I. Aetna considers lumbar provocative discography medically necessary for evaluation for disc pathology in persons with persistent, severe low back pain (LBP) and abnormal interspaces on magnetic resonance imaging (MRI), where other diagnostic tests have failed to reveal clear confirmation of a suspected disc as the source of pain, and surgical intervention is being considered.

Aetna considers lumbar provocative discography experimental and investigational for all other indications (e.g., lumbosacral radiculopathy and chronic non-specific back pain when criteria above are not met) because its effectiveness for indications other than the ones listed above has not been established.

II. Aetna considers cervical and thoracic provocative discography experimental and investigational because there is insufficient evidence to support their effectiveness.
III. Aetna considers functional anesthetic discography
(involving injection of anesthestic directly into the disc)
experimental and investigational because there is
insufficient evidence to support its clinical utility.

IV. Aetna considers contrast disc analysis and mapping
experimental and investigational because its clinical
value has not been established.

**Note:** According to guidelines from the American Association
of Neurological Surgeons/Congress of Neurological Surgeons
(Resnick et al, 2005), lumbar provocative discography is not
recommended as a stand-alone test for treatment decisions
in persons with LBP. It should not be attempted in individuals
with normal lumbar MRI.

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**Background**

Chronic low back pain (LBP) is a common health issue in the
United States with significant economic consequences for the
afflicted individuals. Available evidence suggest that the
intervertebral disc is one of the most common sources of LBP,
accounting for approximately 40 % of cases. The pathological
basis for discogenic LBP might entail full-thickness radial tears
of the annulus fibrosus. While magnetic resonance imaging
(MRI) can image the internal morphology of the intervertebral
disc, Zhou and Abdi (2006) reported that relative low
sensitivity (26.7 % to 59 %) as well as high false-positive (24
%) and false-negative (38 %) rates decrease the value of MRI
in screening for the existence of internal disc disruption as a
cause for discogenic LBP. Furthermore, many radiographical
abnormalities observed on MRI in patients with LBP are also
seen in asymptomatic individuals.
While MRI can detect disc degeneration, it cannot confirm if a disc is symptomatic and responsible for the patient's pain syndrome. Lumbar discography (also known as lumbar provocative discography and provocative lumbar discography) is a test that is used to ascertain if a disc is painful on injection. It is an invasive procedure that entails the injection of radiopaque contrasting materials (1 to 3 ml) into the intervertebral disc followed by computed tomography (CT) to examine disc abnormality. Discography can provide radiographical evaluation of the integrity of the nucleus pulposus and annular rings to determine tears or other lesions that could be the cause of LBP. It can measure disc nociception – a normal disc should not cause pain when injected; however, a disc that is physiologically compromised can mimic the pain experienced by the patient.

Discography is usually carried out when other diagnostic tests have failed to identify the cause of LBP. However, its use is still controversial. Carragee and colleagues (2006) investigated the hypothesis that provocative discography by strict criteria accurately identifies a LBP illness due to a primary disc lesion. Over a 5-year period using a strict enrollment protocol, 32 patients with low LBP and a positive single-level low-pressure provocative discogram, underwent spinal fusion. Subjects with known patient selection co-morbidities were excluded. Generic surgical limitations/morbidity were controlled by comparison to the clinical outcomes of a strictly-matched cohort of 34 patients having a well-accepted single-level lumbar pathology (unstable spondylolisthesis). Treatment success was compared between groups. In the control-spondylolisthesis group, 23 of 32 patients (72 %) met the highly effective success criteria compared with 8 of 30 in the presumed discogenic pain cohort (27 %). The proportion of patients who met the "minimal acceptable outcome" was 29 of 32 (91 %) in the spondylolisthesis group and 13 of 30 (43 %) in the presumed discogenic pain group. Adjusting for surgical morbidity and dropout failure, by either criteria of success, the best-case
positive predictive value of discography was calculated to be 50 to 60%. The authors concluded that positive discography was not highly predictive in identifying bona fide isolated intradiscal lesions primarily causing chronic serious LBP illness in this first study comparing discography results to a gold standard.

Wichman (2007) stated that lumbar discography has been used to identify the source of LBP when non-invasive imaging (e.g., MRI) does not reveal morphologic abnormality consistent with symptoms. Controversy regarding the usefulness of discography has been ongoing for over 50 years. Modern advancements with imaging and technique still have not been sufficient to justify the practicality of this procedure for standard use. Based on review of current literature, pain provoked by discography of normal appearing discs on MRI were likely due to internal disc disruption, increased pain sensitivity, and false positive result with chronic pain, psychological state, central hyperalgia, and technical difficulty of the procedure. These causes of positive pain provocation are not amendable to invasive treatment. In these cases, an invasive diagnostic procedure to identify problems best treated with conservative management is not practical. The author concluded that there is no clear evidence-based purpose for discography in the diagnosis and treatment of LBP.

On the other hand, there are studies that found discography to be useful in the management of patients with LBP. Yuan and associates (2006) examined the clinical importance of discography and CT after discography (CTD) in lumbar disc diseases, and compared CTD with MRI. A total of 265 patients (177 males and 79 females, 298 discs) with back and leg pain underwent discography followed by CT 2 hours later. All discs were classified into 7 types according to the findings by discography and CTD. Comprehensive MRI pictures were available in 237 of the 265 patients (with 257 discs); they accepted the MRI classification and were compared with the CT-discographic findings. A total of 245 patients underwent
operation, among which 247 discs showed visual lesions during the procedure and 238 cases (96.4 %) had their disc diseases diagnosed accurately through discography and CTD. Considering the positive screening rate for the discogenic abnormality, the difference was of statistical significance between the CTD and MRI groups (p < 0.01). MRI was considered to have limited value in disc diseases with passive discographic finding. These investigators concluded that discography is a safe and effective assistant diagnostic tool, which can gather special information regarding disc abnormality. The matched-group study showed that MRI and CTD can not replace each other. MRI may act as the screening tool for disc diseases, but is inferior to CTD, especially for the contiguous disc structure in the spinal fixation procedure.

Hao and associates (2006) examined the diagnostic value of lumbar discography in discogenic LBP and the effects of intervertebral fusion surgery. A total of 45 patients with 101 discs underwent discography, 360 degree fusion manipulation were performed on 18 discography abnormal cases, 27 cases were treated conservatively. Discography, MRI and provocative pain were observed and all the cases were followed-up. Twenty-one cases showed positive provocative pain (21/45, 47 %), and 21 discs of 101 were concordant discography (21/101, 21 %). All cases were followed for an average 16 months (15 to 23 months), the satisfactory rate was 83 % (15/18) in the surgery group and 41 % (11/27) in the conservative group. The authors concluded that the discography is moderately sensitive in the diagnosis of discogenic LBP. Furthermore, the short-term follow-up reveals that operative group has better pain relief than the conservatively-treated group.

Kosharskyy and Rozen (2007) stated that diagnosing discogenic LBP is essential to successful treatment. Traditionally, this should be a LBP in a "band-like" distribution without radiculopathy that is worse in the morning, worse with
Valsalva, and aggravated by standing in flexion. These researchers noted that provocative discography with manometric monitoring plays an important role in aiding the diagnosis.

Buenaventura and associates (2007) evaluated the diagnostic accuracy of discography with respect to chronic spinal pain. Study inclusion/exclusion criteria were based on the modern practice of discography. Selected studies were then subjected to 2 rating instruments for diagnostic accuracy studies (AHRQ and QUADAS). Specific data were then culled from these studies and tabulated. Evidence was then classified into 5 levels: (i) conclusive, (ii) strong, (iii) moderate, (iv) limited, or (v) indeterminate. Evidence is strong for the diagnostic accuracy of discography as an imaging tool. Evidence is also strong for the ability of discography to evoke pain. There is strong evidence supporting the role of discography in identifying that subset of patients with lumbar discogenic pain. There is moderate evidence supporting the role of discography in identifying a subset of patients with cervical discogenic pain. There is limited evidence supporting the role of discography in identifying a subset of patients with thoracic discogenic pain. The authors concluded that discography is a useful imaging and pain evaluation tool in identifying a subset of patients with chronic spinal pain secondary to intervertebral disc disorders. The North American Spine Society's position statement on lumbar discography (Guyer 2003) stated that most of the literature supported the use of discography in select situations. Indications for discography include (i) evaluation of patients with abnormal discs to help assess the extent of abnormality or correlation of the abnormality with the clinical symptoms, which may include recurrent pain from a previously operated disc and lateral disc herniation, (ii) evaluation of patients with persistent, severe symptoms in whom other diagnostic tests have failed to reveal clear confirmation of a suspected disc as the source of pain, (iii) evaluation of patients who have failed surgical
intervention to ascertain if there is painful pseudarthrosis or a symptomatic disc in a posteriorly fused segment and to help assess possible recurrent disc herniation, (iv) evaluation of patients before spinal fusion to determine if the lumbar discs within the proposed fusion segment are symptomatic and to ascertain if discs adjacent to this segment are normal, and (v) evaluation of candidates for minimally invasive surgical intervention to confirm a contained disc herniation or to investigate dye distribution pattern before chemonucleolysis or percutaneous procedures.

The American Association of Neurological Surgeons/Congress of Neurological Surgeons’ guidelines for the performance of fusion procedures for degenerative disease of the lumbar spine (Resnick et al, 2005) stated that discography is not recommended as a stand-alone test for treatment decisions in patients with LBP. It should not be attempted in patients with normal lumbar MRI. Discography appears to have a role in the evaluation of patients with LBP, but it is best limited to the evaluation of abnormal interspaces identified on MRI, the investigation of adjacent-level disc disease, and as a means to rule out cases of non-organic pain from surgical consideration.

While discography may play a role in the evaluation of patients with discogenic LBP, its role in cervical and thoracic discogenic pain is not firmly established. Cervical discography has been employed to aid in ascertaining the specific level or levels causing cervical pain and, potentially, which levels to fuse (Zheng et al, 2004; Wieser and Wang, 2007). The American College of Radiology's panel on musculoskeletal imaging for chronic neck pain (Daffner et al, 2005) did not recommend discography for the evaluation of patients with chronic neck pain. Furthermore, the American Society of Interventional Pain Physicians’ evidence-based practice guidelines in the management of chronic spinal pain (Boswell
et al, 2007) stated that among the diagnostic interventions, the evidence is strong for lumbar discography, whereas, the evidence is limited for cervical and thoracic discography.

Although lumbar discography may play a role in evaluating patients with discogenic LBP and aids in selecting patients for surgical intervention, it does not appear to improve surgical outcomes. Madan et al (2003) reported on their findings of 73 consecutive patients who underwent postero-lateral interbody and posterior spinal arthrodesis for discogenic LBP that is refractory to non-operative management. Chronologically, the first 41 patients (group A) were indicated without discography, whereas the remaining 32 patients (group B) had been indicated only if their pain had been reproduced during disc injection. The 2 groups were similar in demographical, psychometrical, and radiological parameters. Average follow-up times for group A and group B were 2.8 years and 2.4 years, respectively, both with a 2-year minimum. Using modified Oswestry scoring, group A and group B patients had satisfactory outcomes of 75.6 % and 81.2 %, respectively. This difference was neither statistically significant nor suggestive. The authors concluded that pre-operative lumbar discography did not improve surgical outcomes after circumferential fusion for discogenic LBP.

Cohen and associates (2005) provided a clinical overview of lumbar discography and discogenic LBP, with special emphasis on determining the accuracy of discography and if the procedure improves outcomes for surgery. Based on a large number of comparative studies, plain discography is less accurate than MRI in diagnosing lumbar herniated nucleus pulposus and comparable or slightly more sensitive in detecting degenerative disc disease. For disc degeneration, discography followed by CT remains the gold standard for diagnosis. There are very few studies comparing surgical outcomes between patients who have undergone pre-operative provocative discography and those who have not. What little evidence exists is conflicting. Before disc
replacement surgery, approximately half the studies have used pre-operative discography. A comparison of outcomes did not reveal any significant difference between the 2 groups, but none of the studies was controlled, and they used different outcome measures, follow-up periods, and surgical techniques. The authors concluded that although discography, especially when combined with CT, may be more accurate than other radiological studies in detecting degenerative disc disease, its ability to improve surgical outcomes has yet to be proven.

Willems et al (2007) assessed if the pre-operative status of the adjacent discs, as determined by provocative discography, has an impact on the clinical outcome of lumbar fusion in patients with chronic LBP. In 197 patients with an equivocal indication for lumbar fusion (2/3 were patients with prior spine surgery), the decision for either lumbar fusion or conservative management was determined by a temporary external transpedicular fixation trial. During the diagnostic work-up, all patients had undergone provocative discography that included the assessment of the discs adjacent to the intended fusion levels. The individual changes in pain on a visual analog scale, assessed before treatment and at follow-up, and patient satisfaction were the outcome measures. In the 82 patients who underwent a lumbar fusion, no difference in outcome was found between those patients with degenerative or symptomatic discs adjacent to the fusion and those with normal adjacent discs. The authors concluded that in this cohort study of chronic LBP patients with an uncertain indication for lumbar fusion, the pre-operative status of adjacent levels as assessed by provocative discography did not appear to be related to the clinical outcome after fusion.

While discography may demonstrate the connection between an abnormal image and the source of LBP, it does have notable related risks. The most serious complication of lumbar discography is discitis, a post-discography infection with an incidence of 1 to 4 % (Osti et al, 1990). It is thought to be the
consequence of bacterial penetration of the disc by a needle contaminated with skin flora. The use of prophylactic antibiotics has been advocated, although there is question regarding the effectiveness of this approach and possible adverse effects on disc cells. Willems and colleagues (2004) studied the incidence of post-discography discitis without the use of prophylactic antibiotics in a consecutive patient group. Additionally, a systematic literature review was performed using strict criteria: (i) discography was performed by means of a double-needle technique, (ii) complications such as discitis were specifically looked for at follow-up, and (iii) the exact numbers of patients and those lost to follow-up were reported. The clinical results of 200 patients with 100% follow-up for a minimum period of 3 months showed no case of discitis. In the literature review, 10 studies were selected. Nine studies without prophylactic antibiotics reported an overall incidence of 12 cases in 4,891 patients (0.25%) or 12,770 discs (0.094%). The only study with prophylactic antibiotics (127 patients) showed no case of discitis. The authors concluded that regarding the small number of patients in the only study in which antibiotics were used and the overall low incidence of post-discography discitis, not enough evidence was found that prophylactic antibiotics can prevent discitis. It was concluded that in lumbar discography by means of a double-needle technique without prophylactic antibiotics, the risk of post-discography discitis is minimal and there is not insufficient evidence to justify the routine use of prophylactic antibiotics.

An assessment by the Centers for Medicare & Medicaid Services (CMS, 2008) has concluded that the effect of discography on clinical outcomes is uncertain. The CMS explained that uncertainty exists in the selection of appropriate patients for the various procedures to treat low back pain that is suspected to be caused by the disc. CMS noted that patient symptoms alone do not accurately point to the disc as the source of pain. The CMS assessment explained that
identifying the pain generator in LBP is challenging due to the anatomic complexity of the spine and poor understanding of neurophysiologic mechanisms of pain sensation.

The CMS assessment stated that the literature maintains that for clinicians to identify patients appropriate for back pain procedures, positive provocative discography and either MRI and/or CT indicating IDD (or disease) should be relied on. Citing an assessment by the Danish Centre for Evaluation of Health and Technology (DACETA, 2003), the CMS assessment stated "[h]owever, the value of discography as a diagnostic tool in the identification of discogenic pain is controversial. The benefit of discography and abnormalities in imaging studies in guiding a patient's treatment for back pain is questioned." The CMS assessment cited evidence that patients with nonspinal back pain and asymptomatic patients can have positive discography. The CMS assessment also cited evidence that, in patients with LBP, provocation discography can be positive in the absence of imaging structural or physiologic abnormalities. The CMS assessment also cited evidence that showed that, while imaging studies can demonstrate structural and physiologic abnormalities, there is no correlation with either the presence or severity of LBP. The assessment noted that, in fact, patients can have annular tears on MRI or CT and be asymptomatic. The CMS assessment quoted Chou et al (2005), who stated, "Although a bright, focal increase of T2-weighted magnetic resonance signal in the posterior annulus (the so-called high intensity zone lesion) is correlated with annular tears, it is not correlated with low back pain." The CMS assessment also found that Slipman et al (2001) showed no statistical correlation between the side of the patients' concordantly painful annular tear and the side of the patients' LBP during discography. The CMS assessment found that these findings directly question if the annular tear, whose natural history is unknown, is the pain generator being tested during discography. The CMS assessment concluded that, "[i]n summary, the effect that discography has on patient outcomes (mediated through the
choice of therapy) is uncertain and no specific anatomic lesion has been proven to be the source of discogenic low back pain."

An assessment of provocative discography prepared for the Washington State Health Technology Assessment Program by the ECRI Institute (Schoelles et al, 2007) reached similar conclusions about the lack of reliable evidence of the clinical utility of this test. The assessment concluded that, "due to the lack of evidence of sufficient quality, we drew no conclusions about whether performing discography influences clinical outcomes." The assessment identified 3 studies that they judged to be of "low quality" that addressed prediction of surgical success and outcomes; 2 of these studies were found to be not favorable. They identified no study that addressed impact on therapeutic decisions.

The Washington State Health Technology Clinical Committee (HTCC, 2008) found that current evidence does not demonstrate that provocative discography produces reliable results, even though expert opinion evidence supports the use of discography to rule out surgery. The Committee found that the available evidence on specificity is of low quality and focuses on a secondary result of whether the same reader can later read the test in the same way, instead of the more substantive data on whether administering the test at different times produces the same results. The second issue is that the primary outcome relied upon in the test is the replication of normal pain. The Committee observed that there is wide clinical debate on the ability to measure accurately, and the meaning of, the subjective pain response. The relevance is made more unclear by findings that there is no established clinical case definition for degenerative disc disease other than radiographic and other imaging descriptions. The issue of false positives and reliability (percent agreement) are also a key concern raised by several studies, including studies that demonstrated a high rate of positive discography findings in asymptomatic individuals. The Committee noted that patients
may be subject to additional tests and risks of invasive therapies unnecessarily. The Committee found that no professional guideline recommends provocative discography as a stand alone or pre-operative diagnostic test. MRI is recommended as the diagnostic test of choice. The Committee noted that several guidelines do not recommend the use of provocative discography at all, while several advocate its use in addition to other tests.

Carragee et al (2009) compared progression of common degenerative findings between lumbar discs injected 10 years earlier with those same disc levels in matched subjects not exposed to discography. A total of 75 subjects without serious LBP underwent a protocol MRI and an L3/4, L4/5, and L5/S1 discography examination in 1997. A matched group was enrolled at the same time and underwent the same protocol MRI examination. Subjects were followed for 10 years. At 7 to 10 years after baseline assessment, eligible discography and controlled subjects underwent another protocol MRI examination. Graders of MRI, blind to group designation, scored both groups for qualitative findings (Pfirrmann grade, herniations, endplate changes, and high intensity zone). Loss of disc height and loss of disc signal were measured by quantitative methods. Well-matched cohorts, including 50 discography subjects and 52 control subjects, were contacted and met eligibility criteria for follow-up evaluation. In all graded or measured parameters, discs that had been exposed to puncture and injection had greater progression of degenerative findings compared to control (non-injected) discs: progression of disc degeneration, 54 discs (35 %) in the discography group compared to 21 (14 %) in the control group (p = 0.03); 55 new disc herniations in the discography group compared to 22 in the control group (p = 0.0003). New disc herniations were disproportionately found on the side of the anular puncture (p = 0.0006). The quantitative measures of disc height and disc signal also showed significantly greater loss of disc height (p = 0.05) and signal intensity (p = 0.001) in the discography disc compared to the control disc. The
authors concluded that modern discography techniques using small gauge needle and limited pressurization resulted in accelerated disc degeneration, disc herniation, loss of disc height and signal and the development of reactive endplate changes compared to match-controls. Careful consideration of risk and benefit should be used in recommending procedures involving disc injection.

A practice guideline from the American Pain Society on LBP (Chou et al, 2009) stated that provocative discography is not recommended for diagnosis of patients with chronic, non-radicular LBP.

Functional anesthetic discography (FAD) is a new diagnostic procedure that involves the injection of a local anesthetic (e.g., lidocaine or bupivacaine) directly into 1 or more suspected discs using a balloon-anchored catheter for confirming the presence of injured discs as the source of a patient's LBP. In particular, FAD entails a functional examination; it relies on the patient's induction of pain during active patient movement, which is far different than the traditional discography. When the patient performs the movement or position that causes pain, a local anesthetic is then injected into the disc in hopes of alleviating the pain. If the injection relieves the patient's LBP, the disc can be further evaluated for potential treatment. If the injection fails to relieve the patient's LBP, the physician can investigate other possible causes of pain. However, there is insufficient scientific evidence regarding the clinical value of FAD.

In a case-series study, Alamin et al (2008) presented the findings of 3 patients in whom FAD was used for the evaluation of presumptive discogenic LBP. In 1 patient, FAD was confirmatory of the results of provocative discography; while the test results were divergent in the remaining 2 patients. The authors concluded that further study of FAD will allow more definitive recommendations with regards to the validity and utility of this new technique.
In a meta-analysis, Kapoor et al (2010) estimated the incidence of discitis after cervical discography, delineated the consequences of discitis, and identified factors that may influence this complication. Studies pertaining to cervical discography were identified by a literature review and bibliographic search. These were screened for inclusion into the meta-analysis by 2 reviewers. Data were collected on a wide range of clinical and demographic variables including age, gender, morbidities, number of patients, number of discograms, use of prophylactic antibiotics, type of surgical prep, number of needles used, and the number of patients and discs infected. Primary data were used to calculate the incidence of discitis per patient and per disc. A total of 14 studies were included in the analysis. Both procedural details and demographical information on patients were missing from 8 studies. The mean age of patients ranged from 41 to 47 years, and gender distribution varied greatly. Antibiotics use was reported in 3 studies. Cervical discography was complicated by post-procedural discitis in 22 of 14,133 disc injections (0.15 %) and 21 of 4,804 patients (0.44 %). Only 1 patient suffered from an infection at more than 1 spinal level. The authors concluded that the rate of discitis after cervical discography is relatively low. This can perhaps be further decreased by the use of prophylactic intra-discal antibiotics. They stated that should the ability of cervical discography to improve surgical outcomes be proven, the fear of discitis should not preclude performance of disc provocation.

In a prospective case-series study, Alamin et al (2011) compared the results of standard pressure-controlled provocative discography (PD) to those of the FAD in a series of patients presenting with chronic LBP and considering surgical treatment. A total of 52 patients presenting with chronic LBP (mean age of 45 years with a range of 24 to 70; 24 men and 28 women; and 25 % in workman's compensation program) were included in this study. Outcome measures included Oswestry, visual analog scale for back pain, distress and risk assessment method psychometric analysis,
demographic data, MRI scan of lumbar spine. Other outcome measures entailed: during PD – pressurization at pain, pain level, and concordancy; during FAD – position or activity used to elicit typical pain, baseline pain level before injection, during injection, at 5, 10, and 20 mins after the injection, and substance injected. Standard pressure-controlled PD was performed, followed by (in positive cases or in patients with clinical features and imaging studies felt to be highly suggestive of symptomatic disc degeneration) the FAD test—an assessment of the response to injection of a low-dose of local anesthetic into the disc during a position productive of the patient's typical pain. Discordant results of the 2 tests were noted in 46% of the patients in the series. Of them, 26% of patients with positive PD had negative findings on the FAD test; 16% had positive findings at a single-level only, whereas PD had been positive at 2 or more levels; 4% had new positive findings on the FAD test. The authors presented the results of a new diagnostic technique in 52 patients with chronic LBP presumed discogenic in origin that was designed to help differentiate between symptomatic and asymptomatic disc degeneration. The findings of the test differed from those of standard pressure-controlled PD in 46% of the cases reported on here. They stated that further studies are needed to demonstrate the clinical utility of the test.

The Work Loss Data Institute's clinical practice guideline on "Low back - lumbar & thoracic (acute & chronic)" (2011a) listed FAD as one of the interventions/procedures that was considered, but was not recommended. Furthermore, the Work Loss Data Institute's clinical practice guideline on "Neck and upper back (acute & chronic)" (2011b) listed discography as one of the interventions/procedures that was considered, but was not recommended.

Contrast disc analysis and mapping entails the addition of 3-dimensional image post-processing, reconstruction and/or mapping of data with markers as a method of improving the accuracy and predictive value of discography. However, there
is currently a lack of evidence in the peer-reviewed literature to support improved diagnostic utility of this approach as compared to standard, established provocative discography.

Singh et al (2012) systematically assessed and updated the quality of clinical studies evaluating the diagnostic accuracy of provocation thoracic discography. A systematic review of the literature was performed to assess the diagnostic accuracy of thoracic discography with respect to chronic, function limiting, thoracic or extra-thoracic pain. The available literature on thoracic discography was reviewed. A methodological quality assessment of included studies was performed using Quality Appraisal of Reliability Studies (QAREL). The level of evidence was classified as good, fair, and limited (or poor) based on the quality of evidence developed by the U.S. Preventive Services Task Force (USPSTF). Data sources included relevant literature identified through searches of PubMed and EMBASE from 1966 to June 2012, and manual searches of the bibliographies of known primary and review articles. The evidence and clinical value of thoracic provocation discography is limited (poor) with a paucity of evidence, with only 2 studies meeting inclusion criteria. The authors concluded that based on the available evidence for this systematic review, due to limited evidence, thoracic provocation discography is rarely recommended for the diagnosis of discogenic pain in the thoracic spine, if conservative management has failed and facet joint pain has been excluded.

Onyewu et al (2012) systematically evaluated and updated the diagnostic accuracy of cervical discography. The available literature on cervical discography was reviewed. Methodological quality assessment of included studies was performed using Quality Appraisal of Reliability Studies (QAREL). Only diagnostic accuracy studies meeting at least 50 % of the designated inclusion criteria were utilized for analysis. However, studies scoring less than 50 % were presented descriptively and analyzed critically. The level of
Evidence was classified as good, fair, and limited or poor based on the quality of evidence developed by the USPSTF. Data sources included relevant literature identified through searches of PubMed and EMBASE from 1966 to June 2012, and manual searches of the bibliographies of known primary and review articles. A total of 41 manuscripts were considered for accuracy and utility of cervical discography in chronic neck pain. There were 23 studies evaluating accuracy of discography. There were 3 studies meeting inclusion criteria for assessing the accuracy and prevalence of discography, with a prevalence of 16% to 53%. Based on modified Agency for Healthcare Research and Quality (AHRQ) accuracy evaluation and USPSTF level of evidence criteria, this systematic review indicated the strength of evidence is limited for the diagnostic accuracy of cervical discography. The authors concluded that there is limited evidence for the diagnostic accuracy of cervical discography. Nevertheless, in the absence of any other means to establish a relationship between pathology and symptoms, cervical provocation discography may be an important evaluation tool in certain contexts to identify a subset of patients with chronic neck pain secondary to intervertebral disc disorders. Based on the current systematic review, cervical provocation discography performed according to the International Association for the Study of Pain (IASP) criteria with control disc(s), and a minimum provoked pain intensity of 7 of 10, or at least 70% reproduction of worst pain (i.e., worst spontaneous pain of 7 = 7 x 70% = 5), may be a useful tool for evaluating chronic pain and cervical disc abnormalities in a small proportion of patients. Drawbacks of this study included a paucity of literature, poor methodological quality, and very few studies performed utilizing IASP criteria.

The American Society of Interventional Pain Physicians’ updated evidence-based guidelines for interventional techniques in chronic spinal pain (Manchikanti et al, 2013) stated that "The evidence for diagnostic accuracy for lumbar provocation discography is fair and the evidence for lumbar
functional anesthetic discography is limited .... The evidence for the diagnostic accuracy of cervical discography is limited .... The evidence for thoracic discography is limited".

Furthermore, the American College of Radiology Expert Panel on Musculoskeletal Imaging’s "Appropriateness Criteria® chronic neck pain" (Newman et al, 2013) stated that "X-ray discography was considered but not recommended".

An updated practice guideline on "Chronic pain management" by the American Society of Anesthesiologists Task Force and the American Society of Regional Anesthesia and Pain Medicine (2010) stated that "Provocative discography may be considered for the evaluation of selected patients with suspected discogenic pain. Provocative discography should not be used for the routine evaluation of the patient with chronic non-specific back pain".

The New York State Workers’ Compensation Board’s guidelines on "Mid and low back injury medical treatment" (2013) stated that "Discography, whether performed as a solitary test or when paired with imaging (e.g., MRI), is not recommended for acute, subacute, chronic back pain or radicular pain syndromes. Improvement in surgical outcomes has not been shown to follow the use of discography, and there is evidence that performing discography on normal discs is associated with an enhanced risk of degenerative changes in those discs in later years".

Ong et al (2016) noted that open discectomy remains the standard of treatment for patients with lumbar radicular pain secondary to a prolapsed intervertebral disc. Open discectomy performed in patients with small, contained herniations may result in poor outcomes. The various techniques of percutaneous disc decompression (PDD) have been developed to address this population. These investigators performed a literature search on articles, which address PDD for lumbar radicular pain. Published techniques
include chymopapain chemonucleolysis, percutaneous laser disc decompression (PLDD), automated percutaneous lumbar discectomy (APLD), Dekompressor, nucleoplasty, and targeted disc decompression (TDD). In addition, the rationale of provocative discography, selective nerve root injections, and intra-op discograms before performing PDD was discussed in detail. Dekompressor and nucleoplasty have the best level of evidence with a score of 2B+. The chymopapain chemonucleolysis has the most publications, but it is also accompanied by the most significant adverse complications and so it is scored as a 2B+/- . The other techniques were supported mainly by observational studies and thus their scores range between 0 and 2B+/- . There was no supporting evidence for provocative discography in patients with lumbar radicular pain. The evidence for a positive selective nerve root injection as an inclusion criteria or the need for an intra-operative discogram showed mixed results. The authors concluded that nucleoplasty and Dekompressor had a weak positive recommendation for the treatment of patients with lumbar radicular pain. There was no role for provocative discography in this group of patients, although the evidence for a selective nerve root injection or an intra-operative discogram was inconclusive.

An UpToDate review on "Acute lumbosacral radiculopathy: Pathophysiology, clinical features, and diagnosis" (Hsu et al, 2015) states that "Discography is a controversial technique of uncertain utility that involves the injection of contrast under fluoroscopy into the nucleus of a disc thought to be the cause of a patient's low back pain. The test is considered positive if it demonstrates an annular disruption and reproduces the patient's usual low back pain symptoms. It is not helpful in the evaluation of lumbosacral radiculopathy".

Furthermore, an UpToDate review on "Subacute and chronic low back pain: Nonsurgical interventional treatment" (Chou, 2015) states that "Discography is a diagnostic test in which contrast is injected under fluoroscopy into the nucleus of a disc
thought to be the cause of a patient's low back pain, with a positive test based on the reproduction to the patient's pain. Its reliability is controversial because of the absence of a clearly defined gold-standard reference test and false positive results in patients without low back pain. In our opinion, provocative discography remains unproven as a diagnostic test. Nonetheless, trials of interventional procedures targeting degenerated intervertebral discs have typically selected patients for inclusion based on results of provocative discography. Elimination of pain following injection of a local anesthetic into a degenerated disc (discoblock) has been proposed as an alternative to provocative discography".

**Pros:**

Xi and colleagues (2016) examined the relationship between discogenic pain and disc morphology using discography and CT, respectively, and investigated the effectiveness of this combined method in identifying surgical candidates for lumbar fusion by evaluating outcomes. A total of 43 consecutive patients between 2006 and 2013 who presented with refractory LBP and underwent discography and CT were enrolled in the study; "refractory LBP" was defined as pain symptoms that persisted or worsened after 6 months of non-operative treatments. Concordant pain was defined as discography-provoked LBP of similar character and location with an intensity of greater than or equal to 8/10. Fusion candidates demonstrated positive-level discography and concordant annular tears on CT at no more than 2 contiguous levels, and at least 1 negative control disc with intact annulus. Surgical outcomes were statistically analyzed using visual analog scale (VAS; 0 = no pain, 10 = worst pain imaginable), Oswestry Disability Index (ODI), and Short Form-36 (SF-36) for back-related pain and disability pre-operatively, and 2 weeks, 3, 6, 12, and 24 months post-operatively. Annular tears were found in 87 discs. Concordant pain was reported by 9 (20.9 %) patients at L3 to L4, 21 (50.0 %) at L4 to L5, and 34 (82.9 %) at L5 to S1; pain occurred significantly more often
in discs with annular tears than those without \( (p < 0.001) \).

Painless discs were independent of annulus status \( (p = 0.90) \);
18 (42 \%) of the original 43 patients underwent lumbar fusion
at L3 to L4 (\( n = 1 \) (6 \%) ), L4 to L5 (\( n = 6 \) (33 \%) ), L5 to S1 (\( n = 5 \) (28 \%) ), and 2-level L4 to S1 (\( n = 6 \) (33 \%) ) via a minimally
invasive transfemoral lumbar interbody fusion (MITLIF)
approach with the aim to replace the nucleus pulposus with
bone graft material. Median follow-up time was 18 months
(range of 12 to 78 months); VAS, ODI, and SF-36 scores
demonstrated significant improvements at 10 out of 12 post-
operative time-points compared with pre-operative baseline.
The authors concluded that lumbar discography with post-
discography CT can be an effective method to evaluate
patients with discogenic back pain refractory to non-operative
treatments. Those patients with 1- or 2-level high concordant
pain scores with associated annular tears and negative control
disc represented good surgical candidates for lumbar
interbody spinal fusion.

In a meta-analysis, Fang and co-workers (2017) examined the
 correlation between the high-intensity zone (HIZ) of a lumbar
MRI and discography. These researchers conducted an
electronic search of the PubMed, Medline, Embase, and
ScienceDirect databases from their respective inceptions to
October 2016 using the following search terms: "low back
pain", "discogenic low back pain", "HIZ or high-intensity zone",
and "discography". Relevant journals and conference
proceedings were manually searched; 2 reviewers
independently assessed the quality of the studies, extracted
data from the included studies, and analyzed the data. A total
of 11 studies were included. The results of the meta-analysis
indicated that outstanding relativity and statistically significant
correlations were observed between the HIZ and abnormal
disc morphology \( \text{odds ratio} [\text{OR}] = 47.79 ; 95 \% \text{ confidence}
interval} [\text{CI}] : 17.07 \text{ to } 133.77 \text{; } p < 0.00001 \) ), HIZ and pain
reproduction \( \text{OR} = 8.65 , 95 \% \text{ CI: } 6.01 \text{ to } 15.23 , p < 0.00001 \),
and HIZ and abnormal morphology pain reproduction \( \text{OR} = 11.74,
95 \% \text{ CI: } 1.99 \text{ to } 69.36 , p = 0.007 \) . The authors
concluded that the presence of an HIZ on a lumbar MRI T2-weighted image indicated abnormal disc morphology; and there was a strong relationship between the HIZ and pain reproduction. They stated that the HIZ can be an effective index for prediction of discogenic LBP.

In a retrospective, cohort study, Lee and associates (2017) compared the clinical outcomes of patients undergoing anterior lumbar interbody fusion (ALIF) with or without automated pressure-controlled discography (APCD) before the procedure. Patients (n = 36) who underwent ALIF for lumbar discogenic back pain between 2008 and 2013 and were followed for more than 6 months were enrolled in this study. APCD was performed to identify discogenic back pain. Pre-operative x-rays, CT images, and MRI images were obtained. The intervertebral disc height, type of Modic change, grade of disc degeneration, and fusion rate were determined. Additionally, the presence or absence of HIZ and vacuum disc were checked pre-operatively. Clinical evaluation was performed by VAS, ODI, and SF-36 Health Survey before surgery and every 6 months post-operatively. The average patient age was 53.3 years (range of 31 to 73 years). The mean follow-up durations were 19.7 months; 17 patients (the APCD-ALIF group) underwent ALIF after APCD, and 19 patients underwent ALIF without APCD. The APCD-ALIF group had significantly improved clinical outcomes compared with the control group (VAS score 1.8 ± 1.6 versus 3.3 ± 2.4; p = 0.039; ODI score 6.7 ± 6.3 versus 12.1 ± 6.8; p = 0.019). The surgical improvement rate was significantly associated with ODI score (p = 0.005). The authors concluded that the findings of this study confirmed that APCD aided surgical outcomes of ALIF in patients with suspected lumbar discogenic pain. They recommend performing APCD before ALIF to confirm lumbar discogenic pain.

Takano and colleagues (2017) noted that posterior epidural migration of lumbar disc fragments (PEMLDF) is extremely rare. It is often confused with other posterior lesions and is
usually diagnosed intra-operatively. These investigators described the use of pre-operative discography in the diagnosis of PEMLDF. They presented the case of a 78-year-old man who had acute LBP, gait disturbance, and paresthesia in both legs; MRI showed a mass located posteriorly and laterally to the left aspect of the dural sac at the L3 level. The initial diagnosis indicated PEMLDF, malignancy, spontaneous hematoma, or epidural abscess; L3/4 discography clearly showed leakage of the contrast medium into the posterior dural space, indicating PEMLDF. The lesion was identified intra-operatively as a herniated-disc fragment, consistent with the pre-operative discography. The authors concluded that PEMDLF is difficult to diagnose pre-operatively; and discography is useful for the definitive diagnosis of PEMDLF prior to surgery.

Cons:

Cuellar and colleagues (2016) stated that provocative discography, an invasive diagnostic procedure involving disc puncture with pressurization, is a test for presumptive discogenic pain in the lumbar spine. The clinical validity of this test is unproven. Data from multiple animal studies confirmed that disc puncture causes early disc degeneration. A recent study identified radiographic disc degeneration on MRI performed 10 years later in human subjects exposed to provocative discography. The clinical effect of this disc degeneration after provocative discography is unknown. In a prospective, 10-year matched cohort study, these researchers examined the effects of lumbar provocative discography on patients subjected to this evaluation method. Subjects (n = 75) without current LBP problems were recruited to participate in a study of provocative discography at the L3 to S1 discs. A closely matched control cohort was simultaneously recruited to undergo a similar evaluation except for discography injections. The primary outcome variables were diagnostic imaging events and lumbar disc surgery events. The secondary outcome variables were serious LBP events,
disability events, and medical visits. The discography subjects and control subjects were followed by serial protocol evaluations at 1, 2, 5, and 10 years after enrollment. The lumbar disc surgery events and diagnostic imaging (CT or MRI) events were recorded. In addition, the interval and cumulative lumbar spine events were recorded. Of the 150 subjects enrolled, 71 discography subjects and 72 control subjects completed the baseline evaluation. At 10-year follow-up, 57 discography and 53 control subjects completed all interval surveillance evaluations. There were 16 lumbar surgeries in the discography group, compared with 4 in the control group. Medical visits, CT/MRI examinations, work loss, and prolonged back pain episodes were all more frequent in the discography group compared with control subjects. The authors concluded that disc puncture and pressurized injection performed during provocative discography could increase the risk of clinical disc problems in exposed patients.

Lipscomb and associates (2017) noted that discography of the intervertebral disk (IVD) may be used to diagnose pathology of the disk and examine if it may be a source for chronic back pain. It has recently been suggested that discography may lead to IVD degeneration, and has been a cause of controversy among spine care physicians. These researchers characterized the changes in stress and displacement of the human lumbar spine disks after puncture due to discography. Both in-vivo experiment using cadaveric specimens and a finite element model of the same L3 to L5 lumbar spine was developed using CT scans. Discography was simulated in the model as an area in the disk affected by needle puncture. The material properties in the nucleus pulposus were adjusted to match experimental data both before and after puncture. Puncture of the IVD resulted in increased deformation and increased stresses in the annulus fibrosis region of the disk. Pressure in the nucleus pulposus was found to decrease after puncture. Experimental and computational results correlated
well. The authors concluded that puncturing the IVD changed disk biomechanics and hence may lead to progressive spine degenerations in particular in the punctured disks.

In a retrospective analysis of prospectively collected data, Staartjes and associates (2018) examined the value of prognostic tests and socio-demographic factors in predicting outcomes following lumbar fusion surgery for degenerative disc disease (DDD). These researchers included patients who underwent fusion surgery for DDD between 2010 and 2016. The outcome measures included pre- and post-operative VAS and ODI scores. Prospectively collected patient data were reviewed for pre-operative tests, peri-operative data, and clinical outcomes. Prognostic tests used were discography, pantaloon cast test (PCT), Modic changes, and a summary of physical symptoms, coined "loading factor". By means of multi-variate step-wise regression, prognostic factors that were useful in predicting outcomes were identified. A total of 91 patients fit the inclusion criteria, with a mean follow-up of 33 ± 16 months. Discography, Modic changes, and loading factor were of no value for predicting outcome scores (p > 0.05). A positive PCT predicted improved outcomes in back pain severity, but only in patients without prior surgery (p = 0.02). Demographic factors that showed a consistent reduction in back pain were female sex (p = 0.021) and no prior surgery at index level (p = 0.009). No other socio-demographic factors were of predictive value (p > 0.05). The authors concluded that in patients without prior surgery, the PCT appeared to be the most promising prognostic tool. Other prognostic selection tools such as discography and Modic changes yielded disappointing results. In this study, female patients and those without prior spine surgery appeared to be most likely to benefit from fusion surgery for DDD.

Anderson and co-workers (2018) stated that lumbar discography (LD) is used to guide surgical decision-making in patients with DDD. Its safety and diagnostic accuracy are under contention. These investigators evaluated LD's efficacy
within the workers' compensation (WC) population. Multivariate logistic regression analysis was used to determine the impact that undergoing LD before lumbar fusion for DDD had on return-to-work (RTW) rates among 1,407 WC subjects. Discography was negatively associated with RTW status ($p = 0.042; \text{OR} = 0.76$); 22.2% (142/641) of LD subjects met the RTW criteria, compared with 29.6% (227/766) of controls. Additional pre-operative risk factors included psychological co-morbidity ($p < 0.001; \text{OR} = 0.34$), age greater than 50 ($p < 0.005; \text{OR} = 0.64$), male gender ($p < 0.037; \text{OR} = 0.75$), chronic opioid use ($p < 0.001; \text{OR} = 0.53$), legal representation ($p < 0.034; \text{OR} = 0.72$), and fusion technique ($p < 0.043$). The authors concluded that LD subjects used post-operative narcotics for an average of 123 additional days ($p < 0.001$); this raised concerns regarding the utility of discography in the WC population.

Manchikanti and colleagues (2018) performed a systematic review of the diagnostic accuracy of lumbar, cervical, and thoracic provocation and analgesic discography literature. These investigators systematically assessed and re-evaluated the diagnostic accuracy of lumbar, cervical, and thoracic discography. The available literature on discography was reviewed. A methodological quality assessment of included studies was performed using the Quality Appraisal of Reliability Studies (QAREL) check-list. Only diagnostic accuracy studies meeting at least 50% of the designated inclusion criteria were included in the analysis. To assess the level of evidence, a modified grading of qualitative evidence criteria was utilized, with grading of evidence into 5 categories from Level I to Level V incorporating evidence obtained from multiple high quality diagnostic accuracy studies for Level I and opinion or consensus of a large group of clinicians and/or scientists for Level V. Data sources included relevant literature identified through searches of PubMed and Embase from 1966 to June 2017, and manual searches of the bibliographies of known primary and review articles. Over 100 manuscripts were considered for inclusion. Of these, 8 studies
met inclusion criteria for diagnostic accuracy and prevalence with 5 studies assessing lumbar provocation discography and 3 studies assessing cervical discography. The results showed variable prevalence from 16.9 % to 26 % for discogenic pain and 16.9 % to 42 % for internal disc disruption. The cervical discogenic pain prevalence ranged from 16 % to 53 %. Based on methodological quality assessment criteria the strength of evidence for lumbar provocation discography was Level III and for cervical discogenic pain was Level IV. The authors concluded that this systematic review showed that lumbar provocation discography performed according to the International Association for the Study of Pain (IASP) criteria may be a useful tool for evaluating chronic lumbar discogenic pain. The evidence was weaker for cervical and non-existent for thoracic discography. These researchers stated that despite multiple publications in the lumbar spine, value and validity of discography continues to be debated. Furthermore, in reference to cervical and thoracic discography, the available literature and value and validity continues to be low.

Peng and DePalma (2018) noted that cervical disc degeneration is common in individuals without neck pain. Although MRI may identify a degenerative cervical disc, it will not differentiate a disc that is pathologically painful from one that is physiologically aging. The high prevalence of neck pain and disc abnormalities in asymptomatic individuals provides the conceptual appeal for discography, which is advocated as the only test that connects disease to symptoms, but the procedure remains controversial. The main criticism of cervical discography, as with any other provocation test, is that disc stimulation may provide pain in normal discs.

An UpToDate review on "Acute lumbosacral radiculopathy: Pathophysiology, clinical features, and diagnosis" (Hsu et al, 2019) states that "Discography is a controversial technique of uncertain utility that involves the injection of contrast under fluoroscopy into the nucleus of a disc thought to be the cause of a patient's low back pain. The test is considered positive if it
demonstrates an annular disruption and reproduces the patient's usual low back pain symptoms. It is not helpful in the evaluation of lumbosacral radiculopathy.

### CPT Codes / HCPCS Codes / ICD-10 Codes

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<th>Code</th>
<th>Code Description</th>
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<td><em>Information in the [brackets] below has been added for clarification purposes. Codes requiring a 7th character are represented by &quot;+&quot;:</em></td>
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**CPT codes covered if selection criteria are met:**

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<tr>
<th>Code</th>
<th>Code Description</th>
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<tbody>
<tr>
<td>62290</td>
<td>Injection procedure for discography, each level; lumbar [not covered for functional anesthetic discography]</td>
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<tr>
<td>72295</td>
<td>Discography, lumbar, radiological supervision and interpretation [not covered for functional anesthetic discography]</td>
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**CPT codes not covered for indications listed in the CPB:**

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<td>62291</td>
<td>Injection procedure for discography, each level; cervical or thoracic</td>
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<tr>
<td>72285</td>
<td>Discography, cervical or thoracic, radiological supervision and interpretation</td>
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**Other HCPCS codes related to the CPB:**

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<tr>
<td>Q9951, Q9958 - Q9967</td>
<td>High and low osmolar contrast material</td>
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**ICD-10 codes covered if selection criteria are met:**

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<td>M43.06 - M43.07</td>
<td>Acquired spondylolisthesis</td>
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<td>M43.16 - M43.17</td>
<td>Acquired spondylolisthesis</td>
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<td>M46.46 -</td>
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<td>M51.86 -</td>
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<td>M47.16 -</td>
<td>Other spondylosis with myelopathy,</td>
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<td>M47.17</td>
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<td>M47.816</td>
<td>Lumbar/lumbosacral spondylosis without</td>
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<td>- M47.817</td>
<td>myelopathy</td>
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<td>M48.061</td>
<td>Spinal stenosis, lumbar/lumbosacral region</td>
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<td>- M48.07</td>
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<td>Postlaminectomy syndrome, not elsewhere classified</td>
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<td>S33.100+</td>
<td>Dislocation of lumbar vertebra, open/closed</td>
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The above policy is based on the following references:


Amendment to Aetna Clinical Policy Bulletin

Number: 0733

Discography

There are no amendments for Medicaid.

Updated 12/08/2020