The Journal of Arthroplasty xxx (2018) 1-7



Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Inpatient Versus Outpatient Arthroplasty: A Single-Surgeon, Matched Cohort Analysis of 90-Day Complications

Brian Darrith, MD^a, Nicholas B. Frisch, MD, MBA^b, Matthew W. Tetreault, MD^a, Michael P. Fice, MD^a, Chris N. Culvern, MS^a, Craig J. Della Valle, MD^{a,*}

^a Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL ^b Ascension Crittenton Hospital, Rochester, MI

ARTICLE INFO

Article history: Received 15 June 2018 Received in revised form 9 October 2018 Accepted 10 October 2018 Available online xxx

Keywords: outpatient hip arthroplasty outpatient knee arthroplasty complications outpatient hip resurfacing outpatient unicondylar knee replacement

ABSTRACT

Background: Although some prior work supports the safety of same-day arthroplasty performed in a hospital, concerns remain when these procedures are performed in a free-standing ambulatory surgery center. The purpose of this study is to compare 90-day complication rates between matched cohorts that underwent inpatient vs outpatient arthroplasty at an ambulatory surgery center.

Methods: A single-surgeon cohort of 243 consecutive patients who underwent outpatient arthroplasty was matched with 243 inpatients who had the same procedure. One-to-one nearest-neighbor matching with respect to gender, age, American Society of Anesthesiologists Score, and body mass index was utilized. The 486 primary arthroplasties included 178 unicondylar knees (36.6%), 146 total hips (30.0%), 92 total knees (18.9%), and 70 hip resurfacings (14.5%). Ninety-day outcomes including reoperation, readmission, unplanned clinic or emergency department visits, and major and minor complications were compared using a 2-sample proportions test.

Results: The 2 cohorts were similar in distribution of demographic variables, demonstrating successful matching. The inpatient and outpatient cohorts both had readmission rates of 2.1% (P = 1.0). With the number of subjects studied, there were no statistically significant differences in rates of major complications (2.1% vs 2.5%, P = 1.0), minor complications (7.0% vs 7.8%, P = .86), reoperations (0.4% vs 2.1%, P = .22), emergency department visits (1.6% vs 2.5%, P = .52), or unplanned clinic visits (3.3% vs 5.8%, P = .19). *Conclusion:* This study suggests that arthroplasty procedures can be performed safely in an ambulatory surgery center among appropriately selected patients without an increased risk of complications.

© 2018 Elsevier Inc. All rights reserved.

THE JOURNAL OF

9

As surgical and anesthetic techniques become more advanced, the primary joint arthroplasty patient's typical postoperative length of stay has decreased substantially. Previously, a week-long

The study was approved by the Rush Institutional Review Board.

Study Conducted at Rush University Medical Center, Chicago, IL.

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements refer to https://doi.org/10.1016/j.arth.2018.10.015.

* Reprint requests: Craig J. Della Valle, MD, Department of Orthopaedic Surgery, Rush University Medical Center, 1611 W. Harrison St, Suite 300, Chicago, IL 60612. stay was not atypical [1], yet now patients often spend no more than 2 nights in the hospital with same-day discharge becoming increasingly more common [2,3]. Some authors have raised concerns that discharging patients too soon increases the risk for postoperative complications and readmission [2,4,5]. Others provide evidence for the safety and effectiveness of same-day discharge protocols for a variety of arthroplasty procedures—including total hip arthroplasty (THA), total knee arthroplasty (TKA), and unicondylar knee arthroplasty (UKA) [3,6–9]. Some have gone even further by saying that outpatient arthroplasty reduces complication risk or provides psychological benefits for patients [10,11].

Joint replacement is the single most expensive procedure covered by Medicare, costing a total of 6.6 billion for Medicare beneficiaries in 2013 alone [12], and the annual volume of joint replacement surgery is projected to increase [2,13]. It is reasonable that the Center for Medicare Services is considering a proposal to

All authors contributed to the literature review, writing, and editing of each section of this manuscript. Drs Darrith, Tetreault, and Fice collected the data and Culvern performed the statistical analysis.

Table 1

Patient Demographics of the Matched Cohorts.

Variable	All Patients (n	All Patients ($n = 486$)		Inpatients ($n = 243$)		Outpatients $(n = 243)$	
	Mean	SD	Mean	SD	Mean	SD	
BMI	30.6	5.6	30.4	5.5	30.8	5.6	.47
Age	55.3	8.5	55.6	8.4	55.0	8.6	.50
	Number	%	Number	%	Number	%	
Female	182	37.4%	93	38.3%	89	37%	.78
ASA							
1	65	13.4%	32	13%	33	14%	1.0
2	342	70.4%	172	71%	170	70%	1.0
3	79	16.3%	39	16%	40	16%	1.0
Procedure							
UKA	178	36.6%	89	37%	89	37%	1.0
THA	146	30.0%	73	30%	73	30%	1.0
TKA	92	18.9%	46	19%	46	19%	1.0
Hip resurfacing	70	14.5%	35	14%	35	14%	1.0

SD, standard deviation; BMI, body mass index; ASA, American Society of Anesthesiologists score; UKA, unicondylar knee arthroplasty; THA, total hip arthroplasty; TKA, total knee arthroplasty.

allow Medicare reimbursement for outpatient TKA [14]. Given the emphasis that the contemporary healthcare system places on patient outcomes, especially postoperative complications, any perioperative protocol with the potential to improve outcomes or decrease costs without increasing the risk for major complications deserves further investigation. However, the current literature regarding outpatient arthroplasty is dominated by retrospective case series or comparative studies with less than 100 patients per cohort [6–9,11], which are underpowered to detect differences in relatively uncommon outcomes such as readmission and reoperation. There are large database studies which are well-powered yet come with inherent limitations such as no more than 30-day follow-up and the lack of orthopedic-specific postoperative outcomes [5,10,15]. The purpose of this study is to evaluate matched cohorts of patients who underwent UKA, THA, TKA, and hip resurfacing, comparing those who stayed at least 1 night in the

hospital vs those who underwent outpatient surgery at an ambulatory surgery center.

Methods

Between January 1, 2013 and June 30, 2016, 1875 primary arthroplasties (UKA, THA, TKA, and hip resurfacings) were performed by the senior investigator. Of these, 243 (13.0%) were performed at an ambulatory surgical center. During this time period, patients signing up for primary arthroplasty procedures were routinely offered the option of having outpatient or inpatient surgery if the patient was considered to be of appropriate medical health for surgery at the ambulatory surgery center by the surgeon and anesthesiologist on staff at the surgery center. Although there was not a specific body mass index (BMI) or age cutoff for patients to be offered outpatient surgery, in general patients were

Table 2

Ninety-Day Outcomes for All Arthroplasty Types.

Outcomes	Inpatient	Inpatient (n = 243)			Outpatient ($n = 243$)		
	n	%	95% CI	n	%	95% CI	
Readmissions	5	2.1%	0.3-3.90	5	2.1%	0.3-3.9	1.0
Readmission, nonoperative	4	1.6%	0-3.2	2	0.8%	0-1.9	.69
Readmission, operative	1	0.4%	0.1-1.2	3	1.2%	0-2.6	.62
Reoperations	1	0.4%	0-1.2	5	2.1%	0.3-3.9	.22
Any complication	22	9.1%	5.5-12.7	25	10.0%	6.5-14.0	.76
Any major complication	5	2.1%	0.3-3.9	6	2.5%	0.5-4.5	1.0
MUA ^a (knees)	3	1.2%	0-2.6	0	0.0%	0-0	.25
Instability ^a (hips)	1	0.4%	0-1.2	3	1.2%	0-2.6	.62
Superficial SSI	1	0.4%	0-1.2	1	0.4%	0-1.2	1.0
Peripheral nerve injury	0	0.0%	0-0	1	0.4%	0-1.2	1.0
Ileus	0	0.0%	0-0	1	0.4%	0-1.2	1.0
Any minor complication	17	7.0%	3.8-10.2	19	7.8%	4.4-11.2	.86
Peri-incisional erythema	7	2.9%	0.8-5.0	5	2.1%	0.3-3.9	.77
Urinary tract infection	1	0.4%	0-1.2	2	0.8%	0-1.9	1.0
Pneumonia	0	0.0%	0-0	1	0.4%	0-1.2	1.0
Periprosthetic fracture (nonoperative)	0	0.0%	0-0	1	0.4%	0-1.2	1.0
Urinary retention	0	0.0%	0-0	1	0.4%	0-1.2	1.0
Distal deep vein thrombosis	0	0.0%	0-0	2	0.8%	0-1.9	.5
Rash	3	1.2%	0-2.6	3	1.2%	0-2.6	1.0
Superficial hematoma	1	0.4%	0-1.2	1	0.4%	0-1.2	1.0
Blood transfusion	1	0.4%	0-1.2	0	0.0%	0-0	1.0
Superficial SSI (nonoperative)	2	0.8%	0-1.9	1	0.4%	0-1.2	1.0
Miscellaneous	2	0.8%	0-1.9	2	0.8%	0-1.9	1.0
Emergency department visit	4	1.6%	0-3.2	6	2.5%	0.5-4.5	.52
Unplanned clinic visit	8	3.3%	1.0-5.0	14	5.8%	4.3-7.3	.19

CI, confidence interval; MUA, manipulation under anesthesia; SSI, surgical site infection.

 $^{
m a}$ All percentages are out of 243 patients per group, except for MUA (knees only, 135 per group) and hip instability (108 per group).

B. Darrith et al. / The Journal of Arthroplasty xxx (2018) 1-7

Table 3

Ninety-Day Outcomes for Unicondylar Knee Arthroplasty.

Outcomes	Inpatient ($n = 89$)		Outpatient (n =	89)	P-Value	
	Number	Percent	Number	Percent		
Readmissions	2	2.3%	2	2.3%	1.0	
Readmission, nonoperative	2	2.3%	1	1.1%	1.0	
Readmission, operative	0	0.0%	1	1.1%	1.0	
Reoperations	0	0.0%	1	1.1%	1.0	
Any complication	10	11.2%	12	13.5%	.82	
Any major complication	1	1.1%	1	1.1%	1.0	
MUA	1	1.1%	0	0.0%	1.0	
Superficial SSI	0	0.0%	1	1.1%	1.0	
Any minor complication	9	10.1%	11	12.4%	.81	
Peri-incisional erythema	5	5.6%	2	2.2%	.44	
Superficial SSI, nonoperative	1	1.1%	1	1.1%	1.0	
Periprosthetic fracture, nonoperative	0	0.0%	1	1.1%	1.0	
Urinary retention	0	0.0%	1	1.1%	1.0	
Distal DVT	0	0.0%	1	1.1%	1.0	
Urinary tract infection	0	0.0%	1	1.1%	1.0	
Pneumonia	0	0.0%	1	1.1%	1.0	
Rash	2	2.3%	2	2.3%	1.0	
Miscellaneous ^a	1	1.1%	1	1.1%	1.0	
Emergency department visit	3	3.4%	3	3.4%	1.0	
Unplanned clinic visit	5	5.6%	9	10.1%	.40	

MUA, manipulation under anesthesia; DVT, deep venous thrombosis; SSI, surgical site infection.

^a See Table 7 for more details.

physiologically younger, without medical comorbidities that required an inpatient admission (such as chronic anticoagulation) and had an adequate support system to assist them in postoperative care. Because the inpatient facility and the ambulatory surgery center are 50 miles apart from each other, the logistical convenience associated with one facility vs the other was typically the primary motivation for a patient's decision. Furthermore, patients with complex orthopedic problems, such as requiring extensive removal of hardware, were not offered surgery at the outpatient facility. The ambulatory surgery center is a strictly outpatient facility and is "freestanding" in so far as it is neither on the campus nor affiliated with an inpatient hospital.

Each of these 243 consecutive outpatient cases [16] were matched with inpatients using one-to-one nearest-neighbor matching, based on the following criteria: surgical procedure, gender, American Society of Anesthesiologists Score (ASA), age, and BMI. Due to the relatively large number of inpatients available, matched pairs were very similar with 66% having exact gender, ASA, and within 1 year of age and 1 unit of BMI. The 243 inpatient preoperative radiographs were screened for orthopedic

Table 4

Ninety-Day Outcomes for Total Hip Arthroplasty.

complexity that would have precluded performing the procedure at the ambulatory surgery center as described above, resulting in the exclusion of 2 of the 243 inpatients. The 2 associated outpatients were then rematched with 2 new inpatients who met the above inclusion criteria. This resulted in the inclusion of 243 outpatients and 243 inpatients, while dropping 1389 inpatients via the matching process. These 486 primary arthroplasties included 178 UKAs (36.6%), 146 THAs (30.0%), 92 TKAs (18.9%), and 70 hip resurfacings (14.5%). There were no significant differences in terms of gender, ASA, mean age, or mean BMI between the groups suggesting appropriate matching (Table 1). The mean length of hospitalization for the inpatients was 1.9 days (range 1.0-7.4).

The 90-day outcomes recorded for each patient included reoperation, readmission, unplanned clinic or emergency department (ED) visits, major complications (including death, myocardial infarction, stroke, thromboembolic events, acute renal failure, peripheral nerve injury, and surgical site infection [SSI]), and minor complications (blood transfusion, superficial hematoma, SSI treated nonsurgically, urinary tract infection, urinary retention, pneumonia,

Outcomes	Inpatient ($n = 73$)	Inpatient ($n = 73$)		Outpatient $(n = 73)$		
	Number	Percent	Number	Percent		
Readmissions	2	2.7%	3	4.1%	1.0	
Readmission, nonoperative	1	1.4%	1	1.4%	1.0	
Readmission, operative	1	1.4%	2	2.7%	1.0	
Reoperations	1	1.4%	3	4.1%	.62	
Any complication	5	6.9%	6	8.2%	1.0	
Any major complication	2	2.7%	4	5.5%	.68	
Instability	1	1.4%	3	4.1%	.62	
Superficial SSI	1	1.4%	0	0.0%	1.0	
Ileus	0	0.0%	1	1.4%	1.0	
Any minor complication	3	4.1%	2	2.7%	1.0	
Urinary tract infection	1	1.4%	0	0.0%	1.0	
Rash	1	1.4%	1	1.4%	1.0	
Miscellaneous	1	1.4%	1	1.4%	1.0	
Emergency department visit	1	1.4%	3	4.1%	.62	
Unplanned clinic visit	1	1.4%	1	1.4%	1.0	

SSI, surgical site infection.

B. Darrith et al. / The Journal of Arthroplasty xxx (2018) 1-7

	ç	

Table 5

Ninety-Day Outcomes for Total Knee Arthroplasty.

Outcomes	Inpatient (n = 4		Outpatient (n = 46)		P-Value
	Number	Percent	Number	Percent	
Readmissions	0	0.0%	0	0.0%	N/A
Reoperations	0	0.0%	0	0.0%	N/A
Any complication	5	10.9%	5	10.9%	1.0
Any major complication	2	4.3%	0	0.0%	.50
MUA	2	4.3%	0	0.0%	.49
Any minor complication	3	6.5%	5	10.9%	.71
Peri-incisional erythema	2	4.3%	3	6.5%	1.0
Urinary tract infection	0	0.0%	1	2.2%	1.0
Distal DVT	0	0.0%	1	2.2%	1.0
Blood transfusion	1	2.2%	0	0.0%	1.0
Emergency department visit	0	0.0%	0	0.0%	N/A
Unplanned clinic visit	1	2.2%	3	6.5%	.62

 $N/A, \mbox{ not applicable; MUA, manipulation under anesthesia; DVT, deep venous thrombosis.$

peri-incisional erythema, rash, and distal deep vein thrombosis below the knee). Each patient was available for 90-day follow-up.

Statistical Methods

All data were collected from the patients' medical records, and statistical analyses were conducted using Stata version 14.2 (StataCorp, LP, College Station, TX). After the outpatient cohort was matched with an equivalent number of inpatients for each of the 4 procedures, a Fisher's exact test was used to compare the 2 cohorts in terms of gender, t-test for age and BMI, and analysis of variance for ASA. Due to the closely matched cohorts and the relatively small incidence of study outcomes, differences between the inpatient and outpatient groups were compared using a Fisher's exact test. Post hoc power analysis revealed that 211 patients per group, 422 total patients, would detect a difference of 5% in the rate of complications between groups.

Results

Within the initial 90 days following surgery, the rates of postoperative complications between the inpatient and outpatient groups (9.1% vs 10.3%, P = .76), reoperations (0.4% vs 2.1%, P = .22), and readmissions (2.1% vs 2.1%, P = 1.0) were not significantly different with the sample size available for study (Table 2). When the 2 cohorts were stratified according to the procedure, there were no significant differences in any outcomes between the inpatient and outpatient groups (Tables 3-6). All the outpatients were discharged to home within 23 hours of surgery without any inpatient admissions; only 3 of them required an overnight stay at the ambulatory surgery center including 1 for pain control, 1 for nausea, and 1 based solely on patient preference to stay overnight.

The overall rates of major complication were 2.1% (n = 5) and 2.5% (n = 6) for the inpatient and outpatient groups, respectively (P = 1.0; Table 2). The most common major complication was hip instability (n = 4), and 3 of the 4 cases were treated with head and liner exchanges while the fourth was treated successfully non-operatively. The 3 cases of arthrofibrosis requiring manipulation under anesthesia all occurred in the inpatient group, 2 after TKA and 1 after UKA. In each group, there was one case of superficial SSI that required superficial irrigation and debridement. The other 3 cases of superficial SSI were considered minor complications as they did not require surgical intervention. There were no deep infections in either group. Two of the 5 reoperations in the outpatient group occurred at the ambulatory surgery center on the day of

Table 6

Ninety-Day Outcomes for Hip Resurfacings.

Outcomes	Inpatient $(n = 35)$		Outpatient (n = 35)		P-Value
	Number	Percent	Number	Percent	
Readmissions	1	2.9%	0	0.0%	1.0
Readmission, nonoperative	1	2.9%	0	0.0%	1.0
Readmission, operative	0	0.0%	0	0.0%	N/A
Reoperations	0	0.0%	1	2.9%	1.0
Any complication	2	5.7%	2	5.7%	1.0
Any major complication	0	0.0%	1	2.9%	1.0
Peripheral nerve injury	0	0.0%	1	2.9%	1.0
Any minor complication	2	5.7%	1	2.9%	1.0
Delayed wound healing	1	2.9%	1	2.9%	1.0
Superficial SSI, nonoperative	1	2.9%	0	0.0%	1.0
Superficial hematoma	1	2.9%	1	2.9%	1.0
Emergency department visit	0	0.0%	0	0.0%	N/A
Unplanned clinic visit	1	2.9%	1	2.9%	1.0

N/A, not applicable; SSI, surgical site infection.

surgery, including surgical exploration of the sciatic nerve for peroneal nerve palsy and a head and liner exchange for subluxation of THA identified in the recovery room.

The rate of minor complications was 7.0% (n = 17) for the inpatient and 7.8% (n = 19) for the outpatient cohort, respectively (P = .86). Peri-incisional erythema accounted for 33% (n = 12) of all minor complications. Other minor complications seen in both cohorts include urinary tract infection, rash (dermatitis secondary to surgical dressings), superficial hematoma, and superficial SSI treated with oral antibiotics alone (Tables 2 and 7).

Readmission rates were 2.1% (n = 5) for each cohort. This included 4 surgical readmissions, 3 patients with a superficial SSI treated nonoperatively, 1 THA dislocation treated nonoperatively, 1 readmission in the outpatient group for postoperative ileus and urinary retention, and 1 readmission in the inpatient group for concern of cellulitis in the operative lower leg, which was subsequently diagnosed as contact dermatitis and resolved without antibiotic treatment (Table 7). The outpatient group had nearly twice as many unplanned clinic visits (5.8% vs 3.3%), but this difference was not statistically significant with the sample size available for study. The incidence of ED visits was similar between groups (2.5% for outpatients vs 1.6% for inpatients, P = .52; Table 2).

Discussion

As outpatient arthroplasty procedures become more common, it is critical to ensure that patient safety is not compromised. Furthermore, if surgery performed at an outpatient center is to be cost-effective, then the risk of readmissions and complications must be similar. We carefully compared the outcomes of patients undergoing inpatient and outpatient procedures performed at an ambulatory surgery center and found that the risk of 90-day complications, readmissions, and reoperations was similar and lower than many historical cohorts of inpatient procedures with the sample size available for study [7,17–20].

Instability after THA and arthrofibrosis after knee replacement were the most common major complications identified, with an incidence for each that is comparable to previous publications with rates of early instability after THA ranging from 2.1% to 3.9% [21–23] and a 3.8% 90-day rate of arthrofibrosis requiring manipulation after TKA [24]. Because previous publications that utilize databases to evaluate outpatient arthroplasty do not contain orthopedic-specific complications such as instability and arthrofibrosis, we are unable to compare our results with these studies. Smaller case series of outpatient arthroplasty report rates of early

B. Darrith et al. / The Journal of Arthroplasty xxx (2018) 1-7

Table 7

List of all Complications, Reoperations, and Readmissions.

Instant major second production (n = 5) In1 IKA M 48 No No Manipulation under anesthesia at 5 wk In2 IKA F 55 No No Manipulation under anesthesia at 5 wk In3 TKA M 57 No No Manipulation under anesthesia at 5 wk In4 TKA M 56 Yes No Manipulation under anesthesia at 5 wk In5 TKA M 56 Yes No Dislocation and debrieformore Inplatent minor complications (n - 17) . Superficial SS, admitted for V statistics In6 IIIA KA 46 Yes No Superficial SS, admitted for V statistics In6 IIIA IIIA M 57 No No Peri-incisional erythema, treated with oral antibiotics In12 IIIAA F 48 No No Peri-incisional erythema, treated with oral antibiotics In13 IIIA IIIA M 61 No No	Study ID	Procedure	Male/Female	Age (y)	Readmission	Reoperation	Complication
complication (n = 5) int IKA F SS No No Manipulation under anesthesia at 5 wk In2 IKA F SS No No Manipulation under anesthesia at 5 wk In3 TITA F SS Yes Yes Superficit SS, reprinted superficit A In4 TTTA M SS Yes No Manipulation under anesthesia at 5 wk In5 TTTA M SS Yes No Manipulation under anesthesia at 5 wk In5 TTTA M SS Yes No Superficial SS, admitted for V antibiotics In7 UKA F 66 Yes No Reah accondary to contract dematting antibiotics In10 TTKA F 48 No No Reah In11 UKA F 69 No No Reah In12 UKA F 69 No No Reah In13 UKA F 64 No No	Inpatient major						
Init TKA M 48 No No Manipulation under ansthesia at 5 wk In3 TKA M 57 No No Manipulation under ansthesia at 6 wk In4 TKA M 57 No No Manipulation under ansthesia at 6 wk In5 TIA M 56 Yes Supericula SS, required appendix ansthesia at 5 wk In5 TIA M 56 Yes No Distantian at the function of the functio	complication $(n = 5)$						
In2 UKA F 55 No No Monpulation under ansthesia at 8 wk In3 TKA M 57 No No Maiplation under ansthesia at 6 wk In4 TFA F 32 Yes Yes Yes Discritions at 0 debridement In5 TFA No No Discritions at 0 debridement Discritions at 0 debridement In6 TFA F 66 Yes No Superficial SI, admitted for V artibletics In7 UKA F 66 Yes No Superficial SI, admitted for V artibletics In7 UKA F 66 Yes No Superficial SI, admitted for V artibletics In7 UKA F 60 No No Peri-incisional erythema, treated with oral artibletics In71 UKA F 60 No No Peri-incisional erythema, treated with oral artibletics In72 UKA F 61 No No Peri-incisional erythema, treated with oral artibletics	In1	ТКА	М	48	No	No	Manipulation under anesthesia at 5 wk
In3 TAA M 57 No No Manipulators userficial sity experison user ansettes in at 6 wk Infs TAA K S Yes Yes Superficial SS, required userficial superficial SS, required userficial superficial SS, required mediculin, readinities, traited nonoperatively Infs TAA M 56 Yes No Superficial SS, required reduction, readinities, traited nonoperatively Infs HR M 56 Yes No Superficial SS, required reduction, required reduction, required reduction, readinities, traited with oral antibiotics Infs HR M 57 No No Superficial sector demonstration and closen sector demonstration and reduction, required with oral antibiotics Infs HR M 57 No No Reprincipable sector demonstration and formation required with oral antibiotics Infs HR M 63 No No Superficial benationan Infs HR M 61 No No Superficial benation required with oral antibiotics Infs HR M 63 No	In2	UKA	F	55	No	No	Manipulation under anesthesia at 8 wk
InfTHAF53YesYesSuperficial St. required superficial irrigation and desirement irrigation and desirement irrigation and desirement complications (n = 17)Inpatient minor complications (n = 17)VesNoNoRab secondary to contart dermathistic is superficial St. trained for M antibiotics is superficial St. trained with P antibiotics is superficial St. trained with P antibiotics is superficial St. trained with P antibiotics infoInf0TKAM65YesNoNoPeri-incisional erythema, treated with oral antibiotics infoInf1UKAF73NoNoPeri-incisional erythema, treated with oral antibiotics infoInf1UKAF60NoNoPeri-incisional erythema, treated with oral antibiotics infoInf2UKAF61NoNoPeri-incisional erythema, treated with oral antibiotics infoInf3UKAF64NoNoPeri-incisional erythema, treated with oral antibiotics infoInf3UKAF64NoNoPeri-incisional erythema treated with oral antibiotics infoInf3TFAM55NoNoPeri-incisional erythema treated into periatively untinary tract inform oral soft, groin numbersInf3TFAM55NoNoPeri-incisional erythema treated with oral antibiotics infoInf3TFAM56NoNoPeri-incisional erythema treated with oral antibiotics infoInf3TFAM<	In3	TKA	М	57	No	No	Manipulation under anesthesia at 6 wk
Infs Infagination and closed enduction, readmitted, treated nonoperatively Inpatient minor readmitted, treated nonoperatively complications (n = 17) F complications (n = 17) F infn MR M 56 Infn MR M 56 Infn MR M 56 Infn MR M 56 Infn MR M 57 No Rain secondary to contract dermatilis Infn MR M 57 No No Rain secondary to contract dermatilis Inf1 MR M 61 No No Rain Inf1 MR M 61 No No Sach Inf3 MR 61 No No Sach Sach Inf3 MR 61 No No Sach Sach Inf3 TRA M 61 No No Sach Sach Inf3 TRA<	In4	THA	F	53	Yes	Yes	Superficial SSI, required superficial
In5TIAM56YesNoDiscation, readmitted, treated nonoperativelyInplations (n = 17)infHRM54YesNoSuperficial SI, admitted for IV antibiotsIn7HRM57NoNoSuperficial SI, admitted for IV antibiotsIn7HRM57NoNoPeri-incisional crythema, treated with oral antibioticsIn10TKAF73NoNoPeri-incisional crythema, treated with oral antibioticsIn11UKAF63NoNoPeri-incisional crythema, treated with oral antibioticsIn12UKAF61NoNoSuperficial hemationaIn13UKAF61NoNoPeri-incisional crythema, treated with oral antibioticsIn14HRM61NoNoPeri-incisional crythema, treated with oral antibioticsIn13UKAF61NoNoPeri-incisional crythema, treated with oral antibioticsIn14HRM61NoNoPeri-incisional crythemaIn15UKAF61NoNoPeri-incisional crythemaIn18TKAM65NoNoPeri-incisional crythemaIn20UKAF66NoNoPeri-incisional crythemaIn21TKAM55NoNoPeri-incisional crythemaIn21TKAF66YesNoPeri-incisional crythemaI							irrigation and debridement
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	In5	THA	М	56	Yes	No	Dislocation and closed reduction.
Inplatent minor Superficial SSI, admitted for IV antibiotics In7 UKA F 66 Yes No Superficial SSI, admitted for IV antibiotics In8 UKA M 65 Yes No Superficial SSI, admitted for IV antibiotics In9 TKA M 57 No No Perficial SSI, treated with IV1 antibiotics In10 TKA F 48 No No Perficial SSI, treated with oral antibiotics In11 UKA F 63 No No Perficial SSI, treated with oral antibiotics In12 UKA F 63 No No Perficial SSI, admitted SSI, segmentation and SSI admitted SSI admited SSI admitted SSI admitted SSI admited SSI admitted SS							readmitted, treated nonoperatively
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Inpatient minor						······
Inf HR M 54 Yes No Superficial SI, admitted for V antibiotics In7 UKA M 65 Yes No Superficial SI, treated with Va antibiotics In8 UKA M 65 Yes No Superficial SI, treated with Va antibiotics In10 TKA F 48 No No Peri-incisional erythema, treated with oral antibiotics In11 UKA F 69 No No Peri-incisional erythema, treated with oral antibiotics In13 UKA F 69 No No Peri-incisional erythema, treated with oral antibiotics In14 HR M 61 No No Peri-incisional erythema, treated with oral antibiotics In15 UKA F 61 No No Peri-incisional erythema, treated with oral antibiotics In18 TKA M 61 No No Peri-incisional erythema Peri-incisional erythema In18 TKA M 51 No No Per	complications $(n = 17)$						
In7 UKA F 66 Yes No Rasperical SXI received with Y and Inbiotics In9 TKA M 65 Yes No No Peri-incisional erythema, istuated with oral antibuicts In10 TKA F 48 No No Peri-incisional erythema, istuated with oral antibuicts In11 UKA F 69 No No Peri-incisional erythema, istuated with oral antibuicts In13 UKA F 61 No No Peri-incisional erythema, istuated with oral antibuicts In13 UKA F 61 No No Peri-incisional erythema, istuated with oral antibuicts In13 UKA F 61 No No Peri-incisional erythema Peri-incincincinal incision erythema Peri-inc	In6	HR	М	54	Yes	No	Superficial SSI, admitted for IV antibiotics
In8UKAM65YesNoSpecificial SS, Teated with I/ antibioticsIn9TKAF48NoNoPeri-incisional erythema, retared with or al antibioticsIn10TKAF48NoNoPeri-incisional erythema, retared with or al antibioticsIn12UKAF69NoNoPeri-incisional erythema, treated with or al antibioticsIn13UKAF61NoNoPeri-incisional erythema, treated with or al antibioticsIn14HRM61NoNoPeri-incisional erythema, treated with or al antibioticsIn15UKAF61NoNoPeri-incisional erythema, treated with or al antibioticsIn16UKAM61NoNoRashIn17THAM61NoNoRashIn18TKAM61NoNoPeri-incisional erythema, retard with or al antibioticsIn17THAM56NoNoPeri-incisional erythema, retard nonoperativelyIn18TKAM61NoNoPeri-incisional erythema, retard nonoperativelyIn20UKAF64NoNoPeri-incisional erythema, retard nonoperativelyIn21THAM55NoNoPeri-incisional erythema, retard nonoperativelyIn20UKAF59NoNoPeri-incisional erythema, retard nonoperativelyOutaTHAF59NoNo <t< td=""><td>In7</td><td>UKA</td><td>F</td><td>66</td><td>Yes</td><td>No</td><td>Rash secondary to contact dermatitis</td></t<>	In7	UKA	F	66	Yes	No	Rash secondary to contact dermatitis
In9TKAM57NoNoPerincisonal erythema, treated with oral antibioticsIn10TKAF73NoNoRashIn11UKAF73NoNoRashIn12UKAF69NoNoPerincisonal erythema, treated with oral antibioticsIn13UKAM60NoNoPerincisonal erythema, treated with oral antibioticsIn14HRM61NoNoPerincisonal erythema, treated with oral antibioticsIn15UKAF61NoNoPartial plantais teadon tear, nonoperativeIn16UKAF61NoNoRashIn18TKAM65NoNoBlood transfusion, postoperative day 4In19THAM51NoNoPartial plantais teadon tear, nonoperativeIn20UKAF64NoNoPartial volund dehiscence treated nonoperativelyIn21THAM57NoPartial volund dehiscence treated with oral antibioticsOutpatient majorTHAF57YesPartial volund dehiscence treated with oral antibioticsOutpatient majorTHAF57YesYesDialocation treated with head and liner exchangeOut2HAF59YesYesSublaxation in PACU, immediate surgicalOut3THAF57YesYesSublaxation in PACU, immediate and liner exchangeOut6 <td< td=""><td>In8</td><td>UKA</td><td>М</td><td>65</td><td>Yes</td><td>No</td><td>Superficial SSI, treated with IV antibiotics</td></td<>	In8	UKA	М	65	Yes	No	Superficial SSI, treated with IV antibiotics
In10TKAF48NoNoPerincisional erythema, treated with or al antibioticsIn12UKAF69NoNoPerincisional erythema, treated with or al antibioticsIn13UKAF69NoNoPerincisional erythema, treated with or al antibioticsIn14HRM61NoNoPerincisional erythema, treated with or al antibioticsIn15UKAF61NoNoPerincisional erythema, treated with or al antibioticsIn16UKAM61NoNoPerincisional erythema, treated with or al antibioticsIn17THAM61NoNoRashIn18TKAM61NoNoPerincisional erythema, treated vith or al antibioticsIn20UKAF64NoNoPerincisional erythema, treated vith or al antibioticsIn21THAM56NoNoPerincisional erythema, treated vith or al antibioticsUKAF64NoNoPerincisional erythema, treated with or al antibioticsOutpatient majorComplications (n = 6)VesNoPerincisional erythema, treated with or al antibioticsOutpatient majorF59NoYesPot ordy in PACU, immediate surgicalOutpatient minorComplications (n = 19)NoYesSublication treated with head and liner exchangeOutpatient minorUKAF61YesNoNoOutpatient minorNo <td< td=""><td>In9</td><td>TKA</td><td>М</td><td>57</td><td>No</td><td>No</td><td>Peri-incisional erythema, treated with oral antibiotics</td></td<>	In9	TKA	М	57	No	No	Peri-incisional erythema, treated with oral antibiotics
In11UKAFF3NoNoRashIn12UKAF61NoNoPeri-incisional erythema, treated with oral antibioticsIn13UKAM60NoNoPeri-incisional erythema, treated with oral antibioticsIn14HRM61NoNoPartial platnaris tendon teran, nonoperativeIn15UKAF61NoNoPartial platnaris tendon teran, nonoperativeIn17THAM65NoNoRashIn18TKAM61NoNoBlood transfusion, postoperative day 4In19THAM54NoNoPartial platnaris tendon teran, nonoperativeIn20UKAF64NoNoPartial platnaris tendon terangeIn21THAM54NoNoPartial platnarisIn21THAM47YesYesPartial platnarisOutpatient majorUtAF29NoNoPartial platnarisOutpatient majorUtAF54NoYesPact droin platnarisOutpatient majorUtAF59NoYesPact droin platnarisOutpatient majorUtAHR64YesYesPact droin platnarisOutpatient majorUtAF59NoYesYesOutpatient majorUtAF61YesYesSubjection frastal ski, teated with head and liner exchange <t< td=""><td>In10</td><td>TKA</td><td>F</td><td>48</td><td>No</td><td>No</td><td>Peri-incisional erythema (suture abscess)</td></t<>	In10	TKA	F	48	No	No	Peri-incisional erythema (suture abscess)
In12UKAF69NoNoPeri-incisional erythema, treated with oral antibioticsIn13UKAH61NoNoSuperficial hematomaIn15UKAF61NoNoPeri-incisional erythema, treated with oral antibioticsIn16UKAM64NoNoPeri-incisional erythema, treated with oral antibioticsIn16UKAM64NoNoPeri-incisional erythema, treated with oral antibioticsIn17THAM64NoNoRashIn18TKAM61NoNoRashIn17THAM56NoNoPeri-incisional erythema, treated with oral antibioticsIn20UKAF64NoNoPeri-incisional erythema, treated with oral antibioticsIn21THAM56NoNoPeri-incisional erythema, treated with oral antibioticsOutpatient majorrecorrelizations (n = 6)NoNoPeri-incisional erythema, treated with oral antibioticsOutpatient majorrecorrelizations (n = 6)Peri-incisional erythema, treated with oral antibioticsOutpatient majorrecorrelizations (n = 7)Peri-incisional erythema, treated with oral antibioticsOutpatient miorrecorrelizations (n = 7)Peri-incisional erythema, treated with oral antibioticsOutpatient minorrecorrelizations (n = 6)Peri-incisional erythema, treated with oral antibioticsOutpatient minorrecorrelizations (n = 6)Peri-incisional erythem	In11	UKA	F	73	No	No	Rash
In13UKAM60NoNoPeri-incisional crythema, treated with oral antibioticsIn14HRM61NoNoParial plantaris tendon tear, nonoperativeIn15UKAF61NoNoParial plantaris tendon tear, nonoperativeIn17THAM65NoNoRashIn18THAM65NoNoRashIn19THAM54NoNoParial plantaris tendon tear, nonoperative day 4In19THAM54NoNoParial word tearsfusion, postoperative day 4In20UKAF64NoNoParial word debiscence treated nonoperativelyIn21THAM56NoNoParial word debiscence treated nonoperativelyIn22UKAF29NoNoParial word debiscence treated nonoperativelyIn23THAM55NoYesPost drop in PACU, immediate surgicalOutplications (n = 6)OutTHAF59YesYesOut3THAF59YesYesSuburation in PACU; head and liner exchangeOut4UKAM64YesYesSuburation in PACU; head and liner exchangeOut5THAF66YesNoNondisplaced tibal plateat frature, nonoperativeOut6THAF61NoNoNoNondisplaced tibal plateat frature, nonoperativeOut6THA <t< td=""><td>In12</td><td>UKA</td><td>F</td><td>69</td><td>No</td><td>No</td><td>Peri-incisional erythema, treated with oral antibiotics</td></t<>	In12	UKA	F	69	No	No	Peri-incisional erythema, treated with oral antibiotics
In14HRM61NoNoSuperficial hematomaIn15UKAF61NoNoPartial plantaris tendon tear, nonoperativeIn16UKAM64NoNoPartial plantaris tendon tear, nonoperativeIn17THAM61NoNoRashIn18TKAM61NoNoUirany tract infection at 5 wit; goinIn19THAM54NoNoPeri-incisional erythemaIn21TIAM56NoNoPartial would ethicsconce treated nonoperativelyIn22UKAF64NoNoPeri-incisional erythemaIn21THAM55NoPeri-incisional erythematreated with oral antibioticsOutpatient majorTHAM47YesYesPolocation treated with head and liner exchangeOut2HRM55NoYesPolocation treated with head and liner exchangeOut3THAF59YesYesSubjection treated with head and liner exchangeOut4THAF47NoYesSubjection treated with head and liner exchangeOut5UKAM64YesYesSubjection treated with exchangeOut6THAF61YesNoNoOut7UKAF61NoNoNoOut6THAF51NoNoNoOut7UKAF <td>In13</td> <td>UKA</td> <td>М</td> <td>60</td> <td>No</td> <td>No</td> <td>Peri-incisional erythema, treated with oral antibiotics</td>	In13	UKA	М	60	No	No	Peri-incisional erythema, treated with oral antibiotics
In15UKAF61NoNoPeri-incisional erythema, treated with oral antibioticsIn16UKAM65NoNoParial plantaris tendon tear, nonoperativeIn17THAM65NoNoBod transfusion, postoperative day 4In18TKAM54NoNoUrinary tract infection at 5 wki; groin numbers from postionerIn20UKAF64NoNoPeri-incisional erythema numbers from postionerIn21THAM56NoNoPeri-incisional erythema treated with oral antibioticsOutpatient majorUKAF29NoNoPeri-incisional erythema treated with oral antibioticsOutpatient majorUKAF57NoPeri-incisional erythema, treated with oral antibioticsOut1THAM77YesYesSuberiation fractureOut3THAF59YesYesSuberiation in PACU, head and liner exchangeOut3THAF59YesYesSuberiation in PACU, head and liner exchangeOut3UKAM64YesYesSuberiation in PACU, head and liner exchangeOut3THAF66YesNoNoOut5UKAM61NoNoNoOut6THAF61YesNoNoOut7UKAM63NoNoPeri-incisional erythema, treated withOut3T	In14	HR	М	61	No	No	Superficial hematoma
IniféUKAM64NoNoPartial plantaris fendon tear, nonoperativeIn17THAM61NoNoRashIn18TKAM61NoNoBlood transfusion, postoperative day 4In19THAM54NoNoUrinary trat infection at 5 wit; goinIn21THAM56NoNoPartial wound dehiscence treated nonoperativelyIn22UKAF64NoNoPartial wound dehiscence treated with oral antibioticsOutpatient majorUKAF64NoNoPartial wound dehiscence treated with oral antibioticsOutpatient majorUKAF55NoPeri-incisional erythemaOut2HRM55NoPeri-incisional erythemaOut3THAF59YesYesSubication treated with head and liner exchangeOut4THAF59YesYesSubication treated with head and liner exchangeOut5UKAM64YesYesSubication treated with superficialOut6THAF66YesNoNoOut7UKAF61NoNoNoOut3TKAM61NoNoNoOut5UKAF64NoNoNoOut6THAF51NoNoNoOut7UKAF64NoNoNoOut7 <td>In15</td> <td>UKA</td> <td>F</td> <td>61</td> <td>No</td> <td>No</td> <td>Peri-incisional erythema, treated with oral antibiotics</td>	In15	UKA	F	61	No	No	Peri-incisional erythema, treated with oral antibiotics
In17THAM65NoNoRashIn18TKAM61NoNoBlood transfusion, postoperative day 4In19THAM54NoNoUrinary tract infection at 5 wk; groin numbness from positionerIn20UKAF64NoNoPeri-incisional erythema, tractal discence treated nonoperatively in21In21UKAF29NoNoPeri-incisional erythema, treated with real antibioticsOutpatient major complications (n = 6)THAM47YesYesDislocation treated with head and liner exchange exploration of sciatic nerveOut1THAF59YesYesDislocation treated with head and liner exchange exploration of sciatic nerveOut3THAF59YesYesSubluxation in PACU; head and liner exchange out4Out4THAF47NoYesSubluxation in PACU; head and liner exchange out3Out4THAF66YesNoRaeintied for postoperative ileus and urinary retentionOut3TKAM61NoNoNondisplaced tibial plateau fracture, nonoperative ileus and urinary retentionOut4TKAF61YesNoNoOut3TKAM61NoNoNondisplaced tibial plateau fracture, nonoperative ileus and urinary retentionOut3TKAM61NoNoPorsientions(noi for intradewith oral antibiotics <tr< td=""><td>In16</td><td>UKA</td><td>М</td><td>64</td><td>No</td><td>No</td><td>Partial plantaris tendon tear, nonoperative</td></tr<>	In16	UKA	М	64	No	No	Partial plantaris tendon tear, nonoperative
In18TKAM61NoNoBiod transfusion postiperative day 4In19THAM54NoNonumbness from positionerIn20UKAF64NoNoPeri-inctional erythemaIn21THAM56NoNoPeri-inctional erythema, treated nonoperativelyIn22UKAF29NoNoPeri-inctional erythema, treated with oral antibioticsOutpatient majorUKAF29NoNoPeri-inctional erythema, treated with oral antibioticsOutpatient majorUKAF55NoYesPeri-inctional erythema, treated with oral antibioticsOut1THAM47YesYesDislocation treated with head and liner exchangeOut2HRM47YesYesSubjection of sciencerOut3THAF59YesYesSubjection treated with head and liner exchangeOut4UKAM64YesYesSubjection treated with superficialOut5UKAM64YesYesSuperficial SI, treated with superficialOut6THAF61YesNoNondisplaced tibal plateau facture, nonoperativeOut7UKAF61YesNoNondisplaced tibal plateau facture, nonoperativeOut7UKAF61YesNoNondisplaced tibal plateau facture, nonoperativeOut1UKAF64NoNoNondisp	In17	THA	М	65	No	No	Rash
In19THAM54NoNoUrinary tract infection at 5 wkr. groin numbers from positionerIn20UKAF64NoNoPeri-incisional erythemaIn21UKAF29NoNoPeri-incisional erythema, treated with oral antibioticsOutpatient majorVEAF29NoNoOutpatient majorTHAM47YesYesDislocation treated with neal antibioticsOut1THAM47YesYesDislocation treated with head and liner exchangeOut2HRM55NoYesPeri-incisional erythema, treated with sequal and liner exchangeOut3THAF59YesYesSubluxation in PACU, immediate surgical exploration of sciatic nerveOut4THAF47NoYesSubluxation in PACU, immediate surgical irrigation and debridementOut6THAF66YesNoReamitted for postoperative ileus and urinary retentionOut7UKAM61NoNoPortigential DYT of popilical vein out1Out3TKAM51NoNoReamitted for IV antibioticsOut3TKAM61NoNoPeri-incisional erythema, treated with intragent eret with neal antibioticsOut3TKAM51NoNoPeri-incisional erythema, treated with neal antibioticsOut3TKAM61NoN	In18	ТКА	М	61	No	No	Blood transfusion, postoperative day 4
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	In19	THA	М	54	No	No	Urinary tract infection at 5 wk: groin
In20UKAF64NoNoPeri-incisional erythemaIn21UKAF29NoNoPartial wound dehiscence treated nonoperativelyOutpatient majorSNoNoPeri-incisional erythema, treated with oral antibioticsOutpatient majorTHAM47YesYesDislocation treated with head and liner exchangeOut1THAM47YesYesDislocation treated with head and liner exchangeOut2HRM55NoYesPoint of sciatic nerveOut3THAF59YesYesSubluxation in PACU; inmediate surgicalOut4THAF47NoYesSubluxation in PACU; head and liner exchangeOut5UKAM66YesNoReadmitted for postoperativeOut6THAF61YesNoNoNondisplaced tibial plateau fracture, nonoperativeOut6TKAM68NoNoNondisplaced tibial plateau fracture, nonoperativeOut3Out3TKAM61NoNoPosterative urinary retentionOut1UKAF64NoNoPosterative urinary retentionOut3TKAM61NoNoPosterative Urinary retentionOut3UKAF64NoNoPosterative Urinary retentionOut6TKAM61NoNoPosterative Urinary retention </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>numbness from positioner</td>							numbness from positioner
In 21THA In 22M VKAF F29NoNoPartial wound dehiscence treated nonoperatively partial wound dehiscence treated with oral antibioticsOutpatient major complications (n = 6)Out1THAM47YesYesPoto drop in PACU, immediate surgical exploration of sciatic nerveOut2HRM55NoYesDislocation treated with head and liner exchange exploration of sciatic nerveOut3THAF59YesYesDislocation in PACU, immediate surgical exploration of sciatic nerveOut3THAF47NoYesSubinxation in PACU, and and liner exchange out3Out4THAF60YesNoPretentionOut5UKAM64YesNoReadmitted for postoperative ileus and urinary retentionOutpatient minor complications (n = 19)Out7UKAF61YesNoNoOut11UKAM61NoNoPostoperative urinary retentionOut12UKAM52NoNoPostal DVTOut13TTAM53NoNoPostal DVTOut14THAF54NoNoPostal DVTOut15UKAM62NoNoPartinicisional erythema, treated with oral antibioticsOut16UKAF64NoNoPostal DVT<	In20	UKA	F	64	No	No	Peri-incisional erythema
In 22UKAF29NoNoPeri-incisional erythema, treated with oral antibioticsOutpatient major complications (n = 6)Out1THAM47YesYesPisolocation treated with head and liner exchangeOut2HRM55NoYesFoot drop in PACU, immediate surgical exploration of sciatic nerveOut3THAF59YesYesSubluxation in PACU, head and liner exchangeOut4THAF47NoYesSubluxation in PACU, head and liner exchangeOut5UKAM64YesSubluxation in PACU, head and liner exchangeOut6THAF61YesNoReadmitted for postoperative lieus and urinary retentionOut6THAF61YesNoSuperficial SSI, admitted for I VantiboticsOut7UKAF61YesNoNondreaded tiblal plateau fracture, nonoperative urinary retentionOut10UKAM67NoNoPostoperative urinary retentionOut11UKAF64NoNoDistal DVTOut12UKAM63NoNoRashOut13TKAM63NoNoPeri-incisional erythema, treated with oral antibioticsOut14THAF59NoNoRashOut15THAM53NoNoPeri-incisional erythema, treated with oral antibiotics<	In21	THA	М	56	No	No	Partial wound dehiscence treated nonoperatively
Outpatient major complications (n = 6) THA M 47 Yes Yes Dislocation treated with head and liner exchange exploration of sciatic nerve Out2 HR M 55 No Yes Foot drop in PACU, immediate surgical exploration of sciatic nerve Out3 THA F 59 Yes Yes Sublacation treated with head and liner exchange Out4 THA F 59 Yes Yes Sublacation in PACU, immediate surgical exploration in PACU, interacted with superficial irrigation and debridement Out5 UKA M 64 Yes Yes Superficial SSI, treated with superficial irrigation and debridement Out5 UKA M 64 Yes No Readmitted for potoperative ileus and urinary retention Out6 THA F 61 Yes No Superficial SSI, admitted for IV antibiotics Out7 UKA M 61 No No Nondisplaced tibial plateau fracture, nonoperative inary retention Out10 UKA F 64 No No Peri-incisional erythema, treated with oral a	In22	UKA	F	29	No	No	Peri-incisional erythema, treated with oral antibiotics
outlTHAM47YesYesDislocation treated with head and liner exchangeOut2HRM55NoYesFoot drop in PACU, immediate surgical exploration of sciatic nerveOut3THAF59YesYesDislocation treated with head and liner exchangeOut4THAF47NoYesSubluxation in PACU; head and liner exchangeOut5UKAM64YesYesSubluxation in PACU; head and liner exchangeOut6THAF66YesNoReadmitted for postoperative ileus and urinary retentionOut6THAF61YesNoReadmitted for postoperative ileus and urinary retentionOut7UKAF61YesNoNondisplaced tibial plateau fracture, nonoperative out10Out7UKAF61NoNoNoPostoperative urinary retentionOut10UKAM67NoNoPostoperative urinary retentionOut11UKAF64NoNoPostoperative urinary retentionOut12UKAM60NoNoRashOut13TKAM61NoNoPeri-incisional erythema, treated with oral antibioticsOut13TKAM53NoNoCroin argumenter oral antibioticsOut14THAF54NoNoRashOut15THAM53No	Outpatient major						,
Out1THAM47YesYesDislocation treated with head and liner exchangeOut2HRM55NoYesFoot drop in PACU, immediate surgical exploration of sciatic nerveOut3THAF59YesYesDislocation treated with head and liner exchangeOut3THAF59YesYesSubluxation in PACU, head and liner exchangeOut4THAF47NoYesSubluxation in PACU, head and liner exchangeOut5UKAM64YesYesSuperficial SSI, treated with superficial irrigation and debridementOut6THAF66YesNoReadmitted for postoperative ileus and urinary retentionOut7UKAM61NoNoNondisplaced tibial plateau fracture, nonoperative out9Out7UKAM61NoNoPostoperative urinary retentionOut11UKAF64NoNoDistal DVTOut11UKAF64NoNoDistal DVTOut13TKAM60NoRashOut14THAF54NoNoRashOut15THAF59NoNoUrinary tract infection at 6 wkOut15THAF50NoNoPeri-incisional erythema, treated with oral antibioticsOut3TKAM60NoNoPeri-incisional erythema, treated with oral antibioticsOut1	complications $(n = 6)$						
Out2HRM55NoYesFoot drop in PACU, immediate surgical exploration of sciatic nerveOut3THAF59YesVesDislocation treated with head and liner exchangeOut4THAF47NoYesSubluxation in PACU; head and liner exchangeOut5UKAM64YesSuperficial SI; treated with superficialOut6THAF66YesNoReadmitted for postoperative irrigation and debridementOut6THAF61YesNoSuperficial SI; admitted for IV antibioticsOut7UKAM61NoNoNoresning of chronic partial DIV of poptical veinOut8UKAM67NoNoNotospreing of chronic partial DIV of poptical veinOut10UKAM67NoNoPostoperative urinary retentionOut11UKAM52NoNoNoPostoperative urinary retentionOut12UKAM52NoNoRashOut13TKAM60NoNoPostoperative urinary retentionOut14THAF54NoNoRashOut15UKAF61NoNoPri-incisional erythema, treated with oral antibioticsOut14THAF54NoNoPri-incisional erythema, treated with oral antibioticsOut14THAF50NoNoPri-incisional erythema, treated with oral an	Out1	THA	М	47	Yes	Yes	Dislocation treated with head and liner exchange
Out3THAF59YesYesDislocation treated with head and liner exchangeOut4THAF47NoYesSubluxation in PACU: head and liner exchangeOut5UKAM64YesYesSuperficial SSI, treated with superficialOut6THAF66YesNoReadmitted for postoperativeOut6THAF66YesNoReadmitted for postoperativeOut7UKAM68NoNoNondisplaced tibial plateau fracture, nonoperativeOut7UKAM61NoNoMorisplaced tibial plateau fracture, nonoperativeOut9TKAM61NoNoPostoperative urinary retentionOut10UKAF64NoNoDistal DVTOut11UKAF64NoNoPostoperative urinary retentionOut12UKAM52NoNoReadmitted or postionerOut14THAF59NoNoPori-incisional erythema, treated withOut16UKAF59NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut13TKAF59NoNoUrinary tract infection at 6 wkOut14THAF64NoNoPeri-incisional erythema, treated with oral antibioticsOut13UKAF61 <td< td=""><td>Out2</td><td>HR</td><td>М</td><td>55</td><td>No</td><td>Yes</td><td>Foot drop in PACU, immediate surgical</td></td<>	Out2	HR	М	55	No	Yes	Foot drop in PACU, immediate surgical
Out3THAF59YesYesDislocation treated with head and liner exchangeOut4THAF47NoYesSubluxation in PACU; head and liner exchangeOut5UKAM64YesYesSuberficial SSI, treated with superficialOut6THAF66YesNoReadmitted for postoperativeOut6THAF66YesNoReadmitted for postoperativeOut6THAF61YesNoSuperficial SSI, admitted for IV antibioticsOut7UKAF61YesNoSuperficial SSI, admitted for IV antibioticsOut8UKAM68NoNoNoresning of chronic partial DVT of popliteal veinOut10UKAM67NoNoPostoperative urinary retentionOut11UKAF64NoNoPostoperative urinary retentionOut13TKAM60NoNoRashOut14THAF54NoNoRashOut15THAM53NoNoUrinary tract infection at 6 wkOut16UKAF68NoNoUrinary tract infection at 8 wkOut19TKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut14THAF50NoNoUrinary tract infection at 8 wkOut15THAM53NoNoPeri-incisional erythem							exploration of sciatic nerve
Out4THAF47NoYesSubluxation in PACU; head and liner exchangeOut5UKAM64YesYesSuperficial SSI, treated with superficial irrigation and debridementOut6THAF66YesNoReadmitted for postoperative ileus and urinary retentionOutpatient minor complications (n = 19)Out7UKAF61YesNoSuperficial SSI, admitted for IV antibioticsOut9UKAM68NoNoNorsening of chronic partial DVT of popliteal veinOut10UKAM61NoNoPostoperative urinary retentionOut11UKAF64NoNoPostoperative urinary retentionOut12UKAF64NoNoPistal DVTOut13TKAM60NoNoPistal DVTOut14THAF54NoNoRashOut15THAM53NoNoUrinary tract infection at 6 wkOut16UKAF59NoNoUrinary tract infection at 8 wkOut18UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut14THAF50NoNoPeri-incisional erythema, treated with oral antibioticsOut15UKAF68 <td>Out3</td> <td>THA</td> <td>F</td> <td>59</td> <td>Yes</td> <td>Yes</td> <td>Dislocation treated with head and liner exchange</td>	Out3	THA	F	59	Yes	Yes	Dislocation treated with head and liner exchange
Out5UKAM64YesYesSuperficial SSI, treated with superficial irrigation and debridementOut6THAF66YesNoReadmitted for postoperative ileus and urinary retentionOutpatient minor complications (n = 19)Out7UKAF61YesNoSuperficial SSI, admitted for IV antibioticsOut7UKAM68NoNoNondisplaced tibial plateau fracture, nonoperative out10Out10UKAM67NoNoPostoperative urinary retentionOut11UKAM67NoNoDistal DVTOut12UKAM62NoNoDistal DVTOut13TKAM60NoNoPeri-incisional erythema, treated with our al antibioticsOut14THAF54NoNoRashOut15THAM53NoNoPeri-incisional erythema, treated with oral antibioticsOut16UKAF61NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut13THAF59NoNoPeri-incisional erythema, treated with oral antibioticsOut14THAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut15THAF61NoNoPeri-incisional erythema, treated with	Out4	THA	F	47	No	Yes	Subluxation in PACU; head and liner exchange
Out6THAF66YesNoReadmitted for postoperative ileus and urinary retentionOutpatient minor complications (n = 19) </td <td>Out5</td> <td>UKA</td> <td>М</td> <td>64</td> <td>Yes</td> <td>Yes</td> <td>Superficial SSI, treated with superficial</td>	Out5	UKA	М	64	Yes	Yes	Superficial SSI, treated with superficial
Out6THAF66YesNoReadmitted for postoperative ileus and urinary retentionOutpatient minor complications (n = 19) <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>irrigation and debridement</td>							irrigation and debridement
ileus and urinary retentionOutpatient minor complications (n = 19)Out7UKAF61YesNoSuperficial SSI, admitted for IV antibioticsOut8UKAM68NoNoNondisplaced tibial plateau fracture, nonoperativeOut9TKAM61NoNoPostoperative urinary retentionOut10UKAM67NoNoPostoperative urinary retentionOut11UKAF64NoNoDistal DVTOut12UKAM52NoNoRashOut13TKAM60NoNoPeri-incisional erythema, treated with oral antibioticsOut14THAF54NoNoRashOut15THAM53NoNoNoOut16UKAF59NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut24UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut25TKAF68No <t< td=""><td>Out6</td><td>THA</td><td>F</td><td>66</td><td>Yes</td><td>No</td><td>Readmitted for postoperative</td></t<>	Out6	THA	F	66	Yes	No	Readmitted for postoperative
Outpatient minor complications (n = 19)Out7UKAF61YesNoSuperficial SSI, admitted for IV antibioticsOut8UKAM68NoNoNondisplaced tibial plateau fracture, nonoperativeOut9TKAM61NoNoWorsening of chronic partial DVT of popliteal veinOut10UKAM67NoNoPostoperative urinary retentionOut11UKAF64NoNoDistal DVTOut12UKAM60NoRashOut13TKAM60NoNoRashOut14THAF54NoNoRashOut15THAM53NoNoUrinary tract infection at 6 wkOut16UKAF61NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut18UKAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut18UKAF68NoNoPeri-incisional erythema, treated with oral antibiotics </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>ileus and urinary retention</td>							ileus and urinary retention
complications (n = 19)Out7UKAF61YesNoSuperficial SSI, admitted for IV antibioticsOut8UKAM68NoNoNondisplaced tibial plateau fracture, nonoperativeOut9TKAM61NoNoWorsening of chronic partial DVT of popliteal veinOut10UKAM67NoNoPostoperative urinary retentionOut11UKAF64NoNoDistal DVTOut12UKAM52NoNoRashOut13TKAM60NoNoPeri-incisional erythema, treated with oral antibioticsOut14THAF54NoNoRashOut15THAM53NoNoUrinary tract infection at 6 wkOut16UKAF61NoNoUrinary tract infection at 8 wkOut17TKAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut18UKAF46NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF68NoNoPeri-incisional e	Outpatient minor						
Out7UKAF61YesNoSuperficial SSI, admitted for IV antibioticsOut8UKAM68NoNoNondisplaced tibial platau fracture, nonoperativeOut9TKAM61NoNoWorsening of chronic partial DVT of popliteal veinOut10UKAM67NoNoPostoperative urinary retentionOut11UKAF64NoNoDistal DVTOut12UKAM52NoNoRashOut13TKAM52NoNoPeri-incisional erythema, treated withOut14THAF54NoNoRashOut15THAM53NoNoCroin numbness from positionerOut16UKAF59NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut19UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF68NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut22HRM42NoNoRashOut24UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut23UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut24UKAF62 <td>complications $(n = 19)$</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	complications $(n = 19)$						
Out8UKAM68NoNoNondisplaced tibial plateau fracture, nonoperativeOut9TKAM61NoNoWorsening of chronic partial DVT of popliteal veinOut10UKAM67NoNoPostoperative urinary retentionOut11UKAF64NoNoDistal DVTOut12UKAM52NoNoRashOut13TKAM60NoPeri-incisional erythema, treated with oral antibioticsOut14THAF54NoNoRashOut15THAM53NoNoUrinary tract infection at 6 wkOut16UKAF59NoNoUrinary tract infection at 8 wkOut17TKAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut16UKAF61NoNoUrinary tract infection at 8 wkOut17TKAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut18UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPreumonia at 1 wk, urinary tract infection at 8 wkOut21UKAF68NoNoRashOut22HRM42NoNoSuperficial hematomaOut23UKAF62NoNoRashOut24UKA <td>Out7</td> <td>UKA</td> <td>F</td> <td>61</td> <td>Yes</td> <td>No</td> <td>Superficial SSI, admitted for IV antibiotics</td>	Out7	UKA	F	61	Yes	No	Superficial SSI, admitted for IV antibiotics
Out9TKAM61NoNoWorsening of chronic partial DVT of popliteal veinOut10UKAM67NoNoPostoperative urinary retentionOut11UKAF64NoNoDistal DVTOut12UKAM52NoNoRashOut13TKAM60NoNoPeri-incisional erythema, treated with oral antibioticsOut14THAF54NoNoRashOut15THAM53NoNoGroin numbness from positionerOut16UKAF59NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoUrinary tract infection at 8 wkOut18UKAF50NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF50NoNoPeri-incisional erythema, treated with oral antibioticsOut12UKAF46NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF50NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF48NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF48NoNoPeri-incisional erythema treated with oral antibioticsOut22UKAF48NoNoSuperficial hematomaOut23UKAF62 </td <td>Out8</td> <td>UKA</td> <td>Μ</td> <td>68</td> <td>No</td> <td>No</td> <td>Nondisplaced tibial plateau fracture, nonoperative</td>	Out8	UKA	Μ	68	No	No	Nondisplaced tibial plateau fracture, nonoperative
Out10UKAM67NoNoPostoperative urinary retentionOut11UKAF64NoNoDistal DVTOut12UKAM52NoNoRashOut13TKAM60NoNoPeri-incisional erythema, treated with oral antibioticsOut14THAF54NoNoRashOut15THAM53NoNoGroin numbness from positionerOut16UKAF59NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPrei-incisional erythema, treated with oral antibioticsOut21UKAF48NoNoPrei-incisional erythema, treated with oral antibioticsOut23UKAF48NoNoPrei-incisional erythema, treated with oral antibioticsOut23UKAF62NoNoRashOut24UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out9	TKA	Μ	61	No	No	Worsening of chronic partial DVT of popliteal vein
Out11UKAF64NoNoDistal DVTOut12UKAM52NoNoRashOut13TKAM60NoNoPeri-incisional erythema, treated with oral antibioticsOut14THAF54NoNoRashOut15THAM53NoNoGroin numbness from positionerOut16UKAF59NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut22HRM42NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut23UKAF62NoNoRashOut24UKAF62NoNoPeri-incisional erythema, treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out10	UKA	Μ	67	No	No	Postoperative urinary retention
Out12UKAM52NoNoRashOut13TKAM60NoNoPeri-incisional erythema, treated with oral antibioticsOut14THAF54NoNoRashOut15THAM53NoNoGroin numbness from positionerOut16UKAF59NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoPeri-incisional erythema, treated with oral antibioticsOut18UKAF46NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF50NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF68NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut22HRM38NoNoRashOut23UKAF62NoNoPeri-incisional erythema, treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out11	UKA	F	64	No	No	Distal DVT
Out13TKAM60NoNoPeri-incisional erythema, treated with oral antibioticsOut14THAF54NoNoRashOut15THAM53NoNoGroin numbness from positionerOut16UKAF59NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoUrinary tract infection at 8 wkOut18UKAF46NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut22HRM42NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut23UKAF62NoNoRashOut24UKAF62NoNoPeri-incisional erythema, treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out12	UKA	Μ	52	No	No	Rash
Out14THAF54NoNoRashOut15THAM53NoNoGroin numbness from positionerOut16UKAF59NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoUrinary tract infection at 8 wkOut18UKAF46NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF48NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut22HRM42NoNoSuperficial hematomaOut23UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out13	TKA	М	60	No	No	Peri-incisional erythema, treated with
Out14THAF54NoNoRashOut15THAM53NoNoGroin numbness from positionerOut16UKAF59NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoUrinary tract infection at 8 wkOut18UKAF46NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF50NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut21UKAF48NoNoSuperficial hematomaOut22HRM38NoNoSuperficial hematomaOut24UKAF62NoNoPeri-incisional erythema, treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema treated with oral antibiotics							oral antibiotics
Out15THAM53NoNoGroin numbness from positionerOut16UKAF59NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoUrinary tract infection at 8 wkOut18UKAF46NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF50NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPeri-incisional erythema, treated with oral antibioticsOut21UKAF48NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut22HRM42NoNoSuperficial hematomaOut23UKAF62NoNoPeri-incisional erythema, treated with oral antibioticsOut24UKAF62NoNoPeri-incisional erythema, treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out14	THA	F	54	No	No	Rash
Out16UKAF59NoNoUrinary tract infection at 6 wkOut17TKAF61NoNoUrinary tract infection at 8 wkOut18UKAF46NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF50NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPneumonia at 1 wk, urinary tract infection at 8 wkOut21UKAF48NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut22HRM42NoNoSuperficial hematomaOut23UKAM38NoNoRashOut24UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema treated with oral antibiotics	Out15	THA	Μ	53	No	No	Groin numbness from positioner
Out17TKAF61NoNoUrinary tract infection at 8 wkOut18UKAF46NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF50NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPneumonia at 1 wk, urinary tract infection at 8 wkOut21UKAF68NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut22HRM42NoNoSuperficial hematomaOut23UKAM38NoNoRashOut24UKAF62NoNoPeri-incisional erythema, treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out16	UKA	F	59	No	No	Urinary tract infection at 6 wk
Out18UKAF46NoNoPeri-incisional erythema, treated with oral antibioticsOut19TKAF50NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPneumonia at 1 wk, urinary tract infection at 8 wkOut21UKAF68NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut22HRM42NoNoSuperficial hematomaOut23UKAM38NoNoRashOut24UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out17	TKA	F	61	No	No	Urinary tract infection at 8 wk
Out19TKAF50NoNoPeri-incisional erythema, treated with oral antibioticsOut20UKAF68NoNoPneumonia at 1 wk, urinary tract infection at 8 wkOut21UKAF48NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut22HRM42NoNoSuperficial hematomaOut23UKAM38NoNoRashOut24UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out18	UKA	F	46	No	No	Peri-incisional erythema, treated with oral antibiotics
Out20UKAF68NoNoPneumonia at 1 wk, urinary tract infection at 8 wkOut21UKAF48NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut22HRM42NoNoSuperficial hematomaOut23UKAM38NoNoRashOut24UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out19	ТКА	F	50	No	No	Peri-incisional erythema, treated with oral antibiotics
Out21UKAF48NoNoPostoperative fall with distal radius fracture requiring ORIF at 2 wk postoperativeOut22HRM42NoNoSuperficial hematomaOut23UKAM38NoNoRashOut24UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out20	UKA	F	68	No	No	Pneumonia at 1 wk, urinary tract infection at 8 wk
Out22HRM42NoNoSuperficial hematomaOut23UKAM38NoNoRashOut24UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out21	UKA	F	48	No	No	Postoperative fall with distal radius fracture
Out22HRM42NoNoSuperficial hematomaOut23UKAM38NoNoRashOut24UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics							requiring ORIF at 2 wk postoperative
Out23UKAM38NoNoRashOut24UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out22	HR	Μ	42	No	No	Superficial hematoma
Out24UKAF62NoNoPeri-incisional erythema treated with oral antibioticsOut25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out23	UKA	Μ	38	No	No	Rash
Out25TKAM52NoNoPeri-incisional erythema, treated with oral antibiotics	Out24	UKA	F	62	No	No	Peri-incisional erythema treated with oral antibiotics
	Out25	TKA	М	52	No	No	Peri-incisional erythema, treated with oral antibiotics

M, male; F, female; TKA, total knee arthroplasty; UKA, unicondylar knee arthroplasty; THA, total hip arthroplasty; HR, hip resurfacing; SSI, surgical site infection; IV, intravenous; PACU, postanesthesia care unit; DVT, deep vein thrombosis; ORIF, open reduction internal fixation.

dislocation after THA ranging from 0% to 2.0% and rates of knee manipulation for arthrofibrosis ranging from 0% to 5.7% at 90 days [25]. Interestingly, there were no deep infections in either group, but the incidence of superficial SSI, at 1.0% overall, is consistent with previously published reports [10].

In contrast to the current study, Lovecchio et al [5] concluded that outpatients have higher complication rates after TKA and THA, and they attributed this difference to the 4.1% incidence of blood transfusion occurring after the day of surgery in the outpatient cohort. However, this database analysis did not discuss the blood

management strategies utilized in either cohort. In the current study, the one patient requiring a blood transfusion was in the inpatient group and had a history of chronic renal failure with preoperative hemoglobin of 9.0 g/dL. The low prevalence of transfusion in our study is likely related to the routine administration of tranexamic acid prior to surgery.

The incidence of unplanned clinic visits was nearly doubled in the outpatient cohort, yet this difference did not reach statistical significance with our sample size. Although the perception may be that outpatient surgery decreases surgeon workload, in our experience performing outpatient surgery greatly increases the need for physician and physician extender contact with the patient. In our practice, we call patients frequently in the early postoperative period and the threshold to have patients come into the office for evaluation is low, evidenced by the higher rate of unplanned clinic visits. Hence, surgeons considering performing outpatient procedures should anticipate this increase in workload. Importantly, the risk of visit to an ED was only slightly higher in the outpatient group, suggesting that the increased attention paid to these patients did not lead to an increase in healthcare expenditures.

Similarly, the readmission rate for the 2 groups of patients was identical, at just over 2%. Given the high cost of readmissions, this is an important metric to consider when evaluating surgical procedures performed at an ambulatory surgery center. The readmission rates of this current study compare favorably to those reported previously. A single-institution series of 1781 THAs reported 139 readmissions (8.9%) in the 90 days following surgery, with the 3 leading causes of readmission being THA infection, dislocation, and wound complication [17]. Another study of inpatient THAs reports a 90-day readmission rate of 4.7% (11/232), with only 1 of the 11 readmissions occurring after postoperative day 30 [18]. A singlesurgeon series of outpatient THAs performed at an ambulatory surgery center reported a 2% hospital admission rate (3/145) in the 90 days following surgery, which is similar to our own rate of readmission [19]. Large database studies of primary arthroplasty patients report similar readmission rates at 30-day follow-up: 2.0%-3.0% for inpatients and 1.4%-2.4% for outpatients [5,15,26], but the utility of comparing these 30-day values with our 90-day outcomes is limited given the shorter time of follow-up.

The current study's overall reoperation rate of 1.2% compares favorably to the 90-day reoperation rate reported in previous studies. Toy et al [19] found a 90-day reoperation rate of 2.8% (4/ 145) in their series of outpatient THA. Of 111 outpatient knee arthroplasties (86 TKAs and 25 UKAs), Berger et al [7] report 2 reoperations (1.8%) within the first 3 months, both for superficial irrigation and debridement after TKA. Similarly, a smaller series of 51 THA, TKA, and UKA patients only report 1 reoperation (2.0%) [20]. A series of 232 inpatient THAs report a 90-day reoperation rate of 1.3% [18], quite similar to the current study.

Although the reoperation rate was low in both groups, there was a trend toward a higher reoperation rate among the patients who had surgery at the ambulatory surgery center. Two of the 5 reoperations in the outpatient group in retrospect were judgment calls (decompression of a nerve palsy and revision of a subluxed hip), both of which the surgeon may have treated without immediate surgical intervention if they had been performed in the hospital. In the 1 randomized trial of inpatient vs outpatient surgery, Goyal et al [3] reported a 1.4% reoperation rate and no difference between groups, while database studies have reported 30-day reoperation rates ranging from 0.2% to 2.4%, depending on inclusion criteria [5,10,15,26,27]. When interpreting these previous database studies, it is important to consider the inherent selection bias when comparing all inpatient vs outpatient procedures, without appropriately matching the 2 cohorts, and to clarify the definition of "outpatient" arthroplasty [15,16]. Database studies using

methodology similar to the current study, by including same-day discharge as the criteria for an outpatient procedure and by matching the 2 study groups, report 30-day reoperation rates that are similar to the 90-day reoperation rates reported in this study, making meaningful comparison between the rates challenging given the difference in length follow-up.

There are several important limitations to the current study. Given the retrospective nature of this study, the strength of evidence is inherently limited. Although we matched the patients carefully to obtain very similar cohorts (Table 1), it is still possible that some bias exists between the cohorts, and a prospective randomized trial would provide a stronger level of evidence to support the conclusions of the current study. Given the rarity of events, a multicenter study would be ideal to maximize sample size. Furthermore, our sample size while larger than most prior studies was relatively small which limits our statistical power to detect differences between the 2 groups. In addition, the duration of follow-up is limited to 90 days, and further follow-up will be required to address any differences in long-term outcomes. However, because our primary concern is the safety and perioperative outcomes of outpatient surgery, we do have the appropriate followup to answer our study question. Finally, our study includes 4 different arthroplasty procedures, which are equally represented in both study groups. Although the matching process ensures similar patient characteristics in each cohort, the numbers included for each procedure are not sufficiently powered to draw conclusions specific to each of the 4 procedures. However, the single-surgeon matched cohort design increases the internal validity of the study by maximizing similarity between the inpatient and outpatient cohorts.

In conclusion, our data suggest that in select patients total joint arthroplasty can be safely performed in a free-standing ambulatory surgery center with rates of readmission and complications which are similar to patients having a traditional inpatient stay. Given the potential benefits of reduced costs and increased patient satisfaction [2,25,28–32], future larger studies should be performed to confirm the current results.

Acknowledgment

The authors with to acknowledge Bryce Basques for his assistance in formulating the project proposal and initiating the IRB process.

References

- Kolisek FR, McGrath MS, Jessup NM, Monesmith EA, Mont MA. Comparison of outpatient versus inpatient total knee arthroplasty. Clin Orthop Relat Res 2009;467:1438–42.
- [2] Lovald ST, Ong KL, Malkani AL, Lau EC, Schmier JK, Kurtz SM, et al. Complications, mortality, and costs for outpatient and short-stay total knee arthroplasty patients in comparison to standard-stay patients. J Arthroplasty 2014;29:510–5.
- [3] Goyal N, Chen AF, Padgett SE, Tan TL, Kheir MM, Hopper RH, et al. Otto Aufranc Award: a multicenter, randomized study of outpatient versus inpatient total hip arthroplasty. Clin Orthop Relat Res 2017;475:364–72.
- [4] Parvizi J, Mui A, Purtill JJ, Sharkey PF, Hozack WJ, Rothman RH. Total joint arthroplasty: when do fatal or near-fatal complications occur? J Bone Joint Surg Am 2007;89:27–32.
- [5] Lovecchio F, Alvi H, Sahota S, Beal M, Manning D. Is outpatient arthroplasty as safe as fast-track inpatient arthroplasty? A propensity score matched analysis. J Arthroplasty 2016;31:197–201.
- [6] Berger RA, Sanders SA, Thill ES, Sporer SM, Della Valle C. Newer anesthesia and rehabilitation protocols enable outpatient hip replacement in selected patients. Clin Orthop Relat Res 2009;467:1424–30.
- [7] Berger RA, Kusuma SK, Sanders SA, Thill ES, Sporer SM. The feasibility and perioperative complications of outpatient knee arthroplasty. Clin Orthop Relat Res 2009;467:1443–9.
- [8] Cross MB, Berger R. Feasibility and safety of performing outpatient unicompartmental knee arthroplasty. Int Orthop 2014;38:443–7.

B. Darrith et al. / The Journal of Arthroplasty xxx (2018) 1-7

- [9] Gondusky JS, Choi L, Khalaf N, Patel J, Barnett S, Gorab R. Day of surgery discharge after unicompartmental knee arthroplasty: an effective perioperative pathway. J Arthroplasty 2014;29:516–9.
- [10] Courtney PM, Boniello AJ, Berger RA. Complications following outpatient total joint arthroplasty: an analysis of a national database. J Arthroplasty 2017;32: 1426–30.
- [11] Dorr LD, Thomas DJ, Zhu J, Dastane M, Chao L, Long WT. Outpatient total hip arthroplasty. J Arthroplasty 2010;25:501–6.
- [12] New Medicare data available to increase transparency on hospital utilization. Baltimore, MD: Centers for Medicare and Medicaid Services; 2015. https:// www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2015-Fact-sheetsitems/2015-06-01.html. [Accessed 10 January 2018].
- [13] Kurtz S, Ong K, Lau E, Mowat F, Halpern M. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. J Bone Joint Surg Am 2007;89:780–5.
- [14] CMS Proposes Hospital Outpatient Prospective Payment System and Ambulatory Surgical Center Payment System Changes for 2018, and Releases a Request for Information (CMS-1678-P). Baltimore, MD: U.S. Centers for Medicare & Medicaid Services; 2017. https://www.cms.gov/Newsroom/MediaRelease Database/Fact-sheets/2017-Fact-Sheet-items/2017-07-13.html. [Accessed 10 January 2018].
- [15] Bovonratwet P, Ondeck NT, Nelson SJ, Cui JJ, Webb ML, Grauer JN. Comparison of outpatient vs inpatient total knee arthroplasty: an ACS-NSQIP analysis. J Arthroplasty 2017;32:1773–8.
- [16] Bovonratwet P, Webb ML, Ondeck NT, Lukasiewicz AM, Cui JJ, McLynn RP, et al. Definitional differences of 'outpatient' versus 'inpatient' THA and TKA can affect study outcomes. Clin Orthop Relat Res 2017;475:2917.
- [17] Plate JF, Brown ML, Wohler AD, Seyler TM, Lang JE. Patient factors and cost associated with 90-day readmission following total hip arthroplasty. J Arthroplasty 2016;31:49–52.
- [18] Elmallah RK, Cherian JJ, Amin H, Jauregui JJ, Pierce TP, Mont MA. Readmission rates in patients who underwent total hip arthroplasty. Surg Technol Int 2015;27:e7.
- [19] Toy PC, Fournier MN, Throckmorton TW, Mihalko WM. Low rates of adverse events following ambulatory outpatient total hip arthroplasty at a freestanding surgery center. J Arthroplasty 2018;33:46–50.

- [20] Parcells BW, Giacobbe D, Macknet D, Smith A, Schottenfeld M, Harwood DA, et al. Total joint arthroplasty in a stand-alone ambulatory surgical center: short-term outcomes. Orthopedics 2016;39:223–8.
- [21] Phillips CB, Barrett JA, Losina E, Mahomed NN, Lingard EA, Guadagnoli E, et al. Incidence rates of dislocation, pulmonary embolism, and deep infection during the first six months after elective total hip replacement. J Bone Joint Surg Am 2003;85-A:20-6.
- [22] Malkani AL, Ong KL, Lau E, Kurtz SM, Justice BJ, Manley MT. Early- and lateterm dislocation risk after primary hip arthroplasty in the Medicare population. J Arthroplasty 2010;25(6 Suppl):21–5.
- [23] Mahomed NN, Barrett JA, Katz JN, Phillips CB, Losina E, Lew RA, et al. Rates and outcomes of primary and revision total hip replacement in the United States Medicare population. J Bone Joint Surg Am 2003;85-A:27–32.
- [24] Issa K, Rifai A, Boylan MR, Pourtaheri S, McInerney VK, Mont MA. Do various factors affect the frequency of manipulation under anesthesia after primary total knee arthroplasty? Clin Orthop Relat Res 2015;473:143–7.
- [25] Pollock M, Somerville L, Firth A, Lanting B. Outpatient total hip arthroplasty, total knee arthroplasty, and unicompartmental knee arthroplasty. JBJS Rev 2016;4:e4.
- [26] Nelson SJ, Webb ML, Lukasiewicz AM, Varthi AG, Samuel AM, Grauer JN. Is outpatient total hip arthroplasty safe? J Arthroplasty 2017;32:1439–42.
 [27] Otero JE, Gholson JJ, Pugely AJ, Gao Y, Bedard NA, Callaghan JJ. Length of
- [27] Otero JE, Gholson JJ, Pugely AJ, Gao Y, Bedard NA, Callaghan JJ. Length of hospitalization after joint arthroplasty: does early discharge affect complications and readmission rates? J Arthroplasty 2016;31:2714–25.
- [28] Aynardi M, Post Z, Ong A, Orozco F, Sukin DC. Outpatient surgery as a means of cost reduction in total hip arthroplasty: a case-control study. HSS J 2014;10: 252–5.
- [29] Carey K. Price increases were much lower in ambulatory surgery centers than hospital outpatient departments in 2007-12. Health Aff (Millwood) 2015;34: 1738–44.
- [30] Springer BD, Odum SM, Vegari DN, Mokris JG, Beaver Jr WB. Impact of inpatient versus outpatient total joint arthroplasty on 30-day hospital readmission rates and unplanned episodes of care. Orthop Clin North Am 2017;48:15–23.
- [31] Bertin KC. Minimally invasive outpatient total hip arthroplasty: a financial analysis. Clin Orthop Relat Res 2005;435:154–63.
- [32] Goldfarb CA, Bansal A, Brophy RH. Ambulatory surgical centers: a review of complications and adverse events. J Am Acad Orthop Surg 2017;25:12–22.