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Equal care for all? Do surgical outcomes in shoulder arthroplasty depend on insurance type?

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Background: Although it has been shown that Medicare populations have a higher overall rate of complications than those with private insurances for large cohort total joint studies, there is limited information comparing patient-reported outcomes (PROs) among private insurance patients. The purpose of this study was to determine the impact of non-Medicaid insurance type on outcomes after shoulder arthroplasty.

Methods: This retrospective case-controlled study included 203 patients who underwent shoulder arthroplasty from 2012 to 2017 by a single surgeon. Preoperative and postoperative PROs were collected and included the Simple Shoulder Test, the American Shoulder and Elbow Surgeons Shoulder Assessment Form, and the Constant Shoulder Score. Patients were categorized into groups based on insurer—preferred provider organization, health maintenance organization, Medicare, and Veterans Affairs Care program—and outcomes were compared between groups

Results: The 4 insurance provider groups were matched for body mass index, surgery type, and comorbidities ($P = .526$). Preoperatively, no significant differences in PROs between groups were present except for the Constant Shoulder Score ($P = .029$). All payer groups significantly improved from preoperative to postoperative PROs ($P \leq .001$). At the final follow-up, no significant difference in PROs between groups were seen (American Shoulder and Elbow Surgeons Shoulder mean 75.3 ± 20.9 [$P = .757$], Simple Shoulder Test of 9.1 ± 2.9 [$P = .312$], and Constant Shoulder Score of 65.0 ± 15.2 [$P = .526$]).

Conclusions: Our results suggest variations in insurance type did not significantly impact outcomes for our cohort of patients undergoing shoulder arthroplasty. Although variations in patient cohorts exist, patients regardless of insurance type and coverage variations can expect significant improvements in their function and pain after shoulder arthroplasty.

The use of shoulder arthroplasty (SA) has a predicted exponentially growth of 750% over the next few years in the United States.[3,4,6,7,10] Studies have shown efficacy of SA to improve patient-reported outcomes (PROs), especially in glenohumeral disease or rotator cuff arthropathy.[5,13,21,27] PROs assess relevant health status information from limitations in physical function and mental health to symptoms such as pain and stiffness surrounding shoulder pathology.[9,11] Because of the increased importance placed on a patient's quality of life, PROs after surgical procedures have become a standard measurement and focus to assess quality of surgical procedures and value tied to physician reimbursements.[28] As some orthopedic surgeries move into a bundle-payment structure, PROs have come to the forefront for physician and reimbursement structures alike. Weeks et al[26] emphasizes the concern that although bundle payments can reduce waste, in an effort to maintain income levels to cover fixed costs, providers may "cherry pick" or change their behaviors to obtain better patient outcomes.

In order for orthopedic surgeons to address this issue, they need to understand the relationship that exists between PROs and insurance type or healthcare coverage. In a variety of medical specialties, the literature has shown that payer type affects patient outcomes, complication rates, and follow-up rates.[1,15,17,18,23] A study by Lapar et al[18] analyzed outcomes after major surgical operations finding that patients with Medicare or private insurance underwent more elective operations, whereas patients with Medicaid

The Cleveland Clinic Institutional Review Board approved this study (FLA 17-022).

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more commonly underwent nonelective operations. SA is an elective procedure moving toward bundle payment, and with the number of procedures exponentially increasing, Medicare payers have become of interest for multiple reasons.[10,16]

With the "cherry picking" behaviors of providers, the access to care for older patients with more medical comorbidities has worsened.[26] Concomitantly, Floyd et al[10] found that patients with Medicare undergoing different types of shoulder arthroplasty differed in socioeconomic and clinical factors, along with variation in hospital admission, complications, and revision rates depending on the type of arthroplasty. Inquiry has shown that orthopedic literature is lacking consensus on this relationship between insurance type and outcomes such PROs, readmission morbidity, and mortality rates. [2,8,12,14,20,24] Furthermore, there has been little examination comparing different tiered insurance types and their relationship to PROs in shoulder arthroplasty. However, a study by Feng et al[9] comparatively evaluated total knee arthroplasty PROs among patients with commercial and Medicare insurance, finding that total knee arthroplasty candidates can expect similar PROs regardless of insurance type, the opposite of aforementioned studies. Since the use of shoulder arthroplasty has become higher, a profile of an SA population is of as much value.[3,4,6,7,10] Thus, the purpose of this study was to examine the effect of insurance type on PROs after SA. With increasing emphasis on value-based care, it is important for surgeons to understand the factors influencing differences in outcomes to counsel patients appropriately.

Materials and methods

A retrospective review of a prospectively collected SA outcome database was performed to identify 214 patients who underwent anatomic or reverse SA between 2012 and 2017. All patients had a minimum of 6 months of follow-up with an average final follow-up of 1.8 years for the whole cohort with no significant difference seen between groups ($P = .240$). The study had limited exclusion criteria to provide the most inclusive consecutive cohort and allow full understanding of insurance coverage for all comers, the only exclusion criteria was for patients with diagnosis of fracture. Patients were stratified into the 4 most common insurance types available: preferred provider organization (PPO), health maintenance organization (HMO), Medicare, and the Veterans Affairs (VA) Care program for the purposes of our analysis. Patients were excluded if they did not have insurance or did not have 1 of the 4 insurance types as previously described. In addition, bilateral cases were considered as single patient for demographic analyses only. This resulted in 203 patients who were enrolled (Table I).

From this population, patients with SA were stratified as per their insurance provider at the time of surgery. Patient medical records were retrospectively reviewed to verify preoperative insurance status. Demographic information, allergy status, comorbidities, and number of follow-up visits were recorded. PROs from preoperative and postoperative visits were collected via a prospective research database. Functional outcome scores evaluated by the senior surgeon or research coordinator included shoulder pain daily (pain score), the Shoulder Pain and Disability Index, the Simple Shoulder Test, the American Shoulder and Elbow Surgeons Shoulder Assessment Form, the University of California at Los Angeles Shoulder Scale, and the Constant Shoulder Score.

Surgical technique

All surgeries were performed by a single fellowship-trained shoulder surgeon at the same facility. Standardized surgical implants and techniques were used for all patients enrolled in the study, and patients underwent either an anatomic or reverse arthroplasty, as indicated. All patients received a multimodal pain management protocol consisting of gabapentin, acetaminophen, and an ultrasound-guided interscalene block with 0.5% ropivacaine preoperatively followed by intraoperative decadron, ketorolac, and local infiltration of liposomal bupivacaine if no contraindications were noted.

Table I
Demographic comparisons between insurance types.

Group	HMO	PPO	Medicare	VA	*P* value
Gender					
Male	21	31	13	21	<.001
Female	32	36	38	2	
Age	71.42	69.06	71.12	65.61	.048
BMI	29.66	28.85	29.29	27.78	.526
Surgery type					
Hemi	2	1	4	3	.526
TSA	12	21	11	5	
RSA	33	36	33	15	
Resurfacing	1	1	0	0	
Revision	5	8	3	0	
Diagnosis					
Osteoarthritis	35	48	33	16	.526
Avascular necrosis	1	0	2	0	
Rotator cuff arthropathy	6	3	5	1	
Rotator cuff tear	3	4	3	5	
Comorbidity burden					
None	34	42	27	16	.526
1	12	19	20	6	
2	7	6	4	1	

HMO, health maintenance organization; *PPO*, preferred provider organization; *RSA*, reverse shoulder arthroplasty; *TSA*, total shoulder arthroplasty; *VA*, Veterans Affairs.

Statistical analysis

One-way analysis of variance was performed to compare continuous demographics and PRO scores. A Tukey post hoc analysis was performed to determine specific differences in the population studied. Pearson's Chi-square tests were performed to analyze significant association for categorical variables. Descriptive statistics were used to describe mean and standard deviation for continuous variables and proportions for categorical or ordinal variables. A P value $\leq .05$ was considered statistically significant, and SPSS Software (IBM Corp. Released 2016. IBM SPSS Statistics for Macintosh, version 24.0.; IBM Corp., Armonk, NY) was used for all statistical analyses.

Results

Overall, there was variation in cohorts for gender and age, which was significant. The HMO group consisted of 53 patients (32 women, 21 men) compared with the PPO group with 67 patients (36 women, 31 men), Medicare 51 patients (38 women, 13 men), and 23 VA patients (2 women, 21 men) ($P < .001$). There was some variation in age among groups with the VA having the youngest average (average age 65.6 years), the HMO group (71.42 years) with the oldest average and PPO (69.06 years) and Medicare (71.12 years) averaging in between ($P = .048$). Body mass index measured in HMO (29.66), PPO (28.85), Medicare (29.29), and VA (27.78) was not significantly different across groups ($P = .526$). Further analysis showed that reverse SA was the most common surgery type performed (33 patients included in HMO, 36 PPO, 33 Medicare, and 15 VA), and resurfacing was the least common surgery type (1 patient each for HMO and PPO and none for Medicare or VA) with no significant difference for the number of patients per insurance types of each surgery type ($P = .526$). Demographic analysis on diagnosis shows that across insurance group, osteoarthritis was the most predominant diagnosis with 35 patients in the HMO group, 48

Table II
Patient-reported outcome scores for groups based on insurance type.

Patient reported outcome score	HMO	PPO	Medicare	VA	*P* value
Diagnostic visit					
Pain Score	6.69 ± 2.3	6.53 ± 2.3	6.63 ± 2.3	5.55 ± 1.9	.210
ASES	33.94 ± 15.5	34.35 ± 17.4	32.81 ± 16.2	42.65 ± 15.4	.118
SPADI	109.18 ± 19.35	111.60 ± 23.60	111.68 ± 23.39	104.93 ± 19.75	.676
SST	3.29 ± 2.4	3.04 ± 2.5	2.33 ± 2.0	4.40 ± 1.9	.218
UCLA	13.40 ± 3.87	13.41 ± 4.67	12.96 ± 4.43	15.14 ± 4.14	.276
Constant	28.77 ± 10.6	28.14 ± 11.9	25.19 ± 9.96	33.95 ± 10.5	.029*
Last follow-up visit					
Pain	2.13 ± 2.7	1.77 ± 2.3	1.94 ± 2.3	1.70 ± 2.4	.839
ASES	74.05 ± 21.2	76.28 ± 22.0	73.95 ± 19.7	78.77 ± 20.4	.757
SPADI	40.12 ± 34.9	35.81 ± 36.1	43.38 ± 31.0	36.74 ± 28.4	.701
SST	8.63 ± 3.2	9.55 ± 3.1	8.70 ± 2.6	9.75 ± 2.4	.312
UCLA	29.35 ± 6.00	29.35 ± 6.97	28.78 ± 5.84	30.30 ± 5.61	.816
Constant	64.91 ± 15.8	64.88 ± 16.8	63.46 ± 13.5	69.50 ± 11.4	.526
Average follow-up time (yr)	1.798 ± 1.29	1.821 ± 0.971	1.802 ± 1.19	1.304 ± 0.765	.240

ASES, American Shoulder and Elbow Surgeons; *HMO*, health maintenance organization; *Pain Score*, Shoulder Pain Daily; *PPO*, preferred provider organization; *SPADI*, Shoulder Pain and Disability Index; *Constant*, Constant Shoulder Score; *SST*, Simple Shoulder Test; *UCLA*, University of California Los Angeles Shoulder Scale; *VA*, Veterans Affairs.
* Statistical significance of $P < .05$.

in PPO, 33 in Medicare, and 16 in VA (61.6% of all diagnoses). Conversely, avascular necrosis was the least prevalent diagnosis across insurance groups with 1 patient in the HMO group, 2 patients in the Medicare group, and no patients in either the PPO or VA groups (1.5% of all diagnosis). There were no significant differences seen among the number of patients per insurance type for each diagnosis ($P = .526$). Finally, comorbidity burden showed that most patients had no comorbidity burden across insurance types (n = 119, 55.6%), 57 patients were considered to have 1 comorbidity burden, and 18 patients had 2 comorbidities. There is no significant difference for the number of patients per comorbidity of each insurance type ($P = .526$) (Table I). We performed extensive preoperative comparisons using both standard statistical comparisons and logistic regression. Our preoperative analyses demonstrated some variations in demographics, however, did not demonstrated differences in preoperative outcome scores which was our main outcome variable.

Overall, the average follow-up length ranged from 1.3 to 1.8 years, with no differences between the groups ($P = .240$). At the diagnostic visit, the average preoperative American Shoulder and Elbow Surgeons score was 34.86 ± 16.5, average pain score was 6.48 ± 2.2, average Shoulder Pain and Disability Index was 110.20 ± 21.93, Simple Shoulder Test was 3.18 ± 2.3, University of California at Los Angeles was 13.51 ± 4.35, and Constant score was 28.28 ± 11.1. There were no significant differences between the groups at baseline except the VA group had significantly higher Constant scores ($P = .029$) (Table II). All 4 groups improved significantly in outcomes scores from preoperatively to postoperatively ($P < .001$) (Table III). Overall, at the final follow-up, the average American Shoulder and Elbow Surgeons score was 75.34 ± 20.9, average pain scores were 1.91 ± 2.4, average Shoulder Pain and Disability Index score was 39.13 ± 33.4, average Simple Shoulder Test score was 9.05 ± 2.9, average University of California at Los Angeles score was 29.32 ± 6.25, and Constant score was 65.03 ± 15.2. At their final follow-up visits, our results did not show statistically significant differences between insurance groups for any of the outcomes measures (Table III).

Table III
Change in patient-reported outcome scores from preoperative visit to last follow-up.

Patient-reported outcome score	Diagnostic visit	Last follow-up	*P* value
Pain score	6.48 ± 2.2	1.91 ± 2.4	<.001
ASES score	34.86 ± 16.5	75.34 ± 20.9	<.001
SPADI	110.20 ± 21.93	39.13 ± 33.4	<.001
SST	3.18 ± 2.3	9.05 ± 2.9	<.001
UCLA	13.51 ± 4.35	29.32 ± 6.25	<.001
Constant	28.28 ± 11.1	65.03 ± 15.2	<.001

ASES, American Shoulder and Elbow Surgeons; *Pain Score*, Shoulder Pain Daily; *SPADI*, Shoulder Pain and Disability Index; *Constant*, Constant Shoulder Score; *SST*, Simple Shoulder Test; *UCLA*, University of California Los Angeles Shoulder Scale.

Discussion

With increased scrutiny from insurance companies regarding coverage and reimbursement, it is critical that orthopedic surgeons understand the link of these insurance types to PROs and quality. Our results demonstrated significant improvements in PROs for patients with SA regardless of their type of insurance which differs from previously published literature. [1,15,17,18,23] Li et al[19] found that Medicare, Medicaid, and uninsured status had a higher overall rate of complications than private insurances in a large cohort study. Another study looking at Medicaid and Medicare populations undergoing primary SA found that while both groups demonstrated similar outcome improvements, the socially disadvantaged group had a higher rate of complications and reoperations.[25] Our results differ from the larger database studies as this primarily included a single surgeon's practice; by doing this, we eliminated biases from variations in patient-specific risk factors, surgical techniques, implants, and postoperative rehab and recovery protocols allowing for more focused evaluation of our primary outcome impact of insurance type on PROs such as pain and functional scores.

When looking at other types of orthopedic procedures, similar results have been demonstrated in patients with rotator cuff pathology. Sabesan et al[22] found opposite results in patients with massive rotator cuff tear, whereby patients with Medicaid and Medicare had equivalent improvements in postoperative outcome measure when compared with those with private insurance. Although, they did observe less follow-up rates among patients with Medicaid insurance. Conversely, Tanenbaum et al[24] found higher complications in Medicaid or self-pay patients undergoing cervical spine fusions. For patients with hip arthroplasty, postoperative outcome analysis found that patients with Medicaid had lower preoperative and postoperative Harris Hip Scores when compared with those with Medicare or private insurances.[14] Overall, while the literature is varied across procedures, it seems that surgeons can expect equivalent outcome improvements regardless of insurance type in SA.

While this study brings to light some important conclusions, it is not without limitations. First, this study was conducted with a cohort of patients treated by 1 fellowship-trained surgeon with little variance in demographics and comorbidities, this may limit applicability to other patient cohorts and geographical regions. In addition, results may not be applicable and may vary among patients with different private insurance types and Medicaid, regionally. Another limitation was the time period of follow-up. Our study included midterm follow-up outcomes, and future studies need to examine midterm to more longer-term outcomes for various insurance types after SA. Finally, this study did not evaluate data regarding readmissions or complications that occurred at other outside institutions, highlighting another possible confounding variable.

Despite these limitations, this study contributes important information directly comparing PROs for various insurance types and coverages after SA. Our results can give patients and surgeons confidence that variations in insurance coverage will not negatively impact patient follow-up and outcomes or increase complication rates. Such promising findings are importance as we continue to scrutinize insurance coverage and consider bundled payments for SA; regardless of insurance coverage variations, co-pays, and restrictions, patients can expect to achieve excellent outcomes and improvements after SA.

Conclusion

In conclusion, this retrospective review demonstrated that insurance type alone did not significantly affect PROs after primary anatomic or reverse shoulder arthroplasty. This may be of increasing importance for both orthopedic surgeons and patients alike. For orthopedic surgeons, it supports surgical treatment for patients regardless of insurance type as these coverage variations do not appear to be a risk factor negatively impacting success after surgery. As for patients with SA, it assures them that they can expect equivalent outcomes regardless of insurance type and level of coverage. Future efforts could focus on expanding the study to evaluate different geographic regions, patient cohorts, and additional insurance coverage plans to see if these impact outcomes after shoulder arthroplasty.

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