



BRIGHAM AND WOMEN'S HOSPITAL

Department of Rehabilitation Services
Physical Therapy

Standard of Care: Post-Operative Spine Surgery

Case Type / Diagnosis: (diagnosis specific, impairment/ dysfunction specific/ICD 10 codes)

ICD 10 Codes:

M43.00 Spondylosis
M43.10 Spondylolisthesis
M50.30 Other cervical disc degeneration, unspecified cervical region
M54.12 Radiculopathy, cervical region
M54.13 Radiculopathy, cervicothoracic region
S32.009A Unspecified fracture of unspecified lumbar vertebra, initial encounter for closed fracture
M51.36 Other intervertebral disc degeneration, lumbar region
M51.37 Other intervertebral disc degeneration, lumbosacral region
M46.47 Discitis, unspecified, lumbosacral region
M51.86 Other intervertebral disc disorders, lumbar region
M51.87 Other intervertebral disc disorders, lumbosacral region
M51.06 Intervertebral disc disorders with myelopathy, lumbar region
M51.07: Intervertebral disc disorders with myelopathy, lumbosacral region
M51.46 Schmorl's nodes, lumbar region
M51.47 Schmorl's nodes, lumbosacral region
M54.14 Radiculopathy, thoracic region
M54.15 Radiculopathy, thoracolumbar region
M54.16 Radiculopathy, lumbar region
M54.17 Radiculopathy, lumbosacral region
M48.06 Spinal Stenosis, lumbar region
M47.817 Spondylosis without myelopathy or radiculopathy, lumbosacral region
M54.30 Sciatica, unspecified site
M47.817 Spondylosis without myelopathy or radiculopathy, lumbosacral region
Q76.2 Congenital Spondylolisthesis
S12.9XXA Fracture of neck, unspecified, initial encounter
S22.009A Unspecified fracture of unspecified thoracic vertebra, initial encounter for closed fracture
S32.009A Unspecified fracture of unspecified lumbar vertebral initial encounter for closed fracture
S32.10XA Unspecified fracture of sacrum, initial encounter for closed fracture
S32.2XXA Fracture of coccyx, initial encounter for closed fracture

Standard of Care: Post-Operative Spine

This Standard of Care was developed as a comprehensive tool for both orthopedic and neurosurgical spine surgeries. It was adapted from the previous published BWH Standards of Care: *Orthopedic Spine Surgery* and *Operative Management of Spinal Disorders*.

The intent of this protocol is to provide the clinician with a guideline for postoperative rehabilitation of a patient after spinal surgery including but not limited to: laminectomy, foraminotomy, discectomy, facetectomy, corpectomy, and anterior/posterior transforaminal interbody fusion in the cervical, thoracic, and/or lumbar spine. It is not intended to be a substitute for appropriate clinical decision-making regarding the progression of a patient's post-operative course. The actual post-surgical physical therapy management must be based on the specific surgical approach, physical exam/findings, relevant co-morbidities, individual progress, and/or the presence of postoperative complications. If a clinician requires clarification regarding a patient's post-surgical presentation, he or she should consult with the referring surgeon.

The most common etiologies leading to spinal surgery include spinal stenosis and disc herniation, which often present with symptoms of back and/or radicular pain. In patients 60 years and older, the prevalence of degenerative spinal conditions ranges from 20-25%¹. The incidence of spine surgery has increased more than 200% in the last decade.¹

The goals of spinal surgery are to decompress the spinal canal and/or foramen to relieve pressure on nerve roots or spinal cord while minimizing the risk of secondary instability. Surgery may help relieve pain, paresthesias, or weakness; restore nerve function and stop or prevent abnormal motion. Randomized trials indicate that for severely impaired patients, decompression with or without fusion offers greater efficacy than nonsurgical treatments.² Outcomes of surgery are highly dependent upon surgical technique, type of instrumentation used, and the quality of the bony and soft tissue structures. Anatomical reconstruction and surgical soft tissue balancing are important factors for restoration of stability and functional range of motion post-operatively. Spine surgery can be performed from anterior or posterior direction or both and can be performed in the cervical, thoracic and lumbar spine. In the literature, spine fusion surgery with or without decompression has yielded similar clinical outcomes (in perceived disability, gait speed, and overall self- health perception) after two and five year follow-up.³ These results favor a positive outcome for patients undergoing spine surgery regardless of their primary etiology.

Spine surgery can involve removing part or all of the disc (discectomy), the body of the vertebrae (corpectomy), removing part or all of the lamina (laminectomy), and/or removal of part or all of a facet (facetectomy). The spine may or may not be fixated. Fixation can be achieved with metal instrumentation such as plates, screws, or wires; or with bone graft. The bone graft may be one of two types: an autograft (bone taken from the patient) or an allograft (bone from a cadaver). Bone for an autograft is most often harvested from the iliac crest from a small separate incision. In some cases, metal plates, screws or wires are then used in addition to the graft to further stabilize the spine.

Spine surgery can also be used to repair a fractured or collapsed vertebrae. Two procedures that are used include a vertebroplasty (cement is injected into a fractured vertebra through a needle) or kyphoplasty (the surgical filling of an injured or collapsed vertebra through a balloon). A

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kyphoplasty is used to restore the shape or height of the vertebrae if there is a deficit due to the injury.

Indications for Surgery:

- Intractable neck or back pain that failed conservative treatment
- Radicular pain radiating into extremities
- Facet joint arthritis
- Instability
- Spinal stenosis
- Spondylosis
- Spondylolisthesis
- Ankylosing Spondylitis
- Disc protrusion or degeneration
- Injuries to the vertebrae
- Weak/unstable bone caused by infection or tumors
- Spinal cord compression
- Malignancy

Post-Surgical Complications:

Included but are not limited to:

- Dural tear (usually managed with bed rest for 24-72 hours based on the surgeon's orders, and/or presence of a lumbar drain.)
- Myocardial infarction
- Pulmonary embolus
- Upper extremity or lower extremity DVT
- Severe/intractable pain or headache
- New paresthesias
- New upper motor neuron dysfunction (i.e. positive Babinski, new clonus, or spasticity)
- New onset of urinary or bowel urgency
- Abnormal discharge or drainage from operative site
- Bone graft failure
- Airway complication (higher incidence in cervical spine procedures)
- Dysphagia
- Cerebral spinal fluid leak
- Surgical site infections
- Hardware failures
- Pulmonary complications
- Vertebral fractures
- Hematoma formation
- Recurrent disc herniation
- Mislocated instrumentation

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If the patient presents with any of these new signs and symptoms, it is the responsibility of the Physical Therapist to have a discussion with the Responding Clinician regarding the appropriateness of a PT evaluation or intervention. These symptoms may indicate activity restrictions. Please reference the BWH General Surgery Standard of Care for more details.

Precautions for Treatment:

- **Spinal Precautions:** All patients following spine surgery will be on spinal precautions. These are: no bending, twisting or lifting greater than ten pounds for approximately 2-6 weeks based on the spinal surgery and post-operative orders. Patients should also logroll to get out of bed. This will minimize spinal rotation and flexion and decrease stress on the surgical site. Review post-operative orders and clarify regarding precautions with the Responding Clinician prior to treatment.
- **Positioning:** The patient may lay supine or side lying with no head of bed restrictions. If the patient has an order for a back brace for stability, the patient should stay in supine or side lying with the head of the bed less than 30 degrees until the brace is received. Once the brace is received, the patient may have no head of bed restrictions with the brace donned.
- **Bracing:** Patients may require a spinal orthosis post-operatively. This is determined by the surgeon based on the stability of spine post-surgery. Patients who receive an order for a spinal orthosis may be on logrolling precautions with the head of the bed less than 30 degrees until the brace is fit. The treating physical therapist should clarify that the brace is appropriate for the patient, if the patient was measured pre-operatively or has had a previous brace, and if the patient may don the brace supine or sitting.
 - Once the brace is received the patient has no restrictions on the head of the bed height as well as mobility when the orthosis is donned, but will still have spinal precautions.
 - For patients who require a spinal orthosis for stability a brace should stabilize at least one level above and below the operative vertebrae.
 - If the brace is for comfort only, the patient may be allowed out of bed prior to the brace fitting. This is the case for most orthomolds and soft corsets.
 - The brace may be applied over the dressing of the surgical wound or surgical drain sites. If patients had additional lines or drains consult with orthotist regarding brace modifications.
 - Refer to the Spinal Orthotics Resource Guide for further information on specific brace types (Appendix A)
- **Activity:** These patients are usually weight bearing as tolerated and ambulation is encouraged.

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Evaluation:

Medical History: Review past medical/surgical history reported in the chart.

History of Present Illness: Review pertinent diagnostic imaging, laboratory workup and other tests that lead to the current diagnosis and decision to pursue surgical management. Inquire about presenting signs and symptoms, including: type, duration, impact on function, and prior management (i.e. steroid injections, outpatient physical therapy, medications) of symptoms if applicable.

Hospital Course: Review the type of surgery (see brief operative note and/or detailed report of surgical procedure in the medical chart if available), as well as any remarkable intra-operative and post-operative events.

Social History: Inquire regarding occupation, prior functional level, use of assistive devices, home environment setup, family and caregiver support system, and patient goals.

Medications: Review current pharmacological management of the spinal dysfunction or any comorbidities. Common medications used in the management of patients following spinal surgery may include, but are not limited to: anti-inflammatory agents (i.e. ASA, NSAID's, glucocorticosteroids), narcotic/opioid analgesics (i.e. Dilaudid, Morphine, MS Contin, Meperidine, Oxycodone, Percocet, Fentanyl), non-opioid analgesics (i.e. Acetaminophen, Tramadol, Gabapentin), muscle relaxants (i.e. Baclofen, Diazepam, and anticoagulants/antiplatelet therapy for DVT prophylaxis).

Examination:

This section is intended to capture the most commonly used assessment tools for this case type/diagnosis. It is not intended to be either inclusive or exclusive of assessment tools.

Mental Status/Cognition: Alertness, orientation, safety awareness, ability to follow commands, learning preferences, and understanding and use of spinal orthosis should be assessed if applicable.

Pain: Measure using the Visual Analog Scale (VAS), Numeric Analog Scale (NAS) 0-10, or the Functional Pain Scale. Determine activities that may increase or decrease symptoms, location of symptoms, and nature of the pain. Intensity of pain at rest and with physical therapy treatment should be documented at every inpatient session. Plan of action such as pre-medication should also be included in the systems review. Other qualitative details of pain that are important to obtain include the frequency, alleviating/aggravating factors, and descriptors of pain.

Cardiovascular/Pulmonary: Assess supine and seated heart rate, blood pressure and oxygen saturation, as indicated based on patient presentation. Look for any changes with positioning. Patients may have an orthostatic response to positioning.

Endurance/Ability to monitor fatigue: Examination of activity tolerance by utilizing the rate of perceived exertion (RPE) scale or a gross subjective and objective assessment of fatigue level

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should be documented for patients. This should detail the amount of functional activity the patient was able to tolerate during the exam.

Integumentary: Assess the incision area, skin color edema, and presence of drains. Drains are used to remove the edema that accumulates intra-operatively and post-operatively. The drains are removed once the operative site's drainage has decreased to a certain amount. Drains and removal of drains is done on a case-by case basis determined by the surgeon. Types of drains include but are not limited to; intrathecal lumbar drains, Jackson Pratt drains and hemovac.

Range of motion (ROM): Upper and lower extremity quadrant screen as well as neck and trunk as appropriate.

Strength: Assess functional strength and myotomal upper and lower extremity manual muscle testing as appropriate. See appendix B for list of myotomes.

Sensation: Light touch in a dermatomal pattern (see Appendix B for list of dermatomes) and proprioception. If sensation to light touch/proprioception is impaired, then further sensation testing such as sharp/dull, or hot/cold may be indicated to rule out any further neurological damage.

Posture/alignment: Identify a presence of a kyphosis, scoliosis, and fit of orthosis if applicable.

- Lateral View: cervical, thoracic, lumbar alignment
- Anterior View: shoulder, pelvis, and knee position
- Posterior View: scapular position, presence/absence of scoliosis, and foot position

Balance: Static and dynamic balance should be assessed in sitting and standing. Standing balance can be assessed with use of the Romberg Test.

Functional Outcomes: Assessment of pt's performance with bed mobility, transfer training, ambulation and stair climbing as appropriate. The patient may benefit from use of a rolling walker initially for support during ambulation. Patient may progress to a cane or no assistive device as appropriate.

Functional Outcome Measures

The therapist may also use standardized testing to objectively report functional status and impairments. Common standardized tests used this in population include the AM-PAC - Mobility, Neck Disability Index, and the Oswestry Low Back Pain Questionnaire⁴.

Assessment:

The primary goal of inpatient physical therapy for a patient following spinal surgery is to maximize functional independence and safety while minimizing post-surgical impairments, activity and participation restrictions as a result of the surgery.

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Interventions most commonly used for this case type/diagnosis:

1. Therapeutic exercise program: Progress from supine to sitting and active ROM for upper and lower extremities if strength deficits exist. Use of weighted resistance is generally not indicated at this time
2. Education: See below.
3. Functional Mobility Training:
 - Bed mobility and supine ⇔ sit activities via log rolling
 - Transfer training (bed ⇔ chair ⇔ wheelchair ⇔ commode), using adaptive equipment, as appropriate (i.e. Rolling walker, cane)
4. Postural Training and ergonomics.
5. Balance Training: Sitting and standing activities static and dynamic activities as tolerated.
6. Gait Training
 - Assistive device prescription, as appropriate
 - As appropriate, progress to stair training prior to discharge home
7. Endurance Training
 - Increase patient's aerobic capacity during functional activities
 - Progressively increase time and frequency of transfers out of bed to chair or progress time, distance and frequency of ambulation.

Frequency & Duration: The frequency and duration of physical therapy intervention on an inpatient basis will be based on the patient's impairments and functional limitations. For most patients, a frequency of 4-6X/week for 7-10 days or less.

Patient / Family Education

- Assess learning style, patient goals, and motivators.
- Discuss realistic expectations regarding function, appropriate level of assist that patient requires from family, rehab progression.
- Instruct the patient and family members in the following techniques and assess their understanding via return verbalization and/or demonstration:
 - Spinal precautions (if applicable)
 - Donning/doffing spinal orthosis and wearing schedule (if applicable)
 - Deep breathing, coughing and splinting
 - Assessing the integument around the incision and areas that are under the brace if applicable
 - Supine and seated therapeutic exercise program
 - Safe mobility techniques encouraging maximal independence
 - Instruction in ways to minimize inflammation and control pain
 - Proper body mechanics
 - Spinal Precaution
- Written instructions available within the department to facilitate patient/family education include:

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- Instructions for use of spinal orthoses (Hard TLSO, LSO, Soft TLSO, Soft LSO/Warm and Form, Miami J, Philadelphia Collar)
- Post-Op Spine Patient education handout (Neuro and Ortho specific)

Recommendations and referrals to other providers.

Occupational Therapy: Consult for patients who present with impairments that affect their ability to perform activities of daily living independently, and who may have adaptive equipment needs. This applies to a small population of post-operative spinal surgery patients being discharged to home.

Ortho Tech: If an inpatient has been prescribed a pre-fabricated spinal orthotic (Philadelphia collar, Miami J, soft collar, Lumbosacral corset with or without moldable inserts), coordinate the actual measure, fit and patient education about the prescribed orthosis with the designated inpatient ortho tech. Inpatient therapists may fit these devices if individual competency has been obtained; otherwise, plan accordingly with the team or ortho tech. If the patient has not yet been out of bed, the ortho tech and assigned physical therapist need to coordinate their services (brace fit with mobility training). Please see the inpatient orientation manual for specific procedural instructions.

Orthotist: If a patient requires a custom made lumbosacral orthosis, thoracolumbosacral orthosis, cervical thoracolumbosacral orthosis, Jewett brace, Minerva brace, soft pre-fab TLSO and Miami J collar with thoracic extension. The Rehabilitation Services Department uses an outside orthotist vendor- Hanger. These braces are used for a small population of patients. The orthotist measures the patient for a brace and then fits them on the same or following day in collaboration with the PT evaluation. The orthotist is available for adjustments to the brace as needed.

Speech Language Pathology: May be indicated if a patient demonstrates impairments that affect their ability to communicate or to swallow. Often speech is consulted with patients undergoing cervical spine fusion via anterior approach.

Social Worker: May be indicated for patients with difficulty returning to work or social roles, or those patients facing financial or insurance issues that may impede accessibility of necessary resources.

Re-evaluation

- Standard Time Frame- Every 7-10 days while admitted
- A significant change in patient status (i.e.: return to the OR, acute MI, new orthotics etc)

Discharge Planning

Commonly expected outcomes at discharge:

Most patients are discharged to home with or without home physical therapy and home nursing services. Some patients may go to sub-acute rehab or a skilled nursing facility

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and will continue to progress toward their physical therapy goals, and initiate home planning as appropriate.

Criteria for Discharge home from a PT perspective:

- 1) Safe bed mobility, transfers, ambulation, stair climbing depending on a patient's social/environment factors.
- 2) Good understanding of precautions, weight bearing status, ROM, and safe demonstration and use of brace and progression of mobility
- 3) Clean appearing wound
- 4) Afebrile
- 5) Good pain control

Consider the following resources for continued therapy:

Home VNA PT: Home PT is indicated if the patient is functionally below their baseline level of function and presents with deficits in strength, ROM, balance, gait, functional mobility at discharge from the acute care setting.

Outpatient PT: Outpatient physical therapy is indicated if the patient is functioning independently in the home setting but continues to have a specific impairment or functional limitation that requires physical therapy to progress the patient to a higher functional level.

Reviewed/Updated/Revised 2019:

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Operative Management of Spinal Disorders

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Appendix A

ORTHOSES SPECIFICATIONS DEPARTMENT OF REHABILITATION SERVICES

Brace Name	Levels Supported	Purpose of Brace	Who fits?/Who places brace?	How to Order? Epic: Orthotech Prebricated Splints and Braces	Timeframe
Soft Collar		Comfort	BWH Ortho Tech	Extremity Type: Spine – choose soft collar	Same Day
Miami J Collar	C1 to C5	Stability/Immobilization	BWH Ortho Tech	Extremity Type: Spine- choose Miami J collar	Same day
Philadelphia Collar	C1 to C5	Stability/Immobilization Short term use <=72 hr, showering	BWH Ortho Tech	Extremity Type: Spine- choose Philadelphia collar	Same day
Miami JTO	C1 to T1	Stability/Immobilization	Orthotist (outside vendor)	Extremity Type: Spine- select Other -write in comments	Same day except Sundays

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Minerva & SOMI	C1 to T1	Stability/Immobilization	Orthotist (outside vendor)	Extremity Type: Spine- select Other -write in comments	Same day except Sundays
CTLSO	C1 to S1	Stability/Immobilization	Orthotist (outside vendor)	Extremity Type: Spine- select Other -write in comments	24 Hrs for delivery, except Sunday Custom
Jewett	Low thoracic and lumbar spine	Postural Awareness/comfort	Orthotist (outside vendor)	Extremity Type: Spine- select Other -write in comments	Same day except Sundays

Cash	Low thoracic and lumbar spine	Postural Awareness/comfort	Orthotist (outside vendor)	Extremity Type: Spine- select Other -write in comments	Same day except Sundays
Hard TLSO	T5 to S1	Stability/Immobility	Orthotist (outside vendor)	Extremity Type: Spine- select Other -write in comments	24 Hrs for delivery, except Sunday Custom
Soft TLSO	Thoracolumbar	Postural Awareness/comfort	Orthotist (outside vendor)	Extremity Type: Spine- select Other -write in	Same day except Sunday

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				comments	
LSO with insert	lumbar	Comfort	BWH Ortho Tech	Extremity Type: Spine- choose LSO with insert	Same day
LSO without insert	lumbar	Comfort	BWH Ortho Tech	Extremity Type: Spine- choose LSO without insert	Same day
Hard LSO	T11 to S1	Stability/Immobility	Orthotist (outside vendor)	Extremity Type: Spine- select Other -write in comments	24 Hrs for delivery, except Sunday Custom

Appendix B

Cervical and Lumbar Spine Neurological Screen

Neurological Level	Motor	Dermatome
C1-C2	Neck Flexion	Occiput
C3-C4	Shoulder Elevation	Supraclavicular
C5	Shoulder Abduction	Lateral Deltoid
C6	Wrist Extension	Radial Forearm
C7	Wrist Flexion	Middle Finger
C8	Thumb Abduction	Ulnar Forearm
T1	Finger Abd/Add	Medial Elbow
L1-L2	Hip Flexion	Groin
L3-L4	Knee Extension	Anterior Thigh
L4	Ankle DF	Medial Leg/Foot
L5	Great Toe Extension	Dorsum of Foot
S1	Foot Eversion	Lateral Foot
S2	Ankle PF	Posterior Calf

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