Ponugoti and Magill
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SYSTEMATIC REVIEW

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Safety, efficacy and cost-effectiveness of outpatient versus inpatient joint arthroplasty: a systematic review and meta-analysis

Nikhil Ponugoti[1*] and Henry Magill[2]

Abstract

Background The rise in the adoption of outpatient arthroplasty has been attributed to its cost-effectiveness, although safety concerns persist. In this meta-analysis, we compare inpatient and outpatient joint arthroplasty with a primary focus on readmission and complication rates, using exclusively high-quality prospective data. Cost-effectiveness was used as a secondary outcome measure.

Methods A literature search was performed in Medline, Embase and Cochrane Library from inception to October 2023. A predefined strategy was used to conduct a systematic review and meta-analysis. Twelve studies were deemed eligible for inclusion. These were critically appraised using RoB analysis and MINORS criteria. Overall readmission rate, readmission rate for THA, readmission rate for TKA, complication rate and cost-analysis were selected as outcomes of interest. Forest plots were extracted using RevMan 5.3.5 software.

Results The twelve studies included 2470 patients, of which 1052 were outpatients and 1418 inpatient subjects undergoing arthroplasty. Forest plot analysis showed no significant difference in safety outcomes (readmission and complication rates). However, there were significantly lower costs in the outpatient group compared to the inpatient group. The results of the analysis were; overall readmission rate (Odds ratio 0.66; P= 0.29; I^2=18%), readmission rate in THA (odds ratio 0.62; P=0.10; I^2=51%), readmission rate in TKA (odds ratio 0.67; P=0.56; I^2=0%), overall complication rate (odds ratio 0.77; P=0.12; I^2=38%) and cost analysis (RR -2.88; P<0.00001; I^2= 93%).

Conclusions This meta-analysis demonstrates that outpatient total joint arthroplasty (TJA) is a safe option, when compared to inpatient surgery. However, it is clear that further prospective studies and long-term randomized clinical data are necessary for a more comprehensive understanding.

Keywords Outpatient, Inpatient, Arthroplasty

Introduction

Total hip arthroplasty (THA) and total knee arthroplasty (TKA) remain the most common joint replacement procedures, where overall numbers performed are expected to significantly increase [1]. Total joint arthroplasty (TJA) in the United States is expected to rise significantly in the coming two decades [1]. Data from the UK National Joint Registry predicts that by 2030, the demand for total knee arthroplasty (TKA) alone will reach nearly 3.5 million cases [2]. The current financial burden on the National Health Service (NHS) is substantial; where it is estimated to exceed £7,000 per case [2].

While total hip arthroplasty (THA) is generally successful, it is a procedure that traditionally required patients to stay in the hospital for several days and experience a slow

*Correspondence:
Nikhil Ponugoti
nikhil55in@gmail.com
[1] The James Cook University Hospital, Middlesbrough, England, UK
[2] Chelsea and Westminster Hospital, London, UK

recovery before being discharged [3–5]. Similar to trends in other surgical fields, there has been an increasing effort to shorten the hospital stay after surgical intervention. In recent years, the duration of hospital stays following total joint arthroplasty (TJA) has decreased due to the introduction of a comprehensive perioperative care strategy, which incorporates "enhanced recovery" protocols [6, 7]. This aims to enhance patient recovery and satisfaction while also reducing healthcare system costs [8–12]. This development has resulted in the implementation of fast-track protocols, where patients are discharged from the hospital on the day following their surgery [13]. In recent years, there has been a growing trend towards outpatient or day-case procedures.

Same-day discharge for TJA is made possible by minimally invasive techniques that cause less insult to soft tissues, tailored postoperative pain management strategies, and specialized rehabilitation programs [14–18]. The demand for such a service is driven by its emphasis on its potential cost-effectiveness [19]. Studies suggest that outpatient joint replacement surgery can enhance both clinical outcomes and patient satisfaction [20, 21]. However, a proposed downside of outpatient surgery is the possibility of hospital readmission and the increased risk of complications; numerous studies in the literature maintain this controversy [22–27].

Although there are many descriptive reports in the available literature, there are relatively few recent meta-analyses that have been published [28, 29]. These studies often have a significant degree of bias, primarily stemming from the fact that many studies included in these reports are retrospective and non-randomized [25, 30, 31]. The primary aim of this meta-analysis was to systematically assess and compare outpatient versus inpatient joint arthroplasty in relation to readmission rates and complication rates. For these primary outcome measures, this meta-analysis aims only to include high-quality data from randomized controlled trials (RCTs) and prospective comparative studies. As a secondary outcome measure, the meta-analysis aims to formally analyze the data related to the cost-effectiveness of both treatment approaches. This study could assist both surgeons and healthcare economic strategies in selecting the most appropriate approach for managing patients undergoing joint replacement.

Methods

A predefined strategy to conduct this meta-analysis in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines and Cochrane Handbook for Systematic Reviews was utilized.

Search strategy

A search was undertaken in Medline and Embase databases, alongside the Cochrane Library, from inception to October 2023. The MeSH terms used were: (Arthroplasty *or* hip prosthesis *or* knee prosthesis *or* THA *or* THR *or* TKA *or* TKR *AND* Outpatient) *AND* (1) Readmission *or* (2) Post-op complication *or* (3) Complications *or* (4) Cost analysis. An additional search looking for clinical trials was also performed in the ClinicalTrials.gov database (http://clinicaltrials.gov) and the World Health Organization (WHO) International Clinical Trials Registry Platform (http://apps.who.int/trialsearch/).

Study selection

All search terms, titles, abstracts, and full-text articles were independently reviewed by two authors (NP and HM) for relevance. The inclusion and exclusion criteria for this study are as follows:

Eligibility Criteria

Inclusion criteria:

1. Studies comparing outpatient arthroplasty versus inpatient arthroplasty
2. Studies comparing THA and/or TKA only
3. Levels I and II (RCTs, prospective comparative) studies
4. Level III original studies included only for cost analysis between outpatient and inpatient arthroplasty
5. English language studies only

Exclusion criteria:

1. Studies involving UKA or partial joint replacements
2. Studies with cost analysis from databases
3. Studies involving cadavers or animal studies
4. Abstracts, case reports, case series, systematic reviews.

Data extraction

Two authors (NP and HM) extracted data from eligible studies and added them to an Excel sheet presented in Table 1. The tabulated data includes Study, Country, Year, Type of study, Age Mean (SD) OP: IP, M/F ratio (OP:IP), Maximum follow-up, Total no. of patients, No. of outpatients, No. of inpatients and Operation. Two additional original retrospective studies were included for cost analysis only.

Data synthesis and statistical methods

Relative risk was used to assess continuous variables whereas odds ratio was used for dichotomous variables

Table 1 Demographic data of the included studies

Study	Country	Year	Type of Study	Age (OP: IP)	M/F ratio (OP: IP)	Maximum follow up	Total no. of patients	No of Outpatients	No of Inpatients	Surgery
Zomar et al [32]	Canada	2022	RCT	64.6(9.4):63.6(10.5)	27/55:27/55	90 days	115	49	56	THA
Schmidt et al [33]	Denmark	2022	Prospective	66(7):66(7)	53/48:53/48	90 days	202	101	101	TKA
Husted et al 1 THA [34]	Denmark	2021	Prospective	60(12): 63(12)	33/12:48/52	90 days	135	45	90	THA
Husted et al 2 TKA [34]	Denmark	2021	Prospective	60(11):60(11)	20/28:32/46	90 days	126	48	78	TKA
Coenders et al [35]	Netherlands	2020	Prospective	64(58.4-68.1)	97/160	360 days	647	257	390	THA
Huang et al [36]	Canada	2017	Prospective	58.5(5.6):61.5(5.9)	14/6:14/6	90 days	40	20	20	TKA
Gromov et al [19]	Denmark	2019	Prospective	61(11):62(10.40	69/47:192/147	90 days	455	116	339	THA/TKA
Gauthier-Kwan et al [37]	Canada	2018	Prospective	62.5(50.4-75.0):62.5(51.2-74.0)	29/14:22/21	90 days	86	43	43	TKA
Goyal et al [38]	USA	2019	RCT	59.8(8.5):60.2(8.9)	53/59:50/58	30 days	220	112	108	THA
Dorr et al [20]	USA	2010	Prospective	53.5(8.3):54.1(8.4)	31/22:37/32	180 days	69	53	16	THA
Kolisek et al [39]	USA	2009	Prospective	55(42-64):55(42-63)		90 days	128	64	64	TKA
Two retrospective studies included for cost-analysis only										
Moisan et al [40]	Canada	2023	Retrospective	60.6(10.4):71.1(10.0)	11/14:7/18	45 days	50	25	25	THA
Aynardi et al [41]	USA	2014	Retrospective	59(5.8):61.5(13.2)	71/48:26/52	90 days	197	119	78	THA

in this study. The data was used to extract forest plots for the meta-analysis by using RevMan software © 5.3.5. Chi-Square Test and I^2 test were formally used to determine heterogeneity. I^2 of 0% to 25%, 25% to 75%, and greater than 75% were considered as low, moderate, and high heterogeneity, respectively. We have used random effect analysis in extracting forest plots irrespective of heterogeneity to avoid any bias.

Outcome measures

The outcome measures, which were consistently reported for analysis, were the overall readmission rate, readmission rate in THA, readmission rate in TKA, overall complication rate and cost analysis. Subjects who failed their intended discharge in the outpatient group and the underlying causes were discussed in the study. However, we did not include this in our meta-analysis forest plots as it concerns only the outpatient arm of the study.

Results

Literature search results

Medline, Embase, and Cochrane databases retrieved 2225 articles in an initial search using MeSH terms. 1767 articles remained after duplicates were removed. When non-comparative studies other than cost-analysis outcomes were excluded, 36 articles remained. These were screened against the eligibility criteria. 24 further studies were excluded as they were retrospective or review papers. Finally, twelve studies were deemed eligible for qualitative and quantitative analysis. This process was shown by way of a PRISMA flow diagram (Figure 1).

Study characteristics and patient population

The Twelve studies (Table 1) included 2470 patients, of which 1052 were outpatients and 1418 inpatient subjects undergoing arthroplasty. Of the twelve studies, 10 RCTs and prospective studies directly compared the primary outcomes of our meta-analysis. For the purpose of cost comparison, only two non-retrospective studies were available within the search criteria. Consequently, we decided to include retrospective data solely for cost analysis. The researchers believe that pricing data is less influenced by typical limitations and traditional biases associated with retrospective data, such as selection and recall. The mean age among the study population ranged from 53.5 to 71.1 years. For the purposes of this paper, the Husted et al study was divided into two groups which are Husted et al THA and Husted et al TKA to compare the results separately [34]. The mean follow-up period in the included studies was 119 days.

Quality assessment

Two authors (NP and HM) assessed the quality of the included studies. RCTs were assessed using Risk of Bias (ROB) on the RevMan 5.3.5 software. RoB analysis assesses RCTs for random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome and personnel, incomplete outcome data, selective reporting and other bias. Understandably, allocation concealment and blinding of the participants had a high and unclear risk of bias as both outpatient and inpatient arthroplasty groups knew their allocation (Figure 2). Non-randomized comparative studies were assessed using the MINORS criteria, with a subjective score out of 24 for comparative studies. MINORS criteria were a clearly stated aim, inclusion of consecutive patients, prospective collection of data, endpoints appropriate to the aim of the study, unbiased assessment of the study endpoint, follow-up period appropriate to the aim of the study, loss to follow-up less than 5%, prospective calculation of the study size, an adequate control group, contemporary groups, baseline equivalence of groups, adequate statistical analyses. The studies included were all above a score of 15 and were of good quality (Table 2).

Sensitivity analysis

A random effect analysis was used throughout the outcome comparisons to avoid any bias. Overall readmission rate and readmission rate for THA showed significantly lower rates in the outpatient group when the Gromov et al. study data was removed [19]. We decided to retain the Gromov study as it was of good quality [19]. However, it was carried out much earlier than the remaining studies and could be argued that they had yet to fully adjust and comply with all modern outpatient arthroplasty principles. Moreover, the I^2 of these aforementioned outcomes in random effect analysis was 17% and 51% respectively suggesting only a mild to moderate heterogeneity. Otherwise, the remainder of the outcomes included in the study, did not vary by removing any single study data from the forest plots suggesting no individual study had a significant influence on the outcomes.

Outcomes

I) Overall readmission rate

Six studies [19, 33–35, 37, 38] with a total of 722 subjects in the outpatient group and 1149 in the inpatient group reported overall readmission rates. We found no difference in the readmission rate between the groups (Figure 3).

(Odds ratio 0.66; P=0.29; I^2=18%)

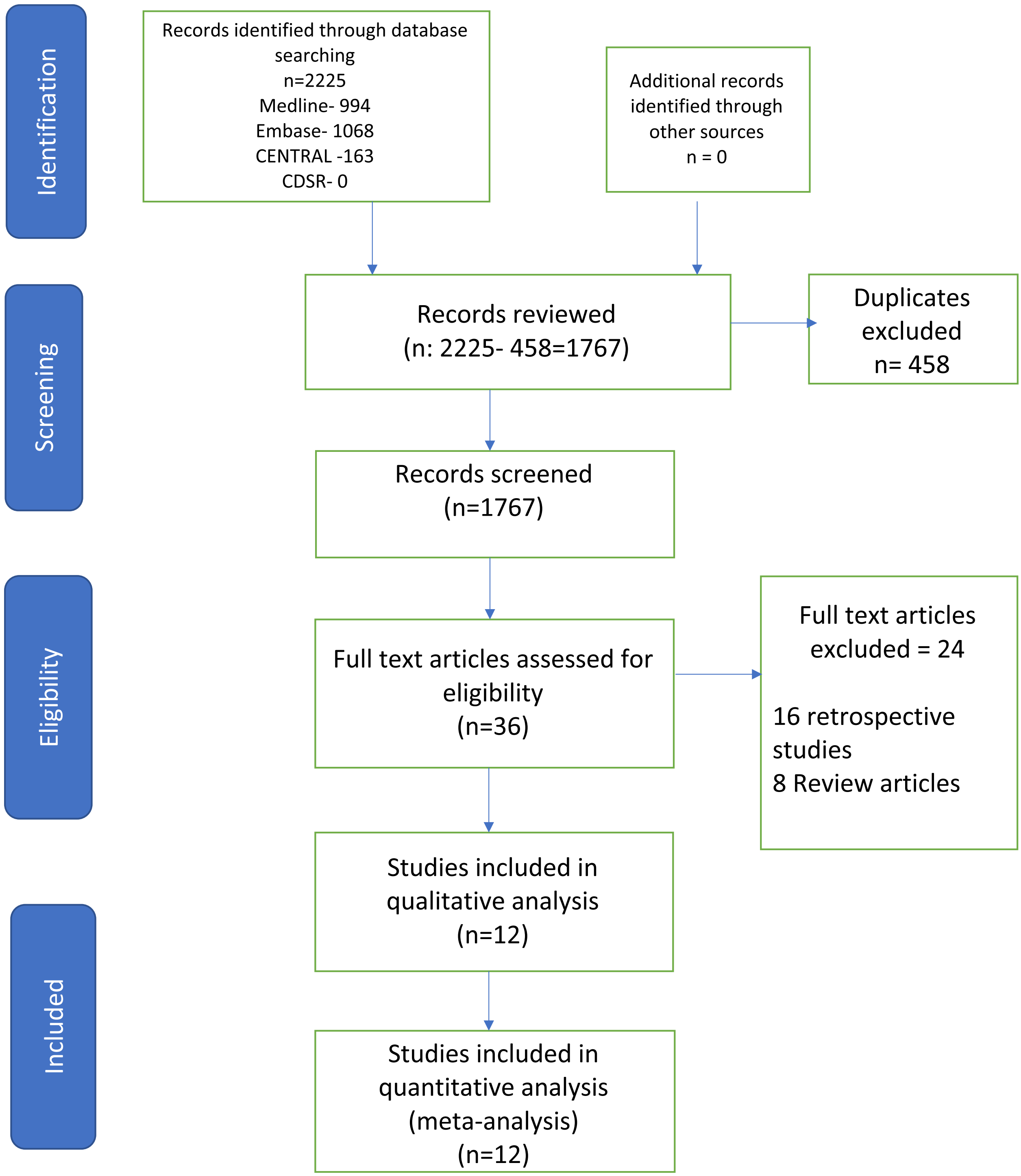

Fig. 1 PRISMA flow diagram

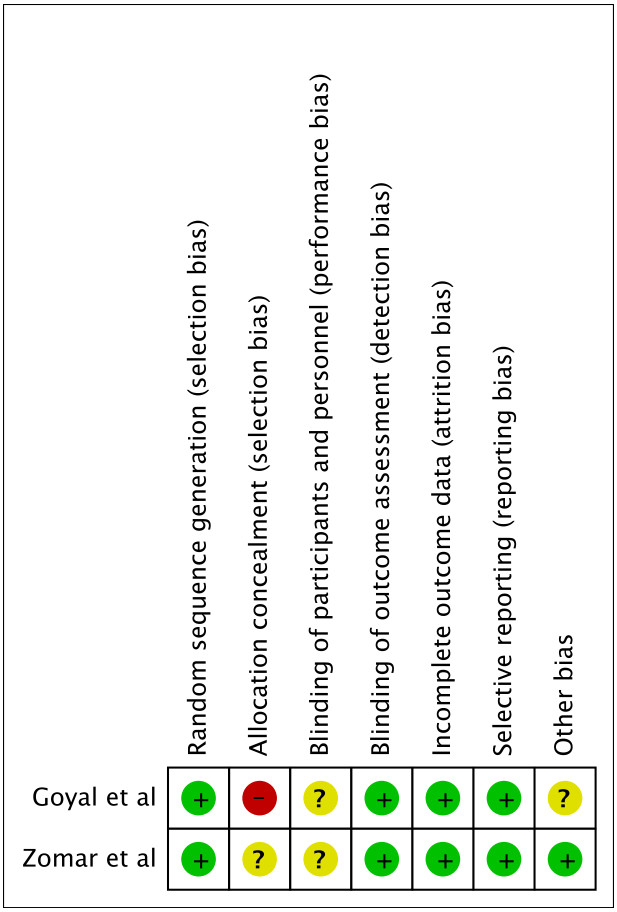

Fig. 2 Risk of bias summary: review authors' judgments about each risk of bias item for each included study.

II) Readmission rate THA

Four THA studies [19, 34, 35, 38] reported readmission rates specific to THA. This comparison did not show any significant difference between the two groups (Figure 4).

(Odds ratio 0.62; P=0.10; I^2=51%)

III) Readmission rate TKA

Three TKA studies [33, 34, 37]reported readmission rates specific to TKA with a total of 192 subjects in the outpatient group and 222 subjects in the inpatient group. The forest plot results suggested no significant difference between the two groups (Figure 5).

(Odds ratio 0.67, *P*= 0.56; I^2= 0%)

IV) Overall complication rate

Eight studies [20, 32, 33, 35–39] compared the overall complication rates with a total of 699 subjects in the outpatient arthroplasty and 798 subjects in the inpatient group. We found no significant difference between the groups (Figure 6). Interestingly, all but one of the included studies used the same criteria for what constituted a successful outpatient pathway. However, Kolisek et al. categorized an outpatient subject as one who was discharged within twenty-three hours of surgery. Importantly, this paper was only included in the overall complication rate analysis and when data by Kolisek were removed, the overall effect remained unchanged [39].

(Odds ratio 0.77, *P*= 0.12; I^2= 38%)

V) Cost analysis

One RCT [32], one prospective study [36] and two retrospective studies [40, 41] compared the cost analysis between the groups. There were 213 subjects in the outpatient group and 179 subjects in the inpatient group. The numbers observed on the forest plot are in the $000s; this is reflected in the graph scaling. We found significantly lower costs in the outpatient group (experimental) than in the inpatient group (control) (Figure 7). This was a common finding both with fixed and random effect analysis.

(RR -2.88; *P*<0.00001; I^2= 93%)

Failure to discharge

It is clear that a proportion of patients who were intended for outpatient arthroplasty were unable to be discharged as intended. Among the studies included in our meta-analysis, the quoted range of failure to discharge varied significantly, from 0% to 24.1%. The studies that have recorded failure to discharge are included in the Table 3. The most commonly quoted basis for failure to discharge was orthostatic hypotension requiring overnight monitoring, wound seepage and bleeding [33, 35, 38]. Other less commonly quoted causes were pain, nausea/vomiting, urinary retention and intraoperative fractures [20, 32, 35, 38, 41]. Interestingly, a large number of included papers had either no failure of the outpatient pathway or did not record this [19, 34, 36, 37, 39].

Discussion

The current literature indicates that extended hospital stays can potentially lead to increased costs, which might not be sustainable within the current healthcare system [41]. In recent years, endeavors have been undertaken to shorten hospital stays, lower expenses, and enhance efficiency [29]. The hesitance to adopt these practices is linked to concerns about safety, especially in relation to readmission rates [42, 43].

The primary aim of this meta-analysis was to address these concerns, by assessing both readmission and complication rates in hip and knee arthroplasty, through a quantitative approach. We are aware of a number of recently published meta-analyses on this topic [28, 29]. However, the quality of existing literature is often

Table 2 MINORS criteria for quality assessment of included studies

Study	A clearly stated aim	Inclusion of consecutive patients	Prospective collection of data	Endpoints appropriate to the aim of the study	Unbiased assessment of the study endpoint	Follow-up period appropriate to the aim of the study	Loss to follow-up less than 5%	Prospective calculation of the study size	An adequate control group	Contemporary groups	Baseline equivalence of groups	Adequate statistical analyses	Total
Schmidt et al [33]	2	2	1	2	1	2	0	1	2	2	2	2	19/24
Husted et al 1 THA [34]	2	2	2	1	1	2	2	0	2	2	1	2	19/24
Husted et al 2 TKA [34]	2	2	2	1	1	2	2	0	2	2	1	2	19/24
Coenders et al [35]	2	2	2	1	1	2	1	1	2	2	2	2	20/24
Huang et al [36]	2	1	2	2	1	2	2	0	2	2	1	2	19/24
Gromov et al [19]	2	2	2	2	1	2	1	0	2	2	1	2	19/24
Gauthier-Kwan et al [37]	2	1	1	2	2	2	2	0	2	2	2	2	20/24
Dorr et al [20]	2	1	2	2	1	2	2	0	2	2	2	2	20/24
Kolisek et al [39]	2	1	2	2	2	2	2	0	2	1	2	2	20/24
Moisan et al [40]	2	2	0	2	1	2	2	0	2	1	1	2	17/24
Aynardi et al [41]	2	2	0	2	1	2	0	0	2	2	1	2	16/24

	Outpatient Arthroplasty		Inpatient Arthroplasty			Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M–H, Random, 95% CI
Coenders et al	3	257	17	390	12.8%	0.26 [0.08, 0.89]
Gauthier–Kwan et al	1	43	1	43	2.8%	1.00 [0.06, 16.52]
Goyal et al	2	112	5	108	7.6%	0.37 [0.07, 1.97]
Gromov et al	7	116	13	339	19.7%	1.61 [0.63, 4.14]
Husted et al 1	5	45	15	90	15.9%	0.63 [0.21, 1.84]
Husted et al 2	5	48	17	78	16.2%	0.42 [0.14, 1.22]
Schmidt et al	13	101	15	101	25.0%	0.85 [0.38, 1.88]
Total (95% CI)		**722**		**1149**	**100.0%**	**0.66 [0.41, 1.07]**
Total events	36		83			

Heterogeneity: $Tau^2 = 0.08$; $Chi^2 = 7.30$, df = 6 (P = 0.29); $I^2 = 18\%$
Test for overall effect: Z = 1.67 (P = 0.09)

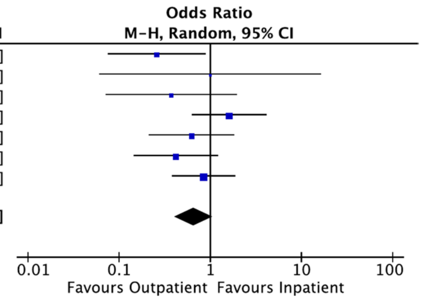

Fig. 3 Forest plot comparing overall readmission rates between outpatient and inpatient groups

	Outpatient Arthroplasty		Inpatient Arthroplasty			Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M–H, Random, 95% CI
Coenders et al	3	257	17	390	24.3%	0.26 [0.08, 0.89]
Goyal et al	2	112	5	108	17.3%	0.37 [0.07, 1.97]
Gromov et al	7	116	13	339	30.9%	1.61 [0.63, 4.14]
Husted et al 1	5	45	15	90	27.6%	0.63 [0.21, 1.84]
Total (95% CI)		**530**		**927**	**100.0%**	**0.62 [0.26, 1.46]**
Total events	17		50			

Heterogeneity: $Tau^2 = 0.39$; $Chi^2 = 6.17$, df = 3 (P = 0.10); $I^2 = 51\%$
Test for overall effect: Z = 1.10 (P = 0.27)

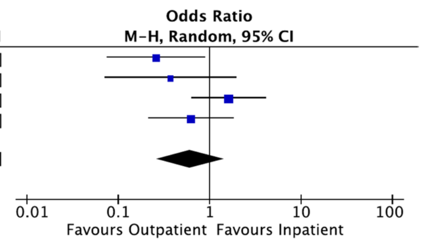

Fig. 4 Forest plot comparing readmission rates specific to THA between outpatient and inpatient groups

	Outpatient Arthroplasty		Inpatient Arthroplasty			Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M–H, Random, 95% CI
Gauthier–Kwan et al	1	43	1	43	5.0%	1.00 [0.06, 16.52]
Husted et al 2	5	48	17	78	34.0%	0.42 [0.14, 1.22]
Schmidt et al	13	101	15	101	61.0%	0.85 [0.38, 1.88]
Total (95% CI)		**192**		**222**	**100.0%**	**0.67 [0.36, 1.25]**
Total events	19		33			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 1.16$, df = 2 (P = 0.56); $I^2 = 0\%$
Test for overall effect: Z = 1.25 (P = 0.21)

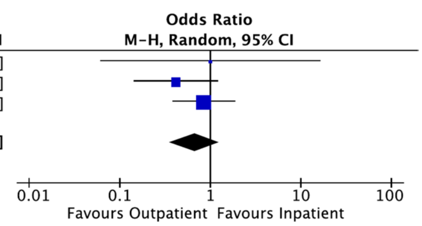

Fig. 5 Forest plot comparing readmission rates specific to TKA between outpatient and inpatient groups

	Outpatient Arthroplasty		Inpatient Arthroplasty			Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M–H, Random, 95% CI
Coenders et al	11	257	45	390	25.1%	0.34 [0.17, 0.68]
Dorr et al	1	53	0	16	3.1%	0.94 [0.04, 24.27]
Gauthier–Kwan et al	8	43	4	43	13.8%	2.23 [0.62, 8.05]
Goyal et al	4	112	7	108	14.1%	0.53 [0.15, 1.88]
Huang et al	2	20	0	20	3.4%	5.54 [0.25, 123.08]
Kolisek et al	3	64	1	64	5.8%	3.10 [0.31, 30.61]
Schmidt et al	13	101	15	101	22.4%	0.85 [0.38, 1.88]
Zomar et al	3	49	7	56	12.2%	0.46 [0.11, 1.87]
Total (95% CI)		**699**		**798**	**100.0%**	**0.77 [0.42, 1.41]**
Total events	45		79			

Heterogeneity: $Tau^2 = 0.26$; $Chi^2 = 11.37$, df = 7 (P = 0.12); $I^2 = 38\%$
Test for overall effect: Z = 0.84 (P = 0.40)

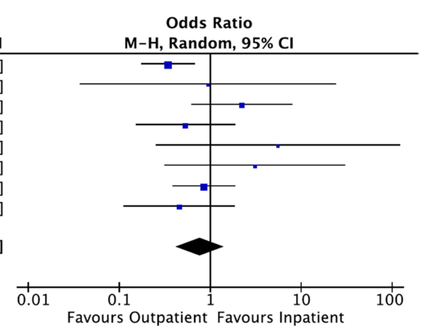

Fig. 6 Forest plot comparing overall complication rates between outpatient and inpatient groups

inadequate, with notable biases. This is the first meta-analysis of outpatient versus inpatient TJA where all data are exclusively from well-conducted and high quality randomized controlled trials and prospective studies.

A key finding of this meta-analysis is that outpatient total joint arthroplasty (TJA) did not result in a higher occurrence of complications or readmissions. These findings differ from some previous research, which indicated a greater likelihood of complications and readmissions with the outpatient approach [26, 41]. Very few studies in the literature have proposed potential clinical benefits of outpatient surgery such as reduced myocardial

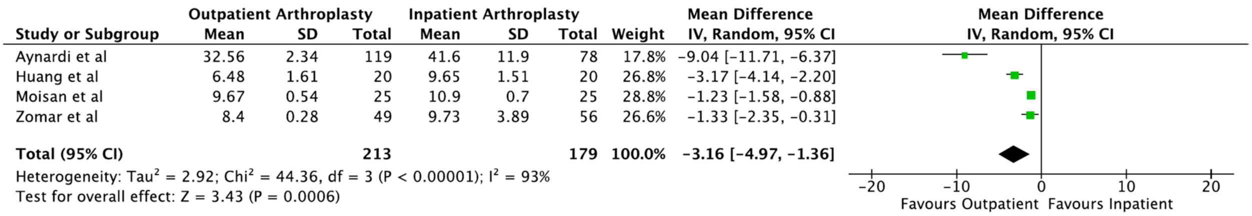

Fig. 7 Forest plot comparing cost-analysis between outpatient and inpatient groups

Table 3 Failed discharge rates among included studies

Study	Failed to discharge (%)
Zomar et al [32]	14.3
Schmidt et al [33]	11.9
Coenders et al [35]	15.6
Goyal et al [38]	24.1
Dorr et al [20]	23.2
Aynardi et al [41]	1.6

infarction, deep venous thrombosis, urinary problems, and lung issues, following outpatient procedures. These authors have attributed possible improvements to perioperative protocols that involve early patient mobilization and personalized pain management strategies [38]. While the overall rates of complications in this study were consistent between inpatient and outpatient treatment routes, it remains uncertain whether specific complications were more prevalent in each pathway.

The proportion of patients who were intended for outpatient arthroplasty but failed discharged was poorly recorded. Interestingly, one study stated that 24% of patients failed their intended same-day discharge due to complications [38]. However, in the same study, 17% of participants who were initially scheduled for inpatient surgery met the criteria for outpatient surgery and were released on the same day [38]. This is likely a reflection of the importance of appropriate patient selection and the specific patient factors that may contribute to successful inpatient treatment. However, the current literature does not provide specific direction on this [10]. In terms of patient selection for suitable and safe outpatient care, some factors have been proposed; these include, high patient motivation, a low ASA grade, primary arthroplasty, age below 75 years, and having a strong support network [21]. This further emphasizes the importance of profiling patients in further research in order to identify individual patient characteristics and hence the best candidates for safe and successful TJA. The broader issue of the failure rate, associated complications and the underlying factors that may contribute to this is indeed an intriguing topic in itself. However, it falls outside the scope of our current study.

In the context of cost comparison, it remains possible that outpatient procedures come with unanticipated costs when we take into account the expenses related to care outside the hospital. For example, when patients are discharged on the same day, they may necessitate supplementary home care, admission to a rehabilitation facility, or additional physical therapy upon returning home. This was not recorded in any of the included studies [44]. The costs associated with an extended inpatient stay may vary widely across different health care systems internationally. The available data on these costs is relatively limited in this study and is primarily from Canada and USA.

Conclusion

This meta-analysis suggests that, *outpatient total joint arthroplasty (TJA) is as safe as, and incurs less costs than, inpatient care.* However, it is clear that further prospective studies and long-term randomized clinical data are necessary for a more comprehensive understanding.

The specific factors that determine a successful outpatient procedure go beyond the scope of this study and likely involve a combination of factors such as patient selection, surgical technique, anaesthesia and rehabilitation protocols. It is evident that more extensive, multicentre data are needed to clarify these contributing elements.

Abbreviations

THA Total hip arthroplasty
TKA Total knee arthroplasty
TJA Total joint arthroplasty
RCT Randomised controlled trials

Authors' contributions

Both NP and HM have contributed equally in design, literature search, data synthesis and writing the manuscript. Thank you

Funding

There was no Funding needed for this study

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Not applicable.

Competing interests
The authors declare no competing interests.

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References

1. Kurtz SM, Ong KL, Lau E, Bozic KJ. Impact of the economic downturn on total joint replacement demand in the United States: Updated projections to 2021. Journal of Bone and Joint Surgery. 2014;96:624–30. https://doi.org/10.2106/JBJS.M.00285.
2. S Sobti DA, E Sudhakar MJ. High Body Mass Index and its Effect on Total Knee Replacement. J Arthritis 2017;06. https://doi.org/10.4172/2167-7921.1000245.
3. Healy WL, Iorio R, Clair AJ, Pellegrini VD, Della Valle CJ, Berend KR. Complications of Total Hip Arthroplasty: Standardized List, Definitions, and Stratification Developed by The Hip Society. Clin Orthop Relat Res. 2016;474:357–64. https://doi.org/10.1007/s11999-015-4341-7.
4. Zhu S, Qian W, Jiang C, Ye C, Chen X. Enhanced recovery after surgery for hip and knee arthroplasty: A systematic review and meta-analysis. Postgrad Med J. 2017;93:736–42. https://doi.org/10.1136/postgradmedj-2017-134991.
5. Dawson-Bowling SJ, Jha S, Chettiar KK, East DJ, Gould GC, Apthorp HD. A multidisciplinary enhanced recovery programme allows discharge within two days of total hip replacement; three- to five-year results of 100 patients. HIP International. 2014;24:167–74. https://doi.org/10.5301/hipint.5000100.
6. Cassard X, Garnault V, Corin B, Claverie D, Murgier J. Outpatient total knee arthroplasty: Readmission and complication rates on day 30 in 61 patients. Orthopaedics and Traumatology: Surgery and Research. 2018;104:967–70. https://doi.org/10.1016/j.otsr.2018.07.014.
7. Lovald ST, Ong KL, Malkani AL, Lau EC, Schmier JK, Kurtz SM, et al. Complications, mortality, and costs for outpatient and short-stay total knee arthroplasty patients in comparison to standard-stay patients. Journal of Arthroplasty. 2014;29:510–5. https://doi.org/10.1016/j.arth.2013.07.020.
8. Memtsoudis SG, Della Valle AG, Besculides MC, Gaber L, Laskin R. Trends in Demographics, Comorbidity Profiles, In-Hospital Complications and Mortality Associated With Primary Knee Arthroplasty. Journal of Arthroplasty. 2009;24:518–27. https://doi.org/10.1016/j.arth.2008.01.307.
9. Jain NB, Higgins LD, Ozumba D, Guller U, Cronin M, Pietrobon R, et al. Trends in epidemiology of knee arthroplasty in the United States, 1990–2000. Arthritis Rheum. 2005;52:3928–33. https://doi.org/10.1002/art.21420.
10. Meneghini RM, Ziemba-Davis M. Patient Perceptions Regarding Outpatient Hip and Knee Arthroplasties. Journal of Arthroplasty. 2017;32:2701-2705.e1. https://doi.org/10.1016/j.arth.2017.04.006.
11. Walde TA, Blattgerste D, Sehmisch S, Kuttler W, Walde HJ, Köster G. Early results and patient satisfaction after total hip arthroplasty using a minimally invasive anterolateral approach. Hip Int. 2009;19(4):367–71. https://doi.org/10.1177/112070000901900411.
12. Larsen JR, Skovgaard B, Prynø T, Bendikas L, Mikkelsen LR, Laursen M, et al. Feasibility of day-case total hip arthroplasty: A single-centre observational study. HIP International. 2017;27:60–5. https://doi.org/10.5301/hipint.5000421.
13. Kehlet H. Fast-track hip and knee arthroplasty. The Lancet. 2013;381:1600–2. https://doi.org/10.1016/S0140-6736(13)61003-X.
14. Berger RA, Kusuma SK, Sanders SA, Thill ES, Sporer SM. The feasibility and perioperative complications of outpatient knee arthroplasty. Clin Orthop Relat Res, vol. 467, Springer New York; 2009, p. 1443–9. https://doi.org/10.1007/s11999-009-0736-7.
15. Bertin KC. Minimally invasive outpatient total hip arthroplasty: A financial analysis. Clin Orthop Relat Res. 2005;435:154–63. https://doi.org/10.1097/01.blo.0000157173.22995.cf.
16. Tsai SW, Chen CF, Wu PK, Chen TH, Liu CL, Chen WM. Modified anterolateral approach in minimally invasive total hip arthroplasty. HIP International. 2015;25:245–50. https://doi.org/10.5301/hipint.5000218.
17. Rottinger H. Minimally invasive anterolateral surgical approach for total hip arthroplasty: early clinical results. Hip Int. 2006;16(Suppl 4):42–7. https://doi.org/10.1177/112070000601604S09.
18. Den Hartog YM, Mathijssen NMC, Vehmeijer SBW. The less invasive anterior approach for total hip arthroplasty: A comparison to other approaches and an evaluation of the learning curve - a systematic review. HIP International. 2016;26:105–20. https://doi.org/10.5301/hipint.5000319.
19. 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. https://doi.org/10.1080/17453674.2019.1577049.
20. Dorr LD, Thomas DJ, Zhu J, Dastane M, Chao L, Long WT. Outpatient total hip arthroplasty. Journal of Arthroplasty. 2010;25:501–6. https://doi.org/10.1016/j.arth.2009.06.005.
21. Kort NP, Bemelmans YFL, van der Kuy PHM, Jansen J, Schotanus MGM. Patient selection criteria for outpatient joint arthroplasty. Knee Surgery, Sports Traumatology, Arthroscopy. 2017;25:2668–75. https://doi.org/10.1007/s00167-016-4140-z.
22. Nelson SJ, Webb ML, Lukasiewicz AM, Varthi AG, Samuel AM, Grauer JN. Is Outpatient Total Hip Arthroplasty Safe? Journal of Arthroplasty. 2017;32:1439–42. https://doi.org/10.1016/j.arth.2016.11.053.
23. Den Hartog YM, Mathijssen NMC, Vehmeijer SBW. Total hip arthroplasty in an outpatient setting in 27 selected patients. Acta Orthop. 2015;86:667–70. https://doi.org/10.3109/17453674.2015.1066211.
24. Bozic KJ, Ries MD. The impact of infection after total hip arthroplasty on hospital and surgeon resource utilization. J Bone Joint Surg Am. 2005;87(8):1746–51. https://doi.org/10.2106/JBJS.D.02937.
25. Courtney PM, Boniello AJ, Berger RA. Complications Following Outpatient Total Joint Arthroplasty: An Analysis of a National Database. Journal of Arthroplasty. 2017;32:1426–30. https://doi.org/10.1016/j.arth.2016.11.055.
26. Lovecchio F, Alvi H, Sahota S, Beal M, Manning D. Is Outpatient Arthroplasty as Safe as Fast-Track Inpatient Arthroplasty? A Propensity Score Matched Analysis. Journal of Arthroplasty. 2016;31:197–201. https://doi.org/10.1016/j.arth.2016.05.037.
27. Thomas G, Faisal M, Young S, Asson R, Ritson M, Bawale R. Early discharge after hip arthroplasty with home support: experience at a UK district general hospital. Hip Int. 2008;18(4):294–300. https://doi.org/10.1177/112070000801800405.
28. Dey S, Gadde R, Sobti A, Macdonald N, Jacob J, Unnithan A. The safety and efficacy of day-case total joint arthroplasty. Ann R Coll Surg Engl. 2021;103:638–44. https://doi.org/10.1308/rcsann.2021.0066.
29. Bordoni V, Marelli N, Previtali D, Gaffurini P, Filardo G, Candrian C. Outpatient total hip arthroplasty does not increase complications and readmissions: a meta-analysis. HIP International. 2022;32:326–33. https://doi.org/10.1177/1120700020948797.
30. Courtney PM, Froimson MI, Meneghini RM, Lee GC, Della Valle CJ. Can Total Knee Arthroplasty Be Performed Safely as an Outpatient in the Medicare Population? Journal of Arthroplasty. 2018;33:S28-31. https://doi.org/10.1016/j.arth.2018.01.003.
31. Basques BA, Tetreault MW, Valle CJD. Same-Day discharge compared with inpatient hospitalization following hip and knee arthroplasty. Journal of Bone and Joint Surgery - American. 2017;99:1969–77. https://doi.org/10.2106/JBJS.16.00739.
32. Zomar BO, Marsh JD, Bryant DM, Lanting BA. The cost of outpatient versus inpatient total hip arthroplasty: a randomized trial. Canadian Journal of Surgery. 2022;65:E553-61. https://doi.org/10.1503/cjs.003821.
33. Schmidt AM, Garval M, Gromov K, Holm C, Larsen JR, Runge C, et al. Feasibility, safety, and patient-reported outcomes 90 days after same-day total knee arthroplasty: a matched cohort study. Acta Orthop. 2022;93:509–18. https://doi.org/10.2340/17453674.2022.2807.
34. Husted CE, Husted H, Nielsen CS, Mikkelsen M, Troelsen A, Gromov K. No increase in postoperative contacts with the healthcare system following

outpatient total hip and knee arthroplasty. Acta Orthop. 2021;92:557–61. https://doi.org/10.1080/17453674.2021.1922966.
35. Coenders MJ, Mathijssen NMC, Vehmeijer SBW. Three and a half years' experience with outpatient total hip arthroplasty. Bone Joint J. 2020;102-B(1):82–9. https://doi.org/10.1302/0301-620X.102B1.BJJ-2019-0045.R2.
36. Huang A, Ryu JJ, Dervin G. Cost savings of outpatient versus standard inpatient total knee arthroplasty. Canadian Journal of Surgery. 2017;60:57–62. https://doi.org/10.1503/cjs.002516.
37. Gauthier-Kwan OY, Dobransky JS, Dervin GF. Quality of Recovery, Postdischarge Hospital Utilization, and 2-Year Functional Outcomes After an Outpatient Total Knee Arthroplasty Program. Journal of Arthroplasty. 2018;33:2159-2164.e1. https://doi.org/10.1016/j.arth.2018.01.058.
38. 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. https://doi.org/10.1007/s11999-016-4915-z.
39. Kolisek FR, McGrath MS, Jessup NM, Monesmith EA, Mont MA. Comparison of outpatient versus inpatient total knee arthroplasty. Clin Orthop Relat Res, vol. 467, Springer New York; 2009, p. 1438–42. https://doi.org/10.1007/s11999-009-0730-0.
40. Moisan P, Montreuil J, Bernstein M, Hart A, Tanzer M. Episode-of-care costs of total hip arthroplasty: day surgery versus same-day admission. Canadian Journal of Surgery. 2023;66:E59-65. https://doi.org/10.1503/cjs.000722.
41. Aynardi M, Post Z, Ong A, Orozco F, Sukin DC. Outpatient Surgery as a Means of Cost Reduction in Total Hip Arthroplasty: A Case-Control Study. HSS Journal. 2014;10:252–5. https://doi.org/10.1007/s11420-014-9401-0.
42. Lazic S, Boughton O, Kellett CF, Kader DF, Villet L, Rivière C. Day-case surgery for total hip and knee replacement: How safe and effective is it? EFORT Open Rev. 2018;3:130–5. https://doi.org/10.1302/2058-5241.3.170031.
43. Hoffmann JD, Kusnezov NA, Dunn JC, Zarkadis NJ, Goodman GP, Berger RA. The Shift to Same-Day Outpatient Joint Arthroplasty: A Systematic Review. Journal of Arthroplasty. 2018;33:1265–74. https://doi.org/10.1016/j.arth.2017.11.027.
44. Vehmeijer SBW, Husted H, Kehlet H. Outpatient total hip and knee arthroplasty: Facts and challenges. Acta Orthop. 2018;89:141–4. https://doi.org/10.1080/17453674.2017.1410958.