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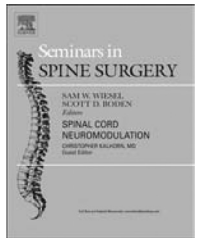

The ultimate decrease in length of stay: Outpatient spine surgery

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A B S T R A C T

Objectives: This review will provide a critical analysis of the current body of literature regarding outpatient spine surgery along with an assessment of the associated economic implications.
Findings: The recent adoption and growing utilization of outpatient spine surgery has attracted increasing attention for its potential to provide efficient and economical care in this era of health care reform. Its growth has been supported by evidence derived primarily from retrospective case series that have reported comparable safety and equivalent clinical outcomes when compared to inpatient spinal surgery.
Conclusions: Financial drivers have placed a greater emphasis on cost-containment and expanded investment in ambulatory surgical centers. Promise for surgeons to share in profits from such centers has been an additional drive for expansion of outpatient spinal surgery.

1. Introduction

Proponents of outpatient spine surgery have sought to create a paradigm shift in the delivery of operative spine care. Advancements in surgical techniques and multimodal anesthesia have enabled spine surgeons to utilize outpatient and ambulatory surgical centers (ASCs) with exponential increases. In 2005, ambulatory surgery encompassed 9% of all cervical procedures; this grew to 13% in 2009.[1] In contrast, inpatient cervical spine surgeries increased 8.7% over the same period.[1] Similarly, between 2003 and 2014, lumbar microdiscectomies performed in the outpatient hospital setting increased from 18.7% to 68.5%, and from 0.7% to 10.6% for ASCs.[2] By all estimates, this trajectory of growth is expected to continue.

In many respects, the pressure to reduce costs in the current era of health care reform has driven the expansion of outpatient spine surgery. An estimated cost savings of up to $140 million has been purported with the utilization of ASCs for spine surgery.[3] Beyond cost, other champions have highlighted decreased risk for nosocomial infections along with greater efficiency and throughput as reasons to promote outpatient surgery.[4,5]

One must soberly look beyond the apparent up-front cost savings of outpatient spine surgery, however. The safety profile of outpatient surgery must be equivalent to inpatient care. Downstream postoperative complications resulting in unplanned hospital transfers or anesthesia-related events may negate initial cost savings.

The current literature that elucidates the safety and outcomes of outpatient spine surgery is comprised of a multiplicity of retrospective studies and case series with relatively low levels of evidence. Prospective, case-controlled analyses have yet to be published on this matter. In exploration of the available data (Table 1), this article provides a critical review of the

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Table 1 – Summary of literature reporting perioperative complications following outpatient spine procedures.

	N	Study type	Morbidity/Transfer to hospital (%)	Admission (%)
Anterior Cervical		**Discectomy and Fusion**		
Silvers et al[3]	50	Retrospective cohort	2% (Vocal cord paralysis, Wound infection)	0
Adamson et al[4]	1000	Retrospective cohort	0.8% (Pain, Chest pain, CSF leak, hematoma, weakness)	2.2
Villavicencio et al[6]	103	Retrospective case series	3.8% (Fracture, Dehydration, medication reaction, nerve root injury) 3.9% required extended observation	1.9
Trahan et al[7]	59	Retrospective case series	1.4% (neck swelling, difficulty breathing, anxiety)	1.4
Tally et al[8]	119	Retrospective case series	1.7% (Anemia, neck swelling)	1.7
Stieber et al[9]	30	Retrospective cohort	10% (dysphagia)	0
Sheperd et al[10]	152	Retrospective case series	3.9% (neck pain, dysphagia, vocal cord paralysis, dysphagia, nausea, neck swelling	0.7
McGirt et al[11]	7288	Administrative database review	1.4%	NR
Martin et al[12]	587	Administrative database review	1.3%	NR
Liu et al[13]	45	Retrospective cohort	0%	0
Lied et al[14]	96	Prospective Case series	5.2% (Hematoma, dysphagia, neurological dysfunction)	0
Garringer et al[15]	645	Retrospective case series	6.1% (Hematoma, Pain, Chest pain nausea, vomiting)	0
Erickson et al[16]	56	Retrospective case series	8.9% (Paresthesia, vomiting, dysphagia, drug reaction	0
Ban et al[17]	1702	Meta-analysis	1.7% (Dysphagia, hematoma, swelling, infection, pain, nausea, vocal cord paralysis)	NR
Purger et al[18]	3135	Administrative database review	5.4%	1.6
Fu et al[19]	4759	Administrative database review	1.5%	NR
Mullins et al[20]	560	Retrospective case series	4.1% (Infection, Hematoma, Dysphagia, Horner's Syndrome, Non-union)	NR
Arshi et al[21]	1215	Insurance database review	5.5% (Revision surgery, Acute renal failure, Respiratory failure, Cerebrovascular accident)	NR
Posterior Cervical		**Foraminotomy**		
Holly et al[24]	21	Retrospective case series	10% (continued pain)	NR
Branch et al[25]	463	Retrospective case series	2.2% (CSF leak, infection, meningitis, vascular occlusion, arm weakness)	0.2
Lumbar		**Microdiscectomy/Decompression**		
Debono et al[26]	201	Retrospective case series	0%	0.5
Pugely et al[28]	1652	Administrative Database review	3.5%	NR
Fallah et al[29]	406	Prospective case series	7.3%	5.8
Best et al[30]	243	Retrospective case series	2.5% (CSF leak, infection, urinary retention)	0.4
Singhal et al[32]	122	Prospective case series	4.9% (Dural tear, anesthetic side-effects)	4.9
Zahrawi et al[33]	103	Retrospective case series	NR	NR
Griffith et al[35]	14	Retrospective case series	NR	NR
Cares et al[36]	10	Retrospective case series	0%	0%
Asch et al[39]	212	Prospective case series	NR	NR
Lumbar Fusion				
Villavicencio et al[40]	52	Retrospective case series	14% (CSF Leak, Pedicle screw malposition, allograft malposition, pain, infection, delirium tremens)	5.8
Emami et al[41]	31	Retrospective cohort	9.4% (Implant malposition, neurological complication)	3
Smith et al[42]	72	Retrospective case series	0%	0
Eckman et al[43]	808	Retrospective case series	0.25% (Transfusion, infection)	0

NR = Not recorded or mentioned

published literature regarding outpatient spine surgery for various cervical and lumbar procedures along with a discussion regarding associated cost savings.

2. Cervical spine

The safety profile and outcomes of outpatient anterior cervical discectomy and fusion (ACDF) remain a topic of considerable debate. Over a dozen studies have been published with a wide array of study designs, methodologies, and complication rates.[3–20] Some have utilized national patient databases such as the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database.[1,2,19,21,22] By using ambulatory filters to sort data, Baird et al analzyed state level healthcare cost and utilization databases and demonstrated an increase in the utilization of ambulatory centers for cervical spine procedures from 2005 to 2009.[1] Fu et al reported on 22,066 ACDF cases that were queried from the ACS-NSQIP database and after post-hoc statistical adjustment for selection bias and patient risk factors; the authors demonstrated that outpatient two-level ACDF was not associated with increased postoperative morbidity relative to inpatients.[19]

The reliability of data from such studies has been challenged. Bovonratwet et al assessed the quality of the data in these databases with regards to outpatient spine surgery.[22] The authors concluded that there is misleading or contradictory information particularly when listing procedures as "outpatient." In fact, for a significant cohort of "outpatient" cases, the associated length of stay listed did not correlate with a same-day discharge (i.e. a length of stay greater than 0).[22] In addition, across the literature, the definitions of "hospital readmission," "hospital transfer," and "complication" have not been standardized.

Additional methodological issues should be noted. An obvious patient selection and practitioner bias is apparent in many studies. The patients who are typically recruited for outpatient ACDF have few or no medical comorbidities while their inpatient counterparts tend to have more.[5] As expected, this is also true for studies concerning lumbar decompression.[23] Selection bias makes comparative analysis within these retrospective studies less reliable because they are without case control or randomization.

Acknowledging these limitations, the complication rate from a number of studies for outpatient ACDF has ranged from 0 to 5.2%, which is similar to that of inpatient surgery.[3–20] The hospital transfer rate range from 0 to 1.68%.[3–20] The most commonly reported complications include dysphagia, pain, hematoma, surgical site infection, and nerve root injury. No perioperative mortality was reported in any of these studies from surgical complications. Adamson et al reported the largest study that reviewed 1000 consecutive 1- and 2-level ACDFs at an ASC and compared the data to an inpatient cohort.[4] Eight patients (0.08%) required hospital transfer and the thirty-day hospital readmission rate of 2.2%. The all-cause morbidity was similar between the outpatient and inpatient cohorts with a follow up period of 90 days. However, the lack of case control and randomization makes this data difficult to interpret.

The lack of long-term follow up also limits the current literature. Arshi et al retrospectively reviewed an insurance database and suggested that after adjusting for patient age, gender, and comorbidities, the patients who underwent an outpatient ACDF were associated with a greater likelihood of posterior cervical fusion at 6 months and at 1 year when compared to those who underwent an inpatient ACDF.[21] In addition, the odds for anterior cervical revision or extension of the fusion construct at 1 year were greater in the outpatient cohort.[21] The etiology of this finding remains unknown and requires further long-term assessment with clinical data.

The evidence regarding outpatient posterior cervical procedures remains scant.[24,25] Brach et al reported on the largest cases series of minimally invasive tubular access for posterior cervical foraminotomy and reported a complication rate of 2.2% of which durotomy was the most common. Over 91% of patients were discharged on an outpatient basis. This study did not compare outcomes to an inpatient cohort in parallel.

3. Lumbar spine

With regards to outpatient lumbar decompression procedures, there is a greater consensus regarding a comparable safety profile when compared to inpatient care.[26–39] Once again, the definitions of "hospital readmission," "hospital transfer," and "complication" were not standardized among the studies and the same limitations mentioned above apply to the lumbar spine literature. The complication rate associated with outpatient lumbar laminectomy or microdiscectomy ranged from 0 to 4.7% and the rate of postoperative hospital transfer was 0 to 6.6%.[26–39] The most commonly reported complications included postoperative hematoma, durotomy, and wound infection. Three studies enrolled patients prospectively for outpatient lumbar decompression.[27,32,39] However, none of these studies compared the outpatient cohort to an inpatient control group and they all lacked randomization. In addition, Singhal et al and Helseth et al excluded patients with multiple comorbidities.[27,32]

Although the published literature suggests that outpatient lumbar decompression has a satisfactory safety profile, specific patient groups were associated with increased complications rates. Fallah et al demonstrated that the complication rate for revision lumbar discectomy in the outpatient setting was 21% as compared to 4.3% in the primary cohort.[29] In addition, patients greater than 65 years of age carried an increased risk for complications following outpatient lumbar decompression.[30] Best et al reported an unexpected inpatient conversion rate of 7.6% due to a perioperative complication or patient request.[30] These studies suggest that lumbar decompression may not be universally applicable in the outpatient setting across all patient groups. However, further case-controlled and randomized trials are warranted.

Few studies have compared lumbar fusion outcomes as a function of ambulatory versus inpatient surgery.[40–43] Only minimally invasive techniques have been studied. Patients who were recruited for same-day surgery were younger and carried less comorbidity than their inpatient

counterparts.[40–43] Eckman et al published the largest retrospective case series of 808 minimally invasive transforaminal lumbar interbody fusion cases and compared them to 306 cases that required a hospital stay. The authors demonstrated comparable clinical outcomes between the cohorts. However, the inpatient group was associated with increased medical complications and readmissions as these patients were older (>65 years of age). Furthermore, the authors did not offer same-day discharge for elderly patients for the first 43 months of the study. These findings were reproduced in more recent studies.[41,42] Although these studies reported comparable outcomes between the outpatient and inpatient cohorts, the lack of case control along with a significant patient selection bias skew the interpretation of these results.

4. Cost savings

The dramatic increase in utilization of ASC's for spine surgery has facilitated significant cost savings as reflected in numerous studies.[3,18,23] Purger et al queried state databases from 2009 to 2011 and demonstrated that the average charge for an inpatient ACDF was $74,667 as compared with $33,362 for the outpatient setting.[23] In 1996, Silvers et al obtained hospital financial data and demonstrated that their health system saved $90,000 in costs over the course of 50 ambulatory ACDF cases.[3] The authors extrapolated this data to the United States national figures and estimated that if 95% of 1 or 2 level ACDF cases are performed on an outpatient basis, this can yield about $90 to 140 million in potential cost savings each year.[3] Similarly, for lumbar decompression, Bekelis et al reported that the median charge for inpatient lumbar microdiscectomy was $24,273 as compared with $11,339 for the outpatient setting.[23] These cost savings clearly make ambulatory spine surgery lucrative for investors in ASC's.

Importantly, the reasons for decreased cost with outpatient spine surgery warrant further discussion. ASC reimbursement is based upon a percentage of hospital outpatient department reimbursement. As such, beyond the cost of an inpatient stay after surgery, operations performed at ASCs are reimbursed at a lower level. In 2003, ASC's were reimbursed at 87% compared to hospital outpatient department reimbursement and this decreased to 56% in 2011.[44,45]

In order to recoup some of this loss of revenue, financially successful ASCs have high efficiency standards with full operating room block times and decreased room turnover rates. Supplies are stocked only to meet or slightly exceed the needs of the ASC in order to limit wasted inventory expenditure. In addition, staffing is optimized to limit overtime or unnecessary personnel. Furthermore, ASCs can send a 12-point quality report to the Centers for Medicare and Medicaid Services to avoid a 2% reimbursement penalty, which is levied on ACSs that do not report their quality data.

Although the immediate economic benefit of ambulatory spine surgery is apparent, the downstream costs associated with complications, hospital transfers, hospital readmissions, and long-term revision surgeries have not been well-described or compared against inpatient care. Long term cost-effectiveness analyses can clarify the understanding of this matter.

5. Conclusion

Outpatient spine surgery has gained considerable momentum over the past two decades. This growth has been driven in part due to an expanding body of retrospective case series that has demonstrated equivalent clinical outcomes, 90-day morbidity, and hospital readmission rates when compared to inpatient care. The utilization of ambulatory surgical centers can be associated with substantial cost-containment for select spinal procedures. Future studies should focus upon utilizing case-controlled cohorts along with prospective, randomized designs to limit selection bias. Nonetheless, outpatient spine surgery offers great potential for efficient and economic care.

6. Disclosures

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