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Authors
Yeates, Eric O
Grigorian, Areg
Schellenberg, Morgan
et al.

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Original Research Article

Decreased hospital length of stay and intensive care unit admissions for non-COVID blunt trauma patients during the COVID-19 pandemic

Eric O. Yeates [a,*], Areg Grigorian [a,b], Morgan Schellenberg [b], Natthida Owattanapanich [b], Galinos Barmparas [c], Daniel Margulies [c], Catherine Juillard [d], Kent Garber [d], Henry Cryer [d], Areti Tillou [d], Sigrid Burruss [e], Liz Penaloza-Villalobos [e], Ann Lin [e], Ryan Arthur Figueras [e], Raul Coimbra [e,f], Megan Brenner [g], Todd Costantini [h], Jarrett Santorelli [h], Terry Curry [h], Diane Wintz [i], Walter L. Biffl [j], Kathryn B. Schaffer [j], Thomas K. Duncan [k], Casey Barbaro [k], Graal Diaz [k], Arianne Johnson [l], Justine Chinn [a], Ariana Naaseh [a], Amanda Leung [a], Christina Grabar [a], Jeffry Nahmias [a]

[a] University of California, Irvine (UCI), Department of Surgery, Orange, CA, USA
[b] University of Southern California (USC), Department of Surgery, Los Angeles, CA, USA
[c] Cedars-Sinai Medical Center, Department of Surgery, Los Angeles, CA, USA
[d] University of California, Los Angeles (UCLA), Department of Surgery, Los Angeles, CA, USA
[e] Loma Linda University, Department of Surgery, Loma Linda, CA, USA
[f] Riverside University Health System Medical Center, Moreno Valley, CA, USA
[g] University of California, Riverside/Riverside University Health System Department of Surgery, Moreno Valley, CA, USA
[h] University of California, San Diego (UCSD), Department of Surgery, San Diego, CA, USA
[i] Sharp Memorial Hospital, Department of Surgery, San Diego, CA, USA
[j] Scripps Memorial Hospital La Jolla, Trauma Department, La Jolla, CA, USA
[k] Ventura County Medical Center, Department of Surgery, Ventura, CA, USA
[l] Santa Barbara Cottage Hospital, Cottage Health Research Institute, Santa Barbara, CA, USA

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ABSTRACT

Background: The COVID-19 pandemic overwhelmed hospitals, forcing adjustments including discharging patients earlier and limiting intensive care unit (ICU) utilization. This study aimed to evaluate ICU admissions and length of stay (LOS) for blunt trauma patients (BTPs).
Methods: A retrospective review of COVID (3/19/20-6/30/20) versus pre-COVID (3/19/19-6/30/19) BTPs at eleven trauma centers was performed. Multivariable analysis was used to identify risk factors for ICU admission.
Results: 12,744 BTPs were included (6942 pre-COVID vs. 5802 COVID). The COVID cohort had decreased mean LOS (3.9 vs. 4.4 days, $p = 0.029$), ICU LOS (0.9 vs. 1.1 days, $p < 0.001$), and rate of ICU admission (22.3% vs. 24.9%, $p = 0.001$) with no increase in complications or mortality compared to the pre-COVID cohort (all $p > 0.05$). On multivariable analysis, the COVID period was associated with decreased risk of ICU admission (OR = 0.82, CI 0.75–0.90, $p < 0.001$).
Conclusions: BTPs had decreased LOS and associated risk of ICU admission during COVID, with no corresponding increase in complications or mortality.

* Corresponding author. The City Blvd West, Suite 1600, Orange, CA, USA 92868
E-mail addresses: yeatese@hs.uci.edu (E.O. Yeates), areg.grigorian@med.usc.edu (A. Grigorian), morgan.schellenberg@med.usc.edu (M. Schellenberg), natthida.owa@gmail.com (N. Owattanapanich), galinos.barmparas@cshs.org (G. Barmparas), daniel.margulies@cshs.org (D. Margulies), cjuillard@mednet.ucla.edu (C. Juillard), kgarber@mednet.ucla.edu (K. Garber), hcryer@mednet.ucla.edu (H. Cryer), atillou@mednet.ucla.edu (A. Tillou), sburruss@llu.edu (S. Burruss), lpenalozavillalobos@llu.edu (L. Penaloza-Villalobos), aclin@llu.edu (A. Lin), rfigueras@llu.edu (R.A. Figueras), r.coimbra@ruhealth.org (R. Coimbra), m.brenner@ruhealth.org (M. Brenner), tcostantini@health.ucsd.edu (T. Costantini), jsantorelli@health.ucsd.edu (J. Santorelli), tcurry@health.ucsd.edu (T. Curry), diane.wintzmd@sharp.com (D. Wintz), biffl.walter@scrippshealth.org (W.L. Biffl), schaffer.kathryn@scrippshealth.org (K.B. Schaffer), thomas.duncan@ventura.org (T.K. Duncan), casey.barbaro@ventura.org (C. Barbaro), graal.diaz@ventura.org (G. Diaz), a11johns@sbch.org (A. Johnson), jochinn@hs.uci.edu (J. Chinn), anaaseh1@hs.uci.edu (A. Naaseh), leungac1@hs.uci.edu (A. Leung), grabarc@hs.uci.edu (C. Grabar), jnahmias@hs.uci.edu (J. Nahmias).

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1. Introduction

Shortly after the first reported case of community transmission of COVID-19 in the United States (U.S.), many hospital systems were stressed and, in some cases, overwhelmed.[1–3] In the cases of overwhelmed systems, compensatory healthcare adjustments were needed to provide the necessary resources to care for a rapidly expanded critically ill population.[4–8] This varied significantly across center and systems but included reducing elective surgeries/procedures, discharging earlier, and limiting the use of precious resources, such as intensive care unit (ICU) beds, whenever possible.[9–15] Though trauma volume decreased significantly at some trauma centers at the start of the pandemic, managing resources became especially important at centers where volume persisted at a relatively high level and penetrating injury rates even increased.[16–20]

There have been reports of resource conservation from some trauma centers throughout the pandemic which include restricting transfusions and limiting resuscitative thoracotomies, however the exact changes in resource allocation surrounding trauma patients have not been adequately quantified.[21] Previous studies comparing hospital length of stay (LOS), ICU LOS, and ICU admissions before and during the COVID-19 pandemic have had mixed results, which may be due to confounding variables.[17,18,22–28] By excluding potential confounding variables, such as penetrating trauma and COVID-19 positive patients, we aim to capture a more direct measure of resource-related adjustments made and the secondary effects on patient outcomes. This could inform trauma-specific resource allocation strategies during a future pandemic or other resource-limited times. Additionally, the effort to deliver patient care to an unprecedented number of patients may reveal that current accepted practices contribute to an unnecessarily long LOS for trauma patients.

Therefore, this study aimed to evaluate changes in LOS and ICU utilization and related outcomes for Southern California blunt trauma patients. We hypothesized a shorter hospital LOS, shorter ICU LOS, and a lower rate and associated risk of ICU admission for blunt trauma patients during the COVID-19 pandemic (COVID) compared to the previous year (pre-COVID).

2. Materials and methods

A post-hoc analysis of a multicenter retrospective study of trauma patients presenting to eleven American College of Surgeons Level-I and II trauma centers in Southern California between the dates of March 19, 2019 to June 30, 2019, and March 19, 2020 to June 30, 2020 was performed. The date of March 19, 2020 was chosen as the start of the COVID period, as this was the date stay-at-home orders were issued by the California governor.[29] Demographic data, comorbidities, injury characteristics, vital signs on arrival, and outcomes were collected for all patients. This study was approved by the Institutional Review Board of the University of California, Irvine, and all other participating institutions, and was deemed exempt from the need for consent.

All patients in each institution's trauma registry, comprised of both trauma activations and consults, were aggregated. Patients who sustained penetrating trauma and patients who tested positive for COVID-19 were excluded. Penetrating trauma was excluded, as multiple studies have reported higher penetrating trauma rates during the COVID-19-associated time period.[17,22] COVID-19 positive trauma patients were excluded as they have worse outcomes compared to the general trauma population.[30] The primary outcomes were hospital LOS, ICU LOS, and ICU admission rate. Secondary outcomes were complications and mortality. Complications collected included sepsis, stroke, myocardial infarction, pneumonia, ventilator-associated pneumonia, acute kidney injury, acute renal failure, deep venous thrombosis, and pulmonary embolism.

Demographic data collected included age, sex (self-reported), race, insurance status, and body mass index (BMI). Comorbidities collected included diabetes, congestive heart failure, cerebrovascular accident, myocardial infarction, coronary artery disease, cancer, end-stage renal disease, chronic obstructive pulmonary disease, dementia, cirrhosis, and smoking. Injury mechanisms included ground-level fall, fall from height, pedestrian struck, motorcycle collision (MCC), motor vehicle collision (MVC), assault, and sports injury. Injury severity score (ISS) and abbreviated injury scale (AIS) scores for the head/neck, face, chest, abdomen, spine, extremity, and external were also recorded. Glasgow coma scale (GCS) scores and vital signs on arrival were also recorded for each patient. Additional data collected included operations performed, such as tracheostomy, laparotomy, craniectomy/craniotomy, and vascular/endovascular. In addition, discharge disposition to either home, skilled nursing facility (SNF), long-term acute care hospital, acute rehabilitation, or hospice was collected.

Patients presenting between March 19, 2019 to June 30, 2019 (pre-COVID) were compared to patients presenting between March 19, 2020 to June 30, 2020 (COVID). Chi-square tests were performed for categorical variables and Student's t-tests or Mann-Whitney U tests for continuous variables. Primary outcomes were also performed for both Level-I and II centers individually. Next, variables thought to be predictive of ICU admission were chosen using both literature review and coauthor consensus.[31–33] These variables included the time period (COVID vs pre-COVID), age, systolic blood pressure, respiratory rate, GCS, and ISS. A bivariate analysis was utilized to identify the strength of association between each of the above variables and ICU admission. Multivariable logistic regression analysis was then performed utilizing covariates with a p-value ≤ 0.20 to identify independent risk factors for ICU admission. Statistical significance was set for a p-value less than 0.05. Additionally, the Hosmer-Lemeshow test was used to evaluate the fit of our model. All analysis was performed using IBM SPSS Statistics for Windows (version 24; IBM Corp., Armonk, NY).

3. Results

3.1. Demographics and comorbidities

A total of 12,744 blunt trauma patients were included (6942 pre-COVID vs. 5802 COVID). The COVID and pre-COVID groups were similar with regards to age, sex, BMI, and comorbidities (all $p > 0.05$). The COVID group was more often Black (8.3% vs. 6.9%, $p = 0.003$), Latino (30.8% vs. 28.4%, $p = 0.003$), and Middle Eastern (0.4% vs. 0.2%, $p = 0.021$), and less often white (48.0% vs. 50.1%, $p = 0.019$) compared to the pre-COVID group. The COVID group also had higher rates of Medicare (22.9% vs. 19.8%, $p < 0.001$) and Medicaid (30.0% vs. 28.0%, $p = 0.013$), but lower rates of private insurance (30.9% vs. 42.6%, $p < 0.001$) (Table 1).

3.2. Injury characteristics and vital signs

Compared to the pre-COVID group, the COVID group had lower rates of pedestrians struck (7.9% vs. 11.0%, $p < 0.001$), motorcycle collisions (7.7% vs. 9.4%, $p = 0.001$), and motor vehicle collisions (23.3% vs. 25.4%, $p = 0.003$). The COVID group had a higher mean respiratory rate (19.2 vs 18.7 breaths/minute, $p < 0.001$) and heart rate (91.1 vs. 89.6 beats/minute, $p < 0.001$) compared to the pre-COVID group. Both groups had similar ISS, systolic blood pressure, temperature, and GCS on arrival (all $p > 0.05$) (Table 2).

3.3. Outcomes

Compared to the pre-COVID group, the COVID group had a shorter mean LOS (3.9 vs. 4.4 days, $p = 0.029$), ICU LOS (0.9 vs. 1.1 days, $p < 0.001$), and a decreased rate of ICU admission (22.3% vs. 24.9%, $p = 0.001$). The COVID group had a lower rate of laparotomy (1.1% vs. 1.8%, $p = 0.002$), but similar rates of tracheostomy, craniectomy/craniotomy, and vascular/endovascular operations (all $p > 0.05$). The

Table 1
Demographics and comorbidities of blunt trauma patients compared by time period.

Characteristic	pre-COVID (n = 6942)	COVID (n = 5802)	p-value
Male, n (%)	4167 (60.0%)	3496 (60.3%)	0.792
Age, years, mean ± sd	48.5 ± 24.6	48.3 ± 24.5	0.674
Race, n (%)			
white	**3478 (50.1%)**	2786 (48.0%)	**0.019**
Black	477 (6.9%)	**480 (8.3%)**	**0.003**
Asian	387 (5.6%)	297 (5.1%)	0.256
American Indian	13 (0.2%)	21 (0.4%)	0.057
Native Hawaiian	20 (0.3%)	14 (0.2%)	0.610
Latino	1972 (28.4%)	**1789 (30.8%)**	**0.003**
Middle Eastern	15 (0.2%)	**26 (0.4%)**	**0.021**
Insurance status, n (%)			
Medicare	1372 (19.8%)	**1327 (22.9%)**	**<0.001**
Medicaid	1941 (28.0%)	**1739 (30.0%)**	**0.013**
Private	**2956 (42.6%)**	1790 (30.9%)	**<0.001**
Uninsured	466 (6.7%)	393 (6.8%)	0.892
Comorbidities, n (%)			
Diabetes	836 (12.0%)	654 (11.3%)	0.178
Congestive heart failure	277 (4.0%)	199 (3.4%)	0.097
Cerebrovascular accident	172 (2.5%)	132 (2.3%)	0.455
Myocardial infarction	40 (0.6%)	36 (0.6%)	0.746
Coronary artery disease	149 (2.1%)	118 (2.0%)	0.659
Cancer	32 (0.5%)	34 (0.6%)	0.327
End-stage renal disease	92 (1.3%)	90 (1.6%)	0.284
COPD	212 (3.1%)	188 (3.2%)	0.548
Dementia	305 (4.4%)	257 (4.4%)	0.922
Cirrhosis	86 (1.2%)	68 (1.2%)	0.731
Current smoker	784 (11.3%)	606 (10.4%)	0.126
BMI, kg/m^2, mean ± sd	26.5 ± 6.5	26.5 ± 6.5	0.782

Sd = standard deviation, COPD = chronic obstructive pulmonary disease, BMI = body mass index.
Pre-COVID = 3/19/19–6/30/19.
COVID = 3/19/20–6/30/20.
Bolded values are significantly different.

COVID group had lower rates of sepsis (0.1% vs. 0.3%, p = 0.003), deep venous thrombosis (0.3% vs. 0.7%, p = 0.013), and pulmonary embolism (0.1% vs. 0.3%, p = 0.013). Otherwise, the rates of complications were similar between groups (all p > 0.05). The COVID group had a lower rate of discharge to SNF (7.5% vs. 9.3%, p < 0.001) and a higher rate of discharge to hospice (0.8% vs. 0.4%, p = 0.003), but otherwise had similar rates of other disposition and mortality compared to the pre-COVID group (all p > 0.05) (Table 3).

3.4. Primary outcomes of Level-I and II centers

Amongst Level-I centers, compared to the pre-COVID group, the COVID group had a shorter mean LOS (3.9 vs. 4.6 days, p < 0.001), ICU LOS (0.9 vs. 1.2 days, p < 0.001), and a decreased rate of ICU admission (21.6% vs. 25.0%, p < 0.001) (Table 4).

Amongst Level-II centers, compared to the pre-COVID group, the COVID group had a similar mean LOS (3.7 vs. 3.5 days, p = 0.552), ICU LOS (1.0 vs. 0.9 days, p = 0.356), and a decreased rate of ICU admission (23.6% vs. 22.7%, p = 0.574) (Table 5).

3.5. Bivariate analysis for risk of ICU admission

Compared to patients who were not admitted to the ICU, patients admitted to the ICU more commonly had a systolic blood pressure <90 mmHg (4.3% vs. 0.9%, p < 0.001), a GCS ≤8 (13.9% vs. 1.8%, p < 0.001), a respiratory rate >22 breaths/minute (24.6% vs. 16.8%, p < 0.001), an ISS ≥25 (18.7% vs. 1.1%, p < 0.001), and an age ≥65 years old (34.6% vs. 21.1%, p < 0.001), but were less likely to present during the COVID time period (42.8% vs. 46.4%, p = 0.001) (Table 6).

Table 2
Injury characteristics and vital signs of blunt trauma patients compared by time period.

Characteristic	pre-COVID (n = 6942)	COVID (n = 5802)	p-value
Mechanism of injury, n (%)			
Ground level fall	2021 (29.1%)	1685 (29.0%)	0.930
Fall from height	616 (8.9%)	572 (9.9%)	0.057
Pedestrian struck	**764 (11.0%)**	458 (7.9%)	**<0.001**
Motorcycle collision	**650 (9.4%)**	446 (7.7%)	**0.001**
Motor vehicle collision	**1766 (25.4%)**	1346 (23.2%)	**0.003**
Assault	421 (6.1%)	374 (6.4%)	0.375
Sports injury	253 (3.6%)	242 (4.2%)	0.126
ISS, median [IQR]	5 [8]	4 [9]	0.796
AIS Head/Neck	2 [1]	2 [2]	0.858
AIS Face	1 [1]	1 [1]	0.730
AIS Chest	2 [1]	2 [1]	0.784
AIS Abdomen	**2 [2]**	2 [1]	**0.025**
AIS Spine	2 [0]	2 [0]	0.405
AIS Extremity	2 [1]	2 [1]	0.250
AIS External	1 [0]	1 [0]	0.742
Vitals on arrival, mean ± sd			
Systolic blood pressure	139.0 ± 25.7	139.1 ± 25.7	0.687
Respiratory rate	18.7 ± 5.0	**19.2 ± 4.7**	**<0.001**
Heart rate	89.6 ± 20.7	**91.1 ± 21.1**	**<0.001**
Temperature, Fahrenheit	98.2 ± 1.0	98.1 ± 1.4	0.992
GCS score, median [IQR]	15 [1]	15 [1]	0.424

ISS = injury severity score, IQR = interquartile range, sd = standard deviation, AIS = abbreviated injury scale.
GCS = Glasgow coma scale.
PRE-COVID = 3/19/19–6/30/19.
COVID = 3/19/20–6/30/20.
Bolded values are significantly different.

Table 3
Outcomes of blunt trauma patients compared by time period.

Outcome	pre-COVID (n = 6942)	COVID (n = 5802)	p-value
LOS, days, mean ± sd	**4.4 ± 8.0**	3.9 ± 5.5	**0.029**
ICU LOS, days, mean ± sd	**1.1 ± 3.4**	0.9 ± 2.9	**<0.001**
ICU admission	**1726 (24.9%)**	1294 (22.3%)	**0.001**
Ventilator days, mean ± sd	**0.5 ± 2.4**	0.4 ± 2.3	**0.003**
Operations, n (%)			
Tracheostomy	78 (1.1%)	64 (1.1%)	0.912
Laparotomy	**123 (1.8%)**	65 (1.1%)	**0.002**
Craniectomy/craniotomy	95 (1.4%)	85 (1.5%)	0.646
Vascular/endovascular	68 (1.0%)	49 (0.8%)	0.426
Complications, n (%)			
Sepsis	**19 (0.3%)**	3 (0.1%)	**0.003**
Stroke	15 (0.2%)	11 (0.2%)	0.741
Myocardial infarction	5 (0.1%)	4 (0.1%)	0.948
Pneumonia	29 (0.4%)	14 (0.2%)	0.087
Ventilator-associated pneumonia	22 (0.3%)	17 (0.3%)	0.808
Acute kidney injury	19 (0.3%)	25 (0.4%)	0.132
Acute renal failure	11 (0.2%)	12 (0.2%)	0.522
Deep venous thrombosis	**46 (0.7%)**	20 (0.3%)	**0.013**
Pulmonary embolism	**23 (0.3%)**	7 (0.1%)	**0.015**
Discharge disposition, n (%)			
Home	4586 (66.1%)	3752 (64.7%)	0.099
Skilled nursing facility	**648 (9.3%)**	436 (7.5%)	**<0.001**
Long-term acute care hospital	106 (1.5%)	78 (1.3%)	0.390
Acute rehabilitation	350 (5.0%)	264 (4.6%)	0.197
Hospice	30 (0.4%)	**49 (0.8%)**	**0.003**
Mortality, n (%)	233 (3.4%)	179 (3.1%)	0.389

LOS = length of stay, ICU = intensive care unit, sd = standard deviation.
Pre-COVID = 3/19/19–6/30/19.
COVID = 3/19/20–6/30/20.
Bolded values are significantly different.

Table 4
Outcomes of blunt trauma patients from Level-I centers compared by time period.

Outcome	pre-COVID	COVID	
	(n = 5422)	(n = 4612)	p-value
LOS, days, mean ± sd	**4.6 ± 8.4**	3.9 ± 5.5	**<0.001**
ICU LOS, days, mean ± sd	**1.2 ± 3.6**	0.9 ± 3.0	**<0.001**
ICU admission	**1356 (25.0%)**	997 (21.6%)	**<0.001**

LOS = length of stay, ICU = intensive care unit, sd = standard deviation.
Pre-COVID = 3/19/19–6/30/19.
COVID = 3/19/20–6/30/20.
Bolded values are significantly different.

Table 5
Outcomes of blunt trauma patients from Level-II centers compared by time period.

Outcome	pre-COVID	COVID	
	(n = 1520)	(n = 1190)	p-value
LOS, days, mean ± sd	3.5 ± 6.3	3.7 ± 5.3	0.552
ICU LOS, days, mean ± sd	0.9 ± 2.9	1.0 ± 2.9	0.356
ICU admission	345 (22.7%)	281 (23.6%)	0.574

LOS = length of stay, ICU = intensive care unit, sd = standard deviation.
Pre-COVID = 3/19/19–6/30/19.
COVID = 3/19/20–6/30/20.
Bolded values are significantly different.

Table 6
Bivariate analysis for risk of intensive care unit admission in blunt trauma patients.

Risk factor	Not admitted to ICU (n = 9724)	ICU admission (n = 3020)	p-value
COVID (vs. pre-COVID)	**4508 (46.4%)**	1294 (42.8%)	**0.001**
Systolic blood pressure <90 mmHg	87 (0.9%)	**129 (4.3%)**	**<0.001**
GCS ≤8	172 (1.8%)	**409 (13.9%)**	**<0.001**
Respiratory rate >22 breaths/minute	1426 (16.8%)	**675 (24.6%)**	**<0.001**
ISS ≥25	104 (1.1%)	**562 (18.7%)**	**<0.001**
Age ≥65 years old	2624 (27.1%)	**1045 (34.6%)**	**<0.001**

ICU = intensive care unit, GCS = Glasgow coma scale, ISS = injury severity score.
Pre-COVID = 3/19/19–6/30/19.
COVID = 3/19/20–6/30/20.
Bolded values are significantly different.

3.6. Multivariable logistic regression analysis for risk of ICU admission

On multivariable analysis, presenting during the COVID period was associated with a decreased risk of ICU admission (OR = 0.82, CI 0.75–0.90, p < 0.001). Additionally, having a systolic blood pressure <90 mmHg (OR = 2.76, CI 1.88–4.04, p < 0.001), GCS ≤8 (OR = 10.05, CI 7.52–13.4, p < 0.001), respiratory rate >22 breaths/minute (OR = 1.49, CI 1.32–1.68, p < 0.001), ISS ≥25 (OR = 18.78, CI 14.23–24.80, p < 0.001), and age ≥65 years old (OR = 1.69, CI 1.53–1.87, p < 0.001) were associated with increased risk of ICU admission (Table 7). The Hosmer-Lemeshow chi-square statistic for this model was 3.290, with a p-value = 0.66. The Cox and Snell R-square was 0.128 and the Nagelkerke R square was 0.189, so the explained variation in our dependent variable based on our model ranges from 13% to 19%.

4. Discussion

The COVID-19 pandemic overwhelmed U.S. hospital systems, forcing compensatory healthcare adjustments including the allocation of non-inpatient space to care for critically ill patients in make-shift ICUs.[15]

Table 7
Multivariable logistic regression analysis for risk of intensive care unit admission in blunt trauma patients.

Risk factor	OR	CI	p-value
COVID (vs. pre-COVID)	0.82	0.74–0.90	**<0.001**
Systolic blood pressure <90 mmHg	2.76	1.88–4.04	**<0.001**
GCS ≤8	10.05	7.52–13.42	**<0.001**
Respiratory rate >22 breaths/minute	1.49	1.32–1.68	**<0.001**
ISS ≥25	18.78	14.23–24.80	**<0.001**
Age ≥65 years old	1.69	1.53–1.87	**<0.001**

OR = odds ratio, CI = confidence interval, GCS = Glasgow coma scale, ISS = injury severity score.
Pre-COVID = 3/19/19–6/30/19.
COVID = 3/19/20–6/30/20.
Bolded values are significantly different.

However, the effects of resource allocation regarding trauma patient outcomes have not been previously quantified.[3–8] This multicenter retrospective study of blunt trauma patients demonstrated a decreased LOS and ICU LOS, as well as a lower rate and associated risk of ICU admission, during the pandemic relative to the previous year. Interestingly, these findings were only noted amongst Level-I trauma centers.

Shortening the LOS of trauma patients is beneficial in general to avoid nosocomial complications and minimize unnecessary healthcare expenditures.[34] However, this becomes especially important during a pandemic to conserve precious resources.[20] This multicenter retrospective study identified a half-day mean decrease in LOS for blunt trauma patients during the COVID period despite similar ages, as well as comorbidities and ISS between the cohorts. This occurred even in the setting of known increased use of some illicit substances during the COVID pandemic as well as an increased rate of Medicaid patients.[35,36] Our findings are similar to prior studies dedicated to examining changes in trauma volume and mechanisms of injury, though these studies had significant limitations.[17,22,24] Notably, these studies did not account for the increase in penetrating trauma during the COVID pandemic.[17,22] They also included COVID-19 positive trauma patients who have worse outcomes compared to the general population, similar to what has been described in the surgical population.[30,37,38] This observed decrease in LOS is presumably due to the trauma provider's conscious efforts to make additional hospital beds available for the growing number of COVID-19 infected patients in the region at that time.[39] However, patients' desires to be discharged earlier and avoid inpatient hospitalization with potential exposure to COVID-19 could be another contributing factor.[40] Overall, this study provides generalizable data of a decreased LOS among blunt trauma patients during the COVID-19 pandemic and provides an example of how resources can be conserved during a pandemic. An alternative interpretation of this data may suggest that our pre-COVID efforts in caring for trauma patients resulted in an unnecessary number of ICU admissions and increased LOS, which may not be associated with any improvements in patient outcomes. However, further studies that also collects readmission data and post-discharge outcomes are needed to definitively determine the true implications of our findings.

The COVID-19 pandemic greatly increased the demand for ICU beds, pressuring providers to limit their usage whenever possible.[6,7,15,20] This study reports both a shorter ICU LOS and lower rate of ICU admission (2.6% absolute difference), even when controlling for significant risk factors, among the blunt trauma population during COVID. Importantly, this small but statistically significant difference was not associated with increased rates of mortality or complications. The few studies discussing ICU resource utilization by trauma patients during the pandemic have had inconsistent results.[23,24,27] One multicenter study in Los Angeles County by Ghafil et al. found no difference in ICU admission rates or ICU LOS during the COVID period, but notably did not exclude COVID-19 positive patients.[23] This subset of trauma patients may have skewed their results.[41] The present study addresses this significant confounding factor and describes a conservation of ICU resources by trauma surgeons during the COVID pandemic. These findings also suggest that there may be further room to safely decrease use of ICU beds for trauma patients, however as previously mentioned further studies including post-discharge outcomes would be needed prior to adoption in a non-pandemic setting.

Surprisingly, the decreased LOS, ICU LOS, and ICU admission rates we observed during the COVID period appear to be due to the Level-I centers alone. This finding could be due to either coincidental regional factors, as the impact of COVID-19 on trauma centers was variable, or a result of true differences in management between different levels of trauma center.[22,42] To our knowledge, there are no studies on this topic. Further studies with a larger number of both Level-I and especially Level-II centers are needed to confirm whether trauma center level alone is associated with outcomes during COVID.

There are a number of limitations to this study. First, our data was derived from multiple trauma registries and therefore was susceptible to missing information and/or misclassification. Second, though we attempted to control for confounding factors for ICU admission, it is possible that we did not account for the true reason for fewer ICU admissions. Third and perhaps our biggest limitation is that we did not capture data on readmissions, unplanned ICU admissions or post-discharge outcomes which would have provided more information on the safety of decreasing LOS and ICU admissions. We also did not collect other clinical data points that could help explain the reason for lower rates of discharge to SNFs and higher rates of discharge to hospice during the COVID period, including whether the discharge disposition was the location originally intended or was it altered due to COVID or other factors. Finally, this study describes only regional changes in trauma practices and may not be applicable to other areas with different management strategies and/or burden of COVID-19 disease.

5. Conclusions

This multicenter retrospective study of blunt trauma patients in Southern California demonstrated a decreased LOS and ICU LOS during the COVID-19 pandemic compared to the previous year. Additionally, it identified a lower rate and associated risk of ICU admission during the COVID period, even after controlling for significant predictors of ICU admission. Furthermore, there was no difference in complications or in-hospital mortality between cohorts. Therefore, it appears trauma centers safely decreased LOS and ICU admissions without additional complications. However, further studies that include post-discharge data are needed to confirm these findings.

Declaration of competing interest

The authors report that there are no conflicts of interest.

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