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Alcohol/substance use and occupational/post-traumatic stress in paramedics

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What is the relationship between alcohol/substance use and occupational/ post-traumatic stress in the paramedic profession? A systematic review

Main text

Abstract (150 words)

Background

Paramedics work in high-pressured environments and experience traumatic events. This contributes to high levels of occupational and post-traumatic stress, which in other health care professionals may result in alcohol/substance misuse. This relationship in the paramedic profession has hitherto remained unexplored. This article presents the first exploration of this literature.

Methods

A systematic literature review was conducted utilising PRISMA guidelines. CINAHL, PubMed, Scopus and Cochrane databases were searched using terms relevant to paramedics and alcohol/substance use. Studies were analysed using descriptive statistics for quantitative data and thematic analysis for qualitative information.

Findings

Eleven studies were identified: nine examined alcohol use; seven examined substance use; five examined both. No significant relationships between alcohol/substance use and occupational/post-traumatic stress were identified. Alcohol use and smoking appear important in relation to occupational stress.

Conclusions

The nature and extent amongst paramedics of alcohol/substance use in relation to occupational/post-traumatic stress needs further investigation, to facilitate appropriate advice and support.

Keywords

Paramedic, Emergency Medical Services, Post Traumatic Stress, Occupational Stress, Alcohol Use, Substance Use

Key points

Alcohol/substance use is common amongst healthcare professionals in general, although this does not necessarily constitute misuse or addiction.

Occupational/Post-Traumatic Stress is more prevalent in paramedics compared to the general population

A direct relationship between Occupational/Post-Traumatic Stress and alcohol/substance use has not been established.

Any relationship is likely to be complex and be affected by other factors such as somatic stress, support networks and personal coping strategies.

Evidence relating to paramedics is limited and would benefit from further research to establish the extent of the issue.

Paramedics should be encouraged to seek support for Occupational/Post-Traumatic Stress and alcohol/substance use so that personal wellbeing is maintained and to ensure the safety of patients, colleagues and the public.

Reflective questions

1. What personal coping mechanisms and support networks do you utilise if experiencing workplace-related stress? How does this affect your overall wellbeing?
2. How would you recognise workplace-related stress and/or alcohol/substance use in colleagues? Would you feel comfortable starting a conversation and signposting them to available support?
3. Do you feel that your workplace promotes personal wellbeing? What could you personally do to promote wellbeing within your local area?

Background

Exposure to traumatic events and working in pressurised environments are features of the work undertaken by paramedics (Regehr et al, 2002; van der Ploeg, 2003). This contributes to high levels of occupational stress (Donnelly, 2012) and increases the risk of developing Post Traumatic Stress Disorder (PTSD) compared to the general population (Bennett et al, 2004; Donnelly and Siebert, 2009; Stanley et al, 2016; Wild et al, 2016). This risk further increases with long working hours and irregular shift patterns (Jones, 2017).

Occupational stress in Health Care Professionals (HCPs), including paramedics, has multiple causal factors, such as poor organisational support, unrealistic demands and inadequate training to perform their role (Weinberg and Creed, 2000). However, personal coping strategies also play an important role (Ruotsalainen et al, 2015). Although different definitions exist, simplistically, occupational stress results from an imbalance between operational demands and personal capacity. Historically, it has been suggested that this may have correlated with increased complaints and clinical errors by paramedics (Hammer et al, 1986; Cydulka et al, 1989). However, contemporary research in this area is lacking.

PTSD is a recognised mental health condition with wide-ranging symptomology (NICE, 2018). Post Traumatic Stress Symptoms (PTSS) are common following exposure to traumatic events without reaching diagnostic criteria (Donnelly and Siebert, 2009). Whilst PTSD/PTSS are often considered negatively, it is possible to garner strength, increase personal resilience and achieve Post Traumatic Growth (PTG) (Ogińska-Bulik and Kobylarczyk, 2015).

Alcohol and substance use across all HCPs are common (Baldisseri, 2007; Pilgrim et al, 2017). However, this covers a wide spectrum of use and cannot always be considered as a disorder or illness (McPherson and Hersch, 2000; Babor et al, 2001). A consequence of misuse and dependence

may be performance impairment (Baldisseri, 2007) leading to poorer service delivery and patient outcomes, increased absenteeism and reduced staff retention (Ruotsalainen et al, 2015).

Research on the relationship between alcohol/substance use and occupational/post-traumatic stress in paramedics is limited (Donnelly and Siebert, 2009), but has been identified as a potential consequence of occupational/post-traumatic stress in emergency service workers (Regehr, 2005; Donnelly and Siebert, 2009). Studies examining this relationship in various emergency occupations have generally failed to recognise the heterogeneity of different professions as a potential confounder (Jones, 2017).

One of the limitations of studying paramedics as a global population is that there is no universal definition and the role has changes significantly since it's inception. Throughout this literature review, the original terms used by authors will be referenced but all relate to the current definition of a paramedic.

Aims

The purpose of this study was to undertake a systematic review of literature relevant to the paramedic profession, exploring the relationship between alcohol and substance use with occupational and post-traumatic stress.

Methods

A systematic approach was taken by following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al, 2009) (Figure 1). Databases, including CINAHL, PubMed, Scopus and Cochrane, were searched between 5th November and 17th December 2018 using different keywords and Medical Subject Headings (MeSH) (Table 1) to ensure all roles were included in the population of interest. Limits were set to English language studies where the abstract

was available for review. As the paramedic profession is young compared to other HCPs such as nursing and medicine, no date limit was set to ensure that the full breadth of literature was identified. Additional literature was identified using the OpenGrey database and checking within reference lists. Where relevant, studies relating to other HCPs will be discussed to compare and contrast against literature for the paramedic profession.

Table 1 - Keywords

Concept	Alternative Keywords
Population	(MeSH "Emergency Medical Technicians") OR (MeSH "Emergency Medical Services") OR (MeSH "Prehospital Care") OR (MeSH "Ambulances") OR (MeSH "Air Ambulances") OR ("Allied Health Personnel") OR (EMS) OR (paramedic*) OR (EMT) OR (prehospital) OR (pre-hospital) OR (ambulance*)
Outcome/Variable 1	(MeSH "Substance-Related Disorders") OR ("Alcohol-Related Disorders") OR (MeSH "Impairment, Health Professional") OR (MeSH "Adaptation, Psychological") OR ("substance abuse") OR ("drug abuse") OR ("alcohol abuse") OR ("substance dependence") OR ("drug dependence") OR ("alcohol dependence") OR ("substance misuse") OR ("drug misuse") OR ("alcohol misuse") OR ("substance use") OR ("drug use") OR ("alcohol use") OR (alcohol*) OR (coping*)
Outcome/Variable 2	(MeSH "Stress Disorders, Post-Traumatic") OR ("Stress, Psychological") OR (PTSD) OR ("post traumatic*") OR ("post-traumatic*") OR ("occupational stress") OR ("workplace stress") OR ("work place stress") OR (work-place stress") OR ("job related stress") OR ("job-related stress")

Inclusion criteria were all studies examining the relationship between alcohol/substance use and occupational/post-traumatic stress in paramedics. Exclusion criteria were systematic reviews, paramedics not an exclusive population and alcohol/substance use not exclusive variables/outcomes.

Critical Appraisal Skills Programme (CASP) tools (CASP, 2018) were used to assess methodology and ensure consistency at the review stage. The main study characteristics and findings were populated in tabular form with descriptive statistics and emergent themes categorised for further discussion.

Findings

262 articles were identified for initial review. After duplications and exclusions were removed, 27 articles were initially selected for full text review (Figure 1). 16 further articles were excluded, due

to no direct examination of the relationship between alcohol/substance use and occupational/post-traumatic stress. The final review included eleven studies, nine utilising quantitative methods; two using mixed-methods. The studies and relevant findings are summarised in Table 2.

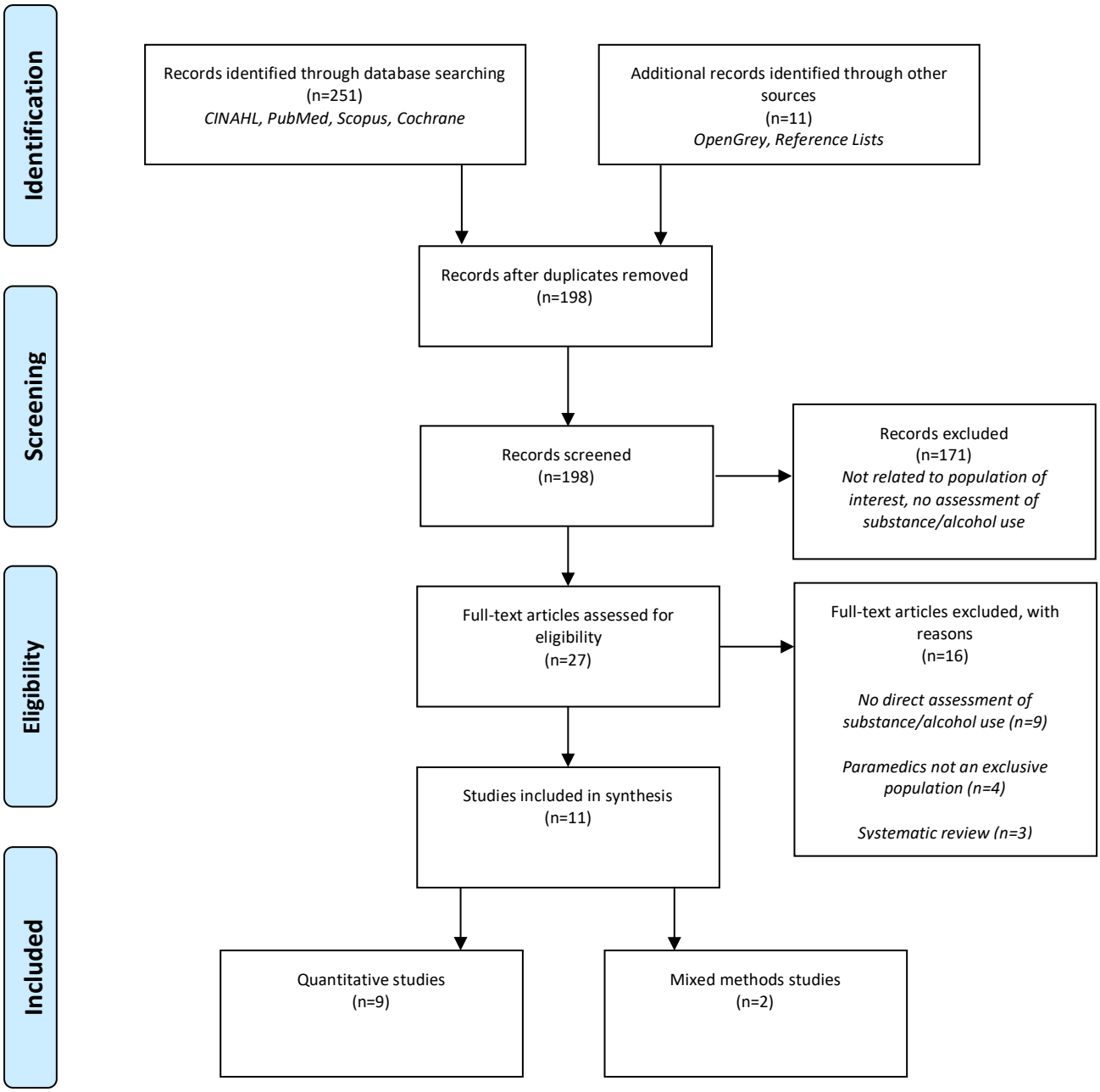

Figure 1 – PRISMA flow diagram

Table 2 - Study Characteristics

Reference	Country/Population	Study type/aims	Relevant findings
Bentley et al, 2013	USA Qualified paramedics and EMTs (n=23,451) Age range: U/K Experience: <2 to >16 years (mean U/K) Male: 73.88% (n=17,326)	Quantitative case-control study which analysed the results of an optional questionnaire sent out to all paramedics and EMTs during biannual recertification period. Examines the relationship between different mental health conditions (including stress disorders) and demographic features (including smoking).	Current or previous smoking increases the risk of developing stress disorders including occupational stress compared to those who have never smoked (OR 1.34-1.37). Good discussion around the limitations of the study and confounding influences.
Cydulka et al, 1989	USA Qualified paramedics and EMTs including officers (n=280) Age range: mean 31.6 years Experience: mean 5.3 years Male: 80.4% (n=221)	Quantitative cross-sectional study which looked at the results of a questionnaire sent to paramedics at urban ambulance service. Examines the relationship between different types of stress and demographic features. Also examines substance/alcohol use in relation to different types of stress and compares this to the finding of Hammer et al. 1986.	Significant positive correlation between substance/alcohol use and somatic distress (r=0.38, p<0.005) but not organisational stress. No consideration of potential bias or confounding factors. Substance/alcohol use not assessed individually and a validated assessment tool was not used.
Donnelly, 2012	USA Qualified paramedics and EMTs (n=1,633) Age range: mean 34.50-34.67 years* Experience: mean 6.0-10.28 years* Male: 69.9-76.1%* *paramedics and EMTs presented separately	Quantitative cross-sectional study which used probability sampling methods to randomly select EMTs to complete an online questionnaire. Examines the impact that chronic stress, critical incident exposure and alcohol use has on the development on PTSS.	Positive correlation between alcohol use and occupational stress (r=0.055, p<0.05) and post-traumatic stress (r=0.222, p<0.01). Risk increases further when alcohol is combined with the presence of high levels of chronic stress. Good assessment of potential bias and confounding factors. AUDIT assessment tool used.
Fjeldheim et al, 2014	South Africa Trainee paramedics (n=131) Age range: mean 22.05 years Experience: N/A Male: 63.6% (n=84)	Quantitative cross-sectional study which incorporated various assessment tools/scales into a questionnaire sent to paramedic students from one university at the end of their first year of training. Examines the relationship between PTSD and various risk factors (including alcohol use)	Alcohol use not associated with the development of PTSD (P=0.154). AUDIT assessment tool used along with other assessment tools to look at traumatic experiences and anxiety/depression. Good discussion around the limitations of the study and confounding factors.
Hammer et al, 1986	USA Qualified paramedics (n=374)	Quantitative case-control study which compared the results of a stress survey completed by	Significant positive correlation between substance/alcohol use and somatic distress (r=0.37, no

	Age range: mean 29.7 years Experience: mean 6.7 years Male: 85.0% (n=318)	paramedics employed by one ambulance service to other healthcare staff working in a hospital environment. Examines the relationship between different types of stress and individual traits/behaviours (including substance/alcohol use).	p-value) but not organisational stress. Substance/alcohol use not assessed individually and a validated assessment tool was not used. No randomisation and no consideration of bias or confounding influences.
Jurišová, 2016	Slovakia Qualified paramedics (n=62) Age range: 21 to 53 years (mean 35.91) Experience: 1-34 years (mean 7.54) Male: U/K % (n=30)	Quantitative cross-sectional study which utilised a questionnaire to assess whether characteristics of Post Traumatic Growth (PTG) were present. Examines the relationship between stress and different coping strategies and PTG.	Substance abuse (smoking) is the least used coping strategy. Positive correlation between PTG and substance abuse (r=0.038, no p-value) but not significant. Level of self-efficacy mediates the correlation. No randomisation but good recognition of study limitations.
Regehr et al, 2002	Canada Qualified paramedics and officers (n=86) Age range: 26 to 56 years (mean 39.68) Experience: 2 months-32 years (mean 14.52) Male: U/K	Mixed methods study with initial cross-sectional questionnaire and narrative follow up for consenting participants. Examines the relationship between exposure to traumatic events and the effect on paramedics/officers (including coping strategies).	Exposure to traumatic events led to an increase in alcohol abuse (1.2% to 11.6%, no p-value) but rates of substance abuse (not defined) was unaffected. Validated tools were not used to assess levels of alcohol/substance abuse. Convenience sampling rather than randomisation used but the limitations of this are recognised along with other bias and confounding influences.
Sterud et al, 2007	Norway Ambulance personnel including officers/managers (n=1,286) Age range: 18 to 66 years (mean 36.8) Experience: U/K Male: 76.8% (n=U/K) Compares to a police sample	Quantitative cross-sectional study assessing and comparing levels of alcohol use in ambulance and police services and examining the relationship with occupational stress.	Emotional exhaustion positively correlates with increased alcohol consumption (r=0.10, p<0.01) but not alcohol related problems or drinking to cope (r=0.06, p-value not significant). AUDIT assessment tool used. No randomisation but good discussion around limitations of the study.
Ward et al, 2006	South Africa Ambulance personnel – public/private/voluntary (n=U/K) Demographic information specific to ambulance personnel not published	Mixed methods cross-sectional study with a closed and open-ended questionnaire. Assesses levels of exposure to critical incidents and presence of mental health problems (including alcohol use).	No correlation between exposure to critical incidents and increased alcohol use (r-value and p-value not presented). CAGE questionnaire used.

	Compares to a sample of other emergency workers		No randomisation but has some discussion around study limitations.
Wild et al, 2016	UK Trainee paramedics (n=453) Age range: mean 30.31 years Experience: N/A Male: 58.3% (n=264)	Mixed methods prospective cohort study with a mixture of structured interviews and self-reporting questionnaires. Investigated incidence and development of PTSD/depression over two-year period and variables that may influence this (including substance/alcohol use)	No correlation between the development of PTSD and substance/alcohol use. Increased likelihood to smoke if PTSD developed during training (p=0.05). AUDIT assessment tool used. No randomisation but extensive discussion around study limitations, bias and confounding influences.
Yip et al, 2016	USA Qualified Paramedics and EMTs (n=2,281); Age range: 29 to 42 years (median 36.2) Male: 78.7% (n=U/K) Experience: U/K	Quantitative retrospective cohort study looking at historical health records of emergency responders. Examines the health implications (including harmful alcohol use and smoking) following the World Trade Centre attacks.	Responding to the World Trade Centre attacks increases risk of alcohol misuse (1.6-4.2%) but the overall risk is not statistically significant (no p-value). Amount of traumatic exposure increases risk of alcohol misuse (p=0.0219). Smoking rates are not significantly different. AUDIT assessment tool used. Good discussion of study limitations.

Whilst full demographic information is absent from some studies and not always presented in a consistent format, it is still possible to make some comparisons. Studies from six countries were found, with the USA providing almost half (n=5). Seven study populations included qualified paramedics, two studied trainees/students and two studied generic ambulance personnel, which is a vaguer population. Where reported, ages ranged from 21 to 66 years old with the mean or median ranging from 22.05 to 36.8 years. The proportion of males ranged from 58.3% to 85.0%. Experience typically ranged from 2 months to 34 years with means between 5.3 and 14.52 years, although this was not applicable in two studies examining trainee/student populations. Demographic ranges of all studies were broadly consistent and previous systematic reviews (Donnelly and Siebert, 2009; Stanley et al, 2016; Jones, 2017).

From eleven studies reviewed, seven assessed substance use and nine assessed the use of alcohol (five assessed both together). Substance use was exclusively assessed without using a validated tool. Alcohol was assessed using the Alcohol Use Disorders Identification Test (AUDIT) (Babor et al, 2001) in five studies (Sterud et al, 2007; Donnelly, 2012; Fjeldheim et al, 2014; Wild et al, 2016; Yip et al, 2016), the CAGE questionnaire (Dhalla and Kopec, 2007) in one study (Ward et al, 2006), and without a tool in the remaining studies (Hammer et al, 1986; Cydulka et al, 1989; Regehr et al, 2002; Bentley et al, 2013; Jurišová, 2016).

In relation to the review criteria, five studies examined occupational stress (Bentley et al, 2013; Cydulka et al, 1989; Donnelly, 2012; Hammer et al, 1986; Sterud et al, 2007) and seven examined post-traumatic stress (Donnelly, 2012; Fjeldheim et al, 2014; Jurišová, 2016; Regehr et al, 2002; Ward et al, 2006; Wild et al, 2016; Yip et al, 2016). One study assessed both(Donnelly, 2012). Various mental health/well-being screening tools were used with no common approach taken.

Alcohol use and occupational stress

Of nine studies assessing alcohol use, four directly examined the relationship with occupational stress (Hammer et al, 1986; Cydulka et al, 1989; Sterud et al, 2007; Donnelly, 2012). Only one study established a statistically significant direct positive correlation between alcohol use and occupational stress ($r=0.055$, $p<0.05$) (Donnelly, 2012). However, the remaining studies observed correlations with other types of stress to some extent.

Three studies that did not identify a relationship between alcohol use and occupational stress did observe a positive correlation with somatic distress or emotional exhaustion (Hammer et al, 1986; Cydulka et al, 1989; Sterud et al, 2007). The definitions of these terms are comparable as both relate to symptoms of chronic stress such as emotional fatigue and absenteeism which are also characteristics of occupational stress. The correlation was statistically significant with p-values of

between <0.005 and <0.05, and r-values of between 0.37 and 0.38 (Hammer et al, 1986; Cydulka et al, 1989). The correlation was not statistically significant when assessing alcohol misuse (defined as drinking to cope or problematic drinking). However, in one study, males exhibited a statistically significant increased risk of alcohol misuse related to emotional exhaustion ($p < 0.001$) (Sterud et al, 2007).

Only one of the studies considers alcohol as a variable (Donnelly, 2012), although this relationship is unclear. The remaining three consider alcohol use as an outcome which means a bi-directional relationship cannot be assessed.

Alcohol use and post-traumatic stress

Out of nine studies assessing alcohol use, six directly examine the relationship with post-traumatic stress or related symptomology (Regehr et al, 2002; Ward et al, 2006; Donnelly, 2012; Fjeldheim et al, 2014; Wild et al, 2016; Yip et al, 2016). Two studies found a clear positive correlation (Regehr et al, 2002; Donnelly, 2012) whilst another found a partial correlation (Yip et al, 2016). The remaining studies did not identify any relationship.

Only one study identifying a positive correlation presents statistical analysis to support this finding (Donnelly, 2012) ($r=0.222$, $p<0.01$), although the second study does document raw data demonstrating alcohol use increased from 1.2% to 11.6% following exposure to traumatic events (Regehr et al, 2002). In general, the third study finds no correlation (Yip et al, 2016). However, it does identify that emergency medical workers with increased exposure at a traumatic event may be at increased risk of harmful alcohol use ($p=0.0219$), although statistical significance does decrease when compared to the overall exposure of other workers. Whether increased alcohol use is a variable or an outcome is unclear and disputed between the studies. Additionally, when seen as an outcome, there is no consensus as to whether alcohol is a short-term or long-term consequence and

whether consumption constitutes misuse. A pertinent observation with these studies is that they all considered alcohol as a variable rather than an outcome which could support an argument that increased alcohol use is potentially an outcome of post-traumatic stress.

Two studies examined student/trainee paramedics as the population (Fjeldheim et al, 2014; Wild et al, 2016) which may be significant when comparing the findings to studies that found a positive correlation in qualified workers. One study found that alcohol use decreased as training progressed, irrespective of whether post-traumatic stress symptoms were exhibited (Wild et al, 2016).

Substance use and occupational stress

Of the seven studies assessing substance use, three examined the relationship with occupational stress (Hammer et al, 1986; Cydulka et al, 1989; Bentley et al, 2013). Two studies identified no correlation (Hammer et al, 1986; Cydulka et al, 1989). As with alcohol use, a relationship between substance use and other relevant types of stress was identified ($p<0.05$) (Cydulka et al, 1989). However, substance use was jointly assessed alongside alcohol use, rather than as an independent variable or outcome. The focus of discussion in these studies has been on alcohol rather than substance use which has not been clearly defined. Therefore, the relevance and significance are diminished.

One study identified a positive correlation; however, substance use was defined solely as smoking and did not examine illicit or other legal substances (Bentley et al, 2013). For current or former smokers, a significant risk of developing occupational stress with odds ratios presented of between 1.34 and 1.37 was presented.

Substance use and post-traumatic stress

Of seven studies assessing substance use, four directly examined the relationship with post-traumatic stress or related symptomology (Regehr et al, 2002; Jurišová, 2016; Wild et al, 2016; Yip et al, 2016). One study found a positive correlation (r=0.038) with PTG (Jurišová, 2016). However, this was not statistically significant and substance use was again defined as smoking only. The study focused on PTG and identified that whilst smoking may be useful as a coping strategy, regression analysis demonstrated that other strategies and personality types mediate the positive effective on PTG and so the overall picture is complex. There is no assessment of baseline levels so whether smoking is a coping strategy cannot be fully concluded.

A second study looking at smoking levels following exposure to a traumatic event found no significant relationship with PTSD (Yip et al, 2016). However, whether smoking is assessed as a variable or outcome was not fully defined or assessed.

Another study presented mixed findings depending on the substance used (Wild et al, 2016). A statistically significant increase in rates of smoking was identified in student paramedics who developed PTSD during their training (p=0.05). However, although not fully defined, other substance use remained static if PTSD developed during training but decreased if PTSD was not experienced. Therefore, substance use was found to be neither an outcome nor a variable. Another study with qualified paramedics also found that levels of substance use remained unchanged after exposure to a traumatic event (Regehr et al, 2002) suggesting that substance use is not necessarily influenced by post-traumatic stress.

Length of service and occupational/post-traumatic stress

Four studies examined the relationship between length of service and occupational/post-traumatic stress and related symptomology (Cydulka et al, 1989; Regehr et al, 2002; Donnelly, 2012; Bentley et al, 2013). Two studies identified that length of service increased the likelihood of occupational stress

with a calculated odds ratio of 1.67 (Bentley et al, 2013) and p-value of <0.05 (Cydulka et al, 1989). However, a further study identified no correlation (Donnelly, 2012).

In relation to post-traumatic stress, two studies identified a statistically significant positive correlation with length of service (Regehr et al, 2002; Donnelly, 2012). Although, when looking at PTG, no relationship with experience was identified (Jurišová, 2016).

No study has directly assessed the relationship between length of service and alcohol/substance use.

Gender and occupational/post-traumatic stress

Four studies examined the relationship between gender and occupational/post-traumatic stress (Hammer et al, 1986; Cydulka et al, 1989; Donnelly, 2012; Yip et al, 2016). In three studies investigating occupational stress, none found a relationship with gender (Hammer et al, 1986; Cydulka et al, 1989; Donnelly, 2012). However, with post-traumatic stress one study found no correlation with gender (Donnelly, 2012) whilst a second study found a statistically significant relationship with females being more likely to experience PTSD (p=0.0011) (Yip et al, 2016).

Three studies examined the relationship between gender and alcohol use (Sterud et al, 2007; Donnelly, 2012; Fjeldheim et al, 2014). Whilst there was no significant relationship with general alcohol use, two studies found that males were more likely to experience alcohol-related problems (Sterud et al, 2007; Fjeldheim et al, 2014) with a p-value of <0.01 presented in one study (Sterud et al, 2007).

None of the studies investigated the relationship between substance use and gender.

Support Networks

Another common theme discussed is support networks (Regehr et al, 2002; Donnelly, 2012; Bentley et al, 2013; Fjeldheim et al, 2014; Jurišová, 2016; Wild et al, 2016). All found that poor levels of support generally increased the likelihood of developing some type of stress, but the direct influence on alcohol and substance use remains unexplored. This opens up the possibility of a confounding influence on overall conclusions. Similarly, personal coping strategies are likely to be a significant influence on whether alcohol/substances are used in relation to stress. However, this has only been explored to a limited extent in four studies (Regehr et al, 2002; Fjeldheim et al, 2014; Jurišová, 2016; Wild et al, 2016).

A graphical representation of the relationships between identified thing is presented in Figure 2.

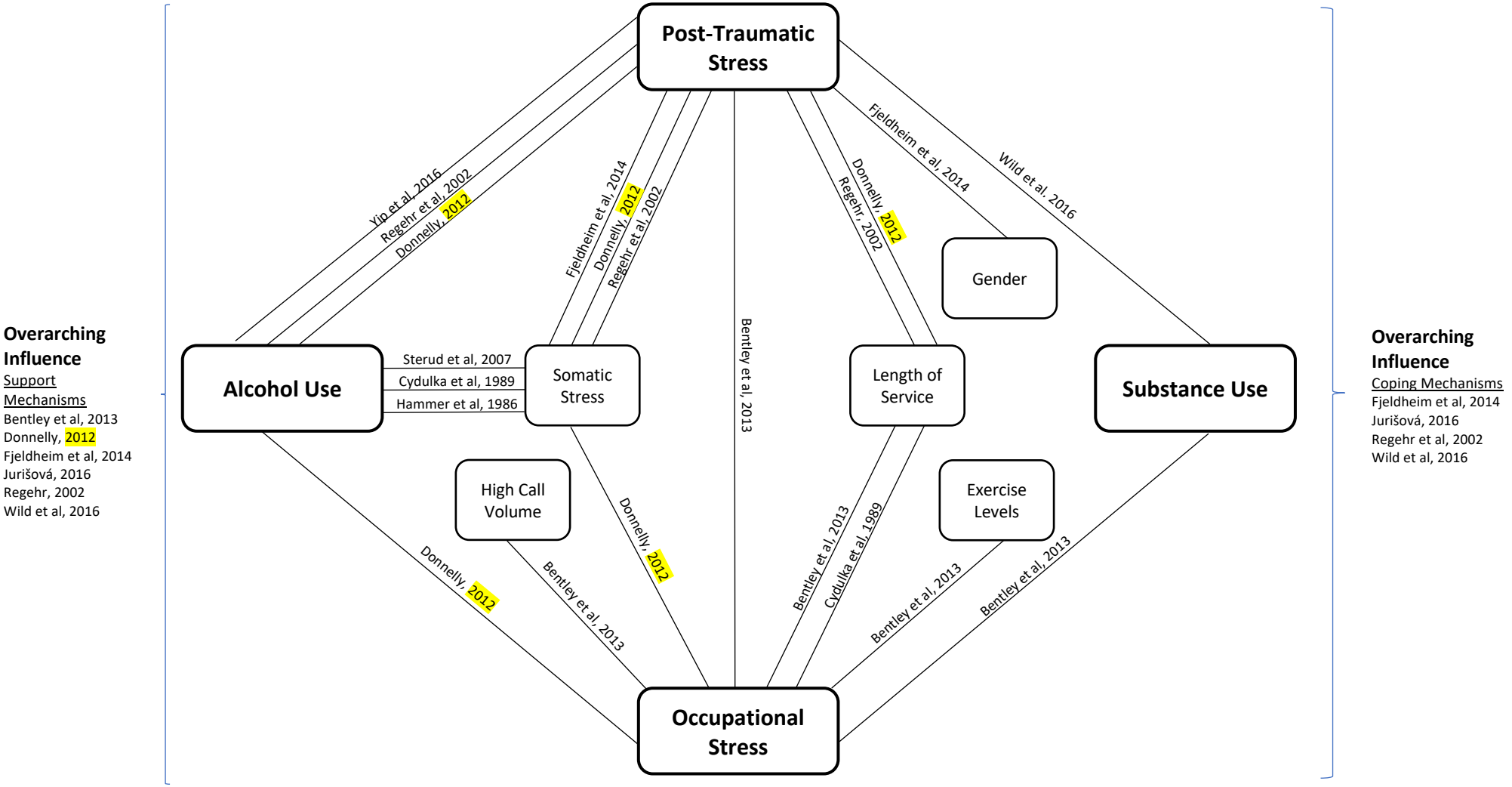

Figure 2 - Graphical representation of relationships between themes identified

Discussion

The primary aim of this systematic review was to investigate the relationship between alcohol/substance use and occupational/post-traumatic stress in relation to paramedics. After undertaking a systematic search, eleven studies of varying quality were identified for review. Mixed, and sometimes contradictory findings, were presented by the authors but some themes can still be explored.

Alcohol use

Several studies identified that alcohol use is common amongst emergency medical workers, including qualified and student paramedics (Hammer et al, 1986; Cydulka et al, 1989). Whether this constitutes misuse and how this compares to other HCPs and emergency service workers is difficult to discern with the current evidence-base. Studies looking at other HCPs show that alcohol misuse is prevalent across health and social care (Ganley et al, 2005; Siebert, 2005; Servodidio, 2011). Data have not been universally presented by all studies in this review. However, where available, rates of alcohol misuse ranged from 1.6% to 24% (Regehr et al, 2002; Fjeldheim et al, 2014; Wild et al, 2016; Yip et al, 2016). Although a wide range, this is not too dissimilar to the estimated 10% to 15% of nurses who abuse alcohol during their career to cope with work-related stress (Servodidio, 2011).

When looking at other emergency service workers, alcohol use has been found to be an issue in the fire service with levels of misuse ranging from 34% to 58% (Jones, 2017) and 33% within the police (Richmond et al, 1998; Davey et al, 2000). However, one study examining different emergency worker groups found similar levels of alcohol misuse across all services (Ward et al, 2006).
It may, therefore, be the case that alcohol misuse in paramedics is comparable with other HCPs and emergency service workers. There is debate as to whether HCPs and emergency workers consume alcohol at higher levels than the general population. A survey of National Health Service staff found

that levels of alcohol use were comparable to the general population (Raistrick et al. 2008), whilst other studies suggest higher levels in emergency workers (Donnelly and Siebert, 2009; Jones, 2017).

Two studies identified that student paramedics may be at increased risk of alcohol misuse (Fjeldheim et al, 2014; Wild et al, 2016). Likewise, the same conclusion has been made with medical students (Pacheco et al, 2017). Whilst concerning, it is important to note that students in general have been found to misuse alcohol whilst enrolled in higher education, regardless of the subject studied (Schuckit et al, 2012; White and Hingson, 2013; Davoren et al, 2016). The rates of misuse presented are not dissimilar to others investigating non-paramedic students. Therefore, the risk of misuse is likely to be the result of educational setting rather than career choice and exposure to occupational and post-traumatic stress.

Substance use

Evidence relating to substance use in the paramedic profession has not been identified within this review. Tobacco smoking was the main substance studied, but any correlation with occupational/post-traumatic stress in paramedics was not established. Other studies examining doctors and nurses found that, although smoking was prevalent (Duaso et al, 2014; Duaso et al, 2017), any relationship with occupational stress was not identified (Perdikaris et al, 2010).

The extent to which HCPs collectively misuse substances compared to the general population has not been determined. The use of illicit/street substances has generally been found to be higher compared to the general population (Meeker et al, 2002; Pilgrim et al, 2017). However, any misuse of prescription drugs may be similar to the general population (Merlo and Gold, 2008; Samuelson and Bryson, 2017).

In a study of HCPs who died from fatal overdoses, opioids were overwhelmingly identified as the main substance of choice for paramedics (Pilgrim et al, 2017). This contrasts with nurses who were found to equally use antidepressants/antipsychotics, benzodiazepines and opioids. Doctors generally showed no significant pattern in which substances were used, although other studies suggest misuse of opioids may be prevalent in the profession (Bennett and O'Donovan, 2001; Ganley et al, 2005). Contrary to previous assertions that HCPs have higher use of illicit/street drugs, this study showed that less than 10% of deaths were due to these substances.

Although not conclusive, the choice of substance may be linked to what is available to the HCP (Pilgrim et al, 2017). This is an important consideration as, in the UK, morphine is the main analgesic carried by paramedics (Brown et al, 2019). Ketamine and midazolam are also increasingly being used by Advanced Paramedics to manage complex medical conditions (Edwards et al, 2016). Although regulations surrounding controlled drugs in the UK are robust, careful consideration of medicines management is needed to mitigate the risk of misuse. Smoking may be significant when examining other substance use, as some limited evidence suggests that it may be a predictor for opioid dependence (Kenna and Lewis, 2008).

When considering preregistration paramedics, a clear relationship with substance misuse was not found. However, comparisons, particularly with student nurses (Bozimowski et al, 2014; Dittman, 2015; Stewart and Mueller, 2018), suggest it is an issue to be considered.

Occupational and post-traumatic stress

Occupational stress is a significant issue in other HCPs as well as paramedics (Ruotsalainen et al, 2015). More than half of doctors have been found to be personally and professionally affected by occupational stress (Rotenstein et al, 2018) with the incidence increasing (Fred and Scheid, 2018). In

nursing, exposure to occupational stressors has been linked to compassion fatigue and a reduction in job satisfaction (Sinclair et al, 2017; Zhang et al, 2018).

In terms of post-traumatic stress, the lack of a clear relationship contradicts the findings of another review which found that alcohol/substance misuse was an outcome (Donnelly and Siebert, 2009). However, many of the studies examined non-paramedic groups so the conclusions could be considered less valid. Additionally, another review found increased levels of alcohol misuse in paramedics but did not determine whether this was linked to occupational/post-traumatic stress (Jones, 2017).

In other HCPs and emergency workers, any link is again unclear. Alcohol use may be a comorbidity for post-traumatic stress (Martin et al, 2017), but use as a result of exposure to traumatic events has not been demonstrated (Bogstrand et al, 2016). Alcohol/substance misuse has been linked to post-traumatic stress in the general population (Welch et al, 2014; Greene et al, 2016), particularly tobacco use (Pericot-Valverde et al, 2018), so it is possible that a relationship does exist. Whether this is as a variable or outcome would need further exploration. This is potentially concerning as levels of post-traumatic stress in UK ambulance workers have been found to be as high as 22% (Bennett et al, 2004) which is higher than the general population (Donnelly and Siebert, 2009; Stanley et al, 2016; Wild et al, 2016).

Development of post-traumatic stress is not necessarily related to exposure to trauma in the sense of serious injury, sometimes it is experiencing someone else's suffering or loneliness (Regehr et al, 2002). As well as other emergency workers, paramedics may be considered at higher risk of suicide in part due to their exposure to traumatic events (Tiesman et al, 2015; Milner et al, 2016). This is particularly concerning when considering that alcohol misuse is also linked to increased risk of suicide (Martin et al, 2017).

In relation to post-traumatic stress, Wild et al (2016) examined other relationships that have not been considered by other studies. Personality/psychological traits as well as childhood experiences may particularly influence the development of post-traumatic stress irrespective of alcohol and substance use. This has not been recognised by other studies and may have a significant impact.

Supporting paramedics and protecting patients

Impaired performance of HCPs has been identified as a potential consequence of alcohol and substance misuse (Baldisseri, 2007). This has a negative impact on overall patient outcomes and reduced efficiency in healthcare delivery, accompanied by increased staff absenteeism and attrition (Ruotsalainen et al, 2015). None of the studies directly looked at the consequences of misuse on patient care. However, in a study examining doctors working under the influence of alcohol, up to 10% of the patients treated were potentially harmed (Sendler, 2018), so this is an important area that needs further investigation.

Two studies did identify that complaints by patients and critical errors were directly linked to occupational stress in paramedics (Hammer et al, 1986; Cydulka et al, 1989) whilst another recognised that a link may be present with post-traumatic stress (Ward et al, 2006). This suggests that stress could, to an extent, result in compassion fatigue in paramedics and poorer patient care, although the relationship with alcohol and substance use remains unclear.

Paramedics have a responsibility to make adjustments or stop practising if mental or physical health problems may cause an impairment (HCPC, 2016). Although not addressed in any of these studies, HCPs tend not to self-report alcohol and substance problems for fear of losing their job and professional registration as well as being judged by colleagues (Kunyk et al, 2016). Problems are

often not recognised by supervisors and managers until a complaint has been received or error made, although many HCPs believe, in hindsight ,that their problem should have been recognised sooner (Cares et al, 2015; Kunyk et al, 2016). The need to move away from individual blame towards examining and addressing structural factors which influence impaired professional performance has been highlighted in the nursing profession (Ross et al, 2018). This helps individuals to feel supported in coming forward and seeking help so that open, honest and constructive dialogue can take place and also supports UK guidelines on workplace mental and physical health (NICE, 2009; NICE 2015). It is therefore important to fully establish the extent of misuse amongst paramedics so that they can be supported appropriately and patients are protected.

Once the extent of misuse has been established, evidence-based surveillance and support programmes can be designed and implemented. Intervention programmes rather than disciplinary action for HCPs with performance concerns have generally proved to be effective (Ganley et al, 2005; Kunyk et al, 2016; Weenik et al, 2017). This has the significant benefit of protecting service users from harm whilst also ensuring professionals are supported and do not leave resulting in reduced staffing, loss of valuable experience and increased training costs for new staff. The results from this review, and studies investigating other student/trainee populations (Bozimowski et al, 2014; Dittman, 2015; Stewart and Mueller, 2018), suggest that this group may be at particular risk of alcohol/substance misuse. Increased monitoring, support and general advice on how to recognise when a problem exists may therefore be particularly beneficial to preregistration paramedics.

Confounding factors

Whilst a good study standard was generally presented, confounding factors and limitations to some of the studies were observed which warrant further discussion.

Screening Tools

There was a lack of consistency in screening tools used. Alcohol was generally assessed using the AUDIT (Babor et al, 2001) or CAGE tool (Dhalla and Kopec, 2007). Whilst both are considered to have high sensitivity for the detection of excessive alcohol use, there are subtle differences in the types of misuse that are detected (Fiellin et al, 2000). None of the studies have assessed substance use using a validated screening tool such as Tobacco, Alcohol, Prescription Medication, and Other Substance Use (TAPS) (McNeely et al, 2016) or Drug Abuse Screening Test (DAST) (Yudko et al, 2007) which would have increased the strength of their findings. In many of the studies, substance/alcohol use has been defined as any use, and not defined separately as misuse or a disorder.

Study population

Globally, the function and workforce of ambulance services varies, as does the definition and qualification level of an emergency medical worker (Al-Shaqsi, 2010). These studies do not differentiate between the type of training received and whether different professional responsibilities influence stress and alcohol/substance use. The heterogeneity of study participants also varies significantly throughout the studies which has not been universally recognised.

Age of studies

No time limit was set for this review to ensure that all relevant studies were retrieved. However, the age of some studies means that their findings may no longer be relevant. For example, attitudes towards smoking in the general population has changed and rates have generally decreased in the UK (West, 2017). Access to illicit substances is also more prevalent now than at the time of the earliest retrieved study. The paramedic profession in the both in the UK and globally has also developed significantly over the past thirty years in terms of education levels and scope of practice. Therefore, meaningful comparisons between studies may not be fully possible

Variables and outcomes

A theme running through this review has been that alcohol and substance use have generally been assessed looking at a unidirectional relationship with occupational/post-traumatic stress. Consideration has often not been fully given to an opposing or bidirectional relationship existing.

Strength and limitations

This systematic review is the first to examine the relationship between alcohol/substance use and occupational/post-traumatic stress solely in the paramedic and emergency medical worker populations. This is unique as other studies have previously not fully recognised the potential confounding limitations of combining both medical and non-medical emergency workers into one population of interest. The review has also attempted to assess variables and outcomes independently and considered a bi-directional relationship between the different areas of interest, which has not previously been reported.

Due to the differing definition and scope of practice of EMS systems around the world, a limitation of this study is that exposure, education level and responsibilities of emergency medical workers may not be directly comparable. Where possible, this has been mitigated as part of the descriptive statistics. Searching was limited to English language studies which may have produced a bias against EMS systems in non-English speaking countries. Another limitation to consider is the definition of alcohol and substance use. Whilst assessment of alcohol use has to an extent generally been comparable, the definition of substance use is either varied or lacking sufficient detail amongst the studies. This means that meaningful analysis has not been possible for substance use other than tobacco smoking. Similarly, occupational and post-traumatic stress are often not fully defined so comparisons may not be entirely valid. The heterogeneity of participants varies between studies and, although reported in descriptive statistics, further exploration of these variables in relation to the study outcomes could be beneficial. Not all studies included hypotheses or statistical information making the statistical significance and validity of some findings unreliable.

Conclusions

Eleven studies of relevance were identified and assessed as part of this systematic review. The overall picture presented is that any relationship between alcohol/substance use and occupational/post-traumatic stress in paramedics is complex and without a strong evidence-base.

Overall, there is insufficient evidence to establish a relationship between substance use and occupational or post-traumatic stress in paramedics. Smoking may be important in relation to occupational stress; however, whether this is as a variable or outcome is unclear. The use of other legal or illicit substances has not been independently assessed in any of the studies. The strongest case has been made for a positive correlation between alcohol use and occupational stress. Whether this is a cause or consequence relationship has not been established nor has whether alcohol use is excessive enough to constitute misuse or a disorder. A relationship between alcohol and post-traumatic stress has not be demonstrated.

Support should be available to paramedics and other emergency medical workers for both occupational/post-traumatic stress and alcohol/substance use disorders. Further studies are needed to establish to what extent alcohol and other substances are used by paramedics and outline the significant influencing factors.

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