental health conditions amongst Norwegian ambulance personnel.	Analysis of 479 cross-sectional anonymous, web-based survey undertaken by operational personnel employed by Emergency Medical Services in the Regional Health Trust of Central Norway between February and April 2021.	Prevalence of mental illness was slightly higher in men than in women. The degree of peer support and having a partner appeared to influence levels of posttraumatic stress and development.
Meadley, B., Perraton, L., Smith, Bonham, M. & Bowles, K. 2022. Australia	To explore the health-related quality of life in a sample of experienced intensive care flight paramedics.	Cross-sectional study of 15 intensive care flight paramedics between 42-48 years from Ambulance Victoria.	In this population, cardiometabolic and physical activity outcomes represent good health. Intensive care paramedics likely demonstrate an excellent health profile due to physical activity levels and a health BMI.
Meadley, B., Wolkow, A., Smith, K., Perraton, L., Bowles, K. & Bonham, M. 2022. Australia	To identify changes in health related quality of life in graduate paramedics during their first twelve months on road.	12-month longitudinal study of 56 graduate paramedics with no history of shift work (28 females and 29 males aged between 23-26 years).	Body weight decreased in males and increased in females and consumption of healthy foods was lower than recommended at all time points. However, none of the markers changed meaningfully in the first year of practice.
Khan, W., Jackson, M., Kennedy, G. & Conduit, R. 2021. Australia	To investigate the relationship between a rotating shift work and sleep, stress, and fatigue amongst Australian paramedics.	Cohort study of 12 Victorian paramedics working rotating shifts full-time.	Levels of stress, fatigue and sleepiness were related to sleep restriction that occurred due to night shift and that the nature of shift work may be detrimental to the workers' health.
Khan, W., Conduit, R., Kennedy, G. & Jackson, M. 2020. Australia	Investigate the prevalence of issues associated with sleep and mental health in Australian paramedics.	Cross-sectional surveys from 136 Victorian paramedics.	Paramedics report significantly high levels of depression, anxiety, fatigue, PTSD, insomnia, narcolepsy, and poor sleep quality. Addressing sleep issues and matching chronotype to shift preference may help to reduce these and improve wellbeing.
Tremblay, M., Albert, W., Fischer, S., Beairto, E. & Johnson, M. 2020. Canada	To characterise the health status of a cohort of experienced paramedics.	Cross-sectional observational based design involving 25 paramedics from Ambulance New Brunswick.	A third of the cohort appeared unaware of their health condition. Additionally, only two fifths of the cohort had nil health related co-morbidities and were considered healthy.
Cash, R., Crowe, R., Bower, J., Foraker, R. & Panchal, A. 2019. United States of America	Compare the distribution of cardiovascular health in EMTs and identify associations between demographic and employment characteristics in EMS professionals.	Cross sectional survey completed by 24 708 nationally certified EMTs and paramedics.	More EMT's achieved optimal health than paramedics. Factors associated with better health included higher education level, higher personal income and working in an urban versus rural environment.
Petrie, K., Gayed, A., Bryan, B., Deady, M., Madan, L., Savic, A., Wooldridge, Z., Counson, I., Calvo, R., Glozier, N. & Harvey, S. 2018. Australia	To examine the impact of management support and behaviours on the mental health outcomes of ambulance personnel.	Cross-sectional survey completed by 1622 participants in two Australian states.	Manager psychosocial safety climate accounted for a significant amount of variance in the levels of employee common mental health disorder symptoms and wellbeing.
Pyper, Z. & Paterson, J. 2016. Australia	To investigate fatigue, stress, and emotional trauma amongst rural and regional ambulance staff.	Mixed methods survey involving 134 (103 male and 31 female) ambulance personnel from rural and regional Australia.	Participants reported high levels of fatigue and emotional trauma. They also reported negative effects of this including drug administration errors and falling asleep whilst driving.
Pek, E., Fuge, K., Marton, J., Banfai, B., Gombos, G. & Betlehem, J. 2015. Hungary	To Assess the self-reported physical and mental health status of Hungarian ambulance personnel.	Cross-sectional study involving 810 (770 male and 40 female) workers from the northern and western regions of Hungarian National Ambulance Service.	Respondents regarded their physical functioning the best and vitality the worst. The longer a staff member had been working for the worse their health was and those with a higher BMI regarded their health status worse.
Roberts, M., Sim, M., Black, O. & Smith, P. 2015. Australia	To investigate risk of musculo-skeletal and mental injury among paramedics and other professionals using workers' compensation claim statistics.	Multivariable regression analysis utilising 214 355 claims dated between July 2003 and June 2012 retrieved from the Victorian Compensation Research Database.	Paramedics had higher workers compensation claim rates for injuries overall and the highest for musculo-skeletal and mental injury.
Streb, M., Haller, P. & Michael, T. 2014. Switzerland	To examine if there is a relationship between sense of coherence and high resilience with the severity of in paramedics.	Cross sectional study involving 688 paramedics, 210 women and 447 men (31 participants did not specify gender).	Resilience and sense of coherence were negatively correlated with PTSD symptoms. Paramedics prepared for dealing with work related trauma and received psychological help had less severe PTSD.
Avraham, N., Goldblatt, H. & Yafe, E. 2014. Israel	To explore the experiences of paramedics during critical incidents and explore the coping strategies utilised to deal with them.	Qualitative analysis of 15 semi-structured interviews with paramedics (5 women, 10 men) from a large emergency service organisation.	Those that connected their feelings to the patient and/or family along with those who sensed a loss of control experienced difficult and negative emotions.
Crampton, D. 2014. United States of America	To identify differences in prevalence of PTSD and compassion fatigue between rural and urban paramedics.	Questionnaires involving 31 rural and 56 urban paramedics from a Colorado EMS agency.	No significant differences between rural and urban paramedics suffering from PTSD or compassion fatigue. No rural paramedics (n=31) felt that they were offered significant help from their employing organisation, in comparison to 18% of urban paramedics (n=56).

Appendix 2. Summary of Characteristics Articles Included .

Author(s) & year of publication	Aim	Methods & Participant Characteristics	Relevant Findings
Fjeldheim, C., Nothling, J., Pretorius, K., Basson, M., Ganasen, K., Heneke, R., Colete, K. & Seedat, S. 2014. South Africa	To examine the prevalence of direct trauma exposure, PTSD symptoms and other mental illness amongst paramedic trainees and identify risk factors associated with the same.	Logistic regression analysis involving 131 trainee paramedics recruited from a local university in Cape Town	94% of trainees had directly experienced trauma with 16% meeting PTSD criteria. High rate of depression, alcohol abuse and chronic perceived stress with low levels of social support was found.
Iranmanesh, S., Tirgari, B. & Bardsiri, H. 2013. Iran	To examine the prevalence of PTSD among Iranian paramedics and emergency personnel.	Descriptive cross-sectional study involving 400 paramedics and emergency service personnel associated with Kerman Medical University.	94% (n=400) of participants reported moderate PTSD.
Courtney, J., Francis, A. & Paxton, S. 2013. Australia	To examine relationships between sleep quality and a variety of mental and physical health measures of rural paramedics in Australia.	Survey of 150 rural paramedics. Regression analysis of variables within survey and reference group from previously published studies.	Rural paramedics had significantly poorer sleep quality with higher fatigue in comparison to similar reference group samples. No significant differences in depression were found.
Hansen, C., Rasmussen, K., Kyed, M., Nielsen, K. & Andersen, J. 2012. Denmark	To Compare the physical and mental health status of paramedics with the general workforce in Denmark.	Online and post distributed questionnaire involving 1691 ambulance personnel and 735 non ambulance personnel.	Similar levels of mental health exist between ambulance personnel and the core work force but substantially higher levels of musculoskeletal pain.
Gayton, S. & Lovell, G. 2012. Australia	To determine if increased resilience is related to paramedic time in service.	Survey of 219 participants. 146 Queensland Ambulance Service paramedics and 73 paramedic students.	Experienced paramedics displayed significantly higher levels of resilience than students. Resilience significantly correlated with general health and wellbeing.
Maunder, R., Halpern, J., Schwartz, B. & Gurevich, M. 2012. Canada	To determine prevalence of paramedic childhood abuse and neglect and if this experience is associated with paramedic's response to critical incidents.	Univariate analysis of surveys involving 235 paramedics (150 males 81 females 1 undisclosed).	Abuse was reported by 38.4% of respondents. Paramedics who reported abuse or neglect more frequently experiences signs of acute stress immediately following critical incident and the following two weeks.
Sofianopoulos, S., Williams, B., Archer, F. & Thompson, B. 2011. Australia	To determine the impact of shift work on paramedic fatigue, sleep, and psychological health in Australia.	Cross-sectional study of 60 paramedics utilising the Epworth Sleepiness Scale, Berlin Questionnaire, Pittsburgh Sleep Quality Index, Beck Depression Inventory and a demographic questionnaire.	90% reported fatigue affecting performance at work. Statistical significance found in chance of falling asleep when sitting and talking to someone and while stopped in traffic.
Blau, G. 2011. United States of America	To determine the impact of sleep issues on perceptions of health and intention to leave by paramedics.	Surveys conducted 2005, 2006 and 2007. 288 paramedic participants.	Sleep impairment had a significant additional impact that explained following years of perceived health and intention to leave.
Tsismenakis, A., Christophi, C., Buress, J., Kinney, Kim. & Kale, S. 2009. United States of America	Study the prevalence and health associations of excess weight among firefighters and ambulance personnel.	Mixed methods cohort study involving 370 participants (160 ambulance personnel and 210 firefighters).	Excess weight is highly prevalent and associated with elevated cardiovascular risk and this prompts public health intervention.
Backe, E., Kaul, G., Klubmann, A., Liebers, F., Thim, C., Mabbeck, P. & Steinboerg, U. 2009. Germany	To investigate salivary cortisol of ambulance personnel during different work demands and compare the perception of these demands to their physiological response.	Observational study involving 25 ambulance personnel aged from 20 and 43 years. (19 male and 5 female).	Rise in cortisol was significantly higher in paramedics than patient transport officers. In 31% of paramedics there was a rise in cortisol of 50% above baseline and in 3 of these 12 cases there was a rise above 200% however there was no link to the individual perception of demand.
Aasa, U., Kalezic, N., Lyskov, E., Angquist, K. & Barnekow-Bergkvist, M. 2006. Sweden	To assess physiological and subjective stress markers of ambulance personnel whilst at work and away from work and compare this to health-related complaints.	Cohort longitudinal study involving 26 ambulance staff during a 24 hr work shift and the following 2 days off work.	Physiological and subjective characteristics did not indicate distinctive stress during the shift. Relationship between frequent health complaints and specific work-related factors need further study.
Aasa, U., Angquist, K. & Barnekow-Bergkvist, M. 2005. Sweden	Investigate the relationship between health complaints and psychosocial work factors in ambulance personnel.	Qualitative questionnaire involving 1500 (300 female, 1200 male) ambulance personnel.	Psychological demands were associated with sleeping problems, gastrointestinal symptoms, and headaches. Worry about work conditions had a significant association with health complaints.
Fullerton, C., Ursano, R. & Wang, L. 2004. United States of America	To examine psychological health and healthcare utilisation in disaster workers.	Statistical analysis of exposed disaster workers (n= 19) and a comparison group (n= 51) of disaster workers who were not exposed to the disaster.	Exposed workers are at an increased risk of acute stress disorder, depression or PTSD and seek care for emotional distress at an increased rate.
Bennett, P., Williams, Y., Page, N., Hood, K. & Woollard, M. 2004. United Kingdom	To examine the prevalence of PTSD, depression, and anxiety in ambulance personnel.	Questionnaires involving 194 EMTs and 380 paramedics (513 male, 91 female).	Overall rate of PTSD was 22% (n=617) and men had a higher reported rate than women. One in 10 reported clinical levels of depression and 22% identified clinical levels of anxiety.
Brough, P. 2004. New Zealand	To investigate trauma and organisational stress within police, fire, and ambulance services.	Cohort study questionnaire involving 223 police officers, 232 ambulance personnel and 231 firefighters.	Organisational and traumatic stress reactions were predictive of psychological strain to similar extents. Organisational stressors predicted job satisfaction to a far greater extent than trauma symptomatology.
Jonsson, A., Segesten, K. & Mattsson, B. 2003. Sweden	To identify the prevalence of PTSD symptoms among Swedish paramedics.	Analysis of surveys completed by 362 Swedish ambulance personnel.	Of 362 paramedics who completed the survey, 223 reported that they had experienced a traumatic situation and of those 15.2% scored a reaction which predicted a high likelihood of PTSD.
Van Der Ploeg, E. & Kleber, R. 2003. The Netherlands	To explore PTSD, fatigue and burnout due to work related stress in ambulance personnel.	Questionnaires involving 123 ambulance personnel (Paramedics and drivers) from 10 ambulance services in the Netherlands).	Paramedics are at risk of developing health symptoms due to work related stressors however it was not found to predict health symptoms in the long term.

Appendix 2 (continued). Summary of Characteristics Articles Included .