SUPRAVENTRICULAR TACHYCARDIA

CHI Formulary Development Project

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Council of Health Insurance

INDICATION UPDATE

ADDENDUM- January 2024

To the CHI Original Supraventricular tachycardia Clinical Guidance- Issued January 2020

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Abbreviations

AAD	Antiarrhythmic Drug
ACHD	Adult Congenital Heart Disease
AF	Atrial Fibrillation
AFL	Atrial Flutter
ANP	Atrial Natriuretic Peptide
AP	Accessory Pathway
ASD	Atrial Septal Defect
AT	Atrial Tachycardia
AV	Atrioventricular
AVN	Atrioventricular Node
AVNRT	Atrioventricular Nodal Reentrant Tachycardia
AVRT	Atrioventricular Reentrant Tachycardia
BBB	Bundle Branch Block
BPM	Beats Per Minute
CHI	Council of Health Insurance
CI	Confidence Interval
CL	Cycle Length
CTI	Cavo-Tricuspid Isthmus
DC	Direct Current
ECG	Electrocardiogram
EPS	Electrophysiology Study
ERP	Effective Refractory Period
FDA	Food and Drug Administration
HPS	His-Purkinje System
HR	Heart Rate
IDF	Insurance Drug Formulary
IV	Intravenous

IVC	Inferior Vena Cava
LA	Left Atrium
LBBB	Left Bundle Branch Block
LV	Left Ventricle
MESA	Marshfield (Wisconsin) Epidemiologic Study Area
MRT	Macroreentrant Tachycardia
MS	Milliseconds
PAC	Premature Atrial Contraction
PJRT	Permanent Junctional Reciprocating Tachycardia
POTS	Postural Orthostatic Tachycardia Syndrome
PPI	Post-Pacing Interval
QALY	Quality-Adjusted Life Years
QoL	Quality of Life
RA	Right Atrium
RBBB	Right Bundle Branch Block
RCT	Randomized Controlled Trial
RF	Radiofrequency
RV	Right Ventricle
S	Seconds
SFDA	Saudi Food and Drug Authority
SR	Sinus Rhythm
SVC	Superior Vena Cava
SVT	Supraventricular Tachycardia
VA	Ventricular Arrhythmia

Executive Summary

Supraventricular tachycardia (SVT) refers to a dysrhythmia that starts at or above the atrioventricular (AV) node. It is characterized by a narrow complex (QRS < 120 milliseconds) and a heart rate exceeding 100 beats per minute (bpm), as compared to a normal resting heart which oscillates between 60 and 100 bpm.

The primary symptom of SVT is a rapid heart rate which may persist for a few minutes to several days. The rapid heartbeat can manifest suddenly, alternating with periods of normal heart rates. Some individuals with SVT may exhibit no apparent signs or symptoms. Common indicators of supraventricular tachycardia include rapid heartbeat, palpitations, pounding sensation in the neck, fatigue, chest pain, shortness of breath, dizziness, and syncope.[2]

A specific form of SVT, known as atrioventricular nodal reentrant tachycardia (AVNRT) or paroxysmal SVT, is identified by intermittent occurrences of SVT without specific triggering factors. Typically, AVNRT manifests with a ventricular rhythm reaching 160 bpm.[1]

Supraventricular arrhythmia is the most common form of arrhythmia during pregnancy and, although often benign in nature, can be concerning.[3] It is also the most common form of arrythmia in infants and children.[2]

Patients with a history of coronary artery disease, heart disease (including heart surgery), thyroid disease, diabetes, obstructive sleep apnea and nicotine and illegal drug use are at increased risk of SVT.[2]

SVT is frequently encountered in clinical settings and is a relatively common occurrence in emergency departments. The prevalence of SVT is estimated at around 35 cases per 100,000 patients, with a prevalence rate of approximately 2.25 cases per 1,000 in the general population.[4]

The rate of occurrence of supraventricular tachycardia in Saudi Arabia is the same as worldwide with approximately 35 cases per 100,000 person-years, with the highest incidence observed in middle-aged individuals. Additionally, it is twice as prevalent in women compared to men.[5]

Supraventricular tachycardia includes many subtypes:[6]

Table 1. Conventional Classification of Supraventricular Tachycardias

Sinus tachycardias	Sinus tachycardia • Physiological sinus tachycardia • Inappropriate sinus tachycardia • Sinus node reentrant tachycardia
Atrial tachycardia	Focal atrial tachycardia Multifocal atrial tachycardia Macro-reentrant tachycardia
Atrioventricular junctional tachycardias	Atrioventricular nodal reentrant tachycardia (typical/atypical)
Non- reentrant junctional tachycardia	Non-paroxysmal junction tachycardia Focal junctional tachycardia Other non-reentrant tachycardias
Atrioventricular tachycardias	Atrioventricular reentrant tachycardia Orthodromic Antidromic (with retrograde conduction through the AV node or, rarely, through another pathway)

This report will mainly focus on the acute and chronic therapy of supraventricular tachycardia in adults with congenital heart disease as well as pregnant patients with supraventricular tachycardia since it is the most common type of arrythmia in this population. Other types of arrythmias will be tackled in a separate report (titled "arrhythmias").

Pharmacological treatment is suitable for acute termination of SVT in cases where vagal maneuvers prove ineffective. The recommended first-line medications are intravenous (IV) adenosine or a calcium channel blocker (CCB) that is not of the dihydropyridine (DHP) class, beta blockers and antiarrhythmics.[7]

CHI issued a supraventricular tachycardia clinical guidance after thorough review of renowned international and national clinical guidelines in January 2020. Updating clinical practice guidelines (CPGs) is a crucial process for maintaining the validity of recommendations.

This report functions as an addendum to the prior CHI supraventricular tachycardia clinical guidance and seeks to offer guidance for the effective management of Supraventricular tachycardia. It provides an **update on the supraventricular tachycardia guidelines** for CHI Formulary with the ultimate objective of updating the IDF (CHI Drug Formulary) while addressing the **most updated best available clinical and economic evidence related to drug therapies.**

Main triggers for the update are summarized, by being the addition of **new guidelines to the report** such as the Heart Rhythm Society (HRS) expert consensus statement on the management of arrhythmias during pregnancy **2023**, the European Heart Rhythm Association (EHRA) consensus document on the management of supraventricular arrhythmias, endorsed by Heart Rhythm Society (HRS), Asia-Pacific Heart Rhythm Society (APHRS), and Sociedad Latinoamericana de Estimulacio´n Cardiaca y Electrofisiologia (SOLAECE) **2016**, the Japanese Circulation Society (JCS)/Japanese Heart rhythm Society (JHRS) joint working group guideline on pharmacotherapy of cardiac arrhythmias **2020**, and the addition of three meta-analysis: The Drugs Used in the Treatment of Supraventricular Tachycardia in Pediatrics: A Systematic Review and Meta-Analysis **2023**, Etripamil Nasal Spray for Conversion of Repeated Spontaneous Episodes of Paroxysmal Supraventricular Tachycardia During Long-Term Follow-Up: Results From the NODE-302 Study **2023** and Amiodarone and adenosine for pediatric supraventricular tachycardia: a systematic review **2023**.

After carefully examining clinical guidelines and reviewing the SFDA drug list, no drugs are to be added or delisted for the management of supraventricular tachycardia. It is worth noting the nasal spray etripamil as a novel investigational therapy for supraventricular tachycardia.

All recommendations are well supported by reference guidelines, Grade of Recommendation (GoR), Level of Evidence (LoE) and Strength of Agreement (SoA) in all tables reflecting specific drug classes' role in Supraventricular tachycardia management.

Table 2 summarizes the major changes based on the different Supraventricular tachycardia guidelines used to issue this report:

Table 2. General Recommendations for the Management of Supraventricular Tachycardia

Management of Supraventricular Tachycardia	
General Recommendations	**Level of Evidence/Grade of Recommendation and reference**
Management of acute supraventricular tachycardia during pregnancy	
In hemodynamically stable pregnant patients with acute onset of SVT, **intravenous adenosine** is recommended as the first-line pharmacological therapy	COR 1, LOE C-LD HRS expert consensus (2023)[8]
In hemodynamically stable pregnant patients with acute onset of SVT refractory or with	COR 2a, LOE C-LD

contraindications to adenosine, **intravenous beta-blockers**, such as metoprolol or propranolol, are reasonable for termination of acute SVT.	HRS expert consensus (2023)[8]
In hemodynamically stable pregnant patients with acute onset of SVT refractory or with contraindications to adenosine or beta-blockers, **intravenous calcium channel blockers**, such as verapamil or diltiazem, or intravenous procainamide may be considered.	COR 2b, LOE C-LD HRS expert consensus (2023)[8]
Management of nonacute atrial ectopy and supraventricular tachycardia during pregnancy	
In pregnant patients with premature atrial contractions (PACs) and intolerable symptoms, treatment with beta-blockers is recommended, preferably with metoprolol or propranolol.	COR 1, LOE B-NR HRS expert consensus (2023)[8]
In pregnant patients with symptomatic SVT in the absence of preexcitation, metoprolol, propranolol, and/or digoxin should be used as first-line options and verapamil as the second-line option for the chronic oral prophylaxis of SVT. *All drugs listed above are pregnancy category C.*	COR 1, LOE C-LD HRS expert consensus (2023)[8]
Acute therapy of SVT in adult congenital heart disease (ACHD) patients:	
IV adenosine for conversion may be considered (caution for sinus node dysfunction and impaired ventricular function with need for chronotropic or inotropic support).	Conditional recommendation EHRA consensus (2017)[6]
Chronic therapy of SVTs in ACHD patients	
Recurrent symptomatic SVT: Catheter ablation may be considered.	Conditional recommendation EHRA consensus (2017)[6]
Recurrent symptomatic SVT: Amiodarone may be considered for prevention if other medications and catheter ablation are ineffective or contraindicated.	Conditional recommendation EHRA consensus (2017)[6]
AVNRT/AVRT hemodynamically stable: IV adenosine may be considered.	Conditional recommendation EHRA consensus (2017)[6]

At the end of the report, a **key recommendation synthesis section** is added highlighting the latest updates in **Supraventricular tachycardia clinical and therapeutic management.**

Section 1.0 Summary of Reviewed Clinical Guidelines and Evidence

This section is divided into two parts: the first includes recommendations from **updated versions of guidelines** mentioned in the previous CHI Supraventricular tachycardia report, while the second includes **newly added guidelines** that have helped generate this report.

1.1 Revised Guidelines

This section contains the **updated versions** of the guidelines mentioned in January 2020 CHI Supraventricular tachycardia Report and the corresponding recommendations:

Table 3. Guidelines Requiring Revision

Guidelines requiring revision	
Old versions	**Updated versions**
European Society of Cardiology (**ESC**) Guidelines for the Management of Patients with Supraventricular Tachycardia (**2019**)	N/A*
American College of Cardiology/American Heart Association/Heart Rhythm Society (**ACC/AHA/HRS**) Guideline for the Management of Adult Patients with Supraventricular Tachycardia (**2015**)	N/A*

**: No updated version available: the existing version is the most recent one and no further updates or revisions have been made or released.*

1.2 Additional Guidelines

This part includes the added guidelines to the previous CHI Supraventricular tachycardia report, along with their recommendations.

Table 4. List of Additional Guidelines

Additional Guidelines
Heart Rhythm Society (**HRS**) Expert Consensus Statement on the Management of Arrhythmias During Pregnancy (**2023**)[8]
European Heart Rhythm Association (**EHRA**) Consensus Document on the Management of Supraventricular Arrhythmias, Endorsed by Heart Rhythm Society (HRS), Asia-Pacific Heart Rhythm Society (APHRS), and Sociedad Latinoamericana de Estimulación Cardiaca y Electrofisiologia (SOLAECE) (**2016**)[6]
Japanese Circulation Society (**JCS**)/Japanese Heart Rhythm Society (**JHRS**) guideline on pharmacotherapy of cardiac arrhythmias (**2020**)[9]

1.2.1 Heart Rhythm Society (HRS) Expert Consensus Statement on the Management of Arrhythmias During Pregnancy (2023)

This international multidisciplinary expert consensus covers general concepts related to arrhythmias, including both brady- and tachyarrhythmias, in both the patient and the fetus during pregnancy. The 2023 HRS expert consensus statement on the management of arrythmias during pregnancy issued the below recommendations:[8]

Table 5. HRS Class of Recommendations (COR)

Class 1 Benefit (STRONG)	Benefit >>> risk
Class 2a Benefit (MODERATE)	Benefit >> risk
Class 2b Benefit (WEAK)	Benefit ≥ risk
Class 3 No benefit (MODERATE) Generally, LOE A or B use only)	Benefit = risk
Class 3 Harm (STRONG)	Risk > benefit

Table 6. HRS Level of Evidence (LOE)

Level A	High-quality evidence from more than 1 RCT Meta-analyses of high-quality RCTs One or more RCTs corroborated by high-quality registry studies
Level B-R (Randomized)	Moderate-quality evidence from 1 or more RCTs Meta-analyses of moderate-quality RCTs

Level B-NR (Nonrandomized)	Moderate-quality evidence from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies Meta-analyses of such studies
Level C-LD (Limited Data)	Randomized or nonrandomized observational or registry studies with limitations of design or execution Meta-analyses of such studies Physiological or mechanistic studies in human subjects
Level C-EO (Expert Opinion)	Consensus of expert opinion based on clinical experience

Management of acute supraventricular tachycardia during pregnancy

- In pregnant patients with acute onset of SVT, vagal maneuvers are recommended as a first-line therapy for tachycardia termination. **(COR 1, LOE C-LD)**
- In hemodynamically stable pregnant patients with acute onset of SVT, intravenous adenosine is recommended as the first-line pharmacological therapy. **(COR 1, LOE C-LD)**
- In hemodynamically unstable pregnant patients with acute onset of SVT, synchronized direct current cardioversion is recommended, with energy dosing as in the nonpregnant patient. **(COR 1, LOE C-LD)**
- In hemodynamically stable pregnant patients with acute onset of SVT refractory or with contraindications to adenosine, intravenous beta-blockers, such as metoprolol or propranolol, are reasonable for termination of acute SVT. **(COR 2a, LOE C-LD)**
- In hemodynamically stable pregnant patients with acute onset of SVT refractory or with contraindications to adenosine or beta-blockers, intravenous calcium channel blockers, such as verapamil or diltiazem, or intravenous procainamide (only in certain situations such as accessory pathway), may be considered. **(COR 2b, LOE C-LD)**

Management of nonacute atrial ectopy and supraventricular tachycardia during pregnancy

- In pregnant patients with PACs and intolerable symptoms, treatment with beta-blockers is recommended, preferably with metoprolol or propranolol. **(COR 1, LOE B-NR)**

- In pregnant patients with PACs who either are asymptomatic or have tolerable symptoms, reassurance is recommended with no need for intervention. **(COR 1, LOE C-LD)**
- In pregnant patients with symptomatic SVT in the absence of preexcitation, metoprolol, propranolol, and/or digoxin should be used as first-line options and verapamil as the second-line option for the chronic oral prophylaxis of SVT. **(COR 1, LOE C-LD)**
- In pregnant patients with Wolff-Parkinson-White syndrome and poorly tolerated or frequent episodes of SVT, therapy with oral flecainide or propafenone is recommended for the pharmacological management of SVT. **(COR 1, LOE C-LD)**
- In pregnant patients with tachycardia-induced cardiomyopathy, aggressive treatment of the tachycardia with beta-blockers as a first-line option and early consultation with an electrophysiologist for escalation of pharmacological therapy and/or ablation are recommended. **(COR 1, LOE C-LD)**
- In pregnant patients with symptomatic recurrent SVT refractory or with contraindications to digoxin, beta-blockers, or calcium channel blockers, alternative antiarrhythmic drugs, including flecainide, propafenone, or sotalol, are reasonable. **(COR 2a, LOE C-LD)**
- In pregnant patients with recurrent SVT refractory or with contraindications to pharmacological therapies, catheter ablation is reasonable with attention to and techniques for eliminating or minimizing radiation exposure to as low as reasonably achievable. **(COR 2a, LOE C-LD)**
- In pregnant patients with poorly tolerated SVT refractory or with contraindications to other pharmacological and interventional therapies, therapy with amiodarone may be considered. **(COR 2b, LOE C-LD)**

1.2.2 European Heart Rhythm Association (EHRA) Consensus Document on the Management of Supraventricular Arrhythmias, Endorsed by Heart Rhythm Society (HRS), Asia-Pacific Heart Rhythm Society (APHRS), and Sociedad Latinoamericana de Estimulación Cardiaca y Electrofisiologia (SOLAECE) (2016)

The European Heart Rhythm Association (EHRA) consensus on the management of supraventricular tachycardia was endorsed by the HRS, APHRS and SOLAECE. This consensus issued the below recommendations:[6]

Table 7. EHRA Scientific Rational of Recommendations

Recommended/indicated	Scientific evidence that a treatment or procedure is beneficial and effective. Requires at least one randomized trial or is supported by strong observational evidence and authors' consensus.
May be used or recommended	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.
Should NOT be used or recommended	Scientific evidence or general agreement not to use or recommend a treatment or procedure.

Acute therapy of SVT in ACHD patients

SVT hemodynamically unstable

- Electrical cardioversion is recommended (caution for sinus node dysfunction and impaired ventricular function with need for chronotropic or inotropic support) (recommended)
- IV adenosine for conversion may be considered (caution for sinus node dysfunction and impaired ventricular function with need for chronotropic or inotropic support). (May be recommended)

AVNRT/AVRT hemodynamically stable

- IV adenosine may be considered (may be recommended)

Chronic therapy of SVTs in ACHD patients

Recurrent symptomatic SVT

- Hemodynamic evaluation of structural defect for potential repair may be considered as initial evaluation of SVT. (May be recommended)
- Catheter ablation may be considered. (May be considered)
- Oral beta blockers may be considered for recurrent AT or atrial flutter. (May be considered)
- Amiodarone may be considered for prevention if other medications and catheter ablation are ineffective or contraindicated. (May be recommended)

- Antithrombotic therapy for AT or atrial flutter is the same as for patients with AF, since CHD patients with atrial tachycardias and atrial flutter probably have similar risks for thromboembolism as patients with AF. (May be considered)
- Oral sotalol should not be used related to increased risk for proarrhythmias and mortality. (Should not be recommended)
- Flecainide should not be used in patients with ventricular dysfunction related to increased risk for proarrhythmic and mortality. (Should not be recommended)
- Implantation of a pacemaker for atrial-based pacing to decrease recurrence of atrial tachycardia/flutter is not recommended. (Should not be recommended).

Planned surgical repair and symptomatic SVT

- Surgical ablation of AT, atrial flutter or accessory pathway may be considered. (May be recommended)
- In patients planned for surgical repair of Ebstein's anomaly, preoperative electrophysiologic study may be considered as a routine test. (May be recommended)
- 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. (May be considered)

Treatment of SVT during pregnancy

Acute therapy

- DC cardioversion in patients with SVT causing hemodynamic instability (recommended)
- Vagal maneuvers, preferably in the supine position, may be considered as first-line therapy. (May be recommended)
- Adenosine may be considered if vagal maneuvers fail. (May be recommended)
- IV metoprolol or propranolol may be considered as a second line drug if adenosine is ineffective. (May be recommended)
- IV verapamil may be considered if adenosine and beta blockers are ineffective or contraindicated. (May be recommended)

Chronic therapy

- No medical therapy may be considered in patients with tolerable symptoms. (May be recommended)
- Metoprolol, propranolol, or acebutolol may be considered in highly symptomatic patients. (May be recommended)
- Verapamil may be reasonable in highly symptomatic patients when beta blockers are ineffective or contraindicated. (May be recommended)
- Sotalol and flecainide may be reasonable in highly symptomatic patient when beta blockers are ineffective or contraindicated. (May be recommended)
- Catheter ablation may be considered in highly symptomatic, drug refractory SVT after the first trimester. (May be recommended)
- Atenolol is not recommended.

1.2.3 Japanese Circulation Society (JCS)/Japanese Heart Rhythm Society (JHRS) Guideline on Pharmacotherapy of Cardiac Arrhythmias (2020)

The 2020 JCS/JHRS developed the below recommendations:[9]

Table 8. JCS/JHRS Classes of Recommendations

Class 1	Evidence and/or general agreement that a given procedure or treatment is useful and effective
Class 2	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given procedure or treatment
Class 2a	Weight of evidence/opinion is in favor of usefulness/efficacy
Class 2b	Usefulness/efficacy is less well established by evidence/ opinion
Class 3	Evidence or general agreement that the given procedure or treatment is not useful/effective, and in some cases may be harmful

Table 9. JCS/JHRS Levels of Evidence

Level A	Data derived from multiple randomized clinical trials or meta-analyses
Level B	Data derived from a single randomized clinical trial or large-scale nonrandomized studies
Level C	Consensus of opinion of the experts and/or small-sized clinical studies, retrospective studies, and registries

Table 10. MINDS Grades of Recommendation

Grade A	Strongly recommended and supported by strong evidence
Grade B	Recommended with moderately strong supporting evidence
Grade C1	Recommended despite no strong supporting evidence
Grade C2	Not recommended because of the absence of strong supporting evidence
Grade D	Not recommended as evidence indicates that the treatment is ineffective or even harmful

Table 11. MINDS Levels of Evidence

1	Systematic review/meta-analysis of randomized controlled trials
2	One or more randomized controlled trials
3	Nonrandomized controlled trials
4a	Analytical epidemiological studies (cohort studies)
4b	Analytical epidemiological studies (case–control studies and cross-sectional studies)
5	Descriptive studies (case reports and case series)
6	Not based on patient data, or based on opinions from a specialist committee or individual specialists

Acute Treatment of Narrow QRS SVT:

- Vagal maneuvers (COR 1, LOE B, GOR (MINDS) B, LOE (MINDS) 2)
- Synchronized cardioversion for hemodynamically unstable SVT or drug-refractory SVT (COR 1, LOE C, GOR (MINDS) B, LOE(MINDS) 4a)
- IV verapamil or diltiazem
- IV procainamide, disopyramide, cibenzoline, aprindine, pilsicainide, flecainide or amiodarone – no longer regularly used for the treatment of SVT
- Self-administered single-dose PO verapamil, diltiazem, and/or β-blocker for infrequent, well-tolerated SVT

Prophylactic Therapy of Supraventricular Tachycardia

- Catheter ablation (COR 1, LOE B, GOR (MINDS) A, LOE (MINDS) 2)
- PO verapamil, diltiazem, or β-blockers in patients without manifest (including intermittent) WPW syndrome (COR 1, LOE A, GOR (MINDS) A, LOE (MINDS) 1)
- PO flecainide or propafenone (COR 2a, LOE B, GOR (MINDS)A, LOE (MINDS) 2)
- PO procainamide, disopyramide, cibenzoline, aprindine, pilsicainide (COR 2a, LOE C, GOR (MINDS) C1, LOE (MINDS) 5)
- PO sotalol (COR 2b, LOE B, GOR (MINDS) C1, LOE (MINDS) 2)
- PO amiodarone (COR 2b, LOE C, GOR (MINDS) C1, LOE (MINDS) 4a)
- PO digoxin in patients without manifest WPW syndrome (COR 2b, LOE B, GOR (MINDS) C1, LOE (MINDS) 2)

1.3 Systematic Reviews/Meta-Analyses

This part includes recent meta-analysis and systematic reviews that play an important role in the management of supraventricular tachycardia:

Table 12. Systematic Reviews/Meta-Analyses

Study	Author (year)	Study Title	Primary Objective	Results	Conclusion
1	Hashim et al. (2023)[10]	The Drugs Used in the Treatment of Supraventricular Tachycardia in Pediatrics: A Systematic Review and Meta-Analysis	To identify and select original research reports on supraventricular tachycardia management drugs in children and infants with no structural heart disease (all children from 1 hour to 17 years of age) in accordance with the PRISMA guidelines.	26 studies out of 65 total studies assessed for eligibility were included in the review by fulfilling the inclusion criteria. There were 8103 patients from 13 countries with SVT who were treated with different antiarrhythmic drugs including (Adenosine, Dexmedetomidine) as acute management and (Amiodarone, Beta-Blockers, Flecainide, Digoxin and Ivabradine) as chronic control. There was a significant difference between the patients who took the drugs and the patients who responded to the drugs, with P-value < 0.005.	There is not a first line treatment or second line treatment for SVT in pediatrics, and drug effectiveness can vary greatly between patients; all choices should be considered during the treatment protocol. The combination of drugs, as opposed to a single drug, is more efficient with less side effects in these patients. According to this review, the management of SVT in infants is highly dependent on the history of the patient and the probable side effects of some treatments that must be avoided.
2	Ip et al. (2023)[11]	Etripamil Nasal Spray for Conversion of Repeated Spontaneous	The primary end point was time-to-conversion of positively adjudicated PSVT to sinus rhythm after etripamil	Among 169 patients enrolled, 105 self-administered etripamil ≥1 time for perceived PSVT. Probability of conversion within 30 minutes	In this extension study, investigational etripamil nasal spray was well tolerated for self-treating recurrent

		Episodes of Paroxysmal Supraventricular Tachycardia During Long-Term Follow-Up: Results From the NODE-302 Study	treatment. Adverse events were based on self-reported symptoms and clinical evaluations.	of etripamil was 60.2% (median time to conversion, 15.5minutes) among 188 PSVT episodes (92 patients) positively adjudicated as atrioventricular nodal dependent by independent ECG analysis. Among 40 patients who self-treated 2 episodes, 75% had a significantly consistent response by 30minutes; 9 did not convert on either episode, and 21 converted on both episodes ($\chi 2$ =8.09; P=0.0045). Forty-five of 105 patients (42.9%) had ≥1 treatment-emergent adverse event, generally transient and mild-to-moderate, including nasal congestion (14.3%), nasal discomfort (14.3%), or rhinorrhea (12.4%). No serious cardiac safety events were observed within 24hours of etripamil.	episodes of PSVT without medical supervision.
3	Toro et al. (2023)[12]	Amiodarone and adenosine for pediatric supraventricular	10 scholarly articles that shed light on treatment with amiodarone and	There is no first- or second-line treatment for SVT in pediatrics, and drug effectiveness can vary	The studies also emphasize that although both amiodarone and adenosine can successfully convert SVT

		tachycardia: a systematic review	adenosine for SVT in pediatric patients.	significantly between patients. Adenosine has a shorter half-life than other drugs, instead, it is safer and more valuable when an electrocardiogram is uncertain, it is recommended as an acute management, and it continues as the first-line option for paroxysmal SVT. Amiodarone management patients with acute STV within, its use showed better results when administered 48 hours after diagnosis. Furthermore, it is recommended to reduce the incidence of junctional ectopic tachycardia (JET), by pre-operative prophylaxis, also for chronic control in this and other types of SVT. In none of the evaluated studies were documented significant adverse effects in pediatric patients. Side effects that did occur were mild and easily managed.	to sinus rhythm, better results have been observed when using combined therapies of each recommended medication. Therefore, more randomized clinical trials, meta-analyses, and systematic reviews are needed to solidify and possibly standardize an effective and safe pharmacological treatment for SVT and its types in pediatric patients.

Section 2.0 Drug Therapy

This section comprises four subsections: the first one contains the newly recommended drugs SFDA registered, the second one covers drug modifications, the third one outlines the drugs that have been withdrawn from the market and the fourth one covers new medications that are not SFDA registered and important for the management of supraventricular tachycardia.

2.1 Additions

After January 2020, there have been no new drugs that have received FDA and EMA approval and are SFDA registered for supraventricular tachycardia treatment.

2.2 Modifications

Please refer to section 2.1.6a in the previous report:

Flecainide does not need “prior authorization (PA)” as a prescribing edit, therefore it was removed.

Please refer to section 2.1.7 in the previous report:

Ivabradine does not need “prior authorization (PA)” as a prescribing edit, therefore it was removed.

Please refer to section 2.3.2.7 in the previous CHI report:

Digoxin does not need “prior authorization (PA)” as a prescribing edit, therefore it was removed.

2.3 Delisting

There are no delisted medications to the drug formulary spreadsheet of supraventricular tachycardia.

2.4 Other Drugs

2.4.1 Etripamil Nasal Spray

Currently under phase 3 trials, etripamil nasal spray is **not yet approved** for the treatment of paroxysmal supraventricular tachycardia. The name of the study is RAPID published in The Lancet journal in June 2023. RAPID is a global, randomized, double-blind phase 3 clinical trial of etripamil versus placebo in patients with PSVT. The trial was designed to evaluate the safety and efficacy of self-administered

etripamil for treating PSVT. The RAPID trial achieved its primary endpoint with 64% of patients who self-administered etripamil converting from supraventricular tachycardia (SVT) to sinus rhythm within 30 minutes compared to 31% on placebo (HR = 2.62, p<0.001). At one hour, the benefit was demonstrated in 73% of patients. In addition, significant reductions in time to conversion in patients who took etripamil were evident early and durable, with a median time to conversion of 17 minutes (95% CI: 13.4, 26.5) for patients treated with etripamil versus 54 minutes (95% CI: 38.7, 87.3) for patients treated with placebo. Data demonstrated statistically significant improvement in multiple defined symptoms of PSVT in patients receiving etripamil compared to placebo, using a patient-reported outcome (PRO) questionnaire. The safety and tolerability profile of etripamil is supportive of the NDA submission.[13]

Section 3.0 Key Recommendations Synthesis

Management of acute supraventricular tachycardia during pregnancy

- In pregnant patients with acute onset of SVT, vagal maneuvers are recommended as a first-line therapy for tachycardia termination. (COR 1, LOE C-LD) [8]
- In hemodynamically stable pregnant patients with acute onset of SVT, intravenous adenosine is recommended as the first-line pharmacological therapy. (COR 1, LOE C-LD) [8]
- In hemodynamically stable pregnant patients with acute onset of SVT refractory or with contraindications to adenosine, intravenous beta-blockers, such as metoprolol or propranolol, are reasonable for termination of acute SVT. (COR 2a, LOE C-LD) [8]
- In hemodynamically stable pregnant patients with acute onset of SVT refractory or with contraindications to adenosine or beta-blockers, intravenous calcium channel blockers, such as verapamil or diltiazem, or intravenous procainamide may be considered. (COR 2b, LOE C-LD) [8]

Management of nonacute atrial ectopy and supraventricular tachycardia during pregnancy

- In pregnant patients with PACs and intolerable symptoms, treatment with beta-blockers is recommended, preferably with metoprolol or propranolol. (COR 1, LOE B-NR) [8]
- In pregnant patients with symptomatic SVT in the absence of preexcitation, metoprolol, propranolol, and/or digoxin should be used as first-line options and verapamil as the second-line option for the chronic oral prophylaxis of SVT. (COR 1, LOE C-LD) [8]
- In pregnant patients with Wolff-Parkinson-White syndrome and poorly tolerated or frequent episodes of SVT, therapy with oral flecainide or propafenone is recommended for the pharmacological management of SVT. (COR 1, LOE C-LD) [8]
- In pregnant patients with poorly tolerated SVT refractory or with contraindications to other pharmacological and interventional therapies, therapy with amiodarone may be considered. (COR 2b, LOE C-LD) [8]

Acute therapy of SVT in ACHD patients:

SVT hemodynamically unstable:

- IV adenosine for conversion may be considered (caution for sinus node dysfunction and impaired ventricular function with need for chronotropic or inotropic support). (May be recommended) [6]

Chronic therapy of SVTs in ACHD patients

Recurrent symptomatic SVT:

- Oral beta blockers may be considered for recurrent AT or atrial flutter. (May be considered) [6]
- Flecainide should not be used in patients with ventricular dysfunction related to increased risk for proarrhythmic and mortality. (Should not be recommended) [6]

Section 4.0 Conclusion

This report serves as **an annex to the previous CHI Supraventricular tachycardia report** and aims to provide recommendations to aid in the management of supraventricular tachycardia. It is important to note that these recommendations should be utilized to support clinical decision-making and not replace it in the management of individual patients with supraventricular tachycardia. Health professionals are expected to consider this guidance alongside the specific needs, preferences, and values of their patients when exercising their judgment.

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Section 6.0 Appendices

Appendix A. Prescribing Edits Definition

I. Prescribing Edits (ensure consistent use of abbreviations, e.g., CU, ST)

Some covered drugs may have additional requirements, rules, or limits on coverage. These requirements and limits may include:

Prescribing Edits Tools	Description
AGE (Age):	Coverage may depend on patient age
CU (Concurrent Use):	Coverage may depend upon concurrent use of another drug
G (Gender):	Coverage may depend on patient gender
MD (Physician Specialty):	Coverage may depend on prescribing physician's specialty or board certification
PA (Prior Authorization):	Requires specific physician request process
QL (Quantity Limits):	Coverage may be limited to specific quantities per prescription and/or time
ST (Step Therapy):	Coverage may depend on previous use of another drug
EU (Emergency Use only):	This drug status on Formulary is only for emergency use
PE (Protocol Edit):	Use of drug is dependent on protocol combination, doses, and sequence of therapy

Appendix B. Supraventricular Tachycardia Scope

2023 HRS expert consensus statement on the management of arrhythmias during pregnancy[8]	Management of acute supraventricular tachycardia during pregnancy - In pregnant patients with acute onset of SVT, vagal maneuvers are recommended as a first-line therapy for tachycardia termination. (COR 1, LOE C-LD) - In hemodynamically stable pregnant patients with acute onset of SVT, intravenous adenosine is recommended as the first-line pharmacological therapy. (COR 1, LOE C-LD) - In hemodynamically unstable pregnant patients with acute onset of SVT, synchronized direct current cardioversion is recommended, with energy dosing as in the nonpregnant patient. (COR 1, LOE C-LD) - In hemodynamically stable pregnant patients with acute onset of SVT refractory or with contraindications to adenosine, intravenous beta-blockers, such as metoprolol or propranolol, are reasonable for termination of acute SVT. (COR 2a, LOE C-LD) - In hemodynamically stable pregnant patients with acute onset of SVT refractory or with contraindications to adenosine or beta-blockers, intravenous calcium channel blockers, such as verapamil or diltiazem, or intravenous procainamide may be considered. (COR 2b, LOE C-LD) Management of nonacute atrial ectopy and supraventricular tachycardia during pregnancy - In pregnant patients with PACs and intolerable symptoms, treatment with beta-blockers is recommended, preferably with metoprolol or propranolol. (COR 1, LOE B-NR) - In pregnant patients with PACs who either are asymptomatic or have tolerable symptoms, reassurance is recommended with no need for intervention. (COR 1, LOE C-LD) - In pregnant patients with symptomatic SVT in the absence of preexcitation, metoprolol, propranolol, and/or digoxin should be used as first-line options and verapamil as the second-line option for the chronic oral prophylaxis of SVT. (COR 1, LOE C-LD) - In pregnant patients with Wolff-Parkinson-White syndrome and poorly tolerated or frequent episodes of SVT, therapy with oral flecainide or propafenone is recommended for the pharmacological management of SVT. (COR 1, LOE C-LD)

	- In pregnant patients with tachycardia-induced cardiomyopathy, aggressive treatment of the tachycardia with beta-blockers as a first-line option and early consultation with an electrophysiologist for escalation of pharmacological therapy and/or ablation are recommended. (COR 1, LOE C-LD) - In pregnant patients with symptomatic recurrent SVT refractory or with contraindications to digoxin, beta-blockers, or calcium channel blockers, alternative antiarrhythmic drugs, including flecainide, propafenone, or sotalol, are reasonable. (COR 2a, LOE C-LD) - In pregnant patients with recurrent SVT refractory or with contraindications to pharmacological therapies, catheter ablation is reasonable with attention to and techniques for eliminating or minimizing radiation exposure to as low as reasonably achievable. (COR 2a, LOE C-LD) - In pregnant patients with poorly tolerated SVT refractory or with contraindications to other pharmacological and interventional therapies, therapy with amiodarone may be considered. (COR 2b, LOE C-LD)
European Heart Rhythm Association (EHRA) consensus document on the management of supraventricular arrhythmias, endorsed by Heart Rhythm Society (HRS), Asia-Pacific Heart Rhythm Society (APHRS), and Sociedad Latinoamericana de Estimulacio´n Cardiaca y	**Acute therapy of SVT in ACHD patients:** -SVT hemodynamically unstable: • Electrical cardioversion is recommended (caution for sinus node dysfunction and impaired ventricular function with need for chronotropic or inotropic support) (recommended) • IV adenosine for conversion may be considered (caution for sinus node dysfunction and impaired ventricular function with need for chronotropic or inotropic support). (May be recommended) -AVNRT/AVRT hemodynamically stable • IV adenosine may be considered (may be recommended) • Atrial overdrive pacing (via esophagus or endocardial) may be considered. (May be recommended) -Atrial flutter/AT hemodynamically stable • IV ibutilide for conversion of atrial flutter may be considered (caution for pro-arrhythmia in patients with impaired ventricular function). (May be recommended) • IV metoprolol (caution for hypotension) may be considered for conversion and rate control. (May be recommended)

Electrofisiologia (SOLAECE)[6]	• Atrial overdrive pacing for conversion of atrial flutter (via esophagus or endocardial) may be considered. (May be recommended) **Chronic therapy of SVTs in ACHD patients** **-**Recurrent symptomatic SVT • Hemodynamic evaluation of structural defect for potential repair may be considered as initial evaluation of SVT. (May be recommended) • Catheter ablation may be considered. (May be considered) • Oral beta blockers may be considered for recurrent AT or atrial flutter. (May be considered) • Amiodarone may be considered for prevention, if other medications and catheter ablation are ineffective or contraindicated. (May be recommended) • Antithrombotic therapy for AT or atrial flutter is the same as for patients with AF, since CHD patients with atrial tachycardias and atrial flutter probably have similar risks for thromboembolism as patients with AF. (May be considered) • Oral sotalol should not be used related to increased risk for proarrhythmias and mortality. (Should not be recommended) • Flecainide should not be used in patients with ventricular dysfunction related to increased risk for proarrhythmic and mortality. (Should not be recommended) • Implantation of a pacemaker for atrial-based pacing to decrease recurrence of atrial tachycardia/flutter is not recommended. (Should not be recommended) **-Planned surgical repair and symptomatic SVT** • Surgical ablation of AT, atrial flutter or accessory pathway may be considered. (May be recommended) • In patients planned for surgical repair of Ebstein's anomaly, preoperative electrophysiologic study may be considered as a routine test. (May be recommended) • 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. (May be considered)

	Treatment of SVT during pregnancy: **-Acute therapy** • DC cardioversion in patients with SVT causing hemodynamic instability (recommended) • Vagal maneuvers, preferably in the supine position, may be considered as first-line therapy. (May be recommended) • Adenosine may be considered if vagal maneuvers fail. (May be recommended) • IV metoprolol or propranolol may be considered as a second line drug if adenosine is ineffective. (May be recommended) • IV verapamil may be considered if adenosine and beta blockers are ineffective or contraindicated. (May be recommended) **Chronic therapy** • No medical therapy may be considered in patients with tolerable symptoms. (May be recommended) • Metoprolol, propranolol, or acebutolol may be considered in highly symptomatic patients. (May be recommended) • Verapamil may be reasonable in highly symptomatic patients when beta blockers are ineffective or contraindicated. (May be recommended) • Sotalol and flecainide may be reasonable in highly symptomatic patient when beta blockers are ineffective or contraindicated. (May be recommended) • Catheter ablation may be considered in highly symptomatic, drug refractory SVT after the first trimester. (May be recommended) • Atenolol is not recommended. (May be recommended)
JCS/JHRS 2020 guideline on pharmacotherapy of cardiac arrhythmias [9]	Recommendations and Levels of Evidence for Acute Treatment of Narrow QRS SVT - Vagal maneuvers (COR 1, LOE B, GOR (MINDS) B, LOE (MINDS) 2) - Synchronized cardioversion for hemodynamically unstable SVT or drug-refractory SVT (COR 1, LOE C, GOR (MINDS) B, LOE(MINDS) 4a) - i.v. verapamil or diltiazem

	- i.v. procainamide, disopyramide, * cibenzoline,* aprindine, pilsicainide,* flecainide*or amiodarone* - Self-administered single-dose p.o. verapamil, diltiazem, and/or β-blocker for infrequent, well-tolerated SVT Recommendations and Levels of Evidence for **Prophylactic** Therapy of Supraventricular Tachycardia - Catheter ablation (COR 1, LOE B, GOR (MINDS) A, LOE (MINDS) 2) - p.o. verapamil, * diltiazem* or β-blockers in patients without manifest (including intermittent) WPW syndrome (COR 1, LOE A, GOR (MINDS) A, LOE (MINDS) 1) - p.o. flecainide* or propafenone* (COR 2a, LOE B, GOR (MINDS)A, LOE (MINDS) 2) - p.o. procainamide, disopyramide, * cibenzoline, * aprindine, pilsicainide (COR 2a, LOE C, GOR (MINDS) C1, LOE (MINDS) 5) - p.o. sotalol (COR 2b, LOE B, GOR (MINDS) C1, LOE (MINDS) 2) - p.o. amiodarone (COR 2b, LOE C, GOR (MINDS) C1, LOE (MINDS) 4a) - p.o. digoxin in patients without manifest WPW syndrome (COR 2b, LOE B, GOR (MINDS) C1, LOE (MINDS) 2)

Appendix C. MeSH Terms PubMed

Query	Filters	Search Details	Results
(((Tachycardia, Supraventricular [MeSH Terms]) OR (Supraventricular Tachycardia [Title/Abstract])) OR (Supraventricular Tachycardias [Title/Abstract])) OR (Tachycardias, Supraventricular [Title/Abstract])	Guideline, in the last 5 years	("tachycardia, supraventricular"[MeSH Terms] OR "supraventricular tachycardia"[Title/Abstract] OR "supraventricular tachycardias"[Title/Abstract] OR "tachycardias supraventricular"[Title/Abstract]) AND ((y_5[Filter]) AND (guideline [Filter]))	1

Appendix D. Treatment Algorithm

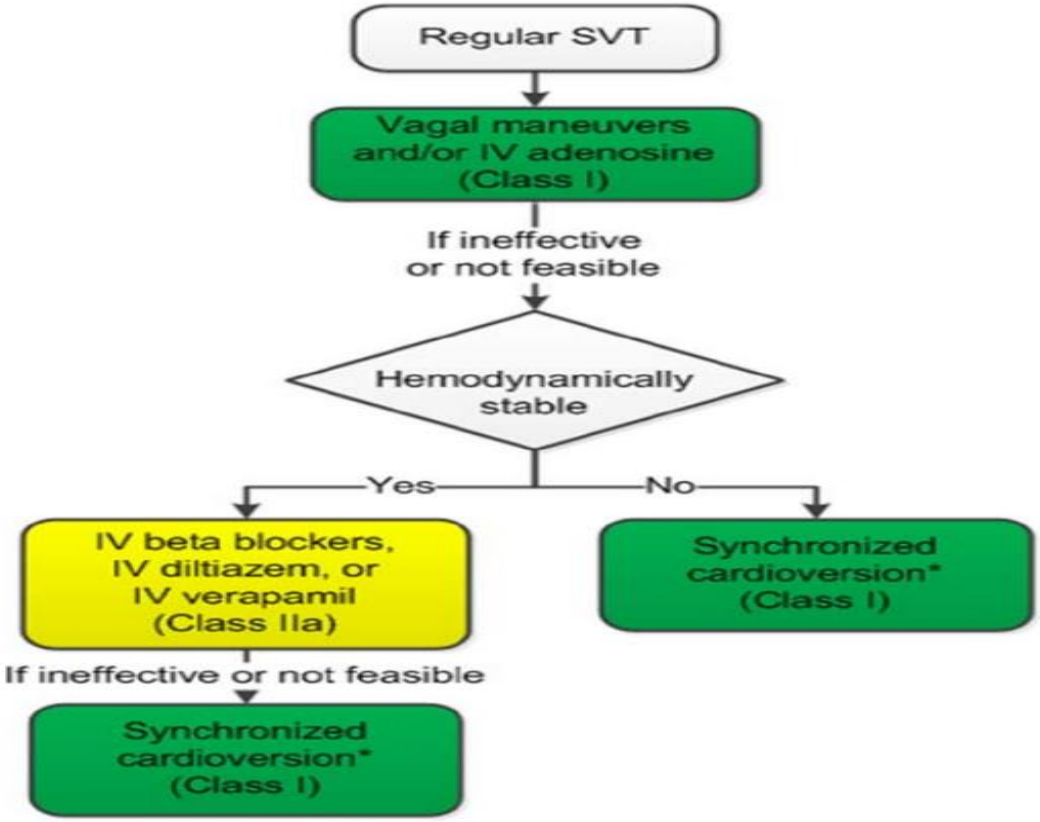

Figure 1. *Acute treatment of regular SVT of unknown mechanisms (retrieved from the 2015 ACC/AHA/HRS guideline for the management of adult patients with supraventricular tachycardia)*

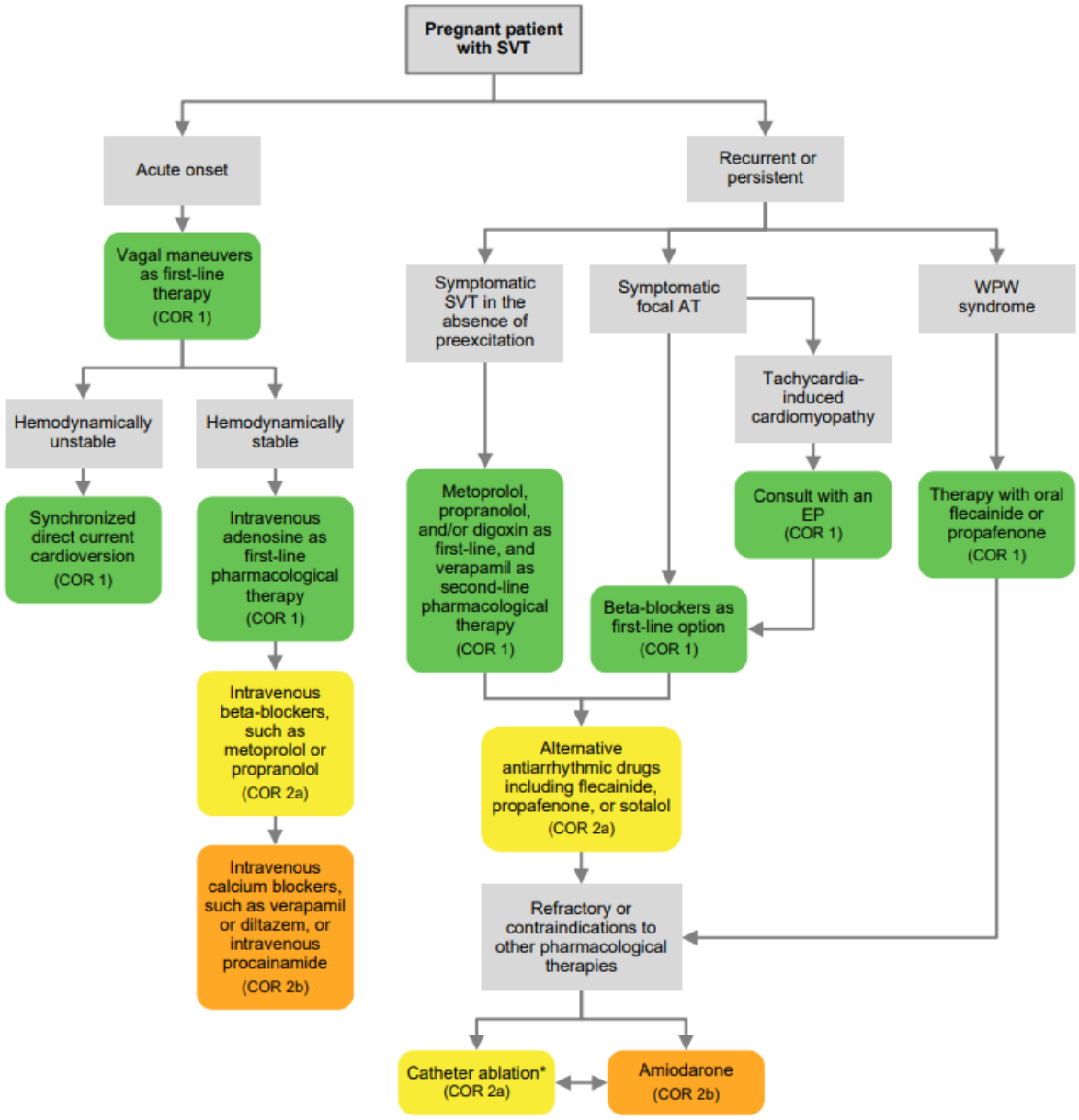

Figure 2. *Algorithm of recommendations for the management of pregnant patients with supraventricular tachycardia (SVT) (retrieved from the HRS 2023 guideline)*

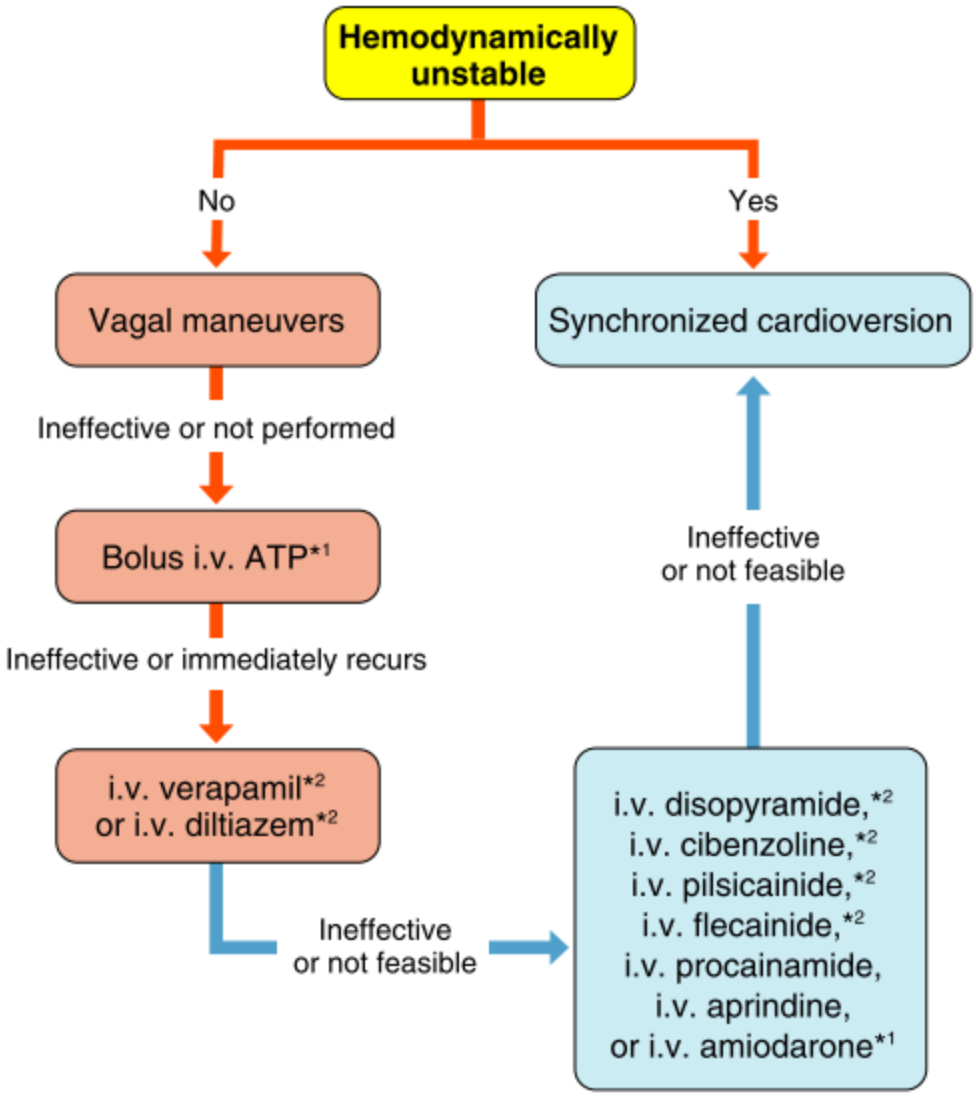

Figure 3. *Acute treatment of narrow QRS supraventricular tachycardia (retrieved from the JCS/JHRS 2020 guideline)*

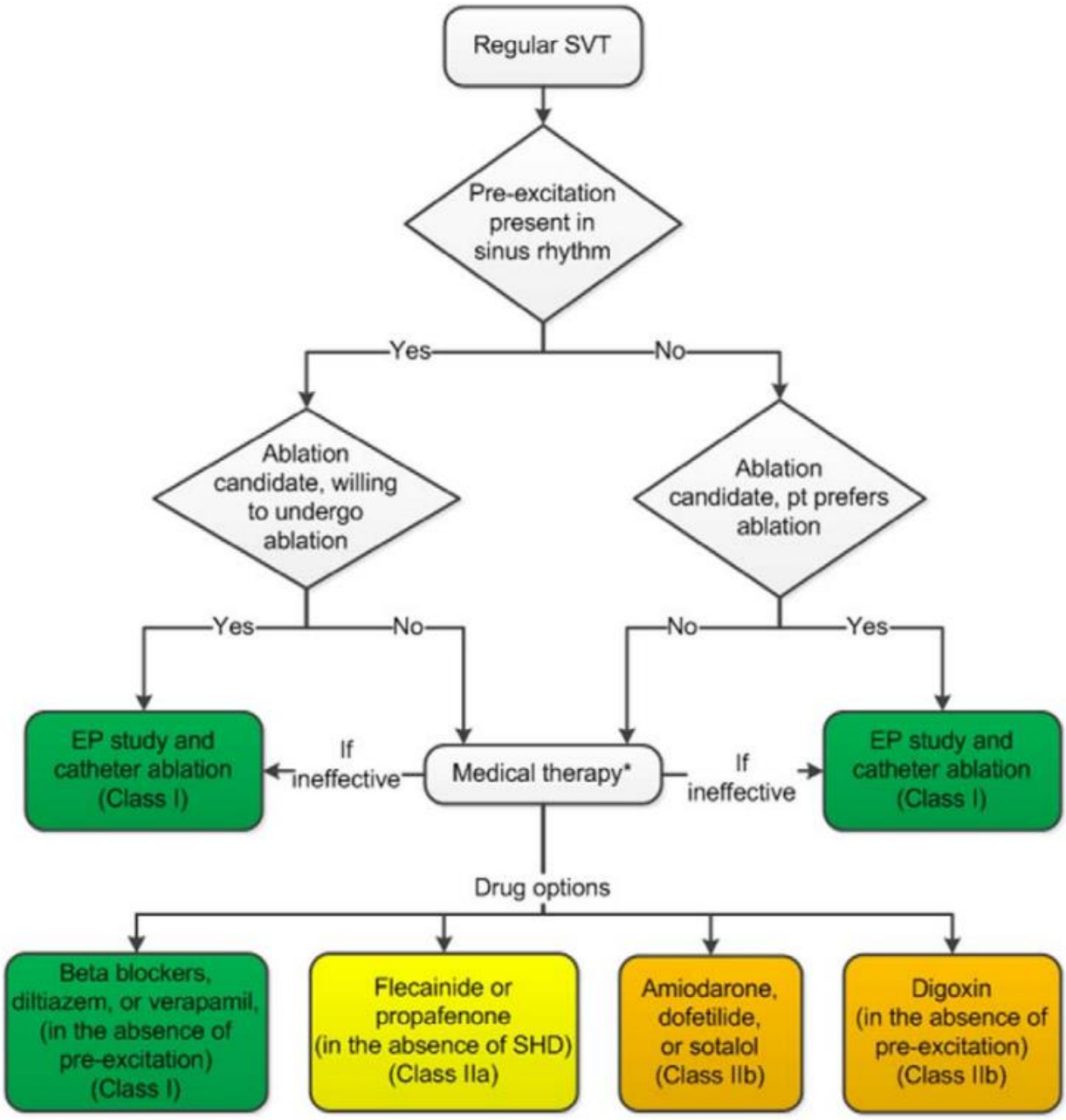

Figure 4. *Ongoing management of SVT of unknown mechanism (retrieved from the 2015 ACC/AHA/HRS guideline for the management of adult patients with supraventricular tachycardia)*