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Systematic Review

Reasons and Risk Factors for Same-Day Discharge Following Total Joint Arthroplasty: A Systematic Review

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ABSTRACT

Background: Nowadays, emphasis is being given to same-day discharge (SDD) following total joint arthroplasty. Unfortunately, despite a high degree of success, there are instances of failed SDD. Therefore, we aim to conduct a systematic review to evaluate factors contributing to failed SDD after total joint arthroplasty.

Methods: Pubmed, Scopus, Cochrane, and Google Scholar were searched. The Newcastle Ottawa score was used for the quality assessment of selected studies. All the studies were evaluated through a narrative synthesis. A total of 11 studies evaluating 157,045 patients were selected. The mean age of patients was 62.5 years.

Results: Elderly patients (odds ratio [OR] 1.01 to OR 3.13), women (OR 1.63 to OR 2.87), non-white race (OR 1.31 to OR 2.19), hypertension (OR 1.11 to OR 1.41), diabetes (OR 1.25 to OR 4.06), cardiovascular diseases (OR 1.67 to OR 12.06), chronic obstructive pulmonary disease (OR 1.30 to OR 1.96), bleeding disorders (OR 1.32 to OR 1.52), obesity (OR 1.35 to OR 3.30), steroid use (OR 1.23 to OR 1.52), late procedure start time (OR 1.22 to OR 5.16), higher postoperative pain (OR 1.93 to OR 5.85), high American Society of Anesthesiologists score (OR 0.92 to OR 3.50) were major predictors of failed SDD.

Conclusions: Through our review, we highlighted that elderly patients, women, non-white race, hypertension, diabetes, cardiovascular diseases, chronic obstructive pulmonary disease, bleeding disorders, obesity, steroid use, late procedure start time, higher postoperative pain, and high American Society of Anesthesiologists score were major predictors of a failed SDD. Many factors evaluated in our study were presented in one or two studies only; therefore, high-quality studies are required to supplement our findings.

Introduction and background

Total joint arthroplasty (TJA) is a procedure for the treatment of end-stage osteoarthritis [1,2]. Recently, there has been an exponential increase in the utilization of TJA with numbers projected to reach 1.5 million by 2050 [3]. To counteract this burden, attention is given to outpatient TJA. Patients are expected to be discharged on the same day of the procedure [4]. This will help reduce the length of stay and the cost associated with it [5,6]. Improvements in implant design, surgical techniques, and operative management have made same-day discharge (SDD) possible [7].

Research has shown that SDD in a carefully selected population is equally safe and effective as an overnight stay [4,8]. This reduces healthcare costs and improves patient satisfaction. Despite SDD arthroplasty being a relatively successful procedure, the failure rate is seen to be as high as 15% in inappropriately selected patients [9]. Identifying suitable patients for SDD has become challenging for surgeons [10-12]. Studies have shown that older age, women, higher body mass index (BMI), and higher American Society of Anesthesiologists (ASA) scores have all been associated with failed SDD [9-12]. However, there are no existing guidelines identifying all the risk factors for failed SDD. Furthermore, all these data have been collected from retrospective studies with variability in results [10-12]. Currently, there is no systematic review that has effectively summarized all this evidence.

Therefore, we aim to conduct a systematic review to sum up all existing evidence regarding risk factors for failed SDD and try to

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build consensus regarding the role of these factors in predicting failed SDD.

Material and methods

Data sources and search strategy

This systematic review was conducted following the Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines [13]. The protocol of the study was registered on International Prospective Register of Systematic Reviews) (CRD42023420548). An organized systemic literature search was performed using electronic databases such as Pubmed/Medline, Google Scholar, and Cochrane. All the available articles from their inception till 6th April 2023 were queried. The search strategy consisted of the following keywords: same-day discharge, outpatient TJA, SDD, fast-track TJA (detailed in Supplementary Table 1). We removed any animal studies, case reports, and conference abstracts. Two authors independently searched these databases.

A total of 2358 articles were retrieved after the initial search. After deduplication and title/abstract screening, 107 articles were selected. Full texts of these articles were read. Finally, a total of 11 studies were included in this review [9,12,14-22] (Fig. 1).

Study selection

After a full-text screening only relevant studies that met the selection criteria were enrolled. Predefined eligibility criteria were set using PECO:

P (Patients): Patients undergoing total joint arthroscopy; E (Exposure): Failed SDD; C (Control): Successful SDD; O (Outcome): Risk factors

Only articles in the English language were included. Studies that did not provide an odds ratio (OR) and 95% confidence interval (CI) from multivariate analysis were also excluded.

Quality assessment and risk of bias in studies

Two reviewers independently used the Newcastle-Ottawa Scale (NOS) to assess the methodological quality and risk of bias of included studies. The NOS score greater than or equal to 7 was considered high methodological quality and low risk of bias.

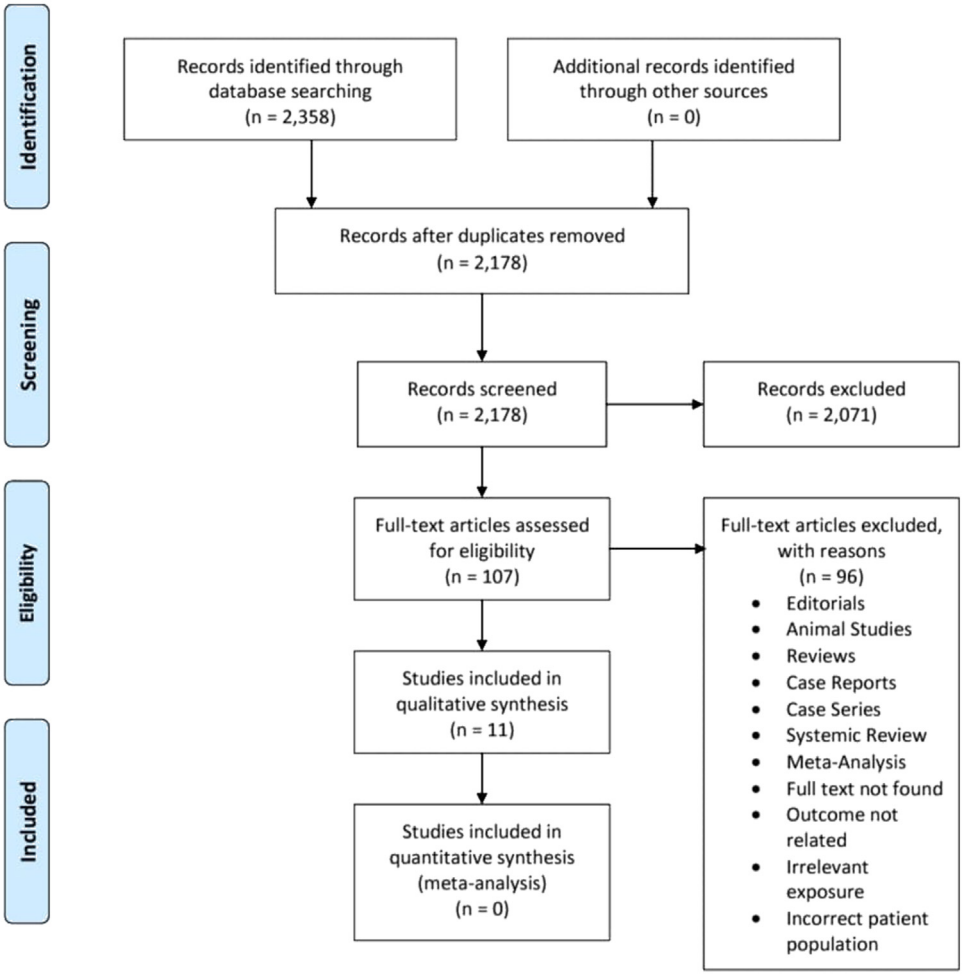

Figure 1. PRISMA flowchart.

Table 1
Baseline characteristics.

Variable	Study design	Total patients	Women (%)	Successful SDD n (%)	Mean age (years)	Type of arthroplasty	Eligibility criteria for SDD surgery	NOS score
Gromov et al. 2017 [14]	Prospective cohort	302	N/A	80 (26.4)	N/A	THA, TKA	ASA <3, Patient operated at 3, No sleep apnea	8
Sher et al. 2017 [12]	Prospective cohort	120,847	N/A	7474 (6.2%)	N/A	THA, TKA	N/A	8
Moore et al. 2020 [15]	Retrospective cohort	325	195 (60)	32 (10%)	66	TKA	N/A	7
Baker et al. 2021 [16]	Retrospective cohort	915	N/A	61 (6.66%)	N/A	THA	N/A	7
Burton et al. 2021 [17]	Retrospective cohort	17,011	N/A	7644 (44.9%)	N/A	TSA	N/A	8
Turcotte et al. 2021 [9]	Retrospective cohort	2266	1221 (53.9)	205 (9.05%)	65.8	TKA	Procedure after 11 am, age <75 years, BMI <35 kg/m2, no sleep apnea, no insulin-dependent diabetes, no significant cardiac conditions or a recent cardiac procedure, no preoperative anemia, no history of urinary retention or BPH, and DVT prophylaxis using a medication other than Coumadin	8
Belay et al. 2022 [18]	Retrospective cohort	13,669	8055 (58.9)	3130 (22.9%)	66.7	TKA	N/A	7
Gazendam et al. 2022 [19]	Retrospective cohort	527	306 (58.06)	426 (80.83%)	64	THA, TKA	No history of OSA, early OR start, no support person at home	7
House et al. 2022 [20]	Retrospective cohort	631	350 (55.5)	581 (92.1%)	58.1	THA, TKA	Low OARA score, patient consent	7
Rodriguez et al. 2022 [21]	Retrospective cohort	278	126 (45)	182 (65.5%)	57.1	THA	Unilateral primary TKA or simple revisions, age 18 to 75 years, BMI 18.5 to 37.0 kg/m2, not currently using warfarin or enoxaparin, patient agrees and has a responsible adult to spend the night on the day of discharge Case scheduled before 12 pm, no history of active ischemia significant valvular disease or arrhythmia uncontrolled or undiagnosed OSA, opioid dependence or addiction GFR <60 ml/min	8
Shen et al. 2023 [22]	Retrospective cohort	274	134 (48.9)	140 (51.1%)	60	TKA	Unilateral surgery, age between 18 and 70 years, BMI between 18.5 and 35 kg/m2, and availability of appropriate social and material support at home. No comorbidities such as coronary artery disease, Valvular heart disease, significant arrhythmias, Coumadin usage, and opioid dependence.	8

BPH, benign prostatic hyperplasia; DVT, deep venous thrombosis; N/A, not available; OARA, Outpatient Arthroplasty Risk Assessment; OR, operating room; OSA, obstructive sleep apnea; TSA, total shoulder arthroplasty.

All studies had a low risk of bias based on NOS score (median = 8). (Table 1) (Supplementary Table 2).

Data extraction

Selected studies were exported to the EndNote Reference Library software version x8.2 (Clarivate Analytics), where each study was screened rigorously. Two authors extracted study characteristics, patient characteristics, and relevant statistical information from each study.

A total of 11 studies [9,12,14-22] evaluating 157,045 patients were selected. The mean age of the patients was 62.5 years, and the rate of successful SDD was 12.7%. Total hip arthroplasty (THA) was evaluated by 2 studies [16,21], total knee arthroplasty (TKA) by 4 studies [9,15,18,22], and total shoulder arthroplasty by 1 study [17]. Four studies evaluated both THA and TKA [12,14,19,20]. (Details are mentioned in Table 1).

Statistical analysis

A comprehensive narrative analysis was conducted to assess the results obtained. Findings were presented in the form of OR with 95% CI. All the ORs were extracted from multivariate studies. We analyzed the findings of individual included studies and compared

Table 2
Risk factors for same-day discharge following TJA.

Factors	Description	Study	OR (95% CI)
Demographical factors			
Age	Age >80 years vs < 80 years	Sher et al. [12]	OR 3.13 (95% CI 2.70-3.70); $P < .001$
	Age >75 years vs < 75 years	Belay et al. [18]	OR 1.84 (95% CI 1.55-2.18); $P < .001$
	Age >75 years vs < 75 years	Gromov et al. [14]	OR 2.60 (95% CI 0.89-7.70); $P = .080$
	Age 70-79 years vs < 70 years	Sher et al. [12]	OR 2.08 (95% CI 1.89-2.27); $P < .001$
	Age 60-69 years vs < 60 years	Sher et al. [12]	OR 1.62 (95% CI 1.47-1.72); $P = .005$
	Age 50-59 years vs < 50 years	Sher et al. [12]	OR 1.39 (95% CI 1.28-1.51); $P < .001$
	Age per decade	Burton et al. [17]	OR 1.25 (95% CI 1.20-1.28); $P < .001$
	Increase in age	Baker et al. [16]	OR 1.04 (95% CI 1.01-1.07); $P = .006$
	Increase in age	Shen et al. [22]	OR 1.01 (95% CI 0.97-1.05); $P = .682$
	Increase in age	Rodriguez et al. [21]	OR 1.02 (95% CI 0.99-1.06); $P = .253$
	Increase in age	Turcotte et al. [9]	OR 1.07 (95% CI 1.05-1.09); $P < .001$
Gender	Women vs men	Baker et al. [16]	OR 2.87 (95% CI 1.49-5.51); $P = .002$
	Women vs men	Burton et al. [17]	OR 1.91 (95% CI 1.79-2.04); $P < .001$
	Women vs men	Belay et al. [18]	OR 1.78 (95% CI 1.58-1.99); $P < .001$
	Women vs men	Shen et al. [22]	OR 2.66 (95% CI 1.52-4.65); $P = .001$
	Women vs men	Gromov et al. [14]	OR 2.33 (95% CI 1.23-4.55); $P = .009$
	Women vs men	Sher et al. [12]	OR 1.76 (95% CI 1.68-1.85); $P < .001$
	Women vs men	Rodriguez et al. [21]	OR 1.63 (95% CI 0.90-2.95); $P = .110$
	Women vs men	Turcotte et al. [9]	OR 1.87 (95% CI 1.37-2.54); $P < .001$
Race	Non-white patients	Turcotte et al. [9]	OR 2.19 (95% CI 1.31-3.66); $P = .003$
	Black patients	Sher et al. [12]	OR 1.31 (95% CI 1.18-1.47); $P < .001$
	Hispanic patients	Sher et al. [12]	OR 1.39 (95% CI 1.19-1.64); $P < .001$
	Asian patients	Sher et al. [12]	OR 1.39 (95% CI 1.14-1.69); $P = .001$
Comorbidities			
Hypertension	Hypertension	Sher et al. [12]	OR 1.11 (95% CI 1.05-1.16); $P < .001$
	Hypertension	Turcotte et al. [9]	OR 1.41 (95% CI 1.03-1.93); $P = .032$
Diabetes	Uncontrolled diabetes mellitus (Hb A1C 7.0-7.9)	House et al. [20]	OR 4.06 (95% CI 1.06-15.49); $P = .041$
	Insulin-dependent diabetes mellitus	Burton et al. [17]	OR 1.54 (95% CI 1.32-1.82); $P < .001$
	Diabetes mellitus	Sher et al. [12]	OR 1.25 (95% CI 1.15-1.35); $P < .001$
Cardiovascular diseases	Left ventricular systolic dysfunction without history of pulmonary edema	House et al. [20]	OR 8.03 (95% CI 1.31-49.21); $P = .024$
	Pacemaker dependence	House et al. [20]	OR 12.06 (95% CI 1.66-87.54);$P = .014$
	Diastolic dysfunction stage 1-2	House et al. [20]	OR 8.03 (95% CI 1.31-49.21); $P = .024$
	Congestive heart failure	Burton et al. [17]	OR 3.33 (95% CI 1.79-7.14); $P < .001$
	Any cardiac disease	Sher et al. [12]	OR 1.67 (95% CI 1.43-1.92); $P < .001$
Pulmonary diseases	COPD	Burton et al. [17]	OR 1.30 (95% CI 1.14-1.49); $P = .001$
	COPD	Belay et al. [18]	OR 1.96 (95% CI 1.16-3.18); $P < .001$
	History of pulmonary diseases	Sher et al. [12]	OR 0.88 (95% CI 0.75-1.03); $P = .100$
Bleeding disorders	Bleeding disorders	Burton et al. [17]	OR 1.52 (95% CI 1.22-1.85); $P < .001$
	Bleeding causing disorders	Sher et al. [12]	OR 1.32 (95% CI 1.09-1.61) $P = .006$
Kidney diseases	Stage 3 kidney disease (GFR 30-60)	House et al. [20]	OR 4.03 (95% CI 1.53-10.62); $P = .005$
Anemia	Chronic stable anemia, Hb < 11	House et al. [20]	OR 8.03 (95% CI 1.31-49.21); $P = .024$
	Chronic stable anemia, Hb 11 to normal	House et al. [20]	OR 3.80 (95% CI 1.19-12.12); $P = .024$
Stroke	History of stroke	Sher et al. [12]	OR 2.08 (95% CI 1.06-4.00); $P = .031$
Sleep apnea	STOP-BANG Sleep apnea score	Moore et al. [15]	OR 1.30 (95% CI 0.96-1.75); $P = .087$
Comorbidity burden	≥3 Comorbidities	Turcotte et al. [9]	OR 1.97 (95% CI 1.27-3.07); $P = .002$
Patient-related factors			
BMI	BMI >40 Kg/m^2	House et al. [20]	OR 2.28 (95% CI 1.11-4.67); $P = .025$
	BMI >40 Kg/m^2	Sher et al. [12]	OR 1.45 (95% CI 1.32-1.59); $P < .001$
	BMI >35 Kg/m^2	Belay et al. [18]	OR 1.35 (95% CI 1.18-1.56); $P < .001$
	BMI >35 Kg/m^2	Gromov et al. [14]	OR 3.30 (95% CI 0.87-12.60); $P = .080$
	BMI >35 Kg/m^2	Turcotte et al. [9]	OR 2.04 (95% CI 1.31-3.16); $P = .002$
	BMI >30 Kg/m^2	Shen et al. [22]	OR 1.91 (95% CI 1.06-3.41); $P = .030$
	BMI level	Moore et al. [15]	OR 1.09 (95% CI 1.00-1.18); $P = .043$
	BMI level	Rodriguez et al. [21]	OR 0.99 (95% CI 0.93-1.06); $P = .787$
Functional status	Poor functional status	Burton et al. [17]	OR 1.89 (95% CI 1.54-2.33); $P < .001$
	Functional status	Sher et al. [12]	OR 1.15 (95% CI 0.88-1.49); $P = .320$
Drug history	Steroid use	Belay et al. [18]	OR 1.52 (95% CI 1.05-2.21); $P = .030$
	Steroid for chronic disease	Sher et al. [12]	OR 1.23 (95% CI 1.06-1.43); $P = .007$
	Direct thrombin and factor Xa inhibitors	House et al. [20]	OR 9.27 (95% CI 3.24-29.40); $P < .001$
Smoking	History of smoking	Sher et al. [12]	OR 0.96 (95% CI 0.89-1.03); $P = .240$
	Prior smoking	Rodriguez et al. [21]	OR 1.55 (95% CI 0.85-2.84); $P = .153$
	Current smoking	Rodriguez et al. [21]	OR 6.24 (95% CI 1.59-24.54); $P = .009$
Allergies	Allergies	Moore et al. [15]	OR 1.52 (95% CI 1.05-2.17); $P = .027$
Previous TJA	No previous TJA	Gazzendam et al.[19]	OR 3.1 (95% CI 0.92-10.6); $P = .069$
Distance from home	Distance from home >50 Km	Gromov et al. [14]	OR 0.84 (95% CI 0.54-1.3); $P = .400$
Hypoalbuminemia	Hypoalbuminemia	Sher et al. [12]	OR 1.43 (95% CI 1.11-1.79); $P = .004$
Perioperative factors			
Procedure start time	Surgery start time after 11 am	Shen et al. [12]	OR 5.16 (95% CI 2.76-9.66); $P < .001$
	Surgery start time after 11 am	Rodriguez et al. [21]	OR 2.28 (95% CI 1.17-4.43); $P = .015$
	Surgery start time after 7 am	Moore et al. [15]	OR 1.22 (95% CI 1.00-1.49); $P = .051$
	Surgery start time	Gazzendam et al. [19]	OR 1.30 (95% CI 1.10-1.60); $P = .001$
	Second procedure in the operating room	Gromov et al. [14]	OR 2.40 (95% CI 1.20-4.80); $P = .010$

Table 2 (*continued*)

Factors	Description	Study	OR (95% CI)
Postoperative pain	Pain score 8-10 vs 1-3	Shen at al. [22]	OR 5.85 (95% CI 2.00-17.11); $P < .001$
	Pain score 8-10 vs 1-3	Rodriguez et al. [21]	OR 4.76 (95% CI 1.64-13.78); $P = .004$
	Pain score 4-7 vs 1-3	Shen et al. [12]	OR 2.80 (95% CI 1.00-7.83); $P = .049$
	Pain score 4-7 vs 1-3	Rodriguez et al. [21]	OR 1.93 (95% CI 0.71-5.24); $P = .199$
	Tolerance for moderate/severe pain	Shen et al. [12]	OR 0.33 (95% CI 0.18-0.58); $P = .001$
Type of TJA	THA vs TKA	Gazzendam et al. [19]	OR 2.10 (95% CI 1.30-3.10); $P = .003$
	THA vs TKA	Gromov et al. [14]	OR 0.79 (95% CI 0.41-1.50); $P = .500$
ASA score	ASA grade 4	Burton et al. [17]	OR 2.86 (95% CI 2.27-3.57); $P < .001$
	ASA grade 4 vs 1	Gazzzendam et al. [19]	OR 3.50 (95% CI 1.40-8.50); $P = .006$
	ASA grade ≥3	Turcotte et al. [9]	OR 2.65 (95% CI 1.71-4.08); $P < .001$
	ASA grade ≥3	Belay et al. [18]	OR 1.85 (95% CI 1.19-2.87); $P = .010$
	ASA grade ≥3	Sher et al. [12]	OR 1.37 (95% CI 1.30-1.45); $P < .001$
	ASA grade 3 vs 1	Gazzzendam et al. [19]	OR 1.30 (95% CI 0.77-2.30); $P = .312$
	ASA grade 2 vs 1	Gazzzendam et al. [19]	OR 1.00 (95% CI 0.56-1.80); $P = .983$
	ASA grade 2	Gromov et al. [14]	OR 0.92 (95% CI 0.49-1.80); $P = .800$
	ASA score	Burton et al. [17]	OR 1.64 (95% CI 1.54-1.75); $P < .001$
	ASA score	Rodriguez et al. [21]	OR 2.04 (95% CI 0.78-5.28); $P = .144$
	ASA score	Shen et al. [22]	OR 1.30 (95% CI 0.61-2.79); $P = .495$
General anesthesia	General anesthesia	Shen et al. [22]	OR 12.60 (95% CI 1.06-154.0); $P = .047$
	General anesthesia	Rodriguez et al. [21]	OR 1.27 (95% CI 0.20-7.91); $P = .799$
Surgical approach	Posterior approach for THA	Rodriguez et al. [21]	OR 1.65 (95% CI 0.94-2.92); $P = .082$
Postoperative confusion	History of postoperative confusion	House et al. [20]	OR 12.06 (95% CI 1.66-87.54); $P = .014$
Severe adverse event pre discharge	Severe adverse event pre discharge	Sher et al. [12]	OR 2.00 (95% CI 1.32-2.94); $P = .001$

CI, confidence interval; OR, odds ratio.

similarities and differences between the data obtained. A meta-analysis could not be performed due to the high heterogeneity between the selected studies.

Results

Risk factors for failed same-day discharge

Risk factors for failed SDD are divided into demographical factors, comorbidities, patient-related factors, and perioperative factors. (Details presented in Tables 2 and 3)

Demographical factors

Age. A total of 8 studies [9,12,14,16-18,21,22] evaluated age as a risk factor for failed SDD. Age was a significant risk factor in most of these studies. Age >80 years [12], age >75 years [18], age 70-79 years vs < 70 years [12], age 60-69 years vs < 60 years [12], and age 50-59 years vs < 50 years [12] were all significant risk factors for failed SDD. Similarly, age per decade [17] was also a significant predictor of failed SDD (OR 1.25 [95% CI 1.20-1.28]; $P < .001$). However, Gromov et al. [14] didn't find age >75 years (OR 2.60 [95% CI 0.89-7.70]; $P = .080$) to be a significant risk factor for failed SDD. Additionally, 4 studies [9,16,21,22] evaluated age as a predictor for SDD with 2 out of them identifying age as a risk factor [9,16], while the other 2 didn't [21,22].

Gender. A total of 8 studies [9,12,14,16-18,21,22] evaluated gender as a risk factor for failed SDD. Out of which, 7 studies [9,12,14,16-18,22] found that women were at a significant risk for failed SDD as compared to men (OR 1.76 to OR 2.87). Rodriguez et al. [21] found no significant relationship between gender and SDD.

Race. Race was evaluated in 2 studies [9,12]. Both of them found non-white race to be a significant risk factor for failed SDD (OR 1.31 to OR 2.19).

Comorbidities

Primary hypertension. Primary hypertension was studied in 2 studies [9,12]. Both of them found hypertension to be a predictor of failed SDD (OR 1.11 to OR 1.41).

Diabetes mellitus. A total of 3 studies [12,17,20] evaluated the role of diabetes in predicting a failed SDD. All of these studies found that diabetes was a significant predictor of failed SDD (OR 1.25 to OR 4.06). Uncontrolled diabetes presented with higher odds of failed SDD.

Cardiovascular diseases. A total of 3 studies [12,17,20] evaluated the impact of cardiovascular disease on SDD. All the studies found a significant role of cardiovascular disease in causing failed SDD (OR 1.67 to OR 12.06). Patients with pacemaker dependence had the highest odds of a failed SDD [20].

Pulmonary diseases. Two studies found chronic obstructive pulmonary disease (COPD) to be a significant risk factor for failed SDD (OR 1.30 to 1.96) [17,18]. However, Sher et al. [12] couldn't find any significant relationship between pulmonary diseases and failed SDD.

Bleeding disorders. Bleeding disorders were studied in 2 studies [12,17]. Both of these studies found that patients with bleeding disorders were at a higher risk for failed SDD (OR 1.32 to OR 1.52).

Kidney diseases. One study [20] found that stage 3 kidney disease has significantly increased failed SDD (OR 4.03).

Anemia. House et al. [20] found that patients with chronic anemia (hemoglobin <11 or 11 to normal) were all at an increased risk of failed SDD (OR 3.80 to OR 8.03).

Stroke. Stroke was evaluated in one study [12]. Patients with a history of stroke were found to be at higher risk of failed SDD (OR 2.08).

Sleep apnea. Sleep apnea was studied by one study [15]. Moore et al. [15] found that patients with higher STOP-BANG sleep apnea scores were at an increased risk for failed SDD (OR 1.30).

Comorbidity burden. Turcotte et al. [15] found that patients who have 3 or more comorbidities were at a higher risk for failed SDD (OR 1.97).

BMI. A total of 8 studies evaluated the role of BMI in causing failed SDD [9,12,14,15,18,20-22]. Studies found that a higher BMI was a significant risk factor for failed SDD. Patients with BMI >40 Kg/m^2, BMI >35 Kg/m^2, and BMI >30 Kg/m^2 [22] were at significant risk for failed SDD. However, Gromov et al. [14] found that BMI >35 Kg/m^2 was not a significant risk factor. Additionally, 2 studies reported contradictory results regarding BMI level and failed SDD.

Patient-related factors

Functional status. A total of 2 studies evaluated the role of functional status in causing failed SDD [12,17] with Burton et al. [17] finding poor functional status as a risk factor for failed SDD. Meanwhile, Sher et al. [12] couldn't find any significant relationship between those 2.

Drug history. Three studies evaluated the impact of drug history in causing failed SDD [12,18,20]. Two studies found steroid intake to be a significant risk factor for failed SDD [12,18] (OR 1.23 to OR 1.52), while one study found direct thrombin and factor Xa inhibitors to be a significant risk factor for failed SDD [20].

Smoking. A total of 2 studies evaluated the role of smoking in causing failed SDD [12,21]. We found that prior smoking was not a risk factor for failed SDD [12,21]. However, current smoking was a significant predictor of failed SDD [21] (OR 6.24 [95% CI 1.59-24.54]; $P = .009$).

Allergies. Allergies were evaluated in one study [15]. We found that allergies were significantly related to failed SDD [15] (OR 1.52 [95% CI 1.05-2.17]; $P = .027$).

Previous TJA. Previous TJAs were evaluated in one study [19]. We found that patients with previous TJAs were not at significant risk for failed SDD [19] (OR 3.1 [95% CI 0.92-10.6]; $P = .069$).

Table 3
Major significant risk factors for failed same-day discharge following TJA.

Significant risk factors	No. of studies	OR range
Old age	8	OR 1.01 to OR 3.13
Women	8	OR 1.63 to OR 2.87
Non-white race	2	OR 1.31 to OR 2.19
Hypertension	2	OR 1.11 to OR 1.41
Diabetes	3	OR 1.25 to OR 4.06
Cardiovascular diseases	3	OR 1.67 to OR 12.06
COPD	2	OR 1.30 to OR 1.96
Bleeding disorders	2	OR 1.32 to OR 1.52
Obesity	6	OR 1.35 to OR 3.30
Steroid use	2	OR 1.23 to OR 1.52
Late surgery start rime	5	OR 1.22 to OR 5.16
Increased postoperative pain score	2	OR 1.93 to OR 5.85
Higher ASA score	8	OR 0.92 to OR 3.50

OR, odds ratio.
Only those factors are enlisted in the table that are (1) significant in most of the studies reporting them; (2) present in more than one study.

Distance from home. Distance from home was evaluated in one study [14]. Gromov et al. [14] found that even if patients' homes were more than 50 km from the hospital, still they were not at increased risk of failed SDD (OR 0.84 [95% CI 0.54-1.3]; $P = .400$).

Hypoalbuminemia. Hypoalbuminemia was evaluated in one study [12]. Sher et al. [12] found that patients having decreased albumin levels were at significantly increased risk for failed SDD (OR 1.43 [95% CI 1.11-1.79]; $P = .004$).

Perioperative factors

Procedure start time. A total of 5 studies [14,15,19,21,22] evaluated the impact of procedure starting time on SDD. We found that if a procedure started late, it increased the risk of failed SDD [15,19,21,22]. In addition, we found that patients were at more risk for failed SDD when the procedure started at 11 am [21,22] (OR 2.28 to OR 5.16) compared to when the procedure started at 7 am [15] (OR 1.22 to OR 1.30). Furthermore, Gromov et al. [14] also found that when the procedure was listed as second in the operating room, it significantly increased the risk for failed SDD (OR 2.40 [95% CI 1.20-4.80]; $P = .010$).

Postoperative pain. A total of 2 studies evaluated the impact of postoperative pain on failed SDD [21,22]. We found that severe highest postoperative pain score (score 8-10) was a significant risk factor for failed SDD [21,22] (OR 4.76 to OR 5.85) compared to moderate highest postoperative pain score (score 4-7) [21,22] (OR 1.93 to OR 2.80). We further found that patients having higher tolerance for pain are more likely to be discharged on the same day [21] (OR 0.33 [95% CI 0.18-0.58]; $P = .001$).

Type of TJA (THA vs TKA). Two studies evaluated the role of TJA type in causing failed SDD [14,19]. Gazzendam et al. [19] found that patients undergoing THA were at a higher risk for failed SDD (OR 2.10 [95% CI 1.30-3.10]; $P = .003$). In contrast, Gromov et al. [14] found that there was no difference between THA and TKA in causing failed SDD (OR 0.79 [95% CI 0.41-1.50]; $P = .500$).

ASA score. A total of 8 studies evaluated the role of ASA score in predicting failed SDD [9,12,14,17-19,21,22]. A total of 5 studies found that an ASA score $\geq$3 is associated with an increased risk of failed SDD [9,12,17-19] (OR 1.37 to OR 3.50). This result was opposed by Gazzendam et al. [19] They found that even an ASA score of $\geq$3 was not related to failed SDD. In addition, an ASA score of 2 was also not related to failed SDD [14,19].

General anesthesia. A total of 2 studies evaluated the role of general anesthesia in causing failed SDD [21,22]. Shen et al. [22] found that patients undergoing general anesthesia were at an increased risk of failed SDD. However, Rodriguez et al. [21] found that general anesthesia was not a risk factor for failed SDD.

Surgical approach. The surgical approach was evaluated in one study [21]. We found that the posterior approach for THA was not a risk factor for failed SDD [21] (OR 1.65).

Postoperative confusion. A total of 1 study [20] evaluated the impact of postoperative confusion on failed SDD. We found that if a patient develops confusion in the postoperative period, he is likely to develop failed SDD [20].

Severe adverse event predischarge. One study evaluated the impact of severe adverse events during predischarge on failed SDD [12].

We found that if patients developed any severe adverse event predischarge, they failed to get discharged on the same day [12].

Discussion

In this systematic review, we have evaluated the reasons and risk factors for failed SDD after TJA. We found that elderly patients, women, non-white race, hypertension, diabetes mellitus, cardiovascular diseases, COPD, bleeding disorders, chronic anemia, stroke, acute renal failure, sleep apnea, higher comorbidity burden, obesity, poor functional status, steroid use, direct thrombin and factor X inhibitor, current smoking, allergies, hypoalbuminemia, late procedure start time, higher postoperative pain, high ASA score, postoperative confusion, and severe event predischarge were all predictors of a failed discharge on the surgery day.

Elderly patients often suffer from poor outcomes after surgery [23-25]. In our review, we found that elderly patients are at significant risk for failed SDD after TJA. This finding is similar to previous literature. Kort et al. [10] found that patients with ages > 75 years are at increased risk for failed SDD. However, in our review, even patients greater than 50 years old were at higher risk for failed SDD. This is not surprising since geriatric patients have higher comorbidity and poor functional status [24,26]. This delays their recovery, leading to prolonged discharge as compared to younger patients. We assessed the role of gender in causing failed SDD after TJA. Our review found that women are at more risk of failed SDD. Previous studies also found that women are at risk for increased length of stay after TJA [27,28]. Studies have found that women have higher pain perception and express their conditions more easily as compared to men [29,30]. Therefore, women are more likely to prefer an overnight stay than men in case of any unforeseen situation. Furthermore, our review also studied the role of race in predicting failed SDD. We found that non-white patients are at higher risk for failed SDD compared to white patients. Studies have found that black patients are at an increased risk for readmission, revision, and extended length of stay following TJA [31-34]. In addition, studies also found that these patients belong to poor socioeconomic backgrounds, have limited healthcare access, and have higher comorbidities [35-37]. All these factors limit their discharge on the day of surgery.

Orthopaedic surgeons have used the ASA score to predict postoperative outcomes after several orthopaedic procedures [38-40]. Studies found that higher ASA scores are related to an increased risk of readmission and an extended length of stay after TJA [38-40]. Our findings are similar to the existing studies. We also found that patients with an ASA score $\geq$ 3 were not likely to be discharged on the surgery day. This is not surprising since patients with high ASA scores have higher comorbidities, poor functional status, and are likely to be in critical condition [41,42]. We found that certain drugs taken by the patient increase the risk of failed SDD. These include steroids and anticoagulants. Studies have found that preoperative steroid use is associated with higher postoperative pain and bleeding risks [43]. Ling et al. [44] found that chronic steroid users are 1.36 times more at risk for 30-day readmission following total shoulder arthroplasty than nonusers. Research suggests that steroids delay wound healing and are associated with delayed recovery postoperatively [43]. Another modifiable risk factor related to failed SDD following TJA is smoking. We found that current smokers were 6 times more at risk for failed SDD than nonsmokers. However, we found that former smokers were not at increased risk for failed SDD. This is in contrast with a study by Duchman et al. [45] who found that both current and former smokers are at an increased risk for developing wound complications following TJA. Nevertheless, smoking is a modifiable risk factor that could be controlled [46]. Some studies recommend patients quit smoking at least 1 month before TJA to avoid postoperative complications [47,48].

The starting time of surgery is an important factor to ensure SDD. Cifarelli et al. [49] found that patients who underwent surgery after 3 pm were unlikely to be discharged on the same day. Our findings were also similar to this. We found that a late surgery time was associated with a failed SDD. This is most likely due to delayed mobilization and recovery from anesthesia [19,50]. Furthermore, late surgery also means that there will be unavailability of physiotherapists and other staff responsible for SDD [19]. To solve this issue, patients scheduled for SDD should be operated on earlier in the day. If there is any unforeseen delay, arrangements should be made to facilitate late discharge on the same day. We further found that any severe adverse event before discharge may lead to a failure in discharging the patient on the same day. These events include death, myocardial infarction, cerebrovascular accident, renal failure, pulmonary embolism, venous thromboembolism, sepsis, septic shock, unplanned intubation, paraplegia, deep wound infection, organ/space infection, and return to the operating room. Since any of the above events increase morbidity and require specific management to treat these conditions, it is obvious that the patient may have a delayed discharge if any of these events develop.

Our systematic review efficiently summarizes all available evidence to highlight risk factors for SDD. Multiple studies in the past have tried to find these risk factors. One review by Kort et al. [10] evaluated risk factors for failure of outpatient TJA. They found that increased age and comorbidities are predictors of failed outpatient TJA. However, they didn't quantify the role of gender, drug history, allergies, procedure start time, and several other factors mentioned in our study. Our study provides detailed guidelines for the surgeon regarding SDD. This can be used to formulate a personalized perioperative plan and can be used for effective patient counseling.

Our reviews should be seen in light of the following limitations. Firstly, this is a review of retrospective studies, so there are chances for confounding bias. Although we selected data from only a multivariate analysis, there are still chances for confounding bias. Secondly, we couldn't evaluate the role of patient education in these risk factors. Thirdly, different studies have different selection criteria for SDD patients; this may produce some bias in these studies. Fourthly, many of the factors included in the review were reported by only one study; therefore, the evidence regarding these factors may not be strong enough. Nevertheless, more studies regarding these factors are needed to support our conclusion. Lastly, we could not evaluate the impact of these risk factors on short-term and long-term outcomes after discharge.

Conclusions

Through our review, we highlighted that elderly patients, women, non-white race, hypertension, diabetes mellitus, cardiovascular diseases, COPD, bleeding disorders, obesity, steroid use, direct thrombin and factor X inhibitor, current smoking, late procedure start time, higher postoperative pain, and a high ASA score were major predictors of a failed discharge on the surgery day. Many factors evaluated in our study were presented in one or two studies only; therefore, high-quality studies are required to supplement our findings.

Conflicts of interest

The authors declare there are no conflicts of interest.

For full disclosure statements refer to https://doi.org/10.1016/j.artd.2024.101363.

CRediT authorship contribution statement

Ramish Sumbal: Writing – review & editing, Visualization, Validation, Supervision, Software, Resources, Project administration, Formal analysis, Conceptualization. **Anusha Ashkar:** Writing – review & editing, Writing – original draft, Validation, Software, Resources, Data curation. **Anusha Sumbal:** Writing – review & editing, Writing – original draft, Visualization, Validation, Investigation, Conceptualization. **Muhammad Abdul Moiz:** Writing – review & editing, Writing – original draft, Validation, Methodology, Data curation.

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Supplementary Table 1
Detailed search strategy.

Search engine	Search strategy
Pubmed/Medline	(("same-day"[All Fields] AND ("discharges"[All Fields] OR "discharging"[All Fields] OR "patient discharge"[MeSH Terms] OR ("patient"[All Fields] AND "discharge"[All Fields]) OR "patient discharge"[All Fields] OR "discharge"[All Fields] OR "discharged"[All Fields])) OR (("s adenosylmethionine"[Supplementary Concept] OR "s adenosylmethionine"[All Fields] OR "same"[All Fields] OR "s adenosylmethionine"[MeSH Terms]) AND "day"[All Fields] AND ("discharges"[All Fields] OR "discharging"[All Fields] OR "patient discharge"[MeSH Terms] OR ("patient"[All Fields] AND "discharge"[All Fields]) OR "patient discharge"[All Fields] OR "discharge"[All Fields] OR "discharged"[All Fields])) OR "SDD"[All Fields] OR (("outpatient s"[All Fields] OR "outpatients"[MeSH Terms] OR "outpatients"[All Fields] OR "outpatient"[All Fields]) AND ("arthroplasty"[MeSH Terms] OR "arthroplasty"[All Fields] OR "arthroplasties"[All Fields])) OR "OTJA"[All Fields] OR "fast-track"[All Fields] OR (("fasting"[MeSH Terms] OR "fasting"[All Fields] OR "fast"[All Fields]) AND ("track and field"[MeSH Terms] OR ("track"[All Fields] AND "field"[All Fields]) OR "track and field"[All Fields] OR "track"[All Fields] OR "tracks"[All Fields] OR "tracked"[All Fields] OR "tracking"[All Fields] OR "trackings"[All Fields]))) AND ((("total"[All Fields] OR "totaled"[All Fields] OR "totaling"[All Fields] OR "totaled"[All Fields] OR "totalling"[All Fields] OR "totals"[All Fields]) AND ("arthroplasty"[MeSH Terms] OR "arthroplasty"[All Fields] OR ("joint"[All Fields] AND "arthroplasty"[All Fields]) OR "joint arthroplasty"[All Fields])) OR "TJA"[All Fields] OR (("total"[All Fields] OR "totaled"[All Fields] OR "totaling"[All Fields] OR "totaled"[All Fields] OR "totalling"[All Fields] OR "totals"[All Fields]) AND ("joint s"[All Fields] OR "joints"[MeSH Terms] OR "joints"[All Fields] OR "joint"[All Fields]) AND "replac*"[All Fields]) OR ("arthroplasty, replacement, hip"[MeSH Terms] OR ("arthroplasty"[All Fields] AND "replacement"[All Fields] AND "hip"[All Fields]) OR "hip replacement arthroplasty"[All Fields] OR ("total"[All Fields] AND "hip"[All Fields] AND "arthroplasty"[All Fields]) OR "total hip arthroplasty"[All Fields]) OR ((("total"[All Fields] OR "totaled"[All Fields] OR "totaling"[All Fields] OR "totaled"[All Fields] OR "totalling"[All Fields] OR "totals"[All Fields]) AND ("hip"[MeSH Terms] OR "hip"[All Fields]) AND "replac*"[All Fields]) OR "THA"[All Fields] OR ("arthroplasty, replacement, knee"[MeSH Terms] OR ("arthroplasty"[All Fields] AND "replacement"[All Fields] AND "knee"[All Fields]) OR "knee replacement arthroplasty"[All Fields] OR ("total"[All Fields] AND "knee"[All Fields] AND "arthroplasty"[All Fields]) OR "total knee arthroplasty"[All Fields]) OR ((("total"[All Fields] OR "totaled"[All Fields] OR "totaling"[All Fields] OR "totaled"[All Fields] OR "totalling"[All Fields] OR "totals"[All Fields]) AND ("knee"[MeSH Terms] OR "knee"[All Fields] OR "knee joint"[MeSH Terms] OR ("knee"[All Fields] AND "joint"[All Fields]) OR "knee joint"[All Fields]) AND "replac*"[All Fields]) OR "TKA"[All Fields] OR ((("total"[All Fields] OR "totaled"[All Fields] OR "totaling"[All Fields] OR "totaled"[All Fields] OR "totalling"[All Fields] OR "totals"[All Fields]) AND ("shoulder"[MeSH Terms] OR "shoulder"[All Fields] OR "shoulders"[All Fields] OR "shoulder s"[All Fields]) AND "replac*"[All Fields]) OR ("arthroplasty, replacement, shoulder"[MeSH Terms] OR ("arthroplasty"[All Fields] AND "replacement"[All Fields] AND "shoulder"[All Fields]) OR "shoulder replacement arthroplasty"[All Fields] OR ("total"[All Fields] AND "shoulder"[All Fields] AND "arthroplasty"[All Fields]) OR "total shoulder arthroplasty"[All Fields]) OR ("theasinensin a"[Supplementary Concept] OR "theasinensin a"[All Fields] OR "tsa"[All Fields]) OR ("arthroplasty, replacement, ankle"[MeSH Terms] OR ("arthroplasty"[All Fields] AND "replacement"[All Fields] AND "ankle"[All Fields]) OR "ankle replacement arthroplasty"[All Fields] OR ("total"[All Fields] AND "ankle"[All Fields] AND "arthroplasty"[All Fields]) OR "total ankle arthroplasty"[All Fields]) OR ((("total"[All Fields] OR "totaled"[All Fields] OR "totaling"[All Fields] OR "totaled"[All Fields] OR "totalling"[All Fields] OR "totals"[All Fields]) AND ("ankle"[MeSH Terms] OR "ankle"[All Fields] OR "ankle joint"[MeSH Terms] OR ("ankle"[All Fields] AND "joint"[All Fields]) OR "ankle joint"[All Fields] OR "ankles"[All Fields] OR "ankle s"[All Fields]) AND "replac*"[All Fields]) OR "TAA"[All Fields])
Google Scholar	Same day discharge, Arthroplasty
Cochrane	Same day discharge, Arthroplasty

Supplementary Table 2
New castle Ottawa score.

Study name and year	Selection (maximum 4)				Comparability (maximum 2)	Outcome (maximum 3)			Total score
	Representativeness of the exposed cohort	Selection of the nonexposed cohort	Ascertainment of exposure	Demonstration that outcome of interest was not present at start of study	Comparability of cohorts on the basis of the design or analysis	Assessment of outcome	Was follow-up long enough for outcomes to occur	Adequacy of follow-up of cohorts	
Gromov et al. 2017 [14]	1	1	1	1	1	1	1	1	8
Sher et al. 2017 [12]	1	1	1	0	2	1	1	1	8
Moore at al. 2020 [15]	1	1	1	0	1	1	1	1	7
Baker et al. 2021 [16]	1	1	1	0	1	1	1	1	7
Burton et al. 2021 [17]	1	1	1	0	2	1	1	1	8
Turcotte et al. 2021 [9]	1	1	1	0	2	1	1	1	8
Belay et al. 2022 [18]	1	1	1	0	1	1	1	1	7
Gazendam et al. 2022 [19]	1	1	1	0	1	1	1	1	7
House et al. 2022 [20]	1	1	1	0	1	1	1	1	7
Rodriguez et al. 2022 [21]	1	1	1	0	2	1	1	1	8
Shen et al. 2023 [22]	1	1	1	0	2	1	1	1	8