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How the exposure to trauma has hindered physicians' capacity to heal: prevalence of PTSD among healthcare workers

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ABSTRACT – Background and Objectives: Post-traumatic stress disorder (PTSD) is a condition affecting individuals exposed to trauma in the past. This article evaluates the prevalence of PTSD in practicing physicians and how it influences work performance.

Methods: A review of the literature, followed by data extraction and meta-analysis were performed. Articles were searched for in PubMed, Web of Science, and Medline using keywords: (“physician” AND “ptsd”), as well as Mesh-terms (“stress disorders, post-traumatic” AND “physicians”). Since 1980, 1363 unique hits published in English were identified and filtered by pre-specified inclusion criteria to yield a sample of 110 full-text articles examining the prevalence of PTSD among healthcare workers. Among these, 9 articles represented an accurate examination of the prevalence of PTSD among physicians only. Information was extracted on the demographic, as well as PTSD prevalence data, from these studies for final comparison.

Results: Across all studies (n = 9) we examined, the prevalence of PTSD among physicians of both genders (n = 1616) was 14.8%, and the range was between 4.4% to 28%. This estimation is higher than the general prevalence of PTSD in the adult population of 3-4%, yet lower than prevalence found among people traumatized by war or torture, a range of 20-45%. Since only 50% of the studies examined here stratified PTSD prevalence among physicians by gender, we could not accurately conclude gender differences.

Conclusions: Our findings prompt a need for further investigation into the development of support programs for healthcare providers, aimed at reducing the traumatic stress experienced by physicians at work.

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Introduction

The modern-day physician is exposed to numerous types of trauma, localizable in the disciplines of emergency, interventional and surgical medicine. Although the view of injured and traumatized patients may appear to be an obvious expectation of the clinician's occupational scenery, in excess such situations may disrupt medical routine and affect personal life. Post-traumatic stress disorder (PTSD) is a widely recognized condition that affects individuals exposed to a traumatic or life-threatening event²³. Military veterans and emergency respondents often exhibit the symptoms of PTSD, which is manifested by a disabling psychological re-experiencing of trauma, and has a prevalence rate several times greater than that of the general population^{16,20}. The symptoms of PTSD may start occurring immediately after the inciting event, or may be delayed for several weeks or even months. Commonly reported symptoms include traumatic flashbacks, avoidance behavior, and increased arousal and agitation¹. In the literature, there are very few studies that have systematically assessed the prevalence of PTSD among healthcare professionals who routinely deal with suffering, death, or practice a highly-stressful specialty, such as trauma surgery. It is important to understand the etiology of PTSD occurrence in physicians since existing research suggests that clinicians with PTSD are likely to provide poor, error-prone medical care¹². This issue of doctors with PTSD not receiving the care they need has further implications for patient care, leading to possible post-treatment complications. For instance, one study of PTSD prevalence among psychiatrists found that when left untreated, the disorder impairs the physician's ability to diagnose and treat patients for anxiety problems, depression as well as related mental conditions¹¹. Psychological interventions for PTSD

exist, but for many still poorly understood reasons, physicians are reluctant to receive treatment⁹. Over the years, symptoms of PTSD may increase or decrease; therefore, early detection and prevention are crucial to proper treatment^{35,26}.

Several interesting studies examined the effects of secondary PTSD among healthcare workers by targeting either specific departments or situations believed to be causative of PTSD^{6,22,28,32}. These studies discussed the incidence of PTSD in the context of exposure level among respondents, failing to report the baseline prevalence. This lack of information limits the interpretation of the results. Some studies in the past surveyed hospital personnel working in the war zones^{14,18,21}. The greatest caveat of such investigations is the ascertainment of what led to the symptoms of PTSD in the first place: experiencing trauma because of dying patients or due to living in a dangerous place? In 2000, Kessler determined that PTSD occurs rather commonly in the general population of Americans¹⁵, prompting the further need to account for baseline PTSD incidence when reporting data in studies on the symptoms, including those examining the health care workers. PTSD has the higher prevalence among people who experience helplessness and life stress during traumatic events^{3,8}. The lifetime prevalence of PTSD among the general population is estimated to be at about 8%, and the values are typically higher among women^{38,39}. Recent national surveys estimate that 15% of physicians endure intense work stress that renders them unable to execute their clinical duties properly²⁹.

The goals of this review and meta-analysis are to identify studies related to the understanding the prevalence of PTSD among physicians, compare strengths and limitations of these studies, and offer future directions for research on this topic.

Materials and Methods

We searched for articles in PubMed, Web of Science, and Medline using keywords: (“physician” AND “ptsd”), as well as Mesh-terms (“stress disorders, post-traumatic AND “physicians”). Studies were included in the analysis if they met several criteria. First, studies published in the English language within the last 35 years. Second, study populations were limited to health care providers, including resident physicians, senior attendings, nursing and support staff. Third, estimation of PTSD prevalence was the main goal of the survey. Fourth, PTSD Checklist (PCL), as well as exposure surveys, were the main measures used to estimate PTSD prevalence among participants. The reason for using PCL-based surveys as an inclusion factor is that this is a self-administered questionnaire that allows for an accurate estimation of the presence of the PTSD among respondents¹¹.

In surveys, we looked for evidence of gauging exposure level to trauma to establish that physicians in the study sample were indeed exposed to a traumatic event, as defined by the DSM-5 criteria¹. For the final analysis, we excluded studies either during literature search or after examining full-text articles if they presented one of the following characteristics. First, studies that included a mixed professional population of participants, including nurses and technicians, so that it would be impossible for us to extract accurate PTSD prevalence among physicians only. Second, studies that examined symptoms of PTSD only, rather than real PTSD as defined by the DSM-5. Third, the study population selection criteria were unclear, or the demographic information was incomplete.

Since 1980, 1363 unique hits published in English were identified and filtered to yield a sample of 110 full-text articles examining the prevalence of PTSD among healthcare

workers. Among these, 9 articles represented an accurate examination of the prevalence of PTSD among physicians only. Figure S1 (PRISMA) depicts these filtering steps. For the final analysis, extracted were data on demographics (gender, age range, the number of participants) as well as PTSD prevalence. Also, information about measures used in each study and other diagnoses that may have led to PTSD among physicians were collected as relevant information.

All results were compounded in the table format (Please see Table 1). The reported range of PTSD prevalence represents the lowest and the highest reported values. Averaging PTSD prevalence values from all 9 studies allowed estimation of total symptom presence across all studies. Since about a half of all studies (Please see Table 1) did not include detailed information about gender distribution or gender-stratified prevalence of PTSD among physicians, we were unable to make a more detailed comparison. Since 8 out of 9 studies included in the analysis (except Weiniger *et al.*)³⁶ did not provide comprehensive data on their findings, our analysis was limited in scope to showing average prevalence rates and co-occurring morbidities that correlated with the presence of PTSD.

Official, ethical approval was not requested in view of the nature of this study which is a meta-analysis of published work.

Results

We can trace the etiology of PTSD symptoms among physicians into specific stressors. Over the course of the analysis, four distinct stressor environments were identified: (1) working in conflict zones, (2) residency-training stress, (3) treating trauma patients, and (4) practicing medicine in the rural areas.

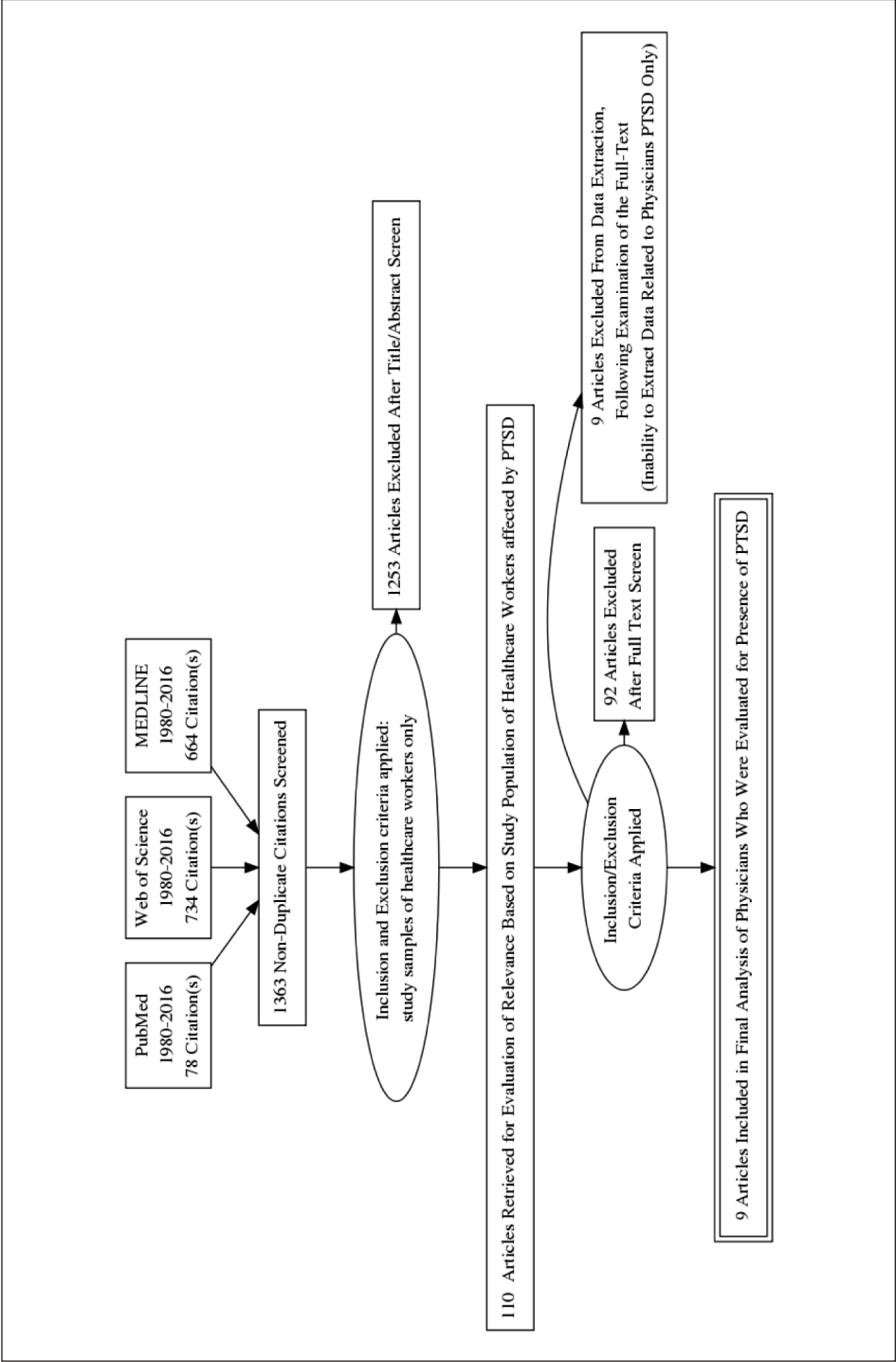


Figure S1. PRISMA search criteria.

Table 1
Summary of the studies on the prevalence of PTSD among physicians working in four exposure types

Theme	Study	Total n of participants (males + females); mean/range of age	Inclusion criteria	Overall prevalence of PTSD among physicians in % (M+F, if data available)	Other commonly reported Dx in physicians with PTSD	Total # of participants	Average PTSD prevalence (%)
A	Einhav <i>et al.</i> (2008) ⁵	n = 215 (166M+49F); Mean age = 42; Range = not reported	Senior/resident physicians practicing during suicide-bombing attacks in Jerusalem	15.6% (22%M+11%F)	Depressive symptoms** , anxiety, phobic anxiety, hostility, paranoid ideation, loss of appetite, sleep disturbances, death thoughts, guilt feelings, somatization, obsessive-compulsive symptoms and interpersonal sensitivity, impairing stress**	n = 548	16.5%
	Hodgetts <i>et al.</i> (2003) ¹¹	n = 118 (21M+97F); Mean age = 40; Range = 21-60+	Resident physicians of family medicine	18% (gender breakdown not specified)	None		
	Weiniger <i>et al.</i> (2006) ³⁶	n = 215 (166M+49F); Mean age = 42; Range = not reported	Senior/resident physicians in various specialties living in Israel	16% (gender breakdown not specified)	Substance abuse, behavioral detachment, and self-blaming		
	Klaimen <i>et al.</i> (1995) ¹⁷	n = 212 (126M+86F); Mean age = 30.1; Range = 24 to 43	Resident physicians of various specialties	13% (9M%+20%F)	Depressive symptoms** , anxiety symptoms		
B	Mills and Mills (2005) ²³	n = 59 (not reported); age distribution not reported	Resident physicians of emergency medicine	11.9% (gender breakdown not reported)	Re-experiencing trauma, avoidance, problems with arousal, impairing stress**	n = 418	12.3%
	Naghavi <i>et al.</i> (2013) ²⁷	n = 147 (62M+78F); age distribution not reported	Resident physicians in various specialties	12% (6%M+6%F)	None		
C	Joseph <i>et al.</i> (2014) ¹³	n = 453 (345M+108F); Mean age = not reported; Range 31-60+	Senior/resident physicians of various specialties	15% (gender breakdown not specified)	Impairing stress**		
	Firth-Cozens <i>et al.</i> (1999) ⁷	n = 41 (31M+10F); age distribution not reported	Senior/resident physicians who treated victims of bombing	28% (gender breakdown not reported)	None	n = 493	21.5%
D	Wilberforce <i>et al.</i> (2010) ³⁷	n = 159 (93M+54F); Mean age = 60; Range = 21 to 70+	Senior physicians in rural family medicine practices	4.4% (5.4%M+3.7%F)	Impairing stress**	n = 159	4.4%

Legend:

Categorical subdivision of environmental stressors that increase presence of the PTSD symptoms among physicians:

A = working in conflict zones; B = practicing high-stress specialty; C = treating trauma patients; D = working in countryside.

** Impairing stress & depressive symptoms were the most commonly reported co-morbidities accompanying PTSD symptoms.

Note: exclusion criteria were not clearly specified in any study included in analysis.

Part 1: Working in conflict zones and PTSD

Three studies looked at the prevalence of PTSD among physicians practicing in areas of conflict. Two of these examined Israeli doctors (Please refer to Table 1 for more details)^{5,36}. The last investigation looked at practitioners working during Bosnia and Herzegovina war of 1992 through 1995¹¹. Each study administered a questionnaire that had two components. The first part estimated the prevalence of the PTSD. The second part evaluated the trauma – events of the surrounding conflicts that caused the most distress among physicians.

To assess the prevalence of PTSD, studies by Einav *et al.* and Weiniger *et al.* used two comparison groups (experimental exposed to victims of terror and control not working with trauma patients)^{5,36}, whereas Hodgetts *et al.* treated all surveyed physicians as a single experimental group¹¹. Among 212 physicians, Einav *et al.* and Weiniger *et al.* found the prevalence of PTSD to be 15.6% and 16%^{5,36}, respectively, whereas Hodgetts *et al.* reported 18% prevalence among its 133 participants¹¹. These values fall within a comfortably comparable range, reinforcing the reproducibility of results across three different examination sites. Authors frequently reported other diagnoses that co-occurred with PTSD, such as burnout syndrome (51.5%)⁵ and traumatizing experience in the past (88%)¹¹.

Part 2: On-the-job stress and PTSD

At this moment, we will look at the next group of studies that examined the relationship between stress and PTSD (Please refer to Table 1 for more details). Klamen *et al.* surveyed 212 residents (picked randomly from the American Medical Association master list) to see whether internship year is associ-

ated with PTSD symptoms, surveying 212 residents to find out¹⁷. Mills and Mills assessed symptoms of PTSD among emergency medicine residents (Four groups: incoming interns, and three emergency medicine resident classes) of a large hospital²³. Naghavi *et al.* also surveyed resident physicians, hypothesizing that stress associated with needle stick injuries leads to PTSD symptoms²⁷.

Klamen *et al.* found that 13% of surveyed residents met the diagnostic criteria for PTSD¹⁷. Interestingly, women experienced the condition twice as much as men (20% versus 9%). Other factors that predicted PTSD symptoms were marital status (being single or divorced contributed a lot to PTSD symptoms), current anxiety and depression, weak social support. Interestingly, in the evaluation of residents based on specialty, those practicing general surgery and psychiatry had the highest susceptibility of meeting the criteria for PTSD. Not a single emergency medicine or orthopedics resident met symptomatic criteria for PTSD, which is fascinating finding considering the common perception of these specialties as highly stressful with a heavy workload.

Naghavi *et al.* surveyed 147 of which 54% had sustained at least one needle-stick injury while training as a resident²⁷. Based on the assumption that on-the-job injury leads to traumatizing flashbacks, all of these previously injured doctors were asked to fill out Impact of Event Scale-6 survey to assess the presence of PTSD symptoms and 12% of these doctors had the disorder. Interestingly, the risk of PTSD was not found to be significantly associated with gender, or involvement in treating high-risk patients. Neither location or time of injury contributed to predisposing respondents to increased risk of PTSD.

Mills and Mills surveyed 63 physicians who reported having had experience with a dying patient²³. Here the past exposure to death was

used as a baseline causation for PTSD. 30% of respondents reported symptoms of PTSD. Of great importance was a correlation between the number of symptoms of PTSD and resident training level. With increased seniority, the incidence of PTSD increased.

Part 3: Treating trauma patients and PTSD

Now we will examine a group of two studies, Joseph *et al.* and Firth-Cozens *et al.*, that examined PTSD prevalence in physicians exposed to trauma patients (Please refer to Table 1 for more details)^{7,13}.

The study of Joseph *et al.* used trauma surgeons (n = 453) in its study population of which 15% met the diagnostic criteria for PTSD¹³. Single, male surgeons, managing more than five surgical cases per call, were at the highest risk of developing the symptoms. Of interest, other predictors of experiencing the symptoms of PTSD were being over 50 years old, managing more than 15 clinical cases during a given shift, and having little vacation time (less than two weeks in a calendar year).

Firth-Cozens *et al.* surveyed physicians (N = 47) who treated victims of the 1998 bombing in Omagh, Ireland; the study found that 25% of doctors who were actively involved in treating bombing survivors had PTSD symptoms⁷. This finding confirms the reported problems with emotional regulation in other studies included in this analysis³⁶.

Part 4: Rural practice and PTSD

At last, we will examine the study by Wilberforce *et al.*, which studied the prevalence of PTSD among physicians practicing in the countryside (in this case, Canada)³⁷. Among a group of 159 respondents, the authors found

the prevalence of PTSD to be 4.4% (Please refer to Table 1 for more details). Males were more likely to exhibit symptoms (47.3% versus 20.4% exhibited by females).

Discussion

This meta-analysis has shown that treating traumatized patients leads to PTSD symptoms in about 14.8% of physicians.

In the context of practicing medicine in conflict zones, Einav *et al.* study participants with PTSD symptoms exhibited higher exposure to terror out of work (for instance, regularly passing through dangerous neighborhoods or being frequently exposed to life-threatening events)⁵. Also, the amount of hours of work correlated positively with predicting the prevalence of PTSD, in which the experimental groups worked longer hours in comparison to control and also exhibited the higher level of disorder prevalence.

Physicians working in conflict zones manifested many other symptoms in addition to PTSD. Einav and colleagues found the high prevalence of anxieties and phobias, depression, loss of appetite, sleeping problems, as well as thoughts about death⁵. These conditions were debilitating enough that many physicians engaged in harmful coping strategies. Weiniger *et al.* indicated substance use and behavioral detachment as most common signs of reaction formation³⁶. An interesting finding on how to precisely ascertain the severity of symptoms of PTSD was proposed by Hodgetts *et al.* Authors determined “Do you believe that the traumatic event still affects you today?” as a question highly predictive and sensitive of the presence of PTSD and other related disorders¹¹. Another question worth exploring is whether working within the conflict zones somehow contri-

buted to the high prevalence of PTSD. Weiniger *et al.* indicated that higher exposure to terror outside the workplace positively correlated with increased commonness of PTSD symptoms³⁶. Einav and colleagues found a similar correlation⁵. The finding points to the question of high importance; that is whether doing studies on PTSD in a conflict zone is even informative? Unsurprisingly, the stress level associated with constant danger would be responsible for some of the findings of high anxiety level and behavioral problems discussed earlier. Living in Israel may be responsible for PTSD prevalence reported among participants, as the baseline PTSD symptoms are higher for the general population due to ongoing warfare.

In the studies examined in this first theme of PTSD exposure, all three exhibited caveats. Hodgetts *et al.* had more female than male respondents, and did not collect information on the type of trauma experienced by physicians¹¹. These methodological imperfections limited the study's opportunity to compare gender difference among those surveyed and failed to ascertain what sort of traumatic experiences increase PTSD prevalence the most, e.g. working as emergency physicians, or as the trauma surgeon. The study, done in Israel, provides useful information about the types of experienced traumas in modern conflict zones that may cause PTSD distress. Therefore, it was difficult to ascertain what factor, in particular, was responsible for a high prevalence of PTSD among physicians.

The study by Weiniger *et al.* and Einav *et al.* had very similar limitations, leading us to conclude that these findings are hardly generalizable to healthcare workers that are working in non-conflict zones^{5,36}. Since there is no baseline data on the prevalence of the PTSD among Israeli doctors before the conflict, likely the findings of elevated high general stress and anxiety are the hallmark of everyone, not only physicians.

Now we will turn to second thematic stressor – work environment, which is particularly crucial in residency training. Klamen *et al.* showed that social support during the internship was described as a protective factor against PTSD, further reinforcing the need for residency programs to consider organizing social events meant to cement the relationships between trainees, support staff, and senior faculty.

In study by Naghavi *et al.* the working environment and support system for residents was strong and acted as a protective mechanism against PTSD, especially for male residents.

There were several limitations in studies presented in the second section of exposure to PTSD. First, the low response rate in Klamen *et al.* and Naghavi *et al.* limits the generalizability of these findings^{17,27}. Second, without conducting a structured clinical interview, any experienced psychiatrist could argue that self-reported symptoms may not be the most accurate gauge of the prevalence of PTSD. In Klamen *et al.* study, there may be a response bias in the data toward residents desiring to report internship stress, leading to increased rate of PTSD symptoms¹⁸. Mills and Mills study, in addition to estimating the prevalence of PTSD based on self-reported symptoms, used experience of death as a factor of trauma²³. Such approach leads physicians to report their symptoms on the self-awareness of one's perception of re-experiencing trauma. The baseline experience with death leading to PTSD-like symptoms will be different for every individual. Though the experience with death as the traumatizing event may be sufficient to cause PTSD distress in many people.

These data point out to several extraordinary rationalizations associated with preventing PTSD. First, junior doctors need to be pro-

vided with appropriate social support. Such common buffer zone may come in the form of frequent group gatherings. Second, residency programs need to realize that medical schools do not adequately prepare young doctors to deal with patient death. The ability to cope with someone's passing away is often a matter of years-long experience and not successfully passing anatomy cadaver lab. Three, traumatizing events come in many flavors, including the fear of getting needle stick injuries, as pointed out in the study of Naghavi and colleagues²⁷. Although the experience of death and stressful time pressure on the job seem to be the most frequently cited reasons behind PTSD symptomology, future research may extend the list of on-the-job injuries and experiences causative of PTSD as well.

In the work of Joseph *et al.* and Firth-Cozens *et al.* reported PTSD prevalence rate of 15% and 25%, respectively. Joseph *et al.* provided finding very generalizable and applicable to trauma surgeons practicing throughout the world, since exposure to extreme, work-associated stress is common to these specialists. The job demands, coupled with long working hours, and tense imagery of patient suffering –without a doubt– alters coping mechanisms in these surgeons. Firth-Cozens *et al.* showed one important indicator of whether the doctor would be prone to re-experiencing trauma, which was the history of having experienced terrifying trauma. Also, emotional disturbances accompanying these past traumas further increased the risk of having PTSD symptoms.

The primary limitation of Joseph *et al.* study was its small sample size. Nevertheless, the study examined a unique group of individuals exposed to a special, post-bombing type of trauma experienced by helping the victims. The rate of PTSD prevalence in the sample is comparable to other studies that examined the prevalence of PTSD among civilians living in

war zones^{5,11,36}. The work of Firth-Cozens *et al.* did not have any significant limitations as it surveyed physicians confirmed to had exposure to a traumatic event in the form of caring for victims of the bombing.

In each of the two studies, the frequency of seeking professional help for treating PTSD was very low or none among surveyed physicians. This pattern is similar to other studies discussed so far that examined doctors are working in the conflict zone and under high-stress situations. Not seeking help by doctors is particularly tricky to understand, for these individuals have a superb intellectual understanding of the long-term ramifications associated with not receiving the psychiatric care they might need to function normally.

Lastly, we will briefly discuss results of Wilberforce *et al.*, who showed that problems which may have been responsible for inducing PTSD symptoms among rural physicians are: insufficient resources to maintain the medical practice, stressful relationships with co-workers and patients, as well as over-working.

Findings of Wilberforce *et al.* are interesting and relevant, especially as the general demographic trend worldwide is an increase in urbanization. All other studies examined in this article were performed either in a population of physicians working in a large hospital or those hailing from large metropolitan areas. Such samples limit an insight into the unique challenges of rural medicine. This work had one major limitation, namely the framing of PTSD categories – “potentially” or “very likely” to be present. Such system of sorting introduces ambiguity. Instead, the authors should had specified PTSD symptoms within a narrow range of being “present” or “not present” – a clear distinction made in all other studies examined in this article. Regardless of this shortcoming, this study prompts the further need to examine how PTSD develops

among rural physicians and what kind of resources could alleviate the stress that may lead to the onset of the disorder. In the times of increasing shortage of primary care providers in small towns, an effort to empower these clinicians is particularly important to reinforce their commitment and interest in the continued practice of medicine in these places, despite well-characterized shortfalls, such as lower wages and long working hours.

How can we alleviate exposure to on-the-job, PTSD-causing stressors? Changes that could promote physicians' ability to prevent the development of PTSD symptoms include stress-reduction programs, time-management techniques, as well as training in crisis intervention and management. Practitioners should be ready for developing the adequate response to stress if they are involved in the main traumas, particularly if they have previously experienced traumatic events⁷. Recognizing PTSD should be taught as part of medical school curriculum so that physicians can identify work factors that may put them at risk of suffering from the disorder⁸. PTSD symptomatology can last for years and can affect job performance. Individuals experiencing PTSD commonly report having poor job performance mainly due to experiencing flashbacks of trauma from the past, often triggered by specific duties at work. Other commonly reported problems include difficulty sleeping, lack of energy, and poor concentration. These symptoms can prohibit the provider to manage patients efficiently and increase the risk of errors, complications, and even death¹³. Reports of PTSD rates among refugees, for example, range from 45 to 75%^{19,34,35}. Secondary PTSD can develop when caregivers, who have no direct contact with the traumatic event, have contact with trauma victims. The chance of re-experiencing traumatic events is particularly potent among healthcare providers, who deal with

pain, suffering, and death – on a daily basis. Chronic PTSD lead to difficulties in maintaining normal daily functioning. Symptoms such as anger and poor concentration are common and impact the ability to perform work. Another problem that co-occurs with PTSD is a burnout syndrome. Shanafelt and colleagues, in a national survey of physicians, highlighted the association between long working hours and the development of stress and burnout syndrome²⁹. PTSD may be present among the majority of any hospital physician population whereas secondary PTSD should be less of concern for hospital support staff, such as housekeeping and management³⁶. Some publications in the past claimed estimated the prevalence of PTSD among doctors to be 12-18%, but they failed to disclose that their estimation includes all healthcare workers (nurses, EMTs)^{2,18,21}. The main issue with interpreting these studies as valid is that heterogeneity of the survey population prevents an accurate analysis of the physician-only prevalence of PTSD. In the context of this article, it is important to understand that physicians, nurses, ambulance workers, and firefighters each experience PTSD with varying degrees^{14,24,30,31}. Therefore, we decided to clarify this discrepancy by preparing a review and meta-analysis of studies that passed through stringent selection criteria limited to physicians with PTSD only. In our analysis, most studies attempted to estimate symptoms of PTSD among physicians but claimed the results to reflect PTSD prevalence – a mistake that may lead to an inaccurate understanding of this problem in the healthcare industry. The presence of PTSD versus the presence of its symptoms is two very different quantities. The former is an indication of the disorder, and the latter suggests that the disorder may or may not occur. Our meta-analysis focused only on studies that used correct measures to make a proper judgment of the prevalence of PTSD

among physicians: questionnaires containing questions that assessed the presence of traumatic events and questions based on the PCL-C scale. PCL-C has been proven to be a reliable method for estimating the prevalence of PTSD¹¹. Correctly applied PCL-C cut-off values, coupled with a diagnostic survey aimed at estimating traumatic exposures, ensure an accurate calculation of PTSD presence among participants. The inclusion factors that we used to pick appropriate for analysis studies included: study group of physicians only; use of a survey and PCL-C to accurately gauge presence of PTSD; studies that presented definition of traumatic experiences as specified by either the DSM-3 or DSM-4; presence of basic demographics, such as gender and age range. All of these selection aspects strengthened the reliability of conclusions drawn from the studies included in our comparative analysis. As a result of our investigation, we conclude that among 9 studies examined (which included 1616 participants in total), the prevalence of PTSD among all physicians was 14.8%, ranging between as low as 4.4% and as high as 28%. These values represent the actual PTSD among doctors and correlate well with reported estimates for the general population^{4,10,15}. Furthermore, we found that presence of such factors as stress, burnout at work, and weak family support were the most commonly cited contributing factors to developing PTSD by physicians.

Future research should attempt to address the question of how PTSD develops among resident physicians. To accomplish this goal, an accurate epidemiological estimation of PTSD prevalence needs to be performed among incoming resident physicians. Subsequently, follow-up studies can be conducted at a later time to estimate how increase in stress exposure and quantity of clinical responsibilities has influenced the development of PTSD symptoms among these physicians. Second, a

qualitative interview study of residents (or focus groups) would be helpful in gaining an understanding of the coping mechanisms, or the lack of thereof, among resident physicians to see how training programs can be readjusted to help heal traumatized minds of the most junior providers.

Conclusion

In conclusion, our study offers a refreshed look into the problem of PTSD prevalence among physicians. We hope that this report will ensure public awareness of the issue of extreme stress experienced by doctors while caring for others. These stressful, negative exposures not only damage the health of health-care providers but affect patients alike. Hospital management, as well as medical school curriculum committees need to act now to help physicians by developing coping strategies and early prevention programs for all doctors to follow.

Limitations

There were a few limitations to our comparative analysis. First, about a half of the studies included in our analysis did not disclose gender breakdown of PTSD prevalence (Please see Table 1), which hindered our understanding of how gender influences the development of PTSD symptoms among physicians. Second, several of the studies examined by us incorrectly framed symptoms of PTSD as the prevalence of PTSD disorder. To stay true to our inclusion criteria in the final comparison, we only evaluated the prevalence of PTSD when estimated by PCL-C. This value allowed us to conclude what per-

centage of examined sample (14.8%) had PTSD. Lastly, it was difficult for us to conceptualize the results of three studies that estimated the prevalence of PTSD among physicians working in conflict zones. We know from the literature that the higher prevalence of PTSD is present among the general population living in the war zones. Therefore, we are not sure whether the PTSD prevalence reported by Weiniger *et al.*, Einav *et al.*, and Hodgetts *et al.* are indeed true among physicians, considering that the baseline symptoms are already high for all inhabitants of conflict zones^{5,11,36}.

Declaration of interest

The authors report no conflicts of interests. The authors alone are responsible for the content and writing of the paper.

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Author Contributions

Damian Sandler conceived project idea, performed literature search and analysis. Alessandra Rutkowska helped with data preparation and discussion.

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