

# “Safer at home”: The effect of the COVID-19 lockdown on epidemiology, resource utilization, and outcomes at a large urban trauma center

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<b>BACKGROUND:</b>	The COVID-19 pandemic has affected the entire global health care system. In California, because of a high burden of cases, a lockdown order was announced on March 19, 2020. This study investigated the impact of the lockdown on the epidemiology and outcomes of trauma admissions at the largest trauma center in Los Angeles.
<b>METHODS:</b>	A retrospective study comparing epidemiological and clinical characteristics and outcomes of trauma admissions during the lockdown period (March 20, 2020, to June 30, 2020) to a similar period in the previous year (March 20, 2019, to June 30, 2019) was performed. Data collection included demographics, mechanism of injury, prehospital transportation, substance use, injury severity, resource utilization, and outcomes.
<b>FINDINGS:</b>	There were 1,202 admissions during the lockdown period in 2020 and 1,143 during the same calendar period in 2019. Following the lockdown, there was a reduction in the automobile versus pedestrian admissions by 42.5%, motorcycle injuries by 38.7%, and bicycle accidents by 28.4% but no significant effect on the number of motor vehicle accident admissions. There was an increase in ground level falls by 32.5%, especially in the elderly group. The absolute number of gunshot wounds increased by 6.2% and knife injuries by 39.3%. Suicides increased by 38.5%. Positive testing for substance use increased by 20.9%. During the lockdown, patients suffered less severe trauma, with Injury Severity Score of <9 ( $p < 0.001$ ), as well as less severe head ( $p = 0.001$ ) and severe chest trauma ( $p < 0.001$ ). Trauma deaths were reduced by 27.9%, and the crude overall mortality was significantly lower during the lockdown period (4.1% vs. 5.9%, $p = 0.046$ ). Intensive care unit admission rates, mechanical ventilation, and intensive care unit length of stay were all reduced.
<b>CONCLUSION:</b>	The COVID-19 lockdown in 2020 had a significant effect on the epidemiology, clinical characteristics, and critical care resource utilization of trauma admissions in a large academic trauma center. These findings may help in planning and optimization of hospital resources during the pandemic. ( <i>J Trauma Acute Care Surg.</i> 2021;90: 708–713. Copyright © 2020 Wolters Kluwer Health, Inc. All rights reserved.)
<b>LEVEL OF EVIDENCE:</b>	Epidemiological study, level III; Retrospective observational, level III.
<b>KEY WORDS:</b>	COVID-19; trauma; epidemiology; resources; outcomes.

The World Health Organization declared a pandemic from the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 or COVID-19) on March 11, 2020.<sup>1</sup> The immediate concerns were related directly to the COVID-19 disease and the increasing pressure on intensive care unit (ICU) and hospital bed capacities. During the pandemic in northern Italy, another critical key-point emerged because of the massive overload of patients in the emergency departments. Additional challenges included a shortage of blood components, a shift of surgeons to other areas, and the need to set up special operating rooms for COVID-19 positive patients.<sup>2</sup>

The state of California issued the first statewide mandatory restrictions in the United States on March 19, 2020, to help contain the virus outbreak. The “lockdown” order, labeled “Safer at Home,” instructed Californians to stay at home, except for necessary travel to obtain food, prescriptions, health care, and commuting to jobs considered essential.

Little is known about changes in trauma epidemiology during the COVID-19 pandemic. A recently published small study in New Zealand with a total of 195 patients compared two 14-day periods before and during the national lockdown for COVID-19.<sup>3</sup> The authors reported an overall reduction in the number and severity of trauma admissions. A study from Italy analyzed hand and wrist trauma, comparing the period of February to March 2020 (during the pandemic) to the same time frame of the previous year. The authors reported similar injuries in both periods but a decreased amount of sport and traffic-related traumas with respect to domestic traumas during the pandemic.<sup>4</sup> Another study from Canada reported a decrease in injury-related emergency department visits during the COVID-19 pandemic in the pediatric population. In particular, motor vehicle collisions and sports-related injuries were reduced significantly during the COVID-19 lockdown.<sup>5</sup>

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The aim of the present study was to investigate the impact of the pandemic lockdown (“Safer at Home”) on injuries treated at a large, urban level 1 trauma center.

## PATIENTS AND METHODS

This was a retrospective observational, trauma registry-based study. The state of California issued a COVID-19 lockdown order, labeled “Safer at Home” on March 19, 2020. The present study included trauma admissions at the Los Angeles County and University of Southern California Medical Center, between March 20 and June 30, 2020, and March 20 and June 30, 2019.

Data abstracted for analysis included demographics, clinical data (vital signs and Glasgow Coma Scale [GCS] score on arrival to the emergency department), alcohol or substance use at the time of injury, injury data (mechanism of injury, Injury Severity Score [ISS], Abbreviated Injury Scale [AIS] score), and outcome measures (in-hospital mortality and complications, hospital length of stay [LOS], ICU LOS, and need and duration for ventilator support). Comorbidities and complications were described using the trauma data dictionary.<sup>6</sup> Substance use disorder included amphetamines, cocaine, opioids, and phencyclidine. Cannabinoids were not included. Primary outcome was the incidence of different mechanisms of injury over the two study periods. Secondary outcomes were in-hospital mortality and complications, ICU admission, need and duration of ventilator support, and ICU and hospital LOS. Patients with incomplete medical records or patients with isolated burn were excluded.

Univariate analysis was performed to compare the demographics, clinical data, injury patterns, and outcomes between the study groups. Categorical variables were summarized as numbers and percentages. Continuous variables were reported as medians with interquartile ranges. Categorical variables were compared using the  $\chi^2$  test or Fisher exact test as appropriate. The Mann-Whitney *U* test was used to compare continuous variables. Forward logistic regression analysis was performed to identify independent risk factors for mortality. Clinically relevant variables were included into the analysis. Results were reported as odds ratios and 95% confidence intervals (CIs). Correlation between variables was tested with multicollinearity analysis. The area under the receiver operating characteristic curve with 95% CI was used to assess the accuracy of the test. Statistical significance was defined as a *p* value of <0.05. Data were initially collected in a computerized spreadsheet (Microsoft Excel 2016) with subsequent data analysis using IBM SPSS for Windows, version 23 (SPSS Inc., Chicago, IL).

The study was approved by the Institutional Review Board of the University of Southern California.

## RESULTS

### Demographics and Clinical Characteristics

There were 1,202 trauma patients during the lockdown period in 2020 and 1,143 trauma patients in the same calendar period in 2019. Seven patients from the lockdown period were excluded from analysis, five because of incomplete data and two because they were still in hospital at the time of study completion. The epidemiological characteristics of the trauma admissions in the two study periods were similar with regards to

age and sex. Existing comorbidities, hypotension, heart rate, and GCS of <9 were similar in the study periods (Table 1).

With regard to blunt trauma mechanism, there was no significant change in the number of admissions because of motor vehicle accidents between the two study periods. However, during the lockdown, there was a reduction of the absolute number of admissions of auto versus pedestrian by 42.5%, and as a percentage of total trauma admissions, they dropped from 11.7% to 6.4% (*p* = <0.001). Similarly, motorcycle accident admissions decreased by 38.7% and, as a percentage of trauma admissions, from 8.4% to 4.7% (*p* = 0.001). Bicycle injury admissions decreased by 28.4% and, as a percentage of all admissions, from 6.5% to 4.4% (*p* = 0.029). On the other hand, ground level falls admissions increased by 32.4% (13.7% of all admissions vs. 17.3%, *p* = 0.019). The increase was more obvious in the older age groups (Tables 2 and 3).

In terms of penetrating trauma due to assaults, there was little change, overall, specifically in gunshot wound (GSW) admissions. This was true for absolute admission numbers and as a percentage of all admissions (Table 2). Knife wound admissions

**TABLE 1.** Demographics, Prehospital Transportation, Toxicology and Clinical Characteristics

	2019	2020	<i>p</i>
	n = 1,143 (%)	n = 1,202 (%)	
Age, median (IQR)	38 (27–56)	40 (27–57)	0.262
Age >65 y	157 (13.7)	199 (16.6)	0.058
Sex, male	903 (79.0)	927 (77.2)	0.295
Transportation			
Ambulance	1,065 (93.2)	1,031 (85.8)	<0.001
Helicopter	8 (0.7)	4 (0.3)	0.255
Police	9 (0.8)	19 (1.6)	0.088
Private	58 (5.1)	139 (11.6)	<0.001
Other	3 (0.3)	9 (0.7)	0.146
Transfer from other facility	58 (5.1)	102 (8.5)	0.001
Toxicology			
Tested for alcohol	628 (54.9)	468 (38.9)	<0.001
Alcohol positive	204 (32.5)	140 (29.9)	0.069
Tested for illicit drugs	333 (29.1)	311 (25.9)	0.178
Positive for any drug	134 (40.2)	162 (52.1)	0.003
Amphetamines	116 (34.8)	118 (37.9)	0.414
Cocaine	32 (9.6)	28 (9.0)	0.892
Opioids	1 (0.3)	1 (0.3)	1.000
PCP	4 (1.2)	12 (3.9)	0.041
Vital Signs			
SBP <90 mm Hg	37 (3.3)	46 (4.0)	0.372
Heart rate	91 (76.75–105)	91 (77–105)	0.645
GCS <9	69 (6.0)	71 (6.1)	1.000
Comorbidities			
Hypertension	213 (18.6)	212 (17.6)	0.555
Alcoholism	37 (3.2)	37 (3.1)	0.906
Diabetes mellitus	110 (9.6)	132 (11.0)	0.308
Smoking	75 (6.6)	61 (5.1)	0.133
Substance use disorder	88 (7.7)	69 (5.7)	0.069

IQR, interquartile range; PCP, phencyclidine; SBP, systolic blood pressure.

**TABLE 2.** Mechanism of Injury

Mechanism	2019	2020	p
	n = 1,143 (%)	n = 1,202 (%)	
MVA	163 (14.3)	150 (12.5)	0.224
AVP	134 (11.7)	77 (6.4)	<0.001
MCA	93 (8.1)	57 (4.7)	0.001
Bicycle accident	74 (6.5)	53 (4.4)	0.029
Overall falls	305 (26.7)	364 (30.3)	0.055
Fall from high place	36 (3.1)	30 (2.5)	0.382
Fall on same level	157 (13.7)	208 (17.3)	0.019
Age ≥70 y	64 (40.8)	87 (41.8)	0.915
Age ≥75 y	51 (32.5)	74 (35.6)	0.578
Other falls	112 (9.8)	126 (10.5)	0.632
GSW	97 (8.5)	104 (8.6)	1.000
Stab wound	61 (5.3)	85 (7.1)	0.088
Assault other penetrating	61 (5.3)	54 (4.5)	0.389
Blunt assault	84 (7.3)	98 (8.2)	0.488
Dog bite	14 (1.2)	14 (1.2)	1.000
Machine	6 (0.5)	25 (2.1)	0.001
Law enforcement related	8 (0.7)	7 (0.6)	0.799
Suicide	26 (2.3)	36 (3)	0.304
Other/unspecified	35 (3.1)	73 (6.1)	0.001
Unknown	19 (1.7)	37 (3.1)	0.030

AVP, auto versus pedestrian accident; MCA, motorcycle accident; MVA, motor vehicle accident.

increased by 39.3%. There was also a significant increase in the percentage of patients presenting with injury due to machinery trauma (0.5% vs. 2.1%,  $p = 0.001$ ) and glass (0.1% vs. 0.7%,  $p = 0.039$ ) in 2020. Suicides demonstrated an increased trend by 38.5%, although this failed to reach statistical significance. Positive testing for substance use increased by 20.9% (Table 1).

### Prehospital Transportation

The mode of transportation to the trauma center changed significantly, with more patients transported by private vehicles during the lockdown (11.6% vs. 5.1%,  $p < 0.001$ ) and fewer patients transported by ground ambulance (85.8% vs. 93.2%,  $p < 0.001$ ). Transfer rate from other facilities was also higher in 2020 (8.6% vs. 5.1%,  $p = 0.001$ ) (Table 1).

### Admission Vital Signs and Comorbidities

There was no difference in the incidence of admission hypotension (4.0% in 2020 vs. 3.3% in 2019,  $p = 0.372$ ) and GCS of  $<9$  (6.1% in 2020 vs. 6.0% in 2019,  $p = 1.000$ ), in the two study groups. The incidence of chronic comorbidities, such as hypertension, diabetes, smoking, alcoholism, and substance abuse, was similar in the two groups (Table 1).

### Alcohol and Substance Use

Overall, 40.1% of all trauma admissions in 2020 and 54.9% of admissions in 2019 were tested for blood alcohol levels ( $p < 0.001$ ). Substance use testing was performed on 26.8% of admissions in 2020 and 29.4% in 2019 ( $p = 0.178$ ). During the lockdown period, there was a significant increase

in patients tested positive for substance use (52.1% vs. 40.2%,  $p = 0.003$ ) (Table 1).

### Injury Severity

Overall, during the lockdown period in 2020, patients were less likely to have significant trauma (ISS,  $\geq 9$ ) than patients admitted in 2019: 38.7% of patients in 2020 had ISS of  $\geq 9$  as compared with 46.7% in 2019 ( $p < 0.001$ ). The incidence of severe injury (ISS,  $>15$ ) was 14.3% in 2020 versus 17.2% in 2019 ( $p = 0.053$ ). During the lockdown period, trauma victims were significantly less likely to have severe head trauma (AIS,  $\geq 3$ ) than in the same period in 2019 (12.6% vs. 17.4%,  $p = 0.001$ ), as well as less likely to have severe chest trauma (AIS,  $\geq 3$ ) (11.6% vs. 16.7%,  $p < 0.001$ ) (Table 4).

### Outcomes

The overall mortality was significantly lower during the lockdown (4.1% vs. 5.9%,  $p = 0.046$ ). Step-wise logistical regression correcting for age, mechanism of injury, AIS head/neck, AIS chest, AIS abdomen/pelvis, blood pressure, and GCS showed that the admission year 2020 was not identified as an independent risk or protective factor for mortality compared with the admission year 2019 (odds ratio, 0.52; 95% CI, 0.26–1.06;  $p = 0.071$ ). There was a reduction in the ICU admission rate (26.3% vs. 31.5%,  $p = 0.006$ ), shorter ICU LOS (3 [2–6] vs. 4 [2–7],  $p = 0.001$ ), and a reduction in mechanical ventilation (9.2% vs. 14.1%,  $p < 0.001$ ) during lockdown. The incidence of specific complications, such as acute kidney injury, acute respiratory distress syndrome, deep vein thrombosis,

**TABLE 3.** Mechanism of Injury: Changes in Absolute Numbers and Percentages During Lockdown

Mechanism	2019	2020	Change in Absolute Numbers and % in 2020
	n = 1,143 (%)	n = 1,202 (%)	
MVA	163 (14.3)	150 (12.5)	-13 (-8.0%)
AVP	134 (11.7)	77 (6.4)	-57 (-42.5%)
MCA	93 (8.1)	57 (4.7)	-36 (-38.7%)
Bicycle accident	74 (6.5)	53 (4.4)	-21 (-28.4%)
Overall falls	305 (26.7)	364 (30.3)	+59 (+19.3%)
Fall from high place	36 (3.1)	30 (2.5)	-6 (-16.7%)
Fall on same level	157 (13.7)	208 (17.3)	+51 (+32.5%)
Age ≥70 y	64 (40.8)	87 (41.8)	+23 (+35.9%)
Age ≥75 y	51 (32.5)	74 (35.6)	+23 (+45.1%)
Other falls	112 (9.8)	126 (10.5)	+14 (+12.5%)
GSW	97 (8.5)	104 (8.6)	+6 (+6.2%)
Stab wound	61 (5.3)	85 (7.1)	+24 (+39.3%)
Assault other penetrating	61 (5.3)	54 (4.5)	-7 (-11.5%)
Blunt assault	84 (7.3)	98 (8.2)	+14 (+16.7%)
Dog bite	14 (1.2)	14 (1.2)	0 (0.0%)
Machine	6 (0.5)	25 (2.1)	+19 (+316.7%)
Law enforcement related	8 (0.7)	7 (0.6)	-1 (-12.5%)
Suicide	26 (2.3)	36 (3)	+10 (+38.5%)

AVP, auto versus pedestrian accident; MCA, motorcycle accident; MVA, motor vehicle accident.

**TABLE 4.** Injury Severity in 2019 and 2020

	2019	2020	<i>p</i>
	<i>n</i> = 1,143 (%)	<i>n</i> = 1,202 (%)	
Injury severity			
ISS, median (IQR)	5 (2–11)	5 (1–10)	<0.001
ISS > 15	197 (17.2)	171 (14.3)	0.053
ISS < 9	609 (53.3)	734 (61.3)	<0.001
Head/neck injury	283 (24.8)	219 (18.2)	<0.001
AIS, median (IQR)	3 (2–3)	3 (2–3)	0.570
AIS ≥3	199 (17.4)	152 (12.6)	0.001
Chest injury	313 (27.4)	152 (12.6)	0.001
AIS, median (IQR)	3 (2–3)	3 (2–3)	0.218
AIS ≥3	191 (16.7)	139 (11.6)	<0.001
Abdomen/pelvis injury	191 (16.7)	175 (14.6)	0.155
AIS, median (IQR)	2 (2–3)	2 (2–3)	0.899
AIS ≥3	77 (6.7)	69 (5.7)	0.347
Extremity injury	395 (34.6)	454 (37.8)	0.112
AIS, median (IQR)	2 (2–3)	2 (2–3)	0.010
AIS ≥3	123 (10.8)	130 (10.8)	1.000

IQR, interquartile range.

pulmonary embolism, and sepsis, was similar in the two study periods (Table 5).

## DISCUSSION

The goal of this analysis was to evaluate the effect of the lockdown on the epidemiology and critical care resources utilization in trauma patients. The study has made some important observations, which can be considered in planning a trauma center's response in preparing for future pandemic peaks. During the lockdown period, there was a significant change of the epidemiology of trauma and critical care resource utilization. In future lockdowns, the finding that, in trauma care, not only there is no need for trauma closures or additional critical care resources but it might be a reduced need for these resources, may be taken into account.

Since the beginning of the outbreak in December 2019, COVID-19 has become a worldwide medical crisis. The World Health Organization declared a pandemic from the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 or COVID-19) on March 11, 2020.<sup>1</sup> All subspecialties of medicine have been affected by the pandemic. As a result, revised recommendations for care during the COVID-19 pandemic have been announced by a large number of specialty professional societies.<sup>7–9</sup> In the United States, the American College of Surgeons recommended increasing or creating new ICU capacity. In trauma centers, it has been mandated that critical trauma center functions (operating room and ICU availability, availability of emergency department resuscitation, radiology availability, team availability of general surgery, orthopedic and neurosurgery, and transfer pattern from other non-trauma centers) be reviewed.<sup>7</sup> The European Society of Trauma and Emergency Surgery published recommendations for trauma and emergency surgery preparation during COVID-19, including details such as operating room setup, patient transport, anesthesia considerations, and surgical approach.<sup>8</sup>

In the field of general surgery, there have already been several reports regarding the effect of COVID-19.<sup>2,10,11</sup> For example, Rauseri et al.<sup>10</sup> reported that emergency surgical admissions and surgical operations significantly decreased (45% reduction compared with 2019 [ $p < 0.001$ ] and 41% reduction compared with 2019 [ $p < 0.001$ ], respectively) during the COVID-19 outbreak period. They also reported that general surgery bed availability decreased 55% during this period ( $p = 0.001$ ).

Although the COVID-19 outbreak has clearly affected all subspecialties of medicine, its specific effects on the epidemiology and critical care resource utilization at major urban trauma centers in the United States have not been well described. The recommendations on trauma center preparations for the pandemic are based on expert opinion and not on data.

Los Angeles was hit very hard by the pandemic, and at the peak of the crisis, the daily census of COVID-19–positive patients in our hospital exceeded 100 inpatients. The present study reports the effects of the pandemic on trauma, in the hope that this may help in planning appropriate future responses in similar events.

Our first observation of significance was the shift in the predominant trauma mechanisms during the lockdown period. With regard to blunt trauma, there was a significant reduction in auto versus pedestrian, as well as motorcycle and bicycle injuries, without any significant change in injuries due to MVC. On the other hand, there was a significant increase of the ground level falls, which could be explained by the stay at home order. An overall decrease in traffic-related trauma was anticipated, because of the significant reduction in commuters. However, the stable number and proportion of motor vehicle collisions, specifically, were unanticipated. This finding may have been the result of other risk factors countering the decreased volume of commuters. For example, illicit substance use was increased during the lockdown and could have contributed to motor vehicle collisions. In addition, the decreased volume of motor vehicles on the road may have enabled higher traffic speeds, which are also known to increase the likelihood for motor vehicle collisions. Finally, the stable volume of motor vehicle collisions at

**TABLE 5.** Outcomes in 2019 and 2020

	2019	2020	<i>p</i>
	<i>n</i> = 1,143 (%)	<i>n</i> = 1,202 (%)	
Mortality	68 (5.9)	49 (4.1)	0.046
Death in ED	19 (1.7)	17 (1.4)	0.737
Hospital LOS, median (IQR)	2 (2–6)	2 (2–5)	0.536
ICU admission	360 (31.5)	316 (26.3)	0.006
ICU LOS, median (IQR)	4 (2–7)	3 (2–6)	0.001
Mechanical ventilation	161 (14.1)	110 (9.2)	<0.001
Ventilator days, median (IQR)	3 (2–6)	3 (2–6)	0.825
Complications			
Acute kidney injury	11 (1.0)	12 (1.0)	1.000
ARDS	2 (0.2)	2 (0.2)	1.000
Deep vein thrombosis	4 (0.3)	5 (0.4)	1.000
Pulmonary embolism	4 (0.3)	1 (0.1)	0.207
Sepsis	4 (0.3)	2 (0.2)	0.442

ARDS, acute respiratory distress syndrome; ED, emergency department; IQR, interquartile range.

our institution may have partially resulted from other neighboring trauma centers in “divert” status. This is supported by the increase in transfer patients received during the lockdown period.

In penetrating trauma, the incidence of injuries due to firearms remained the same, as a percentage of the total trauma admissions, during the study periods (8.6% in 2020 vs. 8.5% in 2019). Law enforcement–related trauma admissions were reduced by 12.5% after the lockdown. This finding differs from another report that found a significant increase in overall penetrating trauma and GSWs.<sup>12</sup> Qasim et al.<sup>12</sup> reviewed trauma admissions over a 6-week period during the pandemic and the same period in the previous year and reported that penetrating trauma increased from 15.4% at baseline to 19.7% ( $p = 0.031$ ) during the COVID-19 pandemic in Philadelphia. This discrepancy with the findings of the present study might be explained by study design, as the Philadelphia group used a pandemic period, as opposed to a specific pandemic lockdown period.<sup>12</sup> Hatchmonji et al.<sup>13</sup> in a commentary suggested an increase in GSW during the lockdown in Philadelphia. Possible reasons cited for the increased GSW during the pandemic included the increased sales of firearms during the pandemic driven by public panic, as well as the inability of the society’s most disadvantaged groups to abide by a “Stay At Home” order.<sup>13</sup>

There was a significant increase of about 20% of patients who tested positive for substance use during the lockdown. The effect of this uptick on the trauma epidemiology, especially domestic violence, is not clear.<sup>14</sup> However, this increase was a possible contributor to the maintained incidence of MVCs despite decreased commuters, as well as to the trend toward increased suicide-related trauma admissions.

The number of suicide-related trauma admissions increased by 38.4% after the lockdown, although it failed to reach statistical significance, possibly because of the low overall numbers during the short period of analysis. The stressful effects of the lockdown and the increased use of illicit substances both contribute to an environment conducive to suicide attempts. Olding et al.,<sup>15</sup> in a small study of 30 patients admitted at a London hospital during the lockdown, suggested an increase of self-harm and domestic violence penetrating trauma. The suicide rate during the lockdown might actually have been even higher, because the trauma database does not include suicides by other means, such as drug overdose or drowning, or other nontrauma methods.

The increased transports to the center by private vehicle likely correlate with the observed increased number of ground level falls and machinery accidents during lockdown. These injuries usually result in less severe injuries and are possibly more likely to be transported by private vehicle than high-speed or firearm injuries.

Another important trend identified resulting from the lockdown was a decrease in overall trauma injury severity and a presumably related overall decrease in trauma mortality. The overall injury severity was significantly lower during the lockdown, with 61.3% of trauma admissions having an ISS of <9 as compared with 53.3% in the previous year. The incidence of severe head and chest trauma was also significantly lower after lockdown, which could explain the significantly lower need for ICU admission and ventilator support, as well as shorter ICU LOS.

Although there have been many publications relating to the effects of the COVID-19 pandemic on patient care, the specific impact on trauma care has not previously been well described. This is the first large study on the effect of the COVID-19 lockdown on the epidemiology, prehospital transportation, use of illicit substances, injury severity, utilization of critical care resources, and outcomes in trauma patients, in one of the largest urban trauma centers in the United States. Regarding the limitations of this study, it is important to note its retrospective, observational nature and that it does not address normal variation from year to year. In addition, we analyzed data from only a single trauma center. Regional and nationwide studies regarding the impact of the COVID-19 pandemic on trauma care are needed to draw large-scale conclusions.

## CONCLUSION

The COVID-19 lockdown in 2020 had a significant effect on the epidemiology, clinical characteristics, critical care resource utilization, and outcomes of trauma admissions in a large, urban, academic trauma center. During the lockdown period, there was a significant change of the mechanism of blunt trauma mechanisms. There was a significant increase of illicit substance use. The overall trauma injury severity was significantly lower, resulting in lower critical care resource utilization and lower overall crude mortality. Because of this epidemiologic shift, the trauma center was able to remain open to trauma admissions during the entire lockdown period, and hospital resources were not overwhelmed.

These findings may help in the planning and optimization of hospital resources in future pandemic peaks, without the need for trauma center closure despite large numbers of COVID-related admissions.

## AUTHORSHIP

H.C. and D.D. designed the study. H.C., D.A.J., P.L., M.D.W., S.N., and R.C. performed the data acquisition. H.C., D.A.J., and P.L. analyzed the data. H.C., M.L., D.A.J., and P.L. wrote the first draft of the article. All authors contributed to the interpretation of the data and writing of the article and approved the final version of the article. E.R.B., M.L., and D.D. supervised all aspects of study design, data acquisition, analyses, and article writing.

## DISCLOSURE

The authors declare no conflicts of interest. The study was approved by the Institutional Review Board of the University of Southern California.

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