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Is outpatient shoulder arthroplasty safe? A systematic review and meta-analysis

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Background: Amid rising health care costs and recent advances in surgical and anesthetic protocols, the rate of outpatient joint arthroplasty has risen steadily in recent years. Although the safety of outpatient total knee arthroplasty and total hip arthroplasty has been well established, outpatient shoulder arthroplasty is still in its infancy. The purpose of this study was to synthesize the current literature and provide further data regarding the outcomes and safety of outpatient shoulder arthroplasty.
Methods: A systematic review was conducted following the standard PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Included were studies that evaluated the outcomes of patients undergoing outpatient total shoulder arthroplasty (TSA) or reverse TSA. Meta-analysis was conducted using Mantel-Haenszel statistics to generate odds ratios (ORs) and their corresponding 95% confidence intervals (CIs) comparing outpatient and inpatient shoulder arthroplasty.
Results: Twelve studies were included, with a total of 194,513 patients, of whom 7162 were outpatients. Of the studies, 8 were level III and 4 were level IV. The average age of the outpatients was 66.6 years, and the average age of the inpatients was 70.1 years. The overall OR for complications was significantly lower in outpatients (OR, 0.40; 95% CI, 0.35-0.45) than in inpatients. There was no significant difference in rates of 90-day readmission (OR, 0.88; 95% CI, 0.75-1.03), revision (OR, 0.96; 95% CI, 0.65-1.41), and infection (OR, 0.93; 95% CI, 0.64-1.35) when comparing outpatients with inpatients.
Conclusion: Outpatient TSA, in an appropriately selected patient population, is safe and results in comparable patient outcomes to those of inpatient shoulder arthroplasty. Given the expected increase in the number of patients requiring TSA, surgeons, hospital administrators, and insurance carriers should strongly consider the merits of a cost- and care-efficient approach to total shoulder replacement.
Level of evidence: Level IV; Meta-analysis/Systematic Review

Keywords: Outpatient arthroplasty; total shoulder arthroplasty; reverse total shoulder arthroplasty; outcomes; complications; readmissions

Total shoulder arthroplasty (TSA) and reverse total shoulder arthroplasty (RTSA) are important tools for the orthopedic surgeon in treating osteoarthritis and other degenerative pathologies of the shoulder. Throughout the past 3 decades, the rate of shoulder arthroplasty has increased steadily.[2-4] The US Food and Drug Administration's approval of the RTSA in 2003 led to a significant increase in the number of shoulder arthroplasty procedures performed. From 1998 to 2008, there was a 2.5-fold increase in shoulder arthroplasty rates, with >50,000 cases being performed per year.[19] The rates of shoulder arthroplasty will likely continue to increase because of both the increase in the geriatric population and the broadening indications for shoulder arthroplasty.

This anatomy study was exempt from institutional review board approval.

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Amid rising health care costs and the evolving demographic characteristics of our population, there is a need for increased capacity and efficiency in all areas of medicine, including elective procedures such as total joint arthroplasty.[7] The literature already supports the use of outpatient arthroplasty in select patients undergoing total hip arthroplasty (THA) and total knee arthroplasty (TKA), with studies showing no significant differences in complications and readmissions.[27,31] In addition to proven safety and efficacy, cost saving is a tremendous focus in health care, and outpatient arthroplasty has been shown to have significant savings for patients undergoing THA, TKA, and TSA.[4,16,24]

Although outpatient THA and TKA are relatively well established, outpatient TSA and RTSA are still somewhat in their infancy. Recent advances in the surgical procedures, anesthesia protocols, and rehabilitation protocols with early mobilization have reduced average lengths of stay and recovery after shoulder arthroplasty.[8,17,30] These surgical advances have culminated in allowing orthopedic surgeons to pursue outpatient shoulder arthroplasty in select patients. The current American Academy of Orthopaedic Surgeons clinical practice guideline supports the use of outpatient shoulder arthroplasty in carefully selected patients but notes that further research is warranted to provide a safe patient selection algorithm.[1]

The purpose of this study was to synthesize the current literature and provide insights regarding the outcomes and safety of outpatient shoulder arthroplasty. Our hypothesis was that outpatient shoulder arthroplasty would be safe and have equivalent outcomes in patients with few comorbidities when compared with inpatient arthroplasty. Comorbidities include a history of cardiovascular abnormalities, diabetes mellitus, chronic obstructive pulmonary disease, and history of clotting disorders or deep venous thrombosis.

Methods

This systematic review was performed using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) 27-item checklist.[23]

Eligibility criteria

The inclusion criteria were as follows: (1) study population undergoing TSA or RTSA, (2) discharge on the day of surgery, and (3) inclusion of at least 1 reported outcome (complications, readmissions, or functional outcomes). We restricted the articles to those published in full and written in English. The exclusion criteria consisted of case reports, reviews, and publications that did not include outcome data.

Data sources

PROSPERO was searched for previous systematic reviews on outpatient shoulder arthroplasty, and none were found; our study was subsequently registered with PROSPERO. MEDLINE (through PubMed), Google Scholar, and Embase were queried for qualified publications. The searches for qualified literature were performed in February 2020.

Searches

PROSPERO was searched with the term ‘‘outpatient arthroplasty.’’ The algorithm used to search PubMed, Google Scholar, and Embase was the search term ‘‘(shoulder arthroplasty) OR (shoulder replacement) AND (ambulatory OR outpatient).’’

Study selection

Titles and abstracts were reviewed by 2 authors (A.M.C. and J.K.H.) to determine the relevance and potential to meet the inclusion criteria. The inclusion and exclusion criteria were strictly followed, and studies that did not meet the inclusion criteria were excluded. Additionally, the references of articles that met the inclusion criteria were reviewed for relevance and candidacy for inclusion. Any discrepancies were resolved by consensus. Pooled means and ranges were calculated to compare individual studies in the systematic review.

Meta-analysis

Demographic data were extracted and reported as pooled means, when possible. Publications that contained data regarding outcomes of both outpatient and inpatient shoulder arthroplasty were subsequently included for meta-analysis. The meta-analysis was conducted using SAS software (version 9.4; SAS Institute, Cary, NC, USA) using Mantel-Haenszel statistics to generate odds ratios (ORs) and their corresponding 95% confidence intervals (CIs). RevMan software (version 5.3; The Cochrane Collaboration, London, UK) was used to generate the forest plots, after verification of the ORs calculated via SAS software.

Risk of bias

Two independent reviewers assessed the risk of bias using the Methodological Index for Non-randomized Studies (MINORS) criteria[29] and included with each study. The following domains were included in the risk-of-bias assessment for both comparative and noncomparative studies: (1) clearly stated aim, (2) consecutive patients, (3) prospective data collection, (4) appropriate endpoints, (5) unbiased assessment of the endpoint, (6) appropriate follow-up, (7) loss of follow-up $< 5\%$, and (8) prospective study size calculation. Comparative studies also included 4 additional domains: adequate control group, contemporary groups, baseline equivalence between groups, and adequate statistical analysis.

Results

The literature search resulted in 76 non-duplicate publications. Sixty-three publications failed to meet the inclusion criteria on review of the abstract. After review of full

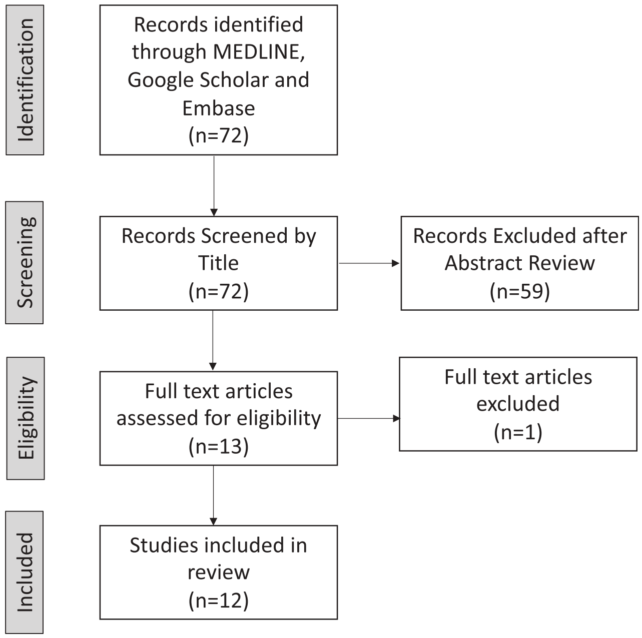

Figure 1 Literature selection algorithm.

manuscripts, 13 studies published between 2016 and 2020 were included for systematic review and meta-analysis. After analysis of each respective study and the sources from which they obtained their data, the decision was made to exclude 1 of the 13 studies[10] based on the fact that it included overlapping data from a larger, more recent study.[3] The search algorithm is summarized in Figure 1.

Of the studies, 9 included both inpatient and outpatient data[3,5,6,9,14,20,22,25,26] whereas 3 included solely outpatient data.[11,15,22] The included studies contained a total of 194,513 patients, of whom 7162 were outpatients and 187,351 were inpatients. Of the studies, 8 were level III[3,5,9,14,20,21,25,26] and 4 were level IV.[6,11,15,22] The average Methodological Index for Non-randomized Studies (MINORS) score for the comparative studies was 16.7 of 24 (69.6% ± 3.92%; range, 62.5%-72%), and the average score for noncomparative studies was 9 of 16 (56.3%; standard deviation, 0%; range, 56.3%-56.3%). The follow-up period for the included studies ranged from 90 days to 2 years. Outcome measures reported by the studies included complications, 90-day readmissions, reoperations, and costs (Table I).

Demographic characteristics

The average age was 66.6 years (range, 52.6-69.4 years) in the outpatient cohort and 70.1 years (range, 52.4-72.4 years) in the inpatient cohort. Diabetes was less frequent in the outpatient cohort, with 18.4% (range, 7.1%-20.7%) of outpatients and 21.1% (range, 15.5%-27.5%) of inpatients having diabetes. The average body mass index of the outpatient cohort was 30.2 (range, 29.0-31.8), whereas that of the inpatient cohort was 30.9 (range, 30.6-31.5). The average American Society of Anesthesiologists score was 2.3 (range, 2.1-2.3) in the outpatient cohort and 2.6 (range, 2.60-2.62) in the inpatient cohort, and the average Charlson Comorbidity Index was 2.69 (range, 1.8-2.9) and 2.97 (range, 2.3-3.0), respectively. On average, 12.5% (range, 2.0%-53.3%) of outpatients were active smokers whereas 7.7% (range, 5.4%-50.3%) of inpatients were active smokers. A summary of these demographic characteristics can be found in Table II.

Complications

Of the 12 studies included in the review, all 12 included complications and 9 studies included both outpatient and inpatient data that qualified for the meta-analysis. The overall OR for complications was 0.40 (95% CI, 0.35-0.45; $P < .00001$) for the outpatient cohort relative to the inpatient cohort. The meta-analysis data are summarized in Figure 2. The complication rates for studies with solely outpatient data are listed in Table III.

Readmission

Eight studies included both outpatient and inpatient data for 90-day readmissions and were included in the meta-analysis (Fig. 3). The overall OR for 90-day readmission was 0.88 (95% CI, 0.75-1.03; $P = .11$) when comparing outpatients with inpatients, failing to reach statistical significance. The overall readmission rate was 3.32% for outpatients and 3.73% for inpatients. Readmission data for the studies with solely outpatient data are listed in Table III.

Revisions

There was no significant difference between the revision rates listed in studies included in the meta-analysis (OR, 0.96; 95% CI, 0.65-1.41; $P = .83$) (Fig. 4). The revision rates for outpatient studies are included in Table III.

Infection

The overall OR for infections showed no significant difference between outpatients and inpatients (OR, 0.93; 95% CI, 0.64-1.35; $P = .71$) (Fig. 5). The infection rates for the outpatient studies are listed in Table III.

Functional outcomes

Functional outcomes were listed by 2 studies. Erickson et al[14] listed functional outcomes for outpatients and inpatients and found that both groups showed significant improvement in visual analog scale, American Shoulder and Elbow Surgeons, and Single Assessment Numeric

Table I Characteristics of included studies

Authors	Year	Journal	LOE	Risk of bias	No. of shoulders	Outcome measures	Follow-up time after surgery	Data source
Ode et al[26]	2020	*JSES International*	III	16	38,855	90-d readmission, 90-d ED visits	90 d	State inpatient and ambulatory databases
Erickson et al[14]	2020	*JSES*	III	17	614	ASES score, VAS score, SANE score, complications	2 yr	Institutional database
Kramer et al[20]	2019	*JSES*	III	18	6503	90-d readmission, 90-d ED visits, infections, VTE, 1-yr mortality rate	90 d, 1 yr	Kaiser Permanente Shoulder Arthroplasty Registry
Charles et al[11]	2019	*JSES*	IV	9	50	Complications, ROM, SANE score, ASES score, VAS score	9.3 ± 6 mo	Institutional database
Leroux et al[22]	2018	*JSES Open Access*	IV	9	41	Complications, LOS, satisfaction, postoperative pain	60 weeks	Institutional database
Bean et al[6]	2018	*J Am Acad Orthop Surg Glob Res Rev*	IV	16	61	Complications, readmissions, revisions, deaths, ED visits, VAS score	90 d	Institutional database
Fournier et al[15]	2019	*JSES*	IV	9	61	Complications, reoperations, readmissions	90 d	Institutional database
Nwankwo et al[25]	2018	*Orthopedics*	III	17	182	ED visits, readmissions, deaths, morbidity	90 d	Institutional database
Arshi et al[3]	2018	*Orthopedics*	III	17	17,542	Complications	1 yr	PearlDiver Patient Record Database (PearlDiver, Colorado Springs, CO, USA)
Basques et al[5]	2017	*Bone and Joint Journal*	III	15	123,347	Readmission, complications	30 d, 90 d	US Medicare Standard Analytical File
Brolin et al[9]	2016	*JSES*	III	16	60	90-d admissions or readmissions, reoperations	90 d	Institutional database
Leroux et al[21]	2016	*JSES*	III	15	7197	30-d adverse event, readmission rates	30 d	ACS-NSQIP

LOE, level of evidence; *JSES*, *Journal of Shoulder and Elbow Surgery*; *ED*, emergency department; *ASES*, American Shoulder and Elbow Surgeons; *SANE*, Single Assessment Numeric Evaluation; *VAS*, visual analog scale; *VTE*, venous thromboembolism; *ROM*, range of motion; *LOS*, length of stay; *J Am Acad Orthop Surg Glob Res Rev*, *Journal of the American Academy of Orthopaedic Surgeons Global Research & Reviews*; *ACS-NSQIP*, American College of Surgeons National Surgical Quality Improvement Program.

Table II Patient demographic characteristics and comorbidities

Authors	Outpatient cohort							Inpatient cohort						
	n	Age, yr	DM, %	BMI	ASA	CCI	Active smoking, %	n	Age, yr	DM, %	BMI	ASA	CCI	Active smoking, %
Ode et al[26]	974	66	14.1					37,881	71	20.2				
Erickson et al[14]	241	68.9	7.10	29.7				373	72.4	15.50	30.9			
Kramer et al[20]	405	69.4	20				53.3	6098	70.1	27.50				50.3
Charles et al[11]	50	56.0		29.8			2							
Leroux et al[22]	41	60.6	10	31.8	2.3	2.9	4.9							7.6
Bean et al[6]	21	59.8	15	29	2.333	1.762	10.0	40	59.9	24	30.6	2.625	2.225	18.9
Fournier et al[15]	61	58.0		31	2.262									
Nwankwo et al[25]	118	68.1			2.3			64	72.4			2.6		
Arshi et al[3]	1555	70-74				2.7 ± 2.91		15,987	70-74				2.97 ± 3.08	
Basques et al[5]	3493	65-69	20.70	12.60%			8.0	119,854	70-74	21.30	10.30%			5.4
Brolin et al[9]	30	52.6		31.6	2.1			30	54.2	31.5	2.3			
Leroux et al[21]	173	Younger than inpatient	11.30	Lower than inpatient	>3+ in 34.5%		13.2	7024		16.70		>3+ in 51.2%		9.8
Pooled means	7162	66.6	18.4	30.2	2.3	2.69	12.5	187,351	70.1	21.1	30.9	2.6	2.97	7.7

DM, diabetes mellitus; *BMI*, body mass index; *ASA*, American Society of Anesthesiologists; *CCI*, Charlson Comorbidity Index.

Study or Subgroup	Outpatient Events	Outpatient Total	Inpatient Events	Inpatient Total	Weight	Odds Ratio M-H, Fixed, 95% CI	Year
Leroux 2016	4	173	554	7024	2.4%	0.28 [0.10, 0.75]	2016
Brolin 2016	4	30	3	30	0.2%	1.38 [0.28, 6.80]	2016
Basques 2017	136	3493	13355	119854	68.4%	0.32 [0.27, 0.38]	2017
Arshi 2018	94	1555	1507	15987	23.6%	0.62 [0.50, 0.77]	2018
Bean 2018	2	21	7	40	0.4%	0.50 [0.09, 2.64]	2018
Nwankwo 2018	5	118	5	64	0.6%	0.52 [0.15, 1.88]	2018
Kramer 2019	0	405	82	6098	1.0%	0.09 [0.01, 1.45]	2019
Erickson 2020	17	244	48	379	3.3%	0.52 [0.29, 0.92]	2020
Total (95% CI)		**6039**		**149476**	**100.0%**	**0.40 [0.35, 0.45]**	
Total events	262		15561				

Heterogeneity: $Chi^2 = 26.56$, df = 7 (P = 0.0004); $I^2 = 74\%$
Test for overall effect: Z = 14.06 (P < 0.00001)

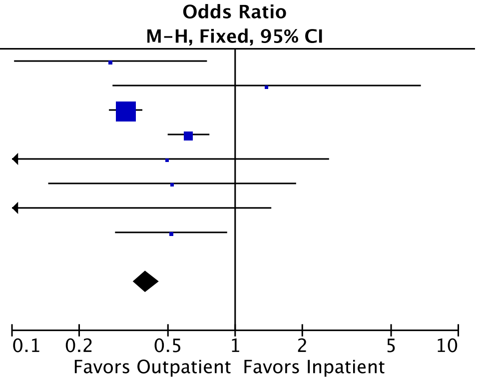

Figure 2 Complication data. *M-H*, Mantel-Haenszel; *CI*, confidence interval.

Table III Outpatient outcome data

Authors	Complications, %	Readmissions, %	Revisions, %	Infections, %
Charles et al[11]	12	2	2	2
Leroux et al[22]	7.30	0	0	0
Fournier et al[15]	11.50	0	—	0

Study or Subgroup	Outpatient Events	Outpatient Total	Inpatient Events	Inpatient Total	Weight	Odds Ratio M-H, Fixed, 95% CI	Year
Brolin 2016	0	30	0	30		Not estimable	2016
Leroux 2016	2	115	175	7198	1.5%	0.71 [0.17, 2.90]	2016
Basques 2017	75	3493	3442	119854	53.6%	0.74 [0.59, 0.94]	2017
Nwankwo 2018	3	118	6	64	2.1%	0.25 [0.06, 1.04]	2018
Bean 2018	0	21	1	40	0.3%	0.61 [0.02, 15.69]	2018
Kramer 2019	15	405	342	6098	11.5%	0.65 [0.38, 1.10]	2019
Ode 2020	76	978	2381	38114	30.9%	1.26 [1.00, 1.60]	2020
Total (95% CI)		**5160**		**171398**	**100.0%**	**0.88 [0.75, 1.03]**	
Total events	171		6347				

Heterogeneity: $Chi^2 = 15.41$, df = 5 (P = 0.009); $I^2 = 68\%$
Test for overall effect: Z = 1.59 (P = 0.11)

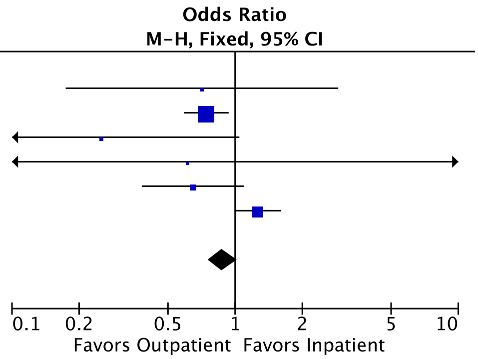

Figure 3 Readmission data. *M-H*, Mantel-Haenszel; *CI*, confidence interval.

Study or Subgroup	Outpatient Events	Outpatient Total	Inpatient Events	Inpatient Total	Weight	Odds Ratio M-H, Fixed, 95% CI	Year
Nwankwo 2018	0	118	1	64	3.6%	0.18 [0.01, 4.45]	2018
Arshi 2018	22	1555	223	15987	72.6%	1.01 [0.65, 1.58]	2018
Bean 2018	0	21	0	40		Not estimable	2018
Erickson 2020	10	241	17	373	23.8%	0.91 [0.41, 2.01]	2020
Total (95% CI)		**1935**		**16464**	**100.0%**	**0.96 [0.65, 1.41]**	
Total events	32		241				

Heterogeneity: $Chi^2 = 1.13$, df = 2 (P = 0.57); $I^2 = 0\%$
Test for overall effect: Z = 0.21 (P = 0.83)

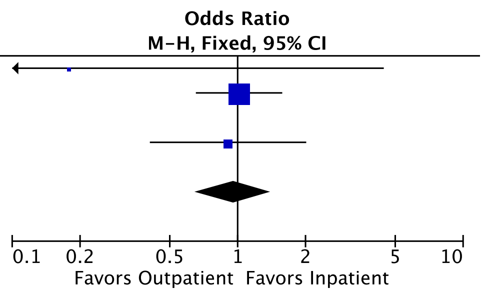

Figure 4 Revision data. *M-H*, Mantel-Haenszel; *CI*, confidence interval.

Study or Subgroup	Outpatient Events	Outpatient Total	Inpatient Events	Inpatient Total	Weight	Odds Ratio M-H, Fixed, 95% CI	Year
Leroux 2016	0	173	48	7024	3.9%	0.41 [0.03, 6.75]	2016
Brolin 2016	0	30	0	30		Not estimable	2016
Basques 2017	12	3493	621	119854	59.1%	0.66 [0.37, 1.17]	2017
Bean 2018	0	21	0	40		Not estimable	2018
Nwankwo 2018	0	118	0	64		Not estimable	2018
Arshi 2018	14	1555	104	15987	30.8%	1.39 [0.79, 2.43]	2018
Kramer 2019	0	405	16	6098	3.5%	0.45 [0.03, 7.59]	2019
Erickson 2020	4	241	2	373	2.6%	3.13 [0.57, 17.23]	2020
Total (95% CI)		**6036**		**149470**	**100.0%**	**0.93 [0.64, 1.35]**	
Total events	30		791				

Heterogeneity: Chi^2 = 5.82, df = 4 (P = 0.21); I^2 = 31%
Test for overall effect: Z = 0.37 (P = 0.71)

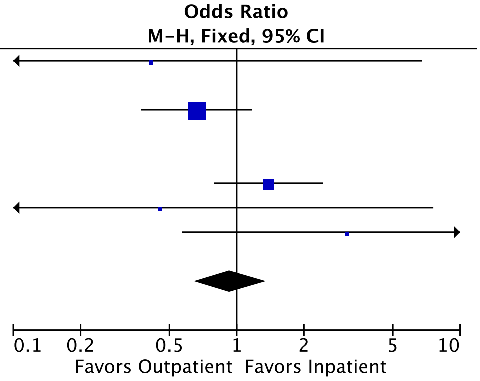

Figure 5 Infection data. *M-H*, Mantel-Haenszel; *CI*, confidence interval.

Evaluation scores at both 1 and 2 years postoperatively. There was no significant difference in functional outcome scores between the outpatient and inpatient groups. Charles et al[11] similarly reported that outpatients showed a significant improvement in visual analog scale score, American Shoulder and Elbow Surgeons score, Single Assessment Numeric Evaluation score, and range of motion.

Discussion

Outpatient arthroplasty is increasingly used because of the growing demand for arthroplasty in our aging population, as well as advances in surgical and anesthesia protocols. The most important finding from our systematic review is that outpatient TSA, with appropriate patient selection, is safe and results in similar patient outcomes to inpatient arthroplasty.

A systematic review by Pollock et al[27] compared the outcomes of outpatient and inpatient THA, TKA, and unicondylar knee arthroplasty and found that outcomes and complication rates were similar between the 2 groups. Additionally, a systematic review by Jaibaji et al[18] found that patients undergoing outpatient THA, TKA, and unicondylar knee arthroplasty tended to be younger and have fewer comorbidities than inpatients and had low rates of complications and readmissions. Recent advances in surgical and anesthesia protocols have made outpatient arthroplasty possible. The use of robust inclusion and exclusion criteria, neuraxial anesthesia, peripheral nerve blocks, and opioid-sparing analgesia are all recommended for successful outpatient arthroplasty.[2,13,28]

The literature on lower-extremity arthroplasty has shown significant cost savings for patients undergoing outpatient arthroplasty. Lovald et al[24] reported cost savings of $8527 per patient over a 2-year period in patients undergoing outpatient TKA. Similarly, Aynardi et al[4] reported a $6798 reduction in costs for patients undergoing outpatient THA. The documented success of outpatient surgery in patients undergoing TKA and THA led to the advent of outpatient TSA that used similar strategies for anesthesia protocols, pain management, and inclusion and exclusion criteria.

In 3 of the reviewed studies, outpatient shoulder arthroplasty was shown to have significantly lower complication rates compared with inpatient arthroplasty.[3,5,14] Arshi et al[3] found a significantly lower rate of stiffness requiring manipulation under anesthesia in the outpatient arthroplasty group compared with the inpatient group (outpatient, 1.09%; inpatient, 2.35%; OR, 0.52; 95% CI, 0.38-0.71; $P < .001$). Basques et al[5] concluded that the rate of thromboembolic events ($P < .001$) was significantly higher in the inpatient group than in outpatients. Erickson et al[14] found that overall complications were significantly more frequent ($P = .023$) in patients who underwent RTSA as inpatients (12.7% [48 of 379]; 95% CI, 9.7%-16.4%) than in those who underwent RTSA as outpatients (7.0% [17 of 244]; 95% CI, 4.3%-10.9%). It is interesting to note that 2 of the studies differed in terms of surgical-site infections requiring repeated surgery: Arshi et al[3] found an increase in surgical-site infections in the outpatient group (outpatient, 0.90%; inpatient, 0.65%; OR, 1.65; 95% CI, 1.15-2.35; $P < .001$), whereas Basques et al[5] found that the rate of surgical-site infections was significantly higher in the inpatient group ($P = .002$). The overall OR for infection failed to reach significance in our meta-analysis (OR, 0.93; 95% CI, 0.64-1.35). The remaining studies containing both outpatient and inpatient data demonstrated no significant difference between outpatients and inpatients. Patients undergoing outpatient arthroplasty were 60% less likely to have a complication (OR, 0.40; 95% CI, 0.35-0.45). These findings are significant and demonstrate that outpatient shoulder arthroplasty is safe and does not lead to increased complications. However, it should be noted that patients undergoing outpatient arthroplasty were carefully selected based on strict inclusion and exclusion criteria, a form of selection bias. Careful patient selection is paramount to the success of outpatient orthopedic arthroplasty.

When we compared readmission rates, the study by Basques et al[5] was the one study included that indicated a significantly higher odds of readmission in patients undergoing inpatient surgery at both 30 days (0.83% vs. 0.60%; $P = .016$; OR, 1.8) and 90 days (2.87% vs. 2.04%; $P < .001$; OR, 1.8). The remaining studies indicated no significant difference in readmission between inpatients and outpatients, and this was confirmed in the meta-analysis (OR, 0.88; 95% CI, 0.75-1.03). Additionally, no significant difference in revisions was reported between inpatients and outpatients in the included studies, and this was verified in the meta-analysis as well (OR, 0.96; 95% CI, 0.65-1.41).

There were no significant differences in functional outcome scores between the outpatient and inpatient groups. Such a finding is important when educating patients on the expectations for outpatient TSA in comparison to inpatient TSA.

Although patient outcomes and complications are the metrics by which the success of outpatient arthroplasty is often judged, a large driving force for outpatient arthroplasty is the economics and potential cost savings for patients and the health care system. A recent systematic review comparing the costs of outpatient and inpatient orthopedic procedures reported mean cost savings ranging from 17.6% to 57.6% for outpatient procedures.[12] Similarly to the lower-extremity outpatient arthroplasty cost savings, outpatient shoulder arthroplasty results in significantly decreased costs compared with those of inpatient arthroplasty. Ode et al[26] found that the charges for shoulder arthroplasty were significantly higher for inpatient cases than for cases performed in the combined outpatient setting ($P < .0001$). The median charge for inpatient cases was $62,905 (range, $41,327-$87,881) compared with $37,395 (range, $21,976-$61,775) for combined outpatient cases.[26] Cancienne et al[10] found that ambulatory TSA had significantly lower reimbursement costs ($14,722) compared with matched controls ($18,336) in numerous itemized cost categories (post-anesthesia care unit, laboratory, physical therapy, occupational therapy, and narcotic prescription costs) ($P < .05$)—a total cost reduction of $3615. Thus, it is important for all types of payers within the health care system to recognize the potential cost savings when shoulder arthroplasty is performed in the outpatient setting.

Limitations

This study is limited by the quality of the studies included in our review, with all studies being retrospective analyses with level III or IV evidence. This review included studies that lacked sufficient sample sizes, validity, and standardization of protocols and outcomes. Another limitation is the large disparity in the number of patients included in each study, ranging from small cohorts to large insurance database searches. Therefore, the studies cannot be given equal weight without statistical analysis. Moreover, this study is limited by a lack of homology of anesthesia protocols among studies. In addition, the selection of patients is inherently biased based on strict inclusion and exclusion criteria. Finally, owing to the lack of homology in reporting the demographic characteristics and comorbidities of included patients, we were unable to run a statistical analysis on the reported demographic characteristics and comorbidities.

Conclusion

Outpatient TSA, in an appropriately selected patient population, is safe and results in comparable patient outcomes to those of inpatient shoulder arthroplasty. Given the expected increase in the number of patients requiring TSA, surgeons, hospital administrators, and insurance carriers should strongly consider the merits of a cost- and care-efficient approach to total shoulder replacement.

Disclaimer

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