Supplemental Digital Content 1: Low Back Injury Severity Code Groups Based on ICD-9 Codes (1)

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| **ICD-9 Code** | **Description** |
| **More Severe** | |
| 344.60 | Syndrome, cauda equina NOS |
| 344.61 | Synd, cauda equina w/neuro bladder |
| 353.1 | Lesions, lumbosacral plexus |
| 353.4 | Lesions, lumbosacral root NEC |
| 353.8 | Disorder, nerve root/plexus NEC |
| 353.9 | Disorder, nerve root/plexus NOS |
| 355.0 | Lesion, sciatic nerve |
| 721.42 | Spondylosis, lumbar w/myelopathy |
| 722 | Disorders, intervertebral disc |
| 722.1 | Dsplcmnt thorc/lmbr disc w/o myelpy |
| 722.10 | Dsplcmnt, lumbar disc w/o myelpy |
| 722.2 | Displacement, disc NOS w/o myelpy |
| 722.7 | Dsord, intervertebral disc w/myelpy |
| 722.70 | Disorder, disc NOS w/myelopathy |
| 722.73 | Disorder, lumbar disc w/myelopathy |
| 722.83 | Syndrome, postlaminectomy, lumbar |
| 724.0 | Stenosis, spinal, oth than cervical |
| 724.00 | Stenosis, spinal, unspec region |
| 724.02 | Stenosis, spinal, lumbar |
| 724.09 | Stenosis, spinal, other spec site |
| 724.3 | Sciatica |
| 724.4 | Neuritis, lumbosacral NOS |
| 724.6 | Disorders, sacrum (incl. LS jt. instability) |
| 729.2 | Neuralgia/neuritis NOS |
| 738.4 | Spondylolisthesis, acquired |
| 756.1 | Anomaly, congenital, spine |
| 756.10 | Anomaly, congenital, spine NOS |
| 756.11 | Spondylolysis, cngn, lumbosacral |
| 756.12 | Spondylolisthesis, congenital |
| 953.2 | Injury, lumbar root |
| 953.5 | Injury lumbosacral plexus |
| 956.0 | Injury sciatic nerve |
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| **Less Severe** | |
| 349.9 | Disorder, nervous system NOS |
| 720.0 | Spondylitis, ankylosing |
| 720.1 | Enthesopathy, spinal |
| 720.2 | Sacroiliitis NEC |
| 720.9 | Spondylopathy, inflammatory NOS |
| 721.3 | Spondylosis, lumbosacral |
| 721.7 | Spondylopathy, traumatic |
| 721.8 | Disorder, spinal NEC |
| 721.9 | Spondylosis NOS |
| 721.90 | Spondylosis NOS w/o myelopathy |
| 722.32 | Schmorl's nodes, lumbar region |
| 722.5 | Dgnratn, thorc/lumbar disc |
| 722.52 | Degeneration, lumbar/lmbsac disc |
| 722.6 | Degeneration, disc NOS |
| 722.9 | Dsord, intrvrtbrl disc, oth & unspc |
| 722.90 | Disorder NEC/NOS, unspecified disc |
| 722.93 | Disorder NEC/NOS, lumbar disc |
| 724 | Disorders, back, other & unspc |
| 724.2 | Lumbago |
| 724.5 | Backache NOS |
| 724.7 | Disorders, coccyx |
| 724.71 | Hypermobility, coccyx |
| 724.79 | Disorder, coccyx NEC |
| 724.8 | Symptom, back NEC |
| 724.9 | Disorder, back NOS |
| 728.2 | Atrophy, muscular disuse NEC |
| 728.8 | Disorders, muscle/ligament/fascia |
| 728.85 | Spasm, muscle |
| 728.9 | Disorder, muscle/ligament NOS |
| 729.1 | Myalgia/myositis NOS |
| 729.9 | Disorder, soft tissue NEC/NOS |
| 737.3 | Kyphoscoliosis and scoliosis |
| 737.30 | Scoliosis, idiopathic |
| 737.39 | Scoliosis NEC |
| 738.5 | Deformity, acquired, back/spine NEC |
| 739.3 | Lesion, nonallopathic, lumbar rgn |
| 739.4 | Lesion, nonallopathic, sacral rgn |
| 756.15 | Fusion, spine, congenital |
| 793.7 | Nonspecif abnl radiolog fnd, musculoskl systm |
| 799.8 | Condition, ill-defined NEC |
| 839.2 | Dsloc, thoracic/lumbar vrt, clsd |
| 839.20 | Dsloc lumbar vertebra, closed |
| 839.42 | Dislocation sacrum, closed |
| 839.69 | Dislocation site NEC, closed |
| 839.8 | Dislocation, mlt/ill-defined, clsd |
| 846 | Sprain/strain, sacroiliac region |
| 846.0 | Sprain/strain, lumbosacral |
| 846.1 | Sprain/strain, sacroiliac ligament |
| 846.2 | Sprain/strain, sacrospinatus |
| 846.3 | Sprain/strain, sacrotuberous |
| 846.8 | Sprain/strain, sacroiliac site NEC |
| 846.9 | Sprain/strain, sacroiliac site NOS |
| 847 | Sprains/strain oth/unspc parts back |
| 847.2 | Sprain/strain, lumbar region |
| 847.3 | Sprain/strain, sacrum |
| 847.4 | Sprain/strain, coccyx |
| 847.9 | Sprain/strain, back NOS |
| 848.8 | Sprain/strain NEC |
| 848.9 | Sprain/strain NOS |
| 905.7 | Late effect, sprain/strain |
| 922.3 | Contusion, back |
| 922.31 | Contusion, back |
| 922.32 | Contusion, buttock |
| 922.9 | Contusion, trunk NOS |
| 959.1 | Injury NOS, trunk |
| 959.19 | Injury NOS, other sites trunk |

Supplemental Digital Content 2: Current Procedural Terminology (CPT) Codes for Identifying Medical Services (2)

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| Category of Service | CPT Code | Description |
| Advanced Imaging | 62284 | Injection procedure for myelography and/or computed tomography, spinal (other than C1-C2 and posterior fossa) |
| 62290 | Injection procedure for discography, each level; lumbar |
| 62292 | Injection procedure for chemonucleolysis, including discography, intervertebral disc, single or multiple levels, lumbar |
| 72131 | Computed tomography, lumbar spine; without contrast material |
| 72132 | Computed tomography, lumbar spine; with contrast material |
| 72133 | Computed tomography, lumbar spine; without contrast material, followed by contrast material(s) and further sections |
| 72148 | Magnetic resonance (eg, proton) imaging, spinal canal and contents, lumbar; without contrast material |
| 72149 | Magnetic resonance (eg, proton) imaging, spinal canal and contents, lumbar; with contrast material(s) |
| 72158 | Magnetic resonance (eg, proton) imaging, spinal canal and contents, without contrast material, followed by contrast material(s) and further sequences; lumbar |
| 72265 | Myelography, lumbosacral, radiological supervision and interpretation |
| 72270 | Myelography, 2 or more regions (eg, lumbar/thoracic, cervical/thoracic, lumbar/cervical, lumbar/thoracic/cervical), radiological supervision and interpretation |
| 72295 | Discography, lumbar, radiological supervision and interpretation |
| 78315 | Bone and/or joint imaging; 3 phase study |
| 78320 | Bone and/or joint imaging; tomographic (SPECT) |
| 78399 | Unlisted musculoskeletal procedure, diagnostic nuclear medicine |
| EMG / NCV | 95860 | Needle electromyography; 1 extremity with or without related paraspinal areas |
| 95861 | Needle electromyography; 2 extremities with or without related paraspinal areas |
| 95900 | Nerve conduction, amplitude and latency/velocity study, each nerve; motor, without F-wave study |
| 95903 | Nerve conduction, amplitude and latency/velocity study, each nerve; motor, with F-wave study |
| 95904 | Nerve conduction, amplitude and latency/velocity study, each nerve; sensory |
| 95905 | Motor and/or sensory nerve conduction, using preconfigured electrode array(s), amplitude and latency/velocity study, each limb, includes F-wave study when performed, with interpretation and report |
| 95907 | Nerve conduction studies; 1-2 studies |
| 95926 | Short-latency somatosensory evoked potential study, stimulation of any/all peripheral nerves or skin sites, recording from the central nervous system; in lower limbs |
| 95934 | H-reflex, amplitude and latency study; record gastrocnemius/soleus muscle |
| Injections (Epidural Steroid Injections) | 62311 | Injection(s), of diagnostic or therapeutic substance(s) (including anesthetic, antispasmodic, opioid, steroid, other solution), not including neurolytic substances, including needle or catheter placement, includes contrast for localization when performed, epidural or subarachnoid; lumbar or sacral (caudal) |
| 62319 | Injection(s), including indwelling catheter placement, continuous infusion or intermittent bolus, of diagnostic or therapeutic substance(s) (including anesthetic, antispasmodic, opioid, steroid, other solution), not including neurolytic substances, includes contrast for localization when performed, epidural or subarachnoid; lumbar or sacral (caudal) |
| 64483 | Injection(s), anesthetic agent and/or steroid, transforaminal epidural, with imaging guidance (fluoroscopy or CT); lumbar or sacral, single level |
| 64484 | Injection(s), anesthetic agent and/or steroid, transforaminal epidural, with imaging guidance (fluoroscopy or CT); lumbar or sacral, each additional level (List separately in addition to code for primary procedure) |
| Injections | 20552 | Injection(s); single or multiple trigger point(s), 1 or 2 muscle(s) |
| 20553 | Injection(s); single or multiple trigger point(s), 3 or more muscle(s) |
| 27096 | Injection procedure for sacroiliac joint, anesthetic/steroid, with image guidance (fluoroscopy or CT) including arthrography when performed |
| 62264 | Percutaneous lysis of epidural adhesions using solution injection (eg, hypertonic saline, enzyme) or mechanical means (eg, catheter) including radiologic localization (includes contrast when administered), multiple adhesiolysis sessions; 1 day |
| 62282 | Injection/infusion of neurolytic substance (eg, alcohol, phenol, iced saline solutions), with or without other therapeutic substance; epidural, lumbar, sacral (caudal) |
| 64475 | Injection, anesthetic agent and/or steroid, paravertebral facet joint or facet joint nerve; lumbar or sacral, single level (changed to 64493) |
| 64476 | Injection, anesthetic agent and/or steroid, paravertebral facet joint or facet joint nerve; lumbar or sacral, each additional level (List separately in addition to code for primary procedure) (changed to 64494 and 64495) |
| 64493 | Injection(s), diagnostic or therapeutic agent, paravertebral facet (zygapophyseal) joint (or nerves innervating that joint) with image guidance (fluoroscopy or CT), lumbar or sacral; single level |
| 64494 | Injection(s), diagnostic or therapeutic agent, paravertebral facet (zygapophyseal) joint (or nerves innervating that joint) with image guidance (fluoroscopy or CT), lumbar or sacral; second level (List separately in addition to code for primary procedure) |
| 64495 | Injection(s), diagnostic or therapeutic agent, paravertebral facet (zygapophyseal) joint (or nerves innervating that joint) with image guidance (fluoroscopy or CT), lumbar or sacral; third and any additional level(s) (List separately in addition to code for primary procedure) |
| 64520 | Injection, anesthetic agent; lumbar or thoracic (paravertebral sympathetic) |
| 64622 | Destruction by neurolytic agent, paravertebral facet joint nerve; lumbar or sacral, single level (changed to 644635) |
| 64623 | Destruction by neurolytic agent, paravertebral facet joint nerve; lumbar or sacral, each additional level (List separately in addition to code for primary procedure) (changed to 644636) |
| 64635 | Destruction by neurolytic agent, paravertebral facet joint nerve(s), with imaging guidance (fluoroscopy or CT); lumbar or sacral, single facet joint |
| 64636 | Destruction by neurolytic agent, paravertebral facet joint nerve(s), with imaging guidance (fluoroscopy or CT); lumbar or sacral, each additional facet joint (List separately in addition to code for primary procedure) |
| Surgery | 22224 | Osteotomy of spine, including discectomy, anterior approach, single vertebral segment; lumbar |
| 22226 | Osteotomy of spine, including discectomy, anterior approach, single vertebral segment; each additional vertebral segment (List separately in addition to code for primary procedure) |
| 22840 | Posterior non-segmental instrumentation (eg, Harrington rod technique, pedicle fixation across 1 interspace, atlantoaxial transarticular screw fixation, sublaminar wiring at C1, facet screw fixation) (List separately in addition to code for primary procedure) |
| 22841 | Internal spinal fixation by wiring of spinous processes |
| 22842 | Posterior segmental instrumentation (eg, pedicle fixation, dual rods with multiple hooks and sublaminar wires); 3 to 6 vertebral segments (List separately in addition to code for primary procedure) |
| 22899 | Spine Surgery Procedure *(unlisted)* |
| 62287 | Decompression procedure, percutaneous, of nucleus pulposus of intervertebral disc, any method, single or multiple levels, lumbar (eg, manual or automated percutaneous discectomy, percutaneous laser discectomy) |
| 63005 | Laminectomy with exploration and/or decompression of spinal cord and/or cauda equina, without facetectomy, foraminotomy or discectomy (eg, spinal stenosis), 1 or 2 vertebral segments; lumbar, except for spondylolisthesis |
| 63011 | Laminectomy with exploration and/or decompression of spinal cord and/or cauda equina, without facetectomy, foraminotomy or discectomy (eg, spinal stenosis), 1 or 2 vertebral segments; sacral |
| 63012 | Laminectomy with removal of abnormal facets and/or pars inter-articularis with decompression of cauda equina and nerve roots for spondylolisthesis, lumbar (Gill type procedure) |
| 63017 | Laminectomy with exploration and/or decompression of spinal cord and/or cauda equina, without facetectomy, foraminotomy or discectomy (eg, spinal stenosis), more than 2 vertebral segments; lumbar |
| 63030 | Laminotomy (hemilaminectomy), with decompression of nerve root(s), including partial facetectomy, foraminotomy and/or excision of herniated intervertebral disc, including open and endoscopically-assisted approaches; 1 interspace, lumbar |
| 63035 | Laminotomy (hemilaminectomy), with decompression of nerve root(s), including partial facetectomy, foraminotomy and/or excision of herniated intervertebral disc, including open and endoscopically-assisted approaches; each additional interspace, cervical or lumbar (List separately in addition to code for primary procedure) |
| 63042 | Laminotomy (hemilaminectomy), with decompression of nerve root(s), including partial facetectomy, foraminotomy and/or excision of herniated intervertebral disc, reexploration, single interspace; lumbar |
| 63044 | Laminotomy (hemilaminectomy), with decompression of nerve root(s), including partial facetectomy, foraminotomy and/or excision of herniated intervertebral disc, reexploration, single interspace; each additional lumbar interspace (List separately in addition to code for primary procedure) |
| 63047 | Laminectomy, facetectomy and foraminotomy (unilateral or bilateral with decompression of spinal cord, cauda equina and/or nerve root[s], [eg, spinal or lateral recess stenosis]), single vertebral segment; lumbar |
| 63048 | Laminectomy, facetectomy and foraminotomy (unilateral or bilateral with decompression of spinal cord, cauda equina and/or nerve root[s], [eg, spinal or lateral recess stenosis]), single vertebral segment; each additional segment, cervical, thoracic, or lumbar (List separately in addition to code for primary procedure) |
| 63056 | Transpedicular approach with decompression of spinal cord, equina and/or nerve root(s) (eg, herniated intervertebral disc), single segment; lumbar (including transfacet, or lateral extraforaminal approach) (eg, far lateral herniated intervertebral disc) |
| 63057 | Transpedicular approach with decompression, each additional segment, lumbar |
| 63170 | Laminectomy with myelotomy (eg, Bischof or DREZ type), cervical, thoracic, or thoracolumbar |
| 63185 | Laminectomy with rhizotomy, 1-2 segments |
| 63190 | Laminectomy with rhizotomy, more than 2 segments |
| 63200 | Laminectomy, with release of tethered spinal cord, lumbar |
| 63267 | Laminectomy for excision or evacuation of intraspinal lesion other than neoplasm, extradural; lumbar |
| 63268 | Laminectomy for excision or evacuation of intraspinal lesion other than neoplasm, extradural; sacral |
| 63272 | Laminectomy for excision of intraspinal lesion other than neoplasm, intradural; lumbar |
| 63273 | Laminectomy for excision of intraspinal lesion other than neoplasm, intradural; sacral |
| 69990 | Microsurgical techniques, requiring use of operating microscope (List separately in addition to code for primary procedure) |
| 72291 | Radiological supervision and interpretation, percutaneous vertebroplasty, vertebral augmentation, or sacral augmentation (sacroplasty), including cavity creation, per vertebral body or sacrum; under fluoroscopic guidance |
| Surgery (Fusions) | 22632 | Arthrodesis, posterior interbody technique, including laminectomy and/or discectomy to prepare interspace (other than for decompression), single interspace; each additional interspace (List separately in addition to code for primary procedure) |
| 22650 | deleted code, replaced by 22614 |
| 22820 | Deleted, replaced with 20930-20938 |
| 22830 | Exploration of spinal fusion |
| 22840 | Posterior non-segmental instrumentation (eg, Harrington rod technique, pedicle fixation across 1 interspace, atlantoaxial transarticular screw fixation, sublaminar wiring at C1, facet screw fixation) (List separately in addition to code for primary procedure) |
| 22841 | Internal spinal fixation by wiring of spinous processes |
| 22842 | Posterior segmental instrumentation (eg, pedicle fixation, dual rods with multiple hooks and sublaminar wires); 3 to 6 vertebral segments (List separately in addition to code for primary procedure) |
| 22849 | Reinsertion of spinal fixation device |
| 22850 | Removal of posterior nonsegmental instrumentation (eg, Harrington rod) |
| 22851 | Application of intervertebral biomechanical device(s) (eg, synthetic cage(s), threaded bone dowel(s), methylmethacrylate) to vertebral defect or interspace (List separately in addition to code for primary procedure) |
| 22852 | Removal of posterior segmental instrumentation |
| 22855 | Removal of anterior instrumentation |

**References**

1. Commission on Professional and Hospital Activities. *International Classification of Diseases, 9th Revision, Clinical Modification, ICD-9-CM*. Ann Arbor, MI: Edwards Brothers, Inc., 1980.
2. American Medical Association**.** *Current Procedural Terminology (CPT)*. Chicago: American Medical Association, 2002.

Supplemental Digital Content 3. Severity Comparisons Within MRI Groups at 6 Months Post-MRI

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| **More Severe vs. Less Severe (ref.)** | **Injections** | | | **EMG/NCV** | | | **Advanced Imaging** | | | **Surgery** | | |
| **RR** | **95% CI** | **Sig.** | **RR** | **95% CI** | **Sig.** | **RR** | **95% CI** | **Sig.** | **RR** | **95% CI** | **Sig.** |
| **No MRI** | 2.70 | (1.29, 5.67) | *p* = 0.009 | 4.59 | (1.24, 16.98) | *p* = 0.02 | 0.48 | (0.06, 3.66) | *p* = 0.48 | 1.64 | (0.34, 7.83) | *p* = 0.54 |
| **Early MRI** | 1.19 | (1.02, 1.40) | *p* = 0.03 | 1.44 | (1.03, 2.03) | *p* = 0.04 | 1.15 | (0.83, 1.60) | *p* = 0.40 | 1.19 | (0.85, 1.67) | *p* = 0.31 |
| **Timely MRI** | 1.04 | (0.81, 1.34) | *p* = 0.75 | 1.22 | (0.73, 2.03) | *p* = 0.45 | 0.79 | (0.46, 1.34) | *p* = 0.37 | 3.10 | (1.26, 7.65) | *p* = 0.01 |

Abbreviations: MRI, magnetic resonance imaging; EMG/NCV, electromyography/nerve conduction velocity; ref., reference group; RR, relative risk; Sig., significance of the estimate. Multivariate log binomial model results comparing those with higher severity against those with low severity (as the reference group) within each MRI group. Estimates of risk ratios (relative risk) are adjusted for age, gender, job tenure, and use of early opioids. Wald 95% CI shown in parentheses.