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ARTHROPLASTY

Implementation of an enhanced recovery protocol at a safety net hospital

A SILVER LINING TO COVID-19?

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Aims

This study aimed to evaluate whether an enhanced recovery protocol (ERP) for arthroplasty established during the COVID-19 pandemic at a safety net hospital can be associated with a decrease in hospital length of stay (LOS) and an increase in same-day discharges (SDDs) without increasing acute adverse events.

Methods

A retrospective review of 124 consecutive primary arthroplasty procedures performed after resuming elective procedures on 11 May 2020 were compared to the previous 124 consecutive patients treated prior to 17 March 2020, at a single urban safety net hospital. Revision arthroplasty and patients with < 90-day follow-up were excluded. The primary outcome measures were hospital LOS and the number of SDDs. Secondary outcome measures included 90-day complications, 90-day readmissions, and 30day emergency department (ED) visits.

Results

The mean LOS was significantly reduced from 2.02 days (SD 0.80) in the pre-COVID cohort to 1.03 days (SD 0.65) in the post-COVID cohort ($p < 0.001$). No patients in the pre-COVID group were discharged on the day of surgery compared to 60 patients (48.4%) in the post-COVID group ($p < 0.001$). There were no significant differences in 90-day complications (13.7% (n = 17) vs 9.7% (n = 12); $p = 0.429$), 30-day ED visits (1.6% (n = 2) vs 3.2% (n = 4); $p = 0.683$), or 90-day readmissions (2.4% (n = 3) vs 1.6% (n = 2); $p = 1.000$) between the pre-COVID and post-COVID groups, respectively.

Conclusion

Through use of an ERP, arthroplasty procedures were successfully resumed at a safety net hospital with a shorter LOS and increased SDDs without a difference in acute adverse events. The resulting increase in healthcare value therefore may be considered a 'silver lining' to the moratorium on elective arthroplasty during the COVID-19 pandemic. These improved efficiencies are expected to continue in post-pandemic era.

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Introduction

During the COVID-19 pandemic, it was estimated that approximately 30,000 primary arthroplasty procedures were cancelled per week in the USA while restrictions regarding nonessestial surgery were in place.[1] As arthroplasty is one of the most effective quality of life-improving procedures available to patients,[2] the widespread cancellation of arthroplasty procedures significantly impacted the physical and psychosocial health of arthroplasty patients.[1,3-9] According to a recent study, delays to arthroplasty during the COVID-19 pandemic were devastating to patients, with 19% of patients awaiting total hip arthroplasty (THA) and 12% awaiting total knee arthroplasty (TKA) reported being in a health state of "worse than death".[9] Additionally, the temporary suspension on arthroplasty procedures threatened the financial integrity of hospitals, physicians, and medical supply companies who rely on elective procedures

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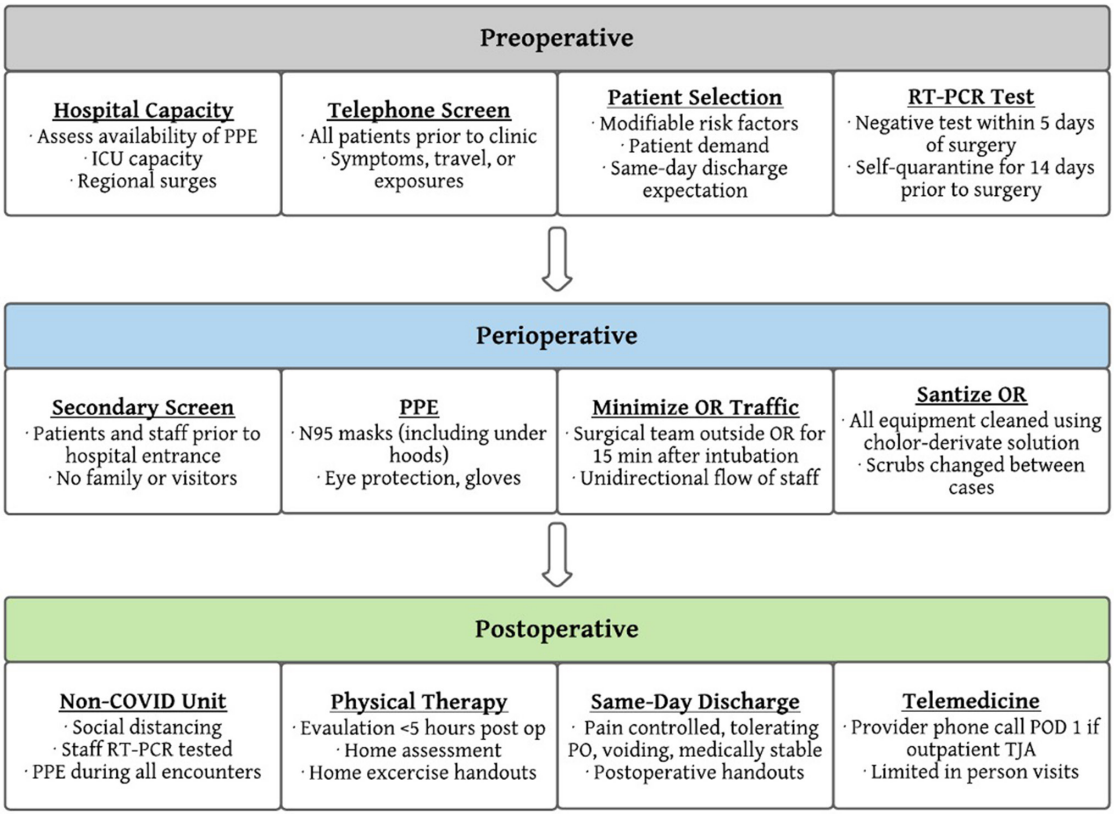

Fig. 1

Flowchart illustrating the COVID-19 screening and protection protocol at our institution. ICU, intensive care unit; OR, operating room; POD, postoperative day, PPE, personal protective equipment; RT-PCR, reverse transcription-polymerase chain reaction; TJA, total joint arthroplasty.

as a revenue source.[6] Resuming arthroplasty procedures was therefore critical to the wellbeing of patients and the healthcare system; however, recovery needed to be conducted in a safe, judicious, and flexible manner as the world balanced equitable allocation of resources towards those affected with COVID-19.

At Rancho Los Amigos National Rehabilitation Center, an urban safety net hospital, there were a unique set of challenges to overcome prior to safely resuming arthroplasty. Safety net hospitals are defined as those which "by mandate or mission deliver a large amount of care to uninsured and other vulnerable populations".[10] Therefore, this cohort tends to be of low socioeconomic status with suboptimally managed medical comorbidities, more housing insecurities, and higher rates of substance abuse.[11-14] Additionally, these patients have been shown to experience higher rates of arthritis,[12] worse quality of life while waiting for surgery,[15] longer hospital length of stay (LOS), and more complications after arthroplasty.[13,14,16] The suspension of arthroplasty procedures, therefore, created a tremendous backlog of arthroplasty patients with neglected and complex deformities, many of whom would be considered high-risk for COVID-19 associated morbidities.[17] Furthermore, as the safety net hospital for the surrounding hospitals, there was an ethical responsibility of caring for all COVID-19 patients who were unable to obtain care elsewhere. Therefore, in an effort to preserve hospital resources while still providing high-level care to arthroplasty patients, several hospital-wide policies were established based on evidence-based practices (EBP).[18,19] Highlights of these changes included patient selection and education, medical optimization, implementation of multiple COVID-19 screening and protection systems and use of an enhanced recovery protocol (ERP) with a focus on outpatient arthroplasty (Figure 1).

The purpose of this study is to assess whether arthroplasty can be resumed at a safety net hospital with decreased hospital LOS, increased same-day discharges (SDDs), and without an increase in postoperative complications, readmissions, or emergency department (ED) visits. The hypothesis is that, through implementation of an ERP, arthroplasty can be safely and effectively resumed during the COVID-19 pandemic, and that the resulting increase in healthcare value would create the foundation for the approach to arthroplasty moving forward.

Methods

Institutional review board approval was obtained for retrospective review of all primary TKA (current

procedural terminology (CPT) code 27477), THA (CPT code 27130), and conversion hip arthroplasty (CPT code 27132)[20] patients treated at a single urban safety net hospital by four arthroplasty fellowship-trained surgeons (DL, SN, RR). Elective arthroplasty at the authors' institution resumed on 11 May 2020 after a two-month moratorium. All consecutive primary arthroplasty patients treated after 11 May 2020 through 31 October 2020 were placed in the post-COVID cohort. These were compared to an equal number of consecutive primary arthroplasty patients who had surgery prior to 17 March 2020, when the two-month hold on elective arthroplasty began, which were placed in the pre-COVID cohort. The number of patients in each cohort were considered based on the number of single anaesthesia events, regardless of the number of joints addressed at the time of surgery. Revision arthroplasty, patients with less than 90 days of follow-up, and those who were lost to follow-up (n = 4) were excluded. The resulting 124 patients in the post-COVID cohort were then compared against the previous 124 consecutive patients in the pre-COVID cohort.

Outcomes. The primary outcome measures included hospital LOS and the number of SDDs. Secondary outcome measures included 90-day complications, 90-day readmissions, 30-day ED visits, and 90-day reoperations. All acute adverse events were collected via comprehensive chart review; these were organized and categorized according to a similar report by Schultz et al.[21] Patient demographic information included age, sex (male or female), self-reported race (Hispanic, African-American, Caucasian, Asian, or other), primary language (English or non-English), BMI, smoking status (current smoker, former smoker, or non-smoker), history of diabetes mellitus (DM), diagnosis of inflammatory arthritis, Charlson Comorbidity Index (CCI), American Society of Anesthesiologists (ASA) classification, and preoperative visual analogue scale (VAS) score. Surgical demographic information included the type of anaesthesia administered (general endotracheal or spinal), use of constrained condylar knee TKA implants, use of cemented components, total operating time, first case of the day status, estimated blood loss (EBL), and the requirement for a blood transfusion postoperatively.

Patients

There was a total of 248 patients included in this study with 124 patients (39 male, 85 female) in the pre-COVID cohort and 124 patients (44 male, 80 female) in the post-COVID cohort, with no significant difference in the sex proportions between groups (p = 0.590). The most common self-reported race was Hispanic, comprising 80.6% (n = 100) in the pre-COVID group and 75.0% (n = 98) in the post-COVID group, with no difference between groups (p = 0.864, chi-squared test). Most patients were non-English-speaking, comprising 79.8% (n = 99) in the pre-COVID group and 74.2% (n = 92) in the post-COVID group, with no difference between groups (p = 0.365, chi-squared test). Patient age, BMI, preoperative diagnosis, and smoking status were not found to be markedly different between groups (Table I). Patients in the post-COVID cohort had a slightly lower mean ASA classification (2.29 (standard deviation (SD) 0.49) vs 2.46 (SD 0.60); p = 0.022, paired *t*-test), although CCI was not found to be significantly different between groups (2.46 (SD 1.41) vs 2.39 (SD 1.77); p = 0.721, paired *t*-test). Patients in the post-COVID cohort had a significantly higher mean preoperative VAS score (8.26 (SD 1.2) vs 6.81 (SD 2.08); p < 0.001, paired *t*-test).

Table I. Patient demographic details in the pre-COVID (n = 124) versus post-COVID (n = 124) groups.

Variable	Pre-COVID	Post-COVID	p-value
Mean age, yrs (SD)	61.6 (9.9)	59.6 (10.4)	0.129*
Sex, n (%)			
Male	31.5 (39)	35.4 (44)	0.590†
Female	68.5 (85)	64.5 (80)	
Mean BMI, kg/m² (SD)	30.8 (4.5)	30.9 (4.7)	0.807*
Self-reported race, % (n)			0.864†
Hispanic	80.6 (100)	75.0 (98)	
African-American	11.3 (14)	14.5 (18)	
Caucasian	6.5 (8)	6.5 (8)	
Asian	1.6 (2)	2.4 (3)	
Other	0.0 (0)	1.6 (2)	
Primary language, % (n)			0.365†
English	20.2 (25)	25.8 (32)	
Non-English	79.8 (99)	74.2 (92)	
ASA classification, % (n)			0.022†
I	5.6 (7)	1.6 (2)	
II	42.7 (53)	66.9 (83)	
III	51.6 (64)	31.5 (39)	
Mean ASA (SD)	2.46 (0.60)	2.29 (0.49)	
Mean CCI (SD)	2.46 (1.41)	2.39 (1.77)	0.721*
Mean preoperative VAS (SD)	6.81 (2.08)	8.26 (1.20)	< 0.001*
Diabetes mellitus, % (n)	25.0 (31)	32.2 (40)	0.261†
Mean preoperative HbA1c (SD)	6.49 (0.60)	6.60 (0.57	0.155*
Inflammatory arthritis, % (n)	12.1 (15)	10.5 (13)	0.841†
Smoking status, % (n)			0.453†
Never smokers	79.0 (98)	74.2 (92)	
Former smokers	21.0 (26)	25.8 (32)	
Current smokers	0.0 (0)	0.0 (0)	

*Unpaired *t*-test.
†Chi-squared test.
ASA, American Society of Anesthesiologists; CCI, Charlson Comorbidity Index; HbA1c, haemoglobin A1c; SD, standard deviation; VAS, visual analogue scale.

Statistical analysis. Statistical analyses were completed with SPSS Statistics (v. 10.15 for macOS; IBM, USA) using a two-sided level of significance of 0.05. All continuous variables were analyzed via unpaired *t*-tests and all categorical data was analyzed by chi-squared tests. To control for potential confounding variables, general linear regression models were performed using length of stay as the dependent variable with pre- and post-COVID

Table II. Surgical characteristics in the pre-COVID (n = 124) versus post-COVID (n = 124) groups.

Variable	Pre-COVID	Post-COVID	p-value
THA, % (n)	22.5 (28)	30.6 (38)	0.178
Conversion THA, % (n)	10.7 (3)	10.5 (4)	0.922
Cemented, % (n)	7.1 (2)	0.0 (0)	0.176
TKA, % (n)	77.4 (96)	69.4 (86)	0.178
Cemented, % (n)	51.0 (49)	32.5 (28)	0.016
CCK, % (n)	6.3 (6)	7.0 (6)	1.000
Same-day bilateral procedures, % (n)	0.8 (1)	6.5 (8)	0.036
Type of anaesthesia, % (n)			
Spinal	44.4 (55)	91.1 (113)	< 0.001
General endotracheal	55.6 (69)	8.9 (11)	< 0.001
First case of the day, % (n)	46.8 (58)	74.2 (92)	< 0.001
Mean EBL, ml (SD)	196.3 (223.8)	172.3 (151.0)	0.324
Total operating time, mins (SD)	164.3 (36.0)	174.3 (42.2)	0.045
Postoperative blood transfusion, % (n)	2.4 (3)	0.8 (1)	0.622

*Chi-squared test.
†Paired *t*-test.
CCK, constrained condylar knee; EBL, estimated blood loss; SD, standard deviation; THA, total hip arthroplasty; TKA, total knee arthroplasty.

Table III. Length of stay and discharge disposition in the pre-COVID (n = 124) versus post-COVID (n = 124) groups.

Variable	Pre-COVID	Post-COVID	p-value
Mean LOS, days (SD)	2.02 (0.80)	1.03 (0.65)	< 0.001*
Same-day discharge, % (n)	0.0 (0)	48.4 (60)	< 0.001†
Midnights in hospital, % (n)			< 0.001†
0	0.0 (0)	48.4 (60)	
1	41.9 (52)	42.7 (53)	
2	50.8 (63)	8.1 (10)	
3	3.2 (4)	0.8 (1)	
≥ 4	4.0 (5)	0.0 (0)	
Discharge disposition, % (n)			0.838†
Home	100.0 (124)	97.5 (121)	
SNF	0.0 (0)	0.8 (1)	
AIR	0.0 (0)	1.6 (2)	

*Independent-samples *t*-test.
†Chi-squared test.
AIR, acute inpatient rehabilitation; LOS, length of stay; SD, standard deviation; SNF, skilled nursing facility.

Table IV. Multivariable regression model predicting hospital length of stay.

Variable	β-coefficient (95% CI)	p-value*
Age	0.01 (-0.01 to 0.02)	0.390
Sex (ref: female)	-0.03 (-0.23 to 0.17)	0.739
BMI	0.01 (-0.01 to 0.03)	0.409
Primary language (ref: English)	0.04 (-0.16 to 0.20)	0.642
ASA (ref: I)		
ASA II	0.01 (-0.5 to 0.51)	0.981
ASA III	-0.18 (-0.71 to 0.34)	0.488
CCI	0.01 (-0.07 to 0.08)	0.896
Inflammatory arthritis	-0.06 (-0.31 to 0.2)	0.657
Diabetes mellitus	0.07 (-0.18 to 0.24)	0.475
Cohort (ref: pre-COVID)		
Post-COVID	1.05 (-1.23 to -0.86)	<0.001

*Multivariable regression analysis.
ASA, American Society of Anesthesiologists; CCI, Charlson Comorbidity Index; CI, confidence interval; OA, osteoarthritis.

designation as predictor variables and patient demographic variables as covariates. All quantitative variables (age, BMI, ASA, CCI) were analyzed as their original values, while qualitative variables (sex, primary language inflammatory arthritis, diabetes mellitus) were coded.

Results

The 124 patients in the pre-COVID group included 28 THAs (22.5%) and 96 TKAs (77.4%), and the 124 patients in the post-COVID cohort included 38 THAs (30.6%) and 85 TKAs (69.4%) (Table II), with no statistically significant difference in the proportion of THA or TKA patient between groups (p = 0.178, chi-squared test). Significantly more patients in the post-COVID cohort underwent same-day bilateral arthroplasty (6.5% (n = 8) vs 0.8% (n = 1); p = 0.036, chi-squared test). There was no difference in the use of cemented THA (p = 0.176, chi-squared test) or CCK TKA implants (p = 1.000, chi-squared test), although patients in the post-COVID group had significantly less cemented TKA (32.5% (n = 28) vs 51.0% (n = 49); p = 0.016, chi-squared test). Patients in the post-COVID group were more likely to have spinal anaesthesia (91.1% (n = 113) vs 44.4% (n = 55); p < 0.001, chi-squared test) and be the first case of the day (74.2% (n = 92) vs 46.8% (n = 58); p < 0.001, chi-squared test). There was no significant difference in mean EBL (p = 0.324, paired *t*-test) or requirement for a postoperative blood transfusion (p = 0.622, chi-squared test) although mean surgical time was significantly longer in the in post-COVID group (174.3 mins (SD 42.2) vs 163.3 mins (SD 36.0); p = 0.045, paired *t*-test).

LOS and disposition. The mean LOS was significantly reduced from 2.02 days (SD 0.80) in the pre-COVID cohort to 1.03 (SD 0.65) in the post-COVID cohort (p < 0.001, paired *t*-test) (Table III). Using a multivariable regression analysis with patient demographic variables as covariates, there remained a significant difference in hospital length of stay between cohorts (p < 0.001) (Table IV). There were no SDDs in the pre-COVID group compared to 60 SDDs (48.3%) in the post-COVID group (p < 0.001, chi-squared test) (Figure 2). Nearly every patient in both groups was ultimately discharged home, with no statistically significant difference in discharge disposition between cohorts (100% (n = 124) vs 97.5% (n = 121), respectively) (p = 0.837, chi-squared test).

90-day complications, readmissions, and ED visits. There were no statistically significant differences in 90-day complications (9.7% (n = 12) vs 13.7% (n = 17); p = 0.429, chi-squared test), 30-day ED visits (3.2% (n = 4) vs 1.6% (n = 2); p = 0.683, chi-squared test), or 90-day readmissions (1.6% (n = 2) vs 2.4% (n = 3); p = 1.000, chi-squared test)

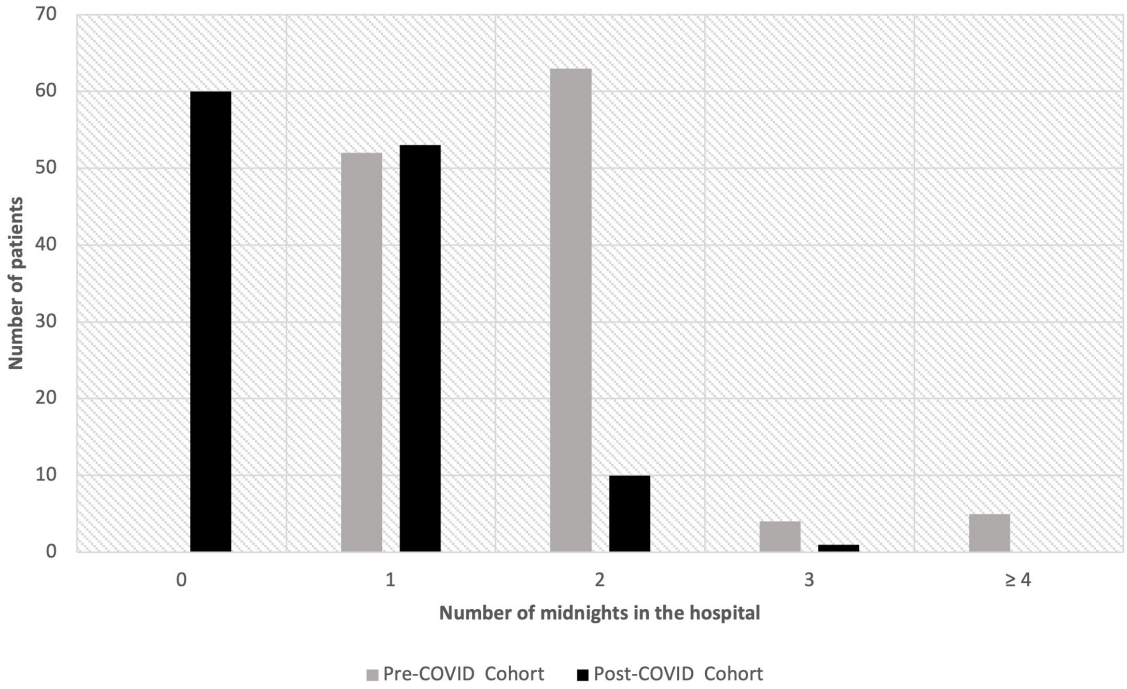

Fig. 2
Histogram graph depicting the number of midnights spent in the hospital for each cohort.

Table V. Complications, 30-day emergency department visits, and 90-day readmissions in the pre-COVID (n = 124) versus post-COVID (n = 124) groups.

Variable	Pre-COVID	Post-COVID	p-value*
Any 90 -day complication, % (n)	13.7 (17)	9.7 (12)	0.429
Acute surgical complications	1.6 (2)	1.6 (2)	1.000
Acute medical complications	4.8 (6)	2.4 (3)	0.500
Superficial wound complications	7.3 (9)	4.8 (6)	0.596
Deep wound complications, % (n)	0.0 (0)	0.8 (1)	1.000
30 -day ED visits, % (n)	1.6 (2)	3.2 (4)	0.684
90 -day readmissions, % (n)	2.4 (3)	1.6 (2)	1.000
90 day reoperations, % (n)	0.8 (1)	1.6 (2)	1.000

*Chi-squared test.
ED, emergency department.

between the post-COVID and pre-COVID groups, respectively (Table V).

In the pre-COVID group, there were a total of 17 complications (13.7%), three unplanned readmissions (2.4%), two ED visits (1.6%), and one reoperation (0.8%). There were two acute surgical complications (1.6%), both of which were intraoperative calcar fractures of the femur treated with a single cerclage wire without further complications. There were six acute medical complications (4.8%), including postoperative anaemia requiring transfusion (2.4%; n = 3), postoperative hypotension (0.8%; n = 1), acute kidney injury (0.8%; n = 1), and one patient passed away on postoperative day (POD) 5 from complications related to an acute small bowel obstruction (0.8%; n = 1). There were nine superficial wound complications (7.2%), eight of which healed with local wound care (88.9%), and one of which returned to surgery (11.1%) for superficial debridement and scar revision on POD 47.

In the post-COVID group, there were a total of 12 complications (9.7%), two unplanned readmissions (3.2%), eight ED visits (6.4%), and two reoperations (1.6%). There were two acute surgical complications (1.6%), including a THA dislocation (0.8%; n = 1), and an intraoperative partial patellar tendon avulsion treated with suture anchor and a knee immobilizing brace (0.8%; n = 1). There were three acute medical complications, including postoperative anaemia requiring transfusion (0.8%; n = 1), sepsis secondary to a retroperitoneal abscess found on POD 22 (0.8%; n = 1), and a provoked pulmonary embolism (0.8%; n = 1). There were six superficial wound complications, five of which healed with local wound care (83.3%), and one of which returned to the OR (16.7%) for superficial debridement and scar revision on POD 41. There was one deep wound complication secondary to an acute hematogenous periprosthetic joint infection, which underwent a debridement antibiotics and implant retention (DAIR) procedure on POD 55 and has remained infection-free since (0.8%; n = 1).

Discussion

This study demonstrates that through use of an ERP, arthroplasty can be successfully resumed at a safety net hospital during the COVID-19 pandemic with a decreased hospital LOS and increased number of SDDs.

Perhaps more importantly, this reduction in LOS was seen without an increase in postoperative complications, ED use, or readmission rates. As a result, the reduced strain in hospital resources for arthroplasty allowed for equitable allocation of resources towards COVID-19 patients. This, in turn, improved the overall healthcare value for arthroplasty, which established the foundation for an ERP to be continued in the post-pandemic era to follow.

Even with availability of proper personal protective equipment, hospital admission after arthroplasty may increase the risk COVID-19 transmission and require resources that may be otherwise used for COVID-19 patients. For this reason, use of a multidisciplinary ERP functioned as a potential solution to not only screen and medically optimize arthroplasty patients, but also to ensure safe and expedited discharge home. The ERP described in the present study was an augmented rapid recovery protocol (RRP) that had been previously implemented in October 2019, and similar to other RRPs, it focuses on preoperative patient education, medical and psychosocial optimization, spinal anaesthesia, multimodal pain control,[22,23] and early mobilization with physical therapy.[21,23–25] With new COVID-19 restriction in place, however, the RRP was modified to the new ERP with a focus on SDD. Modifications to the RRP included: intensive patient and family education, coordination with social workers to ensure optimization of the patient's home environment preoperatively, managing patient expectations for SDD, having more procedures performed as the first case of the day, and coordination with the physical therapy department to enable evaluations in the postoperative recovery unit. Through this approach, this series demonstrated a mean reduction in hospital LOS from 2.02 to 1.03 days , with significantly more SDDs in the post-COVID group compared to the pre-COVID group ($p < 0.001$). SDD patients were called by a provider on POD1 to assess pain level and functional status, as well as answer any additional questions that may have arisen postoperatively, which may have reduced the number of avoidable ED visits. For patients that were admitted postoperatively, they were placed in a separate unit of the hospital designated for patients with negative reverse transcription-polymerase chain reaction COVID-19 tests.

An additional critical factor to the successful resumption of arthroplasty in this series was patient selection and medical optimization. Given the large queue of backlogged arthroplasty patients after the moratorium of elective arthroplasty, patients were initially selected based on a ranking system using patient factors known to be associated with a higher risk for adverse events and a greater severity of COVID-19 illness (i.e. ICU admission, mortality).[19] These included advanced age, chronic pulmonary disease, obstructive sleep apnea, cardiovascular disease, diabetes mellitus, and an immunocompromised status.[17,19,26] Unlike other orthopaedic subspecialties such as sports medicine or paediatrics, however, patients requiring arthroplasty are often older with more significant comorbidities, particularly in a safety net hospital where access to healthcare is an issue for the system. Therefore, additional such as patient demand and deterioration in quality of life were also considered to allow for equitable allocation of care. Ultimately, the relative weight of each patient factor was considered to reflect institutional resources in response to regional surges. This in turn, helped appropriately balance patient risks with the ethical obligation of optimizing public health concerns.

In this series, patients in the post-COVID cohort demonstrated a slightly lower mean ASA classification, which may be a representation of patient selection, although CCI was not found to be different between groups. Patients in the post-COVID cohort did, however, demonstrate significantly higher preoperative VAS pain scores and operating time. These higher pain scores are likely a reflection of the delay in surgery created by the COVID-19 pandemic, as well the preferential selection of patients based on patient demand and the deterioration in quality of life.[9] Additionally, the longer operating time is likely a surrogate for more complex cases performed in the post-COVID group, as these patients had longer delays to surgery with worse radiological joint deterioration. Regardless of these findings, there was no significant difference in EBL, transfusion requirement, complications, readmissions, or reoperations between cohorts.

In the present series, there were eight same-day bilateral arthroplasty procedures during the COVID-19 pandemic and only one in the pre-COVID cohort during a similar timeframe. One potential driving force for performing bilateral simultaneous THA during the COVID-19 pandemic was the opportunity for a single anaesthetic event with the potential reduction in hospital resource use. Although some studies have shown a higher risk of medical complications, thrombotic events, and need for blood transfusions and with simultaneous bilateral arthroplasty,[27–29] other studies have shown that simultaneous bilateral arthroplasty has an acceptable risk, especially in appropriately selected patients.[30,31] Same day bilateral arthroplasty, therefore, serves as an additional example of how the COVID-19 pandemic resulted in a paradigm shift toward maximizing healthcare value in a safety net hospital system.

There are limitations to this study, including the standard limitations of retrospective cohort analysis. Additionally, the relatively small cohort size of 124 patients in each group was necessary, as at the time of data collection only 124 primary arthroplasty cases were performed after the COVID-19 pandemic with 90-day follow-up. Despite the relatively small cohort size, this study demonstrated a low attrition rate with only four patients

lost to follow-up. Although this series reported only on 90-day postoperative outcomes, this data set does have reasonable short-term follow-up for the relevant early complications associated with arthroplasty procedures. Furthermore, insufficient data were collected to compare any patient-reported or functional outcomes in either group which, although not the primary aim of this study, would be an important area of focus for future research. Nonetheless, this is still the largest and most comprehensibly measured cohort, to our knowledge, assessing the outcomes of resuming total joint replacement procedures in a safety net hospital during the COVID-19 pandemic. Future research is necessary to ensure that no increased long-term complications among these groups are found.

This study highlights that through use of a multidisciplinary ERP, arthroplasty procedures can be successfully resumed at a safety net hospital with a shorter hospital LOS, increased SDDs, and no increase in complication or readmission rates when compared to arthroplasty procedures performed prior to the COVID-19 pandemic. The resulting increase in healthcare value resulting from these changes therefore may be considered a silver lining to the moratorium on elective arthroplasty, which can be continued in post-pandemic era and in potential future global crises. Ultimately, from a policy standpoint, it sometimes requires a major change in status quo to make significant and rapidly implemented changes in the approach to surgical healthcare.

Take home message

- The COVID-19 pandemic has had unprecedented impacts on the wellbeing of patients requiring arthroplasty procedures, particularly at safety net hospitals where access to care is an issue for the system.
- Through use of a multidisciplinary enhanced recovery protocol, arthroplasty procedures can be successfully resumed at a safety net hospital with a shorter hospital length of stay, increased same-day discharges, and no increase in complication or readmission rates when compared to arthroplasty procedures performed prior to the pandemic.
- The resulting increase in healthcare value resulting from these changes therefore may be considered a 'silver lining' to the moratorium on elective arthroplasty, which can be continued in the post-pandemic era and in potential future global crises.

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