Effect of Statewide Social Distancing and Stay-At-Home Directives on Orthopaedic Trauma at a Southwestern Level 1 Trauma Center During the COVID-19 Pandemic

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Objectives: To compare orthopaedic trauma volume and mechanism of injury before and during statewide social distancing and stay-at-home directives.

Design: Retrospective.

Setting: Level 1 trauma center.

Patients/Participants: One thousand one hundred thirteen patients sustaining orthopaedic trauma injuries between March 17 and April 30 of years 2018, 2019, and 2020.

Intervention: Statewide social distancing and stay-at-home directives.

Main Outcome Measurements: Number of consults, mechanism of injury frequency, and type of injury frequency.

Results: During the COVID-19 pandemic, orthopaedic trauma consult number decreased. Injuries due to gunshot wounds increased and those due to automobile versus pedestrian accidents decreased. Time-to-presentation increased and length of stay decreased. Operative consults remained unchanged.

Conclusions: Orthopaedic trauma injuries continued to occur during the COVID-19 pandemic at an overall decreased rate, however, with a different distribution in mechanism and type of injury.

Key Words: Social distancing, stay-at-home, COVID-19, orthopaedic trauma

Level of Evidence: Therapeutic Level III. See Instructions for Authors for a complete description of levels of evidence.

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INTRODUCTION

SARS-CoV-2 (COVID-19) has significantly impacted health care systems and the treatment of surgical patients worldwide.[1] In the United States, nonurgent and elective surgeries were postponed to slow transmission of the disease and limit overall disease burden, based on recommendation of the American College of Surgeons.[2] This has affected a multitude of orthopaedic procedures, including the 1.5 million elective total joint replacements, spinal fusions, and arthroscopies performed each year.[3,4] However, delaying surgical treatment in the trauma setting may not be indicated or feasible because it may negatively affect patient outcomes.

Undoubtedly, traumatic injuries will continue to occur during the COVID-19 pandemic, however, it is uncertain to what extent. Historically, the surgical demand from trauma services has been high in nonpandemic times. The Centers for Disease Control and Prevention reports that there are 26 million trauma-related emergency visits and over 2.8 million trauma-related hospitalizations each year in the United States.[5] It has also been shown that fracture incidence and volume vary with changes in season and weather.[6–9] What is unknown is how fracture incidence and volume are affected during the setting of a pandemic, particularly given the implementation of social distancing and stay-at-home directives.

Evaluation of the unique circumstances surrounding the COVID-19 pandemic is necessary to strategically plan for the future, if similar events arise. The goal of this study is to evaluate the effect of statewide social distancing and stay-at-home directives on the volume and nature of orthopaedic trauma cared for at our Level 1 trauma center during the COVID-19 pandemic. We hypothesize that significant differences in volume and mechanism of injury of orthopaedic trauma exist when comparing the period encapsulating statewide social distancing and stay-at-home directives to the same seasonal period in previous years.

MATERIALS AND METHODS

Institutional review board approval was obtained, and a retrospective chart review was performed on all orthopaedic trauma consults placed for 45 consecutive days between March 17, 2020, and April 30, 2020, at a Level 1 trauma center in Las Vegas, NV. The dates were chosen based on the timeline of the COVID-19 pandemic and social distancing and stay-at-home directives in the state of Nevada in 2020.

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The authors report no conflict of interest.

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On March 17, a statewide order was put in place to close casinos and nonessential businesses. On March 21, a statewide emergency directive prohibiting gatherings of 10 or more people, including public recreational areas such as playgrounds, baseball fields, and basketball courts, was initiated. On April 1, the statewide stay-at-home directive was extended through April 30.[10] On May 1, statewide restrictions were eased allowing public recreational areas and golf courses to reopen and nonessential businesses to reopen with curbside pickup.[11]

The COVID-19 cohort was then compared with a control group consisting of orthopaedic trauma consults received during a nonpandemic time. Because of seasonal variability in the volume and nature of orthopaedic trauma seen at our institution, we elected to use a control group from the same dates in the previous 2 years (2018 and 2019) rather than the preceding months of the same calendar year.

All orthopaedic trauma consults during the study time frame of interest were included. Consults seeking evaluation by hand surgery or spine surgery services were excluded from this study, given that these 2 services are also managed by neurosurgery and plastic surgery services. Electronic medical records were reviewed to identify patient demographics and clinical data, including age, sex, mechanism of injury, type of injury, associated injuries, time-to-presentation, and length of stay (LOS).

Statistical analyses were performed using SPSS (version 25, IBM). Chi-square and Fisher exact tests with multiple comparison corrections were used to analyze consultation count data. Analyses of variance with post hoc tests were used to analyze continuous variables, such as age and time-to-presentation. Statistical significance was accepted at $P < 0.05$.

RESULTS

A total of 1113 (2018: 357, 2019: 422, and 2020: 334) orthopaedic trauma consult notes obtained from the electronic medical record were reviewed. Analysis using χ^2 goodness-of-fit showed a significant difference in the number of orthopaedic trauma consults in 2020 from the number expected (371) if the number of consults had followed a uniform distribution across the study periods ($\chi^2 = 11.229$, df = 2, $P = 0.004$), with a significant decrease below expected in 2020. Patient age, sex, incidence of polytrauma, and percentage of cases treated operatively did not significantly differ among years. Average patient age of the sample was 44.52 years (SD 23.34, range 0.1–100.8). The number and percentage of cases who were men was 703 (63.2%). The number and proportion of cases that were polytrauma was 227 (20.4%). The number and percentage of cases treated operatively was 479 (43.0%) (Table 1).

The mean time-to-presentation in the COVID-19 cohort (1.31 days, SD 5.9, range −3 to 69) was significantly longer than both the means for the control groups in 2018 (0.34 days, SD 1.4, range −7 to 14) and 2019 (0.41 days, SD 1.8, range −8 to 21) (F = 8.297, df = 2, $P < 0.001$). A negative value for time-to-presentation signified a consult evaluated after admission. LOS decreased steadily over the 3 years included in the study, however, it was only significantly different between 2018 (5.52 days) and 2020 (3.31 days) (F = 3.574, df = 2, $P = 0.028$) (Table 2).

Injuries were classified into the following mechanism groups: motor vehicle accident (MVC), motorcycle accident (MCC), gunshot wound (GSW), automobile versus pedestrian (AVP), ground level fall, fall from height, infection, all-terrain vehicle accident, twisting injury, crush injury, dog bite, knife stab wound, atraumatic injury, assault, bicycle accident, traction injury, wound check, electric saw injury, and jumping injury. Significant differences were found in 2 mechanisms of injury, GSWs and AVPs, between the previous incidence levels in 2018 and 2019 versus those in 2020. GSWs made up 3.9% and 3.8% of orthopaedic trauma consultations in 2018 and 2019, respectively, with an increase to 8.4% in 2020 ($X^2 = 9.728$, df = 2, $P = 0.008$). AVPs made up 6.7% and 7.6% of orthopaedic trauma consultations in 2018 and 2019, respectively, and was noted to decrease to 2.1% in 2020 ($X^2 = 11.623$, df = 2, $P = 0.003$) (Tables 3 and 4).

Injuries were also classified by type, with more than one type of injury possible per consultation. With regard to type of injury, only radius/ulna ($X^2 = 7.395$, df = 2, $P = 0.025$), pelvis ($X^2 = 7.416$, df = 2, $P = 0.025$), and foot ($X^2 = 9.593$, df = 2, $P = 0.008$) had statistically significant changes in incidence among the 3 study periods. The incidence of radius/ulna injury was only significantly different between years 2018 (5.3%) and 2019 (10.0%). The incidence of pelvis injury significantly differed between years 2018 (12.8%) and 2020 (8.4%). Similarly, the incidence of foot injury significantly differed between years 2018 (9.5%) and 2020 (5.1%) (Tables 5 and 6).

DISCUSSION

The true effect of statewide social distancing and stay-at-home directives on orthopaedic trauma injuries is

TABLE 1. Characteristics of the Full Sample and of Each Study Period

Sample Characteristics	2018	2019	2020	Total Sample	*P*
Consults	357	422	334	1113	0.004
Age, in years	43.6 (SD 22.6)	45.0 (SD 23.5)	44.9 (SD 24.0)	44.5 (SD 23.3)	0.655
Sex = male	223 (62.5%)	265 (62.8%)	215 (64.4%)	703 (63.2%)	0.857
Polytrauma = YES	75 (21.0%)	83 (19.7%)	69 (20.7%)	227 (20.4%)	0.889
Treatment location = trauma	204 (57.1%)	218 (51.7%)	197 (59.0%)	619 (55.6%)	0.103
Surgery = YES	156 (43.7%)	169 (40.0%)	154 (46.1%)	479 (43.0%)	0.236

TABLE 2. Time-To-Presentation and Length of Stay of the Full Sample and of Each Study Period

	2018	2019	2020	Total Sample	*P*
Time-to-presentation, d	0.34 (SD 1.4)	0.41 (SD 1.8)	1.31 (SD 5.9)	0.66 (SD 3.5)	<0.001
Length of stay, d	5.52 (SD 17.3)	4.06 (SD 7.3)	3.31 (SD 4.3)	4.31 (SD 11.1)	0.028

unknown. Stay-at-home directives of some fashion were implemented in 45 states.[10,12] In Nevada, traffic accidents and fatalities dropped by nearly half in March 2020 compared with March 2019.[13,14] The decrease in traffic fatalities continued in April 2020, dropping 8.7% from the previous year. By contrast, January and February 2020 had seen a rise in both traffic accidents and fatalities over the same months the previous year. The Nevada Department of Safety attributes the March and April 2020 reduction to the stay-at-home directives and reports that this is a national trend.[13–15] In this study, injuries as a result of MVC and MCC accidents remained unchanged. However, there was a decrease in injuries as a result of AVP accidents during the COVID-19 period. By contrast, there was an increase in injuries as a result of GSWs during the same period. In addition to social distancing and stay-at-home directives, the closure of schools, parks, playgrounds, and nonessential businesses resulted in the cancellation of numerous recreational activities. Although the short-term and long-term cumulative effects of these public health measures remain unknown, it is important to recognize that patients still continue to experience orthopaedic injuries that differ in mechanism under these unique social circumstances.

Orthopaedic trauma consults decreased lower than projected between March 17 and April 30, 2020, when compared with the same time frames in 2018 and 2019. This finding was expected given the institution of social distancing and stay-at-home directives. It is important to note that this decrease occurred without a significant change in population. According to the US Census Bureau, population estimates of the Las Vegas metropolitan area in 2018 and 2019 were 2,226,115 and 2,266,715, respectively. The 2020 Census currently being collected has projected a 2% increase in population, resulting in an estimated population of approximately 2,312,049 in the Las Vegas metropolitan area.[16] Although population remained steady, Las Vegas visitor volume, convention attendance, and total hotel occupancy decreased 58.9%, 54.8%, and 53.3%, respectively, in March 2020 compared with March 2019.[17]

Although the total consult number decreased, the number of operative consults remained unchanged among years. Surgical indications were not standardized over the 3 year study period, but it is important to note that there was a concerted effort made by the on-call attending physician to use nonoperative treatment when possible to conserve hospital resources during the COVID-19 pandemic. The decrease in consult number without a corresponding decline in operative cases may be due to a number of reasons. One theory is that less severe injuries were triaged by the trauma center and emergency department for outpatient follow–up, and so orthopaedic consults were not placed. Another possibility is that patients with less severe injuries did not present to the hospital for evaluation. However, the persistent volume of operative orthopaedic injuries highlights the importance of provider availability to match the demand of patients requiring acute intervention.

Interestingly, time-to-presentation increased during the COVID-19 pandemic. Given the abundance of information readily available through health care updates, news outlets, and social media, misconceptions about COVID-19 exist and may alter public knowledge and perception of the disease.[18] This information, and often misinformation, may have influenced when patients sought medical care. Concerns regarding exposure risks in the hospital likely prevent patients from presenting acutely, which could result in a delay of treatment and ultimately affect a patients outcome. This emphasizes the need for alternative means for patients to seek medical care while minimizing exposure. Designating hospitals, urgent cares, or outpatient clinics to specific branches of medical care may help to minimize disease transmission. In addition, expansion of telemedicine could be used to triage patients to ensure health care needs are met.

TABLE 3. Incidence of Each Mechanism of Injury of the Full Sample and of Each Study Period

Mechanism of Injury	2018	2019	2020	Total
MVC	50 (14.0%)	46 (10.9%)	43 (12.9%)	139 (12.5%)
MCC	43 (12.0%)	53 (12.6%)	36 (10.8%)	132 (11.9%)
GSW	14 (3.9%)	16 (3.8%)	28 (8.4%)	58 (5.2%)
AVP	24 (6.7%)	32 (7.6%)	7 (2.1%)	63 (5.7%)
GLF	71 (19.9%)	115 (27.3%)	102 (30.5%)	288 (25.9%)
FFH	41 (11.5%)	55 (13.0%)	42 (12.6%)	138 (12.4%)
INF	19 (5.3%)	26 (6.2%)	21 (6.3%)	66 (5.9%)
ATV	7 (2.0%)	4 (0.9%)	10 (3.0%)	21 (1.9%)
TWI	18 (5.0%)	18 (4.3%)	12 (3.6%)	48 (4.3%)
CRI	6 (1.7%)	6 (1.4%)	1 (0.3%)	13 (1.2%)
DGB	2 (0.6%)	1 (0.2%)	4 (1.2%)	7 (0.6%)
KSW	0 (0.0%)	1 (0.2%)	2 (0.6%)	3 (0.3%)
ATI	34 (9.5%)	23 (5.5%)	17 (5.1%)	74 (6.6%)
AST	9 (2.5%)	13 (3.1%)	4 (1.2%)	26 (2.3%)
BYC	10 (2.8%)	2 (0.5%)	3 (0.9%)	15 (1.3%)
TRI	1 (0.3%)	3 (0.7%)	1 (0.3%)	5 (0.4%)
WOC	7 (2.0%)	6 (1.4%)	1 (0.3%)	14 (1.3%)
ESI	0 (0.0%)	2 (0.5%)	0 (0.0%)	2 (0.2%)
JUI	1 (0.3%)	0 (0.0%)	0 (0.0%)	1 (0.1%)

ATI, atraumatic injury; AST, assault; ATV, all-terrain vehicle accident; BYC, bicycle accident; CRI, crush injury; DGB, dog bite; ESI, electric saw injury; FFH, fall from height; GLF, ground level fall; INF, infection; JUI, jumping injury; KSW, knife stab wound; MVC, motor vehicle accident; TWI, twisting injury; TRI, traction injury; WOC, wound check.

TABLE 4. Incidence of Gunshot Wound and Automobile Versus Pedestrian Mechanisms of Injury Compared to Non-gunshot Wound and Non-automobile Versus Pedestrian Mechanisms of the Full Sample and of Each Study Period

Mechanism of Injury	2018	2019	2020	Total
GSW				
Yes	14 (3.9%)	16 (3.8%)	28 (8.4%)	58 (5.2%)
No	343 (96.1%)	406 (96.2%)	306 (91.6%)	1055 (94.8%)
AVP				
Yes	24 (6.7%)	32 (7.6%)	7 (2.1%)	63 (5.7%)
No	333 (93.3%)	390 (92.4%)	327 (97.9%)	1050 (94.3%)
Total counsults	357	422	334	1113

Given the unprecedented nature of the COVID-19 pandemic, several recommendations have been and will continue to be made to help guide clinical practice and resident training.[19–21] In the supply and demand mismatch of health care providers and disease burden, surgical subspecialty providers have developed surgical medical teams to fulfill internal medicine roles to successfully meet the increased demand placed on the health care system.[19] Medical schools have assisted in making up for the provider shortage by graduating fourth-year medical students early.[22] Concern has not only been for availability of health care providers but also for the health and safety of these providers when considering patient–provider contact under pandemic conditions. Development and implementation of alternating provider teams to decrease exposure has been found to meet the supply without compromising resident education.[21] Our study reiterates the importance of the orthopaedic team, not just the role of orthopaedic traumatologists, in providing necessary patient care during the pandemic. It emphasizes the role of residency training as a platform for building a foundation of general orthopaedic knowledge with special attention to basics of fracture care. There is a recent trend of most orthopaedic residents pursuing fellowship training[23–25] to meet what is believed to be patients' current needs.

TABLE 5. Incidence of Injury Type of the Full Sample and of Each Study Period

Type of Injury	2018	2019	2020	Total
Humerus	38 (8.4%)	45 (8.8%)	38 (8.8%)	121 (8.7%)
Radius/Ulna	24 (5.3%)	51 (10.0%)	35 (8.1%)	110 (7.9%)
Femur	53 (11.7%)	61 (12.0%)	63 (14.6%)	177 (12.7%)
Tibia/Fibula	87 (19.2%)	104 (20.4%)	87 (20.2%)	278 (19.9%)
Pelvis	58 (12.8%)	41 (8.0%)	36 (8.4%)	135 (9.7%)
Foot	43 (9.5%)	26 (5.1%)	22 (5.1%)	91 (6.5%)
Scapula/Clavicle	40 (8.8%)	52 (10.2%)	43 (10.0%)	135 (9.7%)
Tendinopathy	1 (0.2%)	0 (0.0%)	0 (0.0%)	1 (0.1%)
Foreign body	0 (0.0%)	1 (0.2%)	1 (0.2%)	2 (0.1%)
Osteonecrosis	2 (0.4%	2 (0.4%)	0 (0.3%)	4 (0.3%)
Nervous	0 (0.0%)	0 (0.0%)	1 (0.2%)	1 (0.1%)
Oncology	0 (0.0%)	5 (0.1%)	1 (0.2%)	6 (0.4%)
Vascular	1 (0.2%)	1 (0.2%)	0 (0.0%)	2 (0.1%)
Tendon rupture/laceration	3 (0.7%)	4 (0.8%)	0 (0.0%)	7 (0.5%)
Laceration	7 (1.5%)	13 (2.5%)	4 (0.9%)	24 (1.7%)
Traumatic amputation	2 (0.4%)	0 (0.0%)	2 (0.5%)	4 (0.3%)
Dislocation	21 (4.6%)	20 (3.9%)	29 (6.7%)	70 (5.0%)
Joint pain	25 (5.5%)	33 (6.5%)	25 (5.8%)	83 (5.9%)
Bursitis	3 (0.7%)	2 (0.4%)	2 (0.5%)	7 (0.5%)
Osteomyelitis	6 (1.3%)	12 (2.4%)	8 (1.9%)	26 (1.9%)
Infection	15 (3.3%)	17 (3.3%)	12 (2.8%)	44 (3.2%)
Compartment syndrome	2 (0.4%)	0 (0.0%)	0 (0.0%)	2 (0.1%)
Wound check	10 (2.2%)	8 (1.6%)	3 (0.7%)	21 (1.5%)
Ligamentous knee injury	2 (0.4%)	0 (0.0%)	3 (0.7%)	5 (0.4%)
Muscle strain	3 (0.7%)	1 (0.2%)	0 (0.0%)	4 (0.3%)
Traumatic arthrotomy	4 (0.9%)	5 (1.0%)	8 (1.9%)	17 (1.2%)
Patella	4 (0.9%)	6 (1.2%)	8 (1.9%)	18 (1.3%)
Total injuries	454	510	431	1395

TABLE 6. Incidence of Radius/Ulna, Pelvis, and Foot Injuries Compared With Consults Without These Injury Types of the Full Sample and of Each Study Period

Type of Injury	2018	2019	2020	Total
Radius/Ulna				
Yes	24 (5.3%)	51 (10.0%)	35 (8.1%)	110 (7.9%)
No	430 (94.7%)	459 (90.0%)	396 (91.9%)	1285 (92.1%)
Pelvis				
Yes	58 (12.8%)	41 (8.0%)	36 (8.4%)	135 (9.7%)
No	396 (87.2%)	469 (92.0%)	395 (91.6%)	1260 (90.3%)
Foot				
Yes	43 (9.5%)	26 (5.1%)	22 (5.1%)	91 (6.5%)
No	411 (90.5%)	484 (94.9%)	409 (94.9%)	1304 (93.5%)
Total injuries	454	510	431	1395

A proposed solution has been to reshape residency training from general to more subspecialty exposure.[26] Depending on the circumstances of an orthopaedic fellow's ultimate practice set up, this shift in training may prove beneficial if his or her practice is solely specialty based. By contrast, our study emphasizes the importance of residency training in developing general orthopaedic surgeons to provide acute basic fracture care. Social distancing and stay-at-home directives may apply to the general public, but orthopaedic surgeons share in the responsibilities of first responders and are fundamental to both patient care and the health care system during these times of need. All orthopaedic surgeons, whether fellowship trained or not, must be proficient in basic fracture care and prepared to step up to the challenge of treating orthopaedic trauma injuries.

We acknowledge that limitations exist in this study. First, the study is a retrospective review of electronic medical records making it susceptible to reporting errors and accuracy of information. In an attempt to mitigate this we performed individual chart reviews rather than relying on *ICD*-10 codes. Second, in several circumstances the analysis is limited by small sample sizes. However, the study was restricted to one institution and the time frame of social distancing and stay-at-home directives in Nevada. Finally, we understand that factors outside of those studied may also confound our results. For example, although LOS decreased during the COVID-19 pandemic, a downward trend was noted over the 3 years. This may be due largely to hospital-wide initiatives to decrease LOS and not solely due to an attempt to limit patient exposure to COVID-19.

Orthopaedic injuries continued to occur during the COVID-19 pandemic, although the volume and distribution in the mechanisms of injury changed. These differences in injury pattern highlight the importance of continued orthopaedic care and understanding how to adapt patient care to the evolving circumstances the health care system may encounter. The persistent operative trauma volume demonstrates that orthopaedic surgeons are essential providers during these unprecedented times and must be prepared to provide acute treatment of orthopaedic injuries. Future studies evaluating the volume and nature of orthopaedic injuries after social distancing and stay-at-home directives have lifted will help determine if orthopaedic trauma returns to a similar pattern of occurrence.

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