




Hip Fracture Volume Does Not Change at a New York City Level I Trauma Center During a Period of Social Distancing

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Abstract

Purpose: To characterize the volume and variation in orthopedic consults and surgeries that took place during a period of social distancing and pandemic. **Methods:** All orthopedic consults and surgeries at an urban level I trauma center from 3/22/20-4/30/2020 were retrospectively reviewed (the social distancing period). Data from the same dates in 2019 were reviewed for comparison. Age, gender, Score for Trauma Triage in the Geriatric and Middle Aged (STTGMA) score and injury type were queried. Operating room data collected included: type of surgery performed, inpatient or outpatient status, and if the cases were categorized as elective, trauma or infectious cases. **Results:** Compared to 2019, there was a 48.3% decrease in consult volume in 2020. The 2020 population was significantly older (44.0 vs 52.6 years-old, $p = 0.001$) and more male (65% vs 35%, $p = 0.021$). There were 23 COVID positive patients, 10 of which died within the collection period. Consult distribution dramatically changed, with decreases in ankle fractures, distal radius fractures and proximal humerus fractures of 76.5%, 77.4% and 55.0%, respectively. However, there was no significant difference in volume of hip, tibial shaft and femoral shaft fractures ($p > 0.05$). In 2020, there was a 41.4% decrease in operating room volume, no elective cases were performed, and cases were primarily trauma related. **Conclusions:** During a period of pandemic and social distancing, the overall volume of orthopedic consults and surgeries significantly declined. However, hip fracture volume remained unchanged. Patients presenting with orthopedic injuries were older, and at higher risk for inpatient mortality.

Keywords

fragility fractures, geriatric trauma, systems of care, trauma surgery, economics of medicine

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Introduction

On March 1st, 2020, the first case of SARS-COV-2 (COVID-19) in New York City was identified, and by May 6, New York City had 173,288 confirmed COVID-19 cases and 13,938 confirmed deaths.¹ The spread of COVID-19 in New York City has been swift and devastating primarily due to New York's high population density coupled with its substantial reliance on mass transit. While these factors have contributed to the difficulty in containing the virus, aggressive actions undertaken by both policymakers and the general public have attempted to curtail the exponential rise in cases to allow hospital systems to confront the challenging burden of patient volume without being overwhelmed.

In an effort to minimize further spread of the virus throughout the state, New York Governor Andrew Cuomo enacted the Policies Assure Uniform Safety for Everyone (PAUSE)

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executive order, colloquially known as the “social distancing” mandate on March 22, 2020.² This order closed all non-essential businesses, discouraged the use of public transportation, recommended that all individuals stay at least 6 feet from one another, and prohibited social gatherings of any size. While it is difficult to decouple the effect of specific measures enacted by policymakers from voluntary safety precautions taken by the general public, overall measures to avoid transmission have resulted in a substantial decline in the rate of increase of COVID-19 cases in New York. Queens County, New York was found to have the most reported cases in New York City. As of May 6, 2020, Queens County alone responsible for 17% of all New York State’s cases, with 54,448 reported cases and 5,460 deaths.³ However, between March 30, 2020 and April 30, 2020, the number of newly hospitalized patients in New York City decreased from 1,638 to 154 patients, respectively.⁴ With COVID-19 patients representing a high patient burden on hospitals in New York City, it is of substantial importance to understand the effect of social distancing measures on orthopedic trauma volume, particularly at a level 1 trauma center in Queens, NY where volume would be expected to be most affected by these measures. The volume and variation of traumatic orthopedic injuries during a period of pandemic or social distancing has not been formally reported in the literature.

The purpose of this study was to assess how social distancing measures in the context of COVID-19 have affected the volume and type of musculoskeletal injuries presenting to a level 1 trauma center situated in the global epicenter of the pandemic. It was hypothesized that the number of upper extremity trauma, lower extremity trauma, and soft tissue consults as well as operative cases would be decreased compared to the same time period 1 year prior. It was further hypothesized that the number of hip fractures would not significantly decrease.

Methods

A retrospective review of prospectively gathered data on orthopedic consults and surgeries from an urban level 1 trauma center was performed. Institutional Review Board (IRB) approval was obtained prior to data collection. Data collection spanned March 22, 2020 to April 30, 2020. This time period corresponded to the initiation of social distancing guidelines in New York City to the end of April, the month where COVID cases peaked. For comparison, the same period for 2019 was retrospectively reviewed. Consults from 2020 were also subdivided into COVID-positive and COVID-negative patients, enabling comparison between 2019 consults, 2020 COVID-negative, and 2020 COVID-positive patients.

All patients that the orthopaedic service was formally consulted on were included. Demographic data, including age, gender, STTGMA score and injury type were collected. The STTGMA score is a previously validated measure of inpatient mortality risk based on injury and comorbidities for patients over the age of 55, and can be used as proxy for patient comorbidity.^{5,6} Operating room (OR) volume data was also queried, including whether the OR cases were inpatient or outpatient,

Table 1. Demographic Data for Orthopedic Consult Volume.

| n | 2019 304 | 2020 157 | p-value | sig. |
|--------------------------|-------------|-------------|---------|------|
| Age (mean (SD)) | 44.0 (25.7) | 52.6 (23.7) | 0.001 | * |
| Gender = M (%) | | | 0.021 | * |
| Male | 162 (53.3) | 102 (65.0) | | |
| Female | 142 (46.7) | 55 (35.0) | | |
| STTGMA Score (mean (SD)) | 0.02 (0.02) | 0.04 (0.11) | 0.081 | |
| COVID Positive (%) | 0 (0.0) | 23 (14.6) | <0.001 | * |

elective, were of traumatic etiology, or had an infectious component.

Statistical analysis included comparisons of patient demographics between 2019 and 2020 using t-tests for continuous variables and chi-squared tests for categorical variables. Consults seen in 2020 were further sub-divided into COVID positive and COVID negative patients and were compared to the 2019 group using 1-way analysis of variance (ANOVA) tests with Tukey post-hoc tests. Comparison of case types that went to the operating room were compared using chi-squared tests. Demographic variables for hip fractures during the specified period in 2019 and 2020 were compared using t-tests for continuous variables and chi-squared tests for categorical variables. All statistical analysis was performed using R (version 3.6.2). Statistical significance was set at $\alpha = 0.05$. Institutional IRB was obtained prior to data collection.

Results

There were 157 consults in the specified time period in 2020 compared to 304 consults in 2019, demonstrating a 48.3% decrease in consult volume. (Table 1) Mean patient age was 46.9 +/- 25.4, which included 264 males, and 197 females. When compared to the 2019 cohort, the 2020 population was significantly older (44.0 vs 52.6 years old, $p = 0.001$), with a higher proportion of males (65% vs 35%, $p = 0.021$). STTGMA scores were not significantly different between the 2 groups ($p = 0.081$). Within the 2020 cohort, 23 patients were COVID positive, 10 of which died during the collection period. The remainder of the demographic information can be found in Table 1.

Comparison between 2019 patients, 2020 COVID-negative patients, and 2020 COVID-positive patients demonstrated a significant difference in age ($p = 0.001$) and STTGMA scores ($p = 0.021$). (Table 2) Post-hoc pairwise comparisons found the 2020 COVID positive group (mean age 71.6 years, +/-15.8) was significantly older than both the 2020 COVID negative group (49.3 years +/- 23.4) ($p < 0.001$) and the 2019 group (44.0 +/- 25.7) ($p < 0.001$). The 2020 COVID positive group (0.07 +/- 0.20) also had significantly higher STTGMA scores than the 2019 group (0.02 +/- 0.02) ($p = 0.020$), but the difference between the COVID positive and negative groups (0.03 +/- 0.05) in 2020 was not statistically significant ($p = 0.101$). The 30-day mortality rate for patients in the COVID positive group was 39% (9 of 23 patients).

Table 2. Demographic Data for Orthopedic Consult Volume Stratified by COVID-19 Status.

| | 2019 | 2020 COVID- 134 | 2020 COVID+ 23 | p-value | sig |
|--------------------------|-------------|-----------------------|----------------------|---------|-----|
| N | 304 | | | | |
| Age (mean (SD)) | 44.0 (25.7) | 49.3 (23.4) | 71.6 (15.8) | <0.001 | * |
| Gender (%) | | | | 0.056 | |
| Male | 162 (53.3) | 87 (64.9) | 15 (65.2) | | |
| Female | 142 (46.7) | 47 (35.1) | 8 (34.8) | | |
| STTGMA Score (mean (SD)) | 0.02 (0.02) | 0.03 (0.05) | 0.07 (0.20) | 0.027 | * |

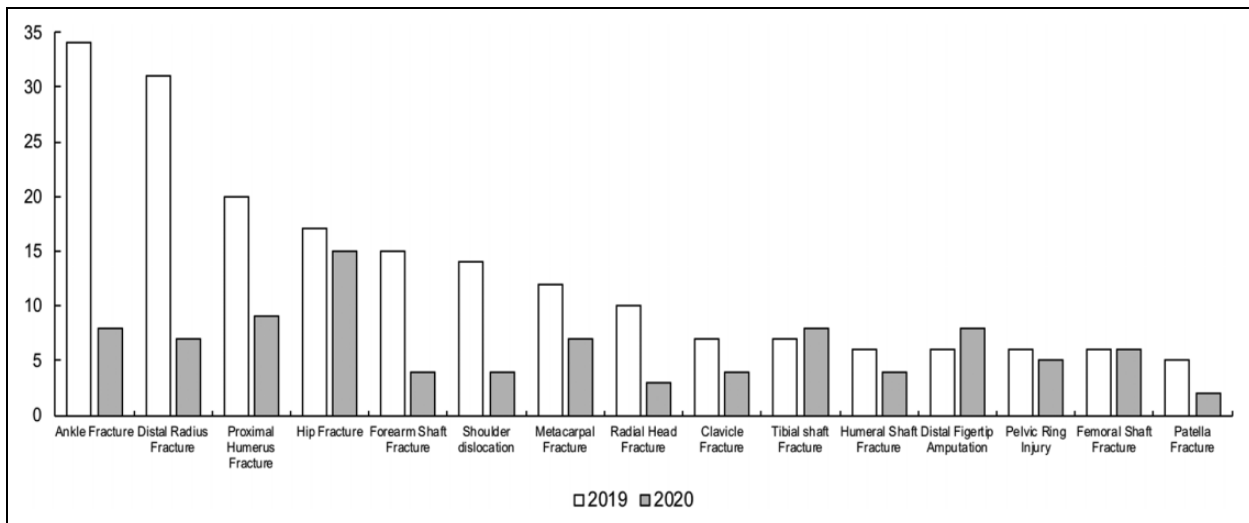


Figure 1. Volume of common consults: 2019 vs. 2020.

The distribution of consults also changed dramatically. (Figure 1) The volume of ankle fractures, distal radius fractures and proximal humerus fractures decreased by 76.5%, 77.4% and 55.0%, respectively. Though overall consult volume was down, certain fracture incidences remained relatively constant. There were 15 hip fractures in 2020 compared to 17 hip fractures in 2019. There were also more tibial shaft fractures in 2020 than 2019 (8 vs. 7) and an equivalent number of femoral shaft fractures (6 each).

OR cases in 2020 decreased 41.4% relative to 2019. (Table 3) The distribution of inpatient vs. outpatient cases significantly favored inpatient cases in 2020. In-line with government mandates, there were no elective cases in 2020. Accordingly, a significantly greater proportion of the case load was trauma-related. There were 12 cases that went to the OR that were found to be COVID positive.

Hip fracture volume was relatively equal between the 2 years. (Table 4) The hip fractures in 2020 tended to be older than those in 2019, but the difference did not reach statistical significance ($p = 0.070$). Gender distribution, STTGMA scores and fracture patterns were also relatively similar. There were 7 patients with hip fractures (46.7% of hip fractures) who were found to be COVID positive. Only 4 of these COVID positive patients were stable enough to undergo surgery, and one of the

hip fracture patients that underwent surgery died during the acute post-operative period.

Discussion

The most important finding of this study was that while overall volume of orthopedic consults and operative cases decreased compared to the same time period 1 year ago, hip fracture volume was relatively unaffected. As a result, resources must be reserved to ensure that this patient population has access to the care needed.

It is well-documented in the literature that hip fracture patients have unique perioperative needs that must be addressed in order to optimize patient outcomes.⁷⁻¹⁰ Hip fractures represent one of the most common orthopedic diagnoses associated with increased morbidity and mortality in the geriatric population.¹¹⁻¹³ The development of “orthogeriatric” co-management teams between medical and orthopedic services, has shown to improve the outcomes of elderly patients sustaining hip fractures.⁸ These models of interdisciplinary care already exist in a variety of countries, including Australia,¹⁴ Great Britain,¹⁰ and the United States.⁹

During periods of pandemic in which medical services are stretched thin, and possibly overwhelmed, it is important to

Table 3. Operating Room Cases Volume.

| N | 2019 | 2020 | p-value | significance |
|--------------------------------|-----------|-----------|---------|--------------|
| Inpatient vs. Outpatient Cases | | | <0.001 | * |
| Outpatient | 52 (37.1) | 8 (9.8) | | |
| Inpatient | 88 (62.9) | 74 (90.2) | | |
| Elective Cases (%) | 51 (36.4) | 0 (0.0) | <0.001 | * |
| Trauma Cases (%) | 81 (57.9) | 73 (89.0) | <0.001 | * |
| Infection Cases (%) | 20 (14.3) | 10 (12.2) | 0.813 | |
| COVID Positive Cases (%) | 0 (0.0) | 12 (14.6) | <0.001 | * |

consider that the number of hip fracture patients presenting to hospitals does not appear to decline. This is particularly noteworthy in light of the literature that has demonstrated poorer outcomes when co-management interdisciplinary geriatric fracture teams are not utilized,⁹ or in situations in which they are unable to be utilized due to lack of resources or manpower. Medicine teams are crucial in assisting with medical perioperative optimization for hip fracture patients, and during times of pandemic in which there is a shortage of medical personnel, one may anticipate poorer outcomes overall.

This risk is exacerbated by the fact that the hip fracture patient population that presented was in general, older and frailer than the typical hip fracture population seen in 2019. It has been reported that older age and male gender confer poorer prognoses in patients infected with COVID-19, and both independent risk factors for mortality.¹⁵ The 2020 COVID positive cohort was substantially older than the 2020 COVID negative and 2019 cohorts. The 2020 COVID positive cohort also had higher STTGMA scores than the 2019 cohort, implying a higher risk for inpatient mortality.⁶ There was a trend toward increased age in the COVID positive cohort compared to the COVID negative cohort, however this did not reach statistical significance. This supports the notion that COVID in general, is more likely to affect older individuals.¹⁶

Overall, the number of orthopedic emergency room consults significantly decreased during the period of social distancing. This is, without surprise, a reflection of the unprecedented decline in activities that predispose patients to orthopedic injuries. Social distancing mandates taken by the general public to minimize interactions and injury-inducing behaviors likely played a tremendous role in the decline in orthopedic consults during this period. The historically most common orthopaedic consults at the authors' institution, including distal radius fractures and ankle fractures, represented a substantially smaller percentage of the overall volume of consults compared to hip fractures during the COVID crisis.

As expected, the overall volume of orthopedic surgeries that took place during the period of social distancing significantly decreased compared to the analogous time period in 2019. No elective surgeries took place, which previously represented 36% of the orthopedic volume at the authors' level 1 trauma center. The decrease in overall cases allowed for resource allocation, enabling our team to assist with the medical care of

Table 4. Demographic Data for Hip Fractures.

| N | 2019 | 2020 | p-value | significance |
|--------------------|-------------|-------------|---------|--------------|
| Age (mean (SD)) | 72.4 (18.4) | 82.6 (11.0) | 0.070 | |
| Gender = M (%) | | | 0.706 | |
| Male | 8 (47.1) | 9 (60.0) | | |
| Female | 9 (52.9) | 6 (40.0) | | |
| STTGMA (mean (SD)) | 0.02 (0.01) | 0.02 (0.01) | 0.641 | |
| COVID Positive (%) | 0 (0.0) | 7 (46.7) | 0.006 | * |
| Fracture Type | | | 0.927 | |
| Intertrochanteric | 10 (58.8) | 10 (66.7) | | |
| Femoral Neck | 7 (41.2) | 5 (33.3) | | |

COVID patients without orthopedic injuries. The COVID-19 pandemic has created a situation in which physicians on the front lines caring for patients were themselves becoming infected, driving a substantial shortage of healthcare professionals to care for infected patients. Healthcare workers trained in other specialties, including orthopedics, began caring for patients in order to combat the surge of COVID-19 patients presenting to hospitals. Konda et al. reported on the creation of a hybrid medical-orthopedic service at Jamaica Hospital Medical Center in Queens, NY, in which orthopedic surgery residents and attendings developed a care model that allowed the team to care for both COVID-19 patients as well as orthopedic patients.¹⁷ The decrease in overall orthopedic consult and operative volume created manpower availability to assist with caring for medical patients.

There are important limitations to this study that should be acknowledged. First, the data regarding 30-day mortality may not be complete as patients may have passed away after discharge, precluding documentation of mortality in the medical record. Future studies that have longer-term follow-up are needed in order to assess how injury patterns affect mortality, and whether hip fracture mortality is affected by COVID status and/or shortage of medical personnel. Additionally, the current volume of patients between the 2 cohorts precluded the ability to perform statistical analyses comparing differences in volume of specific injuries (e.g. ankle fractures); however, the trends are still meaningful and can guide treatment planning.

Conclusions

During a period of pandemic and social distancing, the overall volume of musculoskeletal consults and surgeries at a level 1 trauma center significantly declined; however, the volume of hip fractures remained unchanged. In addition, patients presenting with orthopedic injuries were older with higher STTGMA scores compared to those presenting during a period without social distancing. It is important for both orthopedic and medical personnel to anticipate the resources needed in order to optimize hip fracture outcomes during periods of pandemic.


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