



The effects of the COVID-19 pandemic on elective unicompartmental knee arthroplasty in the USA: further evidence that outpatient arthroplasty is safe and effective

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Abstract

Purpose In response to COVID-19, elective surgeries including unicompartmental knee arthroplasties (UKA) decreased. We aimed to quantify and compare temporal trends in utilization and complications in the calendar year 2019 (pre-pandemic) to 2020 in the USA.

Methods The 2019 to 2020 ACS-NSQIP database was queried for patients undergoing elective UKA. Patients prior to COVID-19 (2019 and 2020 Q1) were compared to those after (2020 Q2-Q4). Case volumes, patient demographics, complications, and lengths of stay (LOS) were compared between years. Pearson's chi-square test was used to compare patient demographics. Linear regression was conducted to evaluate the change in case volumes. *P* values less than 0.05 were significant.

Results In total, 3361 patients underwent UKA: 1880 in 2019 and 1481 in 2020. The number of outpatient UKAs increased (56.4% vs. 65.6%; $p < 0.001$). There was no significant difference in the volume of cases in 2019Q1 through 2020Q1 ($p = 0.424$). Case volumes fell by 60% in 2020Q2 compared with the average quarterly volume in 2019. Comparing 2019 to 2020, there was no significant difference in rates of total complications (2.1% vs. 2.2%; $p = 0.843$), minor complications (1.2% vs. 0.9%; $p = 0.529$), major complications (1.1% vs. 1.4%; $p = 0.447$), infection complications (1.0% vs. 0.8%; $p = 0.652$), wound complications (0.1% vs. 0.1%; $p = 1.0$), cardiac complications (0.0% vs. 0.1%; $p = 0.111$), pulmonary complications (0.1% vs. 0.2%; $p = 0.473$), hematology complications (0.1% vs. 0.1%; $p = 1.0$), renal complications (0.1% vs. 0.0%; $p = 1.0$), and Clavien–Dindo IV complications (0.1% vs. 0.4%; $p = 0.177$).

Conclusion UKA case volumes declined during the second quarter of 2020. A significant proportion of surgeries were transitioned outpatient, despite no change in complication rates.

Keywords NSQIP · Orthopedics · Complications · Unicompartmental knee arthroplasty · COVID-19 · Elective surgery

Introduction

The SARS-CoV-2 (COVID-19) first hit USA on January 30, 2020 [1]. On March 10, 2020, the World Health Organization (WHO) declared COVID-19 a worldwide pandemic [2]. The USA, along with many other countries, quickly rolled out plans to mitigate the spread and damage caused by this virus. One of those strategies was to suspend elective joint arthroplasty nationwide in order to efficiently allocate healthcare workers and resources [3].

The consequences of canceling elective joint arthroplasty have been profound and experienced by both orthopedic surgeons and patients in the USA [4–13]. For example, it was estimated that the backlog of cases by orthopedic surgeons would take approximately 9 to 35 months to recover [14]. From the patient's perspective, the number of patients defined to be in a health quality of life state "worse than death" (WTD) due to waiting for a total joint replacement doubled during the pandemic [5]. However, most studies evaluating elective arthroplasty in the time of COVID-19 have focused on THAs and TKAs.

Unicompartmental knee arthroplasty (UKA) is an efficient, ligament sparing procedure used to treat osteoarthritis limited to either the medial or lateral compartment of the knee. UKAs have historically been used sparingly, as they have been thought to have worse long-term survival

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than traditional TKAs [15, 16]. Thus, they were reserved for patients who were older, lower demand, and thinner. However, use of UKA has been increasing, with a significant increase in the use of outpatient, robotic assisted and in obese patients [17].

The primary aim of this study is to compare temporal trends in case volume of elective unicompartmental knee arthroplasty (UKA) from 2019 (pre-pandemic) to 2020 in the USA using a nationwide database. The best of our knowledge, no one has completed this analysis in the UKA population to date. Our secondary aim of the study is to compare patient demographics and postoperative outcomes of those undergoing surgery before and after the onset of the pandemic. We hypothesized that case volumes precipitously decline in 2020, but patient demographics and postoperative outcomes would differ.

Methods

Database and patient selection

This study is a retrospective analysis of data collected prospectively between 2019 and 2020 by the American College of Surgeon's National Surgery Quality Improvement Program (ACS-NSQIP) database. The NSQIP database incorporates detailed information patient demographics, preoperative data, and 30-day postoperative outcomes on patients undergoing major surgery. As of 2019, the NSQIP database comprises over 1 million cases from 719 participating organizations in the USA and is a source of accurate in-hospital morbidity and mortality as well as 30-day complications. Many research groups have used the NSQIP database to report 30-day complications following total joint arthroplasty procedures. More details ACS-NSQIP database can be found on its website.

The database was queried for all patients undergoing elective UKA (Current Procedural Terminology code 27446) in 2019 and 2020. Patients with missing demographic data were excluded from the analysis. The study was exempt from institutional review board (IRB) approval as the data were derived from a de-identified national surgical database.

Variables and outcomes studied

Comparison of calendar years was performed to understand the decline in national case volume in 2020 compared to 2019. In addition, we directly compared admission quarters to further understand the influence of the COVID-19 pandemic on UKA utilization. As admission quarter 1 (Q1) ends

March 31 which was very close to the start of many pandemic mitigation measures, a comparison of 2020Q1 plus 2019 data (prior to pandemic) and 2020Q2 to Q4 (during the pandemic) was performed.

The following demographics were included in this study: age, gender, race, body mass index (BMI), and comorbidities including diabetes mellitus, smoking history, chronic obstructive pulmonary disease, congestive heart failure, hypertension, dialysis-dependent, disseminated cancer, chronic steroid use, bleeding disorder, ascites, dyspnea, and functional health status. In addition, the 5-item modified frailty index (mFI-5) was calculated for each patient by allocating one point for each of the following comorbidities present: hypertension, diabetes mellitus, congestive heart failure, chronic obstructive pulmonary disease, and functionally dependent health status. Operative and postoperative data included in the study were American Society of Anesthesiologists (ASA) grade, anesthesia administered, total operative time, and hospital length of stay (LOS).

Postoperative complications

Short-term medical and surgical postoperative complications were grouped into minor and major complications. Minor complications included superficial infection, pneumonia, renal insufficiency, and urinary tract infection (UTI). Major complications included organ infections, deep infections, sepsis, unplanned intubations, pulmonary emboli, ventilator use > 48 h, strokes, cardiac arrests, deep vein thromboses, acute renal failures, blood transfusions, return to the operating room, and death. Complications were further divided into the following groups: infection (superficial or deep surgical site infection), wound (wound dehiscence or other complication, not including surgical site infection), cardiac (cardiac arrest or myocardial infarction), pulmonary (pneumonia, pulmonary embolism, unplanned reintubation), hematology (deep vein thromboembolism, need for transfusion), renal (renal insufficiency, acute kidney failure), and adverse hospital discharge (discharge to other than home). Clavien–Dindo IV complications (defined as life-threatening complications including cardiac arrest, myocardial infarction, septic shock, pulmonary embolism, and renal failure) were collected and analyzed separately [18]. Rates of 30-day complications, reoperations, and readmissions were evaluated annually.

Statistical analyses

Bivariate analysis using Pearson chi-squared tests, student's *T* test, and analysis of variance (ANOVA) were used to evaluate for significant differences in patient demographics

between years and admission quarters. Linear regression modeling was used to assess for changes in the case volume over the study period. A statistical significance threshold of $p < 0.05$ was used. Statistical analysis was performed using SPSS version 24 [International Business Machine (IBM), Armonk, NY, USA].

Results

Patient demographics

A total of 3361 patients underwent UKA, 1880, in 2019 and 1481 in 2020 (Table 1). The majority of patients were white, male, and ASA class 2 or 3. Patient demographics in the 2019 and 2020 cohorts were similar with respect to age, gender, BMI, and the presence of the comorbidities diabetes mellitus, tobacco use, chronic obstructive pulmonary disease, heart failure, hypertension. However, there was a significant increase in the number of UKA procedures that were done as an outpatient in 2020 versus 2019 (65.6% vs. 56.4%, $p < 0.001$) (Fig. 1). Further breakdown comparing 2019 and 2020Q1 versus 2020Q2–Q4 demonstrated that patients undergoing elective surgery during the COVID pandemic (after 2020Q2) were no clinically significant differences that rose to the level of statistically significant, other than LOS (0.84 vs. 0.67 days, respectively; $p < 0.001$) (Fig. 2).

Trends in UKA utilization quarterly

There was a 21.2% decline in elective UKA from 2019 to 2020. There was no significant difference in volume in elective UKA cases between 2019Q1 and 2019Q4 ($p = 0.424$; Fig. 3). Further, compared to 2019, elective UKAs did not decline significantly in 2020Q1. However, cases drastically declined in 2020Q2, by almost 60% compared to the average case volume per quarter in 2019. By 2020Q4, elective UKA case volumes returned to 93% of pre-pandemic volumes (Fig. 3).

Postoperative outcomes and complications

The average length of stay was significantly shorter in 2020 versus 2019 (0.71 vs. 0.84 days; $p < 0.001$). This occurred due to a decrease in the total number of length of stays for 1 and 2 days. Further, the proportion of same-day discharges increased 2020 compared to 2019 (56.4% vs. 65.6%; $p < 0.001$; Fig. 2). The overall 30-day complication rate was 2.2%. There was no significant difference in the total complication rates in 2019 (2.1%) versus 2020 (2.2%); $p = 0.843$. Comparing 2019 to 2020, there was no significant difference

in rates of minor complications (1.2% vs. 0.9%; $p = 0.529$), major complications (1.1% vs. 1.4%; $p = 0.447$), infection complications (1.0% vs. 0.8%; $p = 0.652$), wound complications (0.1% vs. 0.1%; $p = 1.0$), cardiac complications (0.0% vs. 0.1%; $p = 0.111$), pulmonary complications (0.1% vs. 0.2%; $p = 0.473$), hematology complications (0.1% vs. 0.1%; $p = 1.0$), renal complications (0.1% vs. 0.0%; $p = 1.0$), and Clavien–Dindo IV complications (0.1% vs. 0.4%; $p = 0.177$). The rate of return to the OR within 30 days (0.9% vs. 0.9%; $p = 0.773$), readmission within 30 days (1.8% vs. 1.7%; $p = 0.882$), and the overall 30-day mortality rate (0.0% vs. 0.1%; $p = 0.441$) was not significant between 2019 and 2020.

Discussion

Unicompartmental knee arthroplasty is an increasingly popular procedure performed on an elective basis in hospitals and in outpatient settings in the USA. The effect of the US government's COVID-19 pandemic precautions on UKA usage has not been investigated. Here we present the first temporal trends analysis of elective UKA in the year prior to and during the COVID-19 pandemic. In this study, we demonstrate a 21.2% decline in elective UKA case volume from 2019 to 2020, with a 60% drop in 2020Q2 compared to 2019, and volume that returned to 93% of baseline by 2020Q4. Most importantly, we show a significant increase in same-day discharges, and an increasing usage of outpatient facilities for UKA procedures, without any difference in complication rates.

Arthroplasty is responsible for a large volume of revenue for the orthopedic surgeons, but was viewed as a nonessential procedure during the COVID-19 pandemic. A 21.2% drop in case volumes in 2020 compared with 2021 likely had a significant financial impact on many surgeons across the nation, with a wide diversity of effect depending on the surgeon's type of practice. To the best of the authors knowledge, this is the first study to quantify the effect of the nationwide suspension of elective surgeries on UKA procedures. Our study results reflect survey responses by American Association of Hip and Knee Surgeons (AAHKS) members related to their practices during this time. In this study, 82% of AAHKS members reported a dramatic reduction in performing inpatient arthroplasty in late March 2020; this rate peaked in early April at 92%, but dropped to a 23% by mid-June 2020 [11]. It is not surprising that our findings in UKA mirrored that of other arthroplasty procedures [19].

This study evaluated the effect of the COVID-19-related measure to limit elective procedures had on case volume, complication rates and death rates during the year of 2020 compared to 2019. Initially used sparingly due to concerns

Table 1 Demographic, comorbidities, surgical location, anesthesia technique, and length of stay by quarter for years 2019 and 2020

	2019				2020				P value *
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Age cohorts									
<40	3 (7)	6 (1.3)	5 (1.0)	3 (6)	4 (9)	0 (0)	2 (5)	6 (1.4)	0.672
40–44	6 (1.4)	5 (1.1)	8 (1.6)	5 (1.0)	11 (2.4)	2 (1.0)	10 (2.6)	7 (1.6)	
45–49	25 (5.9)	18 (3.9)	20 (3.9)	20 (4.1)	25 (5.4)	4 (2.1)	15 (3.9)	26 (5.9)	
50–54	42 (10.0)	39 (8.4)	61 (12.0)	50 (10.4)	50 (10.8)	16 (8.4)	41 (10.6)	38 (8.6)	
55–59	61 (14.5)	69 (14.8)	65 (12.7)	79 (16.4)	69 (15.0)	30 (15.7)	57 (14.7)	69 (15.6)	
60–64	62 (14.7)	81 (17.4)	81 (15.9)	81 (16.8)	81 (17.6)	34 (17.8)	71 (18.3)	91 (20.6)	
65–69	87 (20.7)	87 (18.7)	97 (19.0)	96 (19.9)	78 (16.9)	41 (21.5)	65 (16.8)	79 (17.9)	
70–74	71 (16.9)	73 (15.7)	82 (16.1)	74 (15.3)	69 (15.0)	33 (17.3)	67 (17.3)	68 (15.4)	
75–79	35 (8.3)	55 (11.8)	44 (8.6)	47 (9.7)	54 (11.7)	20 (10.5)	39 (10.1)	31 (7.0)	
80–84	22 (5.2)	25 (5.4)	34 (6.7)	19 (3.9)	16 (3.5)	6 (3.1)	15 (3.9)	21 (4.8)	
85 +	7 (1.7)	8 (1.7)	13 (2.5)	9 (1.9)	4 (9)	5 (2.6)	6 (1.5)	5 (1.1)	
Gender									
Female	183 (43.5)	227 (48.7)	269 (52.7)	199 (41.2)	224 (48.6)	83 (43.5)	185 (47.7)	209 (47.4)	0.869
Male	238 (56.5)	239 (51.3)	241 (47.3)	284 (58.8)	237 (51.4)	108 (56.5)	203 (52.3)	232 (52.6)	
Race									
American Indian or Alaska Native	2 (5)	2 (4)	3 (6)	1 (2)	3 (7)	1 (5)	1 (3)	1 (2)	0.332
Asian	19 (4.5)	21 (4.5)	16 (3.1)	23 (4.8)	13 (2.8)	11 (5.8)	27 (7.0)	14 (3.2)	
Black or African American	13 (3.1)	17 (3.6)	24 (4.7)	16 (3.3)	31 (6.7)	7 (3.7)	18 (4.6)	26 (5.9)	
Native Hawaiian or Pacific Islander	3 (7)	4 (9)	3 (6)	2 (4)	1 (2)	2 (1.0)	1 (3)	2 (5)	
Unknown/Not Reported	54 (12.8)	82 (17.6)	91 (17.8)	116 (24.0)	122 (26.5)	30 (15.7)	77 (19.8)	106 (24.0)	
White	330 (78.4)	340 (73.0)	373 (73.1)	325 (67.3)	291 (63.1)	140 (73.3)	264 (68.0)	292 (66.2)	
BMI category									
<18.5	0 (0)	0 (0)	1 (2)	1 (2)	0 (0)	1 (5)	0 (0)	0 (0)	0.249
18.5–24.9	41 (9.7)	39 (8.4)	63 (12.4)	46 (9.5)	48 (10.4)	20 (10.5)	42 (10.8)	42 (9.5)	
25.0–29.9	125 (29.7)	127 (27.3)	181 (35.5)	174 (36.0)	131 (28.4)	62 (32.5)	139 (35.8)	160 (36.3)	
30.0–34.9	151 (35.9)	168 (36.1)	127 (24.9)	143 (29.6)	167 (36.2)	52 (27.2)	114 (29.4)	131 (29.7)	
35.0–39.9	76 (18.1)	78 (16.7)	98 (19.2)	83 (17.2)	83 (18.0)	30 (15.7)	65 (16.8)	71 (16.1)	
40.0+	27 (6.4)	50 (10.7)	38 (7.5)	36 (7.5)	31 (6.7)	20 (10.5)	26 (6.7)	36 (8.2)	
Diabetes mellitus									
Insulin Dependent	11 (2.6)	21 (4.5)	19 (3.7)	16 (3.3)	17 (3.7)	3 (1.6)	16 (4.1)	13 (2.9)	0.493
No	367 (87.2)	382 (82.0)	425 (83.3)	412 (85.3)	404 (87.6)	164 (85.9)	326 (84.0)	393 (89.1)	
Current smoker									
Non-Insulin Dependent	43 (10.2)	63 (13.5)	66 (12.9)	55 (11.4)	40 (8.7)	24 (12.6)	46 (11.9)	35 (7.9)	0.089
No	381 (90.5)	422 (90.6)	459 (90.0)	439 (90.9)	421 (91.3)	178 (93.2)	360 (92.8)	405 (91.8)	
Yes	40 (9.5)	44 (9.4)	51 (10.0)	44 (9.1)	40 (8.7)	13 (6.8)	28 (7.2)	36 (8.2)	
Dyspnea									
At rest	0 (0)	0 (0)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.316
Moderate	19 (4.5)	19 (4.1)	17 (3.3)	23 (4.8)	21 (4.6)	8 (4.2)	10 (2.6)	15 (3.4)	
No	402 (95.5)	447 (95.9)	492 (96.5)	460 (95.2)	440 (95.4)	183 (95.8)	378 (97.4)	426 (96.6)	
Functional health status									
Independent	415 (98.6)	430 (92.3)	479 (93.9)	441 (91.3)	434 (94.1)	188 (98.4)	376 (96.9)	422 (95.7)	0.004
Partially Dependent	2 (5)	3 (6)	3 (6)	3 (6)	0 (0)	0 (0)	4 (1.0)	0 (0)	
Unknown	4 (1.0)	33 (7.1)	28 (5.5)	39 (8.1)	27 (5.9)	3 (1.6)	8 (2.1)	19 (4.3)	

Table 1 (continued)

	2019				2020				P value *
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
History of severe COPD	No	408 (96.9)	453 (97.2)	492 (96.5)	471 (97.5)	448 (97.2)	383 (98.7)	430 (97.5)	0.031
	Yes	13 (3.1)	13 (2.8)	18 (3.5)	12 (2.5)	13 (2.8)	5 (1.3)	11 (2.5)	
Congestive heart failure	No	418 (99.3)	466 (100.0)	508 (99.6)	483 (100.0)	458 (99.3)	385 (99.2)	441 (100.0)	0.824
	Yes	3 (.7)	0 (0)	2 (.4)	0 (0)	3 (.7)	3 (.8)	0 (0)	
Hypertension	No	196 (46.6)	175 (37.6)	243 (47.6)	214 (44.3)	216 (46.9)	181 (46.6)	210 (47.6)	0.315
	Yes	225 (53.4)	291 (62.4)	267 (52.4)	269 (55.7)	245 (53.1)	207 (53.4)	231 (52.4)	
Currently on dialysis (pre-op)	No	420 (99.8)	466 (100.0)	510 (100.0)	482 (99.8)	461 (100.0)	388 (100.0)	441 (100.0)	0.910
	Yes	1 (2)	0 (0)	0 (0)	1 (2)	0 (0)	0 (0)	0 (0)	
Steroid use for chronic condition	No	410 (97.4)	453 (97.2)	494 (96.9)	474 (98.1)	449 (97.4)	385 (99.2)	429 (97.3)	0.096
	Yes	11 (2.6)	13 (2.8)	16 (3.1)	9 (1.9)	12 (2.6)	3 (8)	12 (2.7)	
> 10% loss body weight in last 6 months	No	420 (99.8)	465 (99.8)	510 (100.0)	483 (100.0)	461 (100.0)	388 (100.0)	441 (100.0)	0.350
	Yes	1 (2)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Bleeding disorders	No	410 (97.4)	457 (98.1)	501 (98.2)	479 (99.2)	458 (99.3)	382 (98.5)	437 (99.1)	0.883
	Yes	11 (2.6)	9 (1.9)	9 (1.8)	4 (8)	3 (7)	6 (1.5)	4 (9)	
mFI	0	183 (43.5)	154 (33.0)	214 (42.0)	198 (41.0)	202 (43.8)	171 (44.1)	197 (44.7)	0.315
	1	184 (43.7)	237 (50.9)	219 (42.9)	218 (45.1)	204 (44.3)	156 (40.2)	200 (45.4)	
	2	49 (11.6)	71 (15.2)	75 (14.7)	64 (13.3)	51 (11.1)	58 (14.9)	42 (9.5)	
	3	5 (1.2)	4 (9)	2 (4)	3 (6)	4 (9)	3 (8)	2 (5)	
Inpatient/outpatient	Inpatient	184 (43.7)	207 (44.4)	216 (42.4)	212 (43.9)	213 (46.2)	112 (28.9)	127 (28.8)	<0.001
	Outpatient	237 (56.3)	259 (55.6)	294 (57.6)	271 (56.1)	248 (53.8)	276 (71.1)	314 (71.2)	
ASA classification	1	14 (3.3)	12 (2.6)	19 (3.7)	12 (2.5)	15 (3.3)	11 (2.8)	14 (3.2)	0.318
	2	238 (56.5)	223 (47.9)	267 (52.4)	263 (54.5)	275 (59.7)	226 (58.2)	250 (56.7)	
	3	164 (39.0)	224 (48.1)	217 (42.5)	195 (40.4)	166 (36.0)	142 (36.6)	176 (39.9)	
	4	4 (1.0)	7 (1.5)	6 (1.2)	12 (2.5)	5 (1.1)	9 (2.3)	1 (2)	
Principal anesthesia technique	General	196 (46.6)	197 (42.3)	213 (41.8)	208 (43.1)	192 (41.6)	168 (43.3)	146 (33.1)	0.239
	MAC/IV Sedation	66 (15.7)	94 (20.2)	110 (21.6)	111 (23.0)	98 (21.3)	72 (18.6)	108 (24.5)	
	Spinal	147 (34.9)	153 (32.8)	171 (33.5)	144 (29.8)	151 (32.8)	136 (35.1)	170 (38.5)	
	Other	12 (2.9)	22 (4.7)	16 (3.1)	20 (4.1)	20 (4.3)	12 (3.1)	17 (3.9)	
Length of Stay (Days)	0	160 (38.0)	177 (38.0)	196 (38.4)	187 (38.7)	195 (42.3)	205 (52.8)	215 (48.8)	<0.001
	1	197 (46.8)	217 (46.6)	231 (45.3)	227 (47.0)	217 (47.1)	146 (37.6)	181 (41.0)	
	2+	64 (15.2)	72 (15.5)	83 (16.3)	69 (14.3)	49 (10.6)	37 (9.5)	45 (10.2)	
Total operation time		82.6	80.4	80.7	80.2	82.5	83.9	85.4	<0.001
Length of total hospital stay		0.84	0.86	0.89	0.84	0.78	0.62	0.67	<0.001

mFI = Modified frailty index

Values are N (%)

*Pearson Chi-square comparing pre-COVID versus post-COVID for categorical variables. Analysis of variance (ANOVA) for continuous variables

Bold values are statistically significant

of implant longevity and larger rate of re-operation than TKAs, UKA procedures are now increasingly utilized. Compared to TKAs, UKA surgeon case volume and technical skill is more closely linked to patient outcomes, complications and revision rates [20, 21]. It is possible that a drop-in case load from the pandemic-related measures may lead to increased adverse outcomes for UKA in the years following from loss of case volume of surgeons across the country.

Importantly, we found a significant decrease in the LOS of inpatient UKAs and a significant increase in the utilization of outpatient facilities for UKA procedures. This likely occurred because orthopedic surgeons were concerned about their patients becoming infected in hospital systems and preferred that patients recover at home when possible. These same trends were found for total shoulder arthroplasty and total joint arthroplasty of the lower extremity [22–24]. Despite this increase, we did not see any difference in overall complication rates, or any subcategory of complications. This study provides further evidence of the safety and efficacy of same-day discharge arthroplasty procedures.

This study has a few limitations that are worth consideration when interpreting the results. This database is one of the largest surgical databases in the country and, however, does not include every hospital. It is possible there may be selection bias, in that the hospitals that choose to contribute may not be a representative sample of the all hospitals in the USA. Possible evidence of this is the relatively low numbers of UKA cases, even pre-pandemic. This may have occurred because the database may not include hospitals that have high volumes of UKA cases. In addition, the trends presented in this study may be a result of confounding factors including but not limited to changes in clinical practice, rather than directly due to the COVID-19 pandemic-related measures. Also, inaccuracy of the data collected is always a possibility; however, NSQIP undergoes auditing for interrater reliability to ensure the validity of the data [25]. Finally, all dependent variables of interest were restricted to 30 days postoperatively, which do not include patients who presented to the hospital later than that. Nonetheless, this is the first nationwide study using this data to compare temporal trends in UKA utilization prior to and during suspension of COVID-19-related elective surgery suspension.

Conclusion

Elective UKA case volumes abruptly declined during the second quarter of 2020; 21.2% decline in case volume from 2019 to 2020, with a 60% drop in 2020Q2 compared to

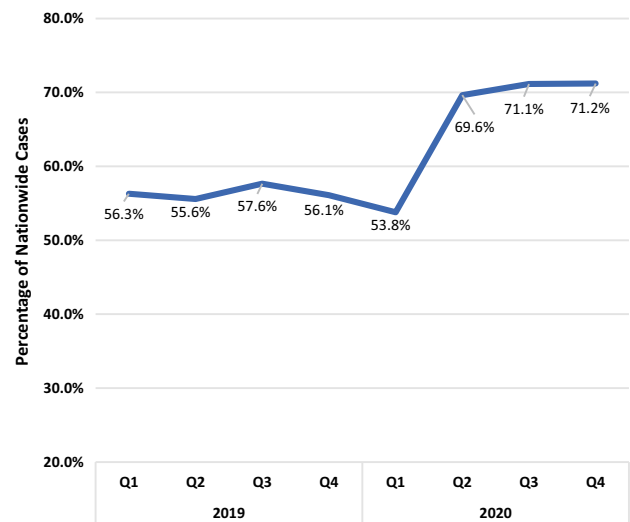


Fig. 1 Percentage of UKA case volume that performed at outpatient facilities by quarter during 2019–2020

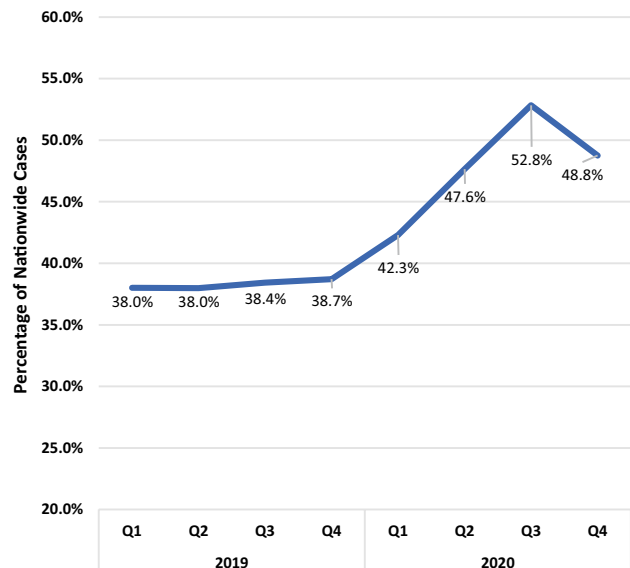


Fig. 2 Percentage UKA case volume that was discharged same day by quarter during 2019–2020

2019. Patient demographics of those undergoing elective UKA in 2020 were similar; however, there were a significant increase in same-day discharges and outpatient procedures, with no difference in morbidity and mortality, providing further evidence outpatient UKA is safe and effective.

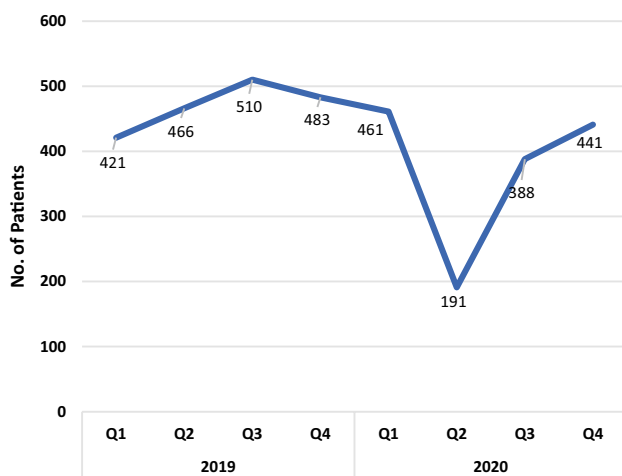


Fig. 3 UKA case volume by quarter in 2019–2020 demonstrating significant decrease in UKA volume in 2020Q2 with swift return to baseline

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Declarations

Conflict of interest The authors received no funding for this study and report no conflicts of interest.

Ethical approval This study was determined to be exempt from the Institutional Review Board (IRB) of Maimonides Medical Center.

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