



ISAKOS
CONGRESS
2023



Boston
Massachusetts
June 18–June 21

Welcome

isakos.com/2023 • [#ISAKOS2023](https://twitter.com/ISAKOS2023)



2023



ISAKOS
CONGRESS
2023



Boston
Massachusetts
June 18–June 21

An Analysis of Shoulder Surgeon Volume on Surgeon Competency, Hospital Costs and Adverse Events: A Systematic Review

**Haseeb Faisal, Moin Khan, Ajaykumar Shanmugaraj,
Shahrukh Khan, Loiy Alkhtab, Timothy Leroux, Rachel Frank**



The cost of shoulder surgical management has increased because of . . .

- **More shoulder procedures**
- **Low-volume facilities**
- **Changing patient demographics**



What do previous reviews say about increased surgeon volume?

A high-surgeon volume is associated with improved surgical outcomes and reduced hospital costs!



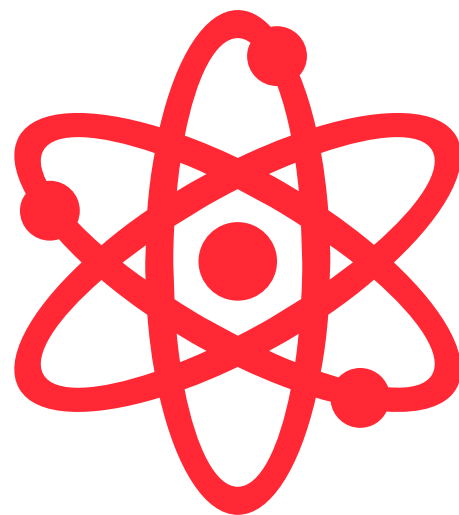
ISAKOS
CONGRESS
2023



Boston
Massachusetts
June 18–June 21

So, why are we investigating this topic?

There has been a significant increase in research on the effect of shoulder volume on patient care and associated costs since these reviews were published!



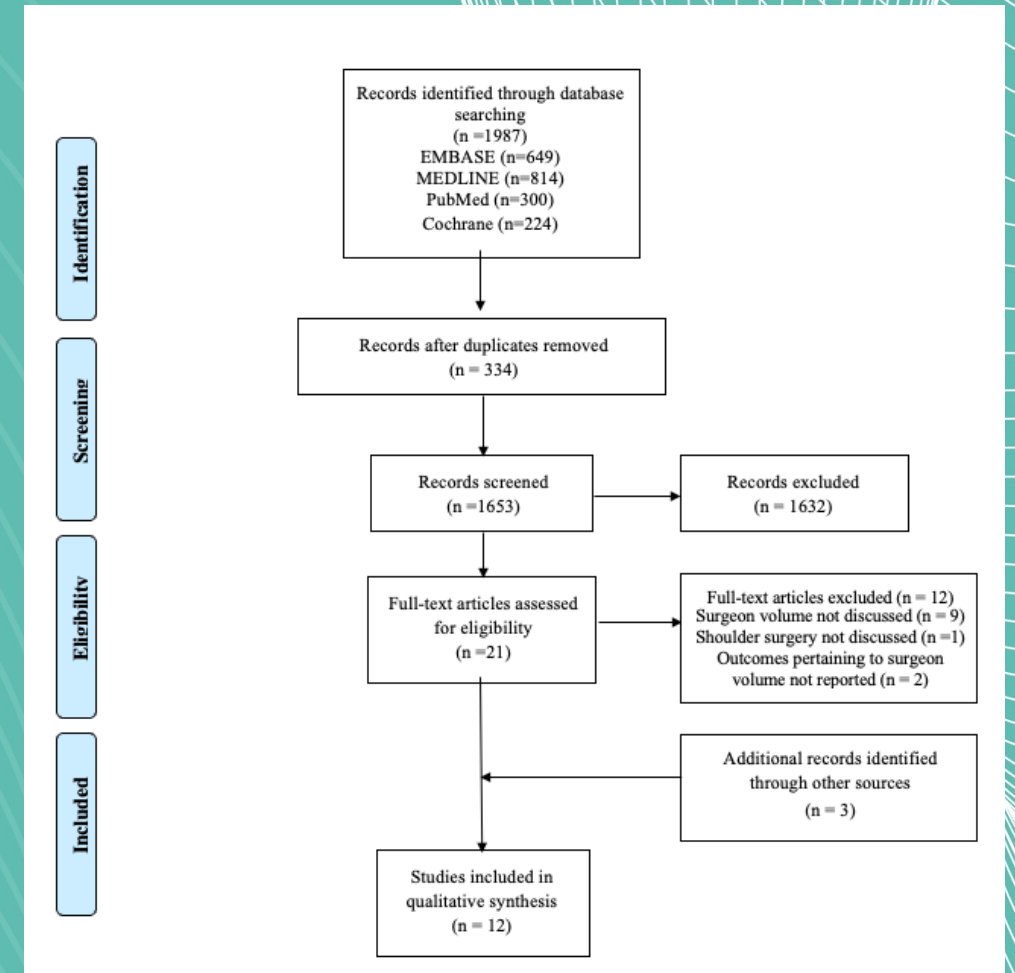
ISAKOS
CONGRESS
2023



Boston
Massachusetts
June 18–June 21

How did we find and evaluate the latest research on this topic?

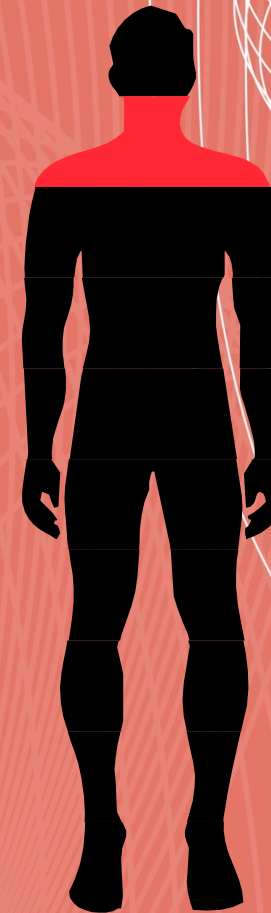
- **Embase, Medline, PubMed, Cochrane**
- **PRISMA-guided systematic screen**
- **R-AMSTAR-guided abstract/title screen**
- **MINORs Appraisal Tool**



PRISMA FLOW DIAGRAM

What are the characteristics of the studies we identified?

- **Twelve studies (inc. 150698 patients)**
- **Rotator cuff repair (53.7%; n = 81066), shoulder arthroplasty (35.7%; n = 53833), and ORIF 53833 (10.6%; n = 15999)**



What does the research say about high shoulder surgeon volume trends?

Rotator Cuff Repairs

**lower surgical time,
length of stay,
costs, and
reoperation/
readmission rates
($p < 0.01$).**



Shoulder Arthroplasty

**lower length of
stay, costs, surgical
time, non-routine
disposition,
blood loss,
reoperation/
readmission rates,
and complications
($p < 0.08$).**

ORIF

**lower length of
stay,
costs, and
complications
($p < 0.01$).**



Primary Author (Year)	Procedure(s)	Surgeon Volume Distribution (Cases/Year)	Outcomes	Trends with Increasing Surgeon Volume	Statistical Analysis
Scott et al. (2015)	Rotator Cuff Repair	Low: <15 Medium: 15 – 30 High: > 30	Costs	\$872 vs. \$630 vs. \$523	NR
	TSA	Low: <2 Medium: 2 – 4 High: > 5		\$2021 vs. \$1876 vs. \$1692	NR
Ramkumar et al. (2017)	Shoulder Arthroplasty	Low: ≤ 4 Medium: 5 – 14 High: ≥ 15	LOS	2.5 vs. 2.3 vs. 1.6 days	low [p = 0.022; OR = 2.90(2.5-5.3)] vs. medium [p = 0.034; OR = 1.20(1.16-1.23)] vs. high surgeon volume
			Costs	\$18600 vs. \$17400 vs. \$14900	low [p = 0.051; OR = 3.66(3.46-3.85)] vs. medium [p = 0.036; OR = 2.84(2.66-3.01)] vs. high surgeon volume
Clark et al. (2017)	TSA	Low: ≤ 30 High: > 30	Operative Duration	120.7 vs. 104.6 min	p = 0.01
	RSA Revision Arthroplasty			140.2 vs. 99.1 min NR	p < 0.0001 insignificant
Sherman et al. (2008)	Rotator Cuff Repair	Lowest: < 6 Low: 6 – < 12 Medium: 12 – < 24 High: ≥ 24	Reoperation/Readmission	NR	lowest [OR = 1.25(1.08-1.44)] vs. low [OR = 1.31(1.15-1.50)] vs. medium [OR = 1.05(0.49-0.91)] vs. high surgeon volume, p < 0.01
Jain et al. (2005)	Rotator Cuff Repair	Low: <15 Medium: 15 – 30 High: ≥ 30	Operative Duration	112 vs. 113 vs. 102 min	p < 0.001
			LOS	NR	low [OR = 2.30(1.2-4.4)] vs. medium [OR = 1.30(0.7-2.6)] vs. high surgeon volume
			Non-routine disposition	NR	low [OR = 2.80(0.9-9.1)] vs. medium [OR = 1.50(0.7-3.1)] vs. high surgeon volume p = 0.001
Jain et al. (2004)	TSA	Low: <2 Medium: 2 – 4 High: ≥ 5	LOS	4.0 ± 0.7 vs. 3.3 ± 0.7 days	low [OR = 1.10(0.8-1.4)] vs. medium [OR = 0.980(0.8-1.2)] vs. high surgeon volume
			Non-routine disposition	30.9% vs. 28.7% vs. 26.8%	
			Complications	1.46% vs. 1.34% vs. 0.80%	low [OR = 2.2(1.1-4.4)] vs. medium [OR = 1.5(0.7-3.2)] vs. high surgeon volume p = 0.001
			LOS	5.4 ± 1.3 vs. 4.1 ± 1.1 days	
	Hemiarthroplasty		Non-routine disposition	37.8% vs. 38.1% vs. 29.8%	low [OR = 1.30(1.1-1.5)] vs. medium [OR = 1.30(1.1-1.6)] vs. high surgeon volume, p = 0.01
			Complications	1.68% vs. 1.29% vs. 0.97%	low [OR = 1.4(0.6-3.0)] vs. medium [OR = 1.5(0.7-3.0)] vs. high surgeon volume

TABLE FOR REPORTED INFLUENCE OF SURGEON VOLUME ON OUTCOMES FOR SHOULDER SURGERY IN EACH STUDY

Author (Year)	Procedure(s)	Surgeon Volume Distribution (Cases/Year)	Outcomes	Trends with Increasing Surgeon Volume	Statistical Analysis
Hammond et al. (2003)	TSA & Hemiarthroplasty	Low: <6 Medium: 6 – 30 High: >30	LOS	NR	high [p ≤ 0.05; OR = 0.30 (0.20-0.60)] vs. low surgeon volume
			Costs	NR	high [p ≤ 0.05; OR = 0.50 (0.30-0.70)] vs. low surgeon volume
Singh et al. (2014)	TSA	Low: < 8 Medium: 8 – 17.5 High: ≥ 17.5	Complications	NR	high [p ≤ 0.05; OR = 0.60 (0.40-0.90)] vs. low surgeon volume
			Operative Duration	163.4 vs. 147.8 vs. 114.4 min	p < 0.0001
			LOS	1.8 vs. 1.9 vs. 1.7 days	p < 0.0001
	RSA		Blood Loss	264.6 vs. 228.2 vs. 201.3 mL	p < 0.0001
			Operative Duration	147.9 vs. 129.5 vs. 115.5 min	p < 0.0001
			LOS	2.3 vs. 2.6 vs. 1.9 days	p = 0.08
	Hemiarthroplasty		Blood Loss	263.6 vs. 283.9 vs. 215.7 mL	p = 0.08
			Operative Duration	127.7 vs. 121.9 vs. 87.1 min	p < 0.001
			LOS	1.7 vs. 2.0 vs. 1.7 days	p = 0.03
Blood Loss	230.7 vs. 185 vs. 162.7 mL	p = 0.03			
Brown et al. (2020)	TSA	Low: < 10 Medium: 10 – 20 High: > 20	Reoperation/Readmission	NR	low [p = 0.009; HR = 1.36(1.08-1.71)] vs. high surgeon volume
	RSA			NR	low [p = 0.001; HR = 1.66(1.21-2.28)] vs. high surgeon volume
Jain et al. (2012)	TSA	Low: < 5 Medium: 5 – 14 High: ≥ 15	LOS	NR	low [p < 0.001; HR = 2.59(1.67-3.97)] vs. high surgeon volume
			Costs	NR	
			Complications	NR	
	Hemiarthroplasty		LOS	5.5 ± 5.4 vs. 3.8 ± 3.0 vs. 3.4 ± 3.1 days	p < 0.01
			Costs	-\$90 ± 11/surgery	p < 0.01
	ORIF		Complications	77(1.8%) vs. 12(1.2%) vs. 4(1.0%)	NR
			LOS	5.3 ± 6.4 vs. 3.2 ± 3.5 vs. 2.8 ± 3.2 days	p < 0.01
Costs	-\$90 ± 11/surgery	p < 0.01			
Complications	121(1.3%) vs. 11(1.0%) vs. 2(0.5%)	NR			
Carducci et al. (2020)	TSA	Low: ≤ 30 Medium: 30 – 100 High: > 100	Costs	NR	p = 0.56
	RSA			NR	p = 0.32
Li et al. (2019)	Rotator Cuff Repair	Low: < 50 High: ≥ 50	Costs	\$34964 ± 18963 vs. \$32940 ± 17302	p < 0.01
			Reoperation/Readmission	4.79 ± 21.4% vs. 2.87 ± 16.7%	p < 0.001

LOS – Length of Stay
TSA – Total Shoulder Arthroplasty
RSA – Reverse Shoulder Arthroplasty
ORIF – Open Reduction Internal Fixation
NR – Not Reported



Conclusion

A high-surgeon volume leads to increased hospital/surgeon efficiency, reduced adverse events, and lower hospital costs across various shoulder procedures.



ISAKOS
CONGRESS
2023



Boston
Massachusetts
June 18–June 21