





# Changes in interpersonal violence and utilization of trauma recovery services at an urban trauma center in the United States during the COVID-19 pandemic: a retrospective, comparative study

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**Purpose:** This study investigated changes in interpersonal violence and utilization of trauma recovery services during the COVID-19 pandemic. At an urban level I trauma center, trauma recovery services (TRS) provide education, counseling, peer support, and coordination of rehabilitation and recovery to address social and mental health needs. The COVID-19 pandemic prompted considerable changes in hospital services and increases in interpersonal victimization.

**Methods:** A retrospective analysis was conducted between September 6, 2018 and December 20, 2020 for 1,908 victim-of-crime patients, including 574 victims of interpersonal violence. Outcomes included length of stay associated with initial TRS presentation, number of subsequent emergency department visits, number of outpatient appointments, and utilization of specific specialties within the year following the initial traumatic event.

**Results:** Patients were primarily female (59.4%), single (80.1%), non-Hispanic (86.7%), and Black (59.2%). The mean age was 33.0 years, and 247 patients (49.2%) presented due to physical assault, 132 (26.3%) due to gunshot wounds, and 76 (15.1%) due to sexual assault. The perpetrators were primarily partners (27.9%) or strangers (23.3%). During the study period, 266 patients (mean, 14.9 patients per month) presented before the declaration of COVID-19 as a national emergency on March 13, 2020, while 236 patients (mean, 25.9 patients per month) presented afterward, representing a 74.6% increase in victim-of-crime patients treated. Interactions with TRS decreased during the COVID-19 period, with an average of 3.0 interactions per patient before COVID-19 versus 1.9 after emergency declaration ( $P < 0.01$ ). Similarly, reductions in length of stay were noted; the pre-COVID-19 average was 3.6 days, compared to 2.1 days post-COVID-19 ( $P = 0.01$ ).

**Conclusions:** While interpersonal violence increased, TRS interactions decreased during the COVID-19 pandemic, reflecting interruption of services, COVID-19 precautions, and postponement/cancellation of elective visits. Future direction of hospital policy to enable resource and service delivery to this population, despite internal and external challenges, appears warranted.

**Keywords:** COVID-19; Recovery; Violence; Wounds and injuries; Crime victims

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## INTRODUCTION

### Background

Care for orthopedic injuries among victims of crime (VOC) can be complicated by the need to address mental and social health, either to reduce crime recurrence or to address the impact of the initial crime. VOC patients, such as victims of domestic violence, experience worse health-related quality of life and inferior patient-reported functional outcomes [1–3]. Therefore, multidisciplinary approaches to treating these patients have been recommended, combining healthcare, social work, rehabilitation, and flexible support—in the form of education, counseling, peer encouragement, care coordination, and more—to address each patient's unique path to recovery [4,5]. At an urban level I trauma center, trauma recovery services (TRS) are provided to VOC patients and have previously been associated with improved overall patient-reported care ratings, lower rates of emergency department (ED) misuse, higher rates of patient-perceived ability to recover, and greater healthcare worker perception and responsiveness [2,6–8].

The COVID-19 pandemic caused widespread interruption of hospital services and drastic shifts in personal lives. Hospital-level changes included reductions in elective surgical procedures, stringent limits on visitation, and the implementation of individual health screenings upon entering medical facilities. A systematic review spanning from December 2019 to October 2020 [9] found that elective visits for orthopedic and trauma care declined by 50% to 74%, while elective surgical procedures conducted at hospitals declined by 33.3% to 100%. Emergent surgery, including trauma surgery, was continued in a manner that protected providers while simultaneously maintaining standards of emergency care for patients [10]. Nonetheless, emergency and trauma visits were reported to decline [11]. Despite these trends in hospital visits, the incidence of crime during COVID-19 increased. Rates of domestic violence rose worldwide, and the United Nations (UN) predicted a 20% increase in interpersonal violence due to the pandemic [12–15]. Additionally, the pandemic altered the overall crime dynamic, leading to more interpersonal crime relative to other forms of crime [1,13–16]. Given this trend, the role of adjuvant services provided for VOCs is of increasing importance. TRS programs can play key roles in recovery, such as managing substance abuse, providing therapy and counseling, and strengthening medical and social support for domestic violence victims [11]. Considering reductions in hospital capacity, services provided to VOCs during this time are paramount to help patients navigate the process of recovery.

In March 2022, the American College of Surgeons (ACS) Verification, Review, and Consultation (VRC) Program released accreditation requirements for level I and II trauma centers endorsing recovery programming [17]. The ACS VRC now states, “Level I and II trauma centers should adopt a means of facilitating the transition of patients into the community using patient-centered strategies such as the following: peer-to-peer mentoring, a trauma survivors program, participation in the American Trauma Society's Trauma Survivors Network program, [and] continuous case management that elicits and addresses patient concerns and links trauma center services with community care” [17]. Lessons about the utilization of TRS during the COVID-19 pandemic can be carried forward to shape and improve future services as hospitals begin to return to prepandemic functionality and implement new programming.

### Objectives

This study investigated changes in interpersonal violence and utilization of TRS during the COVID-19 pandemic. Frequencies and types of interpersonal violence were assessed. Health system utilization, including TRS, was reviewed, and associated patient factors were characterized.

## METHODS

### Ethics statement

This study was approved by the Institutional Review Board of the MetroHealth System (No. 21-00038). Informed consent was waived due to the retrospective nature of the study. The study was performed in accordance with the ethical standards outlined in the 1964 Declaration of Helsinki.

### Study design, setting, and participants

This study involved a retrospective review of the electronic medical charts of all adult VOC patients that interacted with TRS at a level I trauma center between September 6, 2018, and December 20, 2020. VOC status was assigned by two independent reviewers of each chart, including the reason for TRS contact (for instance, ED visit) and subsequent TRS comments.

### Description of experiment

Patients were divided into pre- and post-COVID-19 periods based on the date of contact with TRS. The threshold was defined as March 13, 2020, when the United States declared a national emergency for COVID-19. Data on patients included demographics, homeless status, mechanism of injury, relation of

perpetrator to victim, number of TRS contacts, types of TRS services rendered, and reason for declining TRS. Length of hospital stay and discharge disposition were also documented.

**Inclusion and exclusion of study participants**

A total of 1,908 patients were determined to be VOC who had interacted with TRS during the study period. Of these, 574 were victims of interpersonal violence. Eight were excluded due to being deceased, while 60 were removed after chart review revealed a lack of successful contact with TRS. Four patients were removed after chart review indicated that their initial contact with TRS fell outside the study period.

**Outcome measurements**

The primary outcome was the frequency of interpersonal violence in the pre-COVID-19 cohort compared to the post-COVID-19 cohort. The secondary outcomes included type of violence, TRS utilization, length of initial hospital stay, ED visits at 1 year, and outpatient visits at 1 year.

**Statistical analysis**

All data were stored electronically and analyzed using IBM SPSS ver. 28.0 (IBM Corp). Univariate predictors for each of the outcome variables were determined using the Student t-test for continuous variables and the Pearson chi-square test for categorical variables. Multivariate binary logistic regression was conducted for the secondary outcome variable of TRS utilization, including possible confounding variables from Table 1 (as indicated by  $P < 0.20$  in the univariate analysis) to determine independent predictors. P-values of 0.05 or lower were considered to indicate statistical significance for all results.

**RESULTS**

The final analysis included 502 patients. Patients were primarily female (298 patients, 59.4%), English-speaking (482 patients, 96.0%), and non-Hispanic (435 patients, 86.7%) (Table 1). The majority were Black (297 patients, 59.2%) or White (157 patients, 31.3%). Participants were mostly single (408 patients, 80.1%), with smaller proportions of individuals married (48 patients, 9.6%) or divorced (33 patients, 6.6%). The mean age was 33.0 years, with a median of 32 years (interquartile range, 23–42 years). Regarding the type of health insurance, Medicaid (322 patients, 64.3%) was most common, with lower rates of commercial insurance (28 patients, 5.6%) and uninsured status (25 patients, 5.0%).

Overall, 247 patients (49.2%) presented with a chief concern of

**Table 1.** Patient demographic data based on time of presentation (n=502)

Characteristic	Pre-COVID-19 (n=266)	Post-COVID-19 (n=236)	P-value
Age (yr)	35.1±14.7	31.6±12.1	0.003*
Sex			0.110
Male	117 (44.0)	87 (36.9)	
Female	149 (56.0)	149 (63.1)	
Race			0.560
White	75 (28.2)	61 (25.8)	
Non-White	191 (71.8)	175 (74.2)	
Marital status			0.060
Single	214 (80.4)	194 (82.2)	
Married or partnered	22 (8.3)	29 (12.3)	
Divorced or widowed	30 (11.3)	13 (5.5)	
Employment status			0.120
Unemployed	179 (67.3)	143 (60.6)	
Employed	87 (32.7)	93 (39.4)	
Education status			0.520
Less than high school graduate	94 (35.3)	77 (32.6)	
High school graduate or above	172 (64.7)	159 (67.4)	
Homeless			0.006*
No	237 (89.1)	227 (96.2)	
Yes	29 (10.9)	9 (3.8)	

Values are presented as mean±standard deviation or number (%). \* $P < 0.05$ .

physical assault, 132 (26.3%) with gunshot wounds, and 76 (15.1%) due to sexual assault. The perpetrators were primarily partners (140 patients, 27.9%), unspecified aggressors (119 patients, 23.7%), or strangers (117 patients, 23.3%). No significant differences in the types or perpetrators of violence were identified between the pre- and post-COVID-19 period (Table 2). The study period included 266 qualifying cases of violence (mean, 14.9 patients per month) pre-COVID-19 and 236 cases (mean, 25.9 patients per month) post-COVID. This represents a 74.6% increase in violence-related engagement with TRS after the COVID-19 emergency declaration.

Pre-COVID-19, the average number of TRS interactions per patient was 3.0, compared to 1.9 post-COVID-19 ( $P < 0.01$ ). Similarly, significant reductions were noted in ED and outpatient contacts with TRS. The average length of stay associated with initial ED presentation was 3.6 days pre-COVID-19 compared to 2.1 days post-COVID-19 ( $P = 0.01$ ). No significant difference was observed regarding the visit subtype (Table 3). After controlling for possible confounders, post-COVID-19 presentation was independently associated with decreased utilization of TRS

services (odds ratio [OR], 0.38; 95% confidence interval [CI], 0.24–0.60;  $P < 0.001$ ). An injury mechanism of sexual assault was

**Table 2.** Types and perpetrators of violence experienced by patients presenting before and after the COVID-19 emergency declaration (n=502)

Variable	Pre-COVID-19 (n=266)	Post-COVID-19 (n=236)	P-value
<b>Type of violence</b>			
Physical assault	130 (48.9)	117 (49.6)	0.88
Sexual assault	34 (12.8)	42 (17.8)	0.12
Gunshot wound	71 (26.7)	61 (25.9)	0.34
Motor vehicle collision	8 (3.0)	4 (1.7)	0.83
Robbery	12 (4.5)	5 (2.1)	0.14
Stalking/harassment	4 (1.5)	1 (0.4)	0.22
Other	7 (2.6)	6 (2.5)	0.95
<b>Perpetrator</b>			
Partner	67 (25.2)	73 (30.9)	0.15
Stranger	65 (24.4)	52 (22.0)	0.53
Family member	28 (10.5)	22 (9.3)	0.65
Acquaintance	47 (17.7)	29 (12.3)	0.09
Unspecified	59 (22.2)	60 (25.4)	0.39

Values are presented as number (%). Percentages may not total 100 due to rounding.

also significantly associated with lower TRS utilization (OR, 0.47; 95% CI, 0.27–0.82;  $P = 0.008$ ), while increased age was associated with greater utilization (OR, 1.03; 95% CI, 1.01–1.05;  $P = 0.010$ ). Homelessness and single marital status were not significantly associated with TRS utilization after inclusion of independent confounders (Table 4).

Table 5 illustrates specific services provided by TRS and changes in utilization over the study period. The most frequently utilized services were education about support services, food and housing assistance, referrals, and transportation and parking. Other than education about support services, each of

**Table 4.** Multivariable analysis for possible factors associated with utilization of trauma recovery services

Variable	$\beta$	Odds ratio	95% CI	P-value
Post-COVID-19 presentation	-0.98	0.38	0.24–0.60	<0.001*
Age (yr)	0.03	1.03	1.01–1.05	0.010*
Sexual assault mechanism	-0.77	0.47	0.27–0.82	0.008*
Homeless	1.99	7.33	0.96–56.0	0.055
Single marital status	-0.27	0.76	0.38–1.50	0.440
Constant	1.27	3.56	-	0.020*

CI, confidence interval.

\* $P < 0.05$ .

**Table 3.** Comparison of healthcare system interactions (services utilized) among patients presenting before and after the COVID-19 emergency declaration (n=502)

Variable	Mean no. of interactions		P-value
	Pre-COVID-19 (n=266)	Post-COVID-19 (n=236)	
No. of TRS contacts per patient	3.0	1.9	<0.001*
<b>Location of TRS contact</b>			
Phone	1.60	1.30	0.09
Inpatient bedside	0.42	0.39	0.80
ED	0.37	0.22	0.001*
Outpatient	0.57	0.04	<0.001*
Length of stay (day)	3.6	2.1	0.01*
<b>Total no. of ED visits in 1 yr</b>			
Related to initial presentation	1.20	0.92	0.04*
Due to new interpersonal violence	0.32	0.28	0.70
	0.09	0.08	0.78
<b>Total no. of outpatient visits in 1 yr</b>			
Related to initial presentation	5.50	6.90	0.15
Orthopedic department	2.90	2.90	0.98
Plastic surgery department	0.39	0.38	0.93
Trauma surgery department	0.10	0.17	0.24
Physical medicine and rehabilitation department	0.24	0.20	0.60
Therapy (including physical, occupational, and vocational)	0.14	0.16	0.78
Internal medicine (including medicine/pediatrics and family medicine) department	0.93	1.30	0.51
	0.16	0.10	0.22

TRS, trauma recovery services; ED, emergency department

\* $P < 0.05$ .

**Table 5.** Types of trauma recovery services utilized over the year following presentation by patients who presented before and after the COVID-19 emergency declaration (n=502)

Type	Pre-COVID-19 (n=266)	Post-COVID-19 (n=236)	Percentage change (%)
Education	271	236	2.3
Food and housing assistance	378	90	-73.0
Transportation and parking assistance	299	57	-78.5
Referral	250	158	-29.0
Advocacy and accompaniment	97	84	-2.4
Crisis intervention	65	14	-76.0
Telephone support	20	21	18.0
Victim-of-crime assistance	28	8	-68.0
Provision of comfort items	42	48	29.0
Forensic examination	7	73	1,080
Criminal justice support	6	14	163
Counseling/coaching	1	10	900

the most-utilized services exhibited a significant reduction in utilization between the pre- and post-COVID-19 time periods.

Regression modeling revealed gunshot wound injury, unspecified perpetrator, female sex, and pre-COVID-19 timeframe to be significant predictors of greater length of stay. Post-COVID-19 presentation, sexual assault, and higher age were significant predictors of lower TRS utilization. ED visits were also more likely in the homeless population and less likely among fully employed patients.

## DISCUSSION

In this study, between the pre- and post-COVID-19 periods, the number of VOC patients interacting with TRS increased by nearly 75%. These findings align with previous studies reporting more frequent interpersonal crime during the COVID-19 pandemic [16,18]. Despite observed increases in VOC during the pandemic at this trauma center, we observed a significant overall decrease in contact with TRS. Not only did patients have fewer TRS-associated interactions after COVID-19 began, but they were also less likely to accept TRS resources. Reductions in TRS contacts are attributable to the closure of TRS outpatient centers, dynamic changes in service provision to mitigate person-to-person spread of COVID-19, and decreased availability of certain services due to lockdown procedures. It is also possible that

during the early phases of the pandemic, patients exercised more caution and voluntarily withheld participation in services. Lastly, with service interruption, disadvantaged patient populations may have faced additional barriers in access to care, including personal anxiety, disruptions in transportation access, and changes in employment and insurance status.

Several explanations have been offered for the observed increase in interpersonal violence rates, which is not uncommon after disasters [13,15,19]. These include natural and man-made disasters, which may cause reduced marital satisfaction, economic uncertainty and disruption, increased rates of mental health disorders, elevated aggression, and limited access to support systems, from professional services to family and friends [20]. Women have experienced particularly high rates of victimization during the pandemic, as reported by the UN and several other sources [13,18,21,22]. This may be due to increased time spent with perpetrators due to lockdown protocols and pandemic-related economic obstacles in locating alternative housing [23].

These explanations may also underlie the significant decrease observed in length of hospital stay, along with reduced ED and outpatient interactions, in the present study. Additionally, these trends may relate to the cancellation or postponement of elective visits made to mitigate the spread of COVID-19 [4]. Despite these reductions in length of stay, outpatient visits, and ED visits, the types of violence that occurred before and during COVID-19 did not differ significantly, signaling that methods of injury have been largely unchanged since the start of the pandemic. Thus, the care standards for VOC patient recovery should similarly remain consistent.

These findings highlight an important potential consequence of the COVID-19 pandemic on VOC patients: in a setting involving elevated rates of victimization, without changes in the mechanism of injury, we observed fewer interactions with healthcare systems crucial for victim support and physical medical care. Given the well-documented beneficial impacts of TRS on the recovery of VOC, this suggests that patients' needs were not adequately met as healthcare systems prioritized mitigating the spread of COVID-19 [6,8]. As services begin to reopen, the importance of TRS must be emphasized in reconnecting patients with appropriate follow-up care and support.

## Limitations

Limitations of the present study include its retrospective approach and reliance on previously recorded data, which may have under-reported key elements of interest. Furthermore, our data relies on self-reporting by patients; therefore, the study does



not fully capture the extent of violence and victimization occurring in the community, as these events are likely under-disclosed by patients.

### Conclusions

Given the benefits that TRS has provided trauma patients, the recommendations implemented by the ACS [17], and the increased number of interpersonal violence victims during the COVID-19 pandemic, the expansion of TRS to adapt to this growing patient population appears warranted to properly meet their treatment and recovery needs. Future research should examine how TRS evolved during the COVID-19 pandemic to meet the needs of interpersonal violence patients and address the increased rates of victimization and domestic violence.

The COVID-19 pandemic led to increases in interpersonal violence, with no significant changes in the types of violence being perpetrated. Decreases were observed in TRS utilization, follow-up care, and length of hospital stay, primarily due to pandemic-related service interruption. As the COVID-19 situation continues to stabilize and services are reintroduced, the importance of TRS for proper rehabilitation and recovery is highlighted to meet the needs of those experiencing interpersonal violence.

### ARTICLE INFORMATION

#### Author contributions

Conceptualization: MAB, HAV; Data curation: KYZ, KJS, MK Jr, TM, HAV; Formal analysis: KYZ, KJS, TM, RF; Methodology: MAB, HAV; Project administration: MAB, HAV; Writing—original draft: KYZ, KJS, HAV; Writing—review & editing: all authors. All authors read and approved the final manuscript.

#### Conflicts of interest

The authors have no conflicts of interest to declare.

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#### Data availability

Data analyzed in this study are available from the corresponding author upon reasonable request.

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