PREDICTORS OF POST-TRAUMATIC STRESS DISORDER AMONG AMBULANCE PERSONNEL IN THE WESTERN CAPE PROVINCE

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DECLARATION

I, Itumeleng Mmoko Theophelus Ntatamala, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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Dr Itumeleng MT Ntatamala 15 March 2020

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DEDICATION

To our Heavenly Father, God almighty for His blessings upon my life and throughout this journey that has allowed me to complete this dissertation.

To my loving parents, Mrs Shareen Ntatamala and the late Mr Freddy Ntatamala

To my sister Tebogo Melida Ntatamala and brother, Paul Ntatamala

To my loving wife, Ms Kentse Mpolokeng

To all my friends and family.

To the EMS staff who answer the call of duty to provide health for all.

ABSTRACT

Objective: To determine the factors associated with an increased risk for PTSD in ambulance personnel and the barriers faced in accessing support for work related stress (WRS).

Methods: A cross-sectional study of voluntary participants comprising 388 ambulance personnel was conducted. Participants completed self-administered questionnaires: Impact of Event Scale-Revised (IES-R), EMS Critical Incident Inventory (CII), EMS Chronic Stress Questionnaire (EMS-CSQ), SF-36 Quality of Life questionnaire (SF-36) and Connor-Davidson Resilience Scale (CD-RISC) which were used to assess PTSD and level of occupational stressors.

Results: The prevalence of PTSD in the study population was 30%. Participants were predominantly female (55%), median age 38 (IQR; 31 - 44) years with a professional qualification (83%). Those with PTSD were more likely current smokers (OR=1.76, 95% CI: 1.05 - 2.95), current illicit drug users (OR=16.4, 95% CI: 1.87 - 143.86) and problem drinkers (OR=3.86, 95% CI: 1.80 - 8.23). A self-reported mental health condition (OR=3.76, 1.96 - 7.21), being treated for a medical condition (OR=1.95, 1.22 - 3.11), exposure to chronic WRS (OR=1.05, 1.04 - 1.07) and high critical incident stress score (OR=1.03, 1.02 - 1.04) were positively associated with PTSD risk. Barriers to seeking help for WRS included concerns that services were not confidential, and that the participant's career would be negatively affected.

Conclusion: The PTSD prevalence in ambulance personnel is considerably higher than that found in previous studies conducted among this occupational group in the Western Cape. Identified risk factors should inform interventions designed to support ambulance personnel and a greater focus on addressing barriers to accessing care is needed.

Key words: occupational, paramedic, ambulance personnel, PTSD, predictors, barriers

ABBREVIATIONS AND ACRONYMS

ALS:	Advanced Life Support
ASD:	Acute Stress Disorder
BAA:	Basic Ambulance Assistants
BLS:	Basic Life Support
CD-RISC	Connor-Davidson Resilience Scale
COIDA:	Compensation for Occupational Injuries and Diseases Act 130 of 1993
CII:	Critical Incident Inventory
DSM:	Diagnostic and Statistical Manual of Mental Disorders
ECT:	Emergency Care Technicians
ECP:	Emergency Care Practitioners
EMS:	Emergency Medical Services
EMS-CSQ	EMS Chronic Stress Questionnaire
EMR:	Emergency Medical Responders
IES-R:	Impact of Event Scale-Revised
ILS:	Intermediate Life Support
PTSD:	Post-traumatic Stress Disorder
SASH:	South African Stress and Health Study
SF-36 QOL	SF-36 Quality of Life questionnaire
OECO:	Operational Emergency Care Orderly
WRS:	Work Related Stress
WHO:	World Health Organization

TABLE OF CONTENTS

PART A: THE PROTOCOL

INTRODUCTION

Background

Emergency workers such as ambulance personnel are exposed to several occupational hazards throughout the course of their career. This may occur while responding to routine emergencies such as motor vehicle accidents but occasionally natural disasters, industrial accidents and public events such as stampedes [1, 2]. The hazards encountered during this work include verbal/physical assault, threats, sexual harassment and abuse, chemical exposure, ergonomic and psychological hazards [1-4]). Studies have recognized the increasingly important role that psychological hazards play in the work environment and these may be related to exposure to acute traumatic situations and chronic stressors which are continuously present [3, 5-8]. Exposure to these occupational stressors has been associated with the onset of stress reactions such as post-traumatic stress disorder (PTSD) and other trauma related conditions [3, 7, 8]. In these settings, PTSD is also often diagnosed with other co-morbid conditions including depression, substance abuse and anxiety disorders [9].

Review of the literature

Ambulance personnel are at increased risk of PTSD compared to the general population and other emergency workers. A review of health workers' compensation data in Australia noted that ambulance officers and paramedics had an approximately thirteen times increased risk of lower back/musculoskeletal injuries (Hazard Ratios of 57.6 vs 4.4) and mental injury (Hazard Ratios 17.77 vs 1.29) [10] compared to nursing professionals. Mental injury was referred to as "mental health disorders that result from exposure to workplace stressors". Berger et al (n = 20 424) in their meta-analysis found a pooled PTSD prevalence of 10% in emergency workers that was not only higher than that of the general population (1.3 -3.5%) but was highest amongst ambulance personnel (14.6%, CI 8.80 - 20.30) compared to fire fighters (7.30%, CI 3.60 - 11.00) and police officers (4.70%, CI 1.20 - 8.30) [11]. Sterud et al [12] similarly found that the prevalence of PTSD in five of seven studies of ambulance personnel was approximately 20% while Petrie et al [8] demonstrated an estimated PTSD prevalence of 11% which was higher than the general population. This increased prevalence

may be due to ambulance personnel needing to respond to a greater number of calls than fire fighters and police officers combined, have more sustained work pressure and stress when on duty and possibly have greater personal contact with patients and their families. Such factors may therefore induce feelings of guilt, blame or worthlessness where there is failure to assist a victim in time or successfully [5].

There is a paucity of research into PTSD in emergency workers within lower middle income (LMC) settings. Ward et al [3] found that South African emergency personnel including ambulance, fire and sea rescue service workers experienced increased exposure to critical events and higher rates of general psychopathology compared to those in high income countries. Steward and Swartz [13] conducted a study in the Cape Metropolitan area and found a PTSD prevalence of 6.7% while a cross sectional study in Egypt [14] found that 13,6% of emergency medical responders (EMR) had PTSD compared to 2.9% in a comparative group. This prevalence was comparable with findings in Brazil where an estimated prevalence of 15% for PTSD amongst 234 ambulance workers was reported [15].

The exposure of ambulance personnel to traumatic stress and critical incidents of certain type and frequency has been consistently found to be a predictor for the development of PTSD [9, 16, 17]. Rybojad et al [4] in Poland observed that ambulance personnel with PTSD were more likely to have provided care to victims involved in more traumatic events such as mass casualties and brutal rape and those who encountered several traumatic events within a short duration. South African ambulance personnel (n = 189) found the most traumatic encounters in the course of their work being incidents involving children (27%), the serious injury or death of a colleague (17.1%), the death of a patient in their care (13.2%) and encountering violent crime victims (8.2%) [18]. Donnelly et al [19] further noted that chronic operational stress was an independent predictor of PTSD as well as in combination with critical incident stress. Demographic risk factors observed through several cross-sectional studies include; younger age, female gender, being less educated or occupying lower ranks with the ambulance service [4, 20-22]. Other significant predictors relate to occupational factors (organizational stress, interpersonal conflict, patient factors) [9, 19, 22], lack of social support from colleagues and

management [18, 19, 23], pre-existing psychiatric illness (anxiety and depression) and poor coping style[9, 22]. In a study of paramedic trainees at a Western Cape university, it was found that PTSD was predicted by the number of trauma exposures experienced, depression, resilience and social support with depression having a mediating effect [24].

Ambulance personnel often find difficulty in dealing with stressful and traumatic events which may predispose them to the development of PTSD [25, 26]. Personal coping mechanisms used include humour, the use of alcohol and the use of family support [27]. Focus groups held with ambulance personnel to understand the way they cope with the death of children found that the mechanisms could be classified as “Solve, Solace, Dismiss, and Escape” based on whether they approached or avoided the problem/emotion [25]. In surveying 189 ambulance personnel in Cape Town, Minnie et al [18] noted that emotion focused coping mechanisms (63%) were used more than problem focused coping (28.4%) and about half of the participants (45%) reported speaking to a colleague as a key method of coping with the incident. Similarly, 80% of Canadian paramedics (n=145) reported their source of social support for work related stress was most likely a friend or family member while 70% preferred approaching a work partner [28].

The literature has consistently demonstrated that ambulance personnel and other emergency services workers are exposed to a variety of occupational hazards including stress and critical incident exposure which predispose to the development of mental health conditions such as PTSD, depression, anxiety and substance abuse. There is a paucity of research in this field particularly in low and middle-income countries on identifying factors that not only predispose ambulance personnel to the development of PTSD, but an understanding of what coping mechanisms are found effective and how they can be better supported.

JUSTIFICATION

South African emergency personnel including ambulance, fire and sea rescue service workers have been found to experience a higher prevalence of exposure to critical events and as a result suffer higher rates of general psychopathology compared to those in high income countries [3, 13, 18, 24].

Despite experiencing consistently increasing exposure to critical events, there has been a paucity of research in South Africa and similar middle-income countries on the changing prevalence of PTSD and the factors associated with its development in high risk groups such as ambulance personnel. Little is also known about what barriers they face in accessing support, including how they would like to be supported to manage the stress related to workplace exposure to traumatic situations.

PURPOSE AND BENEFITS

There is limited information available on post-traumatic stress disorder in ambulance personnel in South Africa. This study will result in exploration of the role of acute critical incident and chronic stress as a predictor of PTSD. The results of the study will be beneficial in:

a) Providing recommendations to the Emergency Medical Services department on how to protect the health of workers from trauma related effects and to understand their needs.
b) Assisting with the design of appropriate guidelines and programmes in the emergency services to identify workers who are at risk of developing PTSD and work-related stress
c) Developing guidelines for preventative measures which include administrative measures (e.g. address operational stressors such as shift work, job rotation), environmental (e.g. community engagement, advocacy for improved security) and education (e.g. training of ambulance personnel and management) to reduce occupational health risks.

RESEARCH QUESTIONS

1. What is the prevalence of post-traumatic stress disorder in South Africa ambulance personnel in the Western Cape in urban and rural areas?
2. What are the risk factors associated with an increased risk of PTSD?
3. How would ambulance personnel like to be supported for work related stress and what barriers do they face in accessing this support?

HYPOTHESIS

Increased exposure to traumatic events and critical incident stress experienced by ambulance personnel is associated with an increased prevalence of post-traumatic stress disorder.

AIM

The aim of the study was to determine the factors associated with an increased risk for PTSD and the preferred supportive measures identified for work related stress in ambulance personnel in the Western Cape Province, South Africa.

OBJECTIVES

1. To determine the prevalence of post-traumatic stress disorder associated with exposure to acute critical incident and chronic stress experienced by ambulance personnel.
2. To identify the socio-demographic and occupational factors (age, gender, marital status, living status, location of work, educational level, length of service, job category, previous/known psychiatric history, substance use) associated with of PTSD in ambulance personnel.
3. To determine the supportive measures for work related stress that are currently available and what is preferred by ambulance personnel.
4. To determine what barriers are faced in accessing support for work related stress and PTSD.

METHODOLOGY

STUDY DESIGN

A cross-sectional analytical study design (field prevalence study) was used to collect data on ambulance personnel employed in both rural and urban regions of the Western Cape Province between 15 November 2019 and 17 January 2020.

POPULATION AND SAMPLING

Study population

The study population comprised of ambulance personnel employed by the Western Cape Department of Health situated at each of the 50 ambulance bases. All ambulance personnel in operational roles (providing direct clinical care) from the different employment/job categories were included in the study. This included those in accommodated roles due to ill health and those in administrative and support functions such as managers, cleaners and fleet operators. All workers were required to complete a consent form prior to participating in the study. No incentives were provided for completion of the questionnaire. No exclusion criteria were applied in this study.

The total number of employees in the ambulance service is approximately 2004 and includes permanent and temporary contract workers. Among these, 1704 are operational (in the field as active clinical employees), while 300 include support staff (n = 169) and administrative staff (n = 131).

Sampling strategy

All ambulance personnel employed by the Western Cape Department of Health in both urban and rural EMS stations and presently engaged in operational work (n = 1704), administrative and support work (n = 300) were identified through the occupational health and employee wellness co-ordinators including supervisors/managers while on duty. They were invited to complete an electronic questionnaire at the ambulance bases/stations during work time however could also do so at their own time in their homes or away from work. Where access

to the electronic questionnaire was a problem, an identical hard copy version of the questionnaire was provided to the participants for manual completion.

Power calculations for the sample size

Based on power calculations, a minimum sample size of 400 ambulance personnel was estimated to be appropriate to investigate the prevalence and predictors of PTSD. This was calculated with $\alpha = 0.05$, a background prevalence of PTSD in the general adult population of 3% (South African estimates) [29, 30] and an estimate for PTSD of 6.7% in ambulance personnel in the Western Cape Province [13].

MEASUREMENTS

Study instruments

A self-administered electronic questionnaire (Appendix 1 to 6) was designed using elements to obtain socio-demographic details (author questionnaire), the Connor-Davidson Resilience Scale (CD-RISC), EMS Critical Incident Inventory (CII), EMS Chronic Stress Questionnaire (EMS-CSQ), Impact of Event Scale-Revised (IES-R) and the SF-36 Quality of Life questionnaire (SF-36).

It was expected that the questionnaire would take approximately 30 to 60 minutes to complete.

Author questionnaire (Section I)

The first part of the self-administered questionnaire gathered self-reported sociodemographic and occupational data including 'age, gender, language, level of education, marital status, living status', and occupational data including 'job category, length of service, location of work'. Mental health and medical history data were obtained, including 'own/family history of mental health diagnosis, treatment for medical or mental health condition'. A smoking, alcohol and substance use (illicit and prescription drugs) history was

also elicited. The CAGE questionnaire was used to assess problem drinking (score of ≥ 2/4 indicative of problem drinking.

10-item Connor-Davidson Resilience Scale (CD-RISC)

The second component used the 10-item Connor-Davidson Resilience Scale (CD-RISC) which is a self-administered scale comprised of 10 items intended to measure resilience. The participants adaptive behaviours in stressful situations were used to identify resilient characteristics and these were scored on a 5-point Likert scale (0 = not at all true to 4 = true nearly all of the time), where higher scores indicated greater resilience. It has been noted as one of the most reliable and efficient measures of resilience with internal consistency of between 0.7 from 0.9 [31]. Written permission to use the scale was obtained from the authors (Appendix 7).

EMS Critical Incident Inventory (CII)

The third component used the EMS Critical Incident Inventory (CII) to assess exposure to critical incidents encountered in the line of duty and to obtain an indication of the frequency of exposure ('happened once' to happened three or more times' on a 4-point scale) in the past 6 months [3, 32]. Critical incidents (identified and adapted for the South African local context by Ward et al) included activities encountered during ambulance work such as witnessing the death or injury of a child, being seriously injured (physical), threatened with a gun or other weapon, serious injury or death of colleague amongst others [3, 7, 9].

EMS Chronic Stress Questionnaire (EMS-CSQ)

The fourth component used the EMS Chronic Stress Questionnaire (EMS-CSQ), a validated tool designed to assess the exposure to and perceptions of chronic stress experienced by the ambulance personnel [33]. The tool assessed both organizational and operational types of chronic workplace stress with each scale consisting of 10 questions. The tool defined operational stress as associated with the structural elements of working in EMS such as shift

work, the risk of being injured in line of duty and fatigue [19]. Organizational stress included factors associated with the culture within the organization in which ambulance personnel work (such as conflict with supervisors, constant changes in policies). The ambulance personnel were asked to report levels of stress over the past six months on a 7-point Likert scale ('no stress at all' to 'a lot of stress'), and the responses was summed to give a score ranging from 10 to 70 [19].

Impact of Event Scale-Revised (IES-R)

The fifth section used the Impact of Event Scale-Revised (IES-R) to assess post-traumatic stress symptoms experienced in the past seven days in relation to the most troubling critical incident encountered in the line of duty in the past 6 months. It is a scale that predates the introduction of the DSM IV PTSD diagnosis but has the advantage of being used widely as a measure of traumatic stress in a variety of occupational settings [7, 34]. This 22-item scale contains questions which cover three PTSD symptom clusters namely: intrusion (recurring images, dreams, thoughts or perceptual experiences), avoidance (efforts to avoid thoughts, emotions or conversations) and hyper-arousal (increased vigilance or greater anxiety, concentration difficulties). The ambulance personnel reported their current symptomatic stress on a five-point Likert scale (0-4) in response to any critical or traumatic event/s experienced while being on duty in the past month. Higher scores obtained indicated greater symptomatic stress and a cut off score above 35 was considered indicative of PTSD 'case' [34].

SF-36 Quality of Life questionnaire (SF-36 QOL)

The final component assessed quality of life. Reduced quality of life and interference with occupational functioning due to emotional problems such as feeling depressed, anxious or stressed was measured using three questions from the SF-36 Quality of Life questionnaire (SF-36 QOL). This validated tool comprises of 36 questions and is a widely used to measure general health status [35].

Author questionnaire (Section II)

The questionnaire concluded by enquiring where ambulance personnel would prefer receiving support for work related stress (managers, colleagues, friends or family, psychology services onsite, external psychology services, own private health provider, spiritual/religious leaders) and what barriers they have faced in accessing support systems.

PILOT STUDY

A pilot study was conducted on 3 operational and 2 administrative and staff at two ambulance stations between 10th and 14th November 2019. The pilot study was used to test the comprehensibility, acceptability, and ease of use of the electronic questionnaire as well as the time taken to complete the questions. It was at this phase that the need for manual version of the questionnaire was identified as some participants preferred pen and paper or had poor internet access.

DATA ANALYSIS PLAN

Primary data was collected using an electronic questionnaire and an identical manual version with data subsequently transcribed into a Microsoft Excel sheet before being cleaned for analysis. Secondary data obtained from administrative and People Management Department (Human Resources) such as a list of the type of job categories and annual pay scales (anonymous) were entered into a password protected Microsoft Excel sheet. Stata 14.0 software was used for analysis of all data collected. The associations between, sociodemographic and occupational factors, critical incident exposure with the presence of post-traumatic disorder were investigated as outlined below:

Predictor variables

<u>Pre-trauma factors:</u>

1. Duration of employment: continuous variable but could be converted to categorical variables if necessary (short vs long duration).
2. Type of employment: operational and support staff (categorical variable)

3. Location of work (rural vs urban: binary variable)
4. Marital status: married, single, divorced/widowed (categorical variable)
5. Pre-existing prior psychiatric disorder diagnosis (yes or no: binary variable)

Peri and post-trauma factors:

1. Critical incident exposure: frequency and intensity of exposure. Continuous variable, could be converted to categorical variables if needed (high vs low exposure)
2. Chronic stress exposure: organizational and operational stressors. Continuous variable but could be converted to distinct categorical variables as required (organizational vs operational stressors)
3. Resilience: adaptive behaviours. Continuous variable but can be converted to categorical variable (low resilience vs high resilience)

Outcome variables

1. Current PTSD: continuous variable (cut off score of above 35 will be indicative of PTSD 'case') but could be converted to categorical variables if necessary (into yes or no PTSD as needed for logistic regression for example)
2. Intensity of PTSD by subscales: continuous variable representing intensity of intrusion, hyper-arousal and avoidance symptoms
3. Reduced quality of life (SF-36 QOL score): continuous variable representing role limitations due to emotional problems such as feeling depressed, anxious or stressed.
4. Substance use: alcohol, smoking and drugs (yes vs no).

Covariates

1. Potential confounders that were considered include age (continuous variable), gender (nominal variable); level of education: basic, certificate, diploma and degree (categorical variable)

The distribution and frequencies of each variable were summarised using univariate analysis. Descriptive statistics such as mean (standard deviation) and median (IQR) were used when appropriate. Associations between exposures and outcomes were assessed using bivariate analysis. Correlational analysis for continuous variable was conducted while associations were represented graphically with the use of scatter plots.

Multiple logistic regression was used to investigate associations between predictor variables (critical incident and chronic stress exposure, sociodemographic and occupational exposures, resilience) and clinical outcomes (probable PTSD diagnosis). Multivariate logistic regression was used to adjust for possible confounders (age, gender and education level).

LIMITATIONS

a. Due to resource limitations, the study was unable to use the gold standard test for the diagnosis of PTSD (clinician-based diagnostic interview), thus the IESR was used as a measure of PTSD diagnosis.
b. The evidence for the validity of the PTSD screening tools, especially from the lower middle-income context (LMIC) context, is scarce however it was deemed appropriated that as a widely used and validated tool, IES-R may be used [22, 34].
c. Social desirability bias may occur whereby participants respond in a socially acceptable manner (mental health and substance use questions as an example). This was addressed by visiting ambulances bases and meeting with union representatives to assure participants of the confidentiality of the data provided and afforded participants secure spaces wherein to complete the questionnaire at their own preferred time (at home or at work).
d. Underreporting of psychological symptoms, which could lead to an underestimation by study estimates (macho culture and stigma). This was addressed by visiting ambulances bases and meeting with union representatives to assure participants of the potential benefits of the research and that no punitive measures will follow. Supervisors and managers were sensitized to the need for an environment which encourages expression of psychological symptoms without potential negative effects to be assured.

e. Recall bias on traumatic events experienced in the past 6 months or more was a possibility.
f. Healthy worker effect is a limitation as those who have spontaneously recovered or left the job due to more severe levels of symptomatic stress would be missed. As a result of possible relocation or accommodation of those who cannot function in their normal work due to ill health, the questionnaire was provided to all employees with EMS regardless of role or station.

ETHICS AND COMMUNICATION

This study was submitted for and obtained ethical approval from the University of Cape Town Human Research Ethics Committee of the Faculty of Health Sciences (HREC 517/2019, Appendix 10). The research was conducted within the guidelines provided by the Belmont Report and Declaration of Helsinki throughout its duration (15, 16) and by the guidelines outlined by the Western Cape Provincial Research Ethics Committee (Appendix 11).

Autonomy (informed consent)

Participation in the study was voluntary and at no cost to the employer or employees. Written informed consent (entered electronically or manually) were provided prior to the completion of the questionnaires.

Confidentiality

The study data was recorded by a survey number and the employee persal number was provided by the participant only as an option. All data obtained was coded and employee confidentiality was maintained using password protected computers and software (Microsoft excel). All electronic data was held in strict confidence as per the School of Public Health and Family Medicine at University of Cape Town guidelines. Where public or academic presentations would be made; only summary data would be presented, and no personal identifiers used.

Beneficence

Although the primary and secondary collection of data including its analysis did not have immediate benefits for the ambulance personnel, the study findings provided insights into the extent of exposures to critical incident events and chronic stress experienced by ambulance personnel, and their relationship with PTSD. The study also explored barriers faced by ambulance personnel in accessing support including how they preferred to be supported when experiencing work stressors. Important information was gained from this and can be used to develop programmes for the prevention of PTSD and to inform the development of interventions appropriate for this occupational group.

Non-maleficence

The study was low risk to participants. Stein et al in discussing ethical aspects of research on psychological trauma noted that completing PTSD scales may trigger memories of critical incidents experienced in the past however this was of low risk [36]. Study participants that may suffer such discomfort were able to stop completion of the questionnaire and return to it at a later stage. The EMS Employee Assistance Programme Coordinator and Occupational Health district coordinators were available throughout the duration of the study to support participants who may require support. Furthermore, participants were provided with contact details where further assistance can be sought through an employer provided counselling service which has been contracted to a third party (ICAS). The researcher was also available to be contacted should this be required. All participants were required to give informed consent after being informed of the potential benefits and risks associated with the study. Participants were able to withdraw from the study at any point and there was impact on their job security or progression (supported by the EMS Director). Participants were also provided with the option to be contacted by the researcher should it be found that they are at increased risk of being a PTSD case. Once identified, they were called or contacted by email and advised and appropriately referred for care (referral letter provided).

Justice

The increased risk of stress and trauma related mental health conditions in ambulance personnel reported in both local and international literature justified research conducted with a special focus on this at- risk occupational group.

Reporting and dissemination of research results

A full report is to be sent to the employer, management team, labour unions and staff and occupational health/wellness teams within EMS. The results of the study were used for the purposes of an MMed dissertation and the results are to be submitted to a peer-reviewed scientific journal (local and international). Oral presentations on the results are to be made to the employer, employees, labour representatives and academics during research days and local/international conferences.

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Funding was sourced only from the School of Public Health and Family Medicine, Division of Occupational Medicine's Fund. No additional funding was required.

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PART B: STRUCTURED LITERATURE REVIEW

INTRODUCTION

BACKGROUND

Emergency workers, which include ambulance personnel, firefighters, and police officers are often the first who are called upon to respond to violent situations which expose them to several occupational hazards. These hazards may include verbal/physical assault to oneself and or colleagues, threats, sexual harassment and abuse, exposure to hazardous body fluids and chemicals, ergonomic hazards and psychological hazards [1-4]. The psychological hazards are related to exposure to acute traumatic situations and chronic stressors which are continuously present; both have been associated with the onset of stress reactions such as post-traumatic stress disorder (PTSD) including other trauma related conditions such as acute stress disorder [2, 5, 6].

STRUCTURE OF EMERGENCY MEDICAL SERVICES IN SOUTH AFRICA

Emergency Medical Services (EMS) in South Africa have historically been provided by the public sector through provincial Departments of Health while it has also increasingly been provided by private sector though access is limited due to cost [7, 8]. A number of challenges are faced by the public sector in providing these services, some of which include severe underfunding that stifles service delivery and leads to the lack of critical equipment, medicines and staff shortages amidst an increasing burden of disease that includes unintentional and intentional injuries [7, 9]. In addition to these challenges, violence towards ambulance personnel has been on the increase with a number of EMS vehicles attacked by gangs and criminals, getting hijacked or robbed whilst personnel are threatened with verbal and physical assault on a regular basis [7, 9].

The Health Professions Council of South Africa provides oversight and control over the training of emergency care professionals in South Africa [10]. There are currently several professional categories with different skill sets based on the training received; which can range from a few months to four years. Current categories of professionals have been merged with historical names and include: Basic Ambulance Assistants (Basic Life Support), Emergency Care Technicians (Intermediate Life Support), and Emergency Care Practitioners/Paramedics (Advanced Life Support). The term ‘paramedic’ has often been used to refer to all EMS professionals however it is a distinct staff category. This review will refer

to the collective of EMS professionals as ambulance personnel to distinguish them from other emergency service workers who perform first responder work such as firefighters, general rescue workers and police officers.

LITERATURE SEARCH STRATEGY

This review focuses on post-traumatic stress disorder (PTSD) associated with emergency or first responder work as it continues to be the most reported adverse mental health effect in this high-risk group. Google Scholar and MEDLINE were searched to identify relevant articles on adverse mental health outcomes in emergency medical service or ambulance personnel from 1980-2020 (during which time the majority of PTSD research in this occupational group were conducted). Review articles found in the process were then examined further for additional and earlier citations. The key words used included: paramedic, ambulance personnel, first responder, rescue worker, emergency medical services, work related, post-traumatic stress disorder, PTSD, critical incident stress, trauma, predictors, risk factors, prevalence, systematic review. Reports and literature from well-established international occupational health and safety institutions including the Health and Safety Executive (UK), Canadian Centre for Occupational Health and Safety and the National Institute for Occupational Safety and Health (USA) were also reviewed.

OCCUPATIONAL HEALTH HAZARDS ENCOUNTERED BY AMBULANCE PERSONNEL

Exposure to occupational hazards often occurs during the varied and often physically and mentally challenging work activities undertaken by ambulance personnel while responding to both routine emergencies (such as motor vehicle accidents and medical emergencies) and specific events such as natural disasters, industrial accidents transport accidents (rail and aircraft accidents)[2, 4, 7]. Table 1 outlines the various occupational hazards ambulance personnel are potentially exposed to in the work environment.

Table 1: Occupational hazards in ambulance personnel [1, 2, 4, 7, 11]

OCCUPATIONAL HAZARD	EXAMPLES
Physical and safety	Motor vehicle accidents, fires, noise from siren, homicide, physical and sexual assault, temperature extremes, natural/man-made disasters
Biological	Exposure to infectious body fluids (HIV, Hepatitis B & C), Coronavirus disease (COVID-19), Tuberculosis, Ebola, Severe acute respiratory syndrome
Chemical	Chemical spills, poisoning, ambulance surface cleaners, latex gloves
Ergonomic	Musculo-skeletal injuries (back and joint strain/injury, upper limb disorders)
Psychosocial	Shift work, sleep deprivation, trauma/critical incidents exposure (acute and chronic), workplace bullying and harassment

Exposure to these hazards places ambulance personnel at greater risk of sustaining occupational injuries and developing occupational diseases in comparison to the general population and other health care professionals. A review of health workers compensation data in Australia found that between 2009 and 2012, ambulance personnel were 13 times more likely to develop lower back/musculoskeletal injuries (Hazard Ratios: 57.6 vs 4.4) and mental injury compared to nursing professionals (Hazard Ration: 17.77 vs 1.29) [1]. Mental injury was defined as mental health disorders that result from exposure to "workplace stressors such as traumatic situations, violence and work pressure, and include anxiety, depression and nervous breakdown". The study highlighted the increasingly important role psychosocial hazards are playing in the work environment.

Psychosocial hazards experienced by ambulance personnel can be classified as those related to exposure to acute traumatic situations and chronic stressors which is continuously present [12]. Exposure to acute stressors (also known as critical incident stress) includes those related to patient care such as treating seriously injured patients, experiencing threats to life or physical integrity, responding to sick or dying children and providing care to family or colleagues. Chronic work-related stressors include excessive physical and mental demands on the job (workload), poor organization, interpersonal conflicts in the work environment, lack of support and a requirement to work night shift [12, 13]). Exposure to these work-related stressors have been associated with the onset of stress reactions including post-traumatic stress disorder, acute stress disorder and other trauma related conditions [12].

WORK RELATED MENTAL HEALTH CONDITIONS

Overview of PTSD and other trauma related disorders

PTSD was only recognized as a mental health/psychiatric disorder in 1980 to better understand and link exposure to traumatic events or stressors to various psychological manifestations [14]. The criteria required to meet the diagnosis has since undergone considerable changes (DSMIII-R in 1987 and DSM-IV in 1994) with a focus on improving the definition of the stressor criterion that now places a greater emphasis on the patient's own subjective experience of the trauma in comparison to an extended range of traumatic events [14, 15].

In the latest version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), PTSD in adults is defined as "an exposure to actual or threatened death, serious injury or sexual violence resulting from directly experiencing or witnessing the traumatic event or learning that it occurred to a close family member or friend". Additionally, and of relevance to ambulance personnel, "repeated or extreme indirect exposure to aversive details of the event(s), usually in the course of professional duties (e.g., first responders, collecting body parts; professionals repeatedly exposed to details of child abuse)" has been added in the latest diagnostic criteria as an independent stressor (criterion A4)[16]. Other criteria to be satisfied include intrusion symptoms, persistent avoidance of places/activities associated with the traumatic incident, altered cognition and mood, hyper arousal and reactivity [16]. The symptoms should also last longer than one month, be a cause of clinically significant distress and should not be on account of substance use or other medical condition [16].

Where symptoms persist for at least three days to one month after trauma exposure with more dissociation symptoms, other non-PTSD conditions such as an acute stress disorder (ASD) should be considered. A review by Shalev [17] noted that the majority of patients with ASD (80%) tend to go on to develop chronic PTSD. However, the majority of those who develop PTSD were not previously diagnosed with ASD. Other stress and trauma related diagnoses to be differentiated from PTSD include adjustment disorders which occur during times of significant life changes which causes impairment in social functioning and performance [14, 16].

Overview of non-PTSD disorders following trauma

PTSD commonly occurs with other mental health disorders such as depression, substance use disorders (alcohol, drugs, smoking) and anxiety disorders [14]. It has been noted that about half of those diagnosed with PTSD are likely to also develop depression while substance abuse is common in the same proportion of males with PTSD and a third of females. Anxiety disorders are also commonly associated with PTSD while psychotic disorders may be triggered by traumatic experiences which however is uncommon. Physical symptoms and disorders likely to be reported by those diagnosed with PTSD include cardiovascular diseases, obesity, musculoskeletal symptoms, chronic pain and sleeping disorders [14, 18]. It is postulated that PTSD may increase affected individual's susceptibility to these other disorders, that those with these disorders may have pre-existing individual vulnerabilities to PTSD and these other disorders and that the co-morbid conditions may possibly arise as a complication of PTSD [14].

THE PREVALENCE OF PTSD IN THE GENERAL AND WORKING POPULATION

Prevalence of PTSD in the general population

Initial prevalence studies on PTSD were undertaken in military veterans, patients and those surviving major disasters however later progressed to include more representative community samples [14, 19]. Though studies have varied according to country/locality, cultural context, stressors included, and manner of assessing for PTSD; Klein and Alexander [15] note that most people in a population experience at "least one traumatic event" in their lifetime however only a minority go on to develop PTSD. It has been noted that females have higher PTSD prevalence, and this may be due to experiencing more trauma or being victims of traumatic exposures such as sexual abuse.

Cross sectional data analysed from 26 population surveys in the World Health Organization (WHO) World Mental Health Surveys (71 083 participants) estimated the lifetime prevalence of PTSD in the general population to be 3.9% [20]. The lifetime PTSD prevalence amongst the trauma exposed was 5.6% while the 12-month prevalence was 2.85%. There was significant variation between countries, WHO regions and income groups, with higher lifetime

prevalence in high-income countries (6.9%) compared to lower middle-income countries (3.0%). The 12-months prevalence (among the exposed) in the Africa region was lowest at 1.0%. These results are to be interpreted with caution due to variable response rates across countries (45.9–97.2%) and recall bias since exposures and PTSD was assessed retrospectively and cultural influences to responses given, may in particular account for the regional differences.

In evaluating the lifetime prevalence of psychiatric disorders, the South African Stress and Health (SASH) Study [21] conducted as part of the WHO World Mental Health Surveys found the most common mental health disorders to be; anxiety disorders (15.8%), substance use disorders (13.3%) and mood disorders (9.8%). The lifetime PTSD prevalence was 2.3% and the 12-month prevalence was 0.7%.

Prevalence of PTSD in the working population: a global perspective

The work of emergency workers predisposes them to the development of PTSD [22, 23]. Besides first responders, other affected occupational groupings include health care workers in emergency centres and mental health institutions, train drivers, journalists and working in settings such as banks where armed robberies and industrial disasters are likely to occur [24].

Berger et al (n = 20 424) conducted a meta-analysis which found a PTSD prevalence of 10% in rescue workers which was more than that of the general population (1.3 -3.5%) but also varied depending on occupational grouping, being the highest amongst ambulance personnel (14.6%, CI 8.80 - 20.30) compared to fire fighters (7.30%, CI 3.60 - 11.00) and police officers (4.70%, CI 1.20 - 8.30)[24]. The higher PTSD rates may occur because ambulance personnel respond to a greater number of calls than fire fighters and police officers combined, have more sustained work pressure and stress when on duty often under challenging circumstances whilst having greater personal contact with patients and their families. These factors may increase feelings of guilt, blame or worthlessness where there is failure to assist a victim timeously or successfully [6].

Several systematic reviews and meta-analyses that have investigated the prevalence of PTSD in ambulance personnel have found similar prevalences (Table 2). Sterud et al [25] found that PTSD prevalence in five of seven studies was approximately 20% and that ambulance personnel had a higher prevalence of anxiety and general psychopathology. Further statistical analysis demonstrated a higher standardized mortality rate, increased injuries and fatalities arising from accidents and greater levels of early retirement on medical grounds (standardized ratios) compared to the general population.

Table 2: Systematic reviews and meta-analysis of the prevalence of PTSD in ambulance personnel

Reference	Aim of review	Study design	Studies included	Key findings	Comments
Sterud, Ekeberg & Hem. 2006 [25] (systematic review)	To determine PTSD prevalence Review general health problems, work-related & individual health predictors of PTSD in the ambulance services	Several databases between 1966 and 2005 No language restrictions Systematic reviews and observational studies included	49 studies in total (on general health problems, work-related & individual health predictors of PTSD) 29 cross sectional self-report studies	PTSD prevalence: 20% in five of seven studies Prevalence of depression, anxiety and general psycho-pathology: 20% in four of five studies.	Unclear if findings are different from other occupational groups/general working population.
Berger et al. 2012 [24] (systematic review and meta-analysis	To estimate PTSD prevalence in rescue workers. To determine factors leading to large variability of reported prevalence estimates.	Several databases up until September 2008 No language restrictions Data from PTSD prevalence surveys of first responders included.	28 studies in total 20,424 rescue workers (includes 1265 ambulance personnel)	The worldwide pooled PTSD prevalence (random effects model analysis) of 10.0% (95% CI: 8.1-11.9%). PTSD prevalence in ambulance personnel: 14.60% (CI: 8.80 - 20.30%)	Majority of studies conducted in high income countries (26 Europe & North America; 7 Asia; 5 Oceania; 1 Africa & 1 South America) I^2 statistic and chi-square test for heterogeneity: confirmed rescue workers as very heterogeneous group (I^2 = 95% and $\chi 2$ = 869.92; df = 39; P <0.001, respectively), & have variety of variables influencing the prevalence of PTSD. Addressed using: sub-group analysis, stratification, meta-regression analysis

Jones. 2017 [26] (systematic review)	To describe effect of work-related trauma exposure on the mental health of first responders	Several databases between 1995 and 2015 English language studies Observational studies, excluded systematic reviews and RCTs.	27 studies included in total 18 studies for fire fighters, 9 were EMTs and paramedics from across the world.	Prevalence of PTSD, depression, suicidality, anxiety, problematic alcohol use, and sleep disturbances exceeded those of general populations.	Most studies conducted in high income countries: 12 United States, 4 Australia, 2 Brazil, 2 United Kingdom, 2 Germany, 1 Canada, 1 Netherlands, 1 Poland, 1 Scotland, 1 South Africa, and 1 Taiwan
Petrie et al. 2018 [27] (systematic review and meta-analysis)	Determine updated prevalence of PTSD and common mental health disorders in ambulance personnel worldwide.	Several databases between 1966 and 2018 English language Cohort study x1, all others cross sectional Articles published between 1988 and 2016 however majority (73,1%) had data collection occurring between 2000 - 2016	27 studies included in total, with 18 studies used for meta-analysis. Ambulance personnel (n= 30,878)	Estimated prevalence: 11% for PTSD, 15% for depression, 15% for anxiety, 27% for general psychological distress Random effects modelling used to estimate pooled prevalence. High heterogeneity noted: subgroup analyses and meta-regressions for five variables implicated in heterogeneity performed.	Most studies conducted in high income countries: 1 Africa, 8 America (North and South), 4 Australia, 14 Europe Evidence of publication bias (lack of smaller studies with lower prevalence) but unlikely to have large impact on reported prevalence. Sensitivity analysis excluded all studies with samples less than 250 individuals: PTSD prevalence estimate was similar (11%; 95% CI 4–18%)

Prevalence of PTSD in ambulance personnel: South Africa and middle-income countries

There has been a paucity of research in South Africa and similar lower middle-income countries (LMICs) on PTSD in first responders and in particular ambulance personnel (Table 3). Ward et al [6] found South African emergency personnel including ambulance, fire and sea rescue service workers had increased exposure to critical events and higher rates of general psychopathology compared to those in high income countries (88% having experienced a critical event during the past two months compared to 66% in Swedish ambulance personnel). South African ambulance personnel (n = 189) found the most traumatic encounters in the course of their work being incidents involving children (27%), significant work related injury or death of a colleague (17.1%), the death of a patient being attended to (13.2%) and assisting victims of violent crime (8.2%) [5]. The majority (94%) of paramedic trainees (n = 131) at a South African university in the Western Cape reported having directly experienced trauma directly or witnessed it [28]. The most common encounters being transport accidents (53%), the sudden death of someone close (51%) and witnessing life-threatening illness or injury (51%). Of note is that 16% of paramedic trainees were diagnosed with PTSD, depression (28%), substance use disorder (alcohol) (23%) and chronic perceived stress (7%).

A cross sectional study in the Cape Metropolitan area conducted by Steward and Swartz [29] diagnosed 6.7% of ambulance personnel with PTSD which was surprisingly lower than that found in high income countries. A limitation in the study include possible under reporting of symptoms and bias possibly introduced by a poor response rate (26%) to the 385 screening questionnaires sent out [27]. The participants however did report seeking treatment for depression (53%), stress (53%), anxiety (41%) and PTSD (35%); highlighting the high prevalence of co-morbid mental health conditions in ambulance personnel and the complexity involved in managing workers affected by these.

Other middle-income countries that have studied PTSD in ambulance personnel include Egypt, Ethiopia and Brazil. A cross sectional study in Egypt found that 13,6% of emergency medical responders (EMR) had PTSD compared to 2.9% in a comparative group. The EMR group additionally had significantly higher emotional exhaustion (20%) and depersonalization

(9.3%). Bezabh et al [30] determined the overall PTSD prevalence in Ethiopian firefighters, ambulance nurses and rescue workers (n= 603) to be 19.9% (95% CI 16.9 to 23.1). When stratified according to occupation, ambulance nurses had a PTSD prevalence of 11.5% (95% CI 6.2 - 17.0), firefighters a prevalence of 20.7% (95% CI 17.2 - 24.8) while search and rescue workers had a PTSD prevalence of 38.7% (significantly higher than the overall prevalence of 19.9%). A study in Brazil reported a prevalence of 15% full PTSD and 5.6% partial PTSD amongst 234 ambulance workers while impairments in mental and physical domains were also noted [31]

Table 3: Prevalence rates of post-traumatic stress disorder (PTSD) in ambulance personnel in South Africa and other low- and middle-income countries

Study and country	Subjects (n)	PTSD Prevalence	Prevalence of other mental health conditions	Tools used
Stewart and Swartz. 2005 Cape Town, South Africa [29]	99 paramedics	6.7%	Participants sought treatment for: Depression (53%), Stress (53%) Anxiety (41%), PTSD (35%)	Questionnaires: Harvard Trauma Questionnaire
Ward et al. 2006 Cape Town, South Africa [6]	1099 emergency workers 295 public and private ambulance personnel	None specified PTSD symptoms increase as critical incident exposure increases	Symptoms of PTSD and anxiety, depression as critical incident exposure increases	Questionnaires: CCI, GHQ-28, CAGE, IES-R
Fjeldheim et al. 2014 Cape Town, South Africa [28]	131 paramedic trainees	16%	Depression: 28% Alcohol abuse: 24% Alcohol dependence: 8%	Questionnaires: LEC, DTS, CES-D, AUDIT
Minnie et al. 2015 Cape Town, South Africa [5]	198 paramedics	None specified Increased avoidance after exposure to critical incident		Questionnaires: IES-R, COPE
Khashaba et al. 2014 Mansoura City, Egypt [32]	140 paramedics	13.6%	Depression: 28%	Questionnaires: MBI, BDI, DTS,
Bezabh et al. 2018 Addis Ababa, Ethiopia [30]	113 ambulance nurses	11.5% (95% CI 6.2 to 17.0)	-	Questionnaires: PCL-C
Berger et al. 2007 Brazil [31]	234 ambulance workers	5.6% partial PTSD 15% full PTSD	-	Questionnaires: PCL-C, SF-36
Kerai et al. 2017 Karachi, Pakistan [33]	518 EMS personnel	Higher severity (PTSD score) Mean (SD) IES-R score: 23.9 ± 12.1	Anxiety and depression predict PTSD Substance use problem (34.3%) Medicine to relieve stress (5.2%)	Questionnaires: IES-R, Brief COPE, CAGE-AID, AKUADS

FACTORS ASSOCIATED WITH THE DEVELOPMENT OF PTSD

Correlates and predictors of PTSD in trauma exposed adults

Two landmark meta-analyses by Brewin et al in 2000 [34] and Ozer et al in 2003 [35] on predictors of PTSD categorized these into demographic/pre-trauma factors, peri-traumatic (during the trauma) and post-trauma factors (see Table 4). Brewin et al [34] found significant yet modest effect estimates for the 14 risk factors studied; peri-traumatic and post traumatic factors however had stronger associations with PTSD than pre-traumatic factors. Demographic factors such as gender, age at which trauma occurred and race predicted PTSD in only few populations. More consistent (but to varying extent based on population studied and methods used) were factors such as education level attained, previous trauma and having experienced adverse childhood experiences. Stronger and more consistent predictors included factors such as trauma severity, prior personal and/or family history of psychiatric illness, having experienced childhood abuse, poor social support and concurrent stressors in participant's lives. Ozer et al [33] similarly, found that seven factors studied were all significantly associated with PTSD. Family history, previous trauma and adjustment having the lowest effect size (weighted r = 0.17) while peritraumatic dissociation had the highest (weighted r = 0.35) suggesting that peri-traumatic factors are a better predictor of PTSD than pre-existing characteristics.

Table 4: Correlates and predictors of post-traumatic stress disorder [15, 32 – 33]

Pre-trauma factors	Peri-trauma factors	Post-trauma factors
*Gender (more prevalent in females) *Younger age *Lower socio-economic status *Educational level (lower) *Intelligence level (lower) *Minority racial status *Previous trauma *Childhood trauma and child abuse *Personal psychiatric history *Psychiatric history in the family	*Trauma severity, frequency and intensity *Life threatening trauma *Peritraumatic adverse emotions *Dissociation during traumatic event (or after)	*Poor/lack of social support *Life stressors

Predictors of PTSD in ambulance personnel

The exposure of ambulance personnel to traumatic stress and critical incidents of certain type and frequency including chronic stress has been consistently found to be a predictor of PTSD [13 – 15]. Rybojad et al [13] in Poland found that PTSD symptoms were more likely in ambulance personnel who provided care to victims involved in mass casualties and brutal rape, child victims and own family members including assisting in multiple traumatic events. Donnelly et al [12] further noted that chronic operational stress was an independent predictor of PTSD as well as in combination with critical incident stress. Demographic risk factors observed through a number of cross-sectional studies include; younger age, female gender, being less educated or occupying lower ranks within the ambulance service [13, 33, 36, 37]. Other significant predictors relate to work place factors (organizational stress, interpersonal conflict, patient factors) [12, 14, 33, 36, 37], lack of social support from colleagues and management [28, 38], pre-existing psychiatric illness (anxiety and depression) and poor coping style [33]. Trainee ambulance personnel seem to have similar risk factors. A local study of paramedic trainees at a Western Cape university found that the frequency of trauma exposures, being diagnosed with depression, resilience and level of social support were predictors of PTSD [36].

COPING MECHANISMS AND MEDIATING FACTORS

Ambulance personnel find difficulty in dealing with stressful and traumatic events which may predispose them to the development of PTSD [39-41] and as such develop a range of personal coping mechanisms to deal with these. A scoping review by Alnasser [41] found that though the studies were highly variable, the three key coping mechanisms were the use of humour, the use of alcohol and the use of family support. Focus groups held with ambulance personnel to understand the way they cope with the death of children found that the mechanisms could be classified as “Solve, Solace, Dismiss, and Escape” based on whether they approached or avoided the problem or the emotion [39]. Problem focused approaches include dismissing and “soldiering on” while emotion focused approaches include passive or active avoidance techniques (“escape”). Problem focused mechanisms to solve the problem included debriefing, self-affirmation and preventing burnout and secondary trauma. Methods of

seeking solace included seeking peer and social support from family/friends, seeking professional help as required, undertaking reflection and self-care.

In surveying 189 ambulance personnel in Cape Town, Minnie et al [5] showed that respondents were exposed to critical incidents on a daily basis; 72% of the ambulance personnel noted however having received little or no training on adverse effects of exposure to trauma and how to manage these. Furthermore, they used emotion focused coping mechanisms (63%) more than problem focused coping (28.4%). About half of the participants (45%) reported speaking to a colleague as a key method of coping with the incident. These were similar findings amongst Canadian paramedics where more than 80% (n=145) indicated preference for a friend or family member as a source of support in dealing with work related stress and 70% for a work partner/colleague [12].

A concept that has gained increasing attention as mitigating the effects of stress following trauma through using behaviours that facilitate adaptation is resilience. Resilience is defined by Bonanno as "the ability to maintain a state of normal equilibrium in the face of extremely unfavourable circumstances" [42]. There are various factors which promote resilience which can be important in protecting ambulance personnel. These include building on attitudes and coping strategies, building self-esteem and encouraging a sense of humour. Developing resilient qualities may assist ambulance personnel in meeting and overcoming the challenges related to their work. In evaluating resilience in qualified paramedics (n = 146) compared with second year paramedic students (n = 73), Gayton and Lovell found resilience was increased in the paramedics compared to the students, while higher resilience was positively correlated with improved overall health and well-being [43].

SOUTH AFRICAN LEGISLATIVE FRAMEWORK ON PTSD

The Compensation for Occupational Injuries and Diseases Act 130 of 1993 (COIDA) is an act of parliament in South Africa through which compensation for disablement or death caused by occupational injuries or diseases is provided. According to the act, benefits includes payment for (a) temporary total or partial disablement (up to 75% of normal wage) for up to 24 months, (b) medical expenses for up to 24 months, and (c) compensation for permanent

disability when a final medical report has been received by the Compensation Commissioner[44].

The Western Cape Department of Health as a provincial government is an "exempted" employer as per section 84 of the COID Act and therefore does not contribute financially to the Compensation Fund but secures its own budget for compensation costs generated by claims that have been adjudicated and accepted by the Compensation Commissioner of the Compensation Fund. Of note and unique to the Western Cape Government is that employees receive full pay on incapacity leave (rather than the statutory 75% under COIDA) and can receive medication at state facilities for an occupational disease or injury after a period exceeding the statutory 24 months.

Circular Instruction 172 has classified PTSD as an occupational injury on the basis of the traumatic event or stressor that must have arisen from an accident sustained in the course of an employee's employment and resulting in personal injury requiring medical aid or resulting in disability or death. The diagnosis should be made using internationally accepted diagnostic criteria and only a psychiatrist should confirm the PTSD diagnosis. A notice for a claim for compensation must be made within one year after the date of the accident. Little is known of the number of cases accepted annually by the Compensation Fund at present, however it appears to be high on the list of injuries. Between 2001 and 2006, PTSD was the second highest reported occupational disease in the non-mining sector in South Africa with 970 cases reported in 2001 and 816 cases reported in 2006 [45]. In the Western Cape Emergency Medical Services, by the end of April 2019, there were 62 reported PTSD cases accounting for 3% of the EMS workforce [46].

IMPACT OF PTSD ON WORK OUTCOMES

There are a variety of costs related to employees developing work related PTSD particularly if there is failure to adequately diagnose and treat the condition [47]. These costs are not only borne by the employer but also the employee and their family. A review by Wise [47] of workers compensation and its response to psychological injuries in the United States found

that employees diagnosed with PTSD and other psychological injuries, suffer considerable impact and incur substantial costs. These include medical costs related to access diagnostic services, treatment and follow up for PTSD and managing the development of complications including secondary mental disorders such as anxiety, depression and substance use disorder; the cost related to completion and follow up of compensation costs and adjusting to reduced salary income; and finally costs related to the impact of PTSD on the job including developing increased risk of accidents and further injuries on the job, absenteeism, job loss due to deteriorating performance emanating from the PTSD, early retirement and the additional cost of training replacement employees [47]. The human costs to the employee and family further include negative outcomes associated with absent or poor parenting, relationship problems that may lead to separation or divorce and suicide.

CONCLUSION

This literature review has consistently demonstrated that ambulance personnel and other emergency services workers are exposed to a variety of occupational hazards including stress and critical incident exposure which predispose to the development of mental health conditions such as PTSD, depression, anxiety and substance use disorder. There is a paucity of research in this field particularly in low and middle-income countries on identifying factors that not only predispose ambulance personnel to the development of PTSD, but an understanding of what their preferred coping mechanisms are and how they can be better supported.

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PART C: JOURNAL ARTICLE MANUSCRIPT

The format for submitting a manuscript to the Occupational and Environmental Medicine Journal was followed. The guidelines for authors are contained in Appendix 11.

PREDICTORS OF POST-TRAUMATIC STRESS DISORDER AMONG AMBULANCE PERSONNEL IN THE WESTERN CAPE PROVINCE

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ABSTRACT

Objective: To determine the factors associated with an increased risk for PTSD in ambulance personnel and the barriers faced in accessing support for work related stress (WRS).

Methods: A cross-sectional study of voluntary participants comprising 388 ambulance personnel was conducted. Participants completed self-administered questionnaires: Impact of Event Scale-Revised (IES-R), EMS Critical Incident Inventory (CII), EMS Chronic Stress Questionnaire (EMS-CSQ), SF-36 Quality of Life questionnaire (SF-36) and Connor-Davidson Resilience Scale (CD-RISC) which were used to assess PTSD and level of occupational stressors.

Results: The prevalence of PTSD in the study population was 30%. Participants were predominantly female (55%), median age 38 (IQR; 31 - 44) years with a professional qualification (83%). Those with PTSD were more likely current smokers (OR=1.76, 95% CI: 1.05 - 2.95), current illicit drug users (OR=16.4, 95% CI: 1.87 - 143.86) and problem drinkers (OR=3.86, 95% CI: 1.80 - 8.23). A self-reported mental health condition (OR=3.76, 1.96 - 7.21), being treated for a medical condition (OR=1.95, 1.22 - 3.11), exposure to chronic WRS (OR=1.05, 1.04 - 1.07) and high critical incident stress score (OR=1.03, 1.02 - 1.04) were positively associated with PTSD risk. Barriers to seeking help for WRS included concerns that services were not confidential, and that the participant's career would be negatively affected.

Conclusion: The PTSD prevalence in ambulance personnel is considerably higher than that found in previous studies conducted among this occupational group in the Western Cape. Identified risk factors should inform interventions designed to support ambulance personnel and a greater focus on addressing barriers to accessing care is needed.

Key words: occupational, paramedic, ambulance personnel, PTSD, predictors, barriers

KEY MESSAGES:

What is already known about this subject?

- Ambulance personnel are exposed to various occupational stressors which predispose to the development of stress reactions such as PTSD
- There is an increased prevalence of PTSD in ambulance personnel compared with the general population and other emergency workers

What are the new findings?

- Those with a mental health condition, receiving treatment for a medical condition, self-reported substance use, working in an urban area and exposure to high chronic and critical incident stress score were at increased risk for PTSD
- Barriers identified as limiting access to available support for work related stress include concerns that services were not confidential, and that career progression would be negatively affected

How might this impact on policy or clinical practice in the foreseeable future?

- The high rates of organizational and work-related stress experienced by this population and the strong associations between PTSD and substance use, offer starting points for interventions aimed at reducing the burden and impact of PTSD.
- Greater attention needs to be focused on barriers that have been identified as limiting access to available support for work related stress for improved mental health outcomes

INTRODUCTION

Emergency workers are exposed to several occupational hazards in their line of duty including verbal and physical assault, homicide, sexual harassment and other psychological hazards [1-4]. Exposure to these occupational stressors has been linked to the development of stress reactions such as post-traumatic stress disorder (PTSD) and other trauma related conditions [5-7].

Studies have found an increased PTSD prevalence in ambulance personnel compared with the general population and other emergency workers. A pooled PTSD prevalence of 10% was found in emergency workers compared to 1.3 - 3.5% in the general population [8]. PTSD prevalence was highest amongst ambulance personnel (14.6%, 95% CI: 8.80 - 20.30) compared to fire fighters (7.30%, 95% CI: 3.60 - 11.00) and police officers (4.70%, 95% CI: 1.20 - 8.30) exposed to a major disaster. Petrie et al [9] found an estimated PTSD prevalence of 11% amongst ambulance personnel worldwide (higher than the general population) and 15% for depression and anxiety, and 27% for general psychological distress. Possible explanations for the increased PTSD prevalence include that ambulance personnel respond to a greater number of calls than other emergency workers, have more sustained work pressure and stress when on duty and often have greater personal contact with patients and their families, therefore failure to assist a victim timeously or successfully has a greater effect on them [10].

The prevalence of PTSD in South African ambulance personnel was 6.67% (in 2005) and 16% (in 2014) [11, 12]. Cross sectional studies have identified demographic factors such as younger age, female gender, being less educated, unmarried and living alone as predictors for PTSD in ambulance personnel [13-16]. Other significant predictors include the frequency and intensity of exposure to acute and chronic stress [17-19], lack of social support from colleagues and management [12, 20], pre-existing psychiatric illness and poor coping style [5, 16]. Ward et al [6] found that South African ambulance, fire and sea rescue service workers experienced more exposure to critical events and suffered higher rates of general psychopathology compared to workers in high income countries.

Despite evidence of increasing exposure to critical events, there is a paucity of research in South Africa documenting the trends in the prevalence of PTSD and factors associated with its development in ambulance personnel. Little is also known about what barriers they face in accessing support for work related stress. This study aims to determine the factors associated with an increased risk for PTSD and the preferred supportive measures for work related stress (WRS) in ambulance personnel in the Western Cape Province, South Africa.

MATERIALS AND METHODS

Study design, population and sampling

A cross-sectional study of ambulance personnel employed by the Western Cape Department of Health situated at each of the 50 ambulance bases was conducted between 15 November 2019 and 17 January 2020. An electronic questionnaire was distributed to all ambulance personnel in operational roles (providing direct clinical care) and support service roles. Both electronic and hard copy versions of the questionnaires were provided based on participant's choice. Recruitment of participants was assisted by the Occupational Health/Employee Wellness Coordinators whose primary role was to distribute the hard copy questionnaires to and encourage participation. Only the researcher was permitted to view the completed questionnaire contents. No exclusion criteria was applied in this study. All participants were required to provide informed consent prior to participating in the study. The study was approved by the University of Cape Town's Human Research Ethics Committee (HREC 517/2019).

MEASUREMENTS

Author questionnaire

The author questionnaire gathered self-reported sociodemographic data including 'age, gender, language, level of education, marital status, living status', and occupational data including 'job category, length of service, location of work'. Mental health and medical history data was obtained, including 'own/family history of mental health diagnosis, treatment for medical or mental health condition'. A smoking, alcohol and substance use (illicit and prescription drugs) history was also elicited. The CAGE questionnaire was used to assess

problem drinking (score of ≥ 2/4 indicative of problem drinking). Questions on barriers faced in seeking help for work related stress and preferred sources of support were included.

Impact of Event Scale-Revised (IES-R)

As a measure of PTSD, the Impact of Event Scale-Revised (IES-R) was used to assess post-traumatic stress symptoms experienced (during the past seven days) in relation to the most troubling critical incident encountered in the line of duty in the past 6 months. This validated and widely used 22-item scale contains questions which cover three PTSD symptom clusters [21, 22]. Symptoms are scored on a five-point Likert scale (0-4) in response to any critical or traumatic event/s experienced. Higher scores obtained indicated greater symptomatic stress and a cut off score of above 35 was used as indicative of PTSD 'case' [22]

Connor-Davidson Resilience Scale (CD-RISC)

The validated 10-item Connor-Davidson Resilience Scale (CD-RISC) was used to measure resilience in the ambulance personnel. The participant's adaptive behaviours in stressful situations were used to identify resilient characteristics and these were scored on a 5-point Likert scale. Higher scores indicate greater resilience. The CD-RISC scale has been noted as one of the most reliable and efficient measures of resilience with internal consistency of between 0.7 from 0.9 [23]. Written permission to use the scale was obtained from the authors.

EMS Critical Incident Inventory (CII)

The EMS Critical Incident Inventory (CII) developed by Ward et al [6] and Donnelly and Bennett [24] was used to assess exposure to critical incidents encountered in the line of duty and to obtain an indication of the frequency of exposure in the past 6 months. Activities encountered during ambulance work such as witnessing the death or injury of a child and being seriously injured/threatened are contained in the CCI.

EMS Chronic Stress Questionnaire (EMS-CSQ)

The EMS Chronic Stress Questionnaire (EMS-CSQ) is a validated tool used to assess the exposure to and perceptions of chronic stress experienced by ambulance personnel [25, 26]. The tool assesses both organizational and operational types of chronic workplace stress with each scale consisting of 10 questions. The tool defines operational stress as that associated with the structural elements of working in EMS such as shift work, the risk of being injured in line of duty and fatigue. Organizational stress includes factors associated with the culture within the organization such as conflict with supervisors and staff shortages.

SF-36 Quality of Life questionnaire (SF-36 QOL)

Reduced quality of life and interference with occupational functioning due to emotional problems such as feeling depressed, anxious or stressed was measured using three questions from the SF-36 Quality of Life questionnaire (SF-36 QOL). This validated tool comprises of 36 questions and is a widely used to measure general health status [27].

RESULTS

Of the 2000 distributed questionnaires, 478 were returned representing a 24% response rate however 2 were duplications and 88 were incomplete and could not be used in the analysis. Only 388 entries were therefore analysed in this study.

Demographic and general health qualities of participants

The demographic characteristics of the study population are outlined in Table 1. Participants were predominantly female (55%), with median age 38 (IQR: 31 - 44) years. The majority were Afrikaans speakers (46%) and most had a professional qualification (83%). Most subjects lived with family or friends (79%) and in an urban setting (61%).

A third of participants (30%) were current smokers while half (52%) currently used alcohol. Of those who currently used alcohol (n = 200), 27% had problem drinking based on their CAGE score. Males had significantly more problem drinking than females (32.03% vs 18.06%; p =

0.03). Only 3% of all participants indicated current use of illicit/non-prescription drugs. Twenty-eight percent (28%) of the participants were on treatment for a medical condition and these were primarily hypertension, dyslipidaemia and type II diabetes mellitus.

Occupational history

Most participants worked in operational services (71%) which include ambulance transfer while others worked within support services (Table 1). Half worked in a rural setting (53%). The median years employed in the participant's current role was 7.7 (IQR: 3.4 - 12.2) while the overall median years employed in a health environment was 9.9 (IQR: 5.8 – 15). A significant but moderate positive correlation (Spearman rho 0.52, $p < 0.001$) existed between participant age and employment duration in their current role. A similarly positive yet strong correlation (Spearman rho 0.69, $p < 0.001$) existed between participant age and employment duration in the health sector. A quarter (25%) of the participants reported changing jobs in the past five years primarily for better job prospects and less so for medical reasons.

Table 1. Demographic and occupational qualities of participants (N=388)

Participant characteristics	Frequency (n)	Percentage (%)
Sex		
Male	175	45.10%
Female	213	54.90%
Age		
Age, years (n = 339)	38 (31 - 44)	
Home language		
Afrikaans	178	45.88%
English	122	31.44%
IsiXhosa	84	21.65%
Other	4	1.03%
Level of education		
Basic (Grade 1 – 12)	35	9.02 %
Certificate	284	73.20%
Diploma	45	11.60%
Degree	24	6.19%
Marital status		
Never married	172	44.33%
Married	174	44.85%
Divorced or separated	36	9.28%
Widowed	6	1.55%
Place of living		
Rural	153	39.43%
Urban	235	60.57%
Current living status		
Alone	81	20.88 %
Family or friends	307	79.12%

Data are presented as % or median (interquartile range) unless otherwise indicated.

Table 1 (continued). Demographic and occupational qualities of participants (N=388)

Participant characteristics	Frequency (n)	Percentage (%)
Occupational status		
Professional health qualification	322	82.99%
Job category		
Operational services	277	71.39
• Ambulance Services	233	60.05%
• HealthNet (Non-Emergency Transport)	19	4.90%
• Rescue Services	25	6.44%
Support services	111	28.61
• Call Centre	88	22.68%
• Managers, Admin, Finance & Other	23	5.93%
Years employed in current role (n = 383)	7.7 (3.4 - 2.2)	
Years employed in a health environment (n = 383)	9.9 (5.8 – 15)	
Place of work		
Urban	184	47.42%
Rural	204	52.58%
Job/role change at work in the past 5 years	98	25.26%
Average hours worked per week		
30 - 40 hours	122	31.44%
41 - 50 hours	121	31.19%
51 - 60 hours	130	33.51%
61 - 70 hours	15	3.87%
Monthly salary		
R0 – R10,000	41	10.57%
R10,001 – R20,000	238	61.34%
R20,001 and above	109	28.09%

Data are presented as % or median (interquartile range) unless otherwise indicated.

Mental health status and work-related stress management

The self-reported prevalence of ever being diagnosed with a mental health condition was 11% with 7% reporting currently being on treatment for a mental health condition (Table 2). Based on the IES-R questionnaire, the prevalence of PTSD in all participants was 30.41%; females had a higher prevalence (35%) compared to males (27%), but this this difference was not

statistically significant (p = 0.085). PTSD prevalence in operational staff (30%) was also not significantly different (p = 0.853) to that of support services staff (31%).

Fourty percent (40%) of participants reported having had emotional problems with regular work in the preceding four weeks. Substances used by participants to manage WRS include: cigarette/tobacco smoking (27%), drinking alcohol (11%), illicit drug use (4.13%) and the use of prescription medication (17%). The majority had not received any specific training on how to manage WRS (69%) or on what support services were available (69%).The greatest barrier encountered in seeking help for WRS is the fear that the services provided by the employer were not confidential (38%) and that the participant's career will be negatively affected (23%). The preferred sources of support for participants include a family member or friend (63%); a spouse or partner (56%) and spiritual leader (41%) whilst the least preferred (20%) is a union or labour representative (Table 3). Participants recommended various ways in which services for WRS could be improved (Table 2) including training for staff to recognize when stressed (68%) and a more supportive management (63%) with the least preferred method being telephonic counselling (20%).

Table 2. Frequency and distribution of general and mental health specific variables (N=388)

Participant characteristics	Frequency (n)	Percentage (%)
Smoking history		
Current	118	30.41%
Previous smoker	33	9.02%
Non-smoker	235	60.57%
Alcohol use		
Current	200	51.55%
Previous alcohol use	78	20.10%
No alcohol use	110	28.35%
Alcohol misuse†		
CAGE score: 0 - 1	146	73.00%
CAGE score: 2 - 4	54	27.00%
Illicit drug use		
Current illicit/non-prescription drug use	11	2.84%
Previous illicit drug user	35	9.02%
No illicit drug use	342	88.14%
On treatment for other medical condition	107	27.58%
Substance use to manage work related stress		
Feel need to smoke to manage WRS	103	26.55%
Prescription drug use to manage WRS	65	16.75%
Feel need to drink alcohol to manage WRS	44	11.34%
Feel need to use illicit drugs to manage WRS	16	4.13%
Ever diagnosed with a mental health condition	43	11.08%
Currently on treatment for mental health condition	28	7.22%
Family history of mental health condition	44	11.34%
Prevalence of PTSD		
All participants	118	30.41%
Prevalence of PTSD by gender		
Males (n = 213)	57	26.76%
Females (n = 175)	61	34.86%
Prevalence of PTSD by job category/role		
Operational staff (n = 277)	85	30.69%
Support staff (n = 111)	33	29.73%

Data are presented as % or median (interquartile range) unless otherwise indicated.

† Cage Score; Define positive score ≥2/4 positive responses to CAGE questions on problem drinking.

Table 2 (continued). Frequency and distribution of general and mental health specific variables (N=388)

Participant characteristics	Frequency (n)	Percentage (%)
Role limitations due to emotional problems (SF36)		
• Any emotional problems with regular work in past 4 weeks	156	40.21%
• Cut down on amount of time spent on work/other activities	94	24.23%
• Accomplished less than would like	110	28.35%
• Not work as carefully as usual	90	23.20 %
Awareness of services to manage WRS	277	71.39%
Extent of training on how to manage WRS		
No training	268	69.07%
Some training	110	28.35%
Extensive training	10	2.58%
Extent of training on services available for WRS		
No training	266	68.56%
Some training	111	28.61%
Extensive training	11	2.84%
Barriers to seeking help for WRS		
• Fear that services are not confidential	149	38.40%
• Fear that my career will be negatively affected	88	22.68%
• Difficult to get time off from work	69	17.78%
• Lack finances or medical aid	68	17.52%
• Do not know where to get help	61	15.72%
• Difficult to schedule appointment	48	12.37%
• Lack transport to access help	42	10.82%
How services/support for WRS can be improved		
• Train staff to recognize when stressed	262	67.52%
• Have more supportive management	242	63.37%
• Address staff shortages	243	62.63%
• Provide counselling on premises	224	57.73%
• Allow for debriefing or discussion	219	56.44%
• Train supervisors to detect WRS	203	52.32%
• Improve culture within service	154	39.70%
• Provide accessible treatment services	153	39.43%
• Provide group coaching	148	38.14%
• Lessen workload	119	30.67%
• Rotate shifts: work in high and low trauma settings	86	22.16%
• Rotate shifts to allow enough rest	82	21.13%
• Provide counselling telephonically	78	20.10%

Data are presented as % or median (interquartile range) unless otherwise indicated.

Table 3. Descriptive results for preferred sources of support (N=388)

Sources of support	Mean (SD)*	Likely to seek support
Spouse or partner (n = 336)	4.93 (2.33)	62.50%
Family member or friend (n = 345)	4.62 (2.23)	55.94%
Spiritual or religious leader (n = 337)	3.89 (2.25)	40.95%
Colleague or co-worker (n = 338)	3.30 (2.08)	29.29%
Telephonic counsellors (n = 340)	3.21 (2.10)	27.94%
Supervisor (n = 339)	3.01 (2.03)	25.96%
Employee Assistance Programme (n = 336)	3.22 (1.99)	25.60%
Occupational Health/Wellness Staff (n = 336)	3.09 (2.01)	25.30%
Union or Labour Representative (n = 327)	2.76 (2.00)	20.18%

** Represented as a mean (SD) score derived from a Likert scale out of 7.*

Occupational and environmental risk factors for PTSD

Bivariate analysis was undertaken to examine the correlation between post-traumatic stress symptom scores with various workplace risk factors and these were all statistically significant (Table 4). Increasing PTSD scores had a significant but moderate positive correlation (Spearman rho 0.56, $p < 0.001$) with chronic workplace stress and a weak positive correlation (Spearman rho 0.34, $p < 0.001$) with critical incident stress. A significant but weak negative correlation (Spearman rho - 0.25, $p < 0.001$) was found between PTSD and resilience and a similar weak negative correlation (Spearman rho - 0.22, $p < 0.006$) was found between PTSD and quality of life.

Table 4. Occupational and environmental risk factors for PTSD (Univariate and Bivariate results)

Risk factors	Mean (SD)	Correlation with PTSD score
SF36 QoL score (role limitation)*	37.2 (38.42)	- 0.22 (p = 0.006)
Resilience (CD-RISC score)	28.0 (6.93)	- 0.25 (p < 0.001)
Operational stress	33.8 (15.27)	0.56 (p < 0.001)
Organizational stress	42.5 (16.06)	0.46 (p < 0.001)
Chronic workplace stress†	76.4 (28.41)	0.56 (p < 0.001)
Critical incident stress	27.7 (17.01)	0.34 (p < 0.001)
Posttraumatic stress	23.6 (22.41)	1

**SF36 Quality of Life score (role limitations due to emotional problems)*

† Chronic workplace stress (operational stress and organizational stress combined)

Unadjusted logistic regression analysis was performed (Table 5). PTSD was associated with working in operational services (Health-net) (OR=6.00, 95% CI: 1.32 - 27.10), feeling the need to smoke to manage WRS (OR=2.13, 1.33 - 3.41), the need to use alcohol to manage WRS (OR=3.55, 1.87 - 6.75), alcohol misuse (OR=2.85, 1.50 - 5.44), current illicit drug use (OR=4.18, 1.20 - 14.58), feeling the need to use illicit drugs (OR=4.07, 1.44 - 11.48) and the use of prescription medication to manage WRS (OR=4.63, 2.65 - 8.09). Working in a rural area was found to be protective against PTSD (OR=0.61, 0.40 - 0.95).

Participants with a self-reported mental health condition were more likely to have PTSD (OR=3.76, 1.96 - 7.21) including those currently on treatment for a medical condition (OR=1.95, 1.22 - 3.11). Those who had emotional problems with regular work in the past 4 weeks were also more likely to have PTSD (OR= 5.37, 95% CI: 3.36 - 8.59). PTSD was positively associated with chronic workplace stress (OR=1.05, 1.04 - 1.07) and critical incident stress (OR=1.03, 1.02 - 1.04) and negatively associated with quality of life (OR=0.98, 0.98 - 0.99) and resilience score (OR=0.95, 0.92 - 0.98).

Multivariate regression analysis was computed (Table 5), with adjustment for age, gender and educational level. PTSD was associated with being a current smoker (OR=1.76, 95% CI: 1.05 - 2.95) (previously non-significant) and feeling the need to smoke to manage WRS. Some associations between PTSD and various risk factors were strengthened following adjusted analysis. These included: the need to use alcohol to manage WRS (OR=6.37, CI: 2.93 - 13.85), alcohol misuse (OR=3.86, 95% CI: 1.80 - 8.23), current illicit drug use (OR=16.4, 95% CI: 1.87 - 143.86), feeling the need to use illicit drugs (OR= 5.99, 95% CI: 1.74 - 20.62). The association between PTSD and working in operational services (Health-net) was no longer significant however PTSD was now associated with working in the call centre (OR=4.04, 95% CI: 1.07 - 15.21). Table 6 (Appendix 11) details all analysis performed.

Table 5. Unadjusted and adjusted regression analysis of the predictors of PTSD (N = 388)

	Unadjusted univariate analysis		Adjusted multivariate analysis*	
Predictors	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
Age (n =339)	1.00 (0.97 - 1.02)	0.82	-	-
Gender				
Male	1.00	1.00	-	-
Female	1.46 (0.95 - 2.26)	0.09	-	-
Education				
Basic (Grade 1 to 12)	1.00	1.00	-	-
Certificate	1.62 (0.71 - 3.69)	0.26	-	-
Diploma	0.84 (0.29 - 2.47)	0.76	-	-
Degree	2.03 (0.65 - 6.34)	0.23	-	-
Smoking				
Non-smoker	1.00	1.00	1.00	1.00
Ex-smoker	1.00 (0.46 - 2.20)	0.99	1.09 (0.46 - 2.59)	0.841
Current smoker	1.33 (0.83 - 2.14)	0.23	**1.76 (1.05 - 2.95)**	**0.033**
Feel need to smoke to manage WRS				
Never feel need	1.00	1.00	1.00	1.00
Feel need to smoke	**2.13 (1.33 - 3.41)**	**0.002**	**2.35 (1.40 - 3.93)**	**0.001**
Feel need to use alcohol to manage WRS				
Never feel need	1.00	1.00	1.00	1.00
Feel need to use alcohol	**3.55 (1.87 - 6.75)**	**p < 0.001**	**6.37 (2.93 - 13.85)**	**p < 0.001**

**Data adjusted for age, gender and education.*

Table 5 (continued). Unadjusted and adjusted regression analysis of the predictors of PTSD (N = 388)

	Unadjusted univariate analysis		Adjusted multivariate analysis*	
Predictors	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
Alcohol misuse (n= 200)				
No alcohol misuse (CAGE score 0 -1)	1.00	1.00	1.00	1.00
Alcohol misuse (CAGE score 2 – 4)	**2.85 (1.50 - 5.44)**	**0.001**	**3.86 (1.80 - 8.23)**	**0.001**
Drug/illicit substance use				
Non-drug user	1.00	1.00	1.00	1.00
Ex-drug user	0.95 (0.44 - 2.06)	0.905	1.08 (0.48 - 2.41)	0.850
Current drug user	**4.18 (1.20 - 14.58)**	**0.025**	**16.4 (1.87 - 143.86)**	**0.012**
Feel need to use illicit drugs to manage WRS				
Never feel need	1.00	1.00	1.00	1.00
Feel need to use drugs	**4.07 (1.44 - 11.48)**	**0.008**	**5.99 (1.74 - 20.62)**	**0.005**
Feel need to use prescription drugs to manage WRS				
Never feel need	1.00	1.00	1.00	1.00
Feel need to use prescription drugs	**4.63 (2.65 - 8.09)**	**p < 0.001**	**4.51 (2.48 - 8.20)**	**p < 0.001**
Job category (by department)				
Managers, Admin, Finance & Other	1.00	1.00	1.00	1.00
Ambulance Services	3.10 (0.89 - 10.7)	0.075	2.97 (0.82 - 10.68)	0.096
HealthNet	**6 (1.32 - 27.10)**	**0.020**	5.02 (0.93 - 27.11)	0.061
Rescue Services	0.58 (0.09 - 3.8)	0.571	0.78 (0.11 - 5.40)	0.798
Call Centre	3.44 (0.95 - 12.54)	0.060	**4.04 (1.07 - 15.21)**	**0.039**

**Data adjusted for age, gender and education.*

Table 5 (continued). Unadjusted and adjusted regression analysis of the predictors of PTSD (N = 388)

	Unadjusted univariate analysis		Adjusted multivariate analysis*	
Predictors	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
Work location (within province)				
Cape Town metropole	1.00	1.00	1.00	1.00
Rural areas	**0.61 (0.40 - 0.95)**	**0.027**	**0.90 (0.84 - 0.97)**	**0.006**
Mental health diagnosis				
Never diagnosed	1.00	1.00	1.00	1.00
Diagnosed	**3.76 (1.96 - 7.21)**	**p < 0.001**	**3.52 (1.78 - 6.97)**	**p < 0.001**
On treatment for other medical condition	**1.95 (1.22 - 3.11)**	**0.005**	**2.19 (1.29 - 3.73)**	**0.004**
Emotional problems with regular work (past 4 weeks)	**5.37 (3.36 - 8.59)**	**p < 0.001**	**6.00 (3.57 - 10.10)**	**p < 0.001**
SF36 QoL score (role limitation)	**0.98 (0.98 - 0.99)**	**0.012**	**0.99 (0.98 – 1.00)**	**0.012**
Resilience (CD-RISC score)	**0.95 (0.92 - 0.98)**	**p < 0.001**	**0.95 (0.92 - 0.99)**	**0.004**
Chronic workplace stress†	**1.05 (1.04 - 1.07)**	**p < 0.001**	**1.06 (1.04 - 1.07)**	**p < 0.001**
Critical incident stress	**1.03 (1.02 - 1.04)**	**p < 0.001**	**1.04 (1.02 - 1.06)**	**p < 0.001**

**Data adjusted for age, gender and education.*

† Chronic workplace stress (operational stress and organizational stress combined)

DISCUSSION

The prevalence of PTSD in this study was found to be 30% which is higher than that reported for the general South African population (2.3% lifetime prevalence) [28] and the population prevalence of other countries (1.0% - 4.3%) [29]. It is also higher than that estimated by previous studies conducted in the Western Cape which found a prevalence of 6.7% in ambulance personnel (n = 99) and 16% (n = 131) in paramedic trainees [11, 12]. When compared to studies conducted in other lower middle-income countries (LMICs), PTSD prevalence found in this study is higher than the 13.6% found in Egyptian paramedics (n = 140) and 15% in Brazilian ambulance workers (n = 234) [30, 31]. Systematic reviews and meta-analysis of mostly North American and Western European studies report a prevalence as low as 11% [9] and as high as 20% amongst ambulance personnel [32]. Of interest however is that in Ethiopia [33], search and rescue workers (n = 31) had a higher PTSD prevalence (38.7%) while Polish paramedics had a prevalence of 40% (n = 100) [13].

The higher prevalence found in this study could be explained by differences in study population, context and methodology. In the Western Cape Province, as of 2014, an escalation in criminal attacks was experienced by ambulance personnel (including threats, verbal/physical assaults, robbery/theft, random stoning), with likely increases in chronic stress and critical incident stress exposure [34]. To mitigate the potential impact of these traumatic exposures on ambulance personnel, certain areas within the Cape Town Metropole were designated as 'Red Zones' requiring a police escort be made available before ambulance personnel can go into an area to assist patients [34]. Previous studies conducted in the Western Cape undertaken before 2014, used a different PTSD scoring scale and had relatively smaller sample sizes than this study. Given the escalation in attacks on paramedics since 2014, participants in this study may be at greater risk for PTSD and more likely to have concerns regarding PTSD and a need to report their symptoms compared to non- participants [13].

Of note in the current study is that the PTSD prevalence in operational staff (30%) consisting of ambulance personnel on the road was not significantly different (p = 0.853) to that of support services staff (31%) consisting largely call centre agents/dispatchers (n= 88) and managers/staff in various administrative roles (n = 33). The similar PTSD prevalence may be as a result of relocation or accommodation of operational staff previously exposed to trauma into a call centre or management role due to mental or physical health or incapacity reasons. The lack of skills in handling the secondary trauma related with working (telephonically) with families or patients in distress may also be an independent predictor of PTSD. Smith et al [41] and Golding et al [42] noted that although removed from the scene of the incident, emergency service call-takers and dispatchers experience similar mental health challenges as front-line ambulance personnel which predispose to PTSD including: exposure to traumatic calls at times accompanied with verbal abuse; lack of support from management, lack of control over high workload, shift work often under high-pressure conditions and staff shortages, insufficient recovery time in between stressful calls; insufficient mental health support and debriefing following stressful calls; and a lack of appropriate training to manage calls received including training on recognizing mental health effects associated with the work.

Others have described an increased risk for PTSD among female EMS workers [13, 17, 21] and it is postulated that females could have a greater likelihood of experiencing trauma and being victims of previous traumatic exposures thus the greater risk of developing PTSD [17]. In this study, certain risk factors such as mental health and occupational factors were identified as the strongest predictors of PTSD. Being female, younger age, married, having less education and being of lower rank has previously been described as associated with the development of PTSD in ambulance personnel [13-15, 21]. The current study found that females were more likely than males to develop PTSD (OR=1.46, 95% CI: 0.95 - 2.26) though this was not statistically significant (p = 0.09).

Current mental health problems have been demonstrated as a predictor for PTSD [35, 36]. Kerai et al [16] found that emergency personnel with anxiety and depression had higher levels of post-traumatic stress symptoms. Those with a pre-existing mental health condition may be predisposed to developing PTSD in the presence of chronic and acute stress events associated

with first responder work [2, 21, 37]. Participants who reported having a mental health condition were more likely to have PTSD and more likely to report emotional problems in the past four weeks with role limitations due to emotional problems. These findings were consistent with those reported in Brazilian paramedics [31] with the mean (SD) QOL score for role limitation due to emotional problems in our study 37.2 (IQR: 38.42), which was lower than that for Brazilian paramedics with PTSD, 47.2 (IQR: 33.21). This indicates an even poorer quality of life in our population. Participants with PTSD were also more likely to report being on treatment for a medical condition; a phenomenon also observed in Brazilian paramedics with PTSD as they had more medical visits and hospital admissions in the last 12 months compared to those without PTSD.

Participants reported exposure to high levels of chronic and critical incident stress which were significant predictors of PTSD. The mean critical incident score (27.7) found in this study was higher than that of ambulance service personnel (20.59, 95% CI: 19.11 to 22.06) in the Western Cape [6, 24] indicative of not only high exposure but possible increase in critical incident stress over time. Chronic organizational and operational stress both individually and in combination are significant predictors of PTSD in this population. The mean (SD) operational stress score of 33.8 (15.27) was comparable to that found by Donnelley et al [11] of 31.4 (12.1); while the mean (SD) organizational stress score of 42.5 (16.06) vs 34.8 (13.5) was higher (13.5). These findings also demonstrate high chronic stress exposure in the population surveyed and importantly highlights the potential impact organizational factors such as staff shortages have on PTSD prevalence. Staff shortages for example could result in ambulance personnel experiencing more frequent exposure to critical incidents and resultant increases in chronic stress levels.

In this study, individuals who worked in a rural area however were less likely to develop PTSD. This may be a reflection of workload with less exposure to chronic stress or less critical incident stress events compared to those working in urban settings. Bezabh et al [33] notes that urbanisation in Ethiopia has led to emergency workers responding to more fire, road and construction accidents.

The use of substances to manage or cope with WRS deserves further exploration. In this study the need to smoke, drink alcohol and to use illicit drugs to manage WRS was associated with PTSD. Participants displayed high rates of problem drinking (27% overall, 32.03% in males and 18.06% in females). This was higher than that for paramedic trainees in the Western Cape (23%) and the general population (16% in men and 3% in women) [12, 38]. The use of prescription drugs such as anxiolytics and antidepressants by 17% of participants to manage WRS was also significantly associated with PTSD. This was higher than the 5.6% personal medication use reported in emergency medical service personnel (n=518) in Pakistan [16]. Whilst it is not clear whether the substance use is because of PTSD or preceded it, this places them at risk of dual psychiatric diagnoses (substance use disorder as well as PTSD) which is more difficult to manage and has greater morbidity associated with it [17, 21].

Participants indicated that they are most likely to seek help/support for WRS from a spouse or partner (62.50%) and family member or friend (55.94%) which highlights the important role family and friends can play when formulating interventions aimed at reducing WRS. Canadian paramedics were similarly more likely to seek support from a family member or friend (81.4%) and a regular work partner (73.2%) [26]. Surprisingly however there was lower likelihood of seeking support from employer provided services with only 25% of participants compared to 38.6% in Canadian paramedics likely to seek such support. Various barriers to accessing support, included fear that services are not confidential and fear that participant's career will be negatively affected. Difficulty in getting time off to access care and a lack of finances/medical aid are other barriers faced.

Participants identified the need for more training of staff in recognizing WRS, having a more supportive management, addressing staff shortages and provision of counselling on premises as preferred measures to help reduce WRS. These correlate with the chronic organizational stressors already discussed and highlights the extent to which these are concerning to the participants. Of note is that the majority (69%) reported having not received any specific training on how to manage WRS or on what services are available (69%). Minnie et al [5] also found that 72% of ambulance personnel noted having received little or no training on

managing the emotional effects of exposure to traumatic effects. Promoting resilience in ambulance personnel could also be helpful in mitigating the challenges related to the work of ambulance personnel [39, 40] as reflected in a negative correlation between PTSD and resilience score. Similar studies have shown that lower resilience significantly predicted PTSD status [12, 39]. While resilience training is an option, other interventions such as access to psychiatric screening by trained mental health professionals for earlier detection of PTSD symptoms should be considered while addressing broader organizational and operational concerns raised.

LIMITATIONS

The study had several limitations. The findings are based on 388 respondents from a workforce of 2000 as it relied on voluntary participation. Ambulance personnel who chose not to participate may be different to those who did which may alter the overall PTSD prevalence obtained, a reflection of selection bias. Reasons for lack of participation include possible stigma relating to a mental health topic and 'response fatigue' as other surveys were being conducted during the time of this study. Mistrust and concerns that the questionnaire would not be confidential or would negatively affect one's work prospect may also be a contributing factor however this was mitigated by meeting labour representatives and staff at ambulance bases to explain the study methodology and data handling concerns.

Not all potential risk factors for PTSD were assessed to help keep the questionnaire to an acceptable length. Questions on childhood trauma, inclusion of a full SF36 quality of life questionnaire and other mental health screening tools could not be included. Due to resource limitations, the study was unable to use the gold standard test for the diagnosis of PTSD (clinician-based diagnostic interview) and though the evidence for the validity of the PTSD screening tools, chronic stress, resilience and quality of life (SF30) in populations from LMICs is lacking, these are widely used and validated tools and therefore deemed appropriate. Social desirability bias may have occurred when participants responded in a socially acceptable manner (under report mental health symptoms and substance use) which could have led to reduced study estimates. Recall bias can also arise as the questionnaire requires participants to rate symptoms based on a traumatic event that was experienced up to 6 months earlier. There was no control group from a general population whose findings could be compared to

those of the ambulance personnel. Furthermore, studies of occupational groups are vulnerable to the healthy worker effect which may have led to an underestimate of PTSD as those severely impaired by PTSD may have left their employ, leaving a generally healthier population behind. The cross-sectional study design furthermore limits the inference of causal associations as data on both exposures and outcome were collected simultaneously. Concordance with the findings from other studies and biological plausibility do, however, suggest that significant associations may be reflecting potential risk factors implicated in the development of PTSD in this population.

CONCLUSIONS

PTSD prevalence was high in ambulance personnel and markedly higher than the general population, reflecting an increased risk in this occupational grouping. Those with a mental health condition, receiving treatment for a medical condition, self-reported substance use, working in an urban area and exposure to high chronic and critical incident stress were at increased risk. Support from family and friends including co-workers could form an integral part of interventions designed to support ambulance personnel. Greater attention needs to be focused on barriers that have been identified as limiting access to available support for work related stress. In this regard efforts should be aimed at ensuring access to confidential and acceptable mental health services that is provided in a non-punitive manner without leaving EMS workers out of pocket. The high rates of organizational and work-related stress experienced by this population and the strong associations between PTSD and substance use, offer starting points for interventions aimed at reducing the burden and impact of PTSD.

Further studies using clinician-based diagnostic interviews are recommended and research into evidence-based methods of screening and managing ambulance personnel for PTSD and the development of appropriate interventions and protocols for an LMIC context are needed.

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PART D: APPENDICES

APPENDIX 1: INFORMATION SHEET AND CONSENT FORM

UCT STUDY ON THE PREDICTORS OF PTSD AMONGST AMBULANCE PERSONNEL
IN THE WESTERN CAPE, SOUTH AFRICA – 2019

ENGLISH CONSENT FORM

1. **Title of research project**

A study on the predictors of post-traumatic stress disorder amongst ambulance personnel in the Western Cape Province

2. **Purpose of the research**

This research will form a basis for a master's in medicine Degree (MMed) and will also help to inform us about the extent of post-traumatic stress disorder amongst ambulance personnel in the Western Cape Province and possible contributors to this mental health condition. This information may help us to come up with and recommend improved interventions aimed at reducing the prevalence of PTSD and work-related stress within the emergency medical service. The study has received ethical approval from the UCT Human Research Ethics Committee.

3. **Description of the research project**

If you agree to participate you will be asked to complete the following tests during working time allocated for participation in the research project:

a) **Complete a questionnaire**

An electronic link to a confidential online survey during work time will be provided and you will be requested to complete the questionnaire. It is expected that it will take you approximately 60 to 90 minutes to complete this survey. You will be asked questions about yourself, PTSD symptoms, current and previous employment history, risk factors related to potential risk factors for the development of PTSD and forms of support known and those preferred by yourself in managing work related stress.

4. Confidentiality of information collected

Your name will not appear in any reports on this study, only the staff/persal number will be collected. The information gathered will be kept completely confidential and will be seen only by members of the study team.

5. **Risks and discomforts of the research**

a) From the questionnaire
There is low risk associated with completion of the questionnaire and all information will be treated as confidential. Should you require support during completion of the questionnaire, the researcher will refer you accordingly.

6. **Expected benefits to you and to others**

You will be contacted and given a written referral letter to a health facility should you be found at high risk of developing PTSD. It is your right to tell us that you do not wish to receive this. Your participation will help to us understand the extent of PTSD in ambulance personnel and may inform recommendations for better practices to safeguard health of all emergency personnel.

7. **Costs to you resulting from participation in the study**

The study is offered at no cost to you. In the event of you are found at risk of PTSD and requiring further investigation or management, you will be referred to a facility for further investigation and care with your consent.

8. Voluntariness

Your participation in this study is entirely voluntary and you are free to withdraw at any particular time and you will not be penalized for doing so. Your job security will not be affected by withdrawal from the study.

9. **Contact person(s)**.

You may contact the following person for answers to further questions about the research, your rights, or any injury you may feel is related to the study.

University of Cape Town Researchers:

Dr Itumeleng Ntatamala,
Telephone No. 021 483 9343 and Mobile No. 076 072 1130

The Human Research Ethics Committee:
Floor E53, Room 46
Old Main Building, Groote Schuur Hospital
Observatory, 7925
Telephone number: 021 406 6492

UCT STUDY ON THE PREDICTORS OF PTSD AMONGST AMBULANCE PERSONNEL IN THE WESTERN CAPE, SOUTH AFRICA – 2019

ENGLISH CONSENT FORM

STUDY NO. _____

10. **Consent of the participant**

I have read the information given above, or it has been read to me. I understand the meaning of this information, Dr./Mr./Ms.

_____

has offered to answer any questions concerning the study. By signing this form electronically, I hereby consent to participate in the study. I also understand that I am free to withdraw from the study at any time without penalty.

11. **Documentation of the consent**

One copy of this signed document will be kept together with our research records for this study. A copy of the information sheet about the study can be given to you to keep if requested.

_____ _____

Printed name of participant Signature

DATE: _____

APPENDIX 2: ENGLISH QUESTIONNAIRE

UCT STUDY ON THE PREDICTORS OF PTSD AMONGST AMBULANCE PERSONNEL IN THE WESTERN CAPE, SOUTH AFRICA - 2019

ENGLISH QUESTIONNAIRE

Survey Number _____ | | | |

A. IDENTIFICATION DATA

1. Staff number _____ | | | | | | |

2. Date of birth: Day_____Month_____Year____ | | | | | | |

3. Gender: Male (1) | |
Female (2)
Prefer not to state (3)

4.Language: English (1) | |
Afrikaans (2)
IsiXhosa (3)
Other (4)

5. What is your highest level of education? | |
Primary school (1)
High school Grade 8 - 9 (2)
High school Grade 10 - 12 (3)
Certificate (4)
Diploma (5)
Degree (6)

6. What is your marital status? | |
Married for first time (1)
Married with previous marriages (2)

Never married
(3)
Widowed
(4)
Divorced or separated
(5)

7. What is your living status? ☐

Alone (1)
Family or friends (2)

8. Where do you live? ☐

Rural (1)
Urban (2)

B. EXPOSURE FACTORS

General occupational factors

1. What is your current job title?

_____

2. How long have you been employed in this position? ☐☐☐☐☐☐

Month _____ Year _____

3. Which department/ section are you working in?

_____

4. Where is your area of work located or stationed?

_____

5. How many hours on average do you work per week? ☐

30 - 40 hours (1)
41 - 50 hours (2)
51 - 60 hours (3)
61 - 70 hours (4)

6. How long have you been employed in a healthcare environment? ☐☐☐☐

Year _____ Months _____

7. Have you had to change your job or role at work in the past 5 years?

Yes (1)
No (2)

7.1 If yes, what were the reasons for changing your job or role?

_____

8. Do you have a professional health qualification?

Yes (1)
No (2)

8.1 If yes, when did you obtain your qualification?

Year _____ Months _____

8.2 Could you please specify what your qualification is?

_____

9. What is your monthly salary?

R0 - R5,000 (1)
R5,001 - R10,000 (2)
R10,001 - R15,000 (3)
R15,001 - R20,000 (4)
R20,001 - R25,000 (5)
R25,001 - R30,000 (6)
R30,001 and above (7)

Mental health and medical history

1. Have you ever been diagnosed with a mental health or psychiatric condition?

Yes (1)
No (2)

1.1 If yes, could you please specify what the condition/s is/are?

_____

1.2 Are you on any treatment for a mental health or psychiatric condition? ☐

Yes (1)
No (2)

2. Do you have any other condition or disease which requires medical treatment? ☐

Yes (1)
No (2)

2.1 If yes, could you please specify what the condition/s is/are?

_____

Family history

1. Do you have a family member who has ever been diagnosed with a mental health or psychiatric condition? ☐

Yes (1)
No (2)

1.1 If yes, could you please specify what the condition/s is/are?

_____

C. SMOKING HISTORY

1. Have you ever smoked tobacco (cigarettes or pipe) for as long as a year?

'YES' means at least 20 packs of cigarettes or 360 grams of tobacco in a lifetime or at least one cigarette per day for one year

Yes (1) ☐
No (2)

If YES, go on to Question 1.1
If NO, skip to Question 2

1.1 How old were you when you started smoking? ☐☐

_____ years old

1.2 Do you now smoke? ☐

'YES' means smoking tobacco in the last month or more

Yes (1)
No (2)

If YES, go on to Question 1.3
If NO, skip to Section D

1.3 Do you ever feel the need to smoke to manage work related stress or problems in the workplace? ☐

Yes (1)
No (2)

D. ALCOHOL USE HISTORY

1. Have you ever drunk alcohol? ☐

Yes (1)
No (2)

2 Do you drink alcohol now? ☐

Yes (1)
No (2)

'If yes, go to question 2
If no, go to section D

2.1 Have you felt the need to cut down your drinking? ☐

Yes (1)
No (2)

2.2 Have you felt annoyed by criticism of your drinking? ☐

Yes (1)
No (2)

2.3 Have you had guilty feelings about drinking? ☐

Yes (1)
No (2)

2.4 Have you taken a drink as a morning eye opener? ☐

Yes (1)
No (2)

2.5 Do you ever feel the need to drink alcohol to manage work related stress or problems in the workplace? ☐

Yes (1)
No (2)

E. DRUG AND SUBSTANCE USE HISTORY

1. Have you ever used illicit or non-prescription drugs? ☐

Yes (1)
No (2)

If YES, go on to Question 1.1
If NO, skip to Question 1.3

1.1 How old were you when you started using illicit drugs? ☐☐

_____ years old

1.2 Do you now use illicit or prescription drugs? ☐

'YES' means using illicit drugs in the last month or more

Yes (1)
No (2)

If YES, go on to Question 1.3
If NO, skip to Question 1.4

1.3 Do you ever feel the need to use illicit drugs to manage work related stress or problems in the workplace? ☐

Yes (1)
No (2)

1.4 Do you ever use prescription drugs to manage work related stress or problems in the workplace? ☐

Yes (1)
No (2)

F. WORK RELATED STRESS

1. Are you aware of any services offered by the employer to help you manage work related stress? ☐

Yes (1)
No (2)

If YES, go on to Question 1.1
If NO, skip to Question 2

1.1 What services or forms of support are you aware of?

_____

2. What are some of the barriers or reasons for not seeking help for work related stress? Please select all that apply.

Do not know where to get help	(1)	☐
Difficult to get time off from work	(2)	☐
Difficult to schedule appointment	(3)	☐
Lack finances or medical aid	(4)	☐
Lack transport to access help	(5)	☐
Fear that services are not confidential	(6)	☐
Fear that my career will be negatively affected	(7)	☐
Others (please specify) _____	(8)	☐

3. How likely are you to seek help from the following if suffering from work related stress?

Likert scale: very unlikely (1) to very likely (7)

A family member or friend	☐
Your spouse or partner	☐
Spiritual or religious leader	☐
A colleague or co-worker	☐

Employee Assistance Programme
ICAS telephonic counsellors
A supervisor
An occupational health coordinator
Union or Labour representative

4. What would be the best way to improve services and support for work related stress (WRS)? Select all that apply.

Train staff to recognize when stressed (1)
Train supervisors to detect WRS (2)
Provide group coaching (3)
Provide accessible treatment services (4)
Provide counselling on premises (5)
Provide counselling telephonically (6)
Allow for debriefing or discussion (7)
Rotate shifts to allow enough rest (8)
Rotate shifts to allow working in high and low trauma settings (9)
Address staff shortages (10)
Lessen work load (11)
Improve culture within service (12)
Have more supportive management (13)
(14)

5. In the past 4 weeks, have you had any of the following with your regular work as a result of any emotional problems (stress, anxiety, depression etc)?

If yes, did this cause you to:

5.1 Cut down on the amount of time you spent on work or other activities Yes (1) No (2)

5.2 Accomplished less than you would like Yes (1) No (2)

5.3 Not do work or other activities as carefully as usual Yes (1) No (2)

G. HEALTH AND SAFETY EDUCATION AND TRAINING

1. How much training have you had on how
to manage work related stress you may encounter? ☐

a) no training 1
b) some training 2
c) extensive training 3

2. How much training have you received ☐
on services available to manage work related stress?

a) no training 1
b) some training 2
c) extensive training 3

3. Do you have any concerns and/or recommendations
regarding your risk of developing work related stress?

_____
_____
_____

APPENDIX 3: CONNOR–DAVIDSON RESILIENCE SCALE (CD-RISC)

Connor-Davidson Resilience Scale 10 (CD-RISC-10) ©

initials ☐☐☐ *ID#* ☐☐☐☐☐☐☐ *date* ☐☐/☐☐/☐☐☐☐ *visit* ☐☐ *age* ☐☐

Please indicate how much you agree with the following statements as they apply to you over the last month. If a particular situation has not occurred recently, answer according to how you think you would have felt.

		not true at all (0)	rarely true (1)	sometimes true (2)	often true (3)	true nearly all the time (4)
1.	I am able to adapt when changes occur.	☐	☐	☐	☐	☐
2.	I can deal with whatever comes my way.	☐	☐	☐	☐	☐
3.	I try to see the humorous side of things when I am faced with problems.	☐	☐	☐	☐	☐
4.	Having to cope with stress can make me stronger.	☐	☐	☐	☐	☐
5.	I tend to bounce back after illness, injury, or other hardships.	☐	☐	☐	☐	☐
6.	I believe I can achieve my goals, even if there are obstacles.	☐	☐	☐	☐	☐
7.	Under pressure, I stay focused and think clearly.	☐	☐	☐	☐	☐
8.	I am not easily discouraged by failure.	☐	☐	☐	☐	☐
9.	I think of myself as a strong person when dealing with life's challenges and difficulties.	☐	☐	☐	☐	☐
10.	I am able to handle unpleasant or painful feelings like sadness, fear, and anger.	☐	☐	☐	☐	☐

Add up your score for each column 0 + ____ + ____ + ____ + ____

Add each of the column totals to obtain CD-RISC score = _____

APPENDIX 4: EMS CRITICAL INCIDENT INVENTORY (CCI)

Critical incident Inventory Please indicate if you've experienced any of the following events during your line of duty. If this happened, how often has it caused you in the last six months?		
1.	I was seriously injured while on duty	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
2.	Threatened with serious injury to self while on duty (but did not result in actual serious injury)	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
3.	Present when a fellow EMS worker was killed while I was on duty	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
4.	Witnessed serious injury to fellow EMS worker while actively on duty (that did not result in death)	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
5.	Experienced threat of injury or threat of death to fellow emergency worker while on duty (that did not result in actual serious injury or death)	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
6.	Suicide or attempted suicide by fellow EMS worker	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
7.	Responded to incident involving three or more deaths	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
8.	Responded to incident involving one or two deaths	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
9.	Responded to incident involving multiple serious injuries (three or more victims sustained serious injuries)	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
10.	Incident requiring police protection while on duty	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
11.	Verbal or physical threat by public while on duty (that	1 = Happened once 2 = Happened twice

	did not require police protection)	3 = Happened three or more times 4 = NA
12.	Received serious threats towards loved ones as retaliation for your work in EMS.	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
13	Incident involving serious injury or death to children	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
14.	Incident involving severe threat to children (that did not result in actual serious injury or death to children)	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
15.	Attended to victim(s) known to you	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
16.	Failure to save a patient after extensive effort	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
17.	Made a mistake that led to the serious injury or death of a patient	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
18.	Critical (negative) media interest	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
19.	Close contact with burned or mutilated victim	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
20.	Removing dead body or bodies	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
21.	Incident necessitating search or rescue involving serious risk to yourself	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
22.	Prolonged extrication of trapped victim with life-threatening injuries	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
23.	Use of deadly force by police at an incident	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
24.	Exposure to extremely hazardous materials	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA

25.	Exposure to blood and body fluids (not needle-stick injuries)	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA
26.	Critical equipment failure or lack of equipment in any of the above situations	1 = Happened once 2 = Happened twice 3 = Happened three or more times 4 = NA

APPENDIX 5: EMS CHRONIC STRESS QUESTIONNAIRE (EMS-CSQ)

The Emergency Medical Services Chronic Stress Questionnaire

Instructions: Below is a list of items that describe different aspects of being an EMT or paramedic. Please indicate how much stress each of these has caused you over the past six months.

	No Stress at all			Moderate stress			A lot of stress
Organizational Stressors							
Feeling like different rules apply to different people (e.g. favoritism)	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Feeling like you always have to prove yourself to the organization	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Constant changes in policy/legislation	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Staff shortages	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Bureaucratic red tape	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Lack of training on new equipment	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Dealing with supervisors	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Lack of resources	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Unequal sharing of work responsibilities	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Leaders over-emphasize the negatives (e.g. supervisor evaluations, public complaints)	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Operational Stressors							
Shift work	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Risk of being injured on the job	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Managing your social life outside of work	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Friends/family feel the effects of the stigma associated with your job	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Eating healthy at work	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Fatigue	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Lack of understanding from your friends and family about your work	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Making friends outside of the job	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Negative comments from the public	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)
Feeling like you are always on the job	o(1)	o(2)	o(3)	o(4)	o(5)	o(6)	o(7)

Donnelly, E. A., Chonody, J., & Campbell, D. (2014). Measuring chronic stress in the emergency medical services. *Journal of Workplace Behavioral Health*, *29*(4), 333-353. doi: 10.1080/15555240.2014.965824

APPENDIX 6: IMPACT OF EVENT SCALE-REVISED (IES-R)

INSTRUCTIONS: Below is a list of difficulties people sometimes have after stressful life events. Please read each item, and then indicate how distressing each difficulty has been for you DURING THE PAST SEVEN DAYS with respect to a traumatic event that occurred while on duty in the past 6 months. How much have you been distressed or bothered by these difficulties?

	Not at all	A little bit	Moderately	Quite a bit	Extremely
1. Any reminder brought back feelings about it	0	1	2	3	4
2. I had trouble staying asleep	0	1	2	3	4
3. Other things kept making me think about it.	0	1	2	3	4
4. I felt irritable and angry	0	1	2	3	4
5. I avoided letting myself get upset when I thought about it or was reminded of it	0	1	2	3	4
6. I thought about it when I didn't mean to	0	1	2	3	4
7. I felt as if it hadn't happened or wasn't real.	0	1	2	3	4
8. I stayed away from reminders of it.	0	1	2	3	4
9. Pictures about it popped into my mind.	0	1	2	3	4
10. I was jumpy and easily startled.	0	1	2	3	4
11. I tried not to think about it.	0	1	2	3	4
12. I was aware that I still had a lot of feelings about it, but I didn't deal with them.	0	1	2	3	4
13. My feelings about it were kind of numb.	0	1	2	3	4
14. I found myself acting or feeling like I was back at that time.	0	1	2	3	4
15. I had trouble falling asleep.	0	1	2	3	4
16. I had waves of strong feelings about it.	0	1	2	3	4
17. I tried to remove it from my memory.	0	1	2	3	4
18. I had trouble concentrating.	0	1	2	3	4
19. Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart.	0	1	2	3	4
20. I had dreams about it.	0	1	2	3	4
21. I felt watchful and on-guard.	0	1	2	3	4
22. I tried not to talk about it.	0	1	2	3	4

H. FURTHER ASSISTANCE

Should this study identify that you are at risk of post traumatic stress disorder, would you like to be contacted? If so, please provide your contact details below.

1. Surname _____

2. First name/s _____

3. Address _____
_____
_____
_____

4. Contact number _____

APPENDIX 7: PERMISSION TO USE CONNOR–DAVIDSON RESILIENCE SCALE (CD-RISC)

Dear Shahieda:

Thank you for your interest in the Connor-Davidson Resilience Scale (CD-RISC). I am pleased to grant permission for use of the CD-RISC in the project you have described under the following terms of agreement:

1. You agree not to use the CD-RISC (i) for any commercial purpose unless permission has been granted, or (ii) in research or other work performed for a third party, or (iii) provide the scale to a third party without permission. If other colleagues or off-site collaborators are involved with your project, their use of the scale is restricted to the project described, and the signatory of this agreement is responsible for ensuring that all other parties adhere to the terms of this agreement.

2. You may use the CD-RISC in written form, by telephone, or in secure electronic format whereby the scale is protected from unauthorized distribution or the possibility of modification. **In all use of the CD-RISC, including electronic versions, the full copyright and terms of use statement must appear with the scale. The scale should not appear in any form where it is accessible to the public and should be removed from electronic and other sites once the project has been completed.**

3. Further information on the CD-RISC can be found at the www.cd-risc.com website. The scale's content may not be modified, although in some circumstances the formatting may be adapted with permission of either Dr. Connor or Dr. Davidson. If you wish to create a non-English language translation or culturally modified version of the CD-RISC, please let us know and we will provide details of the standard procedures.

4. Three forms of the scale exist: the original 25 item version and two shorter versions of 10 and 2 items respectively. When using the CD-RISC 25, CD-RISC 10 or CD-RISC 2, whether in English or other language, please include the full copyright statement and use restrictions as it appears on the scale.

5. A fee of $ 100 US is payable to Kathryn Connor, 3107 Lilac Court, Lansdale, PA 19446, USA, either by PayPal (at www.paypal.com), cheque, bank draft or international money order. For PayPal payment, the email address is connordavidsonrisc@gmail.com..

6. Complete and return this form via email to mail@cd-risc.com.

7. In any publication or report resulting from use of the CD-RISC, you do not publish or partially reproduce items of the CD-RISC without first securing permission from the authors.

If you agree to the terms of this agreement, please email a signed copy to the above email address. Upon receipt of the signed agreement and of payment, a copy of the scale will be sent by email.

For questions regarding use of the CD-RISC, please contact Jonathan Davidson at mail@cd-risc.com.

Sincerely yours,

Kathryn M. Connor, M.D.

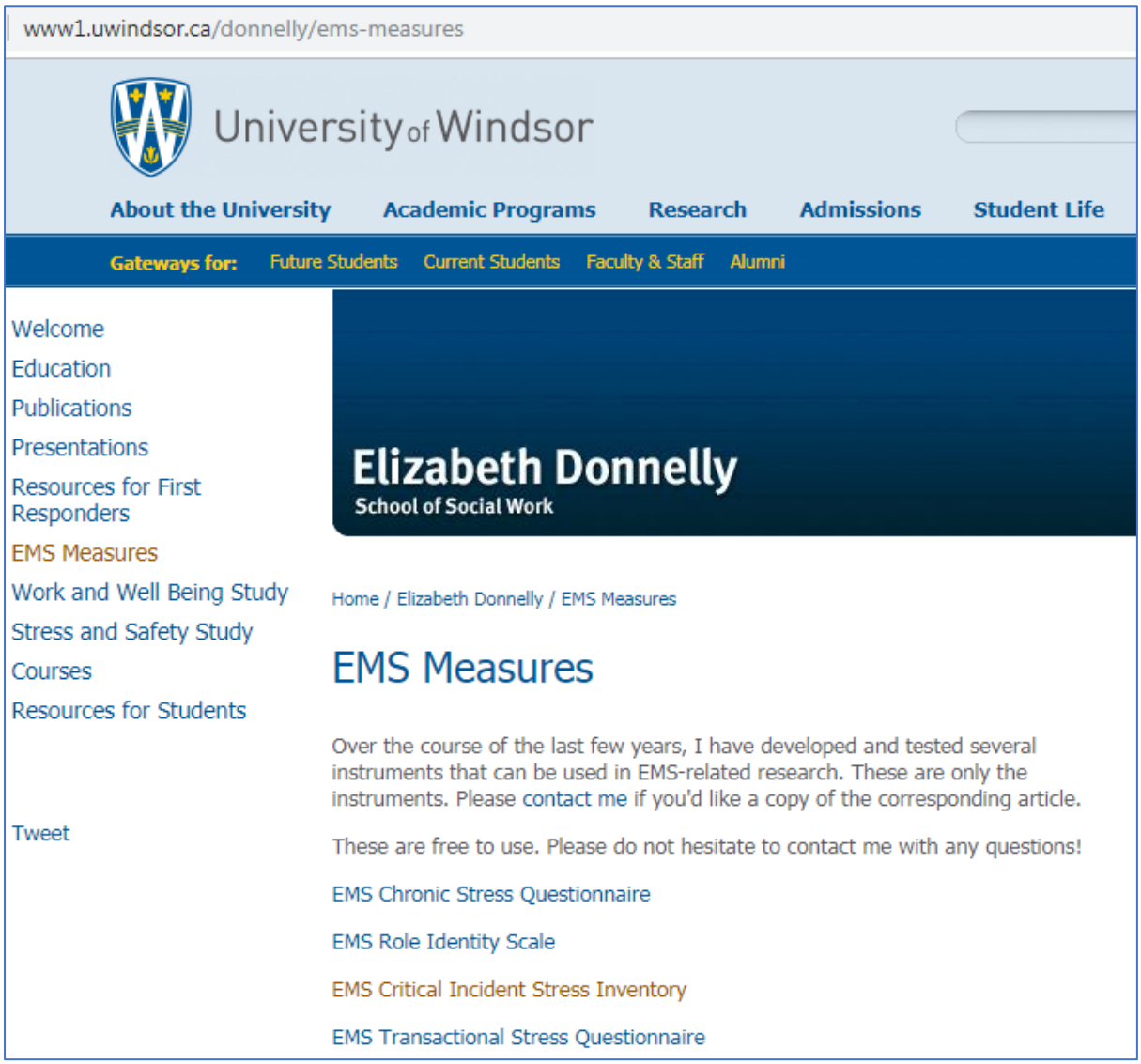
Agreed to by:

Dr Shahieda Adams
Signature (printed)

20 June 2019
Date

Senior Lecturer and Occupational Medicine Specialist
Title

APPENDIX 8: PERMISSION TO USE EMS CRITICAL INCIDENT INVENTORY



APPENDIX 9: LETTER OF SUPPORT FOR RESEARCH: EMS MANAGEMENT

Western Cape Government
Health

DIRECTORATE: **EMERGENCY MEDICAL SERVICES**
ENQUIRIES: **Dr Shaheem de Vries**
shaheem.devries@pgwc.gov.za
☎: +27 21 508 4523

Attention: **Drs IMT Ntatamala and Shahieda Adams (Supervisor)**
Division of Occupational Medicine
University of Cape Town

PROJECT TITLE: THE PREDICTORS OF POST-TRAUMATIC STRESS DISORDER AMONG AMBULANCE PERSONNEL IN THE WESTERN CAPE PROVINCE

Dear Drs IMT Ntatamala and Shahieda Adams

The Emergency Medical Services (Department of Health) hereby indicates in-principle support for your proposed study the predictors of post-traumatic stress disorder among Ambulance in the Western Cape. We recognize that the project has the potential to address an important health challenge facing our EMS population.

In giving our in-principle support, we indicate that our support is based on the understanding that

i) If and when you receive your grant for the study, you will provide us with grant number, ethics approval letter (by a locally accredited ethics committee) and proof of scientific review of your research proposal and/or protocol;
ii) You will submit your research documents (i.e. proposal; ethics letter; questionnaires; PI CV etc) through the online application system, the National Health Research Database (NHRD). The URL link is: http://nhrd.hst.org.za;
iii) Access to facility(ies) applied for is subject to the relevant managers approval.

We look forward to a good working relationship with you/your team as you conduct your project.
I appreciate the time you have taken to enquire and solicit our support.

Yours sincerely

Dr Shaheem de Vries
Head: Emergency Medical Services
Western Cape Government Health

Date: 24th June 2019

WCG Health: EMS – Office of Director, 11 Alexandra Road, Pinelands, 7405
Private Bag X24, Bellville ☎ (+27) 21 508 4523 🖷 (+27) 21 931 8490
www.capegateway.gov.za

APPENDIX 10: HUMAN RESEARCH ETHICS COMMITTEE APPROVAL LETTER

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E53-46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: sumayah.ariefdien@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

29 August 2019

HREC REF:517/2019

Dr S Adams
Division of Occupational Medicine
School of Public Health & Family Medicine
Falmouth Building-FHS

Dear Dr Adams

PROJECT TITLE: THE PREDICTORS OF POST-TRAUMATIC STRESS DISORDER AMONG AMBULANCE PERSONNEL IN THE WESTERN CAPE PROVINCE (MMED CANDIDATE - DR I NTATAMALA)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study, subject to the following: -

1. The time duration required of participants should reflect in both the Measurements Sub-Section of the Methodology Section as well as the Information Sheet to participants.
2. Please write EMS in full at first mention in the Abstract.
3. Please attend to typographical errors such as a missing word in a sentence, EG in paragraph 3 of the Abstract - "will be used assess" instead of 'will be used to asses' and error in word usage, EG in paragraph 3 on page 6 - "increasing" instead of increasingly. Such errors, although not too many, do appear throughout the document.
4. Please add the UCT HREC contact details to the informed consent document.

Approval is granted for one year until the 30 August 2020.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Dr I Ntatamala will also be involved in this study.

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938
NHREC-registration number: REC-210208-007

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

APPENDIX 11: WESTERN CAPE PROVINCE RESEARCH APPROVAL LETTER

Western Cape Government
Health

STRATEGY & HEALTH SUPPORT
Health.Research@westerncape.gov.za
tel: +27 21 483 0866: fax: +27 21 483 6058
5th Floor, Norton Rose House,. 8 Riebeek Street, Cape Town, 8001
www.capegateway.gov.za)

REFERENCE: WC_201909_015
ENQUIRIES: Dr Sabela Petros

University of Cape Town
Anzio Road
Observatory
Cape Town
7925

For attention: DR Shahieda Adams

Re: THE PREDICTORS OF POST-TRAUMATIC STRESS DISORDER AMONG AMBULANCE PERSONNEL IN THE WESTERN CAPE PROVINCE

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.
Please contact the following people to assist you with any further enquiries in accessing the following sites:

Western Cape Province Provincial Offices	**Dr Shaheem de Vries**	**021 508 4523**

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
3. In the event where the research project goes beyond the *estimated completion* date which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
4. The reference number above should be quoted in all future correspondence.

Yours sincerely

DR M MOODLEY
DIRECTOR: HEALTH IMPACT ASSESSMENT
DATE: 5/11/2019

APPENDIX 11: GUIDELINES FOR AUTHORS SUBMITTING MANUSCRIPT (OCCUPATIONAL AND ENVIRONMENTAL MEDICINE)

Occupational and Environmental Medicine is an international peer reviewed journal covering current developments in occupational and environmental health worldwide. Occupational and Environmental Medicine publishes high-quality research relating to the full range of chemical, physical, ergonomic, biological and psychosocial hazards in the workplace and to environmental contaminants and their health effects. The journal welcomes research aimed at improving the evidence-based policy and practice of occupational and environmental research; including the development and application of novel biological and statistical techniques in addition to evaluation of interventions in controlling occupational and environmental risks.

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Submission guidelines

Please review the below article type specifications including the required article lengths, illustrations, table limits and reference counts. The word count excludes the title page, abstract, tables, acknowledgements, contributions and references. Manuscripts should be as succinct as possible.

Original research

Authors should provide key messages under the following headings:

1. What is already known about this subject?
2. What are the new findings?
3. How might this impact on policy or clinical practice in the foreseeable future?

Word count: up to 3,500
Structured abstract: up to 250 words; 'Objectives', 'Methods', 'Results', 'Conclusions'
Tables/Illustrations: up to 5
References: up to 40

Presentation of statistical data

We strongly encourage authors to observe the following guidelines:

- Only essential tables and graphs should be included. Large tables should be kept to a minimum.
- Epidemiological measures of association (e.g. ratios or differences of rates, risks, odds, or prevalences) are preferred for contrasts of disease occurrence.
- Confidence intervals should be reported for measures of association.
- P-values may be reported if necessary for tests such as trend tests or non-parametric tests etc but should be given as quantitative values e.g. $p=0.032$ rather than relative to a cut point e.g. $p<0.05$.
- Generally numerical findings should not be reported to more than 1 or 2 decimal places.
- The approach to carrying out any statistical modelling should be described, including strategies for selection of explanatory variables and goodness of fit. The models presented in the paper should be clearly described and justified, with appropriate references given.
- Results from observational studies (cohort, case-control, or cross-sectional designs) should be reported following the guidelines in the STROBE statement, results of randomised trials should be reported following the CONSORT guidelines, and systematic reviews and meta-analyses should follow the PRISMA guidelines.

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APPENDIX 12: DETAILED REGRESSION ANALYSIS ON THE PREDICTORS OF PTSD

Table 6. Regression analysis on the predictors of PTSD: Demographic and general health qualities of participants (N = 388)

	Unadjusted univariate analysis		Adjusted multivariate analysis*	
Predictors	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
Age (n =339)	1.00 (0.97 - 1.02)	0.82	-	-
Gender				
Male	1 (Ref)	1 (Ref)	-	-
Female	1.46 (0.95 - 2.26)	0.09	-	-
Education				
Basic (Grade 1 to 12)	1.00	1.00	-	-
Certificate	1.62 (0.71 - 3.69)	0.26	-	-
Diploma	0.84 (0.29 - 2.47)	0.76	-	-
Degree	2.03 (0.65 - 6.34)	0.23	-	-
Home language				
English, Afrikaans, Other	1.00	1.00	1.00	1.00
IsiXhosa	1.19 (0.71 - 1.99)	0.51	0.99 (0.55 - 1.76)	0.961
Marital status				
Never married	1.00	1.00	1.00	1.00
Married	0.93 (0.59 - 1.48)	0.76	0.98 (0.56 - 1.70)	0.938
Divorced or separated	1.47 (0.70 - 3.09)	0.31	1.11 (0.47 - 2.61)	0.808
Widowed	1.15 (0.20 - 6.50)	0.87	1.00 (not specified)	-

**Data adjusted for age, gender and education.*

Table 6 (continued). Regression analysis on the predictors of PTSD: Demographic and general health qualities of participants (N = 388)

Predictors	Unadjusted univariate analysis OR (95% CI)	P value	Adjusted multivariate analysis* OR (95% CI)	P value
Living status				
Friends and family	1.00	1.00	1.00	1.00
Alone	1.46 (0.88 - 2.44)	0.15	1.20 (0.69 - 2.10)	0.519
Living location				
Urban	1.00	1.00	1.00	1.00
Rural	0.79 (0.51 - 1.23)	0.31	0.79 (0.48 - 1.29)	0.345
Smoking				
Non-smoker	1.00	1.00	1.00	1.00
Previous smoker	1.00 (0.46 - 2.20)	0.99	1.09 (0.46 - 2.59)	0.841
Current smoker	1.33 (0.83 - 2.14)	0.23	**1.76 (1.05 - 2.95)**	**0.033**
Feel need to smoke to manage WRS				
Never feel need	1.00	1.00	1.00	1.00
Feel need to smoke	**2.13 (1.33 - 3.41)**	**0.002**	**2.35 (1.40 - 3.93)**	**0.001**
Alcohol use				
Non-alcohol user	1.00	1.00	1.00	1.00
Previous alcohol user	0.58 (0.29 - 1.14)	0.11	0.63 (0.31 - 1.30)	0.213
Current alcohol user	1.15 (0.70 - 1.90)	0.58	1.41 (0.80 - 2.47)	0.235
Feel need to use alcohol to manage WRS				
Never feel need	1.00	1.00	1.00	1.00
Feel need to use alcohol	**3.55 (1.87 - 6.75)**	**p < 0.001**	**6.37 (2.93 - 13.85)**	**p < 0.001**

**Data adjusted for age, gender and education.*

Table 6 (continued). Regression analysis on the predictors of PTSD: Demographic and general health qualities of participants (N = 388)

	Unadjusted univariate analysis		Adjusted multivariate analysis*	
Predictors	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
Alcohol misuse (n= 200)				
No alcohol misuse (CAGE score 0 -1)	1.00	1.00	1.00	1.00
Alcohol misuse (CAGE score 2 – 4)	**2.85 (1.50 - 5.44)**	**0.001**	**3.86 (1.80 - 8.23)**	**0.001**
Alcohol use (CAGE scores) n=200				
CAGE score 0	1.00	1.00	1.00	1.00
CAGE score 1	1.74 (0.78 - 3.89)	0.18	**2.90 (1.15 - 7.27)**	**0.024**
CAGE score 2	1.54 (0.56 - 4.20)	0.40	**3.23 (1.01 - 10.32)**	**0.048**
CAGE score 3	**4.44 (1.71 - 11.53)**	**0.002**	**5.46 (1.86 - 16.08)**	**0.002**
CAGE score 4	**8.20 (2.03 - 33.11)**	**0.003**	**12.81 (2.73 - 60.17)**	**0.001**
Drug/illicit substance use				
Non-drug user	1.00	1.00	1.00	1.00
Previous drug user	0.95 (0.44 - 2.06)	0.905	1.08 (0.48 - 2.41)	0.850
Current drug user	**4.18 (1.20 - 14.58)**	**0.025**	**16.4 (1.87 - 143.86)**	**0.012**
Feel need to use illicit drugs to manage WRS				
Never feel need	1.00	1.00	1.00	1.00
Feel need to use drugs	**4.07 (1.44 - 11.48)**	**0.008**	**5.99 (1.74 - 20.62)**	**0.005**
Feel need to use prescription drugs to manage WRS				
Never feel need	1.00	1.00	1.00	1.00
Feel need to use prescription drugs	**4.63 (2.65 - 8.09)**	**p < 0.001**	**4.51 (2.48 - 8.20)**	**p < 0.001**

**Data adjusted for age, gender and education.*

Table 6 (continued). Regression analysis on the predictors of PTSD: Demographic and general health qualities of participants (N = 388)

	Unadjusted univariate analysis		Adjusted multivariate analysis*	
Predictors	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
Occupational status				
Professional qualification				
No qualification	1.00	1.00	1.00	1.00
Qualification obtained	1.77 (0.94 - 3.34)	0.077	2.50 (0.94 - 6.65)	0.065
Year qualification obtained (N = 314)	0.997 (0.97 - 1.028)	0.892	0.99 (0.95 - 1.04)	0.80
Job category				
Support services staff	1.00	1.00	1.00	1.00
Operational staff	1.04 (0.64 - 1.69)	0.853	0.92 (0.53 - 1.62)	0.78
Job category (by department)				
Managers, Admin, Finance & Other	1.00	1.00	1.00	1.00
Ambulance Services	3.10 (0.89 - 10.7)	0.075	2.97 (0.82 - 10.68)	0.096
HealthNet	**6 (1.32 - 27.10)**	**0.020**	5.02 (0.93 - 27.11)	0.061
Rescue Services	0.58 (0.09 - 3.8)	0.571	0.78 (0.11 - 5.40)	0.798
Call Centre	3.44 (0.95 - 12.54)	0.060	**4.04 (1.07 - 15.21)**	**0.039**
Work location (within province)				
Urban	1.00	1.00	1.00	1.00
Rural	**0.61 (0.40 - 0.95)**	**0.027**	**0.90 (0.84 - 0.97)**	**0.006**

**Data adjusted for age, gender and education.*

Table 6 (continued). Regression analysis on the predictors of PTSD: Demographic and general health qualities of participants (N = 388)

Predictors	Unadjusted univariate analysis OR (95% CI)	P value	Adjusted multivariate analysis* OR (95% CI)	P value
Average hours worked per week				
30 - 40 hours	1.00	1.00	1.00	1.00
41 - 50 hours	1.05 (0.60 - 1.84)	0.855	1.10 (0.61 - 2.00)	0.747
51 - 60 hours	1.24 (0.72 - 2.12)	0.443	1.39 (0.77 - 2.52)	0.278
61 - 70 hours	2.26 (0.76 - 6.72)	0.141	1.46 (0.44 - 4.88)	0.539
Years of employment: current role (n = 383)	1.00 (0.97 - 1.03)	0.744	1.01 (0.97 - 1.06)	0.516
Years employed in health sector (n = 383)	0.99 (0.97 - 1.0)	0.644	0.99 (0. .95 - 1.035)	0.723
Changed job/role in past 5yrs	0.88 (0.54 - 1.47)	0.647	1.08 (0.63 - 1.84)	0.786
Monthly salary				
R0 – R10,000	1.00	1.00	1.00	1.00
R10,001 – R20,000	1.77 (0.80 - 3.88)	0.157	1.60 (0.70 - 3.64)	0.261
R20,001 and above	1.35 (0.58 - 3.16)	0.489	1.33 (0.51 - 3.43)	0.559
Training on managing WRS				
No training	1.00	1.00	1.00	1.00
Some training	0.83 (0.51 - 1.35)	0.456	0.990	0.990
Extensive training	0.24 (0.03 - 1.88)	0.173	0.193	0.193
Training on services available for managing WRS				
No training	1.00	1.00	1.00	1.00
Some training	0.99 (0.61 - 1.60)	0.970	0.882	0.882
Extensive training	0.50 (0.11 - 2.36)	0.380	0.367	0.367

**Data adjusted for age, gender and education.*

Table 6. Regression analysis on the predictors of PTSD: Frequency and distribution of mental health specific variables (N=388)

	Unadjusted regression analysis		Adjusted multivariate analysis*	
Predictors	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
Mental health diagnosis				
Never diagnosed	1.00	1.00	1.00	1.00
Diagnosed	**3.76 (1.96 - 7.21)**	**p < 0.001**	**3.52 (1.78 - 6.97)**	**p < 0.001**
Family member mental health diagnosis				
Never diagnosed	1.00	1.00	1.00	1.00
Diagnosed	1.51 (0.79 - 2.90)	0.21	1.48 (0.75 - 2.91)	0.258
Treatment for mental health condition				
Not on treatment	1.00	1.00	1.00	1.00
On treatment	2.10 (0.97 - 4.58)	0.060	2.14 (0.93 - 4.89)	0.073
Treatment for other medical condition				
Not on treatment	1.00	1.00	1.00	1.00
On treatment	**1.95 (1.22 - 3.11)**	**0.005**	**2.19 (1.29 - 3.73)**	**0.004**
Awareness of services to manage WRS				
Not aware	1.00	1.00	1.00	1.00
Aware	1.05 (0.65 - 1.69)	0.853	1.13 (0.68 - 1.90)	0.634

**Data adjusted for age, gender and education.*

Table 6. Regression analysis on the predictors of PTSD: Frequency and distribution of mental health specific variables (N=388)

	Unadjusted regression analysis		Unadjusted regression analysis*	
Predictors	**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
Quality of life (role limitation)				
SF36 QoL RE score	**0.98 (0.98 - 0.99)**	**0.012**	**0.99 (0.98 – 1.00)**	**0.012**
Emotional problems with regular work (past 4 weeks)	**5.37 (3.36 - 8.59)**	**p < 0.001**	**6.00 (3.57 - 10.10)**	**p < 0.001**
Resilience (CD-RISC score)	**0.95 (0.92 - 0.98)**	**p < 0.001**	**0.95 (0.92 - 0.99)**	**0.004**
Chronic stressors				
Chronic Operational stress	**1.09 (1.07 - 1.12)**	**p < 0.001**	**1.09 (1.07 - 1.12)**	**p < 0.001**
Organizational stress	**1.07 (1.05 - 1.094)**	**p < 0.001**	**1.08 (1.06 - 1.10)**	**p < 0.001**
Chronic workplace stress†	**1.05 (1.04 - 1.07)**	**p < 0.001**	**1.06 (1.04 - 1.07)**	**p < 0.001**
Critical incident stress	**1.03 (1.02 - 1.04)**	**p < 0.001**	**1.04 (1.02 - 1.06)**	**p < 0.001**

**Data adjusted for age, gender and education.*

† Chronic workplace stress (operational stress and organizational stress combined)