



Emergency Transport Crew: Post-Traumatic Stress Disorder Prevention Program

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Abstract

Background: The incidences of post-traumatic stress disorder (PTSD) among critical care nurses, emergency room nurses, and paramedics range from 20 to 33%. PTSD is associated with a lower quality of life (QOL), occupational impairments, physical health decline, and increases the risk of premature death. Research supports prevention and surveillance measures for post-traumatic stress disorder in emergency medical service providers, but the practice is not routinely done.

Methods: A multi-purpose quality improvement project focused on educating transport crew members about PTSD. Other interventions emphasized anti-stigma lessons, resiliency assistance, and coping skills training. The pilot provided surveillance efforts, employed an early organizational PTSD recognition, and immediate debriefing for at-risk personnel at three Air Evac Lifeteam bases.

Results: After the QI interventions, most crew members' overall post-test PCL-5 scores were lowered by 12.5%. Another measure of the QI success was the Professional Quality of Life score improvement. Specially, the compassion satisfaction average level increased by 14% and the average burnout level decreased by of 15%.

Conclusions: The QI project demonstrated the transport crew members' well-being can be positively influenced

by a PTSD prevention and surveillance program. These interventions offer a promising reduction in the prevalence of stress and PTSD. A nationwide practice change with these project interventions could improve the mental health of helicopter emergency medical personnel.

Keywords: post-traumatic stress disorder, critical incident stress, emergency medical services, helicopter emergency medical services, quality improvement

Introduction

Stress is a state of physical and emotional activation. The core element of stress is the fight or flight response, also known as the stress response, which is activated in response to any perceived threat, challenge, or change (Canadian Centre for Occupational Health & Safety, 2018). As a result, emergency medical service (EMS) providers may sustain and maintain the fight or flight response for long periods of time, riding waves of the fight or flight syndrome throughout any given shift. According to Regehr & Millar (2007), professionals with the highest risk for stress, trauma, and burnout are paramedics. Operational stress can be cumulative (Erich, 2014). According to Collopy (2012), EMS crews' chronic stress is associated with conflict, lack of support, competitive work environment, and low pay. Additionally, operational stress can induce chronic or long-term stress which can lead to post-traumatic stress disorder (PTSD) (Donnelly, 2012). Other injuries of chronic or long-term stress include personal anxiety, poor health, family problems, substance abuse, depression, and burnout which may be isolated or coexist and be mutually exacerbating (Erich, 2014).

For health care providers, stress and trauma do not have to be adverse. Bower et al. (2009) found gains associated with stressful events. The authors developed a model by which psychological and physiological pathways can lead to improved physical health. Stress appears to lessen the pain and reduce the serious psychological and physical consequences of stressful life experiences. Charles et al. (2021) examined stressors and well-being in more than 2,500 American adults. The authors discovered stressor-free subjects had less active daily lives, but reported fewer chronic illnesses and higher levels of daily well-being such as higher positive affect and lower negative affect.

Problem

The helicopter emergency medical service (HEMS) environment is a complex healthcare setting where emergency medical services and emergency and critical care nursing intersect. HEMS providers care for patients who are severely ill or injured and must do so while enduring additional 'stressors of flight' (Carchietti et al., 2011).

In addition to the emergency situation, stressors of transport are factors creating an extra layer of stress. The extra layer of stress impacts safety during transport operations, creates additional transport challenges related to limited resources, patient acuity, confined work environment, limited or low lighting conditions, thermal changes, aircraft vibration, excessive noise, and gravitational forces (G-forces). According to Iranmanesh et al., (2013), PTSD among critical care nurses, emergency room nurses, and paramedics range from 20 to 33%. In a 2015 National EMS survey, 37% of respondents had contemplated suicide and 6.6% had attempted suicide (Newland et al., 2015) which is staggering when compared to the national average of 3.7% and 0.6% (Centers for Disease Control and Prevention, 2015) respectively.

Furthermore, it is estimated approximately 22% of all paramedics will develop PTSD at some time during their professional career, which is slightly higher than police officers and firefighters at 19% and 16.3% respectively (Drewitz-Chesney, 2012). According to the Institute of Medicine (2012), PTSD is associated with a lower quality of life, occupational impairments, physical health decline, and increased risk of premature death. Suicide results in an estimated seventy billion dollars in combined medical and work loss costs (Centers for Disease Control and Prevention, 2020), and PTSD is attributed to an estimated 3.6 lost workdays every month (Stergiopoulos et al., 2011).

For this project, the authors recognized improvements were needed for Air Evac Lifeteam (AEL), the largest air medical transport provider in the United States. These included programs to proactively identify and prevent the development of adverse emotionally traumatic events and chronic stress as 20.8% of participants met provisional diagnostic criteria for PTSD based on pre-PTSD Checklist for DSM-5 (PCL-5) scores.

Purpose

AEL utilizes the Post-Offer Employment Testing (POET), a physical agility evaluation to ensure that hired employees can perform essential functions of the job for which they are hired (Zurich, 2015). However, there was not a mental health assessment to at least serve as the employee's baseline, nor was there

routine surveillance monitoring for critical incident stress and PTSD. The purpose of this quality improvement (QI) initiative was to develop a PTSD prevention and surveillance program that simultaneously educates flight crew members on the dynamics of PTSD; initiates anti-stigma, resiliency, and coping skills training; initiates surveillance that facilitates employees in self-identifying their PTSD risk; facilitates early organizational recognition and immediate debriefing interventions for at risk personnel; and facilitates voluntary referral to the Employee Assistance Program (EAP) for employees identified as at moderate or high risk for PTSD.

Methods

The project methods consisted of implementing QI interventions and evaluating their effectiveness at AEL's Arkansas bases. Health Resources and Services Administration (2011) defined QI as systematic and continuous actions that lead to measurable improvements in health care services and the health status of targeted patient groups. In this QI project, the participants were flight crew members consisting of nurses, paramedics, nurse/paramedics, and pilots working in an active flight capacity. Furthermore, the Plan-Do-Study-Act (PDSA) cycle was the planning tool used to ensure the project went smoothly. The four key concepts are to foster a plan to test the change (Plan), implement the interventions (Do), evaluate the interventions' outcomes (Study), and identify what modifications should be made to the plan (Act) (Institute for Healthcare Improvement, 2021). Additionally, the authors followed SQUIRE 2.0 and its components in reporting the QI key processes for the pilot (Ogrinc et al., 2015).

A university institutional review board (IRB) gave approval for the proposal (IRB Protocol Number: 1710079277). Written consent was obtained from all participants in the QI project. The data analysis consisted of descriptive statistics: frequencies, percentages, means, and percentage differences.

Sites

The QI project was conducted at three of AEL's Arkansas bases as a pilot test to determine the feasibility for the entire organization. Sample selection for this QI initiative used a non-probability sampling design by way of convenience sampling. Forty-one flight crew members were invited to participate in this QI initiative via company email and 24 members returned a signed consent to participate, giving a sample size ($n = 24$). Each base typically employs four transport crew members from each discipline: nurses, paramedics, and pilots. Transport crew members provide both inter-facility and scene transports for critically ill and/or injured patients across the life span.

Measuring Tools

Two measuring tools were used in the project. First, the PCL-5 is a twenty item self-report assessing for the presence and severity of PTSD symptoms. The tool takes 5-10 minutes to administer and is scored using a 5-point Likert scale ranging from "Not at all" to "Extremely". Items on the PCL-5 correspond with four subscales on the American Psychiatric Association's (APA's) Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA, 2013) criteria for PTSD: intrusion, avoidance, negative

alterations in mood/cognitions, and alterations in arousal and reactivity. Total scores range from 0 to 80 and a 33 or higher score indicates a provisional PTSD diagnosis.

According to U. S. Department of Veterans Affairs (2022), the PCL-5 is a valid and reliable self-reporting instrument for quantifying symptom severity over time. It is extensively used in both military and civilian populations as it aids in screening individuals for PTSD, can assist in making a provisional diagnosis of PTSD, and can help to determine the appropriate next steps for treatment options, if applicable. Additionally, Bovin et al. (2016), studied a PTSD veteran population to confirm the PCL-5 psychometric properties. The authors found the tool contained internal consistency, test-retest reliability of $r = .84$, and contained convergent/discriminant validity. A comparison of crew member pre- and post-test PCL-5 scores were used to determine if there is a reduction in critical incident stress and PTSD.

Second, the Professional Quality of Life (ProQOL) is a thirty-item self-report assessing compassion satisfaction, burnout, and compassion fatigue, taking 20–30 minutes to administer. Each variable has ten corresponding questions that are rated using a 5-point Likert ranging from “Never” to “Very Often” and the sum of each section is used to calculate compassion satisfaction, burnout, and compassion fatigue level, with Low = 22 or less, Average = between 23 and 41, and High = 42 or more. The ProQOL demonstrates strong reliability and validity of three separate constructs using Cronbach’s Alpha (α): compassion fatigue $\alpha = 0.81$, burnout $\alpha = 0.75$, and compassion satisfaction $\alpha = 0.88$, and may be utilized by individuals as part of an ongoing self-care evaluation. The psychometric properties of this tool were based on populations working with people experiencing extremely stressful events (Stamm, 2010). A comparison of the crew’s pre- and post-test ProQOL scale scores was used to determine if any improvements in transport crew member quality of life were achieved by comparing measures of three separate constructs: compassion fatigue, compassion satisfaction, and burnout.

Interventions

The QI interventions occurred over a 2-month time period in a stepwise fashion. In addition to the pre-test PCL-5 and ProQOL, crew members completed a pre-test examination on the identification and symptomatology of PTSD, activating Critical Incident Stress Management (CISM) and Employee Assistance Program (EAP) information. Following the testing, crew members individually viewed a PowerPoint presentation via Learning Management System (LMS) covering the dynamics and symptomatology of PTSD, how to activate the CISM team activation, EAP assistance, and self-identification of PTSD in themselves and among their peers. After viewing the PowerPoint presentation, crew members took the post-test examination focusing on the same content as the pretest. In an effort to reduce the stigma associated with mental illnesses, particularly PTSD, an anti-stigma intervention was implemented at the three sites consisting of anti-stigma posters in offices, bathrooms, and aircraft hangers. An experiential learning activity was conducted following each participating base’s scheduled

monthly meeting. For this intervention, crew members completed a pre-test knowledge examination answering questions on resiliency, coping skills, health maintenance, and PTSD stigmatization. Confidentiality was preserved by insuring there were no means to trace subjects with responses.

Following the assessment, content focused on job factors impacting psychological health and safety, signs of PTSD and its effects on colleagues, and mental health services. The learning strategy was a PowerPoint presentation followed by responding to crew members’ questions. Resiliency and coping skills training occurred through experiential learning activities teaching crew members how to effectively manage stress and maintain health. Stress For Success (Belmont, 2006) is a group energizer and a team-building exercise. This interactive activity makes crew members draw on others for support in times of stress, forces crew members to adjust to competing demands, addresses mindfulness, and is a reminder that stress can be fun. A finger and arm folding activity was utilized as another intervention. Folding arms and maneuvering fingers were activities in this therapeutic group exercise. The suggested outcomes are flexible thinking, changing one’s perspective, and realizing that people process things differently (Belmont, 2006).

Another intervention employed was The Stop Going NUTS (Belmont, 2006) was utilized as a lesson on being mindful of intrusive thoughts, self-sabotaging statements, and unhealthy thoughts and thinking patterns that can cause anxiety, and depression that robs our self-esteem and happiness. A breathing exercise was used to demonstrate the effects breathing has on our emotions and how learning to control breathing can help manage tension and fear during stressful situations.

Crew members also created a social connections map. This activity facilitated crew members in identifying people in their life whom they may not have previously thought of as part of their support network. Another intervention consisted of participants receiving classroom education on how to maintain their health while on duty. Additionally, an intervention called EQUIPMENT, created by Luber (2014) was employed. This activity consists of the following components: engage resources; quality of life; utilize medical/mental services; improve longevity with diet; exercise; practicing/learning new skills; mentor by modeling healthy behaviours on and off duty; educate yourself about long-term trauma exposure/acquire new resources for coping; never forget that you are as important as those you serve; and take care of each other. After completion of the PCL-5, an algorithm was provided to the crew members with additional recommendations for voluntary self-referral for EAP.

Results

Twenty-three transport crew members consisting of nurses 12 (50.2%), paramedics 7 (30.4%), and pilots 4 (17.4%) working at the AEL’s bases participated in this QI pilot. This was a 59% response rate of all possible crew members. Crew member listing dual disciplines (nurse/paramedics) were not included in the data analysis.

The one-time experiential learning activity, as discussed in the intervention section, occurred prior to the scheduled monthly

meeting. To evaluate the effectiveness of the teaching intervention, a pre- and post-test of knowledge on resiliency, coping skills, health maintenance, and PTSD stigmatization was given. Mean scores were compared to determine if there was evidence of a gain in percent change indicating crew members benefited from the intervention. When comparing pre- and post-test scores, the average pre-test score was 83.8%, and the average post-test score was 91.3%, yielding a percent change of 8.9%. Each discipline had an increase in scores following the learning activities. This comparison revealed gains in post-test mean scores and is evidence crew members benefited from this intervention.

Post-Traumatic Stress Disorder

Analysis of pre-test PCL-5 scores revealed PTSD was prevalent for paramedics and pilots but not nurses. The cumulative effects for all crew members detecting symptoms measured by the APA DSM-5 sub-scale criteria were as follows: intrusion (29.2%), avoidance (29.2%), mood/cognitions (33.3%); and arousal (41.7%). Nurses' intrusion scores increased in the post-testing, but remained below the PTSD threshold. Overall, pre-test PCL-5 scores revealed 20.8% of crew members met provisional diagnostic criteria for PTSD prior to the QI interventions as shown in Table 1. Prior to the interventions, the disciplines with the highest percentage of crew members meeting diagnostic criteria for PTSD were paramedics and pilots at 33.3%, and the lowest were nurses at 9.1%. After the QI interventions, crew members meeting criteria for PTSD were reduced. Crew members endorsing symptoms meeting the APA DSM-5 sub-scales criteria consisted of intrusion (20.8%), avoidance (25%), mood/cognitions (29.2%); and arousal (41.7%). Overall, the post-test PCL-5 scores were lowered to 12.5%, as shown in Table 1. When analyzing each discipline's post-intervention sub-scores, nurses' sub-scale scores changed very little post QI project except for intrusion rising to 25%. Paramedic's sub-scores were a mixed pattern of no change (avoidance), increase in mood/cognitions and arousal, and decrease in intrusion. The pilots sub-scores of intrusion, avoidance, and mood/cognitions were reduced to 0 but arousal remained the same.

Comparisons of pre- and post-PCL-5 scores revealed a reduction in PTSD. There was an overall reduction of 40% in crew members, especially pilots and paramedics, meeting PTSD provisional diagnostic criteria after the QI interventions. Additionally, comparisons of pre- and post-PCL-5 sub-scores yielded a percent change reduction in three of the four sub-scores: 29% for intrusion, 14% for avoidance, and 12% for negative alterations in mood/cognitions. There was no change in arousal. In summary, all disciplines reduced their overall provisional PTSD diagnostic criteria.

Quality of Life

Pre- and post-ProQOL sub-scales of compassion satisfaction, burnout, and compassion fatigue scores for all the transport crew were analyzed following QI project implementation. The compassion satisfaction average sub-scale pre-test score was 58.3% and increased to 66.7% on the post-test yielding a percent change of 14%. Regarding average burnout sub-scale, transport crew scored 54.3% rating on the pre-test followed by a 62.5% rating on the post-ProQOL, yielding a percent change of 15%. No changes occurred for transport crew on compassion fatigue after the QI project, as shown in Table 2. In summary, these comparisons revealed increases in the percentage of crew members who rated higher compassion satisfaction, lower burnout, and no changes in compassion fatigue following this QI pilot. Each of the three disciplines' average sub-scale scores varied from the pre- to post-testing as shown in Table 2.

Limitations

Sample selection for this QI pilot used a non-probability convenience sampling of transport crew member (nurses, paramedics, and pilots) and base location from one mid-south region air medical company. Therefore, these findings may not be reflective of all transport crew members throughout the entire organization nor the entire HEMS industry. Both the PCL-5 and the ProQOL were measured by self-report, which lends credence to response bias. Several barriers were encountered during the implementation phase of this QI pilot, including issues with pilot

Table 1

Discipline Percentage of Pre- and Post-Test PTSD Checklist DSM-5 (PLC-5)

Discipline	Intrusion	Avoidance	Cognitions/ Mood	Arousal	Meet Provisional Diagnostic Criteria for PTSD*	
	Pre/Post	Pre/Post	Pre/Post	Pre/Post	Pre/Post	Percent Change
Nurse (n = 12)	9.1/25	18.2/25	27.3/25	44.5/41.7	9.1/8.3	-9
Paramedic (n = 7)	50/16.7	33.3/33/3	33.3/50	33.3/50	33.3/16.7	-50
Pilot (n = 4)	66.7/0	66.7/0	33.3/0	33.3/33.3	33.3/0	-100
All Crew Endorsing Symptoms (N = 21)	29.2/20.8	29.2/25	33.3/29.2	41.7/41.7	20.8/12.5	-40
Percent Change by Criteria (y2-y1)/(y1) x 100	-29	-14	-12	0	-40	

Note. *PCL-5 cutoff score between 31-33 is indicative of probable PTSD

Table 2*Discipline Percentage of Pre- and Post-test ProQOL Scale*

Disciple	Levels	Compassion Satisfaction		Burnout		Compassion Fatigue	
		Pre/Post %	Percent Change	Pre/Post %	Percent Change	Pre/Post %	Percent Change
Nurse (n = 12)	Low	0/0	0	63.6/50	-21	45.4/33.3	-27
	Avg.	45.5/75	65	36.4/50	37	54.5/66.7	22
	High	54.4/25	-54	0/0	0	0/0	0
Paramedic (n = 7)	Low	0/0	0	33.3/66.7	100	16.7/33.3	99
	Avg.	83.3/83.3	0	66.7/33.3	-50	83.3/66.7	-20
	High	16.7/16.7	0	0/0	0	0/0	0
Pilot (n = 4)	Low	0/0	0	66.7/100	50	66.7/66.7	0
	Avg.	66.7/33.3	-50	33.3/0	-100	33.3/33.3	0
	High	33.3/66.7	100	0/0	0	0/0	0
All Crew (N = 21)	Low	0/0	0	54.3/62.5	15	41.7/41.7	0
	Avg.	58.3/66.7	14	45.8/37.5	-18	58.3/58.3	0
	High	41.7/33.3	-20	0/0	0	0/0	0

recruitment, technology, and timing. The first barrier emerged shortly after inviting transport crew members to participate in the QI pilot. The project manager received an email from one of the potential pilot crew members requesting a way be found to withdraw the invitation to participate in the QI pilot from pilots citing concerns that the Federal Aviation Administration (FAA) could deny medical certification to pilots who participate in any sort of therapy, treatment, or diagnosis of a mental and/or emotional disorder, including PTSD, depression, and anxiety. Clarification of project intent was communicated; however, pilots feared factors that could jeopardize medical certification renewal. This could explain the limited number of pilots (n = 4) who volunteered to participate in the QI pilot.

The second barrier was technology malfunctions, which proved exceedingly challenging when attempting to upload the PowerPoint presentation associated with this QI pilot into the company's learning management system (LMS). Clinical care services were pivotal in finding a work-around, which ultimately required changes to the presentation's original format. This barrier resulted in a one-week delay in the deployment of the LMS training to project crew members. The third barrier was the project timing. The project implementation occurred in the winter months when seasonal associated illnesses start to peak and weather was inclement.

An additional limitation could be the group exercise. When multiple crew members are present, there can be hesitation from individuals to vocalize their concerns and stresses leading to an ineffective intervention. Additional strategies could consist of

offering individual sessions allowing for open and free responses. Also, counselling services should be on site during the group intervention. These sessions could trigger heightened anxiety and past stressors which could cause more harm. Lilienfeld (2007) proposed treatment may produce unintentional harm in significant numbers of individuals. The QI project must avoid procedures that place the crew members at risk for mental health deterioration. Safeguards like counseling services during sessions that open the crew to vulnerability must be provided.

Another limitation was not measuring the lasting effects of PTSD. Only short-term effects were measured for PTSD occurrence. There was no testing two- or six-months post-intervention period. Consequently, the intervention's long-term impact is unknown.

Conclusions

According to the results of this QI pilot, a PTSD prevention and surveillance program can contribute to an overall reduction in the percentage of transport crew members who meet provisional diagnostic criteria for PTSD. Nurses in this sample were below the threshold of PTSD and showed the least amount of pre- to post-intervention change. Further, this pilot project also produced a reduction in endorsed symptoms for intrusion, avoidance, and negative alterations in mood/cognitions. The crew members tended to lower the rates of critical incident stress and PTSD symptoms. Furthermore, the results of this QI pilot suggest transport crew members' professional quality of work life benefited with notable decreases in burnout.

The results of this QI pilot are similar to other studies investigating the prevalence rates of PTSD among EMS providers. In a study conducted by Iranmanesh et al. (2013) examining the prevalence rates of PTSD among 400 Iranian paramedics and hospital personnel, the findings were that 36.4% met criteria for PTSD. Donnelly (2012) conducted a study of 1,500 National Registered Emergency Medical Technicians (NREMTs). The authors examined how chronic and critical incident stress along with alcohol use influenced post-traumatic symptomatology. Furthermore, the author reported a substantially lower prevalence rate of 6.4%; however, assessment instruments and methods were different between the two studies. Petrie et al. (2018) conducted a systematic review and meta-analysis from 95 full-text articles, focusing on the prevalence of PTSD and common mental disorders among ambulance personnel and found a prevalence rate of 11% for PTSD worldwide.

There were similar findings in this pilot when compared to other medical emergency services personnel quality of life reports. According to Regehr et al. (2007), professionals with the highest risk for stress, trauma, and burnout are paramedics. This QI pilot found similar findings as paramedics had the highest ProQOL's scores for burnout and compression fatigue, when compared with the other two disciplines. Hunsaker et al. (2015) conducted a national study on emergency department nurse's ProQOL scores and found low- to average-level of compassion fatigue and burnout, and average to high levels of compassion satisfaction. Pilots and paramedics were not sampled in this study. In the QI project, nurses scored average to high levels of compassion, but low to average levels on burnout and compassion/fatigue.

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Implications for Emergency Clinical Practice

- The results of this QI pilot suggest transport crew members' well-being was positively influenced by a PTSD prevention and surveillance program.
- This one-time implementation project demonstrated the need for proactive risk management strategies that include an organizational protocol, screening all existing and newly hired transport crew members via self-assessment on a routine and continual basis.
- Prevention and surveillance strategies are feasible for the HEMS environment and offer a promising potential to reduce the prevalence of chronically induced critical incident stress and PTSD.
- By continuing interventions over longer periods of time and assessing testing scores changes, HEMS would be investing in their employees' well-being.
- Ultimately, these interventions would reap financial benefits in cost savings associated with retaining crew and averting productivity loss.

About the authors

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Conflicts of interest

None

Credit author statement

Contributions:

Heather Dearing conceived the project

Heather Dearing performed the data collection

Heather Dearing performed the data analysis.

Tom Kippenbrock supervised the project

Heather Dearing and Tom Kippenbrock wrote, reviewed, and edited the manuscript

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