Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
COVID-19 induced PTSD: Stressors for trauma and acute care surgeons

Melissa K. James a, b, *, R. Jonathan Robitsek a, Katherine McKenzie a, Julie Y. Valenzuela a, Thomas J. Esposito b

a Department of Surgery, Jamaica Hospital Medical Center, Jamaica, NY, USA
b Department of Medicine, University of Illinois College of Medicine, Peoria, IL, USA

ABSTRACT

Background: At the peak of the pandemic, acute care surgeons at many hospitals were reassigned to treat COVID-19 patients. However, the effect of the pandemic on this population who are well versed in stressful practice has not been fully explored.

Methods: A web-based survey was distributed to the members of the Eastern Association for the Surgery of Trauma (EAST). PTSD and the personal and professional impact of the pandemic were assessed. A positive screen was defined as a severity score of ≥14 or a symptomatic response to at least 5 of the 6 questions on the screen.

Results: A total of 393 (17.8%) participants responded to the survey. The median age was 43 (IQR: 38-52) and 238 (60.6%) were male. The majority of participants were surgeons (351, 89.3%), specializing in general surgery/trauma (379, 96.4%). The main practice type and setting were hospital-based (350, 89%) and university hospital (238, 60.6%), respectively. The incidence of PTSD was 16.3% when a threshold severity score of ≥14 was used and 5.6% when symptomatic responses were assessed. Risk factors for a positive PTSD screen included being single/unmarried (p = 0.02), having others close to you contract COVID-19 (p = 0.02), having family issues due to COVID-19 (p = 0.0004), rural (p = 0.005) and suburban (p = 0.047) practice settings, a fear of going to work (p = 0.001), and not having mental health resources provided at work (p = 0.03).

Conclusion: The COVID-19 pandemic had a psychological impact on surgeons. Although acute care surgeons are well versed in stressful practice, the pandemic nevertheless induced PTSD symptoms in this population, suggesting the need for mental health resources.

1. Introduction

The COVID-19 pandemic has taken a toll on healthcare workers, as most have worked additional shifts and overtime due to increased patient volume. Direct contact with COVID-19 infected patients and increased workload have been major contributors to increased stress levels among healthcare workers. Moreover, the Centers for Disease Control and Prevention (CDC) has reported that over one million healthcare personnel have been infected with COVID-19. This number is suspected to be much higher since occupation was not initially reported.

In many infected cases, healthcare personnel have been infected with COVID-19. This number is suspected to be much higher since occupation was not initially reported. Suspected to be much higher since occupation was not initially reported.

The COVID-19 pandemic has taken a toll on healthcare workers, as most have worked additional shifts and overtime due to increased patient volume. Direct contact with COVID-19 infected patients and increased workload have been major contributors to increased stress levels among healthcare workers. Moreover, the Centers for Disease Control and Prevention (CDC) has reported that over one million healthcare personnel have been infected with COVID-19. This number is suspected to be much higher since occupation was not initially reported.

In many infected cases, healthcare personnel have been infected with COVID-19. This number is suspected to be much higher since occupation was not initially reported. Suspected to be much higher since occupation was not initially reported.

Due to the novelty of the virus and the lack of drug treatments or a vaccine in the early phase of the pandemic, COVID-19 caused heightened anxiety and fear among healthcare workers. It is not uncommon for healthcare workers such as trauma surgeons, emergency medicine physicians, nurses, and emergency medical technicians to experience PTSD as a result of the cumulative stress of practice. Acute care/trauma surgeons, in particular, have extensive experience in physically and mentally demanding situations and are trained to manage major catastrophes such as mass casualty incidents. As a result of the COVID-19 surge at many institutions, elective cases were canceled and surgical staff were redeployed to actively participate in the care of COVID-19 patients. However, the effect of the pandemic on this population who are well versed in stressful practice has been assessed by only a few studies.

There are several validated tools to assess PTSD in both military and civilian populations. The PTSD Checklist-Civilian Version (PCL-C) is a...
2. Methods and materials

The six-item brief version of the PCL-C questionnaire (PCL-6) was used to screen for PTSD, along with questions on health fear, job stress, and financial impact. A web-based survey was developed using SurveyMonkey and distributed to the members of the Eastern Association for the Surgery of Trauma (EAST). Prior to distribution, the study was piloted and refined among a small group of surgeons, valuable feedback from the EAST Research Committee was also incorporated into the survey. Three email notifications containing the link to the survey were sent during the time period of September 28th to December 11th, 2020; data was collected until January 4th, 2021. EAST members were informed that participation was voluntary and the results of the survey would remain anonymous. Each IP address could only complete the survey once. This study was approved as an exempt study by our Institutional Review Board. There was no informed consent, as completing the survey was considered consent to participate.

The COVID-19 pandemic was specified as the traumatic event to be considered when responding to the questions in the PCL-6 screening tool. Therefore, positive screens should be due to the pandemic itself and not to other stressful events in general. There are three validated methods of scoring the PCL-6 screen that were all used in this study. Response options for the PCL-6 are: “not at all” = 1 point, “a little bit” = 2 points, “moderately” = 3 points, “quite a bit” = 4 points, or “extremely” = 5 points. The PCL-6 screen yields a total score ranging from 6 to 30, with higher scores indicating greater PTSD severity. A total symptom severity score for each respondent was determined by summing the scores for each of the six questions. A threshold score of 14 or greater was considered a positive PTSD screen.

Univariate and multivariate analysis of demographic factors was performed based on both the threshold score of 14 and symptomatic vs. asymptomatic responses (Table 2). Symptomatic respondents were more likely to be divorced (13.6% vs. 3.2%; p = 0.001), and to be from a rural practice location (22.7% vs. 7.3%; p = 0.02), when compared to asymptomatic respondents. When job position, specialty area, venue of practice, and practice type were assessed, there were no significant differences between respondents who scored ≤14 vs. ≥14 or respondents who were asymptomatic vs. symptomatic (Table 3). Additional details are provided in Table 1.

The survey was distributed to 2302 EAST members of which 410 (17.8%) responded. A total of 393 (95.8%) respondents completed all six questions of the abbreviated PCL-6 screen and were included for analysis. The median age was 43 years (IQR: 38–52) and 238 (60.6%) were male. The majority of responses were from attending physicians (n = 351, 89.3%) and the most common specialty was general surgery/trauma (n = 379, 96.4%). Venue of practice was primarily university/academic hospital (n = 238, 60.6%), and most respondents’ practices were hospital-based (n = 350, 89%). Sixty-four of the 393 respondents (16.3%) scored 14 or above on the PCL-6 screen and 22 (34.4%) of those with scores ≥14 had symptomatic responses to at least five of the six questions. Table 1 presents responses to the six PCL-6 questions aggregated by scores above or below the threshold score of 14. Question 4 on ‘feeling distant and cut-off from others’ had the most symptomatic respondents (n = 139, 42.2%), with 12.1% more females giving a symptomatic response (p = 0.02). Additional details are provided in Table 1.
Post-traumatic stress disorder among healthcare providers has been a major concern during the pandemic and the toll of this unique stressor has impacted healthcare workers in a variety of ways. Previous studies have shown that 15–22% of surgical residents and trauma surgeons have shown that 15–22% of surgical residents and trauma surgeons screened positive for PTSD induced by routine practice, and this proportion was even higher (40–57%) when only symptoms of PTSD were being (n = 219, 55.7%), those with threshold scores ≥14 more often reported not having mental health resources at their institution (p = 0.002). Additional information is provided in Table 4.

Stepwise linear regression was performed to identify important parameters associated with increasing PCL-6 score (Table 5). Respondents who were unmarried (p = 0.02), and who practiced in the West (p = 0.02) and in rural areas (p = 0.001) had higher PCL-6 scores. Professionally, respondents who feared going to work (p = 0.001) or who expressed that fear affected their clinical practice or decision making (p = 0.01) had higher PCL-6 scores. Not surprisingly, the lack of available mental health resources (p = 0.03) was associated with increasing PCL-6 scores. Similar results were observed when multivariable logistic regression was performed (Table 6).

A total of 65 respondents (16.5%) also contributed free-text responses regarding their thoughts and experiences surrounding the COVID-19 pandemic. The median age of these respondents was 48 years (IQR: 40–56). Most respondents were male (n = 40, 61.5%), married (n = 54, 83.1%) with children (n = 48, 73.8%), and did not screen positive for PTSD (n = 50, 76.9%). Qualitative thematic analysis revealed ten primary themes present in the responses: pandemic management (33/65; 51%), national/state government (25/65; 39%), the public (20/65; 30%), working conditions (17/65; 26%), patient care (15/65; 23%), communications/practice guidelines (13/65; 20%), stress (13/65; 20%), mental/physical health (11/65; 17%), financial concerns (10/65; 15%), and family (9/65; 14%).

4. Discussion

Post-traumatic stress disorder among healthcare providers has been a major concern during the pandemic and the toll of this unique stressor has impacted healthcare workers in a variety of ways. Previous studies have shown that 15–22% of surgical residents and trauma surgeons screened positive for PTSD induced by routine practice, and this proportion was even higher (40–57%) when only symptoms of PTSD were

---

Table 1
The abbreviated PCL-C PTSD screen stratified by the threshold score.

| Abbreviated PCL-C Questions | PTSD <14 (N = 329), n, % | PTSD ≥14 (N = 64), n, % |
|-----------------------------|--------------------------|-------------------------|
| Not at All                  | A little bit             | Moderately              | Quite a bit | Extremely | Not at All | A little bit | Moderately | Quite a bit | Extremely |
| 1) I have repeated, disturbing memories, thoughts, or images related to my stressful experience with COVID-19. | 247 (75.1) (20.4) | 15 (4.6) | 0 (0) | 0 (0) | 6 (9.4) (34.4) | 22 (34) (26.6) | 17 (26) (23.4) | 4 (6.2) |
| 2) I feel very upset when something reminds me of my stressful experience with COVID-19. | 259 (78.7) (19.8) | 65 (5.1) | 0 (0) | 0 (0) | 6 (9.4) (26.6) | 25 (39.1) (23.4) | 12 (18.7) (4.6) | 4 (6.2) |
| 3) I avoid activities or situations because they remind me of my stressful experience with COVID-19. | 293 (89.1) (10.3) | 34 (2.6) | 0 (0) | 0 (0) | 14 (21.9) (6.8) | 19 (29.7) (21.9) | 10 (15.6) (3.7) | 3 (4.7) |
| 4) I feel distant or cut off from other people due to my experience with COVID-19. | 158 (48) (26.7) | 88 (5.1) | 25 (7.6) | 6 (1.8) | 2 (3.1) | 6 (9.4) (21.9) | 14 (21.9) (28.1) | 24 (37.5) |
| 5) I feel irritable or have angry outbursts due to my experience with COVID-19. | 227 (69) (26.4) | 87 (13.9) | 2 (1.6) | 0 (0) | 4 (6.2) (31.2) | 20 (31.2) (29.7) | 14 (21.9) | 6 (9.4) |
| 6) I have difficulty concentrating due to my experience with COVID-19. | 263 (80) (18.2) | 60 (6.1) | 0 (0) | 0 (0) | 9 (14.1) (26.6) | 17 (26.6) | 16 (25) (6.4) | 6 (9.4) |

Table 2
Demographic factors stratified by PTSD threshold score and by symptomatic responses.

| Variable                        | All Patients (N = 393), n, % | PTSD Score <14 (N = 329), n, % | PTSD Score ≥14 (N = 64), n, % | P value | Asymptomatic (N = 371), n, % | Symptomatic (N = 22), n, % | P value |
|---------------------------------|-----------------------------|--------------------------------|--------------------------------|---------|-----------------------------|-----------------------------|---------|
| Age (years)                     | 43 (38, 52)                  | 43 (38, 52.5)                  | 42 (38, 50)                   | 0.17    | 43 (38, 52)                 | 40.5 (38, 50)               | 0.47    |
| Gender                          |                             |                                |                                |         |                             |                             |         |
| Male                            | 238 (60.6)                   | 205 (62.3)                     | 33 (51.6)                      | 0.12    | 227 (61.2)                  | 11 (50)                     | 0.37    |
| Female                          | 150 (38.2)                   | 119 (36.2)                     | 31 (48.4)                      | 0.07    | 139 (37.5)                  | 11 (50)                     | 0.26    |
| Other                           | 3 (0.8)                      | 3 (0.9)                        | 0 (0)                          | >0.99   | 3 (0.8)                     | 0 (0)                       | >0.99   |
| Not documented                  | 2 (0.5)                      | 2 (0.6)                        | 0 (0)                          | >0.99   | 2 (0.5)                     | 0 (0)                       | >0.99   |
| Relationship Status             |                             |                                |                                |         |                             |                             |         |
| Single                          | 47 (11.9)                    | 36 (10.9)                      | 11 (17.2)                      | 0.20    | 42 (11.3)                   | 5 (22.7)                    | 0.16    |
| Married                         | 312 (79.4)                   | 267 (81.1)                     | 45 (70.3)                      | 0.06    | 301 (81.1)                  | 11 (50)                     | 0.001   |
| Divorced                        | 15 (3.8)                     | 11 (3.3)                       | 4 (6.2)                        | 0.28    | 12 (3.2)                    | 3 (13.6)                    | 0.04    |
| Separated                       | 5 (1.3)                      | 4 (1.2)                        | 1 (1.6)                        | 0.59    | 4 (1.1)                     | 1 (4.5)                     | 0.25    |
| Domestic                        | 14 (3.6)                     | 11 (3.3)                       | 3 (4.7)                        | 0.71    | 12 (3.2)                    | 2 (9.1)                     | 0.18    |
| Partnership                     |                             |                                |                                |         |                             |                             |         |
| Have Kids (Yes)                 | 279 (71)                     | 240 (72.9)                     | 39 (60.9)                      | 0.07    | 269 (72.5)                  | 10 (45.4)                   | 0.01    |
| Practice Location               |                             |                                |                                |         |                             |                             |         |
| Urban                           |                             |                                |                                |         |                             |                             |         |
| Suburban                        |                             |                                |                                |         |                             |                             |         |
| Rural                           |                             |                                |                                |         |                             |                             |         |
| Geographical Region             |                             |                                |                                |         |                             |                             |         |
| West                            | 51 (13)                      | 40 (12.1)                      | 11 (17.1)                      | 0.31    | 46 (12.4)                   | 5 (22.7)                    | 0.18    |
| Midwest                         | 93 (23.6)                    | 82 (24.9)                      | 11 (17.1)                      | 0.20    | 89 (24)                     | 4 (18.2)                    | 0.80    |
| South                           | 139 (35.4)                   | 117 (35.6)                     | 22 (34.4)                      | 0.89    | 133 (35.8)                  | 6 (27.3)                    | 0.50    |
| Northeast                       | 103 (26.2)                   | 84 (25.5)                      | 19 (29.7)                      | 0.53    | 96 (25.9)                   | 7 (31.8)                    | 0.62    |
| Non-US                          | 6 (1.5)                      | 6 (1.8)                        | 0 (0)                          | 0.59    | 6 (1.6)                     | 0 (0)                       | >0.99   |
assessed. Recent COVID-19 studies have shown that female and less experienced surgeons, as well as surgeons who knew someone who was diagnosed with COVID-19 had higher stress levels. The current study also assessed the psychological effects of the pandemic on the acute care/trauma surgical community, which is acclimated to stressful practice. The PCL-C screening tool, a validated assessment for PTSD, was utilized to make a presumptive diagnosis of PTSD among respondents unlike other recent COVID-19 studies. Additionally, in a recent global survey of surgeons, the U.S.A was under-represented whereas the respondents to our survey were predominantly from the U.S.A, which has been the most affected country to date. In our study population, the 16.3% incidence rate of PTSD was within the range of previously published rates. The study by Joseph et al., which utilized the same screening tool, showed a similar incidence of PTSD (15%) among acute care surgeons due to the stress of daily practice. If this study by Joseph et al. is used as a baseline/historical control, it indicates that our incidence of PTSD due to the pandemic was very similar to the incidence of PTSD due to day-to-day stressful practice. Our study also utilized a second method to assess the screening tool, which analyzed the number of symptomatic responses to the questions.

### Table 3

| Variable | All Patients (N = 393), n, % | PTSD Score <14 (N = 329), n, % | PTSD Score ≥14 (N = 64), n, % | P value | Asymptomatic (N = 371), n, % | Symptomatic (N = 22), n, % | P value |
|----------|-----------------------------|-------------------------------|-------------------------------|---------|-----------------------------|-----------------------------|---------|
| Job Position |                           |                               |                               |         |                             |                             |         |
| Attending Physician | 351 (89.3) | 290 (88.1) | 61 (95.3) | 0.12 | 329 (88.7) | 22 (100) | 0.15 |
| Surgical Fellow | 12 (3) | 12 (3.6) | 0 (0) | 0.23 | 12 (3.2) | 0 (0) | >0.99 |
| Surgical Resident | 12 (3) | 10 (3) | 2 (3.1) | >0.99 | 12 (3.2) | 0 (0) | >0.99 |
| Physician Assistant | 2 (0.5) | 2 (0.6) | 0 (0) | >0.99 | 2 (0.5) | 0 (0) | >0.99 |
| Nurse Practitioner | 9 (2.3) | 9 (2.7) | 0 (0) | 0.37 | 9 (2.4) | 0 (0) | >0.99 |
| Registered Nurse | 5 (1.3) | 4 (1.2) | 1 (1.6) | 0.60 | 5 (1.3) | 0 (0) | >0.99 |
| Other | 1 (0.2) | 1 (0.3) | 0 (0) | >0.99 | 1 (0.3) | 0 (0) | >0.99 |
| Not Documented | 1 (0.2) | 1 (0.3) | 0 (0) | >0.99 | 1 (0.3) | 0 (0) | >0.99 |
| Specialty Area | 382 (97.2) | 318 (96.7) | 64 (100) | 0.22 | 359 (96.8) | 22 (100) | >0.99 |
| General Surgery/Trauma | 6 (1.5) | 6 (1.8) | 0 (0) | 0.59 | 6 (1.6) | 0 (0) | >0.99 |
| Pediatric Surgery | 1 (0.2) | 1 (0.3) | 0 (0) | >0.99 | 1 (0.3) | 0 (0) | >0.99 |
| Orthopedic Surgery | 2 (0.5) | 2 (0.6) | 0 (0) | >0.99 | 2 (0.5) | 0 (0) | >0.99 |
| Anesthesia | 5 (1.3) | 5 (1.5) | 0 (0) | >0.99 | 5 (1.5) | 0 (0) | >0.99 |
| Emergency Medicine | 2 (0.5) | 2 (0.6) | 0 (0) | >0.99 | 2 (0.5) | 0 (0) | >0.99 |
| Primary Venue of Practice | 238 (60.6) | 202 (61.4) | 36 (56.2) | 0.48 | 227 (61.2) | 11 (50) | 0.37 |
| University/Academic Hospital | 140 (35.6) | 114 (34.6) | 26 (40.6) | 0.39 | 130 (35) | 10 (45.4) | 0.36 |
| Community Hospital | 7 (1.8) | 5 (1.5) | 2 (3.1) | 0.32 | 6 (1.6) | 1 (4.5) | 0.33 |
| Private Practice | 7 (1.8) | 7 (2.1) | 0 (0) | 0.60 | 7 (1.9) | 0 (0) | >0.99 |
| Military Hospital | 1 (0.2) | 1 (0.3) | 0 (0) | >0.99 | 1 (0.3) | 0 (0) | >0.99 |
| Other | 2 (0.5) | 2 (0.6) | 0 (0) | >0.99 | 2 (0.5) | 0 (0) | >0.99 |
| Practice Type | 351 (89.3) | 295 (89.7) | 56 (87.5) | 0.66 | 330 (88.9) | 21 (95.4) | 0.49 |
| Hospital-based | 2 (0.5) | 2 (0.6) | 0 (0) | >0.99 | 2 (0.5) | 0 (0) | >0.99 |
| Academic | 1 (0.2) | 1 (0.3) | 0 (0) | >0.99 | 1 (0.3) | 0 (0) | >0.99 |
| Military | 32 (8.1) | 25 (7.6) | 7 (10.9) | 0.45 | 31 (8.3) | 1 (4.5) | >0.99 |
| Independent | 5 (1.3) | 4 (1.2) | 1 (1.6) | 0.59 | 5 (1.3) | 0 (0) | >0.99 |
| Freelance/Locum Tenens | 2 (0.5) | 2 (0.6) | 0 (0) | >0.99 | 2 (0.5) | 0 (0) | >0.99 |

### Table 4

| Stressors | PTSD <14 (N = 329), n, % | PTSD ≥14 (N = 64), n, % | P Value | Asymptomatic (N = 371), n, % | Symptomatic (N = 22), n, % | P Value |
|-----------|-----------------------------|----------------------------|---------|-----------------------------|-----------------------------|---------|
| I contracted COVID-19 (Yes) | 23 (7) | 5 (7.8) | 0.79 | 26 (7) | 2 (9.1) | 0.66 |
| Others close to me contracted COVID-19 (Yes) | 106 (32.2) | 32 (50) | 0.01 | 124 (33.4) | 14 (63.6) | 0.005 |
| I had family issues due to COVID-19 (Yes) | 133 (40.4) | 49 (76.6) | <0.0001 | 163 (43.9) | 17 (77.3) | 0.003 |
| Increased stress level (Yes) | 239 (72.6) | 61 (95.3) | <0.0001 | 278 (74.9) | 21 (95.4) | 0.04 |
| I feared bringing COVID-19 home to my family (Agree) | 242 (73.6) | 57 (89.1) | 0.006 | 279 (75.2) | 20 (90.9) | 0.12 |
| I feared going to work (Agree) | 41 (12.5) | 25 (39) | <0.0001 | 55 (14.8) | 11 (50) | 0.0002 |
| Risk of contracting COVID-19 from patients (Likely) | 58 (17.6) | 26 (40.6) | 0.0002 | 73 (19.7) | 11 (50) | 0.002 |
| Risk of death due to caring for COVID-19 patients (Likely) | 20 (6.1) | 7 (10.9) | 0.18 | 23 (6.2) | 4 (18.2) | 0.05 |
| Fear affected my clinical practice/decision making (Agree) | 79 (24) | 33 (51.6) | <0.0001 | 98 (26.4) | 14 (63.6) | 0.0004 |
| I preferred not to care for COVID-19 patients (Agree) | 70 (21.3) | 18 (28.1) | 0.25 | 81 (21.8) | 7 (31.8) | 0.29 |
| Mental health resources were provided at my institution (No) | 64 (19.4) | 21 (32.8) | 0.02 | 78 (21) | 7 (31.8) | 0.28 |
| My workload has increased (Yes) | 151 (45.9) | 36 (56.2) | 0.13 | 173 (46.6) | 14 (63.6) | 0.13 |
| My income decreased during the pandemic (Yes) | 103 (31.3) | 36 (46.9) | 0.02 | 124 (33.4) | 9 (40.9) | 0.49 |
| The pandemic was handled well at my institution (No) | 49 (14.9) | 16 (25) | 0.06 | 58 (15.6) | 7 (31.8) | 0.07 |
The rate of PTSD among respondents was markedly lower (5.6%) when this more stringent assessment criteria was utilized, implying that even though COVID-19 affected surgeons, the stress induced was not as severe as the stress of daily practice. Alternatively, this can be interpreted as respondents were less affected by COVID-19 due to their familiarity with stressful practice. The use of a cutoff score in analyzing the PCL-C screen is more commonplace compared to the use of symptomatic responses, therefore the incidence rate of 16.3% is more likely representative of our study population.

Respondents who screened positive for PTSD were mostly from the South and Northeast regions of the U.S.A. The size of the population limited resources, the inability to increase surge capacity, and the fear of the healthcare system and workforce being rapidly overwhelmed.

A greater proportion of females screened positive for PTSD. However, unlike other studies, there was no significant association between gender and a positive PTSD screen. The small size of our study population may have precluded detecting an effect mediated by gender. The PCL-6 PTSD screen encompasses different behaviors that compromise the core PTSD symptoms: re-experiencing, avoidance/numbing, negative cognitions and mood, and arousal/reactivity. Females had significantly more symptomatic responses to the PCL-6 question that addressed negative cognitions and mood, which assessed whether the respondent felt distant or isolated from others. Interestingly, being divorced or single, as well as not having children, was associated with PTSD in our population. This provides a possible explanation for why respondents, especially females, felt isolated from others. Likewise, Mavroudís et al. demonstrated that female surgeons experienced more stress than males regardless of parental status. Additionally, we found that having others close to you diagnosed with COVID-19 or having family issues due to COVID-19 were risk factors for developing PTSD. This suggests that the added burden of family issues in combination with work-related stress potentially had a compound effect on some respondents, ultimately resulting in PTSD.

A significant number of respondents who screened positive for PTSD feared going to work and reported that fear affected their clinical practice and decision making. Interestingly, the likely risk of death due to caring for COVID-19 patients was not a predictor of PTSD in our population. This suggests that the fear of going to work is more likely linked to contracting COVID-19 and possibly spreading it to others rather than the fear of dying from COVID-19 oneself. Although not a risk factor, the financial impact of the pandemic was also a stressor, as more respondents with PTSD reported a decrease in income than those without PTSD. The ambiguity of how long the pandemic would last and consequently how long the loss of income would persist most likely increased the stress level of some respondents. The side effects of the pandemic included the closure of many businesses and a substantial loss of jobs across the U.S.A. Hospitals were not immune to these effects, especially in rural areas. Rural hospitals are often the economic anchor in smaller communities; loss of income or job security would certainly be expected to have a substantial impact on employees. The lack of mental health resources at some institutions was also a stressor and a risk factor for PTSD. Thus, respondents whose institutions did not have such resources available who also screened positive for PTSD had no coping resources, no comfort/support provided or professional outlet to vent, which possibly fueled their stress level.

Based on the qualitative analysis performed, pandemic management by the federal government was seen as being handled poorly whereas local, state, and hospital/healthcare systems were largely viewed as doing a decent job. Lack of communication and collaboration between federal and state authorities was considered a major (“demoralizing”) failure. Some stated that health authorities at all levels should have been “more honest” regarding the “many unknowns” during the initial stages of the pandemic rather than “promulgating media-based propaganda” that led to “unnecessary fear”. Concern was expressed that the apparent lack of federal support and failure to “flatten the curve” would lead to a long-standing “tarnishing” of the professional reputation of healthcare providers. Some questioned the rationale of their peers in suggesting that COVID-19 was nothing to fear, while others noted society’s “glib and complacent” response.

Furthermore, public themed responses were both positive and negative. Positive themes dovetailed with the patient care theme and encompassed public well-being: physical and mental health, availability of care, and the consequences associated with elective case cancellation. Negative themes questioned the seeming difficulty among the public to give equal buy-in regarding social distancing/masking policies while providers made huge sacrifices to care for them. Essentially, many could not fathom the inability of the public to adopt a “we are all in this
together” attitude until they were directly affected. Multiple responses in the working conditions and finance themes suggested that “corporate greed” resulted in the furlough/elimination of positions within healthcare (and the economy as a whole), with the resultant staffing and supply shortages potentially putting patients at risk, while also giving rise to feelings of being overworked and ignored by leadership. Communication and coordination of patient care within and across teams was also noted as being difficult, particularly due to the rapidly evolving care guidelines.

There are several limitations to this prospective study. Namely, the information gathered in this study was self-reported, as a Clinician-Administered PTSD Scale (CAPS) was not practical to administer given the large potential sample size (>2000) and resource constraints. Further, the baseline prevalence of PTSD and personal emotional trauma history of respondents was unknown. Therefore, the actual incidence of PTSD may be lower or higher due to reporting bias. However, participants were asked specifically about stress induced by the COVID-19 pandemic. The study by Joseph et al. was used as a historical control.

Teams was also noted as being difficult, particularly due to the rapidly evolving care guidelines.

Additionally, although the survey was conducted over a three-month period it is still considered a single time point and, not a longitudinal observation, as each subject was only able to respond once. It is also important to note that since the respondents to our survey were predominantly acute care/truma surgeons, many surgeons that primarily perform elective cases were likely not represented in our sample. Moreover, the overall low response rate may suggest that surgeons and other EAST members who may have been truly overwhelmed or had PTSD may not have participated in the survey. Additionally, despite assured anonymity, fear of discovery and the stigma of being labeled with mental health issues possibly factored into non-participation. Lastly, correlations between COVID-19 infection rates, geographical locations, and PTSD incidence were not assessed. It would be interesting to determine if states with higher infections rates had more respondents who screened positive for PTSD.

5. Conclusions

Surgeons were redeployed to treat COVID-19 patients at many hospitals across the country and were not immune from pandemic aftereffects. Although acute care/trama surgeons are familiar with stressful practice that did not prevent COVID-19 induced PTSD. Factors such as being single, having others close to them get infected with COVID-19, and fear of going to work all contributed to PTSD symptoms, sometimes further compounded by a lack of available mental health resources at their hospital. The plethora of issues surrounding the COVID-19 pandemic resulted in increased stress levels pervading both work and home, leading to feelings of “exhaustion,” “sadness,” “anger,” “fear,” “being broken,” and “not okay”. Mental health screening and support for surgeons, especially those exhibiting some of the risk factors identified here is a necessity. Even without the stress of the pandemic, acute care/trama surgeons are at risk of PTSD due to their day-to-day demanding practice. Future studies should evaluate the implementation of mental health/wellness resources for surgeons and their impact on PTSD symptoms and burnout among surgeons. Interventions for mental health support should be implemented institutionally, as well as at a national level via trauma organizations.

Declaration of competing interest

All authors have no conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amjsurg.2022.02.060.

References

1. Centers for Disease Control and Prevention. Cases and Deaths Among Healthcare Personnel. 2021. https://covid.cdc.gov/covid-data-tracker/#healthcare-personnel.
2. Maunder RG, Lancee WJ, Rourke S, Hunter JJ, et al. Factors associated with the psychological impact of severe acute respiratory syndrome on nurses and other hospital workers in Toronto. Psychosom Med. 2004;66(6):938–942.
3. Bai Y, Lin CC, Lin CY, Chen JY, et al. Survey of stress reactions among health care workers involved with the SARS outbreak. Psychiatr Serv. 2004;55(9):1055–1057.
4. McNamara GM, Lee AM, Cheung V, Cheung C, et al. Immediate and sustained psychological impact of an emerging infectious disease outbreak on health care workers. Can J Psychiatr. Apr 2007;52(4):241–247.
5. Lancee WJ, Maunder RG, Goldblum DS, et al. Prevalence of psychiatric disorders among Toronto hospital workers one to two years after the SARS outbreak. Psychiatr Serv. 2006;59(1):91–95.
6. Liu X, Kakade M, Fuller CJ, Fan B, et al. Depression after exposure to stressful events: lessons learned from the severe acute respiratory syndrome epidemic. Compr Psychiatr. Jan 2012;53(1):15–23.
7. Lee SM, Kang WS, Cho AR, Kim T, et al. Psychological impact of the 2015 MERS outbreak on hospital workers and quarantined hemodialysis patients. Compr Psychiatr. Nov 2018;87:123–127.
8. Johnson SU, Ebrahimi M, Hendriksen A. PTSD symptoms among health workers and public service providers during the COVID-19 outbreak. PLoS One. 2020;15(10), e0241032.
9. Luceno-Moreno L, Talavera Velasco B, Garcia-Albuerne Y, Garcia-Albuerne Y. Symptoms of posttraumatic stress, anxiety, depression, levels of resilience and burnout in Spanish health personnel during the COVID-19 pandemic. Int J Emerg Res Publ Health. Jul 30 2020;17(15).
10. Marco CA, Larkin GL, Feerer VR, Monti JE, et al. Post-traumatic stress and stress disorders during the COVID-19 pandemic: survey of emergency physicians. J Am Coll Emerg Physicians. Oct 2020;16(6):1594–1601.
11. Preti E, Di Matteo V, Perego G, Ferrari F, et al. The psychological impact of epidemic and pandemic outbreaks on healthcare workers: rapid Review of the evidence. Curr Psychiatr Rep. Jul 10 2020;22(8):143.
12. Yin Q, Sun Z, Liu T, Ni X, et al. Posttraumatic stress symptoms of healthcare workers during the corona virus disease 2019. Clin Psychol Psychother. May 2020;27(3):384–395.
13. Bentley MA, Crawford JM, Wilkins JM, Fernandez AR, et al. An assessment of depression, anxiety, and stress among nationally certified EMS professionals. Prehosp Emerg Care. Jul-Sep 2013;17(3):330–338.
14. Joseph B, Pandit V, Hadeed G, Kulvatunyou N, et al. Unveiling posttraumatic stress disorder in trauma surgeons: a national survey. J Trauma Acute Care Surg. Jul 2014;77(1):148–154.; discussion 154.
15. Jackson T, Provencio A, Bentley-Kumar K, Peryee C, et al. PTSD and surgical residents: everybody hurts... sometimes. Am J Surg. Dec 2017;214(6):1118–1124.
16. Varany L, Sorge R, Chen A, Lakoff D. Posttraumatic stress disorder in emergency medicine residents. Ann Emerg Med. Dec 2017;70(6):898–903.
17. Tan YQ, Wang Z, Yap CV, Chan YH, et al. Psychological Health of Surgeons in a Time of COVID-19: A Global Survey. Ann Surg. Jan 22 2021.
18. Mavroudis CL, Landau S, Brooks E, Bergmark R, et al. The relationship between surgeon gender and stress during the COVID-19 pandemic. Ann Surg. Apr 1 2021;273(4):625–629.
19. Mavroudis CL, Landau S, Brooks E, Bemark R, et al. Exploring the experience of the surgical workforce during the Covid-19 pandemic. Ann Surg. Mar 1 2021;273(3):e91–e96.
20. Lang AJ, Stein MB. An abbreviated PTSD checklist for use as a screening instrument in primary care. Behav Res Ther. May 2005;43(5):585–594.
21. Wilkins KC, Lang AJ, Norman SB. Synthesis of the psychometric properties of the PTSD checklist (PCL) military, civilian, and specific versions. Depress Anxiety. Jul 2011;28(7):596–606.
22. Lang AJ, Wilkins K, Boy-Byrne PP, Gololini D, et al. Abbreviated PTSD Checklist (PCL) as a guide to clinical response. Gen Hosp Psychiatr. Jul-Aug 2012;34(4):332–338.
23. Rosellini AJ, Stein MB, Colpe LJ, Heeringa SG, et al. Approximating a DSM-5 diagnosis of PTSD using DSM-IV criteria. Depress Anxiety. Jul 2015;32(7):493–501.
24. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders: DSM-IV-TR. Fifth ed. 2000. Washington, DC.
25. Han B, Wong EC, Mao Z, Meredith LS, et al. Validation of a brief PTSD screener for SURGEON gender and stress during the Covid-19 pandemic. Can J Psychiatr. Nov 2020;65(11):942–947.
26. Wilcox SE,俐 L, Herman D, Huska J, et al. The PTSD Checklist (PCL): Reliability, Validity, and Diagnostic Utility. San Antonio: The Annual Convention of the International Society for Traumatic Stress Studies; TX 1993.
27. R Core Team. R. A Language and Environment for Statistical Computing. Vienna, Austria: R Foundation for Statistical Computing; 2020. https://www.R-project.org/.
28. Center for Systems Science and engineering (CSSE) at Johns Hopkins University (JHU). COVID-19 Dashboard. 2021. https://coronavirus.jhu.edu/map.html.