Clinical Policy Title: Melody™ transcatheter pulmonary valve replacement

Clinical Policy Number: 04.03.08

Effective Date: January 1, 2017
Initial Review Date: October 19, 2016
Most Recent Review Date: November 16, 2017
Next Review Date: November 2018

Policy contains:
- Transcatheter pulmonary valve replacement.
- Right ventricular outflow tract.
- Pulmonary valve insufficiency.

Related policies:
- CP# 04.03.01 Transcatheter aortic and mitral valve replacement and repair
- CP# 04.02.06 Heart valve transplant

ABOUT THIS POLICY: Select Health of South Carolina has developed clinical policies to assist with making coverage determinations. Select Health of South Carolina’s clinical policies are based on guidelines from established industry sources, such as the Centers for Medicare & Medicaid Services (CMS), state regulatory agencies, the American Medical Association (AMA), medical specialty professional societies, and peer-reviewed professional literature. These clinical policies along with other sources, such as plan benefits and state and federal laws and regulatory requirements, including any state- or plan-specific definition of “medically necessary,” and the specific facts of the particular situation are considered by Select Health of South Carolina when making coverage determinations. In the event of conflict between this clinical policy and plan benefits and/or state or federal laws and/or regulatory requirements, the plan benefits and/or state and federal laws and/or regulatory requirements shall control. Select Health of South Carolina’s clinical policies are for informational purposes only and not intended as medical advice or to direct treatment. Physicians and other health care providers are solely responsible for the treatment decisions for their patients. Select Health of South Carolina’s clinical policies are reflective of evidence-based medicine at the time of review. As medical science evolves, Select Health of South Carolina will update its clinical policies as necessary. Select Health of South Carolina’s clinical policies are not guarantees of payment.

Coverage policy

Select Health of South Carolina considers the use of Melody™ Transcatheter Pulmonary Valve (TPV) (Medtronic Inc., Mounds View, Minnesota) to be clinically proven and, therefore, medically necessary as an adjunct to surgery in pediatric and adult members with the following clinical indications (Bhatt, 2015; U.S. Food and Drug Administration [FDA], 2015):

- Existence of a full (circumferential) right ventricular outflow tract (RVOT) conduit that was equal to or greater than 16 mm in diameter when originally implanted.
- Dysfunctional RVOT conduit with a clinical indication for intervention, and either:
  - Regurgitation: ≥ moderate regurgitation.
  - Stenosis: mean RVOT gradient ≥ 35 mmHg.

Limitations:

All other uses of the Melody TPV are not medically necessary.

Alternative covered services:
Members should fully discuss alternatives with his or her physician to select the method that best meets expectations and lifestyle.

**Background**

Congenital heart defects affect normal blood flow through the heart (National Heart Lung Blood Institute [NHLBI], 2011). Defects can affect the interior septa, valves, and blood vessels to and from the heart. Congenital heart defects are the most common type of birth defect, affecting eight out of every 1,000 newborns. More than one million adults are living with these conditions.

Some defects of the valves or septa are considered simple, while other defects such as Tetralogy of Fallot are more complex. Patients born with complex heart defects typically need several surgeries during their lifetimes to correct their heart problems (NHLBI, 2011).

Valve defects can involve stenosis, atresia, or regurgitation. The most common valve defect is pulmonary valve stenosis. It involves narrowing of the pulmonary valve, which can affect blood flow from the right ventricle into the pulmonary artery. The RVOT is the portion of the right ventricle through which blood passes to enter the great arteries. It is an important anatomical feature in many corrective surgeries for congenital heart defects, as dilation of this region can cause pulmonary valve insufficiency (NHLBI, 2011).

Pulmonary valve stenosis can range from mild to severe. Most children who have this defect have no signs or symptoms other than a heart murmur and often require no treatment. More severe or complex cases may require open-heart surgery or a heart transplant. Surgical repair is effective in the short term, but valves and conduits have limited durability. Calcification and scar formation can lead to RVOT dysfunction, which, when severe, results in a blocked or regurgitant pulmonary heart valve. Percutaneous catheter-based procedures have emerged in the past 20 years, and are often the preferred way to repair many simple heart defects (NHLBI, 2011).

**Melody TPV:**

The Melody TPV is an artificial heart valve made from a bovine jugular vein valve that is sewn into a small metal frame (Medtronic Inc., 2017). The Medtronic Ensemble™ Transcatheter Valve Delivery System (Medtronic Inc., Mounds View, Minnesota) is a thin, hollow, and long catheter that percutaneously delivers the Melody TPV into the heart while the heart is beating. The Melody TPV is first compressed onto a balloon at the tip of the delivery catheter. Through a small incision typically in the groin, the Melody TPV is directed through a vein to the failing pulmonary heart valve. The small balloon is then inflated to open up the Melody TPV, and the catheter is removed from the body. The Melody TPV immediately becomes the new pulmonary heart valve.

The Center for Devices and Radiological Health (CDRH) of the FDA approved the Melody TPV device on January 27, 2015. According to the approval letter, Melody TPV models PB1016 and PB1018 and Ensemble Transcatheter Valve Delivery System models NU1018, NU1020, and NU1022 were approved for the following uses (FDA, 2015):
• Existence of a full (circumferential) RVOT conduit ≥ 16 mm in diameter when originally implanted.
• Dysfunctional RVOT conduit with a clinical indication for intervention, and either at least moderate regurgitation or a mean RVOT gradient ≥ 35 mmHg.

The purported benefits of the Melody TPV are minimal invasiveness and a potential reduction in the risks of bleeding and infection. It may delay the time when a patient needs additional open heart surgery and reduce the total number of open heart surgeries a patient needs (FDA, 2015).

Searches

Select Health of South Carolina searched PubMed and the databases of:
  • UK National Health Services Centre for Reviews and Dissemination.
  • Agency for Healthcare Research and Quality’s National Guideline Clearinghouse and other evidence-based practice centers.
  • The Centers for Medicare & Medicaid Services (CMS).

We conducted searches on November 7, 2017. Search terms were: “Heart Defects, Congenital” (MeSH) and free text terms “Melody TPV,” “pulmonary valve,” and “transcatheter pulmonary valve.”

We included:
  • Systematic reviews, which pool results from multiple studies to achieve larger sample sizes and greater precision of effect estimation than in smaller primary studies. Systematic reviews use predetermined transparent methods to minimize bias, effectively treating the review as a scientific endeavor, and are thus rated highest in evidence-grading hierarchies.
  • Guidelines based on systematic reviews.
  • Economic analyses, such as cost-effectiveness, and benefit or utility studies (but not simple cost studies), reporting both costs and outcomes — sometimes referred to as efficiency studies — which also rank near the top of evidence hierarchies.

Findings

A systematic review of 14 observational studies, four controlled studies, and five comparative studies evaluated percutaneous pulmonary valve implantation (PPVI) in adults and children with RVOT dysfunction (Hayes, 2016). Study subjects had undergone prior RVOT reconstruction, met selection criteria for the valve, had a conduit size of 16 millimeters (mm) to 22 mm, and who could not undergo, or wished to delay, pulmonary valve replacement through open heart surgery.

PPVI significantly improved most hemodynamic measures, but it was inconsistently effective for other outcomes. Variation in outcomes was related to RVOT etiology and valve pathology, operator experience, and procedure protocol. There were few complications, but some were potentially life threatening. There are no known contraindications to the Melody TPV.
Test angioplasty might be indicated to detect pre-existing coronary artery compression, which can lead to a fatal outcome. PPVI has a learning curve, and protocols that improve outcomes (e.g., pre-stenting) are still being developed. Long-term patient survival, valve durability, and effectiveness in postponing surgery are unclear. The American Heart Association (AHA) recognizes TPVs as an emerging treatment option, but lack of outcome data on surgical pulmonary valve replacement prevents a comparison of outcomes to TPV; these valves are only suitable for patients with non-native RVOTs (Bhatt, 2015).

Policy updates:

In 2017, we added an update of a previous systematic review (Hayes, 2017), one new systematic review and meta-analysis (Chatterjee, 2017), and one post-marketing surveillance study based on adverse event data reported to the FDA’s Manufacturer and User Facility Device Experience (MAUDE) database (Hill, 2017). The new information suggests improvement in long-term outcomes, particularly reduced re-intervention rates, that are associated with procedural experience and widespread adoption of pre-stenting in patients with failing pulmonary conduits or dysfunctional surgical bioprosthetic valves. The new information confirms previous findings, and warrants no policy changes.

Summary of clinical evidence:

<table>
<thead>
<tr>
<th>Citation</th>
<th>Content, Methods, Recommendations</th>
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<tbody>
<tr>
<td>Chatterjee (2017)</td>
<td><strong>TPV Implantation</strong></td>
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<tr>
<td></td>
<td>Key points:</td>
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<tr>
<td></td>
<td>• Systematic review and meta-analysis of 19 observational studies (1,044 total patients) with a pooled follow-up of 2,271 person-years.</td>
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<td>• Procedural success rate: 96.2% (95% confidence intervals [CI] 94.6% to 97.4%).</td>
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<td>• Conduit rupture rate: 4.1% (95% CI 2.5% to 6.8%).</td>
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<td>• Coronary complication rate: 1.3% (95% CI 0.7% to 2.3%).</td>
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<td>• Pooled endocarditis rate: 1.4 per 100 person-years (95% CI 0.9 to 2.0).</td>
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<td>• Incidence of re-intervention: 4.4 per 100 person-years overall (95% CI 3.0 to 5.9) with a marked reduction in studies reporting ≥ 75% pre-stenting (2.9 per 100 person-years [95% CI 1.5 to 4.3] versus 6.5 per 100 person-years [95% CI 4.6 to 8.5]; P&lt;0.01).</td>
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<tr>
<td>Hayes (2016, updated 2017)</td>
<td><strong>Percutaneous Pulmonary Valve Implantation (PPVI) for RVOT defects</strong></td>
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<td>Key points:</td>
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<td>• Systematic review of four controlled (2 historical control) studies, five comparative studies, and 14 uncontrolled studies. Sample sizes ranged 31 to 677 patients with RVOT defects.</td>
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<td>• Overall quality: low.</td>
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<td>• Evidence suggests consistent short-term benefits of PPVI for RVOT; some results were dependent on etiology and pathology of the defect, operator experience, and procedure protocol.</td>
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<td>• Consistent improvement in most hemodynamic measures (22 observational studies).</td>
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<td>• Less consistent improvement in pulmonary regurgitation from baseline; long-term results are unknown (17 observational studies).</td>
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<td>• High procedural success, but approximately 25% to 33% of patients required re-intervention at 5-year follow-up.</td>
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</table>
Citation | Content, Methods, Recommendations
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Hill (2017) | Update: Abstracts of one multicenter prospective study, one retrospective study, and one cost comparison study added. No change to conclusions.

**Key points:**
- Post-market surveillance analysis of adverse events associated with Melody valve implantation reported to FDA’s MAUDE database, and a structured literature review of on- and off-label uses. Results were compared to those described in the prospective Investigational Device Exemption and Post-Market Approval Melody TPV trials.
- On-label uses: 631 adverse events; most frequent events were similar to those described in the prospective trials (e.g., stent fracture \( n = 210 \) and endocarditis \( n = 104 \)).
- Off-label uses: 84 adverse events.
- Post-market passive surveillance does not demonstrate a high frequency of previously unrecognized serious adverse events with “on-label” Melody valve implantation.
- Further study is needed to evaluate safety of “off-label” uses.

Bhatt (2015) for the AHA | Congenital heart disease in the older adult: a scientific statement from the AHA

**Key points:**
- Transcatheter valve implantation has dramatically changed the treatment paradigm, and possibly the threshold for pulmonary valve implantation, although current size limitations and the requirement for a conduit or other fixed structure in the RVOT may limit use in the patient without prior surgery.
- Available transcatheter valves are only suitable for patients with non-native RVOTs, although transcatheter valves with broader applicability are in early trials.
- Early complications associated with transcatheter therapy at least are known.
- Contemporary morbidity, mortality, and durability of surgical pulmonary valve replacement are not known; therefore, there is no contemporaneous benchmark against which to compare transcatheter valve implantation.

**References**

**Professional society guidelines/other:**


What Are Congenital Heart Defects? Last updated July 1, 2011. NHLBI website. 

Peer-reviewed references:


CMS National Coverage Determinations (NCDs):

No NCDs identified as of the writing of this policy.

Local Coverage Determinations (LCDs):


Commonly submitted codes

Below are the most commonly submitted codes for the service(s)/item(s) subject to this policy. This is not an exhaustive list of codes. Providers are expected to consult the appropriate coding manuals and bill accordingly.

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<th>CPT Code</th>
<th>Description</th>
<th>Comments</th>
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<tr>
<td>33477</td>
<td>Transcatheter pulmonary valve implantation, percutaneous approach, including pre-stenting of the valve delivery site, when performed</td>
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<td>I37.0</td>
<td>Nonrheumatic pulmonary valve stenosis</td>
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<td>I37.1</td>
<td>Nonrheumatic pulmonary valve insufficiency</td>
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<tr>
<td>I37.2</td>
<td>Nonrheumatic pulmonary valve stenosis with insufficiency</td>
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<tr>
<th>HCPCS Level II Code</th>
<th>Description</th>
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