



# Medical Coverage Policy

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## Transcatheter Ablation for the Treatment of Supraventricular Tachycardia in Adults

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### Related Coverage Resources

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### Overview

This Coverage Policy addresses transcatheter ablation for the treatment of supraventricular tachycardia (SVT) in adults ≥18 years of age. This policy does not address transcatheter ablation for the treatment of supraventricular tachycardia (SVT) in individuals under 18 years of age.

For information on coverage of transcatheter ablation for the treatment of atrial fibrillation please refer to the Cigna Medical Coverage Policy Nonpharmacological Treatments for Atrial Fibrillation.

### Coverage Policy

**Transcatheter ablation is considered medically necessary as a treatment for ANY of the following supraventricular tachycardias in an adult ≥ 18 years of age:**

- symptomatic focal atrial tachycardia (AT) as an alternative to pharmacological therapy
- cavotricuspid isthmus (CTI) dependent atrial flutter

- recurrent symptomatic non-CTI-dependent atrial flutter
- accessory pathway ablation in individuals with atrioventricular reentrant tachycardia (AVRT), preexcited atrial fibrillation (AF), or high risk findings on an electrophysiological study
- symptomatic atrioventricular nodal reentrant tachycardia (AVNRT)
- junctional tachycardia when medical therapy is not effective or contraindicated
- CTI dependent atrial flutter induced at the time of AF ablation

## General Background

Supraventricular tachycardia (SVT) is any tachycardia with atrial rates in excess of 100 beats/minute at rest and whose origin involves tissue from the His bundle or above. These SVTs include inappropriate sinus tachycardia, atrial tachycardia (AT) including focal and multifocal AT, macroreentrant AT (including typical atrial flutter), junctional tachycardia, atrioventricular nodal reentrant tachycardia (AVNRT), and various forms of accessory pathway-mediated reentrant tachycardias. These SVTs exclude atrial fibrillation (AF).

SVT affects approximately 2 in 1,000 people in the United States. A subset of SVT called paroxysmal supraventricular tachycardia (PSVT) currently affects 570,000 individuals and is most common in women and older adults. PSVT is a clinical syndrome characterized by the presence of a regular and rapid tachycardia of abrupt onset and termination. These features are characteristic of AVNRT or atrioventricular reentrant tachycardia (AVRT), and, less frequently, AT. Patients with SVT account for approximately 50,000 emergency departments visits each year. Existing heart conditions like congenital heart defects and heart failure can increase risk for SVT. SVT affects from 10-20% of adults with congenital heart disease. Pregnancy can increase risk for these abnormal heartbeat rhythms or trigger abnormal heartbeats in patients with SVT.

Sacks et al., (2020) conducted a retrospective analysis of insurance claim data to evaluate the impact gender has on diagnosis, treatment, healthcare resource use (HRU), and expenditure in men and women newly diagnosed with paroxysmal supraventricular tachycardia (PSVT). Individuals (n=5466) were included if they were 18 – 40 years old and were newly diagnosed with PSVT with observable data for one year prior to diagnosis and one year after diagnosis. There were 3655 women and 1811 men included in the analysis. Women had slightly greater usage of beta and calcium channel blockers post diagnosis compared to men (46.07% vs. 44.17%). Significantly more women than men had at least one emergency department (ED) visit and at least one hospital admission post-diagnosis (49.6% vs. 44.5%;  $p < 0.01$  and 24.7% vs. 20.0%;  $p < 0.01$ , respectively). Significantly less women were treated with cardiac ablation compared to men in the year following diagnosis (12.59% vs. 15.30%;  $p < 0.01$ ). In the year prior to SVT diagnosis, more women were treated for panic/anxiety disorder ( $p < 0.01$ ) while more men were treated for atrial fibrillation ( $p < 0.0001$ ) suggesting women are more frequently misdiagnosed as having anxiety. Author noted limitations of the study included a reliance on claims data and short-term follow-up. This study demonstrates the need for provider education focusing on adherence to published guidelines to diagnose and treat PSVT to avoid misdiagnoses and treatment delays in women.

The etiology of SVT is usually nonspecific. However, precipitating factors (e.g., exercise, caffeine, cigarette consumption, relation to emotional upsets, and alcohol intake) should always be considered. The most common symptoms of SVT include heart palpitations, chest pain, lightheadedness, shortness of breath, and fainting. These symptoms are similar to those of panic and anxiety disorders, which can lead to misdiagnosis. Tests like electrocardiograms (ECG) and ambulatory heart monitors which measure the electrical impulses of the heart can help diagnose SVT. These tests can also help determine the type of SVT a patient has which is critical for determining a treatment plan. What makes diagnosing SVT difficult is that it usually occurs only in short periods of time and often an ECG of these periods is not available. Once an ECG is obtained, there are many types of SVT to consider.

Treatment for SVT varies from patient to patient. Treatment depends on a number of factors such as the type of SVT, the frequency and duration of SVT episodes, and the severity of symptoms. Treatment also depends on patient preferences. Treatment may include a “watch and wait” approach, vagal maneuvers, intermittent “pill-in-the-pocket” drug therapy, prolonged drug therapy, or procedures like catheter ablation. The goal of SVT

treatment is to prevent abnormal heartbeats, minimize symptoms and reduce the risk of complications. It's important that patients are a part of the decision-making process when it comes to treatment.

An invasive electrophysiological (EP) study permits the precise diagnosis of the underlying arrhythmia mechanism, localization of the site of origin and provides definitive treatment if coupled with catheter ablation. Radiofrequency current is the most commonly used energy source for SVT ablation. Cryoablation is used as an alternative to radiofrequency ablation to minimize injury to the AV node during ablation of specific arrhythmias. Selection of the energy source depends on operator experience, arrhythmia target location, and patient preference.

### **U.S. Food and Drug Administration (FDA)**

Catheter ablation is a procedure and, therefore, not subject to FDA regulation. Any medical devices, drugs, biologics, or tests used as a part of this procedure may be subject to FDA regulation.

Numerous radiofrequency ablation and cryoablation catheters have received FDA approval through the premarket application (PMA) process for treatment of arrhythmias.

### **Professional Societies/Organizations**

**American College of Cardiology/American Heart Association/Heart Rhythm Society:** In 2015, the ACC/AHA/HRS updated the guideline for the management of adult patients with supraventricular tachycardia (Page, et al., 2016). The guideline is aimed at the adult population,  $\geq 18$  years of age, and offers no specific recommendations for pediatric patients. The guideline states that the recommendations for ongoing management, along with other recommendations and algorithms for specific SVTs, are meant to include consideration of patient preferences and clinical judgment; this may include consideration of consultation with a cardiologist or clinical cardiac electrophysiologist, as well as patient comfort with possible invasive diagnostic and therapeutic intervention. Recommendations for treatment options (including drug therapy, ablation, or observation) must be considered in the context of frequency and duration of the SVT, along with clinical manifestations, such as symptoms or adverse consequences (e.g., development of cardiomyopathy).

The guideline addresses the following evidence-based recommendations for catheter ablation:

#### **Ongoing Management of Suspected Focal Atrial Tachycardia (AT)**

- Catheter ablation is recommended in patients with symptomatic focal AT as an alternative to pharmacological therapy (Class I recommendation; Level of Evidence B-NR).

The guideline states that a large number of nonrandomized cohort studies on focal AT ablation have accumulated in the past two decades. In a 2012 ablation registry provided by 74 voluntary medical centers in Spain, AT was found in 333 of 11,042 of the ablation procedures performed. In experienced centers, when the AT can be induced in the laboratory, acute success rates above 90% to 95% have consistently been reported, with a complication rate of <1% to 2%.

#### **Ongoing Management of Atrioventricular Nodal Reentrant Tachycardia (AVNRT)**

- Catheter ablation of the slow pathway is recommended in patients with AVNRT (Class I recommendation; Level of Evidence B-NR).

The guideline states that catheter ablation of AVNRT is regarded as first-line therapy for treatment of symptomatic AVNRT. It is potentially curative and chronic pharmacological therapy is usually not needed after the procedure. Slow-pathway ablation, also called modification, is the preferred target during ablation of AVNRT. Large registry studies report the success rates of slow-pathway ablation to be >95%, with a <1% risk of AV block. Cryoablation of AVNRT is an alternative to radiofrequency ablation. Recent systematic reviews and trials randomizing patients to radiofrequency ablation versus cryoablation suggest an equivalent acute success rate, with a lower rate of AV block with cryoablation but a higher rate of recurrence during long-term follow-up with cryoablation.

- Oral verapamil or diltiazem is recommended for ongoing management in patients with AVNRT who are not candidates for, or prefer not to undergo, catheter ablation (Class I recommendation; Level of Evidence B-R).
- Oral beta blockers are recommended for ongoing management in patients with AVNRT who are not candidates for, or prefer not to undergo, catheter ablation (Class I recommendation; Level of Evidence B-R).
- Flecainide or propafenone is reasonable for ongoing management in patients without structural heart disease or ischemic heart disease who have AVNRT and are not candidates for, or prefer not to undergo, catheter ablation and in whom beta blockers, diltiazem, or verapamil are ineffective or contraindicated (Class IIa recommendation, Level of Evidence B-R).
- Clinical follow-up without pharmacological therapy or ablation is reasonable for ongoing management in minimally symptomatic patients with AVNRT (Class IIa recommendation, Level of Evidence B-NR).
- Oral sotalol or dofetilide may be reasonable for ongoing management in patients with AVNRT who are not candidates for, or prefer not to undergo, catheter ablation (Class IIa recommendation, Level of Evidence B-NR).
- Oral digoxin or amiodarone may be reasonable for ongoing treatment of AVNRT in patients who are not candidates for, or prefer not to undergo, catheter ablation (Class IIb recommendation, Level of Evidence B-R).
- Self-administered (“pill-in-the-pocket”) acute doses of oral beta blockers, diltiazem, or verapamil may be reasonable for ongoing management in patients with infrequent, well-tolerated episodes of AVNRT (Class IIb recommendation, Level of Evidence C-D).

### **Ongoing Management of Orthodromic Atrioventricular Reentrant Tachycardia (AVRT)**

- Catheter ablation of the accessory pathway is recommended in patients with AVRT and/or preexcited AF (Class I recommendation; Level of Evidence B-NR).

The guideline states that several large series support the use of catheter ablation of the accessory pathway as first-line therapy in patients who have had AF and/or AVRT. These series report a success rate of approximately 93% to 95% and a 3% risk of major complications when patients are followed up for six months to eight years. AF in younger patients is usually associated with the accessory pathway and is unlikely to occur after ablation; in contrast, older patients may have recurrence of AF from causes unrelated to the accessory pathway. Catheter ablation is also effective for treating permanent form of junctional reciprocating tachycardia (PJRT) by ablating the concealed accessory pathway with a success rate of approximately 90%. Catheter ablation of an atriofascicular (Mahaim) pathway is successful in preventing reentrant tachycardia in approximately 70% to 100% of patients.

- Oral beta blockers, diltiazem, or verapamil are indicated for ongoing management of AVRT in patients without pre-excitation on their resting ECG (Class I recommendation; Level of Evidence C-D).
- Oral flecainide or propafenone is reasonable for ongoing management in patients without structural heart disease or ischemic heart disease who have AVRT and/or pre-excited AF and are not candidates for, or prefer not to undergo, catheter ablation (Class IIa recommendation; Level of Evidence B-R).
- Oral dofetilide or sotalol may be reasonable for ongoing management in patients with AVRT and/or pre-excited AF who are not candidates for, or prefer not to undergo, catheter ablation (Class IIb recommendation; Level of Evidence B-R).
- Oral amiodarone may be considered for ongoing management in patients with AVRT and/or pre-excited AF who are not candidates for, or prefer not to undergo, catheter ablation and in whom beta blockers, diltiazem, flecainide, propafenone, and verapamil are ineffective or contraindicated (Class IIb recommendation; Level of Evidence B-R).
- Oral beta blockers, diltiazem, or verapamil may be reasonable for ongoing management of orthodromic AVRT in patients with pre-excitation on their resting ECG who are not candidates for, or prefer not to undergo, catheter ablation (Class IIb recommendation; Level of Evidence C-LD).

- Oral digoxin may be reasonable for ongoing management of orthodromic AVRT in patients without pre-excitation on their resting ECG who are not candidates for, or prefer not to undergo, catheter ablation (Class IIb recommendation; Level of Evidence C-LD).

### Ongoing Management of Atrial Flutter

- Catheter ablation of the cavotricuspid isthmus (CTI) is useful in patients with atrial flutter that is either symptomatic or refractory to pharmacological rate control (Class I recommendation; Level of Evidence B-R).

The guideline states that rate control can be difficult to achieve in atrial flutter, and a rhythm control strategy is often chosen. Catheter ablation of CTI-dependent atrial flutter is often preferred to long-term pharmacological therapy; in this rhythm, the CTI represents the optimal target for ablation because a line of ablation between the tricuspid valve annulus and inferior vena cava can effectively interrupt the circuit.

- Catheter ablation is useful in patients with recurrent symptomatic non-CTI-dependent flutter after failure of at least 1 antiarrhythmic agent (Class I recommendation; Level of Evidence C-LD).

The guideline states that no prospective randomized controlled trials (RCTs) have compared the efficacy or safety of antiarrhythmic drugs with that of catheter ablation for non-CTI-dependent atrial flutter. In general, catheter ablation of non-CTI-dependent atrial flutter is more difficult than ablation of CTI-dependent flutter because the anatomic circuits are complex, are often not anatomically defined, and can be difficult to locate. Observational data support the relative effectiveness and safety of catheter ablation in experienced centers. Many of the atrial flutters that are observed during the first three months after catheter ablation or cardiac surgery will not persist beyond the periprocedural period, so attempts at ablation can be deferred unless pharmacological therapy and/or cardioversion are unsuccessful.

- Catheter ablation is reasonable in patients with CTI-dependent atrial flutter that occurs as the result of flecainide, propafenone, or amiodarone used for treatment of AF (Class IIa recommendation, Level of Evidence B-R).

The guideline states that some patients with AF treated with propafenone, flecainide, or amiodarone will develop atrial flutter. In this circumstance, if flutter becomes the dominant arrhythmia, ablation of the CTI and continued use of the antiarrhythmic drug can decrease the incidence of atrial flutter and facilitate the pharmacological management of AF.

- Catheter ablation of the CTI is reasonable in patients undergoing catheter ablation of AF who also have a history of documented clinical or induced CTI-dependent atrial flutter (Class IIa recommendation, Level of Evidence C-LD).

The guideline states that when AF and atrial flutter coexist, one randomized study demonstrated that at one-year follow-up, greater success in terms of arrhythmia suppression and quality-of-life score resulted from AF ablation (with or without atrial flutter ablation) than from atrial flutter ablation alone. Possibly AF ablation alone is sufficient to control both arrhythmias, although CTI ablation reduced the early postablation arrhythmia recurrence rate

- Catheter ablation is reasonable in patients with recurrent symptomatic non-CTI-dependent flutter as primary therapy, before therapeutic trials of antiarrhythmic drugs, after carefully weighing potential risks and benefits of treatment options (Class IIa recommendation, Level of Evidence C-LD).

The guideline states that no prospective RCTs have compared the efficacy or safety of antiarrhythmic drugs with that of catheter ablation for non-CTI-dependent atrial flutter. Observational data, however, support the relative effectiveness and safety of catheter ablation in experienced centers. Many of the atrial flutters that are observed during the first three months after ablation or cardiac surgery will not persist beyond the periprocedural period, so attempts at ablation can be deferred unless attempts at pharmacological therapy or cardioversion are unsuccessful.

- Catheter ablation may be reasonable for asymptomatic patients with recurrent atrial flutter (Class IIb recommendation, Level of Evidence C-LD).

The guideline states that catheter ablation of atrial flutter is highly effective, with single-procedure success rates >90% and an excellent safety profile. In patients with recurrent atrial flutter, long-term maintenance of sinus rhythm is more likely with ablation than with pharmacological therapy. Also, ablation may avoid potential development of tachycardia-mediated cardiomyopathy.

### **Management of Asymptomatic Patients with Asymptomatic Pre-Excitation**

- Catheter ablation of the accessory pathway is reasonable in asymptomatic patients with preexcitation if an EP study identifies a high risk of arrhythmic events, including rapidly conducting preexcited AF (Class IIa recommendation, Level of Evidence B-R<sup>SR</sup>).

The guideline states that in a large prospective cohort study of 756 asymptomatic patients with close to eight years of follow-up, 9% of patients developed malignant AF (shortest R-R interval  $\leq 250$  ms), and 2% developed ventricular fibrillation. Malignant arrhythmias correlated more with high-risk EP properties of the accessory pathway than with the presence or absence of symptoms. Ablation of the accessory pathway(s) in high-risk patients was also examined in one RCT that enrolled 76 patients, showing that arrhythmic events (defined as symptomatic SVT, AF, and ventricular fibrillation in this study) occurred in 7% of patients who underwent ablation versus 77% who did not undergo ablation. Another study that examined patients on the basis of whether an ablation was performed reported that none of the asymptomatic patients who had undergone ablation of the accessory pathway developed a malignant arrhythmia during eight years of follow-up. The risk of complications with ablation ranged from 0.1% (complete heart block) to 0.9% (ablation-induced right bundle-branch block). It is recommended that the risks and benefits of proceeding with ablation of pathways found not to have high-risk characteristics be discussed thoroughly with patients in advance of the EP procedure.

- Catheter ablation of the accessory pathway is reasonable in asymptomatic patients if the presence of pre-excitation precludes specific employment (such as with pilots) (Class IIa recommendation, Level of Evidence B-R<sup>SR</sup>).

The guideline states that patients with asymptomatic pre-excitation whose job activities would place them or others at risk if a hemodynamically significant arrhythmia occurred (such as airline pilots) are potential candidates for catheter ablation. Catheter ablation is associated with a success rate of approximately 95% and a 3% risk of major complications when patients are followed up for six months to eight years. Other documents advise EP study in asymptomatic athletes who engage in moderate- or high-level competitive sports.

These recommendations have been designated with the notation <sup>SR</sup> to emphasize the rigor of support from the Evidence Review Committee's systematic review (Al-Khatib, et al., 2016).

### **Ongoing Management of Junctional Tachycardia**

- Catheter ablation may be reasonable in patients with junctional tachycardia when medical therapy is not effective or contraindicated (Class IIb recommendation, Level of Evidence C-LD).

The guideline states that radiofrequency ablation has been performed as a potentially curative therapy for junctional tachycardia since the early 1990s. However, in view of the reported 5% to 10% risk of AV block, catheter ablation is generally reserved for highly symptomatic patients in whom drug therapy has been ineffective or not tolerated. Many practitioners use cryoablation as an alternative to radiofrequency ablation. Given that it is often difficult to distinguish junctional tachycardia from AVNRT on the ECG, EP study with the goal of ablation may be a helpful diagnostic and potentially therapeutic intervention. Junctional tachycardia may be observed during and after slow pathway ablation of AVNRT, because of irritation of the compact AV node. This iatrogenic junctional tachycardia is transient and generally benign and can be distinguished from AVNRT through pacing maneuvers at EP study. It is crucial to recognize this phenomenon at the time of EP study because attempts to ablate the junctional tachycardia are unnecessary and could result in AV block.

## Ongoing Management of SVT in Adult Congenital Heart Disease (ACHD) Patients

- Preoperative catheter ablation or intraoperative surgical ablation of accessory pathways or AT is reasonable in patients with SVT who are undergoing surgical repair of Ebstein anomaly (Class IIa recommendation, Level of Evidence B-R).

The guideline states that the prevalence of SVT among patients with Ebstein anomaly was 33% in one large series, the highest noted among ACHD patients, and increased with age. AT, atrial flutter, or AF develops in ≥50% of patients with Ebstein anomaly and significant tricuspid regurgitation. Right-sided accessory pathways are present in 15% to 30% of patients with Ebstein anomaly and may be multiple in up to ≥29% of those patients. Catheter ablation of accessory pathways in patients with Ebstein anomaly is associated with lower success rates than for other populations, acute success rate of 75% to 89% of procedures, with acute recurrence in 25% to 30%. In a series of 83 adults undergoing arrhythmia surgery at the time of surgical repair of Ebstein anomaly, accessory pathways were present in 32%, and atrial flutter/fibrillation was noted in 54% (483), with no recurrence of AP after surgery. Successful surgical ablation of accessory pathways has been reported in 92% to 100%. In a series of patients undergoing right atrial maze procedures or isthmus ablation for atrial flutter/fibrillation in association with repair of Ebstein anomaly, freedom from recurrent flutter/fibrillation was 75% during 34 months of follow-up. In a comparison study of combined operative arrhythmia surgery with repair, versus catheter ablation followed by surgical repair, the combined approach was effective in 94% of cases versus 76% of patients treated with the catheter approach alone. In a series of patients undergoing repair of Ebstein anomaly, patients who underwent preoperative EP study with intraoperative ablation of arrhythmia substrate had lower risk of SCD than patients without arrhythmia intervention. In patients with Ebstein anomaly undergoing planned surgical intervention, an integrated approach of arrhythmia intervention has been demonstrated to be safe and effective.

- Catheter ablation is reasonable for treatment of recurrent symptomatic SVT in ACHD patients (Class IIa recommendation, Level of Evidence B-NR).

The guideline states that multiple observational and multicenter studies have demonstrated acute success rates between 65% and 100% for treatment of SVT associated with ACHD. Acute success rates vary by tachycardia mechanism and type of congenital heart disease and repair. Success rates are highest for SVT associated with AVNRT (>80%), accessory pathways (75% to 89% among patients with Ebstein anomaly), or focal AT (80% to 100%). Success rates for catheter ablation of AT or atrial flutter are significantly lower than that reported in patients without ACHD, with overall 65% to 82% acute success in mixed anatomic substrates, but success rates have improved with advanced mapping and ablation techniques. Acute success rates in ablation of AT or atrial flutter varies significantly by type of congenital heart disease, ranging from 93% to 100% in patients with repaired ASD, 85% to 100% in atrial baffle repairs of transposition of the great arteries, and 54% to 75% of univentricular heart or Fontan repairs. Older age and presence of univentricular heart physiology was associated with decreased acute success rates in a series of 193 ablations of AT. Recurrent AT has been reported in 20% to 85% of patients during short-term follow-up, with development of AF reported in 7% to 30% of patients. Recurrent SVT may represent the same or a new reentrant circuit, and arrhythmia burden may be decreased by ablation procedures. Ablation procedures in patients with complex congenital heart disease are best performed in centers with advanced mapping techniques and expertise in congenital heart disease.

## Ongoing Management of SVT in Pregnant Patients

- Catheter ablation may be reasonable in pregnant patients with highly symptomatic, recurrent, drug refractory SVT with efforts toward minimizing radiation exposure (Class IIb recommendation, Level of Evidence C-LD).

The guideline states that the risk of radiation exposure to the fetus is a concern with catheter ablation in pregnant patients, because high-dose ionizing radiation has been linked to excess malignancy and congenital malformations. The fetal radiation dose for most common cardiovascular interventions is not likely to exceed the 50-mGy negligible-risk threshold dose for excess malignancy. One study that used phantoms to simulate pregnancy estimated a low lifetime risk of malignancies from radiation exposure to the conceptus during a typical ablation procedure. With current technologies such as electro-anatomic mapping systems, catheter ablation

procedures using minimal or even zero fluoroscopy have been described in pregnant women. It is recommended that if a catheter ablation procedure is required in a pregnant woman, radiation-reduction technologies should be used, and the procedure should be avoided in the first trimester when the teratogenic risk is greatest. Shielding the fetus by covering the mother with a lead apron does not eliminate radiation to the fetus because most of the radiation to the fetus comes from scatter.

The guideline addresses the following evidence-based recommendations for acute treatment of SVT of unknown mechanism:

- Vagal maneuvers are recommended for acute treatment in patients with regular SVT (Class I recommendation, Level of Evidence B-R).
- Adenosine is recommended for acute treatment in patients with regular SVT (Class I recommendation, Level of Evidence B-R).
- Synchronized cardioversion is recommended for acute treatment in patients with hemodynamically unstable SVT when vagal maneuvers or adenosine are ineffective or not feasible (Class I recommendation, Level of Evidence B-NR).
- Synchronized cardioversion is recommended for acute treatment in patients with hemodynamically stable SVT when pharmacological therapy is ineffective or contraindicated (Class I recommendation, Level of Evidence B-NR).
- Intravenous diltiazem or verapamil can be effective for acute treatment in patients with hemodynamically stable SVT (Class IIa recommendation, Level of Evidence B-R).
- Intravenous beta blockers are reasonable for acute treatment in patients with hemodynamically stable SVT (Class IIa recommendation, Level of Evidence C-LD).

The guideline addresses the following evidence-based recommendations for ongoing management of SVT of unknown mechanism:

- Oral beta blockers, diltiazem, or verapamil is useful for ongoing management in patients with symptomatic SVT who do not have ventricular pre-excitation during sinus rhythm (Class I recommendation, Level of Evidence B-R).
- EP study with the option of ablation is useful for the diagnosis and potential treatment of SVT (Class I recommendation, Level of Evidence B-NR).
- Patients with SVT should be educated on how to perform vagal maneuvers for ongoing management of SVT (Class I recommendation, Level of Evidence C-LD).
- Flecainide or propafenone is reasonable for ongoing management in patients without structural heart disease or ischemic heart disease who have symptomatic SVT and are not candidates for, or prefer not to undergo, catheter ablation (Class IIa recommendation, Level of Evidence B-R).
- Sotalol may be reasonable for ongoing management in patients with symptomatic SVT who are not candidates for, or prefer not to undergo, catheter ablation (Class IIb recommendation, Level of Evidence B-R).
- Dofetilide may be reasonable for ongoing management in patients with symptomatic SVT who are not candidates for, or prefer not to undergo, catheter ablation and in whom beta blockers, diltiazem, flecainide, propafenone, or verapamil are ineffective or contraindicated (Class IIb recommendation, Level of Evidence B-R).
- Oral amiodarone may be considered for ongoing management in patients with symptomatic SVT who are not candidates for, or prefer not to undergo, catheter ablation and in whom beta blockers, diltiazem, dofetilide, flecainide, propafenone, sotalol, or verapamil are ineffective or contraindicated (Class IIb recommendation, Level of Evidence C-LD).
- Oral digoxin may be reasonable for ongoing management in patients with symptomatic SVT without preexcitation who are not candidates for, or prefer not to undergo, catheter ablation (Class IIb recommendation, Level of Evidence C-LD).

Class (Strength) of Recommendation:

- Class I (Strong) Benefit >>>>Risk
- Class IIa (Moderate) Benefit>>Risk
- Class IIb (Weak) Benefit > Risk
- Class III No Benefit (Moderate) Benefit=Risk

- Class III Harm (Strong) Benefit>Risk

Level (Quality) of Evidence:

- Level A if the data were derived from high-quality evidence from more than one randomized clinical trial, meta-analyses of high-quality randomized clinical trials, or one or more randomized clinical trials corroborated by high-quality registry.
- Level B-R (Randomized) when data were derived from moderate quality evidence from one or more randomized clinical trials, or meta-analyses of moderate-quality randomized clinical trials.
- Level B-NR (Nonrandomized) was used to denote moderate-quality evidence from one or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies. This designation was also used to denote moderate-quality evidence from meta-analyses of such studies.
- Level C-LD (Limited Data) when the primary source of the recommendation was randomized or nonrandomized observational or registry studies with limitations of design or execution, meta-analyses of such studies, or physiological or mechanistic studies of human subjects.
- Level C-EO (Expert Opinion) was defined as expert opinion based on the clinical experience of the writing group.

**Heart Rhythm Society (HRS); European Heart Rhythm Association (EHRA); European Cardiac Arrhythmia Society (ECAS) Asia Pacific Heart Rhythm Society (APHRS); Sociedad Latinoamericana de Estimulación Cardíaca y Electrofisiología (SOLAECE):** The 2017 HRS/EHRA/ECAS/APHRS/SOLAECE expert consensus statement on catheter and surgical ablation of atrial fibrillation addresses cavotricuspid isthmus ablation (Calkins, et al., 2017). The writing group recommendations state:

- If a patient has a history of typical atrial flutter or typical atrial flutter is induced at the time of AF ablation, delivery of a cavotricuspid isthmus linear lesion is recommended, (Class I, Level of Evidence B-R).
- the usefulness of linear ablation lesions in the absence of macroreentrant atrial flutter is not well established, (Class IIb, Level of Evidence C-LD).

**Pediatric and Congenital Electrophysiology Society (PACES)/ Heart Rhythm Society (HRS):** In 2012, the PACES and the HRS published an expert consensus statement on the management of the asymptomatic young patient with a Wolff-Parkinson-White (WPW, ventricular preexcitation) electrocardiogram pattern, which has been endorsed by the American College of Cardiology Foundation (ACCF), the American Heart Association (AHA), the American Academy of Pediatrics (AAP), and the Canadian Heart Rhythm Society (CHRS). For the specific purpose of this statement, the young patient is defined as being between 8 and 21 years of age, an age span routinely cared for by pediatricians and pediatric cardiologists and generally considered old enough to undergo exercise testing and catheter ablation if indicated.

Statements relevant to the use of catheter ablation include the following:

- Young patients with a shortest excited R-R interval (SPERRI)  $\leq$  250 ms in atrial fibrillation are at increased risk for SCD. It is reasonable to consider catheter ablation in this group, taking into account the procedural risk factors based on the anatomical location of the pathway (Class IIA, Levels of Evidence B/C).
- Young patients with a SPERRI  $\geq$  250 ms in atrial fibrillation are at lower risk for SCD, and it is reasonable to defer ablation (Class IIA, Level of Evidence C). Ablation may be considered in these patients at the time of diagnostic study if the location of the pathway and/or patient characteristics do not suggest that ablation may incur any increased risk of adverse events, such as AV block or coronary artery injury (Class IIB, Level of Evidence C).
- Young patients deemed to be at low risk might subsequently develop cardiovascular symptoms such as syncope or palpitations. These patients should then be considered symptomatic and may be eligible for catheter ablation procedures regardless of the prior assessment.
- Asymptomatic patients with a WPW ECG pattern and structural heart disease are at risk for both atrial tachycardia and AV reciprocating tachycardia, which may result in unfavorable hemodynamics. Ablation may be considered regardless of the anterograde characteristics of the accessory pathway (Class IIB, Level of Evidence C).

- Asymptomatic patients with a WPW ECG pattern and ventricular dysfunction secondary to dyssynchronous contractions may be considered for ablation, regardless of anterograde characteristics of the bypass tract (Class IIB, Level of Evidence C).

#### Classification of Recommendations:

- Class I: Conditions for which there is evidence and/or general agreement that a given procedure or treatment plan is beneficial, useful, and effective
- Class II: Conditions for which there is conflicting evidence and/or divergence of opinion about the usefulness/efficacy of a procedure or treatment
- Class IIa: Weight of evidence/opinion is in favor of usefulness/efficacy
- Class IIb: Usefulness/efficacy is less well established by evidence/opinion
- Class III: Conditions for which there is conflicting evidence and/or general agreement that a procedure or treatment is not useful/effective and in some cases may be harmful

#### Level of Evidence:

- Level of Evidence A: Data derived from multiple randomized clinical trials or meta-analyses
- Level of Evidence B: Data derived from a single randomized trial or nonrandomized studies
- Level of Evidence C: Only consensus opinion of experts, case studies, or standard of care
- Level of Evidence D: Expert opinion without studies

The role of catheter ablation for SVT in the children 0-18 years of age has been addressed by professional societies. SVT in young patients varies significantly from SVT in adult patients in terms of mechanism, risk of developing heart failure or cardiac arrest, risks associated with interventional therapy, natural history, and psychosocial impact (Philip, et al., 2016; Page, et al., 2016; Brugada, et al., 2013; Pediatric and Congenital Electrophysiology Society [PACES], 2012). Note: This policy does not address transcatheter ablation for the treatment of SVT in individuals under 18 years of age.

#### Use Outside of the US

**European Society of Cardiology (ESC):** The 2019 ESC Guidelines for the management of patients with supraventricular tachycardia (Brugada, et al., 2020) include these key messages addressing ablation:

- In all re-entrant and most focal arrhythmias, catheter ablation should be offered as an initial choice to patients, after having explained in detail the potential risks and benefits.
- Patients with macro-re-entrant tachycardias following atrial surgery should be referred to specialized centres for ablation.
- In post-AF ablation ATs, focal or macro-re-entrant, ablation should be deferred for  $\geq 3$  months after AF ablation, when possible.
- If a patient undergoes assessment with an EPS and is found to have an AP with 'high-risk' characteristics, catheter ablation should be performed.
- If ablation is necessary during pregnancy, use non-fluoroscopic mapping.
- Ablation is the treatment of choice for TCM due to SVT. AV nodal ablation with subsequent biventricular or His-bundle pacing ('ablate and pace') should be considered if the SVT cannot be ablated.

**European Heart Rhythm Association (EHRA):** The EHRA consensus document on the management of supraventricular arrhythmias (Katrtsis, et al., 2016/2018), endorsed by Heart Rhythm Society (HRS), Asia-Pacific Heart Rhythm Society (APHRS), and Sociedad Latinoamericana de Estimulaci3n Cardiac y Electrofisiologia (SOLAECE) addresses catheter ablation for the following:

#### Inappropriate Sinus Tachycardia

- Catheter ablation should not be routinely considered in patients with inappropriate sinus tachycardia. This treatment must be restricted to the most symptomatic patients after the failure of other therapy and measures (red heart).

#### Sinus Nodal Reentrant Tachycardia

- Catheter ablation may be used in patients with symptomatic sinus nodal reentrant tachycardia (yellow heart).

#### Focal Atrial Tachycardia chronic therapy

- Catheter ablation is recommended, especially for incessant AT (green heart). Recommendations supported by strong observational evidence and authors' consensus but no specific RCT.

#### Atrial Flutter/Macro-reentrant Tachycardia chronic therapy

- In patients with recurrent or poorly tolerated typical AFL, CTI ablation is recommended for preventing recurrences with a low incidence of complications (yellow heart).
- In patients with recurrent atypical or multiple ECG AFL patterns, catheter ablation may be considered after documentation of mechanism (yellow heart).
- In patients with depressed LV systolic function, ablation may be considered to revert dysfunction due to tachycardiomyopathy, and prevent recurrences (yellow heart).

#### AVRT due to manifest or concealed accessory pathways

- Catheter ablation of concealed accessory pathways may be considered in symptomatic patients with frequent episodes of AVRT (yellow heart).

#### Asymptomatic pre-excitation

- Catheter ablation of accessory pathways may be considered in asymptomatic patients with accessory pathways with antegrade refractory period <240 ms, inducible atrioventricular reentrant tachycardia triggering pre-excited atrial fibrillation, and multiple accessory pathways (yellow heart). Recommendation supported by two randomized trials based on small numbers of patients.

#### Chronic therapy of SVTs in ACHD patients

- Recurrent symptomatic SVT: Catheter ablation may be considered (yellow heart).
- Planned surgical repair and symptomatic SVT: In patients with SVT planned for surgical repair of Ebstein's anomaly, preoperative catheter ablation or intraoperative surgical ablation of accessory pathways, flutter or AT may be considered (yellow heart).

#### SVT during pregnancy

- Catheter ablation may be considered in highly symptomatic, drug refractory SVT after the first trimester (yellow heart).

#### Scientific rationale of recommendations:

- A green heart indicates a recommended/indicated treatment or procedure and is based on at least one randomized trial, or is supported by strong observational evidence that it is beneficial and effective.
- A yellow heart indicates that general agreement and/or scientific evidence favor the usefulness/efficacy of a treatment or procedure. May be supported by randomized trials that are, however, based on small number of patients to allow a green heart recommendation.
- A red heart indicates treatment strategies for which there has been scientific evidence that they are potentially harmful and should not be used are indicated.

#### **European Heart Rhythm Association (EHRA) and Association for European Pediatric and Congenital Cardiology (AEPC):**

The EHRA and AEPC Arrhythmia Working Group joint consensus document on pharmacological and non-pharmacological therapy for arrhythmias in the pediatric population (Brugada, et al., 2013) indications for catheter ablation are based mainly on the results of the large retrospective and prospective multicenter pediatric radiofrequency catheter ablation (RFCA) studies from the USA, smaller single-center experiences, and previously published guidelines for adults and children. The document states that although RFCA procedures can be performed safely in infants and young children most studies report a higher rate of severe complications in this age group. There are limited data on the long-term effects of radiofrequency lesions on the immature myocardium. It is recommended to consider RFCA in infants and young children only when all antiarrhythmic therapies have failed, including Class I and III antiarrhythmic drugs and drug combinations.

The document addresses the following recommendations for catheter ablation for pediatric patients:

Wolf-Parkinson-White (WPW) syndrome (leading to paroxysmal supraventricular tachycardia (PSVT) via an accessory pathway):

- Wolff–Parkinson–White (WPW) syndrome and episode of aborted sudden cardiac death (SCD) (Class I recommendation, Level of evidence C)
- WPW syndrome and syncope combined with preexcited RR interval during AF , <250 ms or antegrade accessory pathway effective refractory period; (APERP) during programmed electrical stimulation (PES) <250 ms (Class I recommendation, Level of evidence C)
- WPW syndrome and recurrent and/or symptomatic SVT and age > 5 years (Class I recommendation, Level of evidence C)
- WPW syndrome and recurrent and/or symptomatic SVT and age < 5 years (Class IIb recommendation)
- WPW syndrome and palpitations with inducible sustained SVT during electrophysiological (EP) test, age > 5 years (Class I recommendation, Level of evidence C)
- Asymptomatic preexcitation, age > 5 years, no recognized tachycardia, risks and benefits of procedure and arrhythmia clearly explained (Class IIb recommendation, Level of evidence C)
- Asymptomatic preexcitation, age , < 5 years (Class III recommendation, Level of evidence C)

SVT:

- Incessant or recurrent SVT associated with ventricular dysfunction (Class I recommendation, Level of evidence C)
- Single or infrequent SVT (no pre-excitation), age > 5 years (Class IIb recommendation)
- SVT, age > 5 years, chronic antiarrhythmic (AA) therapy has been effective in control of the arrhythmia (Class IIa recommendation, Level of evidence C)
- SVT, age , < 5 years (including infants), when AA medications, including Classes I and III are not effective or associated with intolerable side effects (Class IIa recommendation, Class C)
- SVT controlled with conventional AA medications, age < 5 years (Class III recommendation, Level of evidence C)

## Medicare Coverage Determinations

	Contractor	Determination Name/Number	Revision Effective Date
NCD		No National Coverage Determination found	
LCD		No Local Coverage Determination found	

Note: Please review the current Medicare Policy for the most up-to-date information.

## Coding Information

**Note:** 1) This list of codes may not be all-inclusive.

2) Deleted codes and codes which are not effective at the time the service is rendered may not be eligible for reimbursement.

**Considered Medically Necessary when criteria in the applicable policy statements listed above are met:**

CPT®* Codes	Description
93621	Comprehensive electrophysiologic evaluation including insertion and repositioning of multiple electrode catheters with induction or attempted induction of arrhythmia; with left atrial pacing and recording from coronary sinus or left atrium (List separately in addition to code for primary procedure)
93622	Comprehensive electrophysiologic evaluation including insertion and repositioning of multiple electrode catheters with induction or attempted induction of arrhythmia; with left ventricular pacing and recording (List separately in addition to code for primary procedure)
93623	Programmed stimulation and pacing after intravenous drug infusion (List separately in addition to code for primary procedure)

CPT®* Codes	Description
93653	Comprehensive electrophysiologic evaluation with insertion and repositioning of multiple electrode catheters, induction or attempted induction of an arrhythmia with right atrial pacing and recording and catheter ablation of arrhythmogenic focus, including intracardiac electrophysiologic 3-dimensional mapping, right ventricular pacing and recording, left atrial pacing and recording from coronary sinus or left atrium, and His bundle recording, when performed; with treatment of supraventricular tachycardia by ablation of fast or slow atrioventricular pathway, accessory atrioventricular connection, cavo-tricuspid isthmus or other single atrial focus or source of atrial re-entry
93655	Intracardiac catheter ablation of a discrete mechanism of arrhythmia which is distinct from the primary ablated mechanism, including repeat diagnostic maneuvers, to treat a spontaneous or induced arrhythmia (List separately in addition to code for primary procedure)
93662	Intracardiac echocardiography during therapeutic/diagnostic intervention, including imaging supervision and interpretation (List separately in addition to code for primary procedure)

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