The Effect of Surgeon Volume on Outcomes Following Total Shoulder Arthroplasty: A Nationwide Assessment

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INTRODUCTION: Increased surgeon volume has been demonstrated to correlate with improved outcomes after orthopedic surgery. However, there is a lack of data demonstrating the effect of surgeon volume on outcomes after total shoulder arthroplasty.

METHODS: The PearlDiver Mariner database was retrospectively queried from the years 2010-2022. Patients undergoing shoulder arthroplasty were selected using the CPT code 23472 (Total Shoulder Arthroplasty). Patients under 40 years of age, those undergoing revision arthroplasty and cases of bilateral arthroplasty were excluded. Additionally, cases with a history of fracture, infection, or malignancy prior to surgery were excluded. Only surgeons who performed a minimum of 10 cases were selected and PearlDiver was queried using their provider ID codes. Primary outcome measures included 90 day, 1-year, and 2-year rates of complication and reoperation.

RESULTS:

A total of 155,560 patients met inclusion criteria and were retained for analysis. The 90th percentile for surgeon volume was determined to be 112 cases during the study period. Surgeons above the 90th percentile (n=340) operated on 68,531 patients whereas surgeons below the 90th percentile (n=3,038) operated on 87,029 patients. Surgeons in the high-volume group were significantly more likely to have completed a Shoulder and Elbow fellowship (p<0.001) and less likely to have no fellowship training or fellowship training outside of Shoulder and Elbow or Sports Medicine (p<0.001). Low-volume surgeons operated on patients with higher baseline comorbidities (CCI: 2.01 vs 1.85, p<0.001). After adjusting for age, gender, CCI, obesity, and tobacco use, high-volume surgeons experienced lower rates of medical complications including renal failure (p<0.001), anemia (p<0.001), AMI (p<0.001), CVD (p=0.002), PNA (0.011), respiratory failure (p=0.012), hematoma (0.026), wound dehiscence (p=0.002) and UTI (p<0.001). All cause readmission (0.90, p<0.001), reoperation at 90 days (OR 0.75, p<0.001) and reoperation at 1 year (OR: 0.86, p<0.001) were significantly lower among high-volume surgeons. High-volume surgeons exhibited lower rates of various complications including prosthetic joint infection (90d: p<0.001; 1yr: p<0.001; 2yr: p<0.001), periprosthetic fracture (90d: p<0.001; 1yr: p<0.001; 2yr: p<0.001), postoperative stiffness (1yr: p<0.001; 2yr: p=0.026), all complications (90d: p<0.001; 1yr: p<0.001).

DISCUSSION AND CONCLUSION:

Surgeons who perform a high volume of total shoulder arthroplasty are more likely to operate on healthier patients than surgeons who perform a lower volume of cases. When compared to low volume surgeons, and after adjusting for age, gender, and CCI, high volume surgeons have a significantly lower overall complication rate. Despite this lower complication rate, high-volume surgeons are responsible for a decreasing portion of shoulder arthroplasty since 2016.

Table 1. 90-Day Surgical and Medical Complications

	Unadjusted OR: High Volume vs Low Volume	P-Value	Adjusted OR: High Volume vs Low Volume	P-Value
Surgical Complications				
Readmission	0.89	<0.001	0.90	<0.001
Reoperation	0.74	<0.001	0.75	<0.001
Prosthetic Joint Infection	0.45	<0.001	0.46	<0.001
Peri-Prosthetic Fracture	0.80	<0.001	0.82	<0.001
Prosthetic Dislocation	1.05	0.276	1.06	0.195
Prosthetic Loosening	0.87	0.253	0.88	0.296
Post-Operative Stiffness	0.97	0.072	0.97	0.070
Scapula Fractures	0.89	0.300	0.92	0.429
Nerve Injury	0.94	0.295	0.94	0.341
All Complication	0.91	<0.001	0.93	<0.001
Medical Complications				
Deep Venous Thrombosis	1.05	0.412	1.07	0.185
Renal Failure	0.78	<0.001	0.81	<0.001
Pulmonary Embolism	0.97	0.612	1.00	0.969
Anemia	0.89	<0.001	0.92	<0.001
Myocardial Infarction	0.88	0.089	0.92	0.233
Stroke	0.86	<0.001	0.90	0.002
Pneumonia	0.86	<0.001	0.90	0.011
Respiratory Failure	0.86	<0.001	0.91	0.012
Hematoma	0.80	0.0134	0.82	0.026
Wound Dehiscence	0.71	<0.001	0.74	0.002
Transfusion	0.87	0.0284	0.92	0.165
Urinary Tract Infection	0.86	<0.001	0.90	<0.001
Sepsis	0.86	0.016	0.90	0.095

Table 2. 2-Year Surgical Complications

	Unadjusted OR: High Volume vs Low Volume	P-Value	Adjusted OR: Low Volume vs High Volume	P-Value
Surgical Complications				
Reoperation	0.92	0.016	0.94	0.057
Prosthetic Joint Infection	0.68	<0.001	0.70	<0.001
Peri-Prosthetic Fracture	0.84	<0.001	0.86	<0.001
Prosthetic Dislocation	1.06	0.142	1.07	0.077
Prosthetic Loosening	0.97	0.542	0.98	0.747
Post-Operative Stiffness	0.96	0.012	0.97	0.026
Scapula Fractures	1.05	0.372	1.07	0.163
Nerve Injury	1.05	0.158	1.06	0.093
All Complication	0.97	0.017	0.98	0.092