

**TABLE E-1 ICD-9 Diagnosis and CPT-4 Procedure Codes Utilized for this Study\***

Code	Description
Diagnosis code	
Spondylolisthesis	
ICD-9	
738.4	Acquired spondylolisthesis
756.12	Spondylolisthesis
Procedure codes	
Laminectomy	
ICD-9	
03.09	Decompression of spinal canal
CPT-4	
63005†	Lumbar laminectomy, except for spondylolisthesis
63012	Lumbar laminectomy with removal of abnormal facets and/or pars interarticularis with decompression of cauda equina and nerve roots for spondylolisthesis
63047	Lumbar laminectomy, facetectomy, and foraminotomy, single vertebral segment
New arthrodesis	
ICD-9	
81.06	Spinal fusion of lumbar and lumbosacral fusion, anterior technique
81.07	Spinal fusion of lumbar and lumbosacral fusion, lateral transverse process technique
81.08	Spinal fusion of lumbar and lumbosacral fusion, posterior technique
CPT-4	
22558	Lumbar arthrodesis, anterior interbody technique, including minimal discectomy to prepare interspace
22630	Lumbar arthrodesis, posterior technique, including laminectomy and/or discectomy to prepare interspace, single interspace
22612	Lumbar arthrodesis, posterior or posterolateral technique, with or without lateral transverse technique, single level
Revision arthrodesis	
ICD-9	
81.36	Spinal refusion of lumbar and lumbosacral fusion, anterior technique
81.37	Spinal refusion of lumbar and lumbosacral fusion, lateral transverse process technique
81.38	Spinal refusion of lumbar and lumbosacral fusion, posterior technique
CPT-4	
22850	Removal of posterior nonsegmental instrumentation
22852	Removal of posterior segmental instrumentation
22855	Removal of anterior instrumentation
Use of instrumentation	
CPT-4	
22840	Posterior nonsegmental instrumentation
22841	Internal spinal fixation by wiring of spinous processes
22842	Posterior segmental instrumentation, 3-6 vertebral segments
22843	Posterior segmental instrumentation, 7-12 vertebral segments
22844	Posterior segmental instrumentation, 13 or more vertebral segments
22845	Anterior instrumentation; 2-3 vertebral segments
22846	Anterior instrumentation; 4-7 vertebral segments
22847	Anterior instrumentation; 8 or more vertebral segments
22848	Pelvic fixation, other than sacrum

\*ICD-9 = International Classification of Disease, Ninth Revision, and CPT-4 = Current Procedural Terminology, Fourth Edition. †Although 63005 is the code for lumbar laminectomy except spondylolisthesis, it was included to ensure inclusion of all cases as it may at times be miscoded.

**TABLE E-2 Inpatient and Outpatient Services and Associated Resource Use for Propensity Score-Matched Patients with at Least Two Years of Postoperative Follow-up**

	Laminectomy			Laminectomy with Arthrodesis		
	Without Arthrodesis (N = 734)	With Arthrodesis (N = 734)	P Value	With Instrumentation (N = 687)	Without Instrumentation (N = 687)	P Value
<b>Hospital days*</b>						
Index hospitalization	2 (2)	4 (2)	<0.0001†	4 (2)	4 (2)	0.0233†
1-year postop. total	1 (5)	1 (4)	0.4362	1 (6)	1 (6)	0.9719
2-year postop. total	3 (6)	3 (6)	0.3146	3 (7)	3 (9)	0.5016
<b>Outpatient services‡</b>						
1-year postop. total	67 (63)	68 (60)	0.2272	68 (59)	66 (56)	0.2114
2-year postop. total	124 (106)	129 (110)	0.2808	130 (112)	124 (99)	0.2286
<b>Outpatient emergency-department services‡</b>						
1-year postop. total	1 (8)	1 (4)	0.7243	1 (6)	2 (6)	0.3782
2-year postop. total	3 (10)	3 (8)	0.7584	3 (10)	3 (10)	0.5764
<b>Medications‡</b>						
1-year postop. total	41 (36)	41 (30)	0.1910	42 (34)	45 (36)	0.3754
2-year postop. total	78 (67)	80 (60)	0.1487	82 (67)	86 (71)	0.4608
<b>Hospital cost§</b>						
Index hospitalization	13,140 (12,407)	36,227 (29,149)	<0.0001†	39,997 (34,826)	27,309 (22,035)	0.0233†
1-year postop. total	5649 (16,285)	4187 (13,837)	0.2503	4365 (15662)	4235 (13,639)	0.9226
2-year postop. total	10,816 (23,093)	9795 (24,301)	0.1766	9805 (28,497)	8857 (23,182)	0.3333
<b>Outpatient cost§</b>						
1-year postop. total	8479 (13,946)	8266 (9610)	0.3779	8600 (10,826)	8434 (11,041)	0.7329
2-year postop. total	15,449 (20,937)	15,733 (18,316)	0.3759	15,726 (17,330)	15,878 (20,859)	0.4767
<b>Outpatient emergency-department cost§</b>						
1-year postop. total	151 (539)	236 (1632)	0.9850	225 (1482)	155 (487)	0.4069
2-year postop. total	320 (937)	432 (1920)	0.8836	358 (1692)	349 (1054)	0.8988
<b>Medication cost§</b>						
1-year postop. total	3828 (4406)	4115 (5205)	0.0653	3984 (4263)	4152 (4346)	0.2691
2-year postop. total	7572 (8693)	8367 (10,078)	0.0286†	7953 (8423)	8349 (8632)	0.2640
<b>Overall costs§#</b>						
1-year postop. total	31,096 (29,454)	52,795 (38,720)	<0.0001†	56,946 (44,839)	44,130 (33,949)	<0.0001†
2-year postop. total	46,976 (41,323)	70,123 (51,900)	<0.0001†	73,482 (59,323)	60,394 (49,688)	<0.0001†

\*The values are given as the mean, with the standard deviation in parentheses. †The difference was significant. ‡The values are given as the mean, with the standard deviation in parentheses. The units for outpatient and outpatient emergency-department services are the number of these services used. The unit for medications is the number of new or refill prescription medications. §The values are given as the mean (in 2009 U.S. dollars), with the standard deviation in parentheses. #Overall costs are the cumulated costs of the index hospitalization and the post-operative inpatient, outpatient, and medication costs.

**TABLE E-3 Inpatient and Outpatient Resource Use for Propensity Score Matched Patients with at Least Five Years of Postoperative Follow-up**

Postop. 5-Year Total	Laminectomy			Laminectomy with Arthrodesis		
	Without Arthrodesis (N = 159)	With Arthrodesis (N = 159)	P Value	With Instrumentation (N = 141)	Without Instrumentation (N = 141)	P Value
Hospital cost*	19,543 (30,238)	19,656 (32,564)	0.9093	25,154 (49,517)	20,376 (34,154)	0.5104
Outpatient cost*	36,437 (42,503)	34,455 (39,872)	0.5776	31,559 (25,888)	33,832 (31,125)	0.7430
Outpatient emergency-department cost*	536 (1076)	762 (1960)	0.8459	614 (1232)	681 (1526)	0.8970
Medication cost*	20,345 (27,188)	20,633 (18,735)	0.1975	22,219 (23,514)	19,225 (15,535)	0.8448
Overall cost*†	89,337 (74934)	102,906 (79,920)	0.00178	111,150 (85,092)	98,052 (69,157)	0.2891

\*The values are given as the mean (in 2009 U.S. dollars) with the standard deviation in parentheses. †Overall costs are the cumulated costs of the index hospitalization and the postoperative inpatient, outpatient, and medication costs.