


OUTPATIENT
SPINE
SURGERY

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Becker's ASC 25th Annual Meeting

Growth in Outpatient Spine Surgeries

- Increase in outpatient spine surgeries:
 - Patient demand
 - Convenience
 - Decreased cost
 - Better experience for patients
 - Can be more efficient
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Benefits of Outpatient Spine Surgery

- For spine surgery alone, annual cost savings of \$140 million have been reported with the use of ASCs
 - Silvers HR, Lewis PJ, Suddaby LS, Asch HL, Clabeaux DE, Blumenson LE. Day surgery for cervical microdiscectomy: is it safe and effective? *J Spinal Disord.* 1996;9(4):287-293.

VALUE = QUALITY/COST




IS IT SAFE?

TABLE 1. Summary of Published Studies Reporting Perioperative Morbidity After ACDF in the Outpatient Surgery Center Setting. Incidence of Hospital Transfer Averaged Less Than 2% With All-Cause Morbidity Similar to That Reported With Inpatient ACDF. No Perioperative Mortality was Reported

Study	N	Morbidity (%)	Hospital transfer (%)	Readmission (%)	Satisfaction (%)	Study design	Evidence
Fu et al (2017) ⁵	4759	1.47	-	-	-	Propensity analysis	Level 3
Purger et al (2017) ¹³	3135	-	-	1.6; 0.2 (OR)	-	Retrospective cohort	Level 3
McClelland et al (2016) ⁴⁴	2448	0.001	-	-	-	Meta-analysis	Level 3
Khanna et al (2017) ⁸	1778	1.2	-	1.8	-	Retrospective cohort	Level 3
McClelland et al (2017) ⁴⁵	1528	-	-	5.4	-	Retrospective cohort	Level 3
McGirt et al (2015) ³	1168	1.4	-	0.34 (OR)	-	Retrospective cohort	Level 3
Adamson et al (2016) ¹	1000	-	0.8	2.2	-	Retrospective cohort	Level 3
Garringer et al (2010) ⁴	645	0.3	6	-	-	Case series	Level 4
Martin et al (2014) ⁴⁶	597	3.2	-	-	-	Retrospective cohort	Level 3
Sheperd et al (2012) ¹²	152	3.9	-	0.66	100	Case series	Level 4
Tally et al (2013) ⁴⁷	119	0	1.68	0	-	Case series	Level 4
Villavicencio et al (2007) ¹⁴	99	3.8	-	-	-	Case series	Level 4
Walid et al (2010) ¹⁵	97	1.0	-	-	-	Retrospective cohort	Level 3
Lied et al (2013) ⁷	96	5.2	-	-	91	Case series	Level 4
Trahan et al (2011) ¹⁶	59	1.4	1.4	1.4	-	Case series	Level 4
Erickson et al (2007) ⁴⁸	58	-	-	-	95.6	Case series	Level 4
Silvers et al (1996) ²	50	2	-	-	86	Retrospective cohort	Level 3
Liu (2009) ⁶	45	0	-	-	-	Retrospective cohort	Level 3
Stieber et al (2005) ⁴⁹	30	10	0	0	-	Retrospective cohort	Level 3

Sivaganesan et al. Spine Surgery in the Ambulatory Surgery Center Setting: Value-Based Advancement or Safety Liability?, *Neurosurgery*, Volume 83, Issue 2, 1 August 2018, Pages 159–165

Cervical Spine: Anterior Cervical Fusion (ACDF)

- Adamson T, Godil SS, Mehrlich M, Mendenhall S, Asher AL, McGirt MJ. Anterior cervical discectomy and fusion in the outpatient ambulatory surgery setting compared with the inpatient hospital setting: analysis of 1000 consecutive cases. *J Neurosurg Spine*. 2016;24(6):878-884.
 - The largest study using clinical data points, 1000 consecutive 1- and 2-level ACDFs at an ASC.
 - Only 8 patients (0.8%) required hospital transfer
 - 30-d hospital readmission rate was 2.2%,
 - There were no deaths.
 - All-cause morbidity was equivalent between outpatient and inpatient cohorts.
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Cervical Spine: Cervical Arthroplasty (CA)

- The cost of outpatient CA was found to be 62% less than that of single-level outpatient ACDF and 84% less than that of inpatient CA.
- Wohns R. Safety and cost-effectiveness of outpatient cervical disc arthroplasty. *Surg Neurol Int.* 2010;1:77.
- 55 outpatient CAs compared to 55 ACDFs and found an equivalent dysphagia rate of 10.9%
- No serious complications such as hematoma formation or severe pain. Similar to ACDF, no perioperative mortality was reported.
- Chin KR, Pencle FJR, Seale JA, Pencle FK. Clinical outcomes of outpatient cervical total disc replacement compared with outpatient anterior cervical discectomy and fusion. *Spine (Phila Pa 1976).* 2017;42(10):E567-E574.

Lumbar Decompression / Microdisectomy

- Helseth et al. reported on a series of 1073 consecutive patients undergoing lumbar procedures at a freestanding neurosurgical clinic with a successful same day discharge rate of 99.8%.
 - Helseth Ø, Lied B, Halvorsen CM, Ekseth K, Helseth E: Outpatient cervical and lumbar spine surgery is feasible and safe: a consecutive single center series of 1449 patients. *Neurosurgery* 76:728–738, 2015


TABLE 4. Summary of Published Studies Reporting Perioperative Morbidity After Lumbar Laminectomy or Lumbar Microdisectomy in the Outpatient Surgery Center Setting. Incidence of Hospital Transfer Averaged <2% With All-Cause Morbidity Similar to That Reported With Inpatient Surgery. No Perioperative Mortality was Reported

SIVAGANESAN ET AL 2018


Study	N	Morbidity (%)	Hospital transfer (%)	Readmission (%)	Study design	Evidence
Zahrawi et al (1994) ⁵⁰	103	2.9	2.9	-	Case series	Level 4
An et al (1999) ²³	61	0	6.6	-	Case series	Level 4
Singhal et al (2002) ²⁴	122	5	5	0	Case series	Level 4
Best et al (2006) ²¹	1346	0.4	1.7	-	Case series	Level 4
Best et al (2007) ²⁵	243	2.5	4.1	-	Case series	Level 4
Fallah et al (2010) ⁴⁰	406	6.9	4.7	-	Case series	Level 4
Pugely et al (2013) ⁵¹	1652	3.5	-	-	Propensity matching	Level 3
Helseth et al (2015) ²⁶	1073	3.3	0.6	-	Case series	Level 4
Debono et al (2017) ³⁵	201	3	0.5	1	Case series	Level 4

Lumbar Decompression complications


- *Helisch et al.* describe a complication rate of 3.9%
 - durotomy (1.3%),
 - deep infection (1.2%),
 - hematoma (0.7%) being the most common.
 - The rate of readmission to the hospital within 90 d was 1.7%.

 - *Fallah et al.* reported on 406 patients who underwent outpatient discectomy, including 62 revision cases.
 - Complication rate in revision cohort was 21% compared to 4.3% in the primary cohort.
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Lumbar: Reasons for admission / re-admission

- Mean age older in inpatients
 - (p < 0.001);
 - **Prevalence of:**
 - Diabetes,
 - Heart Failure,
 - heart disease,
 - CABG/stent/balloon angioplasty,
 - Knee problems
 - Depression higher in inpatients (p < 0.05);
 - *Walid et al. 2010*
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Lumbar Fusion

- Limited studies
 - Mainly for MIS-TLIF and LLIF (lateral)
 - For LLIF: Smith et al reported an unplanned hospitalization rate of 3.7% for 54 lateral fusion cases done at ASC, some multilevel.
 - Most common reasons for admission were urinary retention and pain control.
 - Wade et al 2016:
 - Series of 200 patients , only 1 patient had intraoperative durotomy
 - all patients were discharged within 6 h of surgery.
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Lumbar Surgery Planning

- **1)** Complexity: degenerative vs deformity
 - **2)** Surgical Technique:
 - MIS TLIF/ ALIF/ Lateral/ Cortical approaches
 - **3)** Patient age and co-morbidities:
 - medical and psychological
 - **4)** Multi-model pain management.
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Multi-Model Perioperative Pain Management


- Utilization of both narcotics and non-opioid medications in combination to decrease post-op pain and improve mobility.
- Positive impact on patient satisfaction and earlier discharge rates in both inpatient and ASC settings.
- *Devin CJ, McGirt MJ. Best evidence in multimodal pain management in spine surgery and means of assessing postoperative pain and functional outcomes. J Clin Neurosci. 2015;22(6):930-938.*

Multi-model Anesthesia

- **Kurd et al 2017**
 - “Adapting to the mentality that patients do not necessarily need opioids constantly in the post-anesthesia care unit (PACU) is the biggest challenge implementing a multimodal analgesia protocol”
 - Minimize pre-operative and post-operative narcotic usage
 - Encourage NSAIDs in the post-operative period in non-fusion cases
 - Non-opioid alternatives: Tramadol, Tizanidine, Celebrex, Gabapentin, Pregabalin.
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Goals for Pain Management

- Improve outcomes and faster recovery
 - Increase efficiencies and improve care pathways
 - Improve pain scores and patient satisfaction
 - Reduce Costs and Readmission Rates
 - Reduce Opioids and ORAE
 - Reduce Falls, Infection Rates, and DVTs

 - Decrease PACU Time and LOS
 - Decrease PCA and Pain Pumps
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*Kurd
et al.
JAAOS
2017*

Table 4

Studies of Multimodal Analgesia Regimens for Pain Management in Patients Undergoing Spine Surgery

Study	Study Design (Procedure)	No. of Patients	Intervention	Results	Level of Evidence ^a
Garcia et al ³⁹	RCT (lumbar decompression)	22	Celecoxib, pregabalin, and extended-release oxycodone in addition to intravenous morphine	Postoperative morphine consumption 58% lower and visual analog scale pain scores lower in MMA group than in control group. Earlier solid food intake in MMA group than in control group.	II
Kim et al ⁴⁰	RCT (L4-L5 lumbar fusion)	80	Preoperative MMA (celecoxib, pregabalin, oxycodone, and acetaminophen) versus postoperative intravenous morphine	MMA group had statistically significant lower visual analog scale pain scores at all time points and lower Oswestry Disability Index scores at all time points except 1 d postoperatively. No difference in estimated blood loss, drain output, or nonunion rates.	II
Mathiesen et al ³⁸	Retrospective cohort study (multilevel instrumented fusion)	85	MMA (acetaminophen, NSAIDs, gabapentin, S-ketamine, dexamethasone, ondansetron, and epidural local anesthesia) versus control (epidural or PCA)	Opioid consumption lower in the MMA group than in the control group. Earlier mobilization in the MMA group. Less nausea, sedation, and dizziness in the MMA group.	III
Rajpal et al ³⁷	Retrospective review (elective spine surgery)	200	MMA (extended-release oxycodone, gabapentin, acetaminophen, and dolasetron) versus intravenous PCA	MMA group had 37% reduction in morphine use, improved pain intensity, and less opioid use. MMA group had fewer patients with moderate to severe pain. Intravenous PCA group had more nausea, vomiting, and drowsiness.	III

MMA = multimodal analgesia, PCA = patient-controlled analgesia

^a Levels of evidence were determined according to the Oxford Centre for Evidence-Based Medicine criteria.¹⁰

Pre-operative medications

- From Massel., et al.,
 - one hour before surgery , concurrent administration of :
 - Celecoxib 200mg
 - Pregabalin 75mg,
 - Acetaminophen 500mg,
 - Oxycodone ER 10mg
 - **Reduces postoperative pain throughout recovery.**
 - **Excellent option for lumbar fusions or multi-level lumbar decompressions**
 - Cervical fusions may not require as much narcotic or Pregabalin.
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Table 1

Studies of Nonsteroidal Anti-inflammatory Drugs for Pain Management in Patients Undergoing Spine Surgery


Study	Study Design (Procedure)	No. of Patients	Intervention	Results	Level of Evidence ^a
Glassman et al ¹¹	Retrospective review (lumbar fusion)	288	Intramuscular ketorolac and opioid analgesics	Nonunion rates were higher in patients who received intramuscular ketorolac than in patients who did not receive NSAIDs.	III
Jirarattanaphochai et al ¹⁵	Randomized controlled trial (lumbar discectomy, decompression, or fusion)	120	Parecoxib (40 mg preoperatively and every 12 hr for 48 hr postoperatively) and morphine	Patients receiving parecoxib had 39% reduction in morphine use, reduced pain at rest, and greater satisfaction.	I
Jirarattanaphochai and Jung ¹⁶	Meta-analysis of 17 randomized controlled trials (lumbar spine surgery)	789	NSAIDs and opioid analgesics	Lower pain scores and lower opioid use in patients receiving NSAIDs and opioids than in patients receiving opioids alone.	II
Li et al ¹³	Meta-analysis of five retrospective comparative studies (spinal fusion)	1,403	High-dose ketorolac defined as >120 mg/d, diclofenac >150 mg/d, celecoxib >600 mg/d, rofecoxib >50 mg/d	Increased risk of nonunion with high-dose ketorolac. No detrimental effects of short-term use of NSAIDs (ketorolac, diclofenac, celecoxib, or rofecoxib [removed from market]) at normal doses.	IV

^a Levels of evidence were determined according to the Oxford Centre for Evidence-Based Medicine criteria.¹⁰


COX 2 Inhibitors

- Level I evidence supports the routine perioperative use of NSAIDs to improve pain control and reduce opioid consumption in patients undergoing spine surgery,
- Use of selective COX-2 inhibitors or short-term, low-dose nonselective COX inhibitors **does not appear to affect spinal fusion rates**, although high-dose nonselective COX inhibitors may decrease fusion rates
- Li Q, Zhang Z, Cai Z: High-dose ketorolac affects adult spinal fusion: A meta-analysis of the effect of perioperative nonsteroidal anti-inflammatory drugs on spinal fusion. *Spine (Phila Pa 1976)* 2011;36(7):E461–E468

Considerations for Outpatient Spine Surgery

- Surgical Procedure:
 - 1-2 level ACDF, CA ; Lumbar MCD/Laminectomy; select MISTLIF/LLIF/ALIF
 - Patient Criteria and Co-morbidities:
 - Young (less than 55)
 - Healthy
 - Psychiatric history: Anxiety and depression (Trahan et al., 2011)
 - Pre-operative planning
 - Minimally invasive vs OPEN techniques
 - Complexity of pathology
 - Revision surgery – higher rate of perioperative hospital admission 6% vs 4%
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*Patient
Selection-
MOST
IMPORTANT!*

1. Patient Motivated to Improve
 2. Compliant Patient
 3. Medical Clearance
 4. Low co-morbidities
 5. Insurance
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Post-op Period: ACDF

- Outpatient ACDF carries the feared complication of delayed neck hematoma.
 - Is there an optimal postoperative observation period to prevent any early delayed complications??
 - Lied et al. studied the timing in detecting a postoperative complication after ACDF.
 - Thirty-seven patients (9%) among 390 consecutive surgeries experienced any surgical complication.
 - When stratified by the timing of presentation—immediate (within 6 hours), early (6–72 hours), and late (greater than 72 hours)—all 5 patients (1.2%) who developed a neck hematoma **had been diagnosed and undergone evacuation within 6 hours.**
 - Lied B, et al. 2008 and 2013
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Common Complications in Outpatient Spine Surgery

- Bleeding
 - → Anterior Cervical Hematoma formation
 - → Lumbar Epidural hematoma formation
 - Dural Tears
 - Urinary Tract Infections
 - Dysphagia (Cervical spine)
 - Uncontrolled Postop Pain
-
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Avoiding Complications

- UTIs: Do Not place Foley Catheters for short procedures (< 2 hours)
 - Obtain Urinalysis on all patients pre-op.
 - Treat those with Asymptomatic UTI preoperatively with ABX
- Minimize Bleeding:
 - Use cautery as needed as well as Hemostatic agents (e.g. Floseal)
 - Ensure epidural bleeding has halted PRIOR to closure.
- Use Minimally Invasive Techniques if possible
 - Tubal Retractors and/or Wiltse Approach
 - Less tissue damage and bleeding
- Spend Extra time to avoid Dural Tears
 - Perform revision surgery in the hospital

Practice makes perfect...

- Take 6 months to perform 1-level ACDF/CA and lumbar decompressions at the hospital, with outpatient protocols in place
 - If successful with sending patients home more than 75% of the time same day, then transition these protocols to the ASC setting.
 - Avoid same day discharge on patients from > 1 hour away (i.e. rural), esp with no nearby hospital.
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THANK YOU!

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