JSES Reviews, Reports, and Techniques 3 (2023) 511–518

Contents lists available at ScienceDirect

JSES Reviews, Reports, and Techniques

journal homepage: www.jsesreviewsreportstech.org

Factors influencing physical therapy utilization after shoulder surgery: a retrospective review

Vani Sabesan, MD[a,b,*], Mirelle Dawoud, MD[b], Ahmed Al-Mansoori, MD[b], B. Joshua Stephens, BS[c], Alessia C. Lavin, MD[a], Juan Manuel Lozano, MD, MSc[d], Clyde K. Fomunung, BS, MBA[a]

[a]HCA Florida JFK Hospital, Palm Beach Shoulder Service – Atlantis Orthopaedics, Palm Beach, FL, USA
[b]Cleveland Clinic Florida, Levitetz Department of Orthopedic Surgery, Weston, FL, USA
[c]Nova Southeastern University, Dr. Kiran C. Patel College of Osteopathic Medicine, Davie, FL, USA
[d]Herbert Wertheim College of Medicine, Florida International University, Miami, FL, USA

ARTICLE INFO

Keywords:
Physical therapy
Shoulder surgery
Healthcare costs
Copays
Insurance types
Utilization

Level of evidence: Level IV; Retrospective Case Series

Background: Postoperative physical therapy (PT) is a cornerstone to achieve optimal patient outcomes. Access to postoperative PT can be limited by insurance type, coverage, and cost. With copayments (CP) for PT as high as $75 per visit, PT can be costprohibitive for patients. The purpose of this study was to evaluate factors affecting PT utilization among patients that underwent shoulder surgery.
Methods: A retrospective analysis was performed of 80 shoulder surgery patients with postoperative PT sessions attended at a single institution from 2017 to 2019. Patients were divided based on insurance type: private insurance (PI), and Medicare with or without supplemental insurance (MI), and CP or no copayment. Demographics, CP, total, and postoperative number of PT sessions utilized was collected and analyzed.
Results: The cohort had 53 females and an average age of 62. There was no significant difference between PI and MI at baseline other than surgery performed ($P = .03$), older MI group (69 years vs. 56 years: $P < .01$), and more females in PI group (76% vs. 55%; $P = .05$). There was no significant difference in the number of PT sessions between groups. The PI group was more likely to have a CP ($P < .01$). The CP group more often had PI and significantly more total PT visits ($P = .05$), while the no copayment group more often had Medicare ($P < .01$). CP was not independently associated with a change in the number of PT visits or total PT visits.
Conclusions: The utilization of PT after shoulder surgery was found to not be influenced by insurance type or CP as determined by the number of PT sessions attended. Further investigations are necessary to better understand the relationship between CP and different insurance types and develop effective strategies to increase access to PT for postoperative shoulder patients.
© 2023 Published by Elsevier Inc. on behalf of American Shoulder & Elbow Surgeons. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Physical therapy (PT) plays an essential role in the proper rehabilitation of patients following many orthopedic procedures and is especially critical in producing the most beneficial outcomes for patients undergoing shoulder surgery.[5,11,21,31,37] The benefits conveyed by PT in postoperative rehabilitation are numerous, including a better patient understanding of functional and strength-based progression after shoulder surgery, increased speed of recovery time, decreased pain, and an increase in final functional gains in their shoulder.[22,23,30] The clinical application of PT is not limited to postoperative rehabilitation; it has been shown to help a majority (75%) of patients with atraumatic full-thickness rotator cuff tears avoid surgery as well.[22] Additionally, PT has benefited patients who retore after a rotator cuff repair (RCR), providing equal satisfaction levels and clinical outcome scores in comparison to revision surgical treatment.[21]

Because health care costs produce a significant burden for Americans, and it has been reported that many do not seek out treatment in order to avoid costs, access to PT can be limited due to cost.[4,6,7,17,18] A fourth of the population reports they have delayed or skipped care as a result of the challenges due to cost, and 43% of adults with insurance reported struggling to pay deductibles.[4] As such, patients of lower socioeconomic status may have limited access to PT and underutilize health care services due to factors such as direct cost or insurance coverage.[4,6,12,18,24] Previous

This study was performed under approval of the Cleveland Clinic Institutional Review Board (FLA 17-022).
*Corresponding author: Vani Sabesan, MD, Atlantis Orthopaedics, 4560 Lantana Road Suite 100 Lake, Worth, FL 33463, USA.
E-mail address: Sabes001@gmail.com (V. Sabesan).

https://doi.org/10.1016/j.xrrt.2023.05.007
2666-6391/© 2023 Published by Elsevier Inc. on behalf of American Shoulder & Elbow Surgeons. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

analyses have found that the cost of PT varies depending on insurance type, the number of sessions, facility, and transportation costs.[6,7,10,17,24] While some insurance plans provided by employers are required to cover PT, this may be limited to a certain number of sessions or facilities that are not within a reasonable distance. This may be why, in prior studies, PT utilization was higher for privately insured patients compared to the Medicare cohorts.[1] This suggests that differences in insurance type may affect patient outcomes through the underutilization of PT. Delayed or reduced care as a result of economic stress has been found to have a significant impact on patient-reported and functional outcomes.[2,6,7,40] The high cost of PT is included in this and may impact utilization and outcomes. The purpose of this study was to evaluate utilization of PT after shoulder surgery and better delineate factors that impact utilization including cost, insurance type, and copayments. We hypothesized that if PT Copayments (CPs) and insurance type vary in coverage and cost for patients, then these would be critical factors impacting PT utilization after shoulder surgery.

Methods

This was an institutional review board approved retrospective study of 80 consecutive patients who underwent shoulder surgery along with formal PT after surgery at a single institution by two fellowship trained shoulder surgeons from 2017 to 2019. The types of shoulder surgery included rotator cuff repair, total and reverse shoulder arthroplasty, and open reduction and internal fixation for proximal humerus fractures. Both surgeons suggested and encouraged outpatient PT with formalized therapy, while home PT was not a surgical recommendation. All comers were originally included postoperatively after shoulder surgery to make the results more inclusive and comprehensive in nature. Only patients who attended internal PT at the same institution were included in the study. Patients were excluded if they had a revision surgery or no PT sessions attended at the same internal PT at the same institution.

Data collected included demographics such as age, gender, body mass index (BMI), comorbidities, smoking status, arm dominance, affected side, health insurance, preoperative diagnosis, and surgery type. The cost of CPs for PT sessions for each insurance type was determined using CPT coding, billing data, and the insurance carriers posted plan coverage. The number of sessions utilized by each patient was recorded in the electronic medical records.

The cohort was divided based on insurance type: private insurance (PI) and Medicare with or without supplemental insurance (MI). Comparisons between insurance types were made for number of sessions utilized and whether or not CP was present. Patients were then subdivided into a CP group or No Copayment (NCP) group. Patients who had a deductible and NCP were put in the NCP group since the cost sharing by insurance companies could not be calculated for these surgeries. Those with a deductible and NCP were considered to not have shared costs with the insurance company at time of service. The distribution of the baseline characteristics for the sample was compared according to the exposure of interest (CP for PT).

Continuous variables were analyzed using t-tests for independent means and obtaining the difference between means, along with 95% confidence intervals (95% CI). Data were evaluated for distribution to verify that appropriate analyses were performed. Given that the variables in our data followed normal distribution, parametric tests were utilized to compare the means between variables. Differences between proportions and a 95% CI were calculated for categorical variables. Bivariate analyses were also conducted to assess the association between baseline characteristics and the mean number of PT visits. A t-test for independent samples was also used to compare the number of visits according to dichotomous variables (CP, gender, etc.), obtaining the difference between means with 95% CI. One-way analysis of variance was used to evaluate the mean number of PT visits for categorical variables with more than two values (for insurance type). Finally, the association between continuous variables (age, BMI, and total number of comorbidities) and the number of PT visits was assessed obtaining Pearson's correlation coefficients.

Multivariate linear regression was used to assess the adjusted association between CP and the outcomes while controlling for potential confounders. Variables that showed some statistical association ($P < .2$) with either the exposure or with the outcome after the bivariate analyses described before were considered candidates to be included in a multivariate linear regression model. Such candidate covariates were further evaluated to assess their correlations; when two variables were correlated, one of them was selected to be included in the regression model. All analyses were conducted using IBM SPSS Statistics version 25 (Armonk, NY, USA).

Results

Of the 80 patients, there were 53 females and 27 males, with an average age of 62 years and a BMI of 28. The average number of PT sessions attended was 18, and the average cost of CP for PT sessions was $32 (range $5-$75). The PI group had 42 patients, and the MI group had 38 patients. There were no significant differences between groups at baseline other than older age for the MI group (69 years vs. 56 years; $P < .01$), a greater proportion of females in the PI group (76% vs. 55%; $P = .05$), and surgery type ($P = .03$). RCR was the largest surgery type at 39 cases total, while the remaining surgeries were each under 15, which serves as a possible limitation for our analyses. The MI group had a significantly higher average number of total comorbidities ($P = .03$), although obesity, hypertension, and mental disorder were comparable between the groups. Those in the PI group were more likely to have CP ($P < .01$), with no significant difference in the dollar amount of CP ($P = .64$). There was no significant difference between the groups in the number of utilized total and postoperative PT sessions (Table I).

The association between baseline characteristics including surgery type, insurance type, and CP and mean number of PT sessions (both postoperative and total) were analyzed (Table II). Patients who had a CP had significantly more total PT visits than those without a CP ($P = .05$). However, no difference was observed between patients with and without CP for the number of postoperative PT visits ($P = .10$). Few other variables showed some association with the outcome given that P values were less than .20 (fracture, surgery type, hypertension, and mental disorder). Overall, there was no significant difference for postoperative or total PT utilization by insurance type ($P = .53$ and $P = .53$, respectively) (Table II). Correlations between age, BMI, and number of comorbidities with the number of PT sessions, both postoperative and total showed no significant difference, although there was a trend toward a lower BMI correlating with postoperative ($P = .10$) and total ($P = .16$) PT sessions utilized (Table III).

Given that CP was the only factor showing significance in PT sessions utilized, the cohort was then divided based on the presence of CP. The distribution of baseline characteristics was analyzed according to exposure (Table IV). Statistically significant differences between the two groups were observed for type of insurance ($P < .01$) and having any comorbidity ($P < .01$). Patients with CP more often had PI (73%), while those without CP more often had Medicare (60%) ($P < .01$) (Fig. 1). The frequency of at least 1 comorbidity was higher among patients with CP, as compared to those without CP (93% vs. 66%, respectively; $P < .01$) (Fig. 2). All other baseline features, except for surgeon, showed no association; P values larger

Table I
Comparison of baseline characteristics between patients according to insurance*.

Characteristic	Private N = 42	Medicare N = 38	Diff (95% CI)	*P* value
Age (y) - mean (SD)	55.5 (9.9)	68.5 (8.2)	−13.0 (−17.1 to 8.9)	<.01†
Female gender	32 (76.2)	21 (55.3)	−7 (−22.7 to 8.7)	.05†
Fracture	5 (11.9)	6 (15.8)	−1 (−7.2 to 5.2)	.61
Surgeon 1	28 (66.7)	27 (71.1)	3 (−10.9 to 16.9)	.67
Type of surgery				.03†
RCR	23 (55.8)	16 (42.1)	7 (−15.2 to 29.2)	.17
ORIF	7 (9.5)	5 (11.9)	2 (−2.8 to 6.8)	.56
RSA	3 (7.1)	11 (28.9)	−8 (−17.2 to 1.2)	.01†
TSA	3 (7.1)	5 (13.2)	−2 (−6.7 to 2.7)	.40
Other	6 (14.3)	1 (7.9)	5 (−0.2 to 10.2)	.31
Surgery dominant arm	22 (52.4)	19 (50.0)	3 (−19.9 to 25.9)	.83
Copayment	22 (52.4)	8 (21.1)	14 (−4.1 to 32.1)	<.01†
CPamount	33.4 (19.2)	29.5 (20.2)	3.9 (−8.5 to 16.3)	.64
Smoker	2 (4.8)	3 (7.9)	−1 (−3.9 to 1.9)	.56
Diabetes	7 (9.5)	9 (23.7)	−2 (−9.9 to 5.9)	.43
BMI (kg/m^2) - mean (SD)	27.1 (4.7)	28.9 (3.8)	−1.8 (−3.7 to 0.1)	.06
Morbid obesity	1 (2.4)	1 (2.6)	0 (−1.1 to 1.1)	.94
Hypertension	13 (30.1)	19 (50.0)	−6 (−24.2 to 12.2)	.08
Mental comorbidity	2 (4.8)	5 (13.2)	−3 (−7.3 to 1.3)	.18
Any comorbidity	29 (69.0)	32 (84.2)	−3 (−37.1 to 31.1)	.11
Total number of comorbidities - mean (SD)	1.8 (1.8)	2.8 (2.5)	−1.0 (−2.0 to −0.4)	.03†
No. postoperative physical therapy (PT) sessions - mean (SD)	17.4 (12.5)	15.7 (11.3)	1.7 (−2.0 to −0.4)	.53
No. total PT sessions - mean (SD)	19.1 (14.6)	17.1 (13.5)	2.0 (−4.3 to 8.3)	.53

The PI group had 42 patients, and the supplemental insurance (MI) group had 38 patients. There were no significant differences between groups at baseline other than age, where the MI group was older (68.5 y vs. 55.5 y; $P < .01$), a greater proportion of females in the PI group (76.2% vs. 55.3%; $P = .05$), and surgery type ($P = .03$). Those in the PI group were more likely to have copayment ($P < .01$). The MI group had a significantly higher average number of total comorbidities ($P = .03$). There was no significant difference between the two groups in the number of utilized total and postoperative PT sessions.
SD, standard deviation; *CI*, confidence interval; *PI*, private insurance; *RCR*, rotator cuff repair; *ORIF*, open reduction internal fixation; *RSA*, reverse shoulder arthroplasty; *TSA*, total shoulder arthroplasty; *BMI*, body mass index.
*All values are counts (%), unless indicated.
†Represents statistically significant values.

Table II
Bivariate analysis for the associations between copayment and of other baseline characteristics with the number of physical therapy (PT) sessions (postoperative and total).

Characteristic (n)	Value	No. postoperative PT sessions			No. total PT sessions		
		Mean (SD)	Difference (95% CI)	*P* value	Mean (SD)	Difference (95% CI)	*P* value
Copayment	Yes (30)	19.4 (12.7)	4.5 (−0.9 to 9.9)	.10	22.2 (16.1)	6.4 (0.12 to 12.7)	.05*
	No (50)	14.9 (11.2)			15.7 (12.1)		
Gender	Female (53)	16.2 (12.0)	−1.2 (−6.9 to 4.4)	.66	17.5 (13.7)	−1.8 (−8.5 to 4.8)	.58
	Male (27)	17.4 (11.9)			19.4 (14.8)		
Fracture	Yes (11)	10.7 (9.1)	−6.8 (−14.4 to 0.7)	.08	10.7 (9.1)	−8.6 (−17.5 to 0.3)	.06
	No (69)	17.6 (12.1)			19.3 (14.3)		
Surgeon	Surgeon 1 (55)	17.1 (11.4)	1.4 (−4.4 to 7.1)	.64	18.4 (13.2)	0.9 (−5.8 to 7.7)	.79
	Surgeon 2 (25)	15.7 (13.1)			17.5 (15.9)		
Type of surgery	RCR (39)	19.1 (11.4)	NA	.18	21.6 (14.5)	NA	.14
	ORIF (12)	10.8 (7.7)			10.8 (7.7)		
	RSA (14)	18.3 (15.8)			18.9 (17.1)		
	TSA (8)	14.6 (12.5)			15.6 (12.0)		
	Other (7)	16.6 (11.9)			12.9 (10.0)		
Surgery dominant arm	Yes (46)	15.3 (10.0)	−3.3 (−8.7 to 2.1)	.23	17.4 (13.1)	−1.8 (−8.3 to 4.6)	.57
	No (33)	18.6 (14.2)			19.3 (15.5)		
Type of insurance	Private (42)	17.4 (12.5)	NA	.53	19.1 (14.6)	NA	.53
	Medicare (38)	15.7 (11.3)			17.1 (13.5)		
Smoker	Yes (5)	19.6 (12.8)	3.2 (−7.8 to 14.1)	.57	21.2 (14.8)	3.3 (−9.7 to 16.2)	.62
	No (75)	16.4 (11.9)			18.0 (14.0)		
Diabetes	Yes (16)	15.4 (8.1)	−1.6 (−8.2 to 5.1)	.64	16.1 (8.8)	−2.5 (−10.3 to 5.3)	.52
	No (64)	16.9 (12.7)			18.7 (15.0)		
Morbid obesity	Yes (2)	19.5 (6.4)	2.9 (−14.1 t0 20.0)	.73	19.5 (6.4)	1.4 (−18.7 to 21.5)	.89
	No (78)	16.6 (12.0)			18.1 (14.2)		
Hypertension	Yes (32)	14.1 (9.4)	−4.3 (−9.3 to 0.7)	.09	15.5 (12.3)	−4.4 (−10.7 to 1.9)	.17
	No (48)	18.3 (13.1)			19.9 (14.9)		
Mental comorbidity	Yes (7)	9.4 (5.6)	−7.9 (−17.1 to 1.4)	.09	10.6 (5.6)	−8.3 (−19.2 to 2.6)	.14
	No (73)	17.3 (12.1)			18.9 (14.4)		
Any comorbidity	Yes (61)	16.2 (11.4)	−1.9 (−8.2 to 4.3)	.54	17.9 (14.1)	−1.0 (−8.4 to 6.3)	.78
	No (19)	18.1 (13.5)			19.0 (14.0)		

The association between having a copayment or the other baseline characteristics, and the mean number of PT sessions (both postoperative and total) was analyzed. Patients who had a copayment had significantly more total PT visits than those without a copayment ($P = .05$). However, no difference was observed between patients with and without copayment for the number of postoperative PT visits ($P = .10$). Few other variables showed *P* values <.20 (fracture, surgery type, hypertension, and mental comorbidity). Overall, there was no significant difference for postoperative or total PT utilization by insurance type ($P = .53$ and $P = 53$, respectively).
CI, confidence interval; *SD*, standard deviation; *RCR*, rotator cuff repair; *ORIF*, open reduction internal fixation; *RSA*, reverse shoulder arthroplasty; *TSA*, total shoulder arthroplasty; *BMI*, body mass index.
*Represents statistically significant values.

Table III
Correlations between continuous baseline characteristics and the number of PT sessions (both postoperative and total).

Variable	No. postoperative PT sessions		No. total PT sessions	
	Pearson correlation	*P* value	Pearson correlation	*P* value
Age (y)	0.08	.50	0.07	.54
BMI (kg/m^2)	−0.19	.10	−0.16	.16
Total number of comorbidities	0.27	.81	0.09	.42

The correlations between the three continuous baseline variables and the number of PT sessions were analyzed for both postoperative and total PT sessions. Correlations between age, BMI, and number of comorbidities with the number of PT sessions both postoperative and total showed no significant difference, although there was a trend toward a lower BMI correlating with postoperative ($P = .10$) and total ($P = .16$) PT sessions utilized.
BMI, body mass index; *PT*, physical therapy.

Table IV
Comparison of baseline characteristics between patients according to copayment[*].

Characteristic	Copayment N = 30	No copayment N = 50	Diff (95% CI)	*P* value
Age (y) - mean (SD)	60.0 (11.0)	62.7 (11.3)	−2.7 (−7.9 to −2.4)	.29
Female gender	19 (63.3)	34 (68.0)	−4.7 (−26.2 to 16.9)	.67
Fracture	3 (10.0)	8 (16.0)	4.8 (−10.1 to 19.7)	.45
Surgeon 1	18 (60.0)	37 (74.0)	−14.0 (−35.3 to 7.3)	.19
Type of surgery				.77
RCR	15 (50.0)	24 (48.0)	2.0 (−20.6 to 24.6)	.82
ORIF	4 (13.3)	8 (16.0)	−2.7 (−18.5 to 13.2)	.75
RSA	5 (16.7)	9 (18.0)	−1.3 (−18.4 to 15.7)	.89
TSA	2 (6.7)	6 (12.0)	−5.3 (−18.1 to 7.3)	.48
Other	4 (13.3)	3 (6.0)	7.3 (−6.5 to 21.2)	.30
Surgery dominant arm	17 (56.7)	29 (58.0)	−1.3 (−23.7 to 21.1)	.91
Type of insurance				<.01[†]
Private	22 (73.3)	20 (40.0)	33.3 (12.5 to 54.2)	<.01[†]
Medicare	8 (3.8)	30 (60.0)	−14.0 (−23.6 to −4.4)	.03[†]
Smoker	2 (6.7)	3 (6.0)	0.7 (−10.4 to 11.8)	.89
Diabetes	6 (20.0)	10 (20.0)	0.0 (−18.1 to 18.1)	1.00
BMI (kg/m^2) - mean (SD)	27.4 (3.6)	28.3 (4.8)	−0.8 (−2.9 to 1.2)	.42
Morbid obesity	1 (3.3)	1 (2.0)	1.3 (−6.2 to 8.8)	.75
Hypertension	13 (43.3)	19 (38.0)	5.3 (−16.9 to 27.6)	.64
Mental comorbidity	2 (6.7)	5 (10.0)	−3.3 (−15.5 to 8.9)	.65
Any comorbidity	28 (93.3)	33 (66.0)	−27.3 (11.5 to 43.2)	<.01[†]
Total number of comorbidities				
Mean (SD)	2.5 (1.8)	2.1 (2.4)	0.4 (−0.7 to 1.4)	.49
Median (IQR)	2.0 (1.0-3.0)	1.0 (0.0-3.0)	NA	1.0

The distribution of baseline characteristics in the two groups was analyzed according to exposure. Statistically significant differences between the two groups were observed for type of insurance ($P = .02$) and having any comorbidity ($P < .01$). Patients with copayment more often had private insurance (73.3%), while those without copayment more often had Medicare (60%) ($P < .01$). The frequency of at least one comorbidity was higher among patients with copayment, as compared to those without it (93.3% vs. 66.0%, respectively; $P < .01$). All other baseline features, except for the surgeon, showed *P* values larger than .2.
SD, standard deviation; *CI*, confidence interval; *IQR*, interquartile range; *CP*, copayment; *BMI*, body mass index; *RCR*, rotator cuff repair; *ORIF*, open reduction internal fixation; *RSA*, reverse shoulder arthroplasty; *TSA*, total shoulder arthroplasty.
[*]All values are counts (%), unless indicated.
[†]Represents statistically significant values.

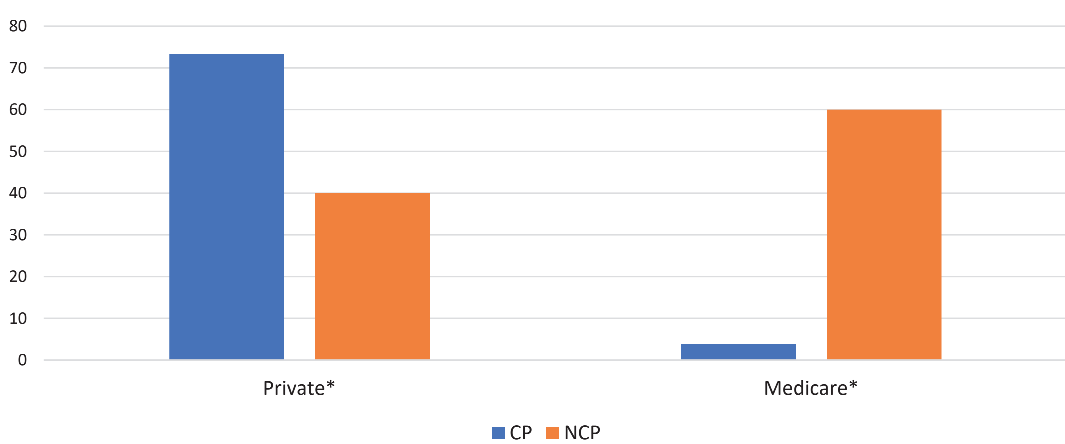

Figure 1 Insurance type for patients with and without copayment. *Denotes significance ($P < .05$). Patients with copayment more often had private insurance (73.3%), while those without copayment more often had Medicare (60%) ($P < .01$). *CP*, copayment; *NCP*, no copayment.

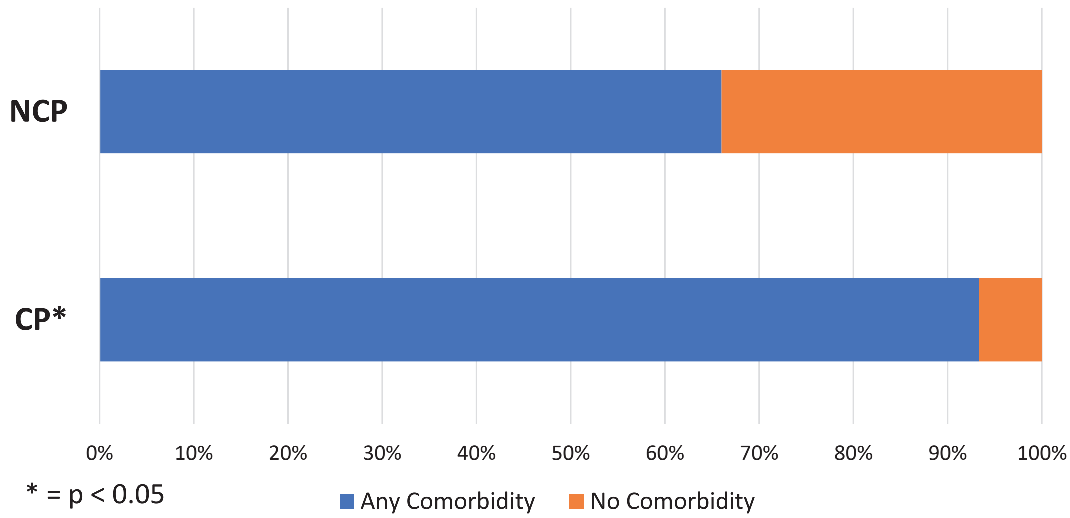

Figure 2 Comorbidity history with and without copayment. *Denotes significance ($P < .05$). The frequency of at least one comorbidity was higher among patients with copayment, as compared to those without copayment (93.3% vs. 66.0%, respectively; $P < .01$). *CP*, copayment; *NCP*, no copayment.

than .2 was the threshold to be considered for inclusion in the multivariate regression model.

Variables that showed some statistical associations ($P < .2$) were considered candidates to be included in the linear regression model. This included surgeon, type of insurance, fracture, type of surgery, hypertension, mental comorbidity, any comorbidity, and BMI. These candidate covariates were evaluated further to assess their correlations. The findings of the multivariate linear regression model for the association between CP, and the number of PT visits included the following covariates in the model: fracture, type of surgery, type of insurance, having mental disorder, and having any comorbidity (Table V). This analysis demonstrated that having CP was not independently associated with a change in the number of PT visits, although there was a trend toward having more total PT visits when there was a CP (beta 6.6, 95% CI −0.4 to 13.6, $P = .06$).

Discussion

Shoulder surgery has doubled from 2011 to 2017 and is expected to increase over 200% by 2025.[39] PT is a mainstay in postoperative shoulder surgery and has well-documented benefits to help patients recover. Particularly, PT following shoulder surgery has shown to help guide patients through the recovery period, increasing patient satisfaction, function, and speed of recovery, highlighting its importance in the postoperative period.[31] The use of formal PT has been proven to be vital by Romano et al, noting that patients following reverse shoulder arthroplasty, who worked with a therapist to form a personalized rehabilitation, had improved clinical outcomes and decreased complication rates.[33] Understanding the role of PT provides a basis to begin developing a more individualized and streamlined therapy approach that would provide patients with the most effective outcomes. Despite this, many patients do not utilize PT in such a fashion that would match the benefits brought forth in the literature.[5,11,23,27,31,37]

Regardless of its proven benefits, the variables contributing to the decreased utilization of PT among shoulder surgery patients have been reported.[4,22,27] Proposed contributing factors include cost, copays, deductibles, facility fees, travel costs, loss of working days, and patient expectations of the efficacy and necessity of PT.[6,8,14,18] Furthermore, issues with mobility in the elderly population, which makes up the largest proportion of Medicare, may also limit utilization of PT.[24] Our study found trends toward CP affected total PT utilization after shoulder surgery, but no independent association was found. This suggests that CPs on insurance may have some impact on PT utilization among those who had shoulder surgery.

It has been established that privately insured patients who underwent arthroscopic rotator cuff repair had a higher percentage of PT postoperatively compared to patients with Medicare.[4,6,40] Others have proposed that the differences in utilization can be attributed to patient and provider habits, Medicare patients having limited access or limited mobility to get to PT appointments, the use of nonformal PT alternatives, regular patient prescriptions for PT, which are required for Medicare patients, a more significant cost burden for Medicare patients and decreased motivation of the Medicare group to participate in PT due to preconceived notions on the efficacy of PT.[4,22,31] Interestingly, in our study we found that there were no significant differences between PI and Medicare in terms of PT session utilization. We did see, however, patients with CPs trended toward increased utilization of PT with a significantly higher distribution of patients with PI, and the NCP group had more patients with Medicare and lower PT utilization. Factors previously discussed, such as patient habits, PT access, preconceived notions about PT, and cost burden associated with Medicare, may have contributed to these findings.[4,6,22,31,41]

It is also well established that a barrier to using PT is cost, with copays that can be more than $75, coinsurance, facility fees, and high deductibles.[3,4,6,13,27] Patients who are financially constrained may find difficulty accessing formal PT services. Additionally, lower socioeconomic patients may require such therapy to return to work, and if they cannot pay for the therapy, a vicious financial cycle occurs.[3,25,35,36] The number of visits that a patient can use is also unclear due to a financial cap laid upon by the insurance provider, which can restrict PT visits.[6] Considering that RCR requires at least 3-6 months of PT, Medicaid specifically only allows for 1 evaluation visit and 3 subsequent treatment visits; this clearly can present a problem for patient recovery. Previous studies convey the understanding that higher CP would lead to decreased number

Table V
Linear regression analysis for the association between copayment and other covariates with the number of PT sessions (both postoperative and total).

Covariate	No. postoperative PT sessions			No. total PT sessions		
	B coefficient	95% CI	*P* value	B coefficient	95% CI	*P* value
Constant	21.4	13.4 to 29.4	<.0001	22.9	13.6 to 32.3	<.0001
Copayment	4.7	−1.3 to 10.6	.12	6.6	−0.4 to 13.6	.06
Fracture	−6.2	−13.7 to 1.4	.11	−7.8	−16.5 to 1.0	.08
Type of surgery	−1.3	−3.3 to 0.59	.17	−1.8	−4.1 to 0.4	.11
Type of insurance	−0.15	−2.8 to 2.5	.91	0.05	−3.0 to 3.1	.97
Mental comorbidity	−5.8	−15.2 to 3.6	.22	−5.9	−16.8 to 5.1	.29
Any comorbidity	−2.6	−9.3 to 4.0	.43	−2.4	−10.2 to 5.4	.54

The findings of the multivariate linear regression models for the association between copayment and the number of PT visits including the following covariates in the model were found: fracture, type of surgery, type of insurance, having mental comorbidity, and having any comorbidity. This analysis shows that having copayment is not independently associated with a change in the number of PT visits (total or after surgery), although there is a trend towards having more total PT visits when there is a copayment (beta 6.6, 95% CI −0.4 to 13.6, $P = .06$).
CI, confidence interval; *PT*, physical therapy.

of PT visits.[4,17,18] Conversely, our study found that there was no significant difference in terms of PT visits between patients with and without copays as well as among individual insurance types. This suggests that it is not the amount of CP alone that would determine the PT utilization following shoulder surgery but rather patients are influenced by a multitude of factors including personal health habits, level of activity, return to work or activities of daily living, geographic or mobility-based barriers to access to PT, and patient expectations on the efficacy and necessity of PT.[18,22]

Patients may also experience barriers to PT access because of insurance companies. Insurance companies have decreased PT coverage because of cost containment as well as no clear consensus on optimal number of sessions to adequately rehabilitate a shoulder. This leaves room for an insurance company to assume the lowest amount of PT necessary to increase their financial gains. The result is that patients are placed at a disadvantage. For example, Medicare part B allows for a PT yearly cap of $1980. Considering that each and every PT location and session within that same location may be billed differently, the patient and insurance company will be unable to predict how many individual sessions of formal physical rehabilitation will be covered.[3,6,13,17,18,40] Therefore, placing a price cap may limit the necessary number of visits for patients. This financial barrier impacts the utilization of PT among patients, which will prevent optimal recovery and treatment. Our study could not confirm the relationship between CP and different insurance types, but further investigations should be performed to better understand this relationship.

The average cost to insurance for a patient undergoing PT postoperatively following RCR was estimated at $262.81 per visit.[13] The average number of visits for a postshoulder surgery patient elucidated from our study was about 18 visits; with that information, the average cost to the insurance of a patient's PT following shoulder surgery would be $4730. In our study, we found that the average CP among shoulder surgery patients was about $32, with a range of $5-$75, so the overall CPwould be in the range of $90-$1361 with an average of $587. Knowing that this expense is great, the appeal of alternative forms of formal PT grows. Internet-based and home-based PT programs have been shown to reduce costs significantly when compared to formal PT programs.[2,6,14,16,17,19,27,28,33,38] This evidence suggests that alternative forms of PT may therefore be an effective method for future patients with financial constraints to recover after shoulder surgery.

In our results, patients with a history of mental comorbidity were found to have trends in decreased postoperative PT sessions. This is an important consideration for health care professionals, as they may identify patients early who will have the largest problems with adherence to a formal PT and consider alternatives. It is known that decreased adherence to a PT regimen can lead to suboptimal results, so it is important for physicians to consider PT alternatives and closer follow-up for these patients to increase adherence and optimize clinical outcomes.[15,34] In our study, we found no significant difference in the number of PT sessions attended between those with and without mental health comorbidities. Future studies could address the efficacy of PT alternatives in low-adherence patient populations.

The strength of this study is not without limitations. One limitation was the small sample size to further examine CPs. Also, the influence of surgery type was not uncovered given that our analyses included patients with multiple surgery types and, thus, few cases in each surgery type. Given that PT utilization, length, and exercises vary for different shoulder surgeries, this may have played a role in PT utilization as well as costs.[20,26,29,43] However, the overall use of therapy postoperatively is consistent. Additionally, given the retrospective nature of the study, there may be an element of selection bias present for the patients included in the study. Even with the case-controlled comparative study, future studies to understand amounts paid and the influence of CPs on PT utilization are needed. Additionally, our study did not include deductibles, which may also play a role in PT utilization and drive up patient costs, especially when surgery and PT are performed during different insurance coverage periods.[9] Furthermore, there may be confounding variables that can influence PT utilization aside from the factors we analyzed, and examples of these include level of patient education, socioeconomic status, access in terms of distance from home to PT office, cost of lost time and travel to the PT office, and other health care disparities.[32,41] Also, our study did not include Medicaid patients, which may also have a decreased PT utilization due to a myriad of factors such as access to PT.[42] Furthermore, patients were only included in our study if they attended PT at our own institution, and given that there are numerous other PT locations patients could have attended, this may have been a limitation of selection bias that we could not account for. Due to the differences among various CPamounts, which may stratify PT visits, there was a wide confidence interval in our findings, and thus did not provide the power needed to evaluate clinically significant differences in CP amounts and PT utilization. Given the focus of our study was on insurance type, our sample was limited only to patients that underwent postoperative PT at our institution, which enhanced the quality of our data collection but limited our sample size. An additional limitation was that we only collected data on patients who attended PT at our internal institutional PT facilities, which may have limited the generalizability of our results given that other PT practices may differ.

Conclusion

PT is essential for the recovery of shoulder surgery patients, and PT utilization was not influenced by insurance type or CP, as determined by the number of PT sessions attended. It appears that a financial investment in rehabilitation did not decrease compliance and utilization for patients during postoperative rehabilitation after shoulder surgery. To ensure optimal outcomes, it is vital to develop a more individualized and streamlined approach to PT that considers patients' unique needs and limitations. Further investigations are necessary to better understand the relationship between CP and different insurance types and develop effective strategies to increase access to PT for postoperative shoulder patients. This is particularly important for orthopedic surgeons to understand in order to help their patients optimize outcomes after shoulder surgery.

Disclaimers:

Funding: No funding was received from external sources.
Conflicts of interest: Vani J Sabesan receives research support from Orthofix Inc., & Wright Medical Technology, Inc. is a paid consultant for Zimmer Biomet and Restor3D and has a board membership with Florida Orthopaedic Society, ISTA, and Journal of Shoulder and Elbow Surgery. The other authors, their immediate families, and any research foundation with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

References

1. Ackerman IN, Busija L. Access to self-management education, conservative treatment and surgery for arthritis according to socioeconomic status. Best Pract Res Clin Rheumatol 2012;26:561-83. https://doi.org/10.1016/j.berh.2012.08.002.
2. Allen KD, Arbeeva L, Callahan LF, Golightly YM, Goode AP, Heiderscheit BC, et al. Physical therapy vs internet-based exercise training for patients with knee osteoarthritis: results of a randomized controlled trial. Osteoarthritis Cartilage 2018;26:383-96. https://doi.org/10.1016/j.joca.2017.12.008.
3. Althausen PL, Shannon S, Lu M, O'Mara TJ, Bray TJ. Clinical and financial comparison of operative and nonoperative treatment of displaced clavicle fractures. J Shoulder Elbow Surg 2013;22:608-11. https://doi.org/10.1016/j.jse.2012.06.006.
4. Arshi A, Kabir N, Cohen JR, Lord EL, Wang JC, McAllister DR, et al. Utilization and costs of postoperative physical therapy after rotator cuff repair: a comparison of privately insured and medicare patients. Arthroscopy 2015;31:2392-2399.e1. https://doi.org/10.1016/j.arthro.2015.06.018.
5. Boudreau S, Boudreau E, Higgins LD, Wilcox RB. Rehabilitation following reverse total shoulder arthroplasty. J Orthop Sports Phys Ther 2007;37:734-43. https://doi.org/10.2519/jospt.2007.2562.
6. Carvalho E, Bettger JP, Goode AP. Insurance coverage, costs, and barriers to care for outpatient musculoskeletal therapy and rehabilitation services. N C Med J 2017;78:312-4. https://doi.org/10.18043/ncm.78.5.312.
7. Civelek M, Lusis AJ. Systems genetics approaches to understand complex traits. Nat Rev Genet 2014;15:34-48. https://doi.org/10.1038/nrg3575.
8. Cuff DJ, Pupello DR. Comparison of hemiarthroplasty and reverse shoulder arthroplasty for the treatment of proximal humeral fractures in elderly patients. J Bone Joint Surg 2013;95:2050-5. https://doi.org/10.2106/JBJS.L.01637.
9. Curry EJ, Penvose IR, Knapp B, Parisien RL, Li X. National disparities in access to physical therapy after rotator cuff repair between patients with Medicaid vs. private health insurance. JSES Int 2021;5:507-11. https://doi.org/10.1016/j.jseint.2020.11.006.
10. Dall TM, Gallo P, Koenig L, Gu Q, Ruiz D. Modeling the indirect economic implications of musculoskeletal disorders and treatment. Cost Eff Resour Alloc 2013;11:5. https://doi.org/10.1186/1478-7547-11-5.
11. Denard PJ, Lädermann A. Immediate versus delayed passive range of motion following total shoulder arthroplasty. J Shoulder Elbow Surg 2016;25:1918-24. https://doi.org/10.1016/j.jse.2016.07.032.
12. Di Fabio RP, Mackey G, Holte JB. Disability and functional status in patients with low back pain receiving workers' compensation: a descriptive study with implications for the efficacy of physical therapy. Phys Ther 1995;75:180-93.
13. Dickinson RN, Kuhn JE, Bergner JL, Rizzone KH. A systematic review of cost-effective treatment of postoperative rotator cuff repairs. J Shoulder Elbow Surg 2017;26:915-22. https://doi.org/10.1016/j.jse.2017.02.009.
14. Dunn WR, Kuhn JE, Sanders R, An Q, Baumgarten KM, Bishop JY, et al. 2013 Neer Award: predictors of failure of nonoperative treatment of chronic, symptomatic, full-thickness rotator cuff tears. J Shoulder Elbow Surg 2016;25:1303-11. https://doi.org/10.1016/j.jse.2016.04.030.
15. Eriksson L, Lindström B, Gard G, Lysholm J. Physiotherapy at a distance: a controlled study of rehabilitation at home after a shoulder joint operation. J Telemed Telecare 2009;15:215-20. https://doi.org/10.1258/jtt.2009.081003.
16. Gaugler JE, Duval S, Anderson KA, Kane RL. Predicting nursing home admission in the U.S: a meta-analysis. BMC Geriatr 2007;7:13. https://doi.org/10.1186/1471-2318-7-13.
17. Grona SL, Bath B, Busch A, Rotter T, Trask C, Harrison E. Use of videoconferencing for physical therapy in people with musculoskeletal conditions: a systematic review. J Telemed Telecare 2018;24:341-55. https://doi.org/10.1177/1357633X17700781.
18. Hernon MJ, Hall AM, O'Mahony JF, Normand C, Hurley DA. Systematic review of costs and effects of self-management interventions for chronic musculoskeletal pain: spotlight on analytic perspective and outcomes assessment. Phys Ther 2017;97:998-1019. https://doi.org/10.1093/ptj/pzx073.
19. Hush JM, Cameron K, Mackey M. Patient satisfaction with musculoskeletal physical therapy care: a systematic review. Phys Ther 2011;91:25-36. https://doi.org/10.2522/ptj.20100061.
20. Kennedy JS, Reinke EK, Friedman LGM, Cook C, Forsythe B, Gillespie R, et al. Protocol for a multicenter, randomised controlled trial of surgeon-directed home therapy vs. outpatient rehabilitation by physical therapists for reverse total shoulder arthroplasty: the SHORT trial. Arch Physiother 2021;11:28. https://doi.org/10.1186/s40945-021-00121-2.
21. Kloek CJJ, van Dongen JM, de Bakker DH, Bossen D, Dekker J, Veenhof C. Cost-effectiveness of a blended physiotherapy intervention compared to usual physiotherapy in patients with hip and/or knee osteoarthritis: a cluster randomized controlled trial. BMC Public Health 2018;18:1082. https://doi.org/10.1186/s12889-018-5975-7.
22. Kuhn JE, Dunn WR, Sanders R, An Q, Baumgarten KM, Bishop JY, et al. Effectiveness of physical therapy in treating atraumatic full-thickness rotator cuff tears: a multicenter prospective cohort study. J Shoulder Elbow Surg 2013;22:1371-9. https://doi.org/10.1016/j.jse.2013.01.026.
23. Levy JC, Everding NG, Gil CC, Stephens S, Giveans MR. Speed of recovery after shoulder arthroplasty: a comparison of reverse and anatomic total shoulder arthroplasty. J Shoulder Elbow Surg 2014;23:1872-81. https://doi.org/10.1016/j.jse.2014.04.014.
24. Marinko LN, Chacko JM, Dalton D, Chacko CC. The effectiveness of therapeutic exercise for painful shoulder conditions: a meta-analysis. J Shoulder Elbow Surg 2011;20:1351-9. https://doi.org/10.1016/j.jse.2011.05.013.
25. Mattson J. Transportation, distance, and health care utilization for older adults in rural and small urban areas. transportation research record. J Transp Res Board 2011;2265:192-9. https://doi.org/10.3141/2265-22.
26. Maund E, Craig D, Suekarran S, Neilson A, Wright K, Brealey S, et al. Management of frozen shoulder: a systematic review and cost-effectiveness analysis. Health Technol Assess 2012;16:1-264. https://doi.org/10.3310/hta16110.
27. Morris BJ, Haigler RE, Laughlin MS, Elkousy HA, Gartsman GM, Edwards TB. Workers' compensation claims and outcomes after reverse shoulder arthroplasty. J Shoulder Elbow Surg 2015;24:453-9. https://doi.org/10.1016/j.jse.2014.07.009.
28. Mulieri PJ, Holcomb JO, Dunning P, Pliner M, Bogle RK, Pupello D, et al. Is a formal physical therapy program necessary after total shoulder arthroplasty for osteoarthritis? J Shoulder Elbow Surg 2010;19:570-9. https://doi.org/10.1016/j.jse.2009.07.012.
29. Osborne JD, Gowda AL, Wiater B, Wiater JM. Rotator cuff rehabilitation: current theories and practice. Phys Sportsmed 2016;44:85-92. https://doi.org/10.1080/00913847.2016.1108883.
30. Pastora-Bernal JM, Martín-Valero R, Barón-López FJ, Moyano NG, Estebanez-Pérez M-J. Telerehabilitation after arthroscopic subacromial decompression is effective and not inferior to standard practice: preliminary results. J Telemed Telecare 2018;24:428-33. https://doi.org/10.1177/1357633X17706583.
31. Roberson TA, Bentley JC, Griscom JT, Kissenberth MJ, Tolan SJ, Hawkins RJ, et al. Outcomes of total shoulder arthroplasty in patients younger than 65 years: a systematic review. J Shoulder Elbow Surg 2017;26:1298-306. https://doi.org/10.1016/j.jse.2016.12.069.
32. Rogers MJ, Penvose I, Curry EJ, DeGiacomo A, Li X. Medicaid health insurance status limits patient accessibility to rehabilitation services following ACL reconstruction surgery. Orthop J Sports Med 2018;6:232596711876335. https://doi.org/10.1177/2325967118763353.
33. Romano A, Oliva F, Nastrucci G, Casillo P, Di Giunta A, Susanna M, et al. Reverse shoulder arthroplasty patient personalized rehabilitation protocol. preliminary results according to prognostic groups. Muscles Ligaments Tendons J 2017;7:263. https://doi.org/10.11138/mltj/2017.7.2.263.
34. Russell TG, Buttrum P, Wootton R, Jull GA. Internet-based outpatient telerehabilitation for patients following total knee arthroplasty. J Bone Joint Surg Am 2011;93:113-20. https://doi.org/10.2106/JBJS.I.01375.
35. Semahegn A, Torpey K, Manu A, Assefa N, Tesfaye G, Ankomah A. Psychotropic medication non-adherence and associated factors among adult patients with major psychiatric disorders: a protocol for a systematic review. Syst Rev 2018;7:10. https://doi.org/10.1186/s13643-018-0676-y.
36. Shields E, Thirukumaran C, Noyes K, Voloshin I. A review of a workers' compensation database 2003 to 2013: patient factors influencing return to

work and cumulative financial claims after rotator cuff repair in geriatric workers' compensation cases. Geriatr Orthop Surg Rehabil 2017;8:208-14. https://doi.org/10.1177/2151458517732209.

37. Steinhaus ME, Gowd AK, Hurwit DJ, Lieber AC, Liu JN. Return to work after shoulder arthroplasty: a systematic review and meta-analysis. J Shoulder Elbow Surg 2019;28:998-1008. https://doi.org/10.1016/j.jse.2018.12.011.
38. Thigpen CA, Shaffer MA, Gaunt BW, Leggin BG, Williams GR, Wilcox RB. The American Society of Shoulder and Elbow Therapists' consensus statement on rehabilitation following arthroscopic rotator cuff repair. J Shoulder Elbow Surg 2016;25:521-35. https://doi.org/10.1016/j.jse.2015.12.018.
39. Uesugi Y, Koyanagi J, Takagi K, Yamaguchi R, Hayashi S, Nishii T. Exercise therapy interventions in patients with hip osteoarthritis: comparison of the effects of DVD and website-based interventions. JMIR Rehabil Assist Technol 2018;5:e10. https://doi.org/10.2196/rehab.8251.
40. Wagner ER, Farley KX, Higgins I, Wilson JM, Daly CA, Gottschalk MB. The incidence of shoulder arthroplasty: rise and future projections compared with hip and knee arthroplasty. J Shoulder Elbow Surg 2020;29:2601-9. https://doi.org/10.1016/j.jse.2020.03.049.
41. Wagner ER, Solberg MJ, Higgins LD. The utilization of formal physical therapy after shoulder arthroplasty. J Orthop Sports Phys Ther 2018;48:856-63. https://doi.org/10.2519/jospt.2018.8176.
42. Wiznia DH, Nwachuku E, Roth A, Kim C-Y, Save A, Anandasivam NS, et al. The influence of medical insurance on patient access to orthopaedic surgery sports medicine appointments under the affordable care act. Orthop J Sports Med 2017;5:232596711771414. https://doi.org/10.1177/2325967117714140.
43. Yeranosian MG, Terrell RD, Wang JC, McAllister DR, Petrigliano FA. The costs associated with the evaluation of rotator cuff tears before surgical repair. J Shoulder Elbow Surg 2013;22:1662-6. https://doi.org/10.1016/j.jse.2013.08.003.