Medical Policy

***Current Policy Effective Date: 5/1/25**
(See policy history boxes for previous effective dates)

Title: Positional Magnetic Resonance Imaging

Description/Background

Positional magnetic resonance imaging (MRI) allows imaging of the patient in various positions, including sitting and standing. This technology is being evaluated for the diagnosis of patients with position-dependent back pain.

Back Pain
Determining the cause of back pain is a complex task. In some patients, extensive evaluation with various imaging modalities does not lead to a definitive diagnosis. Some recent studies have suggested that imaging the body in various positions with “loading” of the spine may lead to more accurate diagnosis. This loading can be accomplished by having the patient sit or stand upright. Also, imaging can be completed with the patient in the position that causes the symptom(s). This is being evaluated in suspected nerve root compression and in some cases of spondylolisthesis.

Diagnosis
An open magnetic resonance imaging (MRI) system has been developed that allows imaging of the patient in various positions. The imaging can be conducted with partial or full weight bearing. Dynamic-kinetic imaging (images obtained during movement) can also be obtained with this system. Conventional MR imaging of the spine is typically completed with the patient in a recumbent position. Weight bearing can be simulated by imaging in the supine position with a special axial loading device.

One concern with positional MRI is the field strength of the scanners. Today’s clinical MRI scanners may operate at a field strength between 0.1 Tesla (T) to 3 T and are classified as either low-field (<0.5 T), mid-field (0.5-1.0 T), or high-field (>1.0 T). Low-field MRI is typically used in open scanners. Open scanners are designed for use during interventional or intraoperative procedures, when a conventional design is contraindicated (e.g., an obese or claustrophobic patient), or for changes in patient positioning.

In general, higher field strength results in an increase in signal-to-noise ratio, spatial resolution, contrast and speed. Thus, low-field scanners produce poorer-quality images compared to high-field scanners, and the longer acquisition times with low-field scanners increases the possibility of image degradation due to patient movement. However, field strength has less of an effect on the contrast-to-noise ratio, which determines the extent to which adjacent structures can be distinguished from one another.

Regulatory Status:

Several MRI systems have been cleared for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process as open or total body systems for positional imaging. One such system is FONAR's Upright® MRI. FDA product code: LNH.

Medical Policy Statement

Positional MRIs are considered experimental/investigational, including their use in the evaluation of patients with cervical, thoracic, or lumbosacral back pain. The use of positional MRIs has not demonstrated improved patient outcomes.

Inclusionary and Exclusionary Guidelines

N/A

CPT/HCPCS Level II Codes *(Note: The inclusion of a code in this list is not a guarantee of coverage. Please refer to the medical policy statement to determine the status of a given procedure)*

Established codes:

N/A

Other codes (investigational, not medically necessary, etc.):

76498*

**Currently, there is no way to signify with coding that a magnetic resonance imaging (MRI) is open or positional.*

Rationale

Evidence reviews assess whether a medical test is clinically useful. A useful test provides information to make a clinical management decision that improves the net health outcome. That is, the balance of benefits and harms is better when the test is used to manage the condition than when another test or no test is used to manage the condition.

The first step in assessing a medical test is to formulate the clinical context and purpose of the test. The test must be technically reliable, clinically valid, and clinically useful for that purpose. Evidence reviews assess the evidence on whether a test is clinically valid and clinically useful. Technical reliability is outside the scope of these reviews, and credible information on technical reliability is available from other sources.

POSITIONAL MAGNETIC RESONANCE IMAGING

Clinical Context and Test Purpose

The purpose of positional magnetic resonance imaging (MRI) in individuals with position-dependent back or neck pain is to inform a decision whether the pain can be attributed to changes in the spinal canal. For example, pressure on the spinal cord from a herniated disc may be increased with sitting when compared to standing.

The question addressed in this evidence review is: Does use of positional MRI improve health outcomes in patients who have position-dependent back or neck pain?

The following **PICOs** was used to select literature relevant to the review.

Populations

The population of interest is individuals who are being evaluated for position-dependent back or neck pain.

Interventions

The intervention is positional MRI using seated or standing positions in neutral, extension, and flexion.

Comparators

The following test is currently being used to make decisions about managing position-dependent back or neck pain: conventional supine MRI, which is the reference standard. Studies comparing positional MRI with loaded supine MRI are also of interest.

Outcomes

In evaluating this approach to imaging, it is important to determine whether MRI results in additional diagnostic information. However, it is also important to determine whether treatment of these additional findings results in improved outcomes. This additional step is important given the previously described false-positive findings with MRI of the spine. For example, Jarvik et al (2001) reported that many MRI findings have a high prevalence in subjects without low back pain, and that findings such as bulging discs and disc protrusion are of limited diagnostic use. They also reported that the less common findings of moderate or severe central stenosis, root compression, and disc extrusion were more likely to be clinically relevant.[1] The health outcomes of interest include symptoms (e.g., pain), self-reported functional outcomes, and quality of life measures.

Study Selection Criteria

For the evaluation of the clinical validity of positional MRI, studies that met the following eligibility criteria were considered:

- Reported on the accuracy of the marketed version of the technology (including any algorithms used to calculate scores)
- Included a suitable reference standard (describe the reference standard)
- Patient/sample clinical characteristics were described
- Patient/sample selection criteria were described.

Clinically Valid

A test must detect the presence or absence of a condition, the risk of developing a condition in the future, or treatment response (beneficial or adverse).

Imaging Under Loading Stress

Dahabreh et al (2011), the Tufts Medical Center Evidence-based Practice Center for the Agency for Healthcare Research and Quality (AHRQ) prepared a systematic review of emerging MRI technologies for musculoskeletal imaging under loading stress.[2] Included were 36 studies that used positional weight-bearing MRI in patients with musculoskeletal conditions. Also included were studies evaluating axial compression devices. Most studies were cross-sectional or had case-control designs. The most commonly imaged body region was the lumbar spine. Four studies of lumbar spine were identified that compared positional weight-bearing MRI with conventional MRI, myelography, or non-weight-bearing imaging in the same MRI device, however, these studies did not report the effect of the technology on patient outcomes. Two studies of foot imaging that compared weight-bearing MRI with MRI in the supine position with the same MRI device found that the 2 techniques provided similar information. Two studies of imaging the knee joint found differences between weight-bearing MRI and non-weight-bearing MRI using the same device; no functional outcomes were reported. The potential effect on image quality of low magnetic field strengths ($\leq$ 0.6 Tesla) in weight-bearing MRI scanners was not assessed. The systematic review concluded that despite the large number of available studies, considerable uncertainty remains about the utility of this technique for the clinical management of musculoskeletal conditions. Examples of primary studies and key studies published after the systematic review are described next.

Positional MRI in Neutral, Flexion, and Extension (Kinetic MRI)

Systematic reviews published in 2014 (Lao et al and Lord et al) have indicated that the literature on positional (kinetic) MRI consists primarily of examining anatomic changes in neutral, flexion, extension, and axial rotation.[3,4] For example, kinetic MRI studies in healthy and symptomatic individuals have identified changes in neuroforaminal size, cord compression, cord length, cross-sectional area, ligamentum flavum thickness, and motion at the index and adjacent levels.

Seated MRI vs. Supine MRI

In 2007, Ferreiro Perez et al compared recumbent and upright-sitting positions in 89 patients with disc herniation or spondylolisthesis (cervical or lumbar spine).[5] Using a 0.6 T Upright MRI system for both positions, pathology (disc herniation or spondylolisthesis) was identified in 68 patients (76%). Images from 18 patients (20%) were not interpretable due to motion artifact. Pathologic features were better identified (i.e., either only evident or seen to be enlarged) in 52 of the 68 patients (76%) when in the sitting position; 10 of these were only observed in the sitting position. Pathologic features were better identified in the recumbent position in 11 of the 68 patients (16%). The overall underestimation rate was calculated to be 62% for patients in the recumbent position and 16% for those in the upright-seated position. This research suggests that there may be advantages when the position during imaging is matched with the positional symptoms of the patient. However, a more appropriate comparison group would be a standard recumbent clinical MRI system (e.g., field strength >0.6 T). In addition, technical problems with motion artifact were due to poor stabilization in an upright-sitting position.

Standing MRI vs. Supine MRI
In a 2013 study by Tarantino, 57 patients with low back pain when standing (50% also had back pain in the supine position) received an MRI in both upright and recumbent positions using a 0.25 T tilting system.[6] A table tilt of 82 degrees was used to reproduce the orthostatic position without the patient instability associated with standing at 90 degrees. In comparison with the supine position, there was a significant decrease in intervertebral disc thickness (11.2 mm vs. 12.9 mm) along changes in other measures and a qualitative increase in the volume of disc protrusions and/or spondylolisthesis in the upright position.

Standing MRI vs. Axial Loaded Supine MRI
In a study by Charoensuk et al (2021), 54 patients suspected of having spinal stenosis underwent both standing MRI and MRI plus axial loading using a compression device.[7] Primary outcome measures included measures of the intervertebral disc (i.e., cross-sectional area [DA], disc height [DH], and anteroposterior distance [DAP]), dural sac (cross-sectional area [DCSA]), spinal curvature (i.e., lumbar lordosis [LL] and L1-L3-L5 angle [LA]), and total lumbar spine height (LH). Results showed that there was a major difference observed with LL, but minor differences observed in DCSA, DAP, DA, LA, and LH. This suggests that the standing position might be adequately simulated while recumbent by utilizing an axial-loaded MRI using a compression device.

A 2008 study (Madsen et al) compared vertical (standing) MRI and recumbent MRI with axial loading in patients with lumbar spinal stenosis.[7] Sixteen patients with neurogenic claudication, experienced mainly during walking or in an erect position, were recruited for this phase of the study. Each patient underwent 4 scans with a 0.6 T Upright MRI system, consisting of vertical, horizontal with compression at a load of 40% of body weight, horizontal with no load, and finally horizontal with a 50% axial load. All horizontal scans were conducted with a cushion placed below the lower back to induce extension of the lumbar spine. Results showed similar dural sac cross-sectional area (DCSA) between the 2 positions, suggesting that the standing position may be adequately simulated while recumbent by axial loading and lordosis. Results were not correlated with patient symptoms in this study.

Clinically Useful
A test is clinically useful if the use of the results informs management decisions that improve the net health outcome of care. The net health outcome can be improved if patients receive correct therapy, or more effective therapy, or avoid unnecessary therapy, or avoid unnecessary testing.

Direct Evidence
Direct evidence of clinical utility is provided by studies that have compared health outcomes for patients managed with and without the test. Because these are intervention studies, the preferred evidence would be from randomized controlled trials.

No evidence from randomized controlled trials was identified to support the use of positional MRI for position-dependent back or neck pain. Moreover, the systematic review by Dahabreh et al (2011) concluded that, despite a large number of available studies, considerable uncertainty remained about the utility of this technique for the clinical management of musculoskeletal conditions.[2]

Chain of Evidence

Indirect evidence on clinical utility rests on clinical validity. If the evidence is insufficient to demonstrate test performance, no inferences can be made about clinical utility.

Because the clinical validity of positional MRI for diagnosis of position-dependent back or neck pain has not been established, a chain of evidence cannot be constructed.

SUMMARY OF EVIDENCE

For individuals who have position-dependent back or neck pain who receive positional magnetic resonance imaging (MRI), the evidence includes comparative studies. Relevant outcomes are test accuracy, symptoms, functional outcomes, and quality of life. Although positional MRI may result in new findings, no studies were found that described clinical outcomes of patients whose treatments were selected based on these new findings. The clinical benefit of basing treatment decisions, including surgery, on these additional findings needs to be established. Studies that correlate positional MRI findings with patient symptoms and outcomes of treatment are also needed. The evidence is insufficient to determine the effects of the technology on health outcomes.

Ongoing and Unpublished Clinical Trials

A search of ClinicalTrials.gov did not identify any ongoing or unpublished trials that would likely influence this review.

SUPPLEMENTAL INFORMATION

Clinical Input Received through Physician Specialty Societies and Academic Medical Centers

While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during this process, through the provision of appropriate reviewers, input received does not represent an endorsement or position statement by the physician specialty societies or academic medical centers, unless otherwise noted.

2008 Input

In response to the request for input through physician specialty societies and academic medical centers, information was received from 1 physician specialty society and 1 academic medical center while the policy was under review in 2008. Both reviewers agreed that positional MRI is considered investigational.

PRACTICE GUIDELINES AND POSITION STATEMENTS

No practice guidelines and/or position statements identified.

U.S. Preventive Services Task Force Recommendations

Not applicable.

Government Regulations
National/Local:

There is no national or local coverage determination on this topic. There is an NCD (publication 100-3, manual section 220.2, version 5) for Magnetic Resonance Imaging effective 7/7/11, which states that MRI is useful in examining the head, central nervous system, and spine. However, this NCD does not include information on positional MRI.

(The above Medicare information is current as of the review date for this policy. However, the coverage issues and policies maintained by the Centers for Medicare & Medicare Services [CMS, formerly HCFA] are updated and/or revised periodically. Therefore, the most current CMS information may not be contained in this document. For the most current information, the reader should contact an official Medicare source.)

Related Policies

N/A

References

1. Jarvik JJ, Hollingworth W, Heagerty P et al. The Longitudinal Assessment of Imaging and Disability of the Back (LAIDBack) Study: baseline data. Spine (Phila Pa 1976) 2001; 26(10):1158-66.
2. Dahabreh IJ, Hadar N, Chung M. Emerging magnetic resonance imaging technologies for musculoskeletal imaging under loading stress: scope of the literature. Ann Intern Med 2011; 155(9):616-24.
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4. Lord EL, Alobaidan R, Takahashi S, et al. Kinetic magnetic resonance imaging of the cervical spine: a review of the literature. Global Spine J. Jun 2014;4(2):121-128. PMID 25054099
5. Ferreiro Perez A, Garcia Isidro M, Ayerbe E et al. Evaluation of intervertebral disc herniation and hypermobile intersegmental instability in symptomatic adult patients undergoing recumbent and upright MRI of the cervical or lumbosacral spines. Eur J Radiol 2007; 62(3):444-8.
6. Tarantino U, Fanucci E, Iundusi R et al. Lumbar spine MRI in upright position for diagnosing acute and chronic low back pain: statistical analysis of morphological changes. J Orthop Traumatol 2013; 14(1):15-22.
7. Charoensuk J, Laothamatas J, Sungkarat W, et al. Axial loading during supine MRI for improved assessment of lumbar spine: comparison with standing MRI. Acta Radiol. Jan 2023; 64(1): 217-227. PMID 34939453
8. Madsen R, Jensen TS, Pope M et al. The effect of body position and axial load on spinal canal morphology: an MRI study of central spinal stenosis. Spine (Phila Pa 1976) 2008; 33(1):61-7.
9. HAYES Medical Technology Directory. Upright Magnetic Resonance Imaging for Diagnosis of Spinal Disorders. Lansdale, PA: HAYES, Inc., Publication date: September 4, 2014. Last update: August 2017. Archived October 2019.

The articles reviewed in this research include those obtained in an Internet based literature search for relevant medical references through January 2025, the date the research was completed.

Joint BCBSM/BCN Medical Policy History

Policy Effective Date	BCBSM Signature Date	BCN Signature Date	Comments
1/1/10	10/29/09	10/13/09	Joint policy established
9/1/12	6/12/12	6/19/12	Routine maintenance
11/1/13	8/22/13	9/3/13	Routine maintenance
3/1/15	12/12/14	12/29/14	Routine review of investigational service. No change in policy status.
5/1/16	2/16/16	2/16/16	Routine review
5/1/17	2/21/17	2/21/17	Routine policy maintenance. No change in policy status.
5/1/18	2/20/18	2/20/18	Routine policy maintenance. Eliminated some references. No change in policy status.
5/1/19	2/19/19		Routine policy maintenance, no change in policy status.
5/1/20	2/18/20		Routine policy maintenance. No change in policy status.
5/1/21	2/16/21		Routine policy maintenance. No change in policy status.
5/1/22	2/15/22		Routine policy maintenance, no change in policy status.
5/1/23	2/21/23		Routine policy maintenance, no change in policy status. (ds)
5/1/24	2/20/24		Updated rationale, added reference #7, no change in policy status. Vendor managed: N/A (ds)
5/1/25	2/18/25		Routine policy maintenance, no change in status. Vendor managed: N/A (ds)

Next Review Date: 1st Qtr. 2026

BLUE CARE NETWORK BENEFIT COVERAGE
POLICY: POSITIONAL MAGNETIC RESONANCE IMAGING

I. Coverage Determination:

Commercial HMO (includes Self-Funded groups unless otherwise specified)	Not covered
BCNA (Medicare Advantage)	See government section.
BCN65 (Medicare Complementary)	Coinsurance covered if primary Medicare covers the service.

II. Administrative Guidelines:

N/A