



ELSEVIER

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Allergies, Preoperative Narcotic Use, and Increased Age Predict Failed Same-Day Discharge After Joint Replacement

Elizabeth G. Lieberman, MD ^{a,*}, Erik J. Hansen, MD ^b, John C. Clohisy, MD ^c, Ryan M. Nunley, MD ^c, Charles M. Lawrie, MD ^c^a Department of Orthopaedic Surgery, Oregon Health & Science University, Portland, OR^b Department of Orthopaedic Surgery, Medical University of South Carolina, Charleston, SC^c Department of Orthopaedic Surgery, Washington University in St. Louis, St. Louis, MO

ARTICLE INFO

Article history:

Received 22 November 2020

Received in revised form

25 December 2020

Accepted 7 January 2021

Available online xxx

Keywords:

same-day discharge
outpatient arthroplasty
total knee arthroplasty
total hip arthroplasty
joint arthroplasty

ABSTRACT

Background: Identifying predictors of failed same-day discharge (SDD) is critical for patient selection. We evaluated patient factors associated with failure of SDD in patients undergoing elective total joint arthroplasty (TJA) in a hospital setting.**Methods:** We retrospectively reviewed consecutive patients who underwent primary total knee arthroplasty (TKA) and total hip arthroplasty (THA) between January 31, 2018 and February 1, 2020 by one of the 3 fellowship-trained arthroplasty surgeons. Patient demographics, comorbidities, and clinical data were collected. Analysis was performed to assess risk factors for failed SDD.**Results:** In total, 2615 TJAs (1425 TKAs, 1190 THAs) were performed over the study period. Two hundred seventy-one (10.4%) were SDDs (80 TKAs, 191 THAs). There were fewer TKAs than THAs (5.6% vs 16.1%, $P < .001$). Forty-five patients failed SDD (16.6%). Failure rates were similar in TKA and THA (18.8%, 15.7%, $P = .54$). The most common reasons for failure of SDD were hypotension (11, 24.4%), delayed resolution of spinal anesthesia (11, 24.4%), and nausea (5, 11.1%). Age over 70 years ($P = .007$), greater than 2 self-reported allergies ($P < .001$), and preoperative narcotic use ($P = .01$) were associated with failure of SDD. Gender, body mass index, American Society of Anesthesiologists class, and prior TJA were not significantly associated ($P > .05$).**Conclusion:** Success of SDD was greater than 80%. Hypotension, delayed resolution of spinal anesthesia, and nausea accounted for 60% of failures of SDD. Patients >70 years, those with >2 self-reported drug allergies, or patients who used preoperative narcotics were at high risk for failure of SDD after THA or TKA.

© 2021 Elsevier Inc. All rights reserved.

Outpatient total joint arthroplasty (TJA) is becoming increasingly commonplace. There are many motivating factors including cost savings, patient safety, and patient satisfaction that are driving

the trend toward same-day discharge (SDD). SDD has been shown to be economical and safe when performed in appropriately selected patients [1]. The success of SDD is reliant on a team-based approach with standardized and comprehensive preoperative and postoperative protocols [2]. Prior research has found outpatient arthroplasty performed in a hospital setting to have high rates of successful discharge with reports of 82%–100% of patients discharging on the day of surgery [3,4]. The success of SDD in a hospital setting has naturally evolved to increased rates of TJA procedures being performed at ambulatory surgery centers (ASC). The COVID-19 pandemic has accelerated the rate of TJA procedures moving to ASCs in order to keep elective surgery patients out of hospitals [5]. ASCs do not always have the ability to admit a patient for overnight stay, thus with this transition comes the risk of unplanned hospital admission for the patients who fail SDD.

Declaration of Interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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.2021.01.015>.

* Reprint requests: Elizabeth G. Lieberman, MD, Department of Orthopaedic Surgery, Oregon Health & Science University, 10000 SE Main St. Ste 226, Portland, OR 97216.

<https://doi.org/10.1016/j.arth.2021.01.015>

0883-5403/© 2021 Elsevier Inc. All rights reserved.

Patient selection is paramount to SDD success. Exclusion criteria have been previously defined including factors such as age, body mass (BMI), and other medical comorbidities. However, current risk stratification and patient selection algorithms remain imperfect as failures of SDD continue to occur [6–8]. Therefore, the purpose of this study is to examine reasons for failed SDD and to evaluate patient factors associated with failure of SDD in patients undergoing elective primary TJA in a hospital setting.

Materials and Methods

Institutional Review Board Approval was obtained prior to initiation of this study. We performed a retrospective review of consecutive patients who underwent unilateral TJA at a single multispecialty hospital between January 2018 and February 2020. All surgeries were performed by one of the 3 arthroplasty fellowship-trained surgeons (xx, xx, xx) in a single hospital. No surgeries were performed at an outpatient surgery center. Two of the 3 surgeons performed both direct anterior and posterior approach for total hip arthroplasty (THA), and the third surgeon performed only posterior approach for THA. Total knee arthroplasties (TKAs) were all performed using conventional instrumentation; no navigation, robotic, or computer assistance was utilized. Patients were included in the study group if they were designated preoperatively as SDD. This designation is offered to all patients who express interest in SDD and who do not have significant cardiac, renal, pulmonary, or psychological comorbidities.

All patients underwent standardized medical evaluation by an anesthesia practitioner at our institution's Center for Preoperative Assessment and Planning, designated a "joint coach" or person who would assist them perioperatively and participated in a preoperative TJA educational class. Patients communicated with an orthopedic case manager who coordinated preoperative outpatient visits and arranged home health aftercare visits. SDD inclusion and exclusion criteria are displayed in Table 1.

A multimodal analgesia regimen was prescribed, which is shown in Table 2. Our preferred anesthesia was spinal anesthesia with bupivacaine. Patients received intraoperative intravenous (IV) tranexamic acid, which was adjusted based on age and kidney function. Preoperative antibiotics were given prior to skin incision. A periarticular injection was administered by the surgeon prior to closing. Patients were hydrated with IV normal saline; 3 L given intraoperatively and 1 L given in the postacute care unit. Institutional protocol for patients receiving spinal anesthesia was to place a Foley catheter preoperatively, which was maintained in the acute postoperative period. Postoperatively, all patients were admitted to our surgical inpatient unit. Patients were ordered to be out of bed with physical therapy or nursing assistance as soon as their spinal

Table 1
Inclusion and Exclusion Criteria for SDRP Eligibility.

Inclusion	Exclusion
Patient interest/expectation	Patient desires overnight stay
Completed CPAP appointment	Limited support at home
Primary joint arthroplasty	Discharge location >2 h from hospital
Healthy joint coach	Bilateral arthroplasty surgery
Safe discharge location	Revision or complex total joint arthroplasty
Established home aftercare visits	Extended care facility placement
	Surgery performed for fracture
	Significant medical comorbidity
	Baseline physical deconditioning
	Significant cardiopulmonary, renal, respiratory, or psychiatric comorbidities

CPAP, Center for Preoperative Assessment and Planning; SDRP, same-day rapid discharge protocol.

Table 2
Perioperative Multimodal Analgesia Regimen.

Time of Delivery	Medication ^a
Preoperative	
Evening before surgery	Celecoxib 200 mg PO
Within 2 h of surgery	Acetaminophen 650 mg PO
Intraoperative	
Age <65 y	Ketorolac IV 30 mg
Age >65 y	Ketorolac IV 15 mg
	Periarticular injection: ketorolac + bupivacaine
Postoperative	
All patients	Celecoxib 200 mg PO BID × 5 d
Age <65 y	Ketorolac IV 30 mg × 1 dose
Age >65 y	Ketorolac IV 15 mg × 1 dose
THA	Hydrocodone/acetaminophen 5/325 mg PO Q4H prn pain
TKA	Oxycodone/acetaminophen 5/325 mg PO Q4H prn pain

PO, by mouth; IV, intravenous; BID, twice daily; Q4H, every 4 hours; THA, total hip arthroplasty; TKA, total knee arthroplasty.

^a All medications adjusted based on age, renal function, and patient allergies.

was light enough to permit standing. Ice was placed around the operative extremity when patients were in bed or seated in a chair. Once they were ambulatory, the Foley catheter was removed. Patients were felt to be safe for discharge when they met the following criteria: physical therapy clearance, voiding independently, tolerating oral fluids and food, pain adequately controlled on oral medications, and felt confident in their discharge. All patients were seen by a physical therapist who evaluated 5 categories of patient mobility as shown in Table 3. Patients were cleared for discharge if the amount of assistance required in each category could be met by the assistance available to the patient at their home. If unable to discharge on the day of surgery, the reason for failed SDD was documented.

We reviewed electronic medical records to collect demographic information, number of patient-reported allergies, and preoperative narcotic use (including tramadol). Statistical analysis was performed using Microsoft Excel 2020 (Microsoft Office Corporation, Seattle, WA). Mean values were compared with Student's *t*-test and analysis of variance. Proportions were calculated and analyzed with the chi-squared test. A *P*-value of .05 was set as the level of significance for all analysis.

Results

Of the 2615 TJAs (1425 TKAs, 1190 THAs) performed over the study period, 271 (80 TKAs, 191 THAs) patients (10.4% of all elective primary TKAs/THAs) were preoperatively designated as SDD. The rate of SDD TKA patients was lower than SDD THA patients (80/1425, 5.6% vs 191/1190, 16.1%, $P < .001$) (Table 4). Overall, 45 patients failed SDD (16.6%). The failure rate was similar in TKA and THA (18.8%, 15.7%, $P = .54$) (Table 5). There was no difference in average age between successful and failed SDD (Table 4). However, when patients were grouped by age, there was higher percent failure in the >70-year-old group compared to the <50 and 50–70-year-old groups (37% vs 13.1%, 18.0%, $P = .003$) (Table 5). We compared patients less than 65 years with those 65 and older as this is the cutoff for Medicare. However, there was not a statistically significant difference between the groups. Similar rates of men and women were indicated for SDD. There was no difference in success or failure of SDD based on BMI, American Society of Anesthesiologists class, gender, or prior TJA (Tables 4 and 5).

The most common reasons for failure of SDD were postoperative hypotension (11, 24.4%), longer than anticipated spinal anesthesia (11, 24.4%), and nausea (5, 11.1%) (Table 6). Patients with >2 self-reported drug allergies had higher rates of failed SDD compared to those with <2 allergies (41.9% vs 9.5%, $P < .001$). Patients

Table 3

Physical Therapy Assessment Prior to Discharge.

Category	Tasks Assessed
Bed mobility	Assistance level, maintenance of precautions/weight-bearing status, physiologic response
Functional transfers	Assistance level, maintenance of precautions/weight-bearing status, safe use of DME, physiologic response
Ambulation	Assistance level, maintenance of precautions/weight-bearing status, safe use of DME, distance similar to requirement to return home, physiologic response
Stair negotiation	Assistance level, maintenance of precautions/weight-bearing status, safe use of DME, ability to negotiate amount required to return home, physiologic response
Overall balance/safety	Impulsiveness, comprehension of limitations/precautions/weight-bearing status, losses of balance requiring assistance to recover

DME, durable medical equipment.

reporting preoperative narcotic use, including tramadol, also had higher rates of failed of SDD (26.5% vs 14.1%, $P = .01$).

Discussion

In our cohort, success of SDD after primary THA and TKA with protocolized patient selection in a hospital setting was 83%. Patients age 70 and older, those who had >2 self-reported drug allergies, or patients who used preoperative narcotics were at increased risk for failure of a planned SDD after primary TJA.

In this study, 17% of patients failed SDD and required unanticipated overnight stay. This is similar to previous studies, which have reported successful SDD ranging from 74% to 100% [1,7,9–11]. Goyal et al [7] conducted a study randomizing unselected patients into outpatient vs inpatient THA and found that 76% of the unselected outpatient group was successful with SDD. Patients in this study

were <75 years old, BMI <40, and independent ambulators. Authors concluded SDD to be safe with unselected patients, however cautioned that an overnight stay option should be available [7].

Today, many outpatient TJAs are being performed at ASCs, where overnight stay may not be an option without transfer to a hospital. In a systematic review of outpatient arthroplasty, Jaibaji et al [1] found higher rates of successful SDD at ASCs compared to the hospital setting (97.5% vs 81.4%). There are likely differences in patient selection for surgery at an ASC vs hospital setting, which contribute to the different rates of success. However in their review, the only consistently different patient factors were younger age and ASA score, which was generally lower in the ASC patients [1]. In this study, all surgeries were performed in a hospital setting, which may influence patient selection. However, our findings of higher failure rate in older patients and patients with multiple allergies or preoperative narcotic use can be used to help determine which patients are at higher risk for requiring overnight admission and might be better suited for SDD in a hospital setting vs ASC.

The patients in this study were designated as SDD primarily based on patient interest and surgeon judgment. Medical comorbidities were considered individually, especially significant renal, cardiac, pulmonary, or psychological diagnoses. We have similar criteria for selecting THA and TKA patients for SDD. However, the higher rate of THA SDD patients suggests bias toward these patients, which may come from surgeon experience or preference. Although we did exclude patients undergoing bilateral or complex TJA, we did not have any specific age, BMI, or ASA cutoffs for SDD patients. However, we do have an inpatient stay option in our current hospital setting, thus the stakes of failing discharge are lower than surgeries performed at an ASC without an overnight stay option. Prior studies have reported specific inclusion and exclusion criteria to help guide surgeons in safe patient selection. Meneghini et al validated a risk assessment tool specific for

Table 4

Patient Demographics and Success vs Failure of SDD.

	Overall (n = 271)	Successful SDD (n = 226)	Failed SDD (n = 45)	P-Value
Age (y)	56.91 ± 11.59 (19–83)	56.56 ± 11.32 (20–83)	58.61 ± 12.72 (19–77)	.27
<50	61 (22.5%)	50 (22.1%)	11 (24.5%)	
50–70	183 (67.5%)	159 (70.4%)	24 (53.3%)	
>70	27 (10.0%)	17 (7.5%)	10 (22.2%)	
Medicare (age in years)				.13
<65	199 (73.4%)	170 (75.2%)	29 (64.4%)	
65 and older	72 (26.6%)	56 (24.8%)	16 (35.6%)	
Type of arthroplasty				<.0001
THA	191 (70.4%)	161 (71.2%)	30 (66.7%)	
TKA	80 (29.6%)	65 (28.7%)	15 (33%)	
Gender				.2
Men	143 (52.8%)	125 (55.5%)	18 (40%)	
Women	128 (47.2%)	101 (44.5%)	27 (60%)	
Average BMI (kg/m ²)	28.6 ± 5.25 (19.2–58.5)	28.86 ± 5.38 (19.2–58.5)	27.56 ± 4.37 (19.3–35.9)	.12
ASA class				.46
1	10 (3.7%)	7 (3.1%)	3 (6.7%)	
2	224 (82.7%)	187 (82.7%)	37 (82.2%)	
3	37 (13.6%)	32 (14.1%)	5 (11.1%)	
Allergies (average #)	1.04 ± 1.93 (0–21)	0.85 ± 1.37 (0–10)	1.9 ± 3.46 (0–21)	.0004
2	240 (88.6%)	208 (92.0%)	32 (71.1%)	
>2	31 (11.4%)	18 (8.0%)	13 (28.9%)	
Prior surgery				.12
No prior sx	197 (72.7%)	160 (70.8%)	37 (82.2%)	
Prior THA	45 (16.6%)	39 (17.6%)	6 (13.3%)	
Prior TKA	27 (10.0%)	26 (11.5%)	1 (2.2%)	
Both	2 (0.7%)	1 (0.4%)	1 (2.2%)	
Preop analgesia				.084
None	219 (80.8%)	188 (83.2%)	31 (68.9%)	
Narcotics	30 (11.1%)	22 (9.7%)	8 (17.8%)	
Tramadol	22 (8.1%)	16 (7.1%)	6 (13.3%)	
General anesthesia	4 (1.5%)	1 (0.4%)	3 (6.7%)	.002

ASA, American Society of Anesthesiologists; BMI, body mass index; SDD, same-day discharge; sx, surgery; THA, total hip arthroplasty; TKA, total knee arthroplasty.

Table 5
Patient Factors vs Percent of Failed SDD.

	% Fail	P-Value
Age (y)		
<50	11/61 (18.0%)	.007
50–70	24/183 (13.1%)	
>70	10/27 (37.0%)	
Medicare (age in years)		.07
<65	29/199 (14.6%)	
65 and older	16/72 (22.2%)	
Type of arthroplasty		.54
THA	30/191 (15.7%)	
TKA	15/80 (18.75%)	
Gender		.06
Men	18/143 (12.5%)	
Women	27/128 (21.1%)	
ASA class		.46
1	3/10 (30%)	
2	37/224 (12.1%)	
3	5/37 (13.5%)	
Allergies		<.0001
≤2	32/240 (9.5%)	OR 3.9
>2	13/31 (41.9%)	
Surgery		.19
No prior sx	37/197 (18.8%)	
Prior THA	6/45 (13.3%)	
Prior TKA	1/27 (3.7%)	
Both	1/2 (50%)	
Preop analgesia		.01
None	31/219 (14.1%)	OR 2.3
Narcotic pain medication	8/30 (26.6%)	
Tramadol	6/22 (27.2%)	
General anesthesia	3/4 (75%)	

ASA, American Society of Anesthesiologists; OR, odds ratio; SDD, same-day discharge; sx, surgery; THA, total hip arthroplasty; TKA, total knee arthroplasty.

outpatient TJA and found that scores based on 9 comorbidity areas had higher positive predictive value for successful SDD (up to 98.8%) compared to ASA designation or Charleston comorbidity scores [12,13]. Individual exclusion criteria that have been commonly cited in prior studies include but are not limited to age (<65 to <80) [7,14–18], BMI (<35 to <45) [4,7,15,16,18,19], ASA score (<3) [12,17,20], functional independence [21], postoperative home support [4,20,22], and nonoptimized cardiac, hepatic, pulmonary, or renal diseases [1,4,19,21]. There is lack of consensus regarding which factors or combination of risk factors lead to SDD failure and based on this study, we would suggest considering multiple allergies and preoperative narcotic use when evaluating patients.

Table 6
Reasons for Failure of SDD.

Reason for Failure	Number of Patients	Percent of Failures (n = 45)
Long spinal	11	24.4%
Hypotension	11	24.4%
Nausea	5	11.1%
Pain control	4	8.9%
Incision drainage	3	6.8%
Spouse anxiety	2	4.5%
Patient anxiety	2	4.5%
PT recommend observation	1	2.2%
Urinary retention	1	2.2%
Confusion	1	2.2%
Peroneal nerve palsy monitoring	1	2.2%
Glucose monitoring	1	2.2%
Headache	1	2.2%
Chest pain	1	2.2%

SDD, same-day discharge; PT, physical therapy.

In their 2016 review, Pollock et al [23] reported the average age of patient undergoing outpatient hip and knee arthroplasty to be younger than the 2014 United States reported average (hip 53.5–63 vs 67.7, knee 55–68 vs 66.1). Similarly, Goyal et al reported average age of outpatient TJA patients to be 58.3 compared to UK Joint Registry averages of 70 and 69-year-old for THA and TKA respectively [1]. The average age of our same-day rapid discharge protocol designated patients was 57, which is consistent with these prior findings. We did find that patients over age 70 had higher rates of failure compared to those who were 70 or younger. There was however no difference between patients under the age of 50 and those between 50 and 70. Previous studies have associated older age with increased length of hospital stay and pertaining specifically to outpatient TJA, older age has been shown to be associated with higher rates of adverse events or readmission [24–26]. Thus, while there has not been an age limitation proven to predict success, we feel age should be considered when indicating a patient for SDD.

Multiple studies have found associations between patient reported allergies and negative outcomes following TJA [27–30]. In this study, we found that patients who reported 2 or more allergies were at increased risk for failed SDD. This is similar to findings reported by Fraser et al [10] who found 78% of patients who reported 2 or more allergies failed SDD, while the failure rate of patients reporting 0 or 1 allergies was 22%. It has been hypothesized that patient reported allergies may be an indicator of lower functional status or correlated with higher levels of depression or anxiety, however that was not the focus of the present study [27–29].

Preoperative narcotic use has been negatively associated with TJA outcomes. Patients who take narcotic pain medication before TJA surgery are at higher risk of requiring IV pain medication postoperatively, have been found to have longer length of stay, and have increased postoperative narcotic pain medication requirements [31–33]. Chronic opioid use has been listed as an exclusion criterion for SDD in some studies [7,34]. We found patients who reported preoperative narcotic use to be at a higher risk of failing SDD than those who did not report narcotic use. In a recent study, Crawford et al [35] found high rates of underreporting of narcotic use, which may confound our results which are based on self-reported narcotic use. Preoperative tramadol use has also been associated with lower postoperative function; however, there is limited literature focused on tramadol [36]. Although there were fewer patients who reported preoperative tramadol use in this study, the rates of failed SDD were similar to chronic opioid users.

In addition to identifying risk factors for failure of SDD, we studied the reasons why patients were not able to discharge, the most common being long-acting spinal anesthesia or hypotension. Spinal anesthesia is generally favored over general anesthesia for SDD patients; however, there may be increased risk of delay in ambulation or urinary retention with spinal anesthesia [1,15]. Although long-acting spinal anesthesia was a common reason for failed SDD in our study, general anesthesia was not a superior alternative and 3 out of 4 patients who had general anesthesia required overnight stay. The dosage and agents used for the spinal anesthesia are modifiable factors, which may reduce the rate of failed SDD due to long-acting spinal anesthesia [18]. The patients with long-acting spinal anesthesia may have received higher dosage per weight; however, this relationship was not directly studied. Hypotension is another common reason cited for failure of SDD [1]. Although we have protocols in place to stop antihypertensive medications perioperatively and give patients IV fluid during surgery, this is another area where modifying protocols may increase successful SDD.

There were several limitations to this study. This was a retrospective review of patients who were selected for SDD at a single institution. Thus, our results may not be generalizable to all patient populations or facilities. The main focus of this study is to examine preoperative patient factors; however, there are perioperative factors that were not included in this study such as length of surgery, blood loss, intraoperative fluid administration, time of day when surgery is performed, and physical therapy protocols, which may impact success of SDD. Although we found higher rates of failures in patients with 2 or more reported allergies, we did not quantify the severity or type of allergies. We also did not examine medications which are not part of our SDD protocol. This includes the dosage used for spinal anesthesia, which was one of the common reasons for failed SDD. Bupivacaine was the anesthetic of choice during the study period; however, we did not verify the specific medications used in individual patients. Additionally, our selection criteria had some degree of subjectivity as we do not use a scoring system and consider comorbidities on an individual patient basis. Only 10% of lower extremity arthroplasty procedures performed during the study period were selected to be SDD so we are unable to apply this data to a more general patient population.

In conclusion, we have seen high rates of success with our SDD program but there are still some areas for improvement. We found that patients who are over 70 years have multiple reported allergies, or who take narcotic pain medication, including tramadol, preoperatively are at increased risk for failing SDD. These factors should be taken into consideration among other patient factors when indicating patients for outpatient arthroplasty. We found hypotension and long-acting spinal anesthesia to be the most common reasons for failed SDD, both of which are potentially modifiable and should be considered in future studies.

References

- [1] Jaibaji M, Volpin A, Haddad FS, Konan S. Is outpatient arthroplasty safe? A systematic review. *J Arthroplasty* 2020;35:1941–9.
- [2] Crawford AM, Chen AF, Sabeti A, Jay JF, Shah VM. Team approach: same-day discharge of patients undergoing total joint arthroplasty. *JBJS Rev* 2020;8:e0176.
- [3] Springer BD, Odum SM, Vegari DN, Mokris JG, Beaver 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.
- [4] Weiser MC, Kim KY, Anoushiravani AA, Iorio R, Davidovitch RI. Outpatient total hip arthroplasty has minimal short-term complications with the use of institutional protocols. *J Arthroplasty* 2018;33:3502–7.
- [5] O'Connor CM, Anoushiravani AA, DiCaprio MR, Healy WL, Iorio R. Economic recovery after the COVID-19 pandemic: resuming elective orthopedic surgery and total joint arthroplasty. *J Arthroplasty* 2020;35(7S):S32–6.
- [6] Berger RA, Sanders S, Gerlinger T, Della Valle C, Jacobs JJ, Rosenberg AG. Outpatient total knee arthroplasty with a minimally invasive technique. *J Arthroplasty* 2005;20(7 Suppl 3):33–8.
- [7] 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.
- [8] Courtney PM, Rozell JC, Melnic CM, Lee GC. Who should not undergo short stay hip and knee arthroplasty? Risk factors associated with major medical complications following primary total joint arthroplasty. *J Arthroplasty* 2015;30(9 Suppl):1–4.
- [9] Kim KY, Anoushiravani AA, Elbuluk A, Chen K, Davidovitch R, Schwarzkopf R. Primary total hip arthroplasty with same-day discharge: who failed and why. *Orthopedics* 2018;41:35–42.
- [10] Fraser JF, Danoff JR, Manrique J, Reynolds MJ, Hozack WJ. Identifying reasons for failed same-day discharge following primary total hip arthroplasty. *J Arthroplasty* 2018;33:3624–8.
- [11] Keulen MHF, Asselberghs S, Boonen B, Hendrickx RPM, van Haaren EH, Schotanus MGM. Predictors of (un)successful same-day discharge in selected patients following outpatient hip and knee arthroplasty. *J Arthroplasty* 2020;35:1986–92.
- [12] Meneghini RM, Ziemba-Davis M, Ishmael MK, Kuzma AL, Caccavallo P. Safe selection of outpatient joint arthroplasty patients with medical risk stratification: the "Outpatient Arthroplasty Risk Assessment Score". *J Arthroplasty* 2017;32:2325–31.
- [13] Ziemba-Davis M, Caccavallo P, Meneghini RM. Outpatient joint arthroplasty-patient selection: update on the Outpatient Arthroplasty Risk Assessment Score. *J Arthroplasty* 2019;34:S40–3.
- [14] Dorr LD, Thomas DJ, Zhu J, Dastane M, Chao L, Long WT. Outpatient total hip arthroplasty. *J Arthroplasty* 2010;25:501–6.
- [15] Gogineni HC, Gray CF, Prieto HA, Deen JT, Boezaart AP, Parvataneni HK. Transition to outpatient total hip and knee arthroplasty: experience at an academic tertiary care center. *Arthroplast Today* 2019;5:100–5.
- [16] Toy PC, Fournier MN, Throckmorton TW, Mihalko WM. Low rates of adverse events following ambulatory outpatient total hip arthroplasty at a free-standing surgery center. *J Arthroplasty* 2018;33:46–50.
- [17] Richards M, Alyousif H, Kim JK, Poitras S, Penning J, Beaulé PE. An evaluation of the safety and effectiveness of total hip arthroplasty as an outpatient procedure: a matched-cohort analysis. *J Arthroplasty* 2018;33:3206–10.
- [18] 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.
- [19] Sershon RA, McDonald JF, Ho H, Goyal N, Hamilton WG. Outpatient total hip arthroplasty performed at an ambulatory surgery center vs hospital outpatient setting: complications, revisions, and readmissions. *J Arthroplasty* 2019;34:2861–5.
- [20] Larsen JR, Skovgaard B, Pryntz T, Bendiksen L, Mikkelsen LR, Laursen M, et al. Feasibility of day-case total hip arthroplasty: a single-centre observational study. *Hip Int* 2017;27:60–5.
- [21] Crawford DA, Adams JB, Berend KR, Lombardi AV. Low complication rates in outpatient total knee arthroplasty. *Knee Surg Sports Traumatol Arthrosc* 2020;28:1458–64.
- [22] Gromov K, Jørgensen CC, Petersen PB, Kjaersgaard-Andersen P, Revald P, Troelsen A, et al. Complications and readmissions following outpatient total hip and knee arthroplasty: a prospective 2-center study with matched controls. *Acta Orthop* 2019;90:281–5.
- [23] Pollock M, Somerville L, Firth A, Lanting B. Outpatient total hip arthroplasty, total knee arthroplasty, and unicompartmental knee arthroplasty: a systematic review of the literature. *JBJS Rev* 2016;4. <https://doi.org/10.2106/JBJS.RVW.16.00002>.
- [24] Sher A, Keswani A, Yao DH, Anderson M, Koenig K, Moucha CS. Predictors of same-day discharge in primary total joint arthroplasty patients and risk factors for post-discharge complications. *J Arthroplasty* 2017;32:S150–S156.e1.
- [25] Piuze NS, Strnad CJ, Sakr Esa WA, Barsoum WK, Bloomfield MR, Brooks PJ, et al. The main predictors of length of stay after total knee arthroplasty: patient-related or procedure-related risk factors. *J Bone Joint Surg Am* 2019;101:1093–101.
- [26] Byrne PA, Gupta S, Hopper GP, Deakin AH, Roberts JL, Kinninmonth AWG. Patient factors associated with shorter length of stay following total hip arthroplasty—a retrospective cohort study. *Surg Technol Int* 2017;31:197–200.
- [27] Ferrer T, Hinarejos P, Goicoechea N, Leal-Blanquet J, Sanchez-Soler J, Torres-Claramunt R, et al. Anxiety is the cause of the worse outcomes of allergic patients after total knee arthroplasty. *Knee Surg Sports Traumatol Arthrosc* 2019;28:1335–41.
- [28] Otero JE, Graves CM, Gao Y, Olson TS, Dickinson CC, Chalus RJ, et al. Patient-reported allergies predict worse outcomes after hip and knee arthroplasty: results from a prospective cohort study. *J Arthroplasty* 2016;31:2746–9.
- [29] Graves CM, Otero JE, Gao Y, Goetz DD, Willenborg MD, Callaghan JJ. Patient reported allergies are a risk factor for poor outcomes in total hip and knee arthroplasty. *J Arthroplasty* 2014;29(9 Suppl):147–9.
- [30] McLawhorn AS, Bjerke-Kroll BT, Blevins JL, Sculco PK, Lee YY, Jerabek SA. Patient-reported allergies are associated with poorer patient satisfaction and outcomes after lower extremity arthroplasty: a retrospective cohort study. *J Arthroplasty* 2015;30:1132–6.
- [31] Kim K, Chen K, Anoushiravani AA, Roof M, Long WJ, Schwarzkopf R. Preoperative chronic opioid use and its effects on total knee arthroplasty outcomes. *J Knee Surg* 2020;33:306–13.
- [32] Smith SR, Bido J, Collins JE, Yang H, Katz JN, Losina E. Impact of preoperative opioid use on total knee arthroplasty outcomes. *J Bone Joint Surg Am* 2017;99:803–8.
- [33] Jain N, Brock JL, Malik AT, Phillips FM, Khan SN. Prediction of complications, readmission, and revision surgery based on duration of preoperative opioid use: analysis of major joint replacement and lumbar fusion. *J Bone Joint Surg Am* 2019;101:384–91.
- [34] Kort NP, Bemelmans YFL, van der Kuy PHM, Jansen J, Schotanus MGM. Patient selection criteria for outpatient joint arthroplasty. *Knee Surg Sports Traumatol Arthrosc* 2017;25:2668–75.
- [35] Crawford DA, Andrews RL, Hurst JM, Berend KR, Lombardi AV, Morris MJ. Accuracy of patient-reported preoperative opioid use and impact on continued opioid use after outpatient arthroplasty. *J Arthroplasty* 2020;35:1504–7.
- [36] Driesman A, Kaplan D, Feng JE, Warren DP, Vigdorichik J, Meere P, et al. Tramadol in knee osteoarthritis: does preoperative use affect patient-reported outcomes after total knee arthroplasty? *J Arthroplasty* 2019;34:1662–6.