

Disparities in Pediatric Orthopedic Surgery Care During the COVID-19 Pandemic Pre- and Post-Vaccine Availability

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INTRODUCTION:

The COVID-19 pandemic has led to significant disruptions in medical care, with an estimated 40% of U.S. adults avoiding care during this time. Currently, the return to baseline health care utilization following COVID-19 restrictions within the pediatric orthopedic population remains unexplored. The purpose of our study was to analyze the case volume and demographics of pediatric orthopedic patients at three time points: pre-pandemic (2019), pandemic (2020), and pandemic post-vaccine availability (2021), to determine the impact of COVID-19 restrictions on our single-center, multi-site institution.

METHODS: This was a retrospective cohort study of 6,318 patients seeking treatment at our institution from May through August in 2019, 2020, and 2021. Patient age, sex, address, encounter date, and ICD-10 codes were obtained. Diagnoses were classified into fractures and dislocations, non-fracture-related trauma, sports, elective, and other categories. Geospatial analysis comparing incidence and geospatial distribution of diagnoses across the time periods was performed and compared with the Centers for Disease Control (CDC) social vulnerability index (SVI).

RESULTS:

The total number of pediatric orthopedic visits decreased by 22.2% during the pandemic ($p < 0.001$) and remained 11.6% lower post-vaccine availability compared to pre-pandemic numbers ($p < 0.001$). Post-vaccine availability, total fractures remained 13.4% lower than pre-pandemic volume; however, lower extremity fracture rates returned to near pre-pandemic levels ($p = 0.131$). There was no significant difference in age ($p = 0.097$) or sex ($p = 0.248$) of patients across all three time points, however, patients seen during the pandemic were more often white race (67.7% vs. 59.3%, $p < 0.001$). Trauma visits increased by 26.2% post-vaccine availability compared to the pandemic ($p < 0.001$). Sports volume decreased during the pandemic but returned to pre-pandemic volume in the post-vaccine availability period ($p = 0.298$). Elective visits declined by 12.7% over three years ($p < 0.001$). Geospatial analysis of patient distribution illustrated neighborhood trends in access to care during the COVID-19 pandemic, with significantly fewer patients from high SVI and low socioeconomic status (SES) neighborhoods seeking fracture care during the pandemic than pre-pandemic. Post-vaccine availability, fracture population distribution resembled pre-pandemic levels, suggesting a return to baseline health care utilization.

DISCUSSION AND CONCLUSION: Pediatric orthopedic surgery case volume broadly decreased during the COVID-19 pandemic and did not return to pre-pandemic levels. All categories increased in the post-vaccine availability time point except elective cases. Geospatial analysis revealed that neighborhoods with a high social vulnerability index (SVI) were associated with decreased fracture visits during the pandemic, whereas low SVI neighborhoods did not experience a decline. Future research is needed to study these neighborhood trends and more completely characterize factors preventing equitable access to care in the pediatric orthopedic population.

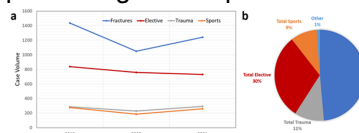


Figure 1. Yearly change in pediatric orthopedic fracture, elective, trauma, and sports visits (a) and average distribution of case volume from 2019 to 2021 (b).

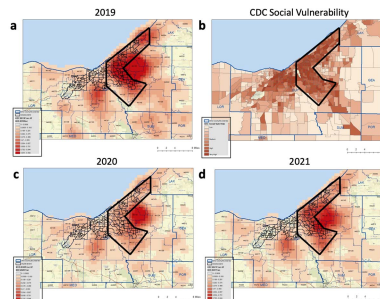


Figure 2. Geospatial disparities in pediatric orthopedic fracture patients across Northeast Ohio. Kernel density estimate heat map of fracture cases in 2019 (a), 2020 (c), and 2021 (d) reveal trends in neighborhood access to care during the pandemic. CDC Social Vulnerability Index (SVI) based on socioeconomic status, household composition, minority status and language, and housing and transportation illustrates association between high SVI neighborhoods and decreased care during the pandemic (b). Black outlines on (a), (b), (c), and (d) indicate high SVI neighborhoods.

TABLE 1. Pediatric Orthopedic Surgery Patient Demographics and Case Volume During the COVID-19 Pandemic Pre- and Post-Vaccine Availability

Variables	Pre-pandemic (2019)	Pandemic (2020)	Post-vaccine availability (2021)	P (2019 vs. 2020)	P (2020 vs. 2021)	P (2019 vs. 2021)
Total	2984	2319	2636	<0.001	<0.001	<0.001
Sex				0.968	0.248	0.287
Male	1603 (53.7)	1242 (53.5)	1455 (55.1)			
Female	1381 (46.2)	1077 (46.4)	1181 (44.8)			
Mean Age	10.9 ± 5.1	10.9 ± 5.2	11.0 ± 5.9	0.168	0.097	0.293
≤5	593	497	500			
6-11	1101	803	892			
≥12	1290	1019	1194	<0.001	<0.001	0.054
Race				<0.001	<0.001	0.054
White	1772 (59.3)	1570 (67.7)	1638 (62.0)			
Black	928 (31.0)	538 (23.1)	754 (28.6)			
Hispanic/Latino	120 (4.0)	90 (3.8)	85 (3.2)			
Multiracial/Other	113 (3.7)	94 (3.8)	114 (4.3)			
Asian	25 (0.8)	25 (1.0)	30 (1.1)			
Unknown/declined	26 (0.8)	12 (0.5)	17 (0.6)			
Total Fractures	1434	1050	1241	<0.001	<0.001	<0.001
Upper Extremity Fractures	949 (66.1)	672 (64.0)	822 (66.2)	<0.001	<0.001	<0.001
Lower Extremity Fractures	308 (21.4)	241 (22.9)	282 (22.7)	<0.001	0.011	0.131
Dislocations/Subluxations	95	63	63	<0.001	1	<0.001
Total Trauma (non-fracture)	287	229	294	<0.001	<0.001	0.682
Violence	91 (31.7)	84 (36.6)	87 (29.6)	0.463	0.749	0.682
Motor vehicle	94 (29.2)	48 (20.9)	100 (34.0)	<0.001	<0.001	0.095
Total Sports	277	187	300	<0.001	<0.001	0.298
Strain or Strain	158 (57.0)	80 (48.1)	109 (41.9)	<0.001	0.003	<0.001
Total Elective	837	757	730	0.005	0.322	<0.001
Spine	304 (43.4)	308 (48.3)	316 (43.2)	0.82	<0.001	0.303