Review

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Outcomes of outpatient total hip arthroplasty: a systematic review

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Abstract

Introduction: Similar to other total joint arthroplasty procedures, total hip arthroplasty (THA) is shifting to an outpatient setting. The purpose of this study was to analyse outcomes following outpatient THA.

Methods: A comprehensive literature search was performed in April 2019 according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) guidelines using the PubMed, Embase, and Cochrane databases to identify articles that reported functional outcomes following outpatient total hip arthroplasty (THA).

Results: 9 articles, with 683 hips and a collective study period of 1988 to 2016, were included in this analysis. The mean age across all studies was 58.9 years and the follow-up period ranged from 4 weeks to 10 years. 4 studies reported Harris Hip Scores (HHSs) for their patient populations and in 3 studies, the average HHSs were excellent (>90) by 6 weeks postoperatively. The fourth study reported fair HHS scores for the outpatient and inpatient THA groups (75 ± 18, 75 ± 14, $p = 0.77$, respectively) at 4 weeks postoperatively. VAS scores improved significantly in two studies and NRS at rest and during activity improved significantly ($p < 0.001$) in a separate study. Overall, 88.1% of the enrolled patients were discharged the same day of surgery, as expected. Out of the 6 studies reporting on readmissions rate, there were two (0.34%) readmissions within 3 months of surgery.

Conclusion: In patients with no significant comorbidities, outpatient THA leads to favourable outcomes as well as low readmission rates in the short term.

Keywords

Inpatient, outpatient, patient-reported outcomes, readmissions, total hip arthroplasty

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Introduction

There is a clear consensus in the literature that total hip arthroplasty (THA) leads to outstanding functional outcomes and low complication rates.[1,2] As THA remains the gold-standard in treating end-stage osteoarthritis, the number of cases performed globally is expected to rise.[3,4] This increasing number of hip replacements can burden healthcare systems, as the hospital costs per inpatient day have climbed in recent years.[5,6] In addition, longer length of stay (LOS) following THA is associated with an increased complication rate due to prolonged immobilisation.[7,8] In the last decade, the LOS in patients undergoing THA has been reduced from several weeks to several days.[9] Decreased LOS has been shown to be safe and effective, with no increased risks of readmissions or re-operations.[10–14]

With expedited rehabilitation protocols, and patients' desire to return to daily activities as quickly as possible, THA is shifting toward the outpatient setting. Literature has shown that discharging THA patients the same day of their surgery can lead to excellent patient satisfaction and patient-reported outcomes (PROs).[15–18] To our knowledge, this is the first systematic review on PROs following outpatient THAs. The purpose of this study was to (1) analyse

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outcomes following outpatient THAs including PROs, postoperative pain assessment, and readmission rates.

Methods

This study was approved by our Institutional Review Board (IRB ID: 5276).

We performed a comprehensive literature search in April 2019 using the PubMed, Embase, and Cochrane databases to identify articles that reported functional outcomes following outpatient THA. The search followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses)[19] guidelines and included the following key words: Hip replacement, Arthroplasty, Outpatients, Outpatient Clinics, Ambulatory Care, Ambulatory Surgical Procedures, Ambulatory Care Facilities, Outcome And Process Assessment, Outcome Management, Patient Outcome, Therapeutic Outcome, Therapy Outcome, Treatment Outcome, Outcome Assessment, Outcome Assessment, Outcome Assessment, Outcome Measurement, Patient Outcome Assessment.

2 reviewers (JS and PJR) reviewed the titles and abstracts before selecting articles for full-text review. In any cases of disagreement, a third reviewer (BGD) helped the group reach consensus on article inclusion. During the full-text review, the bibliographies of all reviewed articles were also referenced for additional relevant studies. Articles were included in our analysis if they included PROs following outpatient THA. Abstracts, case reports, review articles, technical notes, and cadaveric studies were excluded from our analysis. Additionally, studies which did not differentiate THA and total knee arthroplasty (TKA) outcomes were excluded.

Demographics, follow-up period, discharge details, hospital readmissions, emergency room (ER) visits, and patient reported outcomes (PROs) were recorded for all included studies.

Quality assessment

2 authors (JS and PJR) independently assessed each selected article using the validated Methodological Index for Non-randomized Studies (MINORS) criteria.[20] This scoring system generated a numerical score (out of 24 points) for each study based on its data collection process, endpoints, follow-up rate, statistical analysis, and control group, if applicable. Any disagreements in MINORS scoring were discussed until a final consensus was reached (Table 1).

Table 1. Level of evidence and MINORS.

Study	Level of Evidence	MINORS
Berger et al.[8]	4	14
Berger et al.[9]	4	14
Dorr et al.[17]	4	12
Goyal et al.[21]	1	24
Hartog et al.[22]	4	14
Klapwijk et al.[18]	4	14
Larsen et al.[23]	4	16
Mahmood et al.[24]	4	12
Schroeder et al.[25]	4	15

Data analysis

To approximate the effect of THA on functional outcomes, the standardised mean difference (SMD) was calculated for studies that reported preoperative PROs, postoperative PROs, and a measure of statistical dispersion of the data. The SMD was calculated by dividing the difference between the respective postoperative PRO and preoperative PRO by the standard deviation of preoperative PRO. In cases where the preoperative PRO standard deviation was not provided, it was approximated using the range.[26] The effect sizes were compared to the literature values of weak, SMD between 0.2 and 0.49; moderate, SMD between 0.5 and 0.79; large, SMD $\geqslant$ 0.8.[27] Additionally, we reported the proportion of patients who demonstrated improvement that met the minimal clinically important difference (MCID) and patient acceptable symptomatic state (PASS) for HHS.[28] For this analysis, we used the threshold values for the modified Harris Hip Score (mHHS), as it is suggested in the literature that there is no statistically significant or clinically meaningful difference between HHS and mHHS.[29]

Results

Study selection and demographics

The literature search yielded 114 articles related to functional outcomes after outpatient THA. After the initial title and abstract review, 2 reviewers (JS and PJR) analyzed the full text of 13 articles. 4 articles were excluded for not differentiating between outpatient THA and outpatient TKA outcomes (Figure 1). 9 articles, with 683 hips and a collective study period of 1988 to 2016, were included in this analysis.[8,9,17,18,21–25] The majority of patients underwent primary THA during the study period, and the follow-up period ranged from 4 weeks to 10 years.[8,9,17,18,21–25] The mean age across all studies was 58.9 years; additional demographic details are provided in Table 2.

Patient-reported outcomes

A total of 10 PROs were utilized in our selected studies: the Harris Hip Score (HHS), a visual analog pain scale (VAS), the EQ-5D (EuroQol Group), Numeric Rating

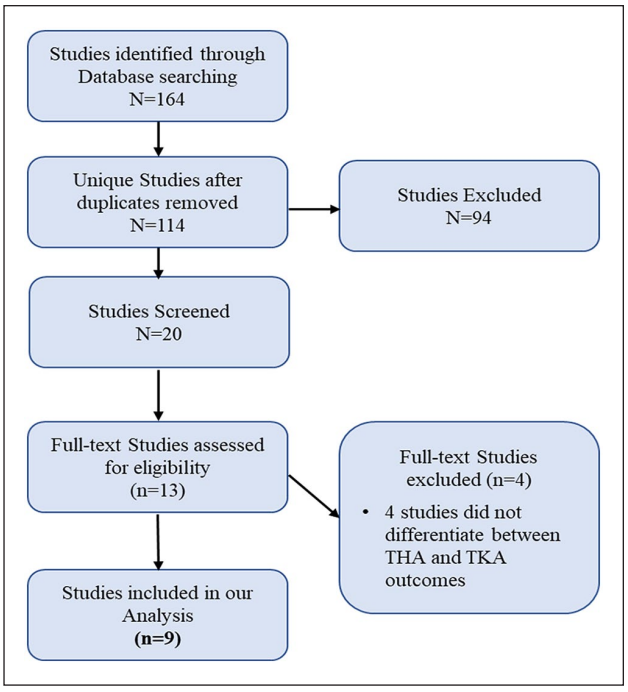

Figure 1. Search strategy.
THA, total hip arthroplasty; TKA, total knee arthroplasty.

Scale at rest and during activity (NRS), Oxford Hip Score (OHS), the physical functional short form of the Hip Injury and Osteoarthritis Outcome Score (HOOS-PS), the physical and mental portions of the Short Form (SF-12P, SF-12M), and pain on a narrative analog scale (NAS).

4 studies reported HHS scores for their patient populations and in 3 studies, the average HHS scores were excellent (>90) by 6 weeks postoperatively.[8,9,17] The fourth study reported fair HHS scores for the outpatient and inpatient THA groups (75 ± 18, 75 ± 14, $p = 0.77$, respectively) at 4 weeks postoperatively.[21] On average, at latest follow-up, all patients achieved the MCID and PASS for HHS. With regard to pain following surgery, VAS scores improved significantly in two studies,[17,21] NRS at rest and during activity improved significantly ($p < 0.001$) in Hartog et al.[22] and NAS pain decreased from 8.4 preoperatively to 1.1 postoperatively in Schroeder et al.[25] Additionally, in Schroeder et al., 55.6% of patients were pain free by latest follow-up.[25] In both studies utilising the EQ-5D, all patients demonstrated significant improvement at latest follow-up ($p < 0.05$),[18,22] and the effect sizes were moderate (SMD = 0.6)[18] and large (SMD = 1.26), respectively (Figure 2).[22]

2 studies asked patients numerous qualitative questions to assess their recovery and satisfaction with surgery.[8,17] In their group of 100 outpatient THA patients, the average time to discontinue crutches was 6 days, the average time to discontinue oral narcotics was 6 days, and the average time to resume activities of daily living was 10 days.[8] In Dorr et al.,[17] at 6 weeks, 96% would have the surgery again, 19% had problems with postoperative pain, 87% felt going home the same day gave them more confidence[9,17,21,23] in hip replacement in first 6 weeks, 87% felt going home the same day accelerated recovery, 96% were glad they had same day surgery, and 94% would recommend the surgery to others.[17]

Discharge details

7 studies reported that 88.1% of the enrolled patients were discharged the same day of surgery, as expected.[8,9,17,18,21–23] The most common reasons for the delay in discharge following THA were nausea, dizziness, and hypotension (5.2%) while 0.7% of the patients were not discharged the same day because they did not meet hospital discharge criteria (0.7%) (Table 2).

Readmissions

Out of the 6 studies reporting on readmissions rate, there were 2 (0.34%) readmissions within 3 months of surgery due to seroma and periprosthetic fracture that occurred as a consequence of motorcycle accident.[8,9,17,21–23] Goyal et al.[21] found no significant difference between the number of hospital readmissions in the outpatient THA and inpatient THA group ($p = 0.21$). Further, there was no significant difference in calls placed between the office staff and patients in the outpatient and inpatient group ($p = 0.94$).[21]

Postoperative pain management

6 studies reported a postoperative pain medication protocol for their patient populations.[9,17,18,21–23] 4 studies used Celecoxib for pain control in addition to a combination of hydrocodone, tramadol, acetaminophen, hydrocodone, ketorolac, pregabalin depending on the study.[17,18,21,22] In Berger et al.[9] and Larsen et al.[23] oxycodone was prescribed as needed.

Discussion

The existing body of literature shows that outpatient THA can reduce the economic burden on the healthcare system and diminish complications related to immobility. To our knowledge, this is one of the first systematic reviews to synthesize patient reported outcomes (PROs) following outpatient THA. In this study, we reviewed nine studies on outpatient THA outcomes for demographics, discharge details, readmissions, and PROs. All patients demonstrated significant improvement in HHS, OHS, VAS, EQ-5D, NPRS, and HOOS-PS scores, and the effect size was large (SMD>0.8). Among the studies that reported discharge details for their patient populations, 88.1% of THA patients were discharged the same day of their surgery.[8,9,17,18,21–23] Additionally, across all reviewed studies, there were 2 (0.34%) readmissions within 3 months of surgery.

Table 2. Data from selected studies.

Study	No. of Hips/ Sex	Age/BMI	Comorbidities	THA approach	Follow-up	No. of Hips Discharged Same day	Delayed discharge details	Readmissions/ER visits	PROs
Berger et al.[8]	100 26F/74M	Age (years): 56 (41–75) BMI (M/F): 26.8 (22.5–33.0)/ 24.1 (20.6–29.1)	Patients with BMI >35, within 1 year of myocardial infarction, pulmonary embolism, anticoagulation therapy, or >2 important medical comorbidities were excluded	primary THA	3, 6, 12 weeks	97 (97%)	3 total patients: 1 had nausea and 2 had hypotension	no readmissions or complications at 3 months postoperatively	HHS (preop, 3,6,12 weeks): 56 (32–77), 91 (61–100), 94 (79–100), 96 (74–100) SF-12P (preop,3,6,12 weeks): 35.1 (20.5–56.8), 48.5 (26.4–58.7), 49.1 (30.4–59.8), 52.0 (28.7–62.3) SF-12M (preop, 3,6,12 weeks): 59.2 (31.4–70.1), 60.5 (26.4–58.8), 60.2 (31.4–70.1), 59.9 (30.2–69.7)
Berger et al.[9]	150 38F/112M	Age: 58 (41–75) BMI (M/F): 30.4 (22.5–39)/ 28 (20.6–35.8)	Patients with BMI >40, within 1 year of myocardial infarction, pulmonary embolism, anticoagulation therapy, or >2 important medical comorbidities were excluded	primary THA	3 months	144 (96%)	6 total patients: 5 had postoperative nausea while 1 had postop pain	9 ER visits within 3 months: 3 in first week: nausea-induced dehydration, anemia, pain, 1–4 weeks: leg swelling, urinary tract infection, fall, face swelling; 2 between 1 and 3 months: one for pneumonia and one from low blood pressure	HHS (preop, 6 weeks, 3 months): 51 (32–74), 91 (56–100), 95 (62–100), $p < 0.01$
Dorr et al.[17]	69 22F/31M	Age: 54.1 ±8.4 (23–65) BMI: 28.3 ± 5.2 (20.8–42.9)	NR	primary THA posterior	6 weeks	53 (77%)	16 total patients: 2 had pain, 5 had hypotension, 4 dizziness, 3 had nausea, 1 infection, 1 home problem	no readmissions	HHS: 95.6 ± 5 VAS (1 week, 2 week, 3 week): 2.8 ± 1.7, 2.5 ± 1.7, 1.9 ± 1.5
Goyal et al.[21]	112 outpatient (53 F/59M) 108 inpatient (50F/58M)	Age: 60.0 ± 8.7 (27–74) BMI: 27.9 ± 4.4 (18.0–39.9)	Patients with BMI ⩾40, history of cardiopulmonary disease, chronic preoperative opioid use, preoperative hemoglobin ⩽ 10 g/dL, walker/wheelchair, no assistance at home were excluded	primary THA anterior	4 weeks	85 (76%)	27: 26 stayed 1 night and 1 stayed 2 nights: 9 dizziness/ hypotension, 6 pain, 5 patient preference, 4 nausea, 2 ambulatory dysfunction, 1 urinary retention	1 hospital readmission in outpatient and 4 from inpatient $p = 0.21$; 1 inpatient underwent reoperation for infection; 1 outpatient had motor vehicle collision and sustained periprosthetic fracture	Preop VAS (out vs in): 4.7 ± 2.4 vs 4.4 ± 2.5, $p = 0.32$, VAS (out vs in) day 1 following surgery: 3.7 ± 2.3 vs 2.8 ± 2.1, $p = 0.005$, 4 week follow-up: 1.7 ±1.9 vs 1.7 ± 1.9, $p = 0.77$ preop HHS scores (out vs in) :53 ± 13 vs 53 ± 14, $p = 0.98$, HHS at 4 weeks (out vs in): 75 ± 18 vs 75 ± 14, $p = 0.77$)

(Continued)

Table 2. (Continued)

Study	No. of Hips/ Sex	Age/BMI	Comorbidities	THA approach	Follow-up	No. of Hips Discharged Same day	Delayed discharge details	Readmissions/ER visits	PROs
Hartog et al.[22]	27	Age: 63 (48–71) BMI: 26 (20–33)	Patients with cardiovascular impairment or insulin dependent diabetes mellitus were excluded	primary THA anterior	3 months	24 (89%)	3: nausea/dizziness	1 readmission 11 days after surgery due to seroma formation	EQ-5D (preop vs 6 weeks vs 3 month): 0.71 (-0.04–0.96), 0.93 (0.68–1.00), 0.92 (0.44–1.00), $p < 0.001$ NRS at rest: (preop vs 6 weeks vs 3 month): 3.6 (1–8), 0.6 (0–3), 1.0 (0–10), $P < 0.001$ NRS at activity: (preop vs 6 weeks vs 3 month): 6.6 (3–9), 1.4 (0–3), 1.9 (0–9). $P < 0.001$
Klapwijk et al.[18]	42	Age: 65 (41–82) BMI: 26 (18–39)	Patients with visual/ mental impairment or language barrier were excluded	primary THA anterior	6 weeks	38 (90%)	4: discharge criteria not fulfilled for 2, 1 atrial fibrilation, 1 liquor leakage		Median OHS (preop, first week, 6 week): 24 (6–42), 29 (12–46), 43 (18–48), $p < 0.05$ Median EQ-5D (preop, 6 week): 0.69 (-0.06–0.84), 0.78 (-0.03–1.00), $p < 0.05$ Median HOOS-PS (preop, 6 week): 46.1 (8.8–100), 16 (0–51) Median SF-12P at 6 weeks: 41 (21–57) Median SF-12M at 6 weeks: 59 (29–68)
Larsen et al.[23]	20 5F/15M	Age: 64.6 BMI: 28.8	Revision cases, patients with ASA class >2, and with no support person were excluded	primary THA	6 weeks	17 (85%)	3 did not meet discharge criteria	no readmissions or complications at 6 weeks postoperatively	Patient satisfaction was 4.75/5 at 6 weeks
Mahmood et al.[24]	40 21F/19M	Age: 67.27	NR	primary THA	6 weeks	NR			OHS: 31.33
Schroeder et al.[25]	18 10F/6M	Age: 42 ± 8	8 patients had spastic quadriplegic cerebral palsy, 3 were hemiplegic and 4 were diplegic	NR	10 ± 6 years	NR			NAS pain scale: 8.4 to 1.1, $p = 0.002$

BMI, body mass index.

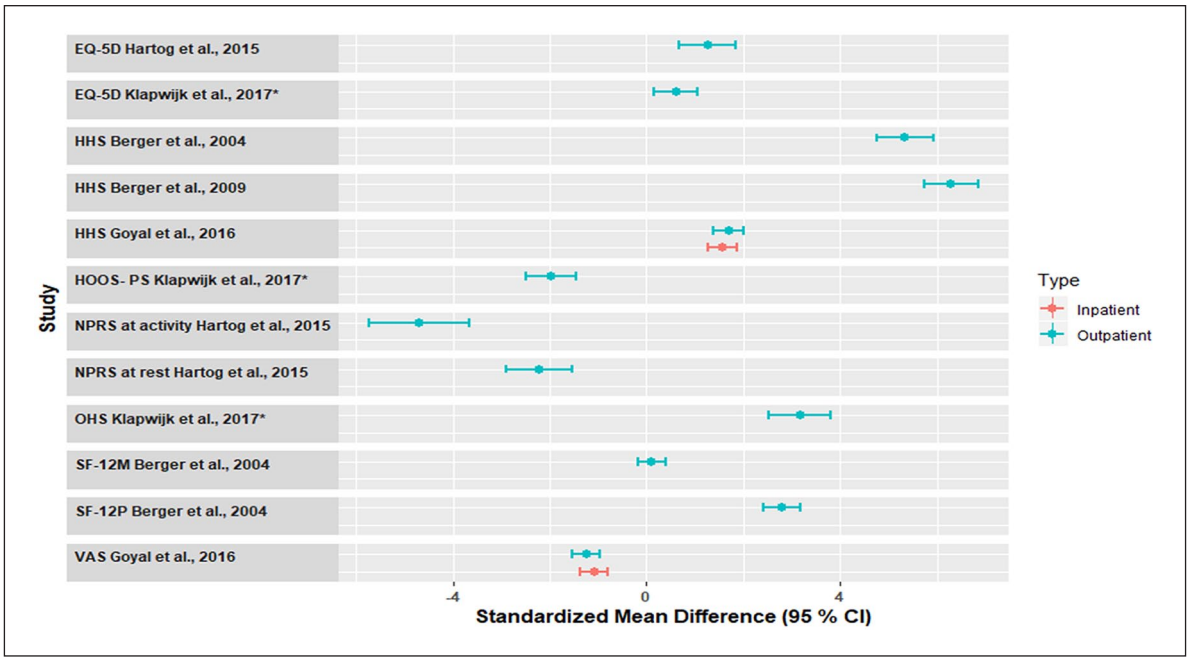

Figure 2. SMD with 95% Confidence Interval (CI), *includes inpatient and outpatient THAs, HHS: Harris Hip Score, VAS: visual analog pain scale, EQ-5D: (EuroQol Group), NRS: Numeric Rating Scale at rest and during activity, OHS: Oxford Hip Score, (HOOS-PS): the physical functional short form of the Hip Injury and Osteoarthritis Outcome Score.

1 of our selected studies directly compared outcomes between an inpatient THA group and an outpatient THA group.[21] The outpatient group demonstrated nearly identical postoperative HHS and VAS scores compared to the inpatient THA group; however, the effect size was slightly higher for the outpatient THA group. A recent Dutch registry study reported on 2089 THA inpatient outcomes collected over a 20-year period, and found fair Harris Hip Scores at 3 months postoperatively (78.3 ± 14.5).[30] For HHS, the SMD for the reviewed outpatient studies ranged from 1.7 to 6.3 and the SMD for the Dutch registry was 1.8. Thus, the effect size of outpatient THA is comparable to that of inpatient THA. The mean follow-up periods for the outpatient group and inpatient registry groups were 2.4 and 3 months, respectively. Thus, with regard to short-term follow-up, outpatient and inpatient cases demonstrate comparable favourable outcomes.

The majority of outpatient THAs reviewed in this systematic review were performed on patients of BMI $< 40\,kg/m^2$, without history of cardiovascular impairment, and with available home support.[8,9,21–23] An analysis of the New Zealand Joint Registry revealed that out of 22,600 patients who underwent THA, 76% were classified American Society of Anesthesiologists (ASA) $\leqslant 2$. ASA class was defined as follows: (1) normal healthy patient, (2) patient with mild systemic disease, (3) patient with severe systemic disease, (4) patient with severe systemic disease that is a constant threat to life.[31] They found that THA patients with a preoperative ASA physical class 3 and 4 had significantly worse ($p < 0.001$) Oxford Hip Scores than patients with ASA Class 1 and 2. Furthermore, patients with ASA class 3 underwent a revision THA at a significantly ($p = 0.040$) higher rate than patients with ASA class 1.[32] In addition, studies have shown that obesity is a risk factor for revision THA.[33–35] Ponnusamy et al.[35] found that THA patients with a body mass index (BMI) $> 35\,kg/m^2$ were at greater risk for a revision, particularly septic revisions. The findings in this systematic review coincide with the New Zealand registry, revealing favorable outcomes for patients with ASA $\leqslant 2$. The majority of our reviewed studies excluded patients with significant comorbidities. Hence, the favourable PROs summarized in the present study cannot be extrapolated for patients with significant comorbidities.

The 3-month readmission rate found in the present study was 0.34%. 1 readmission was related to a sequela of motorcycle accident and the other was due to a seroma.[21,22] This is lower than previously published readmission rates for primary THAs.[36–39] Schairer et al.[37] and Saucedo et al.[40] found that a hospital LOS of more than 5 days was an independent risk factor of unplanned hospital readmissions within 90 days of surgery. Corroborating the existing body of literature, the low readmission rate found in the present study suggests that performing THA in the outpatient setting results in infrequent readmissions. This reinforces the benefit of performing outpatient THA for both patients and the health-care system.

Literature shows that proper postoperative pain management plays a key role in patient satisfaction, rehabilitation, and complications.[41–45] It is well-established that decreased

postoperative pain is correlated to shorter LOS and fewer pain related readmissions.[46–48] Parvizi et al.[49] reviewed pain management in patients undergoing total joint arthroplasty. In their study, they advocated the use of multimodal pain management in order to achieve both pain relief and decreased reliance on opioids. They found that NSAIDS and the associated COX-2 inhibitors are the most effective medications for decreasing postoperative opioid usage. Although acetaminophen is not as widely used as NSAIDS, studies have shown favorable postoperative outcomes following its usage. Similar to Parvizi et al.,[49] in this systematic review, 7 studies that reported on postoperative pain management used NSAIDS and acetaminophen.[8,9,13,17,18,21,23] Of these, 5 studies reported used opioids additionally.[8,9,17,21,23] Delayed discharge was associated with nausea, dizziness, and hypotension, all of which can be attributed to opioid use.[8,9,17,21,23] Interestingly, 3 studies reported on delayed discharge as a result of inadequate pain control.[9,17,21] A standardised pain management protocol will aid patient recovery during the transition from the hospital to home care and can decrease opioid related complications postoperatively.

In summary, outpatient THA results in favourable functional outcomes, high patient satisfaction, and infrequent readmissions in patients without significant comorbidities. Further, outpatient THA can be successfully executed, with 88% of patients discharged the same day of surgery, as expected. With proper pain management and rehabilitation protocols in place at the time of discharge, patients can adjust to their daily lives on an accelerated timeline. Finally, performing THA on an outpatient basis avoids inpatient hospital complications and can ease the economic burden of hip osteoarthritis.

We acknowledge several limitations in this study. First, our review included only 1 comparative study, limiting the average Level of Evidence of our studies. Second, we analysed studies with mostly short-term follow-up and studies with long-term follow-up are needed to assess the longevity of our results. Third, individual studies had varying discharge criteria for their THA patients following surgery.

Conclusion

THA in the outpatient setting leads to favourable outcomes, pain reduction, and low readmission rates in the short-term for patients with no significant comorbidities.

Declaration of conflicting interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: BGD: receives royalties from: Arthrex Inc., DJO Global Inc., Medacta International, Orthomerica Products Inc., Pacira Pharmaceuticals Inc., Medwest Associates, Prime Surgical LLC, Trice Medical Inc., Smith & Nephew Inc., Stryker Corporation.
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