Risk Factors for Ambulatory Surgery Conversion to Extended Stay among Patients Undergoing Posterior Lumbar Decompression

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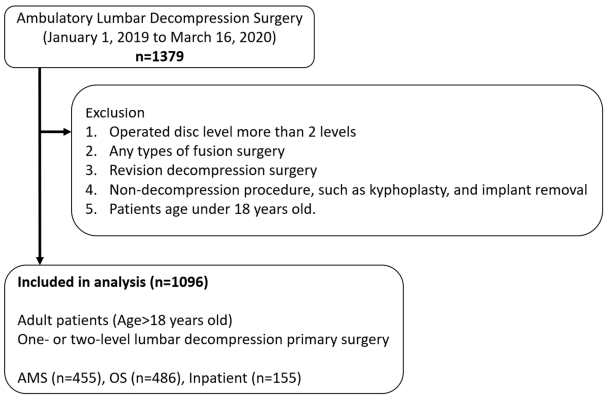
INTRODUCTION:
Ambulatory surgery (AMS) is increasingly becoming common in the US because it is associated with a similar or even higher quality of care compared to conventional inpatient surgery, with significant cost reduction, and with patient's desire to recuperate at home. However, there are instances when AMS patients may be subjected to extended hospital stays. The Center for US Medicare and Medicaid services (CMS) created the Two-Midnight Rules for patients' hospital stays. When the hospital stay is less than two midnights or 48 hours then the stay is considered outpatient but under extended observation care. A prolonged stay beyond 48 hours is considered an inpatient admission. Unexpected extended hospital stays, which can lead to higher medical costs, unplanned patients schedule, and unplanned hospital operation are a great burden not only to patients, but to medical providers and insurance companies alike. However, no study has investigated the risk factors for AMS conversion to extended stay in a spine surgery patient population. Our study aimed to investigate the factors associated with the conversion of patient status from AMS to observation service (OS) (fewer than 48 hours) or Inpatient (greater than 48 hours) using a hospital wide database of over 1,000 AMS lumbar decompression patients.
METHODS:
This is a single-center, retrospective observational study. Ethical board approval was obtained for this study. The records of patients who underwent one- or two-level lumbar decompression AMS were retrospectively reviewed between January 1, 2019 to March 16, 2020. The exclusion criteria were as follows: 1) operated disc level more than 2 levels, 2) any type of fusion surgery, 3) revision decompression surgery, 4) non-decompression procedure, such as kyphoplasty or implant removal, and 5) patients under 18 years old. Patients were categorized in three groups based on LOS that consisted of AMS, OS (stay more than one night but less than 48 hours), and Inpatient (stay greater than 48 hours). Demographics, comorbidities (the American Society of Anesthesiologists Physical Status (ASA) classification and the Charlson Comorbidity Index (CCI) score), medication history such as opioid and chronic steroid, surgical information, and administrative information such as operation start time was collected. Simple and multivariable logistic regression analyses were conducted comparing AMS patients and OS/Inpatient as well as OS and Inpatients.
RESULTS:
Of the 1,096 patients, 455 (42%) patients were classified as AMS, 486 patients were converted to OS (44%), and 155 patients (14%) to Inpatient. Among various factors, the multivariable analysis demonstrated that age (>80 years old), high ASA grade, history of sleep apnea, drain use, high EBL, laminectomy for spinal stenosis, a high pain score in the acute recovery care unit, long surgical durationm and late surgery start time after 12:00 pm were independent risk factors for the conversion from AMS to OS/Inpatient. For conversion from OS to Inpatient, higher ASA Class 3 or more, coronary artery disease, diabetes, hypothyroidism, steroid use, drain use, dural tear, and laminectomy for spinal stenosis were considered independent risk factors.
DISCUSSION AND CONCLUSION:
Our study identified several risk factors for the conversion from AMS to an extended stay in the hospital setting. Several surgical specific factors along with patient factors are significantly associated with AMS conversion. Addressing modifiable surgical factors, such as blood loss, drain use, operation duration time, and postoperative pain management might reduce the AMS conversion rate and be beneficial to patients and facilities.

Flow of cases through selection for analysis.



The results of multivariate analysis

	AMS vs OS / Inpatient					OS vs Inpatient				
Factors	Coefficients	OR	Lower CL	Upper CL	P value	Coefficients	OR	Lower CL	Upper CL	P value
Age >80	**1.390**	**4.000**	**1.470**	**12.610**	**0.006**	-0.200	0.820	0.340	1.880	0.646
Female gender	0.210	1.230	0.900	1.680	0.197	0.380	1.460	0.930	2.310	0.104
Insurance (Medicare, Medicaid)	0.190	1.210	0.780	1.890	0.390	0.400	1.490	0.880	2.510	0.137
ASA Class≥2	**0.640**	**1.900**	**1.250**	**2.920**	**0.003**	0.330	1.400	0.630	3.410	0.421
ASA Class 3 or over	**1.150**	**3.160**	**1.350**	**7.830**	**0.008**	**1.090**	**2.990**	**1.060**	**8.930**	**0.037**
CCI	-	-	-	-	-	-	-	-	-	-
CCI score 1	-0.230	0.790	0.520	1.200	0.274	-	-	-	-	-
CCI score 2 or over	0.010	1.010	0.660	1.540	0.962	-	-	-	-	-
Comorbidities										
Arthritis	0.120	1.130	0.720	1.760	0.597	0.110	1.110	0.640	1.890	0.698
CAD	0.160	1.170	0.600	2.310	0.645	**0.820**	**2.260**	**1.060**	**4.780**	**0.036**
COPD	1.430	4.190	0.460	554.210	0.245	-	-	-	-	-
DM	-	-	-	-	-	**0.800**	**2.240**	**1.110**	**4.430**	**0.024**
Hypertension	0.040	1.040	0.730	1.500	0.824	0.010	1.010	0.620	1.620	0.971
Hypothyroidism	0.400	1.490	0.790	2.920	0.221	0.740	2.090	1.050	4.080	0.036
Obesity	-0.190	0.830	0.580	1.170	0.292	-0.090	0.920	0.550	1.510	0.740
OSAS	**0.870**	**2.390**	**1.430**	**4.080**	**0.001**	-0.110	0.900	0.460	1.690	0.740
Opioid Use	0.300	1.350	0.980	1.860	0.068	0.020	1.020	0.640	1.620	0.917
Steroid Use	-0.310	0.730	0.400	1.340	0.317	**1.090**	**2.970**	**1.210**	**6.970**	**0.018**
Surgery related factors										
Drain Use	**0.600**	**1.830**	**1.330**	**2.510**	**0.000**	**0.890**	**2.430**	**1.550**	**3.860**	**0.000**
Dural tear complication	0.820	2.280	0.650	11.990	0.211	**5.020**	**151.170**	**19.020**	**19590.820**	**0.000**
Estimated blood loss	**0.000**	**1.000**	**1.000**	**1.000**	**0.026**	0.000	1.000	1.000	1.000	0.064
Laminectomy	**0.780**	**2.180**	**1.520**	**3.160**	**0.000**	**0.710**	**2.030**	**1.280**	**3.210**	**0.003**
Max Pain Score in recovery unit	**0.050**	**1.050**	**1.000**	**1.100**	**0.037**	0.040	1.040	0.970	1.110	0.287
Number of operated Levels	-0.030	0.970	0.630	1.500	0.903	0.500	1.660	0.990	2.740	0.054
Surgery Duration Minutes	**0.010**	**1.010**	**1.000**	**1.010**	**0.000**	0.000	1.000	0.990	1.010	0.671
Upper Level Surgery	0.230	1.260	0.710	2.310	0.434	-0.210	0.810	0.410	1.550	0.530
Early afternoon (12:00 pm-3:30 pm)	**0.780**	**2.190**	**1.580**	**3.050**	**0.000**	-	-	-	-	-
Late afternoon (3:30 pm-5:30 pm)	**1.500**	**4.490**	**2.940**	**6.950**	**0.000**	0.320	1.380	0.810	2.320	0.233
Night shift (after 5:30 pm)	**2.660**	**14.230**	**8.050**	**26.730**	**0.000**	-0.370	0.690	0.370	1.230	0.210

** *Bold values indicate significance (p<0.05).*

ASA: American Society of Anesthesiologists physical status, CCI: Charlson Comorbidity Index, CAD: Coronary Artery Disease, COPD: Chronic Obstructive Pulmonary Disease, DM: Diabetes Mellitus, OSAS: Obstructive Sleep Apnea.