



## Original Research

# The Differential Effect of COVID on Total Joint Arthroplasty Between Hospital and Ambulatory Surgery Centers/Hospital Outpatient Departments: A Michigan Arthroplasty Registry Collaborative Quality Initiative Analysis

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## ABSTRACT

**Background:** Coronavirus disease (COVID) created unprecedented challenges, especially for high-volume elective subspecialties like total joint arthroplasty. Limited inpatient capacity and resource conservation led to new outpatient selection criteria and site of service changes. As a Michigan Arthroplasty Registry Quality Collaborative Initiative quality project, demographic changes, complications, and differential effects on inpatient vs outpatient centers pre- and post-COVID were analyzed.

**Methods:** The registry identified all total joint arthroplasty at hospitals and ASCs/HOPDs between 07/2019-12/2019 and 07/2020-12/2020. These intervals represented pre-COVID and post-COVID elective surgery shutdowns. Case volumes, demographics, and 90-day complications were compared.

**Results:** Comparing 2020 to 2019, hospital volumes decreased (−9% total hip arthroplasty [THA], −17% total knee arthroplasty [TKA]), and ambulatory surgery center (ASC)/hospital outpatient department (HOPD) increased (+84% THA, +125% TKA). Entering 2020, ASC/HOPD patients were older ( $P = .0031$ ,  $P < .0001$ : THA, TKA), had more American Society of Anesthesiologists score 3–4 ( $P = .0105$ ,  $P = .0021$ ), fewer attended joint class ( $P < .0001$ ,  $P < .0001$ ), and more hips were women ( $P = .023$ ). Hospital patients had higher preoperative pain scores ( $P = .0117$ ,  $P < .0001$ ; THA, TKA), less joint education attendance ( $P < .0001$ ,  $P < .0001$ ), younger TKAs ( $P = .0169$ ), and more American Society of Anesthesiologists score 3–4 (0.0009). After propensity matching, there were no significant differences between site of service for 90-day fractures, deep vein thromboses or pulmonary embolisms, infection, or hip dislocations. Hospital THAs had higher readmissions ( $P = .0003$ ) and TKAs had higher 30-day emergency department visits ( $P = .005$ ). ASC/HOPD patients were prescribed higher oral morphine equivalents ( $P < .0001$ ,  $P < .0001$ ; THA, TKA).

**Conclusions:** COVID's elective surgery shutdown caused a dramatic site of service shift. Traditional preoperative education was negatively impacted, and older and sicker patients became outpatients. But short-term complications were not increased in ASCs/HOPDs. These site of service and associated patient demographic changes may be safely sustained.

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## Introduction

The SARS-CoV-2 (coronavirus disease [COVID]-19) pandemic began in December of 2019. It quickly spread worldwide [1]. The first reported case in the United States was on January 30, 2020 [2].

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Implementation of the public health measures to slow viral spread in the United States led to major changes to total joint arthroplasty (TJA). After the World Health Organization declared COVID a worldwide pandemic, the surgeon general recommended cancellation of all US elective surgeries on March 14 [3], and on March 18, the Centers for Medicare and Medicaid Services reinforced the recommendation [4]. State recommendations for cessation were followed to lessen the burden on hospitals and preserve essential resources for COVID patients [5]. Michigan was an early COVID hotspot, and the Governor's executive order immediately stopped elective surgery on March 21 [6]. The order was lifted 2 months later May 28, 2020 [7], with varied return to operations depending on hospitals' COVID burden, staffing, and resources.

Canceling elective surgery profoundly affected US TJA volumes. In mid-March, it was estimated that total knee arthroplasty (TKA) and total hip arthroplasty (THA) declined by 94% and 92%, respectively [8]. Other projections estimated that up to 30,000 primary and 3000 revision procedures were canceled every week [9]. The result was a significant backlog. With modeling, it was estimated that at 2 years, there would still be over 1,000,000 surgery cases backlogged [10], with significant pressure to ramp volume after the shutdown [11–13]. Considering backlogs, persistent COVID admissions, and staffing shortages, Meneghini noted that outpatient surgery and utilization of ambulatory surgery centers (ASCs) would save hospital beds and provide changes in clinical workflow for TJA [13]. O'Conner supported this suggestion, stating that one of the 6 pillars for effective resumption of elective TJA was early discharge and/or outpatient surgery [14].

Prior to COVID, there was an increasing site of service shift to the ambulatory setting. Removal of TKA and THA from the Centers for Medicare and Medicaid Services inpatient only list supported the shift [15–17]. Pre-COVID, site of service changes were mostly economic driven, and studies showed outpatient TJA reduced costs, was safe, and had high patient satisfaction [18–23]. COVID's induced sudden and large shift to the ambulatory setting would require changes in risk stratification and preoperative selection. The changes would be expected to affect the prior patient demographics of ASCs/hospital outpatient departments (HOPDs). The resultant effects on outpatient centers with less experienced staff, physical space, and central processing capacity [13] were unknown.

The Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) is the largest statewide database in the United States. Currently, there are 81 participants (64 hospitals and 17 ASCs), and data on over 96% of all total joint cases in Michigan are abstracted. Approximately 400,000 cases have been captured to date. As a quality improvement project, MARCQI evaluated the

effects of the COVID-induced shutdown on practice patterns. This study's purpose was to examine the demographic changes and short-term complications associated with TJA pre- and post-COVID shutdown and to analyze the differential effects upon hospitals and ASCs/HOPDs. Our hypothesis was that THA and TKA case volumes would decrease in the hospital setting and increase in the ASC/HOPD setting, and higher-risk patients with more medical comorbidities would have surgery performed in the ASC/HOPD setting post-COVID without an increase in short-term complications.

## Material and methods

MARCQI studies carry a "not regulated" designation by the University of Michigan's Institutional Review Board as secondary use of data previously collected for quality improvement under 45 Code of Federal Regulations 46. MARCQI data is specifically abstracted by trained nurses and includes diagnoses and events occurring at the participating index hospital as well as at all participating hospitals within the state [24]. The study population included all patients who underwent a primary THA or TKA between July 2019 and December 2019 or July 2020 and December 2020. Primary THAs included standard primaries, conversions, and resurfacings. Primary TKAs included standard primary, uni- and bi-compartmental, and patellofemoral replacements. The 2 timeframes were selected as the pre- and post-COVID elective surgery shutdown periods of interest. In Michigan, mandated elective surgery shutdowns extended from March 21, 2020, through May 28, 2020. Therefore, July through December 2020 represented a post-COVID shutdown period, and a 6-month-matched timeframe from 2019 represented a pre-COVID period.

Case volumes, patient demographics, and short-term complications performed at hospitals and ASCs/HOPDs were compared. Demographics included age, body mass index, sex, preoperative Patient-Reported Outcome Measurement Information System pain scores, diabetes and smoking histories, American Society of Anesthesiologists (ASA) score level >2 (ASA 3–4), and traditional preoperative joint class attendance. Only in-person or interactive webinar with live recorded attendance fulfilled joint education attendance. Short-term complications included 90-day readmissions, 30-day emergency department (ED) visits, fractures, deep vein thromboses (DVT) or pulmonary embolisms (PEs), infections, dislocations, and oral morphine equivalent (OME) discharge prescriptions.

There were 45,039 TJA cases in the timeframes (Table 1). To account for differences in demographics between hospitals and ASCs when comparing complications, a one-to-one greedy

**Table 1**  
Number of cases included for complication comparisons.

THA procedures (n = 17,282)	Prematch	Postmatch	Total
ASC/HOPD			
2019	219	219	621
2020	404	402	
Hospital			
2019	8722	191	621
2020	7937	430	
TKA procedures (n = 27,757)	Prematch	Postmatch	Total
ASC/HOPD			
2019	326	326	1052
2020	735	726	
Hospital			
2019	14,590	292	1052
2020	12,106	760	

ASC, ambulatory surgery center; HOPD, hospital outpatient department; THA, total hip arthroplasty; TKA, total knee arthroplasty. Prematch and Postmatch refers to number of cases before and after the one-to-one greedy using propensity scoring.

**Table 2**

Number of total joint arthroplasty procedures performed in the ASC/HOPD and hospital setting during 2019 and 2020.

ASC/HOPD	THA	TKA
2019 (n = 545)	219	326
2020 (n = 1139)	404	735
Hospital	THA	TKA
2019 (n = 23,312)	8722	14,590
2020 (n = 20,043)	7937	12,106

ASC, ambulatory surgery center; HOPD, hospital outpatient department; THA, total hip arthroplasty; TKA, total knee arthroplasty.

matching algorithm utilizing a propensity scoring system was used to sequentially match hospital patients closest to each ASC patient [25]. This method created a statistically matched hospital cohort for THAs and TJAs in 2019 and 2020 for unbiased complication comparisons. This matching process resulted in a comparative group of 621 THAs and 1052 TKAs performed in the hospital and ASC for 2019 and 2020.

Descriptive statistics of patient populations were compared using Pearson's chi-squared testing for categorical variables and T-testing for continuous variables. For preoperative comorbidities, we calculated the mean and standard deviations for continuous variables and percentages for binomial variables. When *P*-values were reported, <0.05 was used to determine statistical significance.

## Results

There were 45,039 TJA cases performed over the two 6-month timeframes: 23,857 cases (8941 THA, 14,916 TKA) from July through December of 2019 and 21,182 in 2020 (8341 THA, 12,841 TKA). In the ASC/HOPD setting, there were 545 cases (219 THAs, 326 TKAs) in 2019, increasing to 1139 cases (404 THAs, 735 TKAs) in 2020. In hospitals, there were 23,312 arthroplasties (8722 THAs, 14,590 TKAs) in 2019, declining to 20,043 (7937 THAs, 12,106 TKAs) in 2020 (Table 2). The breakdown of THA and TKA by subtype is seen in Table 3.

In ASCs/HOPDs, there was an 84% increase in THA and 125% increase in TKA in 2020 compared to 2019 (Fig. 1). In contrast, in hospitals, there was a 9% decrease in THAs and 17% decrease in TKAs in 2020 compared to 2019 (Fig. 2).

The preoperative patient demographics for the ASC/HOPD and hospitals in 2019 and 2020 are shown in Table 4. Of note, the patient's age for THA in ASCs/HOPDs increased from a mean age of 57.06 in 2019 to 59.10 in 2020 ( $P = .0031$ ). Likewise, the percentage of females significantly increased from 39.73% in 2019 to 49.5% in

2020 ( $P = .023$ ). The percentage of patients with ASA 3–4 significantly increased from 5.48% to 12.13% ( $P = .0105$ ), and the percentage of patients attending joint education decreased from 40.18% to 6.19% ( $P < .0001$ ). For primary TKA ASC/HOPDs, the age also significantly increased from 58.61 in 2019 to 63.15 in 2020 ( $P < .0001$ ). Percentage of TJAs with ASA 3–4 in ASCs/HOPDs significantly increased from 8.28% to 15.24% ( $P = .0021$ ), and the percentage of patients attending joint education preoperatively decreased from 45.09% to 9.39% ( $P < .0001$ ).

In the hospital setting, patients undergoing THA had a significantly higher preoperative pain scores in 2020 (6.47) compared to 2019 (6.38) ( $P = .0117$ ), and fewer patients attended joint education in 2020 (53.18%) vs 2019 (71.91%) ( $P < .0001$ ). The age of patients undergoing TKA in hospitals decreased significantly from 66.88 in 2019 to 66.61 in 2020 ( $P = .0169$ ). The TKAs in the hospital also showed an increase in preoperative pain scores from 5.94 in 2019 to 6.09 in 2020 ( $P < .0001$ ). There was a significant increase in the percentage of patients undergoing TKA in the hospital with an ASA 3–4 in 2020 (54.30%) vs 2019 (52.25%) ( $P = .0009$ ), and the percentage of joint education attendance decreased from 73.06% to 54.04% ( $P < .0001$ ).

In 2019, patients undergoing THA at hospitals had higher readmissions compared to ASCs/HOPDs (4.19% vs 0.46%,  $P = .01$ ) (Table 5). Patients undergoing TKA at hospitals had a higher 30-day ED visits vs ASC/HOPDs (4.19% vs 2.76%,  $P = .003$ ). Both THA and TKA were discharged home with more OME opioid prescriptions from ASC/HOPDs, 396.7 and 444.8, respectively, compared to hospitals, 307.5 and 339.3 ( $P < .0001$  and  $P < .0001$ ). In 2019, there were no differences in postoperative fractures, DVT/PEs, infections, or hip dislocations between ASCs/HOPDs and hospitals.

In 2020, THA and TKA at hospitals had higher readmission rates of 4.68% and 1.49%, compared to the ASC/HOPD of 1.49% and 1.10% ( $P = .008$  and  $P = .009$ ) (Table 6). Both THA and TKA were discharged home with more OME of opioid prescriptions from ASCs/HOPDs (278.5 and 362.2, respectively) compared to hospitals (247.5 and 284.3) ( $P = .0002$  and  $P < .0001$ ). For THA and TKA in 2020, there were no differences in 30-day ED visits, postoperative fractures, DVT/PEs, infections, or hip dislocations between ASCs/HOPDs and hospitals.

## Discussion

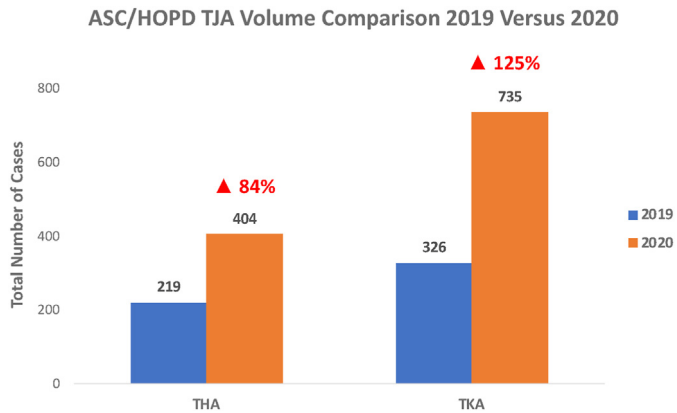
The impact of COVID on TJA volumes was swift and dramatic. To minimize viral spread, conserve essential supplies, and maximize hospital bed availability for COVID patients, elective surgeries were canceled in Michigan between March and May of 2020[6,7,26]. To overcome the associated backlog of cases, innovative changes in

**Table 3**

Total hip and total knee arthroplasty procedure volumes by subtype.

THA procedures	2019		2020	
	ASC/HOPD	Hospital	ASC/HOPD	Hospital
Primary total hip conventional	214	8392	398	7671
Primary total hip resurfacing	0	72	2	52
Conversion	5	258	4	214
TKA procedures	2019		2020	
	ASC/HOPD	Hospital	ASC/HOPD	Hospital
Primary total knee	238	13,552	604	11,382
Bicompartment knee	0	13	0	8
Isolated patella femoral	3	52	7	49
Unicompartmental lateral	1	38	0	28
Unicompartmental medial	84	935	124	639

ASC, ambulatory surgery center; HOPD, hospital outpatient department; THA, total hip arthroplasty; TKA, total knee arthroplasty.

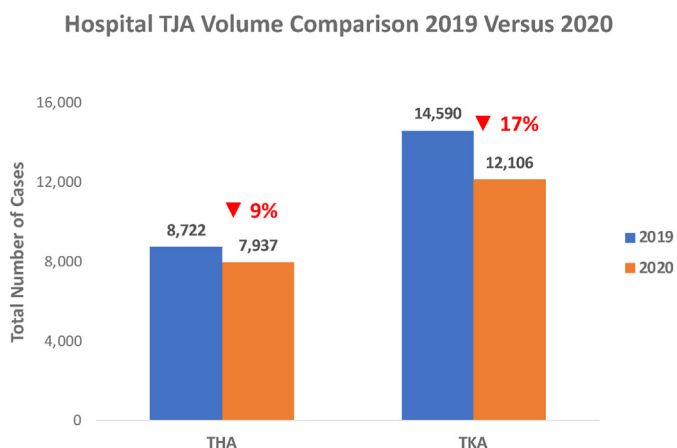


**Figure 1.** Comparison of total joint arthroplasty (TJA) volume at ASC/HOPDs from 2019 to 2020. ASC, Ambulatory Surgery Center; HOPD, hospital outpatient department; THA, total hip arthroplasty; TKA, total knee arthroplasty.

workflow were required [8–10]. ASCs/HOPDs represent a rapidly growing sector of healthcare delivery and can offload hospitals by performing elective surgeries [27]. Previous studies provided relatively strict guidelines for patient selection and risk stratification for safely performing TJA in ASCs/HOPDs [28–30].

In Michigan, following the COVID shutdown, there was a substantial TJA site of service shift to the ASCs/HOPDs and notable differences in preoperative demographics for their TJA patients. MARCQI noted an increase of 84% in THAs and 125% in TKAs in the ASC/HOPD setting, and a concomitant 9% decrease in THAs and 17% decrease in TKAs in the hospital setting. In 2020, following the COVID shutdown, patients undergoing primary THA in the ASCs/HOPDs were significantly older, more likely to be female, had more ASA 3–4 scores, and fewer attended joint education. Primary TKA patients at ASCs/HOPDs in 2020 were also older, had more ASA 3–4, and fewer attended joint education.

Despite these changes, in particular increased age and ASA class, there were no significant increases in postoperative complications. Comparing ASC/HOPDs to hospitals in 2020 via a propensity-matched cohort, THA and TKA patients were less likely to be readmitted. There were no differences in 30-day ED visits, fractures, DVT/PEs, infections, or hip dislocations postoperatively. Despite COVID, there was a low incidence of common postoperative complications in hospital patients, such as TKA infection rate of 0.26% in 2020, compared to other published data [31]. This is likely because we used propensity matching to create a smaller sample size of



**Figure 2.** Comparison of total joint arthroplasty (TJA) volume at hospitals from 2019 to 2020. THA, total hip arthroplasty; TKA, total knee arthroplasty.

theoretically healthier hospital patients to allow for unbiased complication comparisons to the ASC/HOPD cohort.

There were higher OMEs prescribed at discharge from ASCs/HOPDs compared to hospitals in 2019 and 2020. Of note, discharge OMEs reported do not reflect refills. There are potential explanations for this finding. THA and TKA candidates who had surgery delayed due to COVID were more likely to be using opioid medications preoperatively [32]. For same-day surgeries, inadequate pain control is a predominant reason for unexpected hospital admissions or readmissions [33]. Additionally, the shift to the ambulatory care setting often shifts the burden of medication management away from the hospital and on to the surgeon and his or her respective team. A reaction to this shift would be to increase the opioid medications at discharge in an effort to decrease the need for refills in the immediate postoperative period. The OME findings were concerning since decreasing opioid use has been a MARCQI focus. A pain optimization pathway (POP) had been developed and was widely used at member hospitals. Past MARCQI publications showed the POP to be effective at decreasing opioid prescriptions with sustained performance over time [34]. In addition, decreased total OME prescribed over large and diverse populations was not associated with worse postoperative pain or satisfaction [35]. In our study, while the average discharge OMEs decreased from 2019 to 2020, the discharge OMEs were still higher than the MARCQI POP recommendations ( $\leq 240$  OME for THA and  $\leq 320$  OME for TKA) [34]. This finding may highlight the more developed and mature pathways of care seen in hospitals. As more ASCs join MARCQI, we expect that they will adopt similar prescribing patterns as the established members. This is a priority for MARCQI to track and address moving forward.

Joint education attendance for THA and TKA at both settings decreased in 2020. Multiple studies demonstrated benefits of a traditional in-person or interactive preoperative patient education for TJA, including decreased preoperative anxiety, more realistic surgical expectations, better postoperative pain control, improved early range of motion, shorter lengths of stay, higher home discharge rates, and lower costs [36–38]. In 2020, hospital preoperative pain scores were higher compared to 2019. It has been shown that TJA patients who had surgery delayed due to COVID had increased preoperative pain and anxiety [39], furthering the need for effective preoperative education. While preoperative education is required and a tracked MARCQI, many facilities ended in-person education options and did not develop virtual options during the pandemic. As telehealth evolves, more educational opportunities are being offered virtually [40]. There may also be a role for nontraditional digital platforms and smartphone apps to improve patient compliance remotely without burdening medical facilities [41].

There were limitations to this study. The data, although specifically abstracted by trained nurses, is registry-level data with inherent limitations. Complications in patients who left the state would be missed, as would those presenting to non-MARCQI facilities [42]. It has been reported that out-of-state migration within 1 year of TJA is rare, and therefore this would be unlikely to impact the data in a significant way [43]. The complication data being limited to a 90-day postoperation window could also be viewed as another limitation, and therefore the application of this study for long-term outcomes must be taken with caution. Future studies may be directed at the long-term outcomes of this site of service transition.

## Conclusions

There was a drastic site of service shift in TJA from the hospital to the ambulatory setting after the COVID elective surgery

**Table 4**

Comparison of preoperative patient demographics of patients undergoing total joint arthroplasty.

Demographics by site	Primary hip			Primary knee		
	2019 (n = 219)	2020 (n = 404)	Comparison P-value	2019 (n = 326)	2020 (n = 735)	Comparison P-value
ASC/HOPD						
Age (SD)	<b>57.06 (7.33)</b>	<b>59.10 (9.56)</b>	<b>.0031</b>	<b>58.61 (7.29)</b>	<b>63.15 (8.47)</b>	<b>&lt;.0001</b>
BMI (SD)	29.70 (4.90)	29.14 (5.08)	NS	31.71 (5.55)	31.30 (5.90)	NS
Female	<b>39.73%</b>	<b>49.50%</b>	<b>0.023</b>	59.51%	54.83%	NS
Preoperative pain score (SD)	6.25 (2.04)	6.44 (1.90)	NS	5.78 (1.83)	5.79 (1.93)	NS
History of DM	8.68%	6.93%	NS	10.74%	10.07%	NS
History of smoking	40.64%	37.81%	NS	38.65%	36.36%	NS
ASA > 2 (ASA 3-4)	<b>5.48%</b>	<b>12.13%</b>	<b>.0105</b>	<b>8.28%</b>	<b>15.24%</b>	<b>.0021</b>
Joint education attendance	<b>40.18%</b>	<b>6.19%</b>	<b>&lt;.0001</b>	<b>45.09%</b>	<b>9.39%</b>	<b>&lt;.0001</b>
Hospital	(n = 8722)	(n = 7937)	P-value	(n = 14,590)	(n = 12,106)	P-value
Age (SD)	65.69 (10.77)	65.86 (10.74)	NS	<b>66.88 (9.33)</b>	<b>66.61 (9.38)</b>	<b>.0169</b>
BMI (SD)	30.72 (6.35)	30.65 (6.32)	NS	33.06 (6.59)	33.10 (6.57)	NS
Female	54.13%	53.80%	NS	60.55%	60.49%	NS
Preoperative pain score (SD)	<b>6.38 (2.09)</b>	<b>6.47 (2.09)</b>	<b>.0117</b>	<b>5.94 (2.10)</b>	<b>6.09 (2.12)</b>	<b>&lt;.0001</b>
History of DM	16.63%	16.81%	NS	22.02%	21.77%	NS
History of smoking	51.03%	50.31%	NS	47.03%	46.96%	NS
ASA > 2 (ASA 3-4)	49.05%	48.67%	NS	<b>52.25%</b>	<b>54.30%</b>	<b>.0009</b>
Joint education attendance	<b>71.91%</b>	<b>53.18%</b>	<b>&lt;.0001</b>	<b>73.06%</b>	<b>54.04%</b>	<b>&lt;.0001</b>

ASC, ambulatory surgery center; HOPD, hospital outpatient department; BMI, body mass index; DM, diabetes mellitus; ASA, American Society of Anesthesiologists score; SD, standard deviation.

Values in bold represent statistically significant differences from 2019 to 2020. P-value <.05 used to determine statistically significant difference.

shutdown. Preoperative joint education attendance was negatively impacted, and there was a larger proportion of older patients and patients with significant medical comorbidities that moved to the outpatient setting. Despite these changes post-COVID, short-term complications were not increased in ASCs/HOPDs in this propensity-matched cohort, suggesting a safe and sustainable change in practice.

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work collaboratively, the opinions, beliefs, and viewpoints expressed by the authors do not necessarily reflect the opinions, beliefs, and viewpoints of BCBSM or any of its employees.

## Conflicts of interest

D. Markel receives royalties from Smith and Nephew, is a consultant for Stryker and Smith and Nephew, and is a board member for MARCQI. R. Hughes is a board member and co-director of MARCQI and receives funding from Blue Cross Blue Shield of Michigan. B. Hallstrom is a board member and co-director of MARCQI, receives funding from Blue Cross Blue Shield of Michigan, and is a committee member for the American Joint Replacement Registry and the International Society of Arthroplasty Registries. N. Frisch is a consultant and receives funding from Zimmer Biomet and is a board member for the American Association of Hip and

**Table 5**

Comparison of postoperative complications of patients undergoing total joint arthroplasty in 2019.

ASC/HOPD vs hospital in 2019			
Primary hip			
Postoperative complications	ASC/HOPD (n = 219)	Hospital (n = 191)	P-value
Readmission	<b>0.46%</b>	<b>4.19%</b>	<b>.01</b>
30-d ED visit	2.28%	5.24%	NS
Fracture	0%	0%	NS
DVT/PE	0%	0.52%	NS
Infection	0.46%	0.52%	NS
Hip dislocation	0%	1.57%	NS
Average OME (SD)	<b>396.7 (175.8)</b>	<b>307.5 (141.2)</b>	<b>&lt;.0001</b>
Primary knee			
Postoperative complications	ASC/HOPD (n = 326)	Hospital (n = 292)	P-value
Readmission	2.15%	1.37%	NS
30-d ED visit	<b>2.76%</b>	<b>8.25%</b>	<b>.003</b>
Fracture	0%	0.34%	NS
DVT/PE	0.92%	0.34%	NS
Infection	0%	0%	NS
Average OME (SD)	<b>444.8 (263.8)</b>	<b>339.3 (166.9)</b>	<b>&lt;.0001</b>

NS, not statistically significant; ASC, ambulatory surgery center; HOPD, hospital outpatient department; ED, emergency department; DVT, deep vein thrombosis; PE, pulmonary embolism; OME, oral morphine equivalents; SD, standard deviation.

Bold values represent statistically significant differences. P-value <.05 used to determine statistically significant difference.

**Table 6**  
Comparison of postoperative complications of patients undergoing total joint arthroplasty in 2020.

ASC/HOPD vs hospital in 2020			
Primary hip			
Postoperative complications	ASC/HOPD (n = 402)	Hospital (n = 430)	P-value
Readmission	<b>1.49%</b>	<b>4.68%</b>	<b>.008</b>
30-d ED visit	2.99%	4.22%	NS
Fracture	0%	0.70%	NS
DVT/PE	0%	0.23%	NS
Infection	0.25%	0.70%	NS
Hip dislocation	0.75%	0%	NS
Average OME (SD)	<b>278.5 (122.9)</b>	<b>247.5 (117.2)</b>	<b>.0002</b>
Primary knee			
Postoperative complications	ASC/HOPD (n = 726)	Hospital (n = 760)	P-value
Readmission	<b>1.10%</b>	<b>3.04%</b>	<b>.009</b>
30-d ED visit	3.17%	4.50%	NS
Fracture	0.14%	0.13%	NS
DVT/PE	0.93%	0.69%	NS
Infection	0.28%	0.26%	NS
Average OME (SD)	<b>362.2 (176.2)</b>	<b>284.3 (141.6)</b>	<b>&lt;.0001</b>

NS, not statistically significant; ASC, ambulatory surgery center; HOPD, hospital outpatient department; ED, emergency department; DVT, deep vein thrombosis; PE, pulmonary embolism; OME, oral morphine equivalents; SD, standard deviation.

Bold values represent statistically significant differences. P-value <.05 used to determine statistically significant difference.

Knee Surgeons, the Political Action Committee, and the Young Arthroplasty Group; all other authors declare no potential conflicts of interest.

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