Risk Adjustment for Episode Costs Following Total Shoulder Arthroplasty

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INTRODUCTION: As demand for shoulder arthroplasty continues to grow, adequate cost containment is of paramount importance. Given the historical use of bundle payments for lower extremity arthroplasty, it is reasonable to anticipate such programs will be universally implemented in shoulder arthroplasty in the future. The purpose of this project is to evaluate how patient demographics, medical comorbidities, and surgical variables impact episode of care costs in effort to ensure accurate reimbursement scales and equitable access to shoulder care.

METHODS: Consecutive series of primary total shoulder arthroplasty (anatomic and reverse) procedures were retrospectively reviewed at a single academic institution from 2014 to 2020 using claims cost data from Medicare and a single private insurer. Patient demographic data, medical comorbidities, and clinical outcomes were collected. A stepwise multivariate regression was performed to determine the independent effect of comorbidities and demographics on 90-day episode-of-care costs.

RESULTS: Overall, 1452 shoulder arthroplasty patients were identified (1402 Medicare and 50 private payer patients). The mean 90-day episode-of-care cost for Medicare and private payers was $25,822 and $31,055, respectively. Among Medicare patients, dementia ($3,407, P = 0.003), prior history of stroke ($3,182, P = 0.005), chronic pulmonary disease (CPD) ($1,958, P = 0.007), anemia ($1,772, P = 0.039), and heart disease ($1,699, P = 0.014) were associated with significantly increased episode of care costs. Demographics that significantly increased costs included advanced age ($199 per year in age, P < 0.001) and elevated BMI ($183 per point, P < 0.001). Among private payers, hyperlipidemia ($6,254, P = 0.031) and advanced age ($713 per year, P < 0.001) were associated with an increase in total episode costs.

DISCUSSION AND CONCLUSION: Providers should be aware that certain demographic variables and comorbidities (history of stroke, dementia, CPD, anemia, heart disease, advanced age, and elevated BMI) are associated with an increase in total costs following primary shoulder arthroplasty. Further study is required to determine if target costs in bundled payment models should be adjusted to better compensate for specific comorbidities.

Table 1: Stepwise multivariate regression for Total Episode of Care costs for Medicare insurance primary shoulder arthroplasty patients, stratified by demographics and comorbidities

Variable	Cost Coefficient	Lower 95	Upper 95	P Value
Male	-$1,340	-$2,412	-$267	0.015
Age	$199	$119	$279	<0.001
BMI	$183	$91	$275	<0.001
CHF	$1,954	-$279	$4186	0.087
CPD	$1958	$542	$3,374	0.007
Dementia	$3,407	$270	$6,544	0.033
Diabetes	-$1,408	-$279	-$23	0.047
Anemia	$1,772	$92	$3,452	0.039
Heart Disease	$1,699	$342	$3,056	0.014
Hyperlipidemia	-$1,968	-$3,039	-$896	<0.001
Stroke	$3,182	$983	$5,382	0.005
Sleep Apnea	-$1,235	-$2,729	$258	0.105

Abbreviations: BMI, Body Mass Index; CHF, Congestive Heart Failure; CPD, Chronic Pulmonary Disease