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
Benefits of Outpatient Spine Surgery

- For spine surgery alone, annual cost savings of $140 million have been reported with the use of ASCs

**VALUE = QUALITY/COST**
### 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

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Morbidity (%)</th>
<th>Hospital transfer (%)</th>
<th>Readmission (%)</th>
<th>Satisfaction (%)</th>
<th>Study design</th>
<th>Evidence</th>
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<tbody>
<tr>
<td>Fu et al (2017)</td>
<td>4759</td>
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<tr>
<td>Purger et al (2017)</td>
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<td>1.6; 0.2 (OR)</td>
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<tr>
<td>McClelland et al (2016)</td>
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<td>Meta-analysis</td>
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<td>Khanna et al (2017)</td>
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<td>McClelland et al (2017)</td>
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<td>McGirt et al (2015)</td>
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<td>Garringer et al (2010)</td>
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<td>Martin et al (2014)</td>
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<td>Sheperd et al (2012)</td>
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<td>Villavicencio et al (2007)</td>
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<td>Silvers et al (1996)</td>
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<td>Liu (2009)</td>
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<td>Stieber et al (2005)</td>
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<td>10</td>
<td>0</td>
<td>0</td>
<td>-</td>
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<td>Level 3</td>
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</table>

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)


- 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.
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.

- 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.
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%.


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**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**

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Morbidity (%)</th>
<th>Hospital transfer (%)</th>
<th>Readmission (%)</th>
<th>Study design</th>
<th>Evidence</th>
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</thead>
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<tr>
<td>Zahrawi et al (1994)</td>
<td>103</td>
<td>2.9</td>
<td>2.9</td>
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<td>An et al (1999)</td>
<td>61</td>
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<td>6.6</td>
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<td>Singhal et al (2002)</td>
<td>122</td>
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<td>5</td>
<td>0</td>
<td>Case series</td>
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<tr>
<td>Best et al (2006)</td>
<td>1346</td>
<td>0.4</td>
<td>1.7</td>
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<td>Case series</td>
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<tr>
<td>Best et al (2007)</td>
<td>243</td>
<td>2.5</td>
<td>4.1</td>
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<td>Case series</td>
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<td>Fallah et al (2010)</td>
<td>406</td>
<td>6.9</td>
<td>4.7</td>
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<td>Case series</td>
<td>Level 4</td>
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<td>Pugely et al (2013)</td>
<td>1652</td>
<td>3.5</td>
<td>-</td>
<td>-</td>
<td>Propensity matching</td>
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<tr>
<td>Helseth et al (2015)</td>
<td>1073</td>
<td>3.3</td>
<td>0.6</td>
<td>-</td>
<td>Case series</td>
<td>Level 4</td>
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<tr>
<td>Debono et al (2017)</td>
<td>201</td>
<td>3</td>
<td>0.5</td>
<td>1</td>
<td>Case series</td>
<td>Level 4</td>
</tr>
</tbody>
</table>
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.
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*
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.
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.
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.

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, Tizanindine, Celebrex, Gabapentin, Pregabalin.
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
<table>
<thead>
<tr>
<th>Study</th>
<th>Study Design (Procedure)</th>
<th>No. of Patients</th>
<th>Intervention</th>
<th>Results</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garcia et al(^{39})</td>
<td>RCT (lumbar decompression)</td>
<td>22</td>
<td>Celecoxib, pregabalin, and extended-release oxycodone in addition to intravenous morphine</td>
<td>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.</td>
<td>II</td>
</tr>
<tr>
<td>Kim et al(^{40})</td>
<td>RCT (L4-L5 lumbar fusion)</td>
<td>80</td>
<td>Preoperative MMA (celecoxib, pregabalin, oxycodone, and acetaminophen) versus postoperative intravenous morphine</td>
<td>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.</td>
<td>II</td>
</tr>
<tr>
<td>Mathiesen et al(^{38})</td>
<td>Retrospective cohort study</td>
<td>85</td>
<td>MMA (acetaminophen, NSAIDs, gabapentin, S-ketamine, dexamethasone, epidural local anesthesia) versus control (epidural or PCA)</td>
<td>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.</td>
<td>III</td>
</tr>
<tr>
<td>Rajpal et al(^{37})</td>
<td>Retrospective review (elective spine surgery)</td>
<td>200</td>
<td>MMA (extended-release oxycodone, gabapentin, acetaminophen, and dolasetron) versus intravenous PCA</td>
<td>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.</td>
<td>III</td>
</tr>
</tbody>
</table>

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.
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Glassman et al&lt;sup&gt;11&lt;/sup&gt;</td>
<td>Retrospective review (lumbar fusion)</td>
<td>288</td>
<td>Intramuscular ketorolac and opioid analgesics</td>
<td>Nonunion rates were higher in patients who received intramuscular ketorolac than in patients who did not receive NSAIDs.</td>
<td>III</td>
</tr>
<tr>
<td>Jirarattanaphochai et al&lt;sup&gt;15&lt;/sup&gt;</td>
<td>Randomized controlled trial (lumbar disectomy, decompression, or fusion)</td>
<td>120</td>
<td>Parecoxib (40 mg preoperatively and every 12 hr for 48 hr postoperatively) and morphine</td>
<td>Patients receiving parecoxib had 39% reduction in morphine use, reduced pain at rest, and greater satisfaction.</td>
<td>I</td>
</tr>
<tr>
<td>Jirarattanaphochai and Jung&lt;sup&gt;16&lt;/sup&gt;</td>
<td>Meta-analysis of 17 randomized controlled trials (lumbar spine surgery)</td>
<td>789</td>
<td>NSAIDs and opioid analgesics</td>
<td>Lower pain scores and lower opioid use in patients receiving NSAIDs and opioids than in patients receiving opioids alone.</td>
<td>II</td>
</tr>
<tr>
<td>Li et al&lt;sup&gt;13&lt;/sup&gt;</td>
<td>Meta-analysis of five retrospective comparative studies (spinal fusion)</td>
<td>1,403</td>
<td>High-dose ketorolac defined as &gt;120 mg/d, diclofenac &gt;150 mg/d, celecoxib &gt;600 mg/d, rofecoxib &gt;50 mg/d</td>
<td>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.</td>
<td>IV</td>
</tr>
</tbody>
</table>

<sup>a</sup> 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

Considerations for Outpatient Spine Surgery

• Surgical Procedure:
  – 1-2 level ACDF, CA; Lumbar MCD/Laminectomy; select MIS TLIF/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%
Patient Selection - MOST IMPORTANT!

1. Patient Motivated to Improve
2. Compliant Patient
3. Medical Clearance
4. Low co-morbidities
5. Insurance
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.
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
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.
THANK YOU!

Vivek Mohan MD MS FAAOS