Business Articles in Spine Journals Focus Primarily on Fusion and Identify Factors Impacting Surgery and Costs

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Objectives: Review and analyze business-related spine articles in top general orthopaedic journals compared to top subspecialty spine journals.

Design: Literature Review

Intervention: General orthopaedic vs subspecialty spine journals.

Outcome Measure: Publication type, subject

Results: From 2017-2021, there were a total of 16 spine-related business articles across JBJS, B&JJ, CORR, and JAAOS. That accounts for 0.2% of total publications (16/7011) and 6.3% of the business publications (16/253) in these journals over this 5-year span. Spine surgery business publications accounted for a wide range of editorial space, ranging from 2.9% of B&JJ business publications to 8.5% of JAAOS publications. Among the four subspecialty journals of interest, there were 158 business-related articles published for the 5-year study period. *Spine* accounted for approximately 53% of these publications. Business articles represented 2.2% of all articles published in subspecialty spine journals from 2017-2021. The distribution of business topics represented in the subspecialty journals was notable, with the most addressed topic being cost analysis. Comparatively, 75% of spine-related business articles in general orthopaedic journal articles focused on value-based practice. Advanced age, insurance status, gender, ethnicity, and obesity were important drivers of cost.

Conclusions: Subspecialty spine journals tend to publish a higher number and percentage of business articles related to spine surgery compared to general orthopaedics journals. This demonstrates increasing interest in the economics of surgical procedures and identifying ways to safely improve cost efficiency, and combat health disparities in spine surgery.

Level of Evidence: IV; Review

Keywords: Orthopaedic business, spine, cost, value-based practice, finance, fusion

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INTRODUCTION

Publications regarding the business aspects of spine 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 from 2016-2020 in those journals focused on the subspecialty of spine.[1] Although spine surgery made up a small part of business publications in general orthopaedic journals, subspecialty journals such as The Spine Journal (TSJ), Spine, Global Spine Journal (GSJ), and European Spine Journal (ESJ) may produce more business articles compared to the literature in the top general orthopaedic journals: Journal of bone and joint science (JBJS), Clinical Orthopaedics and Related Research (CORR), Bone and Joint Journal (B&JJ), and Journal of the American Academy of Orthopaedic surgery (JAAOS).

While most subspecialty journals may have a lower ranking according to H-index and impact factor, some journals such as *Spine* have a higher ranking than general journals (i.e. JAAOS) according to these measures. Subspecialty journals may also provide greater insight into respective innovations and outcomes. The number of business-related articles in general orthopaedic journals have been slowly increasing, however, the sheer number of these articles is still scarce. We hypothesize that, in the last five years, more business articles regarding spine surgeries would be published in subspecialty-specific journals (TSJ, Spine, GSJ, ESJ) than in top general orthopaedic journals (JBJS, CORR, B&JJ, JAAOS).

METHODS

Top spine surgery journals were identified as ranked by H index in Scimago Journal & Country Rank[2] and articles from 2017-2021 were selected that address any aspect of business. Business articles were defined based on criteria established in the Journal of Orthopaedics Business.[1] A complete list of identified articles can be found in Appendix A. Business-related categories include cost analysis (CA),

value-based practice and QALY (VBP), practice efficiency (PE), payer analysis (PA), the business of scholarship, grant funding, publication, and leadership (S). Cost analyses compare the cost of treatments or drivers of increased costs. Value-based practice articles look at both cost and outcomes and often correlate them using quality-adjusted life years (QALY). Practice efficiency articles investigate ways to increase the efficiency or effectiveness of clinic or operating room routines to allow greater productivity. Payer analyses look at methods of payment such as commercial versus government insurance programs, bundled payments, or factors affecting payment. Business of scholarship articles examine the business aspects of publishing, research funding, and leadership.

RESULTS

Business-related spine surgery articles in general orthopaedic journals:

From 2017-2021, the total number of business articles published in general versus spine subspecialty journals are shown in **Table 1**. There was a total of 16 spine-related business articles across JBJS, B&JJ, CORR, and JAAOS. That accounts for 0.2% of total publications (16/7011) and 6.3% of the business publications (16/253) in these journals over this 5-year span. Spine surgery business publications accounted for a wide range of editorial space, ranging from 2.9% of B&JJ business publications to 8.5% of JAAOS publications.

Figure 1. Business Articles Published per Year in Subspecialty Spine Journals

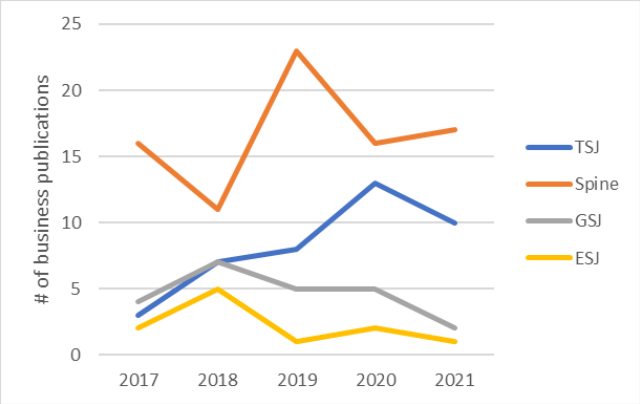


Figure 2. Business Article Categories in Spine Subspecialty Journals

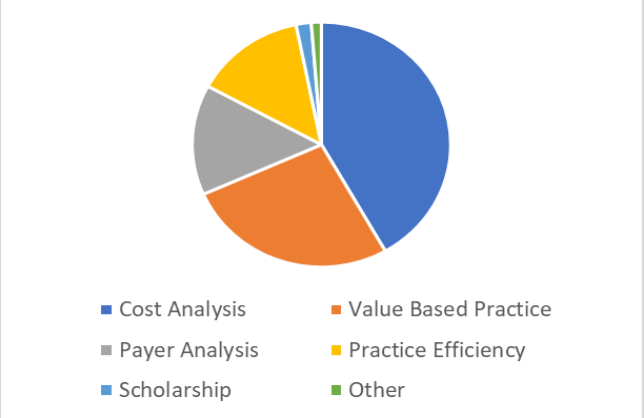


Table 1. Articles Total (Business) per Journal by Year

Journal	2017	2018	2019	2020	2021
General:					
JBJS	403(14)	417(21)	401(16)	443(17)	371(17)
CORR	521(11)	462(7)	478(10)	490(10)	491(14)
B&JJ	269(2)	262(7)	281(10)	300(8)	314(7)
JAAOS	158(5)	185(11)	257(21)	284(30)	224(15)
Subspecialty:					
TSJ	255(3)	291(7)	263(8)	252(13)	258(10)
Spine	533(16)	498(11)	425(23)	510(16)	469(17)
GSJ	152(4)	140(7)	132(5)	255(5)	449(2)
ESJ	494(2)	487(5)	365(1)	404(2)	425(1)

Table 2. Subspecialty Spine Journal Article Descriptors

	TSJ	SPINE	GSJ	ESJ	TOTAL
# articles	1319	2435	1128	2175	7057
# business articles	41	83	23	11	158
by region:					
Cervical	5	19	7	2	33
Thoracic	0	4	1	0	5
Lumbar	20	33	12	6	71
> 1 Spinal Level	10	17	1	2	30
n/a	6	10	2	1	19
by category:					
Payer Analysis	9	12	2	0	23
Cost Analysis	11	32	18	4	65
Value-Based Practice	13	23	2	5	43
Practice Efficiency	6	13	1	2	22
Scholarship	1	2	0	0	3
Other	1	1	0	0	2
by topic:					
Fusion	15	27	11	3	56
Deformity	5	14	2	1	22
Pain Management	1	13	4	4	22
Laminectomy	2	8	2	1	13
Discectomy	5	4	0	0	9
Other	13	17	4	2	36

Bus*iness-related spine surgery articles in spine journals:*

Across the four subspecialty journals of interest, there were 158 business-related articles published for the 5-year study period **(Table 2)**. *Spine* accounted for approximately 53% of these publications (83/158). Business articles represented 2.2% of all articles published in subspecialty spine journals from 2017-2021. The number of articles published per year by each respective subspecialty journal is shown in Figure 1. The distribution of business categories represented in the subspecialty journals was notable, with the most commonly addressed topic being cost analysis, followed by value-based practice (Figure 2). Spine and TSJ had 83 and 41 articles representing 3.4% and 3.1% of their total publications, respectively. GSJ had 23 representing 2.0% and ESJ had 11 articles representing 0.5%. Of the business-related articles in spine journals, 41% were focused on cost analysis, 27% on value-based practices, 14.5% focused on payer analysis, 13.9% focused on practice efficiency, 1.9% on the business of scholarship and 1.3%% on other business-related topics. Comparatively of the 16 spine-related business articles in general orthopaedic journals, 75% of articles focused on value-based practice, 12% on cost analysis, 6% on practice efficiency, 6% on payer analysis, 0% on scholarship.

Topics address in business articles within subspecialty journals:

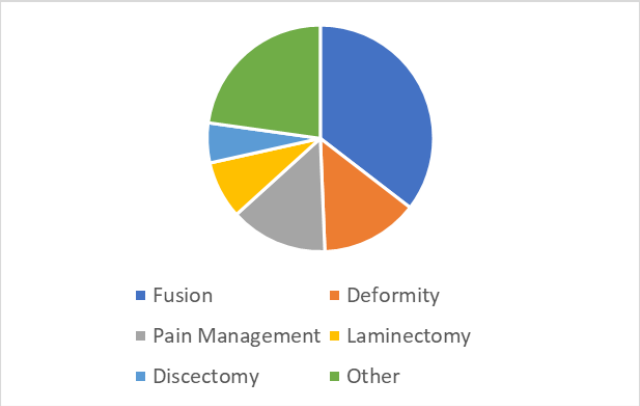
Across subspecialty spine journal business articles, the procedures highlighted in the literature were heavily skewed towards a few topics. Spinal fusion accounted for 35% articles, deformity correction and pain management both for 14% each, laminectomy for 8% articles, and discectomy for 6% of articles. The remaining 23% of articles were either unrelated or dedicated to other procedures **(Figure 3)**. Cost of treatment and factors that affect cost were dominating patterns in business articles within the spine journal literature. A summary of all cost data is seen in **Tables 3-9.**

Fusion:

Lumbar:

There were a wide variety of procedures for lumbar fusion reported in the literature. Of all procedures, the overall cost-effectiveness was lowest in the lateral lumbar fusion (LLIF) group.[3] LLIF also had the highest mean index hospital

Figure 3. Procedure Categories in Spine Subspecialty Journal Business Articles



costs at $52,879.[4] Minimally invasive transforaminal interbody fusion (TLIF) was found to be more cost-effective when compared to open TLIF.[5] TLIF had the lowest mean index hospital costs for surgery[6,7] and was more cost-effective when compared with combined anterior and posterior fusion.[6] For type of procedure overall, minimally invasive surgery had the most incremental cost effectiveness when compared to open and robotic fusion.[8] Bariatric surgery was also seen as a viable, cost-effective preoperative strategy in obese patients considering elective lumbar fusion.[9]

Cervical:

Anterior cervical discectomy and fusion (ACDF) surgery provided a significant gain in health-state utility in older patients with degenerative cervical pathology, with a mean cumulative 2-year cost per QALY gained of $99,720.[10] While older patients have a slightly higher cost utility compared to their younger counterparts, surgery in the older cohort provided a significant improvement in pain, disability, and quality-of-life outcomes.[10] There was also a significantly higher cost for care in those who received PACU x-rays after ACDF.[11] Studies showed that cervical disc replacement may be more cost-effective procedure in comparison to ACDF at 7 years following surgery.[12,13] For two level, however, it remains unclear which procedure is more cost effective at both 5 years[14] and 7 year.[15] A recent study found that later surgical start time for cervical disc correction is associated with longer LOS and higher cost.[16]

Average index cost for lumbar fusion was $31,914[4,6,7,17–21] versus $13,616 for cervical fusion.[14,22–27] For both lumbar and cervical fusion, bundled payments were found to be less cost effective than traditional payment along with higher mean total 90-day hospital costs.[23,28] Important drivers of cost included surgical approach, implants, operating room time, and length of hospital stay.[18] Other reported associations with cost were surgeon volume[29], increased care complexity[28], comorbidity[30–32] and adverse events.[22,33]

Discectomy:

Mean index cost for lumbar discectomy was $5,668.[34–37] The highest index surgical costs were associated with annular closure device (ACD) usage: $11,404.[35] For lumbar disc herniations, patients with annular defects ≥6 mm, the ACD was, at 2 years, a highly cost-effective surgical modality compared to conventional lumbar discectomy.[35] ACD use produced an estimated direct cost savings of -$3,215 and -$6,099 per patient at two and five years, respectively, versus conventional.[35] Observed costs per QALY gained with percutaneous endoscopic thoracic discectomy (PETD) or interlaminar discectomy (PEID) were similar for patients, demonstrating that the two different approaches of lumbar discectomy are equally cost-effective and valuable interventions.[37] Overall, endoscopic discectomy was more cost-effective compared with microdiscectomy at 1-year follow-up.[36] Advanced age, male gender, unemployment, obesity, higher ASA class, and insurance status were all important drivers of cost.[38]

Deformity:

Adult Spinal Deformity (ASD):

In adults with spinal deformities, mean index hospital cost for surgical correction was $73,543.[3,39–45] Carreon et al. found, neither operative nor non-operative management was dominant in cost-effectiveness, as the greater gains in QALY in the surgery group come at a greater cost.[46] However, The incremental cost-effectiveness ratio for operative compared to non-operative treatment was highly cost-effective at 4 and 5 years.[46] Lateral interbody fusion with posterior spinal fusion (PSF) is a similarly effective surgery for ASD when compare

Table 3. Summary of All Cost Data for Fusion (Lumbar)

Category	Cost Data	Value	Citation
Fusion:			
Lumbar	Mean index hospital costs for LF:	$26,784.62	Kelley et al. TSJ 2021
		$22,890.00	Beckerman et al. GSJ 2020
	(w/ computer assisted navigation)	$34,669.49	Kelley et al. TSJ 2021
	(w/ skin staples + waterproof wound dressings)	$35,829.00	Johnston et al. TSJ 2021
	(w/ 2-octyl cyanoacrylate plus polymer mesh tape)	$34,361.00	Johnston et al. TSJ 2021
	PLF	$34,432.00	Schadler et al. GSJ 2018
		$28,439.00	Saifi et al. GSJ 2019
	PLIF	$36,605.00	Schadler et al. GSJ 2018
	LLIF	$52,879.00	Schadler et al. GSJ 2018
	Combined APLF	$38,448.89	Buttermann et al. ESJ 2020
		$31,466.00	Jazini et al. TSJ 2018
		$11,006.17	Stubig et al. GSJ 2018
	TLIF	$29,428.00	Jazini et al. TSJ 2018
		$29,947.00	Saifi et al. GSJ 2019
	Mean total surgical costs for open LF:	$42,538.98	Passias et al. TSJ 2021
	(minimally invasive)	$41,471.21	Passias et al. TSJ 2021
	(robotic assisted)	$60,407.01	Passias et al. TSJ 2021
	Mean 90-day hospital costs for LF:	$30,827.00	Greenberg et al. TSJ 2021
		$31,716.00	Malik et al. TSJ, Jan 2020
		$45,934.00	Bronson et al. Spine 2019
	Bundle payment	$51,105.00	Bronson et al. Spine 2019
	PLF	$25,509.00	Donnally et al. Spine 2019
	(non-physician owned hospital)	$26,151.00	Malik et al. TSJ, Sep 2019
	(physician owned hospital)	$21,572.00	Malik et al. TSJ, Sep 2019
	(non-network hospital)	$28,025.00	Malik et al. TSJ, Oct 2020
	(network hospital)	$27,994.00	Malik et al. TSJ, Oct 2020
	ALIF	$28,111.00	Qureshi et al. Spine. 2017
	Mean surgeon reimbursement for LF:	$738.00	Lopez et al. TSJ 2020
	ALF	$674.00	Lopez et al. TSJ 2020
	PLF	$931.00	Lopez et al. TSJ 2020
	PLIF/TLIF	$1,041.00	Lopez et al. TSJ 2020
	Mean total hospital charges for LF:	$110 324.40	Kleiner et al. GSJ 2018
	single-level ALIF	$169,106.00	Shahrestani et al. Spine 2021
	multilevel ALIF	$256,527.00	Shahrestani et al. Spine 2021

Table 4. Summary of All Cost Data for Fusion (Cervical)

Category	Cost Data	Value	Citation
Cervical:			
	Mean index hospital costs for CF:	$13,167.64	Lopez et al. TSJ 2020
		$17,735.00	Culler et al. Spine. 2017
	Bundle payment	$14,924.00	Malik et al. TSJ 2019
	PCF	$15,521.60	Martini et al. Spine. 2021
		$7,291.00	Myhre et al. GSJ 2017
	ACF	$13,648.00	Puvanesarajah et al. 2017
	single-level ACDF	$13,025.00	Overley et al. TSJ 2018
		$18,142.00	Barton et al. Spine 2019
		$24,254.00	Virk et al. Spine. 2019
	Mean 90-day hospital costs for ACF:	$17,163.00	Malik et al Spine 2021
	ranked hospitals	$22,635.00	Malik et al Spine 2021
	Mean 7-year cost for ACDF:	$103,924.00	Kim et al. Spine. 2018
		$143,714.00	McAnany et al. GSJ 2018
	two-level	$158,373.48	Merrill et al Spine. 2018
	Mean total hospital charges for ACDF:	$57,245.00	Lord et al. GSJ 2017
	(w/ BMP)	$61,838.00	Lord et al. GSJ 2017
	(PACU x-rays)	$1,031.76	Khan et al. Spine. 2021
	Mean surgeon reimbursement for single-level ACDF:	$950.34	Lopez et al. TSJ 2021
	multilevel	$1,138.41	Lopez et al. TSJ 2022

Table 5. Summary of All Cost Data for Discectomy

Category	Cost Data	Value	Citation
Discectomy:			
Lumbar	Mean index hospital costs for LD:	$6,240.00	Puvanesarajah et al. Spine 2017
		$8,404.00	Ament et al. Spine 2019
	(w/ ACD)	$11,404.00	Ament et al. Spine 2019
	TELD	$2,997.80	Choi et al. TSJ 2019
	IELD	$3,629.30	Choi et al. TSJ 2019
	UBED	$3,642.40	Choi et al. TSJ 2019
	MD	$3,926.20	Choi et al. TSJ 2019
	PETD	$5,275.58	Wang et al. Spine 2019
	PEID	$5,494.45	Wang et al. Spine 2019
	Mean 90 day hospital costs for LD at ASC:	$5,814.00	Malik et al. TSJ 2020
	at HOPD	$7,829.00	
	Median 1-year costs for LD:	$4,664.00	Jain et al. TSJ 2021
	Mean 2-year cost for LD:	$14,290.00	Ament et al. TSJ 2019
	(w/ ACD)	$11,488.00	Ament et al. TSJ 2019
	Mean surgeon reimbursement for LD:	$601.00	Lopez et al. TSJ 2020

Table 6. Summary of All Cost Data for Deformity

Category	Cost Data	Value	Citation
Deformity:			
ASD:	Mean index hospital costs for ASD surgery:	$83,513.00	Swamy et al. TSJ 2019
		$92,133.00	Yagi et al. ESJ. 2018
		$68,900.00	Jain et al. Spine. 2020
		$70,766.00	Ames et al. Spine. 2020
		$72,240.00	Arima et al. Spine. 2021
		$49,647.00	Yagi et al. ESJ. 2018
	Anterior	$84,329.00	Ogura et al. TSJ 2020
	Posterior	$64,281.00	Ogura et al. TSJ 2020
		$49,849.00	Yamamoto et al. Spine. 2021
	Transpsoas	$111,381.00	Swamy et al. TSJ 2019
	Long Spinal Fusion	$69,546.00	Beschloss et al. Spine 2021
		$65,937.00	Yamamoto et al. Spine. 2021
	Mean 90-day hospital costs for ASD surgery:	$85,190.00	Varshneya et al. Spine. 2020
	Mean 1-year cost of ASD surgery:	$30,223.77	Jacobs et al. Spine. 2020
	Cervical	$55,097.00	Poorman et al. TSJ 2018
	Mean 2-year cost of ASD surgery (cervical):	$97,620.00	Varshneya et al. Spine. 2020
	(w/ BMP)	$107,975.00	
	Median*	$137,990.00	Raman at al. Spine. 2018
	Mean 3-year cost for ASD surgery:	$72,947.87	Passias et al. Spine. 2022
	Mean 5-year cost of ASD surgery:	$96,000.00	Carreon et al. Spine. 2019
	(non-op)	$49,546.00	
AIS:	Net lifetime costs for non-op (observation) of AIS:	$85,279.00	Ikwuezunma et al. Spine. 2021
	Bracing	$60,377.00	Ikwuezunma et al. Spine. 2021
	Mean index hospital costs of AIS surgery:	$23,640.00	Sanders et al. Spine. 2017
	Accelerated d/c	$18,360.00	Sanders et al. Spine. 2017
		$15,130.00	Kobayashi et al. GSJ 2020
	low density screw constructs	$14,871.00	Tannous et al. GSJ 2018
	2 screw constructs	$23,840.00	
	magnetic rod implant	$42,012.26	Harshavardhana et al. Spine. 2019
	conventional growing rod	$63,237.92	

Table 7. Summary of All Cost Data for Laminectomy

Category	Cost Data	Value	Citation
Laminectomy:			
	Mean index hospital costs for laminectomy:	$11,230.00	Frankel et al. Spine. 2019
		$6,329.00	Ziino et al. Spine 2020
		$8,490.80	Machado et al. Spine. 2017
		$3,138.05	Rosas et al. Spine 2021
		$13,465.00	Aichmair et al. ESJ 2017
		$15,411.80	Alluri et al. Spine 2020
	(w/ fusion)	$24,126.00	Vail et al. Spine. 2018
		$20,192.00	Ziino et al. Spine 2020
	Mean 3-year cost of laminectomy:	$45,776.00	Tye et al. Spine. 2017
	Mean implant costs for laminectomy w/ fusion:	$6,204.94	Goh et al. TSJ 2020

Table 8. Summary of All Cost Data for Pain Management

Category	Cost Data	Value	Citation
Pain Mgmt:			
	Mean index cost per episode:	$894.00	Fritz et al Spine 2017
	outpatient	$79.97	Herman et al. Spine. 2017
		$110.55	Hahne et al. Spine. 2017
	inpatient	$2,987.06	Olafsson et al. ESJ 2018
		$4,242.35	Herman et al. Spine. 2017
	(x-rays)	$998.00	Lemmers et al. ESJ 2019
	(w/ surgical mgmt)	$5,016.00	Huysmans et al. Spine 2019
	epidural steroid injection	$2,844.88	Alvin et al. GSJ 2019
			Salathé et al. GSJ 2018
	facet injection	$1,580.00	Starr et al. TSJ 2019
	radiofrequency ablation	$2,360.00	Starr et al. TSJ 2020
	Paracetamol	$116.88	Lin et al. ESJ 2018
	Median yearly HCR cost for chronic back pain:	$9,781.00	Herman et al. Spine. 2019
	CLB	$6,590.00	Spears et al. Spine. 2020
	Mean 2-year cost for CLB:	$7,161.00	Alvin et al. GSJ 2019
	Mean total non-op costs prior to surgery:	$1,013.07	Alvin et al. GSJ 2019
		$1,736.60	Davison et al. GSJ 2020
		$2,177.83	Adogwa et al. Spine 2019
	Mean yearly HCR costs for sciatica:	$1,134.00	Chye et al. ESJ 2021

Table 9. Summary of All Cost Data for all other procedures

Category	Cost Data	Value	Citation
Other			
	Mean index cost for odontoid fracture surgery	$131,855.00	Alluri et al. Spine 2021
	(non-op)	$65,374.00	
	Mean cost for non-op mgmt of thoracolumbar fracture	$8,928.58	Hanson et al. GSJ 2019
		$10,759.50	Linhares et al. Spine 2020
	Mean yearly HCE for adults with SRD	$9,820.00	Gliedt et al. Spine 2021
	Mean cost of one diagnosed case of unsuspected malignancy during routine bone biopsy	$31,000.00	Hershkovich et al. Spine 2019
	Mean index cost for kyphoplasty:	$7,870.00	Gold et al. TSJ 2021
		$5,073.00	Lindquester et al. TSJ 2020
	Mean index cost for corpectomy:	$30,175.00	Ho et al. Spine 2019
	micro	$29,827.00	
	Mean index cost for TCSI:	$16,618.34	Mitchell et al. TSJ 2018
		$75,801.00	Vaikuntam et al. Spine 2019
	Mean index cost for posterior cervical foraminotomy:	$8,520.00	Sayari et al. TSJ 2019

with conventional PSF.[44] Transpsoas procedures were associated with better outcomes in terms of health related quality-of-life, and had lower costs over 1-year follow-up period compared with the more invasive open technique.[39] At index surgery and at 2-year follow-up, the posterior-only approach was significantly less expensive than combined anterior and posterior, but QALY gained at 2-years was similar between the two approaches. Therefore, the posterior-only approach may be more cost-effective for ASD.[43] Cost–utility analyses suggests that bone morphogenetic protein (BMP) may be favored in ASD surgery, as usage was associated with reduced number of revisions.[41] Varshneya et al. found increased post-operative complication rates with BMP use, they similarly found reduced the odds of reoperation throughout 2 years of follow-up.[47] While revision surgery for ASD is known to be technically challenging and to have a higher rate of major complications than primary surgery, revision surgery was deemed cost-effective at 2 years after operation.[48]

Among adult spinal deformity patients, those with BMIs in obesity I, obesity II, or obesity class III range had more expensive total surgery costs. Obese patients had costs 32% higher than nonobese patients ($224,440.61 vs. $331,048.23).[49] Discharge destination to rehabilitation also had a significant impact on the cost of ASD surgeries.[50] Variations in patient cohort, healthcare costs, revision frequencies, and quality-of-life improvement influenced the cost/QALY differential between countries (i.e. US vs. JP).[40]

Adolescent Idiopathic Scoliosis (AIS):

Mean index hospital costs were $28,727[51–54] for AIS, which were significantly lowered by accelerated discharge.[51,52] Operative treatment for AIS was favored over non-operative. However for those undergoing non-operative treatment, scoliosis bracing was the preferred choice in management over observation.[55] Surgical approach and payer type along with comorbidities, mobility status, time to discharge and discharge location were all associated with increased costs for deformity surgery in both the adolescent and adult population.[41,42,56]

Laminectomy:

For laminectomy, mean index hospital costs were $12,798.[57–63] The addition of fusion significantly increased mean cost ($24,126)[63], with average implant for fusion costing about $6,200.[64] Decompressive surgery alone (laminectomy) was identified as the most cost-effective approach for lumbar spinal stenosis over conservative management.[61] Fusion paired with laminectomy specifically for lumbar spondylolisthesis showed reduced likelihood of surgical revision versus laminectomy alone, but increased use of opioids in the first 2 months following surgery.[63] However, no further association with opioid use was noted beyond the initial 2-month postoperative period.

ASA status and post-operative urinary retention (POUR) both were unique drivers of cost for laminectomy. Mean total costs associated with POUR was approximately $2,680[65], while the mean cost increase per one-point increase in ASA score was $7,475.[66] Other associated drivers of cost included age, adverse events and length of stay, as well as hospital volume and type.[60,63,67]

Pain Management:

Index cost per episode of pain management differed in the outpatient and inpatient setting, which were $95 and $3,615 respectively.[68–70] Median yearly healthcare related costs for chronic low back pain ranged from $6,590-$9,781.[68,71] Epidural steroid injections (ESI) were found to provide greater improvement in quality-of-life at a lower cost for cervical radiculopathy and neck pain versus conservative management.[72] However, ESI may not be cost-effective in patients with lumbar degenerative disorders.[73] For patients with acute, nonspecific lower back pain, higher total 1-year costs were noted for early physical therapy intervention. Nonetheless, it was deemed cost-effective relative to usual primary care after 1 year.[69] Furthermore, Hahne at al found individualized physical therapy that also incorporates advice is also cost-effective compared with two sessions of guideline-based advice alone for people with low back pain.[74]

Chronic back pain related health care costs in the United States continue to increase, with lower back and neck

pain and musculoskeletal disorders contributing $87.6 and $95.9 billion in costs.[75] Soer et al. reported an overall reduction in chronic back pain-related health care utilization in patients with complex chronic back pain may be achieved using multidisciplinary spine intervention.[76] Mindfulness-based stress reduction, and to a lesser extent Cognitive Behavioral Therapy, may also provide cost-effective treatment for chronic back pain.[68] But of all non-pharmacologic interventions, Yoga had the largest effects and cost savings.[77]

Scholarship:

A strong association was found between the number of patents authored by orthopaedic spine surgeons and the amount of royalty and licensing fees they receive from industry.[78] Surgeon demographics were also significantly associated with industry-surgeon financial relationships.[78,79] About 91.6% of surgeons reported at least one financial relationship with industry, with a median total value of payments of $994.07.[79]

Other:

Malpractice:

More than one third of malpractice cases involved a claim of insufficient informed consent. For the 26 cases won by the plaintiff, the average amount in settlement was $2,384,775 versus $3,945,456 in cases brought before a jury.[80] Spine surgeons successfully defended themselves in 75% of lawsuits, although the cases won by physicians were significantly longer than those settled.[80,81]

DISCUSSION

Distribution of Articles:

From 2017-2021, 6.3% of business-related articles in general orthopaedic journals were focused on spine in compared to 5.3% seen in a recent study from 2016-2020.[1] There were a greater number of business articles dealing with spine surgery in subspecialty orthopaedic journals compared to general. This is not surprising, given the focus of these journals on spine topics. However, the distribution of business articles in spine journals differed with those from general orthopaedic journals. Business articles from spine specific journals favored cost analysis, while those from general journals more commonly addressed value-based practice.

Spinal Fusion:

Spinal fusion was one of the most published topics across subspecialty journals. These articles addressed cost effectiveness, reimbursement, resource utilization, and type of fusion performed. The volume and utilization of both lumbar and cervical fusions have increased over the past ten years.[82] Many of the articles published during the study period suggested that spinal fusion can be a cost-effective treatment option for certain conditions, such as degenerative disc disease and spondylolisthesis. These conclusions were based on benefits of the procedure, such as pain relief and improved function, outweighing the costs. Studies also accounted for long-term benefits of the procedure, such as the reduced need for revision or other related surgeries or treatments in the future. Nonetheless, spinal fusion is a complex and invasive procedure that carries a moderate risk of complications, which were noted to increase early postoperative costs. The articles on fusion that pertained to payer analysis generally agreed that bundled payments may negatively impact surgery due to the financial penalty, discouraging advancement and creating financial disincentives and barriers to access of surgical care. These findings suggest the need for continued monitoring of bundle payment models in spinal fusion.

Understanding the business side of orthopaedic spine surgery can help healthcare providers identify opportunities for growth and better positioning of their practice in the marketplace. It also assures compliance and timely reimbursement, minimizing financial losses or penalties, and allowing them to focus more on patient care. The field of orthopaedic spine surgery is rapidly changing, rendering this information particularly important. Multiple studies identified patient, surgical, or operational factors associated with increased cost of care. The decision to perform spinal surgery should be made on a case-by-case basis, considering specific health and socioeconomic conditions of the patient. By staying informed on the latest developments and trends in the field, new technologies and techniques, and cost-effectiveness

studies creates more efficient shared decision-making; allowing physicians and patients to work together to design the most appropriate treatment option.

CONCLUSION

This analysis demonstrates the tendency of spine-oriented journals to publish a higher percentage of business articles related to spine surgery compared to general orthopaedic journals. The composition of these business articles demonstrates the recent focus on cost analysis of spinal fusion as well as factors that drive cost of spine related surgical procedures. The subjects of spine business related articles in these journals over the last 5 years show that this field is increasingly interested in the economics of surgical procedures and identifying ways to safely improve cost efficiency and combat health disparities.

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Appendix A: List of Spine Business Articles

General Orthopaedic Journals (n=16)

CORR:

1. Zhuang T, Feng AY, Shapiro LM, Hu SS, Gardner M, Kamal RN. Is uncontrolled diabetes mellitus associated with incidence of complications after posterior instrumented lumbar fusion? A national claims database analysis. Clinical Orthopaedics and Related Research®. 2021 Dec 1;479(12):2726-33.
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JBJS:

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B&JJ:

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JAAOS:

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