

# Business Articles in Shoulder and Elbow Surgery Support Outpatient Total Shoulder Arthroplasty and Identify Factors Impacting Surgery Cost

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**Objectives:** Review business related shoulder and elbow articles in top general orthopaedic journals and compare to top shoulder and elbow subspecialty journals.

**Design:** Literature review.

**Intervention:** General orthopaedic vs subspecialty journals.

**Main outcome measurement:** Publication type, subject, methods

**Results:** There were a total of 21 shoulder and elbow related business articles across JBJS, B&JJ, CORR, and AAOS during the study time period. That accounts for 0.3% of total publications (21/6098) and 8% of the business publications (21/261) in these journals over this 5 year span. Shoulder and elbow business publications accounted for a wide range of editorial space, ranging from 0% of CORR business publications to 11% of BJ&J publications. Across the five shoulder and elbow surgery journals of interest, there were 57 business related articles published for the 5-year duration. The Journal of Shoulder and Elbow Surgery accounted for 77% of these publications (44/57). Business articles represented 0.8% of articles in the fine shoulder and elbow publications (57/7155) over the study time period.

**Conclusions:** This analysis demonstrates the tendency of shoulder and elbow oriented orthopaedic journals to publish a higher percentage of business articles related to shoulder and elbow surgery compared to general orthopaedics journal. The composition of these business articles demonstrates the recent focus on cost analysis of outpatient shoulder arthroplasty as well as factors that drive cost of shoulder and elbow procedures. The subject of shoulder and elbow business related articles in these journals over the last 5 years demonstrates that this field is increasingly interested in outpatient procedures and identifying ways to safely improve cost efficiency.

**Level of Evidence:** IV review

**Keywords:** Orthopaedic business, shoulder and elbow, cost, value based care, finance, shoulder arthroplasty, total shoulder.

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## INTRODUCTION

Publications regarding the business aspects of orthopaedic surgery comprise a range of 2% to 8% of published articles in the top four general orthopaedic journals. Only 14 (5.3%) of the 261 business articles published in the last 5 years in the top four general orthopaedic journals focused on the subspecialty of shoulder and elbow (Thomas et al 2021). Although shoulder and elbow made up a small part of business publications in general orthopaedic journals, subspecialty such as the Journal of Shoulder and Elbow Surgery, Arthroscopy and the American Journal of Sports Medicine (AJSM) are well regarded with high H-index and impact factor. Therefore, subspecialty journals may publish more business articles relative to general orthopaedics journals.

We hypothesize that more business articles regarding shoulder and elbow surgery would be published in the last 5 years in the subspecialty specific journals: The Journal of Shoulder and Elbow Surgery, Shoulder and Elbow Journal, and Techniques in Shoulder and Elbow, Arthroscopy and AJSM than in the top 4 general orthopaedic journals. Our secondary hypothesis is that the number of citations will be higher for articles published in the shoulder and elbow subspecialty specific journals than for articles published in the general orthopaedic journals.

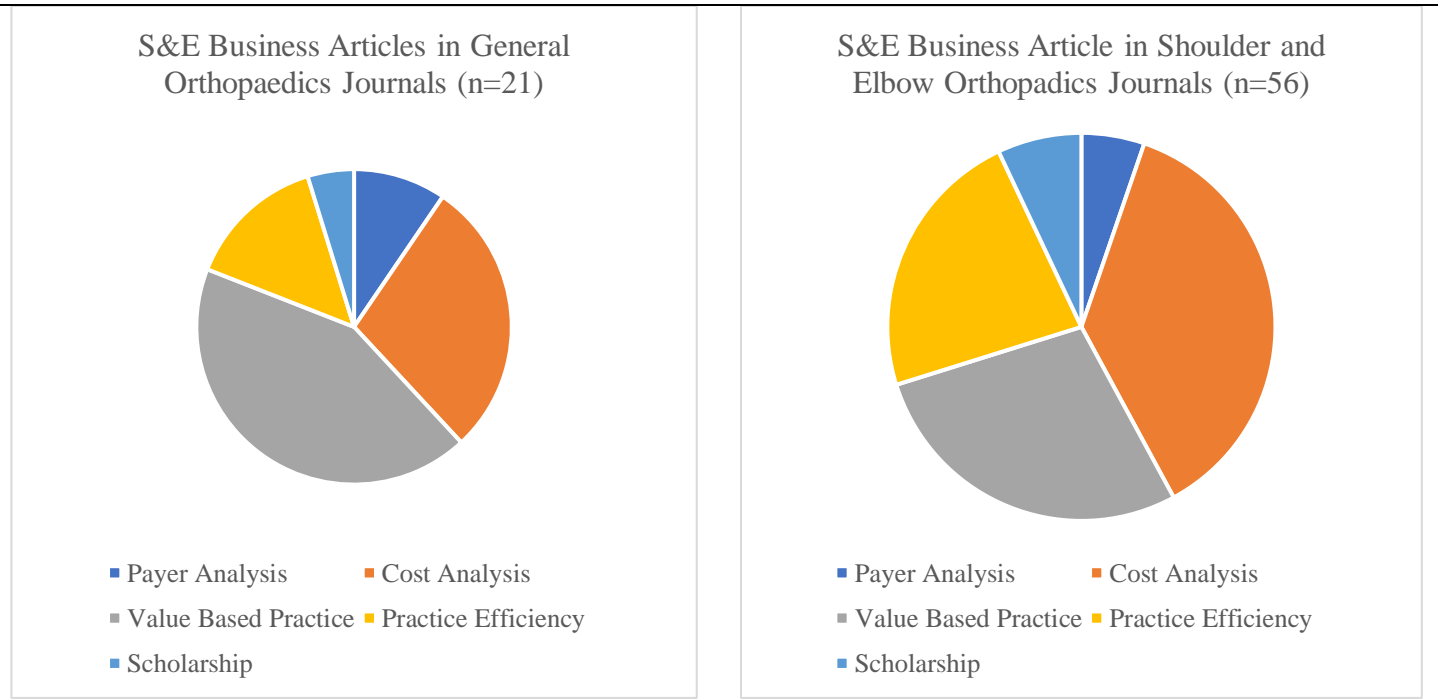
## METHODS

Top shoulder and elbow orthopaedic surgery journals were identified as ranked by H index in Scimago Journal & Country Rank and articles from 2016-2020 were selected that address any aspect of orthopaedic business. Business articles were defined based on criteria established in the Journal of Orthopaedics Business (Thomas et al 2021), and business-related categories include cost analysis (CA), value based practice and QUALY (VBP), management and human resources, quality improvement and management (HR), practice efficiency or management (PE), the business of scholarship, grant funding, publication, and leadership (S). This is as previously defined in the Journal of Orthopaedic Business (JOB).

## RESULTS

There were a total of 21 shoulder and elbow related business articles across JBJS, B&JJ, CORR, and AAOS during the study time period. That accounts for 0.3% of total publications (21/6098) and 8% of the business publications

Figure 1. Shoulder and elbow business articles of general and specialty specific journals by business category



(21/261) in these journals over this 5-year span. Shoulder and elbow business publications accounted for a wide range of editorial space, ranging from 0% of CORR business publications to 11% of BJ&J publications.

Across the five shoulder and elbow surgery journals of interest, there were 57 business related articles published for the 5-year duration. The Journal of Shoulder and Elbow Surgery accounted for 77% of these publications (44/57). Business articles represented 0.8% of articles in the fine shoulder and elbow publications (57/7155) over the study time period.

The distribution of business topics represented by these two different classes of journals was notable. General orthopaedic journals most commonly addressed topic of value-based care, while shoulder and elbow based journals focused on cost analytics more than any other topic. JSES had 44 articles representing 2% of its publications, while Shoulder and elbow had 2 articles representing 1% of publications, Arthroscopy had 2 articles representing 0.3% of publications, JSES had 8 articles representing 0.31% of publications, and techniques in shoulder and elbow had no business-related publications. Of the S&E business articles in shoulder and elbow journals, 37% of articles were cost analysis, 23% focused on practice efficiency, 28% on value based practices, 5% payer analysis, 7% business of scholarship and 0% on human resources. Comparatively of the 21 shoulder and elbow business articles in general orthopaedic journals 43% of articles focused on value based care, 29% on cost analysis, 14% on practice efficiency, 10% on payer analysis, 5% on scholarship, and 0% on human resources.

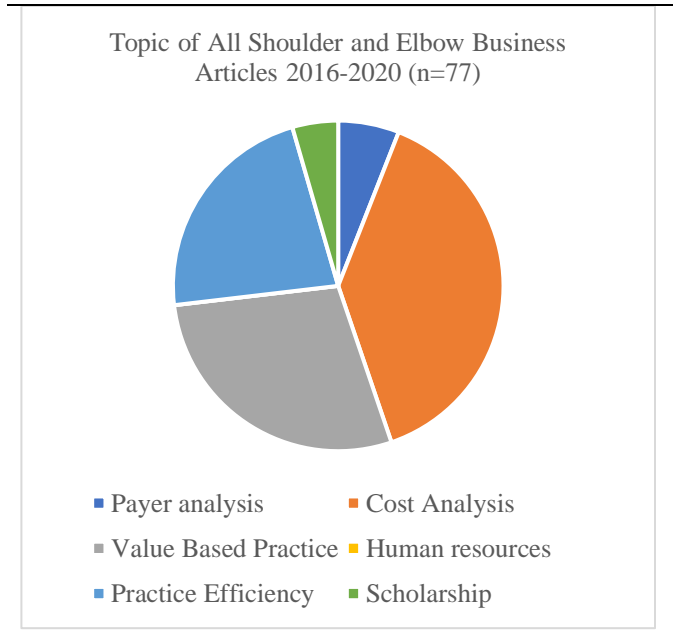
*Topics address within shoulder and elbow business articles:* Across both sources of shoulder and elbow business

articles, the procedures highlighted in the literature were heavily skewed towards a few topics. Shoulder arthroplasty accounted for 27 articles, rotator cuff repair for 17 articles, trauma for 11 articles, other procedures for 9 articles, and business practices unrelated to a certain procedure for 8 articles. Cost of treatment was a dominating pattern in business articles within shoulder and elbow journal literature.

### TSA

The cost of TSA ranged from average inpatient cost of \$18,766.75 (Cancienne et al. 2017, Odum et al. 2018, Gregory et al. 2019, Kennon et al. 2020, Berglund et al. 2019) to outpatient cost of \$18,814.50 (Cancienne et al. 2017, Berglund et al. 2019). Reverse TSA cost average is \$13,685.01 (Kennon et al. 2020, Berglund et al. 2019, Berglund et al. 2019). ICER for rTSA was \$37,000 (Makhni et al. AJSM 2016) Factors associated with higher TSA costs were younger age, female gender, use of bone graft, implant company, TSA for humerus fracture, ASA score >3, lower preoperative ASES, and patients with Hepatitis C, Atrial Fibrillation, COPD, or Cirrhosis (Chalmers et al. 2019, Malik et al. 2019, Menendez et al. 2018, Rosas et al. 2018, London et al. 2020). High volume TSA surgeons were associated with lower TSA costs (Gregory et al. 2019). Total outpatient TSA charges are \$29,728.73, with implant cost comprising 83% of total cost (Walters et al. 2020). Compared with traditional inpatient hospitals, TSAs performed at Ambulatory Surgery Centers (ASCs) or Orthopaedic Specialty hospitals have lower charges, lower costs, shorter non-operative operating room (OR) time, and shorter length of stay (Padegimas et al. 2019, Malik et al. 2020). The increased cost of a TSA at a traditional

Figure 2. Topic of all shoulder and elbow business articles



inpatient hospital is partially due to the amount of non-surgical OR time and cost of support staff involved in checking in patients and transporting them to OR (Padegimas et al. 2019, Menendez et al. 2018). Several studies found no difference in complications between inpatient or outpatient TSA (Leroux et al. 2016, Brodin et al. 2017, Charles et al. 2019). Certain practices found to increase costs without altering clinical course of patients were applying manual pressure while cementing glenoid, collecting post-operative X-rays, and sending routine pathology (Garbis et al. 2020, Dempsey et al. 2017, Howard et al. 2017). Patients requiring discharge to a non-home location had an increased rate of minor/major/severe adverse events (Lavoie-Gagne et al. 2021).

Patient's estimates of surgeon fees and Medicare reimbursements of TSA were much higher than their true values (Jamgochian 2019). 0.95 per 1,000 Medicare beneficiaries receive a TSA each year, and over 95% of patients live within 200 km of a surgeon who performs at least 20 TSAs per year (Zmistowski et al. 2018). From 2005 to 2014 hospital reimbursement for rotator cuff repair increased by 123% while surgeon reimbursement increased by only 3% (LaPrade et al. Arthroscopy 2020)

### RCR

Arthroscopic rotator cuff repair with rTSA for those that fail is the most cost effective treatment for massive rotator cuff tears (Dornan et al. Arthroscopy 2017). The cost of arthroscopic rotator cuff repair is \$25,353 (Li et al. 2019). Factors increasing costs are number of anchors used, cost of other surgical supplies, concomitant subacromial decompression, and distal clavicle excision (Tashjian et al. 2018, Sabesan et al. Arthroscopy 2019, Li et al. 2019, DeFroda et al. 2021, Johnson et al. 2020). Factors that reduce cost are high volume surgeon, performing open instead of

arthroscopic biceps tenodesis, use of supply score card, and anchorless implants (DeFroda et al. 2021, Austin et al. 2016, Black et al. 2016). Average ICER/QALY for RCR is \$13,460 and increases by \$163 per QALY with addition of PRP (Flury et al. 2019, Makhni et al. AJSM 2016, Samuelson et al. 2016 Arthroscopy). There is no difference in use of resource or QALY whether RCR was performed open versus arthroscopically (Murphy et al. 2016). Avenues to reduce costs and improve efficiency without changing outcomes when treating patients with rotator cuff tears are avoiding MRIs if patient will be managed conservatively, having patients do unsupervised physical therapy after surgery, and using a smartphone app to log operative details (Cortes et al. 2019, Dickinson et al 2017, Sahoo et al. 2020). Patients believe a reasonable surgeon fee and Medicare reimbursement for arthroscopic RCR are \$7,757.50 and \$4674.50, respectively (Southam et al. 2018, Jamgochian et al. 2019).

### Instability

The cost of laterjet (\$13,672) is less than that of revision arthroscopy (\$15,287). There are declining but significant productivity losses and medical charges with each shoulder dislocation (Van der Linde et al. 2019). Incremental cost effectiveness ratio (ICER) is slightly less for Bankhart repair versus Laterjet procedure for instability - \$4212 versus \$4681 per QALY, respectively (Min et al. 2018) While ICER is less for biceps tenodesis (\$3,344) for SLAP lesion than SLAP repair (\$4,289).

### TEA

Cost of total elbow arthroplasty (TEA) is \$18,936.50 for primary TEA, \$18,796.50 for revision TEA, and \$34,286 for two stage revision TEA (Wagner et al. 2017, Federer et al. 2019). ICER per QALY for TEA is \$2,375.76 (Federer et al. 2019). Cost of TEA can be reduced by using liposomal bupivacaine instead of interscalene pain catheter (Thompson et al. 2019).

### Trauma

Proximal humerus fracture – Cost of treatment of proximal humerus fractures is \$1,269 for non-operative management, \$11,183 for ORIF, and added cost for ORIF of proximal humerus fracture may not improve QALY (London et al. 2020, Corbacho et al. 2016). ICER per QALY for proximal humerus fracture managed with hemiarthroplasty and total shoulder arthroplasty are \$36,700 and \$57,400, respectively (Nwachukwu et al. 2016).

Clavicle fracture – Insured patients are more likely to have surgery for clavicle fractures, but not worker's compensation patients (Congiusta et al. 2019, Shields et al. 2016). ICER per QALY at 2 years after ORIF for displaced mid shaft clavicle fracture is \$8,000 (Liu et al. 2018). Internationally, ICER per QALY for clavicle ORIF has been calculated to \$429,738.50 (Sørensen et al. 2020, Nicholson et

al. 2019). Medicare and private insurance reimbursement of a post-operative visit and X-ray after clavicle are \$150.40 and \$271.02, respectively (Morales et al. 2019).

Cost savings can be found with other upper extremity trauma by using tension wiring instead of locked plating for olecranon fractures, by not getting follow up X-rays for non-operative scapula fractures, and by not getting X-rays in atraumatic patients under age 50 (Francis et al. 2017, Steinmetz et al. 2020, Feder et al. 2018)

### Practice management

Medicare reimbursement for 39 shoulder procedures has fallen by 29% overall from 2002 to 2018 (Malik et al. 2020). Physician-owned practices did not have more shoulder procedures compared with non-physician owned practices, but they had 13% faster time to surgery (Black et al. 2018).

### Academia

In JSES, there is no significant rate of positive outcomes in studies if senior author had conflict of interest or received royalties from industry (Foughty et al. 2017, Somerson et al. 2020). The quality of studies defined by QHES has been declining in upper extremity Orthopaedic articles (Rajan et al. 2018). North American studies, those regarding reliability and validation, those about the hip had higher citation rates and altmetric attention scores than others (Kunze et al. AJSM 2020, Movasaggi et al. AJSM 2018)

### Other procedures

Half of patients who underwent subacromial decompression for subacromial shoulder pain met ICER threshold of <\$20,000 per QALY at 1 year post-op (Rombach et al. 2019). The cost per player to Major League Baseball of undergoing Tommy John surgery is \$1.6 million (Meldau et al. 2020).

## **DISCUSSION**

### *Distribution of Articles*

There were a larger number of business articles dealing with shoulder and elbow surgery in shoulder and elbow subspecialty journals compared with prominent general orthopaedic surgery journals. This is not surprising, given the focus of these journals on shoulder and elbow topics. However, the distribution of business articles in shoulder and

elbow journals differed in comparison with those from general orthopaedics journals. Business articles from shoulder and elbow journals favored cost analysis, while those from general orthopaedic journals more commonly addressed value-based practice.

### *Outpatient Surgery*

Outpatient surgery for shoulder arthroplasty was one of the most published topics. Even more recent reviews have highlighted this theme (Sandler JSES 2022). These articles addressed the cost, resource utilization, and complication of shoulder arthroplasty performed in ambulatory surgery centers or physician owned hospitals. Many of these articles suggest that performing shoulder arthroplasty as an outpatient procedure or in ambulatory surgical centers does not place patients at increased risk and may reduce costs associated with the procedure.

### *Factors Increasing Cost*

Multiple studies identified patient, surgical, or operational factors associated with increased cost of care. Patients with certain medical comorbidities can raise the cost of shoulder arthroplasty. Concomitant procedures with rotator cuff repairs create increased costs. Additionally, certain features of management, especially imaging, were found to increase the cost of care without impacting the management of the patient.

## **CONCLUSION**

This analysis demonstrates the tendency of shoulder and elbow oriented orthopaedic journals to publish a higher percentage of business articles related to shoulder and elbow surgery compared to general orthopaedics journal. The composition of these business articles demonstrates the recent focus on cost analysis of outpatient shoulder arthroplasty as well as factors that drive cost of shoulder and elbow procedures. The subject of shoulder and elbow business related articles in these journals over the last 5 years demonstrates that this field is increasingly interested in outpatient procedures and identifying ways to safely improve cost efficiency.

Table 1: Summary of Business article findings for TSA			
TSA Cost - Inpatient		\$18,766.75	
			Cancienne et al. JBJS 2017 \$18,336.00
			Odum et al. JSES 2018 \$17,894.00
			Gregory et al. JSES 2019 \$32,330.00
			Kennon et al. JSES 2020 \$14,674.00
			Berglund et al. JSES 2019 \$10,599.74
TSA Cost- Outpatient		\$18,814.50	
	Mean decrease from inpatient	\$6,518.50	Cancienne et al. JBJS 2017 \$14,722.00
			Gregory et al. JSES 2019 \$22,907.00
TSA Charges		\$29,728.43	Walters et al. JAAOS 2020 \$29,728.43
RTSA Cost Average		\$13,685.01	
	RTSA Cost	\$17,405.00	Kennon et al. JSES 2020 \$17,405.00
	RTSA Cost (press fit)	\$10,048.89	Berglund et al. JSES 2019 \$10,048.89
	RTSA Cost (cemented)	\$13,601.14	Berglund et al. JSES 2019 \$13,601.14
	RTSA Cost	\$11,863.52	Berglund et al. JSES 2019 \$11,863.52
High volume TSA reduced cost by		\$1,751.00	Gregory et al. JSES 2019 \$1,751.00
Factors associated with increased cost of TSA			Younger age, use of bone graft, implant company, reverse total shoulder, TSA performed for humerus fx, Female, ASA>3, low pre-op ASES, Hepatitis C, Afib, COPD, and Cirrhosis
			Chalmers et al. JSES 2019
			Malik et al. JAAOS 2019
			Menendez et al. JBJS 2018
			Rosas et al. JSES 2017
TSA implant charges \$ (83% of total cost)		\$24,882.43	Walters et al. JAAOS 2020 \$24,882.43
Patient estimates TSA of surgeon value			
	surgeon fee	\$14,231.00	Jamgochian et al. JSES 2019
	Medicare reimbursement	\$9,372.00	Jamgochian et al. JSES 2019
No difference in complications between inpatient and outpatient TSA			Leroux et al. JSES 2016
			Brolin et al. JSES 2017
			Charles et al. JSES 2019
Non-operative OR time is _ min shorter for TSA in specialty Ortho hospitals vs traditional hospital		10.7	Padegimas et al. JSES 2019
Table 1 cont: Summary of Business article findings for TSA			
Physician owned hospitals			
90 day charges of TSA at physician owned hospitals are _ less than non-physician owned hospitals		\$8,904.00	Malik et al. JAAOS 2019
90 day costs of TSA at physician owned hospitals are _ less than non-physician owned hospitals		\$1,659.00	Malik et al. JAAOS 2019
TSA LOS at ortho specialty hospital is less than tertiary referral center by ___ days		0.54 days	Padegimas et al. JSES 2016
Average amount of nonsurgical time patients are in OR for TSA is _ min or _% of total OR time		59 min (33.2%)	Padegimas et al. JSES 2017

Table 1 continued: Summary of Business article findings for TSA			
_ % of Cost of Inpatient TSA is from implant cost, _% from personnel cost from patient check in to patient OR	57% , 20%	Menendez et al. JBJS. 2018	
_ to reduce infection in TSA would be economical at absolute risk reduction of ____			
Intrawound Vanc Powder	0.19%	Hatch et al. JSES 2017	
Topical benzoyl peroxide	0.023%	Menendez et al. JSES 2020	
Topical hydrogen peroxide	0.002%	Menendez et al. JSES 2020	
No clinical difference in cemented area of glenoid component with 10-12 min manual pressure vs no pressure		Garbis et al. JAAOS 2020	
Cost per patient for all post op X-rays	\$1,776.76	Dempsey et al. JSES 2017	\$1,776.76
Cost per patient of pathology for routine TSA is _ and led to no unexpected diagnoses	\$108.28	Howard et al. JSES 2017	\$108.28
Neural network can predict cost, LOS, and disposition of TSA patients		Karnuta et al. JSES 2020	
Patients discharged to a non-home facility have odds ratio of _ of severe adverse event/unplanned admission	1.82	Lavoie-Gagne et al. JAAOS 2021	
ICER rTSA for massive cuff tear	\$37,400.00	Makhni et al. AJSM 2016	\$37,400.00
Use of TSA in Medicare patients			
2014 Annual TSA per 1000 beneficiaries	0.95	Zmistowski et al. JAAOS 2018	
% of US population living within 50km of a surgeon who performs at least 20 TSA for Medicare beneficiaries annually	74.40%	Zmistowski et al. JAAOS 2018	
% of US population living within 200km of a surgeon who performs at least 20 TSA for Medicare beneficiaries annually	96.90%	Zmistowski et al. JAAOS 2018	

Table 2 Summary of business article findings in rotator cuff repair			
Statement	Value	Citation	Cost Datum
Cost of RCR surgery	\$25,353.00	Li et al. JSES 2019	\$25,353.00
High volume lowers cost of RCR by	\$4,107.00	DeFroda et al. JSES 2021	\$4,107.00
Open Biceps tenodesis lowers cost of RCR by	\$5,542.00	DeFroda et al. JSES 2021	\$5,542.00
Average reduction of direct supply costs per case for RCR following use of scorecard	\$279.00	Austin et al. JSES 2016	\$279.00
Anchorless RCR lowers implant costs by ___ compared with transosseous equivalent repairs	\$336.05	Black et al. JSES 2016	\$336.05
Number of anchors drives direct cost of RCR		Tashjian et al. JSES 2018	
___% Of surgeons would swich anchor brand due to cost if incentivized	44.40%	Johnson et al. JSES 2020	
SAD adds cost to RCR: SAD cost	\$7,845.50	Li et al. JSES 2019	\$4,992.00
		DeFroda et al. JSES 2021	\$10,699.00
Distal Clavicle excision increases cost of RCR by	\$3,210.00	DeFroda et al. JSES 2021	\$3,210.00
Patient estimated survey: Reasonable RCR surgeon fee	\$7,757.50		
	\$ 5,645.00	Southam et al. OJSM. 2018	\$5,645.00
	\$9,870.00	Jamgochian et al. JSES 2019	\$9,870.00
Patient estimated Surgeon RCR Medicare reimbursement	\$ 4,674.50		
	\$ 3,644.00	Southam et al. OJSM. 2018	\$3,644.00
	\$5,705.00	Jamgochian et al. JSES 2019	\$5,707.00
No difference in outcomes between supervised vs unsupervised PT after RCR		Dickinson et al. JSES 2017	
Smartphone app can log standardized details of RCR		Sahoo et al. JSES 2019	
Average Incremental cost effectiveness ratio for RCR is _ per QALY	\$18,296.00	Flury et al. JSES 2019	\$18,296.00
___% of patients have premature MRIs prior to RCR	90.20%	Cortes et al. JSES 2019	
No difference in use/cost of resources or QALY for open vs arthroscopic RCR		Murphy et al. BJJ 2016	
Most significant factors affection arthroscopic RCR Profit	Surgical supplies	Sabesan et al. Arthroscopy 2019	
Mean cost per patient of RCR	£3,646.94	Nicholson et al. BJJ 2019	£ 3,646.94
Incremental Cost effectiveness ratio of RCR - 1yr \$/QALY	£13,552.36	Nicholson et al. BJJ 2019	£ 13,552.36
Incremental Cost effectiveness ratio of RCR - 2yr \$/QALY	£5,694.78	Nicholson et al. BJJ 2019	£5,694.78
ICER RCR without PRP (\$/QALY)	\$6,775	Samuelson et al. 2016 Arthroscopy	\$6,775
ICER RCR with PRP (\$/QALY)	\$6,612	Samuelson et al. 2016 Arthroscopy	\$6,612
ICER RCR for massive cuff tear	\$15,500	Makhni et al. AJSM 2016	\$15,500
Most cost effective tx of massive RC tear	arthroscopic RCR conversion to rTSA if failure occurs	Dornan et al. Arthroscopy 2017	

Table 3 Summary of business article findings in shoulder and elbow Trauma			
Statement	Value	Citation	Cost Datum
ICER of HA for humerus fracture from hospital perspective per QALY	\$36,700.00	Nwachukwu et al. JSES 2016	\$36,700.00
ICER of TSA for humerus fracture from hospital perspective per QALY	\$57,400.00	Nwachukwu et al. JSES 2016	\$57,400.00
Cost of nonsurgical proximal humerus fx	\$1,269.00	London et al. JAAOS 2020	\$1,269.00
Cost of ORIF proximal humerus fx	\$ 11,183.00	London et al. JAAOS 2020	\$11,183.00
Cost of Hemiarthroplasty proximal humerus fx	\$17,225.00	London et al. JAAOS 2020	\$17,225.00
Cost of RTSA proximal humerus fx	\$21,486.00	London et al. JAAOS 2020	\$21,486.00
Consumable costs of open AC joint repair	\$851.87	Abdelrahman et al. JSES 2019	\$ 851.87
Consumable costs of arthroscopic AC joint repair	\$1,729.95	Abdelrahman et al. JSES 2019	\$1,929.95
2015 Medicare total reimbursement of clinical visit and clavicle XR	\$150.40	Morales et al. JAAOS 2019	\$150.40
2015 Private insurance reimbursement of clinical visit and clavicle XR	\$271.02	Morales et al. JAAOS 2019	\$271.02
Worker's compensation reimbursement for operative clavicle fracture	\$29,136.00	Shields et al. JSES 2016	\$29,136.00
Worker's compensation reimbursement for non-operative clavicle fracture	\$8,336.00	Shields et al. JSES 2016	\$8,336.00
Saving of using tension band wiring compared with locked plating in olecranon fracture	\$1,300.00	Francis et al. JSES 2017	\$1,300.00
Patients without insurance had odds ratio of _ of uncergoing surgery for clavicle fx	0.63	Congiusta et al. CORR 2019	
ICER per QALY of ORIF for displaced midshaft clavicle fracture at 1 yr	\$38,000.00	Liu et al. JBJS 2019	\$38,000.00
ICER per QALY for ORIF of displaced midshaft clavicle at 5 yrs	\$8,000.00	Liu et al. JBJS 2019	\$ 8,000.00
ICER per QALY for clavicle ORIF	\$429,738.50		
	€182,306.00	Sørensen et al. JSES 2020	€ 182,306.00
	£480,309.41	Nicholson et al. BJJ 2019	£ 480,309.41
Cost of Non Op displaced midshaft clavicle fx	£1,322.69	Nicholson et al. BJJ 2019	£ 1,322.69
Cost of ORIF displaced midshaft clavicle fx	£5,405.32	Nicholson et al. BJJ 2019	£ 5,405.32
ORIF of proximal humerus fx had extra cost of _ compared with non-op and lower QALY	£ 1,758.00	Corbacho et al. BJJ 2016	£ 1,758.00
Xray expenses per patient for non-op scapula fx. No change to patient care based on Xray	\$ 640.26	Steinmetz et al. JAAOS 2020	\$ 640.26



Table 4: Summary of business articles related to to instability

Statement	Value	Citation	Cost Datum
Productivity loss with subsequent shoulder dislocations	€1469, €881, and €728	Van der Linde et al. S&E 2019	€1469 , €881, €728
Medical costs with subsequent shoulder dislocations	€3759, €3267, and €2424	Van der Linde et al. S&E 2019	€3759, €3267, €2424
Incremental cost effectiveness ratio of Bankhart (\$/QALY)	\$4,212.00	Min et al. JSES 2018	
Incremental cost effectiveness ratio of Laterjet (\$/QALY)	\$4,681.00	Min et al. JSES 2018	
Cost of Laterjet	\$13,672	Makhni et al. Arthroscopy 2016	\$13,672
Cost of revision shoulder arthroscopy	\$15,287		\$15,287

Table 5: Summary of business articles related to total elbow arthroplasty

Statement	Value	Citation	Cost Datum
Cost of TEA	\$18,936.50		
	\$19,409.00	Federer et al. JSES 2019	\$19,409.00
	\$18,464.00	Wagner et al. S&E 2017	\$18,464.00
Cost of TEA revision for Aseptic Loosening	\$18,796.00	Wagner et al. S&E 2017	\$18,796.00
Cost of 2 stage TEA revision for infection	\$34,286.00	Wagner et al. S&E 2017	\$34,286.00
Incremental cost effectiveness ratio of TEA per QALY	\$2,375.76	Federer et al. JSES 2019	\$2,375.76
Liposomal bupivacane more effective than interscaline catheter and lowers cost by ___	\$1,145.32	Thompson et al. JSES 2018	\$1,145.32

Table 6: Summary of business articles related to scholarship

Statement	Value	Citation	Cost Datum
Outcomes of studies published in JSES had no higher rate of positive outcomes if author had conflict of interest		Foughty et al. JSES 2017	
46% of senior authors of JSES articles received royalties from implant manufacturers, totalling _ over a 2 yr period. 90% of authors report income. No relation between receiving royalties and positive study outcomes	\$16,051,251.00	Somerson et al. JSES 2020	\$16,051,251.00
Quality of cost utility studies of upper extremity Orthopaedic surgery papers has been declining bases on QHES		Rajan et al. BJJ 2018	
Independent predictors of citation rate of sports articles at 5 years	publishing in AJSM, those from North America, and those examining the hip	Movasaggi et al. AJSM 2018	
Greater Almetric attention score of Literature associated with	Publication in AJSM, studies concerning measure validation and reliability, and North American Studies	Kunze et al. AJSM 2020	
From 2005-2014, surgeon reimbursement for arthroscopic RCR increased by	3%	LaPrade et al. Arthroscopy 2020	

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#### List of Shoulder and Elbow business articles:

##### General Orthopaedic Journals

##### CORR

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##### B&JJ

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