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Original Research

Posttraumatic Stress Responses and Psychological Well-being in Norwegian Medical Helicopter Personnel



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A B S T R A C T

Objective: Emergency medical personnel are exposed to multiple stressors, including those of psychological etiologies. The aim of this study was to report the prevalence of anxiety, depression, and posttraumatic stress symptoms in Norwegian medical helicopter personnel and to determine to what degree they report personal growth or deprecation due to exposure to work-related events.

Methods: This was a web-based, cross-sectional survey performed among rescue paramedics and physicians staffing helicopter emergency medical services and search and rescue helicopters between May 5, 2021, and July 5, 2021. Questions included demographic data, the traumatic events exposure index, the Generalized Anxiety Disorder 7 scale, the Patient Health Questionnaire 9 (Depression), the posttraumatic change scale, and the posttraumatic symptom scale.

Results: Of the 245 eligible participants, 10 declined to take part and 74 failed to answer, producing a response rate of 66% (72 rescue paramedics and 89 physicians). Of the study population, 3.9% reported moderate to severe posttraumatic stress disorder symptoms, and 1.9% described moderate to severe depression and anxiety. The majority (76%) described posttraumatic emotional growth because of their work experience.

Conclusion: Despite exposure to several traumatic stressors, participants reported a lower prevalence of posttraumatic stress symptoms, depression, and anxiety compared with a Norwegian adult population.

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The nature of emergency medicine, with high-intensity and dramatic episodes, can be rewarding and attractive for the personnel involved.¹ However, emergency medical personnel are exposed to several negative factors that may influence their welfare.² These include workplace violence and accidents.^{3,4} In addition, the coronavirus disease 2019 pandemic has highlighted the risks and dilemmas of treating patients with transmissible diseases.⁵ There also appears to exist an emotional burden associated with working in this field highlighted by studies documenting elevated rates of burnout, posttraumatic stress disorder (PTSD), and decreased well-being.^{6–8} In this

context, it should be noted that exposure to major stressors is not exclusively associated with PTSD symptoms. Major depressive disorder, alcohol and substance abuse, and a range of anxiety disorders have also been identified as common sequelae of traumatic experiences.^{9,10}

Emergency medical services (EMS) may have higher rates of PTSD in comparison to other first responders, although a review discussed the challenges of comparing studies performed among different professions and services.¹¹ Specifically, there is a range of distinctions between different EMS cohorts in terms of stressor exposure, socio-demographic factors, and professional culture.

Helicopter emergency medical services (HEMS) and search and rescue (SAR) helicopters can be assessed as an extension of EMS. Personnel in these services are exposed to multiple stressors,

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including those of psychological etiologies, that may be potentially debilitating and are often identified with stigma.^{12–15} However, studies have identified that varying degrees of posttraumatic growth (PTG) development or resilience responses are the more likely outcomes after stress exposure.¹⁶ In the context of traumatic stress, resilience has been defined as the capacity of an individual to “bounce back” to normal function after a short period of stress reactions.¹⁷ In contrast, PTG represents positive personal changes after a period of psychological distress related to traumatic stress exposure.¹⁸ The changes referred to as PTG occur on a continuum of positive to negative changes; a negative personal development is referred to as posttraumatic depreciation (PTD).¹⁶ PTG and PTD are typically seen as altered perceptions of oneself, altered perceptions of others, and altered perceptions of the world and in meaning making.¹⁹ This 3-domain structure parallels the areas of disrupted perceptions commonly found in people diagnosed with PTSD.²⁰

Examining the psychological well-being of a workforce with an increased occupational risk is crucial toward ensuring their health and implementing preventative measures. Therefore, the aim of this study was to report the prevalence of anxiety, depression, and PTSD in rescue paramedics and physicians working in Norwegian HEMS or SAR helicopters and to determine to what degree they report growth or depreciation as a consequence of exposure to work-related events.

Methods

Study Setting

The Norwegian air ambulance network is publicly funded and consists of 13 HEMS bases. In addition, the network operates 7 fixed wing bases with both propeller and jet aircraft.²¹ Finally, there are 6 SAR helicopter bases on mainland Norway and one in the remote archipelago of Spitzbergen. HEMS and SAR helicopters fly with consultant anesthesiologists on all missions and have an additional medical crewmember who has a dual function as both paramedic and rescue man (in this study specified as rescue paramedic). Both physicians and rescue paramedics are recruited according to a specified national standard describing function and qualifications.²² The physicians in both HEMS and SAR service are employed by the health trusts, whereas the rescue paramedics in the HEMS service are employed by the Norwegian air ambulance service, who also operate the helicopter. Five of the 6 mainland SAR bases are operated by the Royal Norwegian Air Force; therefore, the rescue paramedics at these bases are also military personnel.²³ At the remaining SAR base on mainland Norway and at the remote Spitzbergen base, the rescue paramedics are employed by the operator of the SAR helicopter, which is Canadian Helicopter Company and Lufttransport AS, respectively. Both HEMS and SAR helicopters are equipped and staffed to perform both HEMS and SAR missions night and day.²⁴ Patient treatment is the responsibility of the physician with assistance primarily from the rescue paramedic and on certain missions also from the remaining crew. The majority of missions for both services are dependent on cooperation with other institutions, including the police and fire service but especially ground EMS.²⁵

Study Design

This study used data from a cross-sectional, web-based survey (QuestBack, Oslo, Norway) that was performed among physicians and rescue paramedics staffing HEMS and SAR helicopters in Norway. The study took place between May 5, 2021, and July 5, 2021, with 3 reminders to nonresponders. In total, 143 physicians and 102 rescue paramedics were eligible to participate in the study. Respective

institutions and helicopter operators were contacted for permission to perform the study.

The survey consisted of questions pertaining to the following:

1. Demographic data (age, sex, length of work experience, HEMS/SAR background, professional background, cohabitation, and peer support access)
2. A traumatic events exposure index consisting of 10 items (based on the peer support program of EMS in Health Trust Sør Trøndelag developed for the current study); it reports defined, traumatic events from the work environment during the last 12 months and how they were perceived as traumatic/nontraumatic.
3. The Patient Health Questionnaire 9 (PHQ-9) is depression specific, which is based on the original Primary Care Evaluation of Mental Disorders.²⁶ It contains 9 items with a score of 0 to 3 for each item, with scores ranging from 0 to 27. In clinical studies, a score of 10 is often applied as a cutoff value for moderate depression.
4. The Generalized Anxiety Disorder 7 (GAD-7) scale²⁷; this scale contains 7 items with possible scores of 0 to 3 for each item, with scores ranging from 0 to 21. In clinical studies, a score of 10 is often applied as a cutoff value for moderately severe anxiety.
5. The posttraumatic change scale (PTCS) contains 12 items. This scale was developed and validated by the Norwegian Armed Forces Joint Medical Services.¹⁶ It measures 3 different dimensions: self-confidence, interpersonal involvement including social adaptability, and awareness. The items are rated on a 5-point Likert scale (1–5). The purpose of the scale is to identify PTG, PTD, or no change. A mean score above 3 indicates PTG (mean PTCS ≥ 3.1), whereas a mean score below 3 indicates PTD (mean PTCS ≤ 2.9). No change was measured as a mean score of 3, in this study, it was defined as $2.9 < \text{mean PTCS} < 3.1$.
6. The posttraumatic symptom scale 10 (PTSS-10); this scale was developed and validated for a Norwegian population.²⁸ It contains 10 items measuring posttraumatic symptoms during the last 7 days. Each item has a 7-point Likert scale (1–7). The possible score range is 10 to 70. A score ≥ 35 is defined as a cutoff threshold for probable PTSD.

The survey was written in Norwegian and is provided in Appendix 1. An English version of the scales are also included in Appendix 2. The introduction to the study and participation consent are found in Appendix 3.

Statistical Analysis

The data were analyzed using SPSS Statistics, Version 27 (IBM Corp, Armonk, NY). Statistical data are presented as frequencies, percentages, averages with mean, standard deviations, and medians with interquartile ranges (IQRs) where appropriate.

A simple linear regression analysis was applied to establish the strength of association between PHQ-9, GAD-7, and PTSS-10. These are reported as *b* (standardized Beta coefficient), *t* (*t*-test for linear regression) *p* (significance). Cronbach alpha was applied to measure internal consistency of the different scales/tests used in this study.

Ethical Approval

The study has been approved by the Regional Committee for Medical and Health Research Ethics of Central Norway (Ref. 230727). After being supplied with written information regarding the study, participants were required to consent prior to answering the study questions.

Results

The invitation to participate in the study was answered by 171 (70%) of 245 eligible candidates, and a total of 161 (66%) consented to

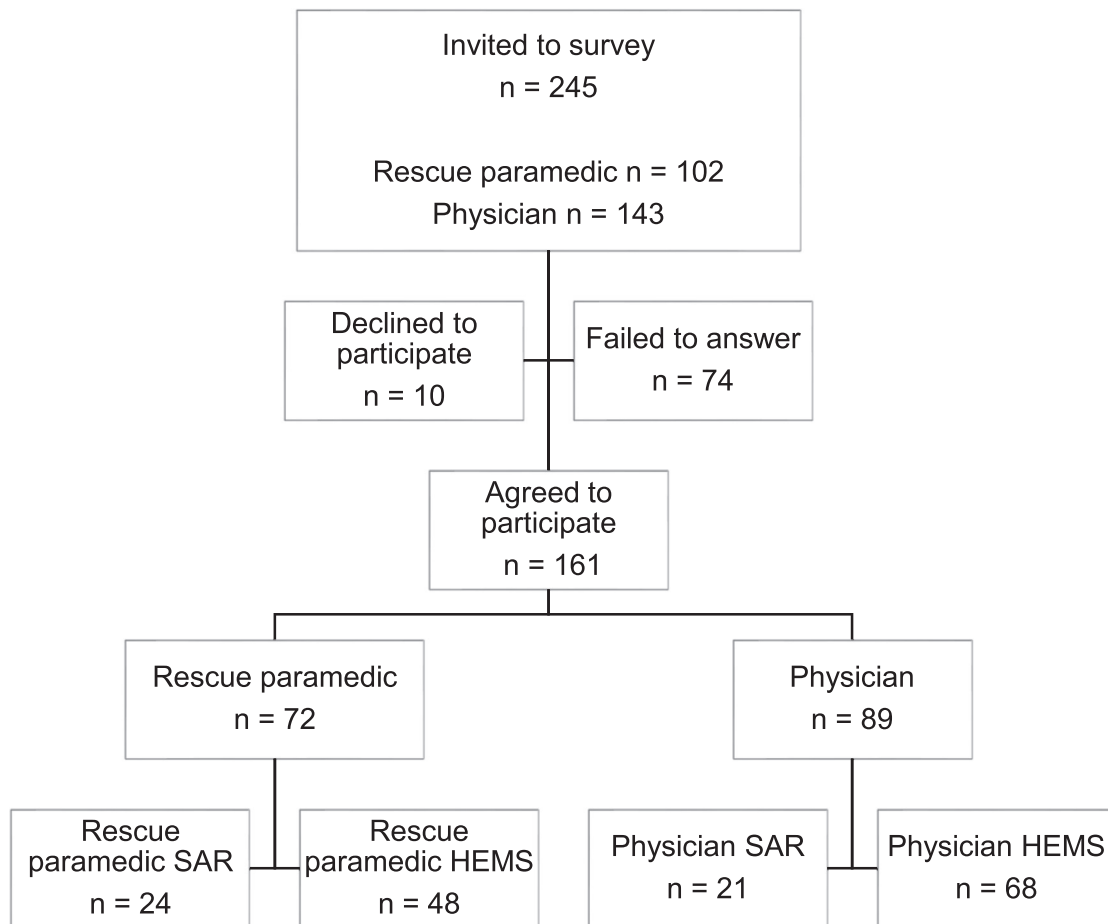


Figure 1. Inclusion of the study population.

participate and completed the questionnaire (Figure 1). The demographics of the study population are shown in Table 1. Participants were asked to answer questions about exposure to potentially traumatic events in the last 12 months (the traumatic events exposure index) and to describe if the event had an emotionally traumatic impact on them. These findings are portrayed in Table 2.

Current depressive symptoms were studied using the PHQ-9 (Cronbach $\alpha = 0.815$), and anxiety was studied by applying the GAD-7 (Cronbach $\alpha = 0.821$). Both scores used cutoff scores above 10 as indicative of moderate to serious conditions. A PTSS-10 above or equal to 35 was also considered a cutoff value for clinical PTSD (Cronbach $\alpha = 0.898$). Rescue paramedics and physicians working in SAR reported median scores of 3 (IQR: 1-6) for the PHQ-9, 2 (IQR: 0.5-5) for the GAD-7, and 14 (IQR: 11.5-23.5) for the PTSS-10 compared with those working in the air ambulance with median scores of 2 (IQR: 1-4) for the PHQ-9, 1 (IQR: 1-3) for the GAD-7, and 12 (IQR: 10-16) for the PTSS-10 (See Table 3).

We performed a simple linear regression in order to predict a possible correlation between anxiety (PHQ-9) and depression (GAD-7) as independent values with PTSS-10 as a dependent value. Both relationships were found to correlate positively, and in both cases, linearity and assumption of normality were not violated (PHQ-9: $b = 0.777$, $t = 15.544$, $P < .001$ /GAD-7: $b = 0.836$, $t = 19.234$, $P < .001$).

We applied the PTCS to define self-reported emotional growth, depreciation, or no change within the study population (Cronbach $\alpha = 0.872$). Mean scores above 3 indicated growth, whereas scores below 3 indicated depreciation. Mean scores of 3 (defined as $2.9 < \text{PTCS mean} < 3.1$) indicated no change. This is described in Table 4.

Discussion

This study indicates that despite repeated exposure to a range of potential traumatic stressors, rescue paramedics and physicians

Table 1
Demographics of Study Population

Demographic Variable	Study Population Total (N = 161)	Rescue Paramedic (n = 72)	Physician (n = 89)
Age in years mean (SD)	44.8 (7.1)	42.2 (7.4)	46.9 (6.1)
Years of prehospital experience, mean (SD)	13.6 (8.2)	15.8 (8.8)	11.9 (7.3)
Male, n (%)	145 (90)	71 (99)	74 (83)
Female, n (%)	16 (10)	1 (1)	15 (17)
Access to peer support, n (%)	103 (64)	59 (82)	44 (49)
Used peer support, n (%)	6 (4)	4 (6)	2 (2)
Married/partner, n (%)	151 (94)	68 (94)	83 (93)

SD = standard deviation.

Table 2
Exposure to Traumatic Events in the Last 12 Months

Traumatic Event	Exposure Experienced as Traumatic n (%)	Rescue Paramedic (n = 72)			Physician (n = 89)	
		Exposed but No Traumatic Experience n (%)	No Exposure n (%)	Exposure Experienced as Traumatic n (%)	Exposed but No Traumatic Experience n (%)	No Exposure n (%) / Move n (%) down
Death of young person/child < 30 years	8 (11)	44 (61)	20 (28)	7 (8)	48 (54)	34 (38)
Serious illness/trauma in patient < 30 years	2 (3)	62 (86)	8 (11)	2 (2)	77 (87)	10 (11)
Patient with serious injuries	0	69 (96)	3 (4)	6 (7)	79 (89)	4 (5)
Suicide/attempted suicide	5 (7)	55 (76)	12 (17)	6 (7)	58 (65)	25 (28)
Death generally	3 (4)	67 (93)	2 (3)	4 (5)	84 (94)	1 (1)
Inability to help sick/injured patient	0	19 (26)	53 (74)	7 (8)	22 (25)	60 (67)
Threats/aggression toward you or colleague	0	6 (8)	66 (92)	2 (2)	13 (15)	74 (83)
Threats/aggression toward patient	2 (3)	29 (40)	41 (57)	0	31 (35)	58 (65)
Accident in helicopter/ambulance	2 (3)	11 (15)	59 (82)	4 (5)	13 (15)	72 (81)
Diagnostic/treatment anomalies causing patient deterioration	4 (6)	3 (4)	65 (90)	5 (6)	8 (9)	76 (86)

Accident is defined as a nonplanned event causing damage to equipment or personal injury. Question does not apply to patient treatment.

Table 3
Depression, Anxiety, and Posttraumatic Stress Symptoms

Study Scale	Depression PHQ-9 Median (IQR)	Depression PHQ-9 ≥ 10 n (%)	Anxiety GAD-7 Median (IQR)	Anxiety GAD-7 ≥ 10 n (%)	PTSS-10 Median (IQR)	PTSS-10 ≥ 35 n (%)
Total Study population (N = 161)	2 (1-4.5)	3 (2)	2 (1-3.5)	3 (2)	13 (11-17)	5 (3)
Rescue paramedic (n = 72)	2 (1-4)	2 (3)	2 (1-3)	2 (3)	13 (10-16)	3 (4)
Physician (n = 89)	2 (1-5)	1 (1)	2 (1-4)	1 (1)	13 (11-17)	2 (2)

GAD-7 = Generalized Anxiety Disorder 7; IQR = interquartile range; PHQ-9 = Patient Health Questionnaire 9; PTSS = posttraumatic symptom scale.

working in Norwegian helicopter SAR and HEMS report low incidences of PTSD, anxiety, and depression. This indicates a high degree of resilience in this population. The majority also described posttraumatic growth as a consequence of their work experiences. Physicians expressed the inability to assist patients as the most emotionally traumatic event, and rescue paramedics appear to have better access to formalized peer support compared with physicians.

Recent systematic reviews have shown a prevalence of PTSD in EMS as high as 11%.^{11,29} However, studies from Switzerland and Germany including the same personnel may be more comparable to Norwegian conditions, quoting positive PTSD screening at 4.3% and 5.4%, respectively.^{29,30} A recent survey performed by this research group found manifest PTSD symptoms in 5% of a Norwegian EMS population, with 8.6% and 2.9% reporting moderate to severe symptoms of depression and anxiety, respectively.³¹ In this current study, 3.9% of the study population reported manifest PTSD symptoms, and 1.9% described both moderate to severe depression and anxiety. The prevalence of all 3 conditions was slightly higher for rescue paramedics compared with physicians, although the number of positive screened participants was low, thus obviating any relevant analysis of significance. However, PTSD among the study population appears to be comparable to a general Norwegian adult population; a recent study showed a point prevalence among men of 3.8% and 8.5% for

women.³² Similar adult Norwegian studies indicated a depression rate of 8.1% and anxiety at 2.9%.^{33,34}

It is important to take note of the distinction between sex and the relevance it has on our study. There were only 16 female participants in this study, primarily physicians, constituting 9.9% of the study population. To ensure anonymity, we chose not to perform any further analysis of sex differences within this cohort. However, a similar study of Norwegian EMS reported a 47% female participation rate.³¹ The study indicated comparable PTSD rates between the sexes (ie, 5.3% women and 4.7% men). Other studies have confirmed this, showing that women working as first responders or in the military did not report a higher prevalence of PTSD compared with their male colleagues.^{30,35} Research indicates that especially younger women are more exposed to traumatic stress than men and that selection or self-selection for certain professions may compensate for this difference.³⁶

Personnel working as crewmembers in helicopter SAR and HEMS are typically highly motivated individuals who have undergone rigorous selection processes with a focus on nontechnical and crew resource management skills. This also applies to physicians, who have undertaken several years of additional medical and prehospital operative skills training to qualify for their positions in a safe aviation environment. High levels of education, motivation and training, and

Table 4
Posttraumatic Growth, No Change, or Deprecation

PTCS	Total (N = 161) n (%)	SAR (n = 45) n (%)	Air Ambulance (n = 116) n (%)	Rescue Paramedics (n = 72) n (%)	Physicians (n = 89) n (%)	PTSS-10 ≥ 35 (n = 5) n (%)
Growth PTCS mean ≥ 3.1	122 (76)	34 (76)	88 (76)	52 (72)	70 (79)	3 (60)
No change PTCS 2.9 < mean < 3.1	23 (14)	5 (11)	18 (16)	9 (13)	14 (16)	0
Deprecation PTCS 1 ≤ mean ≤ 2.9	16 (10)	6 (13)	10 (9)	11 (15)	5 (6)	2 (40)

PTCS = posttraumatic change scale; PTSS = posttraumatic symptom scale; SD = standard deviation.

increased professionalization may explain the relatively low levels of PTSD and the generally healthy mental well-being of this category of personnel.³⁷ Another Canadian study on HEMS personnel which included nurses, paramedics, physicians, and pilots, emphasized this aspect and also reported a similarly low prevalence of mental health complaints, including PTSD.³⁸ This factor can also be enhanced by high reported degrees of job satisfaction and the robust debrief culture, which has been described in a recent study of Norwegian helicopter physicians.¹⁴ Regular debriefing may also compensate to a certain degree for the apparent decreased access to peer support among physicians reported in this study. Peer and social support, including marital/partner relationships, are described as playing a major role in mitigating the effects of PTSD.^{39,40} However, there is evidence that optimal peer support is provided when the intervention is provided with same-level individuals on a strictly peer-to-peer basis.⁴¹ In this study, close to 94% of the study population was in a marital/partner relationship.

In our study, 19% had experienced an accident in a helicopter or ambulance during the last 12 months, and 13% had received threats or been exposed to violence. By comparison, 10% of Norwegian EMS personnel reported an accident in the ambulance, whereas 47% were exposed to aggression.³¹ However, the inability to assist ill or injured patients was perceived as the most traumatic experience for physicians in this study, confirming findings in other studies indicating that physical threats and peritraumatic fear are not necessarily the most stressful aspect of a traumatic situation.^{42,43} Therefore, it may also be of importance to distinguish between danger-based and non-danger-based stressors and bear in mind the significance of moral injury-related stress symptoms, especially in health personnel.^{44,45} Non-danger-based stressors are experiences in which the primary triggers are not danger or life threats but rather a provocation of individual or normative morality or entail the witnessing of suffering and the loss of life in others.^{44,46}

Training, education, experience, and exposure will facilitate the development of resilience, which can be described as the individual's ability to adjust to potentially harmful influences and challenges.⁴⁷ The PTCS was also applied in this study, a concept that incorporates more than resilience and a return to normal function but encompasses "positive psychological changes experienced as a result of the struggle with highly challenging life circumstances."¹⁹ We found that over three quarters of the study population reported PTG, and there was little variation between the professions and services. In addition, and possibly surprisingly, the majority of participants with manifest PTSD symptoms also reported growth. These figures are low and should therefore be interpreted with caution; however, they do confirm findings in other studies in which positive correlations between PTG and PTSD were described.⁴⁸ Ultimately, the concept of PTG provides an optimistic view on how personnel employed in challenging professions can undergo a positive emotional development after or even during the process of psychological suffering.⁴⁹

The response rate in this study was 66%, which implies caution is needed when interpreting the results. Response rates from self-reported questionnaires among similar occupational groups have been described as a typical challenge.²⁹ Missing answers may influence the results, and there is a risk that eligible participants with serious psychological complaints did not participate in the survey. Therefore, there is a certain risk of participation bias. In addition, our study population only included personnel working in SAR/HEMS at the time of the study, thereby excluding those who have left the services or are now working in other nonoperative positions. Moreover, in this study, we focused entirely on health personnel. Consequently, no information regarding other nonmedical crewmembers has been collected. However, these crewmembers may also be exposed to similar stressors.

Several of the rescue paramedics and physicians in these services have been or are currently employed in the Norwegian military forces on different contracts. The regional ethics committee strongly recommended against using questions regarding military deployment on the grounds of identification; therefore, we cannot conclude if such exposure also has an influence on these study results.

We used validated scales to measure anxiety, depression, PTSD, and posttraumatic change. Self-reported surveys can only give an indication of the prevalence of these conditions and do not have a diagnostic function in their own right compared with diagnostic interviews.⁵⁰

Conclusion

This study shows that despite exposure to several potential traumatic stressors, rescue paramedics and physicians working in Norwegian helicopter SAR and HEMS report a lower prevalence of PTSD compared with a Norwegian adult population. The same applies for anxiety and depression. The majority describe posttraumatic growth as a consequence of their work experience. Formalized and strictly peer-to-peer support efforts, especially for physicians, could be improved.

Supplementary materials

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.amj.2022.02.006>.

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