Artificial Intervertebral Disc: Lumbar Spine

Policy Number: 7.01.87
Origination: 12/2005
Last Review: 6/2019
Next Review: 12/2019

Policy
Blue Cross and Blue Shield of Kansas City (Blue KC) will not provide coverage for artificial intervertebral discs of the lumbar spine. This is considered investigational.

When Policy Topic is covered
Not Applicable

When Policy Topic is not covered
Artificial intervertebral discs of the lumbar spine are considered investigational.

Description of Procedure or Service

<table>
<thead>
<tr>
<th>Populations</th>
<th>Interventions</th>
<th>Comparators</th>
<th>Outcomes</th>
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<tbody>
<tr>
<td>Individuals:</td>
<td>Interventions of interest are:</td>
<td>Comparators of interest are:</td>
<td>Relevant outcomes include:</td>
</tr>
<tr>
<td>• With lumbar degenerative disc disease</td>
<td>• Lumber artificial intervertebral disc</td>
<td>• Conservative therapy</td>
<td>• Symptoms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lumbar spinal fusion</td>
<td>• Functional outcomes</td>
</tr>
</tbody>
</table>

Total disc replacement, using an artificial intervertebral disc designed for the lumbar spine, is proposed as an alternative to fusion in patients with persistent and disabling degenerative disc disease.

For individuals who have lumbar degenerative disc disease who receive a lumbar artificial intervertebral disc, the evidence includes randomized controlled trials (RCTs) with 5-year outcomes and longer term case series. Relevant outcomes are symptoms, functional outcomes, quality of life, and treatment-related morbidity. Five-year outcomes for the ProDisc-L RCT have provided evidence for the noninferiority of artificial disc replacement. Superiority of ProDisc-L with circumferential fusion was achieved at 2 but not at 5 years in this unblinded trial. At this time, the potential benefits of the artificial disc (eg, faster recovery, reduced adjacent-level disc degeneration) have not been demonstrated. In
addition, considerable uncertainty remains whether response rates will continue to decline over longer time periods and long-term complications with these implants will emerge. Although some randomized trials have concluded that this technology is noninferior to fusion, outcomes that would make noninferiority sufficient to demonstrate the clinical benefit of the artificial lumbar disc have not been established. The evidence is insufficient to determine the effects of the technology on health outcomes.

**Background**

When conservative treatment of degenerative disc disease fails, a common surgical approach is spinal fusion; more than 200,000 spinal fusions are performed each year. However, the outcomes of spinal fusion have been controversial over the years, in part due to the difficulty in determining if a patient's back pain is related to degenerative disc disease (DDD) and in part due to the success of the procedure itself. In addition, spinal fusion alters the biomechanics of the back, potentially leading to premature disc degeneration at adjacent levels, a particular concern for younger patients. During the past 30 years, a variety of artificial intervertebral discs have been investigated as an alternative approach to fusion. This approach, also referred to as total disc replacement or spinal arthroplasty, is intended to maintain motion at the operative level once the damaged disc has been removed and to maintain the normal biomechanics of the adjacent vertebrae.

Potential candidates for artificial disc replacement have chronic low back pain attributed to DDD, lack of improvement with non-operative treatment, and none of the contraindications for the procedure, which include multilevel disease, spinal stenosis, or spondylolisthesis, scoliosis, previous major spine surgery, neurologic symptoms, and other minor contraindications. These contraindications make artificial disc replacement suitable for a subset of patients in whom fusion is indicated. Patients who require procedures in addition to fusion, such as laminectomy and/or decompression, are not candidates for the artificial disc.

Use of a motion-preserving artificial disc increases the potential for a variety of types of implant failure. These include device failure (device fracture, dislocation, or wear), bone-implant interface failure (subsidence, dislocation-migration, vertebral body fracture), and host response to the implant (osteolysis, heterotopic ossification, and pseudotumor formation).

**Regulatory Status**

While a number of artificial intervertebral discs in the lumbar spine have been used internationally, only 3 devices (activL®, Charité®, ProDisc®-L) have been approved by the U.S. Food and Drug Administration (FDA) through the premarket approval process. Because the long-term safety and effectiveness of these devices were not known, approval was contingent on completion of postmarketing studies. The activL® (Aesculap Implant Systems), Charité® (DePuy), and ProDisc®-L (Synthes Spine) devices are indicated for spinal arthroplasty in skeletally mature patients with degenerative disc disease (DDD) at 1 level. DDD is defined as discogenic back pain with degeneration of the disc confirmed by patient history and radiographs. Production under the name Charité® was stopped in 2010.
A number of other artificial lumbar discs are in development or available only outside of the United States:

- The INMOTION® lumbar artificial disc (DePuy Spine) is a modification of the Charité® device with a change in name under the same premarket approval. The INMOTION® is not currently marketed in the United States.
- The Maverick™ artificial disc (Medtronic) is not marketed in the United States due to patent infringement litigation.
- The metal-on-metal FlexiCore® artificial disc (Stryker Spine) has completed the investigational device exemption trial as part of the FDA approval process and is currently being used under continued access.
- Kineflex-L™ (Spinal Motion) is a 3-piece, modular, metal-on-metal implant. An FDA advisory committee meeting on the Kineflex-L, scheduled in 2013, but was cancelled without explanation.

**Rationale**

This evidence review was created in April 2003 and has been updated regularly with searches of the MEDLINE database. The most recent literature update was performed through February 5, 2019.

This review was informed by 3 TEC Assessments (2005, 2007, 2013).1,2,3 This review focuses only on artificial discs currently available in the United States. Evidence reviews assess the clinical evidence to determine whether the use of a technology improves the net health outcome. Broadly defined, health outcomes are length of life, quality of life, and ability to function, including benefits and harms. Every clinical condition has specific outcomes that are important to patients and to managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens; and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of a technology, 2 domains are examined: the relevance and the quality and credibility. To be relevant, studies must represent one or more intended clinical use of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The randomized controlled trial is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. Randomized controlled trials are rarely large enough or long enough to capture less common adverse events and long-term effects. Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice.
Clinical Context and Therapy Purpose

The purpose of the lumbar artificial intervertebral disc is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The question addressed in this evidence review is: Does implantation of a lumbar artificial intervertebral disc improve the net health outcome in patients with degenerative disc disease?

The following PICOs were used to select literature to inform this review.

Patients

The relevant population of interest is individuals with lumbar degenerative disc disease.

Intervention

The therapy being considered is implantation of a lumbar artificial intervertebral disc.

Comparators

The following therapies are currently being used to make decisions about lumbar artificial intervertebral disc.

Relevant comparators are conservative therapy and lumbar spinal fusion.

Outcomes

The general outcomes of interest are symptoms, functional outcomes, quality of life, and treatment-related morbidity.

Artificial Intervertebral Discs

Randomized Controlled Trials

Three RCTs have compared the treatment of degenerative disc disease (DDD) using lumbar fusion with artificial lumbar intervertebral discs currently available in the United States. They include the pivotal trials for the ProDisc-L and activL discs, and a Food and Drug Administration (FDA)-regulated trial of the ProDisc-L for 2-level DDD. A fourth trial compared ProDisc-L with multidisciplinary rehabilitation. The primary outcome in the FDA-regulated trials is a composite measure of success, which incorporates symptom improvement and absence of complications. The composite success end points included improvements in Oswestry Disability Index (ODI) scores (typically 15 points), improvement or maintenance in neurologic status, radiologic measures of range of motion, freedom from additional surgery, and freedom from serious device-related adverse events. Five-year outcomes have been reported from the pivotal trial for the ProDisc-L. Eight-year
data have been reported from a comparison of ProDisc II with multidisciplinary rehabilitation.

A key feature all of these trials is the recruitment of patients specifically with degenerative disease of the intervertebral disc. DDD is partly a diagnosis of exclusion where the degenerated disc is believed to be the pain generator. Radiographic evidence of DDD may include a reduction of disc height and Modic changes, a posterior high-intensity zone, or a dark/black nucleus pulposus on T2-weighted images. Patients with common indications for spinal fusion such as scoliosis, spondylolisthesis, instability, or radiculopathy are excluded (see separate policy).

**ProDisc-L at a Single Level**
The pivotal study for the ProDisc-L was an unblinded noninferiority trial that originally followed patients for 24 months. In the per-protocol analysis reported to FDA, ProDisc-L had a success rate of 53.4% and fusion had a success rate of 40.8%, which achieved both non-inferiority and superiority. Two-year results from this trial were published in 2007, and 5-year follow-up was reported in 2012. The definition of success was changed from the analysis requested by FDA and was reported to be higher at 63.5% at 2 years and 53.7% at 5 years. Noninferiority but not superiority of artificial disc replacement was achieved at 5 years. This change in overall success in ProDisc-L patients indicates a possible decrement in response over time with the artificial disc. This decline in response rate was not observed in the standard fusion group and resulted in a between-group convergence of the primary outcome measure over time. Several individual components of the primary outcome measure and secondary outcome measures (ODI, 36-Item Short-Form Health Survey Physical Component Summary, neurologic success, device success) were also statistically better in the ProDisc-L group than in the fusion group at 2 years, but not at 5 years. Post hoc analysis of radiographs found fewer patients with adjacent-level degeneration in the ProDisc-L group than in the control group. However, the adjacent-level reoperations did not differ significantly between groups (1.9% ProDisc-L vs 4% controls).

An updated TEC Assessment (2013) evaluated 5-year follow-up from the ProDisc pivotal trial. The Assessment concluded that:

- Additional study of ProDisc in an appropriately powered clinical trial with minimum 5-year follow-up is needed to confirm the results of the investigational device exemption trial in patients with single-level chronic symptomatic DDD unresponsive to conservative management.
- Questions remain about the durability of the disc, in particular, the long-term effects on patient health of polyethylene wear debris. Surgical revision of a failed or dysfunctional disc may be complicated and dangerous to the patient, so the lifespan of a prosthetic device is a key issue.
- The main claim of the artificial disc—that it maintains range of motion and thereby reduces the risk of adjacent-level segment degeneration better than fusion—remains subject to debate.
Hellum et al (2011) reported an RCT that compared the use of the ProDisc-L with a multidisciplinary rehabilitation program. Patients (N=173) were ages 25 to 55 years, had low back pain for at least a year, received physical therapy or chiropractic treatment for at least 6 months without sufficient effect, had an ODI score of at least 30, and showed degenerative intervertebral changes that included at least 40% reduction of disc height, Modic changes, a high-intensity zone in the disc, and morphologic changes identified as changes in the signal intensity in the disc of grade 3 or 4 (see Table 1). The multidisciplinary rehabilitation included a cognitive approach and supervised physical exercise. The primary outcome was ODI score (see Table 2), and the trial was powered to detect a 10-point difference in ODI score. The analysis was intention-to-treat with the last observation carried forward. There were 13 (15%) dropouts in the surgical arm and 21 (24%) in the rehabilitation arm. Also, 5 (6%) patients crossed over from rehabilitation to surgery. Of the 34 patients lost to follow-up, 26 answered a questionnaire between 2.5 and 5 years after treatment. In the intention-to-treat analysis, there was a statistically significant benefit of surgery, but the mean difference did not achieve the 10-point difference in ODI score considered clinically significant. There were significantly more patients who achieved a 15-point improvement in ODI score in the ProDisc group, with a number needed to treat of 4.4. The radiographic assessment identified a similar level of adjacent segment degeneration in both groups, but an increase in facet arthropathy in the ProDisc II group. Eight-year follow-up of this trial was reported by Furunes et al (2017). In both the intention-to-treat and per-protocol analysis there was a statistically significant benefit of surgery as measured by the mean ODI, but these differences did not reach the clinically significant threshold of 10 points (see Table 2). More patients in the surgery group (43/61 [70%]) reached a clinically important difference of 15 ODI points than in the rehabilitation group (26/52 [50%]; p=0.03). Twenty-one (24%) patients randomized to rehabilitation crossed over to surgery while 12 (14%) patients randomized to surgery had undergone additional back surgery.

Table 1. Summary of Key RCT Characteristics for Discs Available in the United States

<table>
<thead>
<tr>
<th>Study</th>
<th>Countries</th>
<th>Sites</th>
<th>Follow-Up</th>
<th>Participants</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Active</td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 y</td>
<td>156 (97%)</td>
<td>73 (97%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 y</td>
<td>137 (85%)</td>
<td>56 (75%)</td>
</tr>
<tr>
<td>Delamarter et al (2011)</td>
<td>U.S.</td>
<td>16</td>
<td>2 y</td>
<td>Noninferiority trial of patients with DDD at 2 contiguous levels</td>
<td>ProDisc-L at 2 levels (n=158)</td>
</tr>
<tr>
<td>Garcia et al (2015)</td>
<td></td>
<td></td>
<td>2 y</td>
<td>Patient-blinded noninferiority trial of patients with DDD</td>
<td>activL (n=218)</td>
</tr>
<tr>
<td>Hellum et al (2011, 2012) and Furunes (2017)</td>
<td>Norway</td>
<td>5</td>
<td>2 y</td>
<td>Patients with chronic low back pain, ODI score ≥30, and DDD in 1 or 2 levels</td>
<td>ProDisc II (n=87)</td>
</tr>
</tbody>
</table>
Patients from RCT assessed for adjacent-level degeneration and facet arthropathy

ProDisc II (n=59) Multidisciplinary rehabilitation (n=57)

Patients from RCT assessed at 8-y follow-up

ProDisc II (n=77) Multidisciplinary rehabilitation (n=74)

DDD: degenerative disc disease; ODI: Oswestry Disability Index; RCT: randomized controlled trial.

**Table 2. Summary of Key RCT Outcomes for Discs Available in the United States**

<table>
<thead>
<tr>
<th>Study</th>
<th>Success Rate at 2 Years</th>
<th>Success Rate at 5 Years</th>
<th>ODI Score Improvement</th>
<th>VAS Score</th>
<th>Adjacent-Level Degeneration at 5 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>ProDisc-L</td>
<td>148 (63.5%)</td>
<td>134 (53.7%)</td>
<td>126 (34.2%)</td>
<td>125 (37.1%)</td>
<td>(9.2%)</td>
</tr>
<tr>
<td>Fusion</td>
<td>71 (45.1%)</td>
<td>52 (50.0%)</td>
<td>51 (36.2%)</td>
<td>51 (40.0%)</td>
<td>(28.6%)</td>
</tr>
<tr>
<td>P inferiority</td>
<td>&lt;0.01</td>
<td>0.024</td>
<td>0.455</td>
<td>0.567</td>
<td></td>
</tr>
<tr>
<td>P superiority</td>
<td>0.044</td>
<td>NS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delamarter et al (2011)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ProDisc-L</td>
<td>58.8%</td>
<td>30.3 (24.3)</td>
<td>73.2%</td>
<td>43.3</td>
<td>2.4%</td>
</tr>
<tr>
<td>Fusion</td>
<td>47.8%</td>
<td>38.7 (24.1)</td>
<td>59.7%</td>
<td>36.7</td>
<td>8.3%</td>
</tr>
<tr>
<td>P noninferiority</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P superiority</td>
<td>NS</td>
<td></td>
<td></td>
<td></td>
<td>0.047</td>
</tr>
<tr>
<td>activ-L</td>
<td>NR</td>
<td>75.2%</td>
<td>2.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ProDisc-L or Charité</td>
<td>NR</td>
<td>66.0%</td>
<td>1.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P noninferiority</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P superiority</td>
<td>0.02</td>
<td>0.09</td>
<td>NS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ProDisc II</td>
<td>51 (70%)</td>
<td>19.8 (16.7)</td>
<td>20.0 (16.4 to 23.6)</td>
<td>35.4</td>
<td>34%</td>
</tr>
<tr>
<td>Rehab</td>
<td>31 (47%)</td>
<td>26.7 (14.5)</td>
<td>14.4 (10.7 to 18.1)</td>
<td>49.7</td>
<td>4%</td>
</tr>
<tr>
<td>p</td>
<td>0.006</td>
<td>0.02</td>
<td>0.009</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>NNT (95 CI)</td>
<td>4.4 (2.6 to 14.5)</td>
<td>MD = -6.9 (-11.7 to - 2.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CI: confidence interval; MD: mean difference; NNT: number needed to treat; NR: not reported; ODI: Oswestry Disability Index; RCT: randomized controlled trial; Rehab: multidisciplinary rehabilitation; VAS: visual analog score.

**ProDisc-L at 2 Levels**
The ProDisc-L for 2-level lumbar DDD was reported in 2011 from a multicenter, randomized, FDA-regulated noninferiority trial. All patients had DDD at 2 contiguous vertebral levels from L3 to S1 with or without leg pain, a minimum of 6 months of conservative therapy, and a minimum ODI score of 40. The ProDisc-L group had faster surgeries (160.2 minutes vs 272.8 minutes), less estimated blood loss (398.1 mL vs 569.3 mL), and shorter hospital lengths of stay (3.8 days vs 5.0 days) than the arthrodesis group. The composite measure of success demonstrated noninferiority but not superiority of ProDisc-L. The ProDisc-L group showed significant benefit in the percentages of patients who achieved at least a 15-point improvement in ODI scores and greater improvements in the 36-Item Short-Form Health Survey scores. A greater percentage of patients in the arthrodesis group required secondary surgical procedures. As noted in an accompanying commentary, the study had a number of limitations. Comparison with a procedure (open 360° fusion) that is not the criterion standard precludes decisions on the comparative efficacy of this procedure to the standard of care. Other limitations include the relatively short follow-up and lack of blinding of patients and providers.

**activL**
Two-year outcomes from the multicenter investigational device exemption trial of the activL artificial intervertebral disc were reported by Garcia et al (2015). In this patient-blinded noninferiority trial, patients with DDD were randomized to treatment with activL or an FDA-approved disc (ProDisc-L or Charité). activL was both noninferior and superior to the control group of patients treated with ProDisc-L or Charité. Intention-to-treat analysis of secondary outcome measures showed similar improvements between activL and controls. Range of motion at the index level, measured by an independent core radiographic laboratory, was higher in the activL group than in the controls.

**Observational Studies**
While observational studies do not provide evidence of efficacy or comparative efficacy, they may provide information about the durability of any observed improvements and potential impacts of patient selection factors (see Tables 3-4).

**Table 3. Summary of Prospective Cohort Study Characteristics**

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Participants, N (% of total treated)</th>
<th>Treatment Delivery</th>
<th>Follow-Up (Range), Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siepe et al (2014)15.</td>
<td></td>
<td>181 (90%)</td>
<td>ProDisc-II at 1 or 2 levels</td>
<td>7.4 (5.0-10.8)</td>
</tr>
<tr>
<td>Laugesen et al (2017)16.</td>
<td>Denmark</td>
<td>57 (84%) with DDD</td>
<td>ProDisc-II at 1 or 2 levels</td>
<td>10.6 (8.1-12.6)</td>
</tr>
</tbody>
</table>

DDD: degenerative disc disease.
### Table 4. Summary of Key Cohort Study Results

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment</th>
<th>Functional Status at Baseline</th>
<th>Score at FU</th>
<th>p</th>
<th>VAS Score at Baseline</th>
<th>VAS at FU</th>
<th>p</th>
<th>Complication Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siepe et al (2014)</td>
<td>1 or 2 level ProDisc-II</td>
<td>42 (ODI)</td>
<td>22</td>
<td>&lt;0.001</td>
<td>7</td>
<td>3.3</td>
<td>&lt;0.001</td>
<td>• 11.9% 1 level</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• 27.6% 2 levels</td>
</tr>
<tr>
<td>Laugesen et al (2017)</td>
<td>1 or 2 level ProDisc-II</td>
<td>63.2 (PDQ)</td>
<td>45.6</td>
<td>&lt;0.001</td>
<td>6.8</td>
<td>3.2</td>
<td>&lt;0.001</td>
<td>33% revised to fusion</td>
</tr>
</tbody>
</table>

FU: follow-up; ODI: Oswestry Disability Index; PDQ: Dallas Pain Questionnaire; VAS: visual analog scale.

Siepe et al (2014) reported on a minimum 5-year follow-up for 181 patients implanted with the ProDisc II at their institution.\(^{15}\) This represented 90.0% of the initial cohort of 201 patients from this prospective clinic-funded quality review. ODI and VAS pain scores were assessed by investigators not involved in pre- or postoperative decision making. At final follow-up, ODI and VAS pain scores were significantly improved over baseline. Overall satisfaction rates were 89.1% for single-level and 69.0% for 2-level disc replacement.

Laugesen et al (2017) found significant improvements in pain and function with 1- or 2-level ProDisc II implantation at follow-up of 10.6 years, but pain remained moderate, and about one-third of patients required revision to fusion.\(^{16}\) The authors noted the need for appropriate selection criteria.

Another case series, by Tropiano et al (2005), followed 55 patients for an average of 8.7 years after disc replacement with the ProDisc-L; 60% of patients reported excellent results.\(^{17}\)

### Summary of Evidence

For individuals who have lumbar degenerative disc disease who receive a lumbar artificial intervertebral disc, the evidence includes RCTs with 5-year outcomes and case series with longer term outcomes. Relevant outcomes are symptoms, functional outcomes, quality of life, and treatment-related morbidity. Five-year outcomes for the ProDisc-L RCT have provided evidence for the noninferiority of artificial disc replacement. The superiority of ProDisc-L with circumferential fusion was achieved at 2 but not at 5 years in this unblinded trial. The potential benefits of the artificial disc (eg, faster recovery, reduced adjacent-level disc degeneration) have not been demonstrated. Also, considerable uncertainty remains whether response rates will continue to decline over longer time periods and long-term complications with these implants will emerge. Although some randomized trials have concluded that this technology is noninferior to spinal fusion, outcomes that would make noninferiority sufficient to demonstrate the clinical benefit of the artificial lumbar disc have not been established. The evidence is insufficient to determine the effects of the technology on health outcomes.
SUPPLEMENTAL INFORMATION

Clinical Input From 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.

In response to requests, input was received from 1 physician specialty society and 3 academic medical centers while this policy was under review in 2008. The 4 reviewers disagreed with the policy statement that artificial intervertebral discs for the lumbar spine are investigational.

After considering the clinical input in 2008, it was concluded that, due to limitations of the available randomized controlled trials (described herein), combined with the marginal benefit compared with fusion, evidence was insufficient to determine whether artificial lumbar discs are beneficial in the short term. Also, serious questions remained about potential long-term complications with these implants.

Practice Guidelines and Position Statements

North American Spine Society
The North American Spine Society (2019) issued coverage recommendations for lumbar artificial disc replacement. The following recommendation was made:

Lumbar Artificial Disc Replacement is indicated for patients with discogenic low back pain who meet ALL of the following criteria

1. Symptomatic single level lumbar disc disease at L3-L4, L4-L5 or L5-S1 level
2. Presence of symptoms for at least 6 months or greater and that are not responsive to multi-modal nonoperative treatment over that period that should include a physical therapy/rehabilitation program but may also include (but not limited to) pain management, injections, cognitive behavior therapy, and active exercise programs
3. Any underlying psychiatric disorder, such as depression, should be diagnosed and the management optimized prior to surgical intervention
4. Primary complaint of axial pain, with a possible secondary complaint of lower extremity pain

Lumbar Disc Arthroplasty is NOT indicated in ANY of the following scenarios:

1. Any case that does not fulfill ALL of the above criteria
2. Presence of symptomatic degenerative disk disease at more than one level
3. Presence of spinal instability with spondylolisthesis greater than Grade I
4. Chronic radiculopathy (unremitting pain with predominance of leg pain symptoms greater than back pain symptoms extending over a period of at least one year)
5. Osteopenia as evidenced by a DEXA bone mineral density T-score less than or equal to -1.0
6. Poorly managed psychiatric disorder
7. Significant facet arthropathy at the index level
8. Age greater than 60 years or less than 18 years
9. Presence of infection or tumor

American Pain Society
In 2009, the American Pain Society’s practice guidelines concluded there was “insufficient evidence” to adequately evaluate the long-term benefits and harms of vertebral disc replacement. The guidelines were based on a systematic review commissioned by the Society and conducted by the Oregon Evidence-Based Practice Center. The rationale for the recommendation was that, although artificial disc replacement has been associated with outcomes similar to fusion, the trial results were only applicable to a narrowly defined subset of patients with single-level degenerative disease, and the type of fusion surgery in the trials is no longer widely used due to frequent poor outcomes. Also, all trials had been industry-funded, and data on long-term (>2 years) benefits and harms following artificial disc replacement were limited.

National Institute for Health and Care Excellence
The National Institute for Health and Care Excellence (2009) updated its guidance on the safety and efficacy of prosthetic intervertebral disc replacement in the lumbar spine with studies reporting 13-year follow-up but with most of the “evidence from studies with shorter durations of follow-up.” The Institute concluded that evidence was “adequate to support the use of this procedure.”

U.S. Preventive Services Task Force Recommendations
Not applicable.

Medicare National Coverage
Effective for services performed on or after August 14, 2007, Centers for Medicare & Medicaid Services (CMS) found “that LADR [lumbar artificial disc replacement] is not reasonable and necessary for the Medicare population older than 60 years of age; therefore, LADR is non-covered for Medicare beneficiaries older than 60 years of age.” For Medicare beneficiaries 60 years of age and younger, there is no national coverage determination for LADR, leaving such determinations to be made by the local contractors.

The national coverage determination (NCD) was revised in September 2007 to reflect a change from noncoverage for a specific implant (the Charité), to noncoverage for the LADR procedure for the Medicare population older than 60 years of age. CMS provided this explanation,

“The original NCD for LADR was focused on a specific lumbar artificial disc implant (Charite™) because it was the only one with FDA [Food and Drug Administration]
approval at that time. In the original decision memorandum for LADR, CMS stated that when another lumbar artificial disc received FDA approval CMS would reconsider the policy. Subsequently, another lumbar artificial disc, ProDisc®-L, received FDA approval, which initiated the reconsideration of the NCD on LADR. After reviewing the evidence, CMS is convinced that indications for the procedure of LADR exclude the populations older than age 60; therefore, the revised NCD addresses the procedure of LADR rather than LADR with a specific manufacture’s implant."24.

Ongoing and Unpublished Clinical Trials
A currently unpublished trial that might influence this review is shown in Table 5.

Table 5. Summary of Key Trials

<table>
<thead>
<tr>
<th>NCT No.</th>
<th>Trial Name</th>
<th>Planned Enrollment</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCT02381574</td>
<td>French Lumbar Total Disk Replacement Observational Study (FLTDR Observational Study)</td>
<td>600</td>
<td>Dec 2020</td>
</tr>
</tbody>
</table>

NCT: national clinical trial.

REFERENCES
a randomized controlled multicenter trial. Spine J. Oct 2017;17(10):1480-1488. PMID 28583869


38. Schoenfeld AJ. Commentary on an article by Rick Delamarter, MD, et al.: "Prospective, randomized, multicenter Food and Drug Administration investigational device exemption study of the ProDisc-L total disc replacement compared with circumferential arthrodesis for the treatment of two-level degenerative lumbar disc disease. Results at twenty-four months". J Bone Joint Surg Am. Apr 20 2011;93(8):e41. PMID 21398573


**Billing Coding/Physician Documentation Information**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>22857</td>
<td>Total disc arthroplasty (artificial disc), anterior approach, including discectomy to prepare interspace (other than for decompression), single interspace, lumbar</td>
</tr>
<tr>
<td>22862</td>
<td>Revision including replacement of total disc arthroplasty (artificial disc), anterior approach, single interspace; lumbar</td>
</tr>
<tr>
<td>22865</td>
<td>Removal of total disc arthroplasty (artificial disc), anterior approach, single interspace; lumbar</td>
</tr>
<tr>
<td>0163T</td>
<td>Total disc arthroplasty (artificial disc), anterior approach, including discectomy to prepare interspace (other than for decompression), each additional interspace, lumbar (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>0164T</td>
<td>Removal of total disc arthroplasty, (artificial disc), anterior approach, each additional interspace, lumbar (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>0165T</td>
<td>Revision including replacement of total disc arthroplasty (artificial disc), anterior approach, each additional interspace, lumbar (List separately in addition to code for primary procedure)</td>
</tr>
</tbody>
</table>

**ICD-10 Codes**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M51.05-</td>
<td>Thoracolumbar, and lumbosacral intervertebral disc disorders code range (except codes that end in “4” which are thoracic)</td>
</tr>
</tbody>
</table>

Effective January 1, 2007, CPT category I codes became available that are specific to total disc arthroplasty when performed at a single lumbar spine interspace. The language of the codes was revised for 2009, and the codes now appear as below:

22857 Total disc arthroplasty (artificial disc), anterior approach, including discectomy to prepare interspace (other than for decompression), single interspace, lumbar

22862 Revision including replacement of total disc arthroplasty (artificial disc), anterior approach, single interspace; lumbar

22865 Removal of total disc arthroplasty (artificial disc), anterior approach, single interspace; lumbar
When more than 1 interspace is involved, the following CPT category III add-on codes would be used:

0163T Total disc arthroplasty (artificial disc), anterior approach, including discectomy to prepare interspace (other than for decompression), each additional interspace, lumbar (List separately in addition to code for primary procedure)
0164T Removal of total disc arthroplasty (artificial disc), anterior approach, each additional interspace, lumbar (List separately in addition to code for primary procedure)
0165T Revision including replacement of total disc arthroplasty, anterior approach, each additional interspace, lumbar (List separately in addition to code for primary procedure)

Additional Policy Key Words
N/A

Policy Implementation/Update Information
12/1/05 New policy, considered investigational.
12/1/06 No policy statement changes.
12/1/07 No policy statement changes. Coding updated.
12/1/07 Policy statement revised to reference only the lumbar spine and remains investigational.
12/1/08 No policy statement changes.
12/1/09 No policy statement changes.
12/1/09 No policy statement changes.
12/1/10 No policy statement changes.
12/1/10 No policy statement changes.
12/1/11 No policy statement changes.
12/1/12 No policy statement changes.
12/1/12 No policy statement changes.
12/1/13 No policy statement changes.
12/1/13 No policy statement changes.
12/1/14 No policy statement changes.
12/1/14 No policy statement changes.
12/1/15 No policy statement changes.
12/1/15 No policy statement changes.
12/1/16 No policy statement changes.
12/1/16 No policy statement changes.
12/1/17 No policy statement changes.
12/1/17 No policy statement changes.
6/1/18 No policy statement changes.
12/1/18 No policy statement changes.
State and Federal mandates and health plan contract language, including specific provisions/exclusions, take precedence over Medical Policy and must be considered first in determining eligibility for coverage. The medical policies contained herein are for informational purposes. The medical policies do not constitute medical advice or medical care. Treating health care providers are independent contractors and are neither employees nor agents Blue KC and are solely responsible for diagnosis, treatment and medical advice. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, photocopying, or otherwise, without permission from Blue KC.