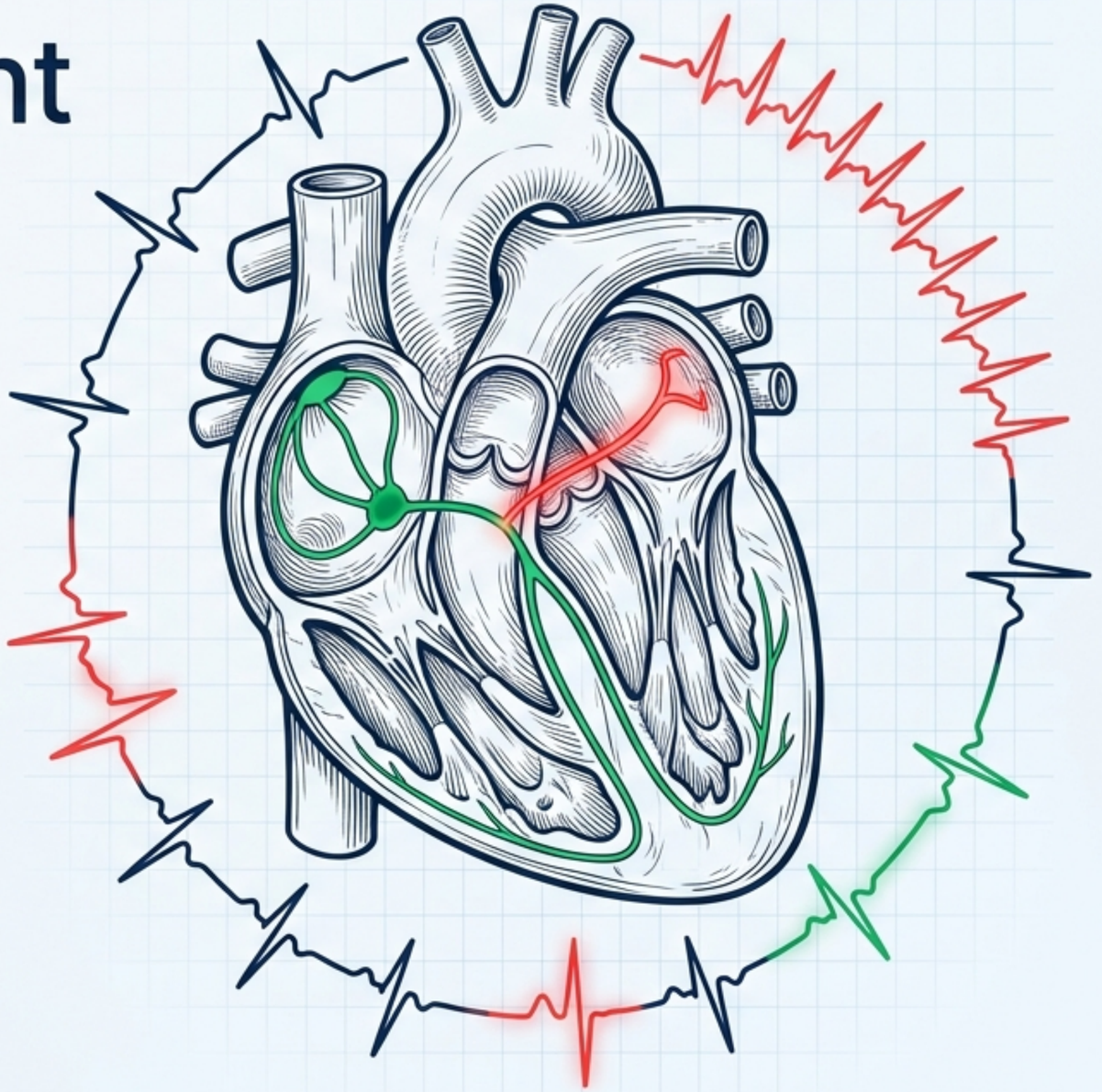
The Rhythm Blueprint

A Clinical Playbook for Supraventricular Tachycardias

Acute management pathways,

WPW risk stratification, and

definitive ablation architectures



Clinical Reference / Med2Date 2026

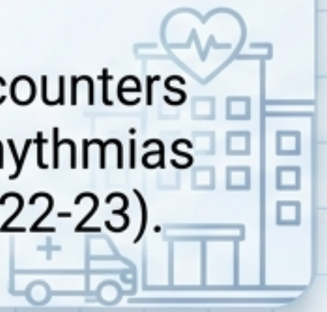
Epidemiology & Clinical Landscape

35/ 100,000

Incidence of paroxysmal SVT per person-years in Australia.

140,000+

Emergency encounters for cardiac arrhythmias nationwide (2022-23).



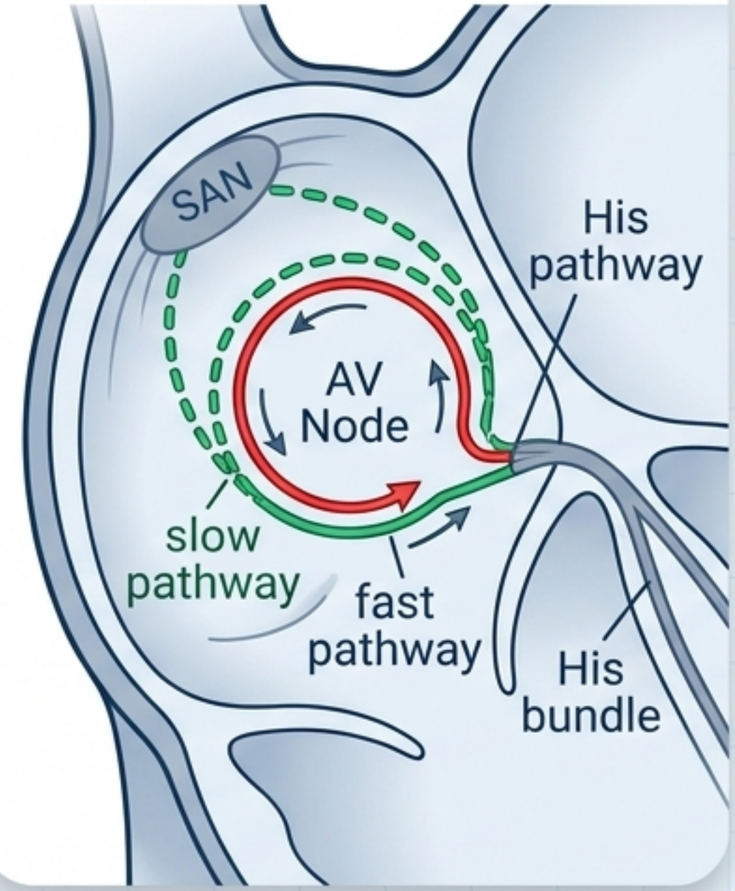
2:1

Female to Male predominance for AVNRT (onset typically 30s-50s).

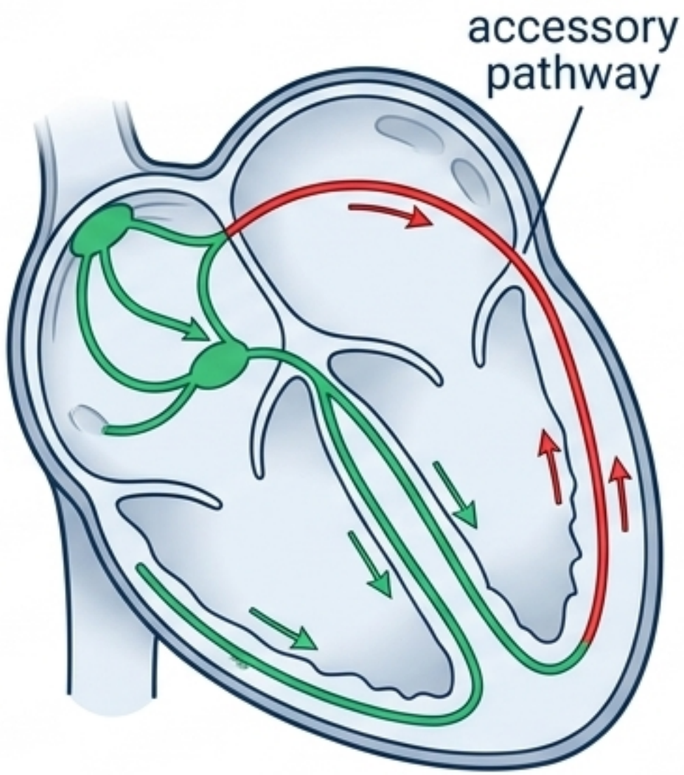
Clinical Context:
While not universally life-threatening, recurrent SVT impairs quality of life, causes tachycardia-mediated cardiomyopathy, and places a massive burden on emergency departments.

Pathophysiology of SVT Mechanisms

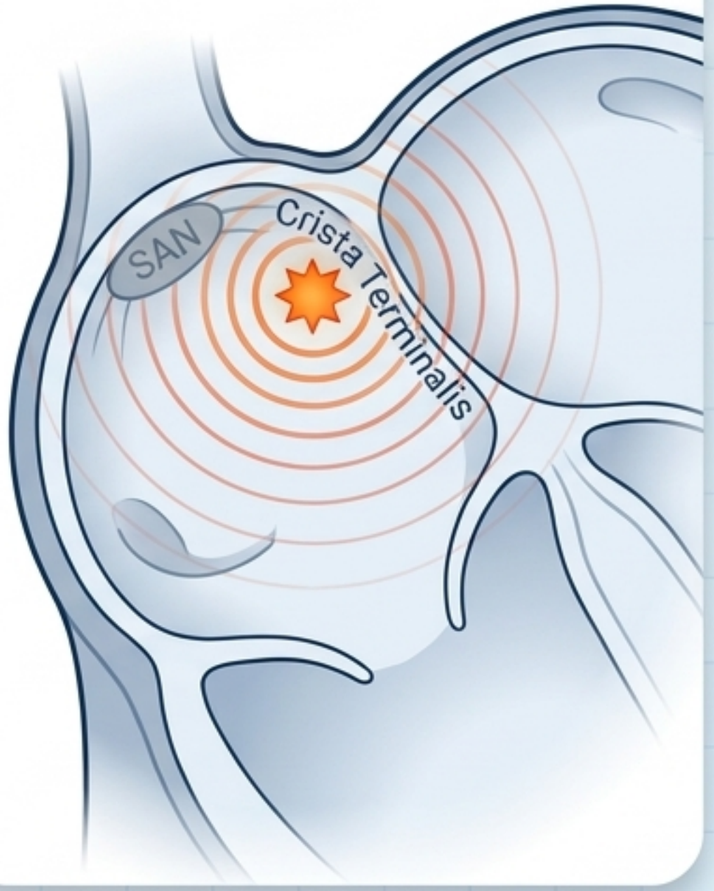
AVNRT (≈60%)



AVRT (≈30%)



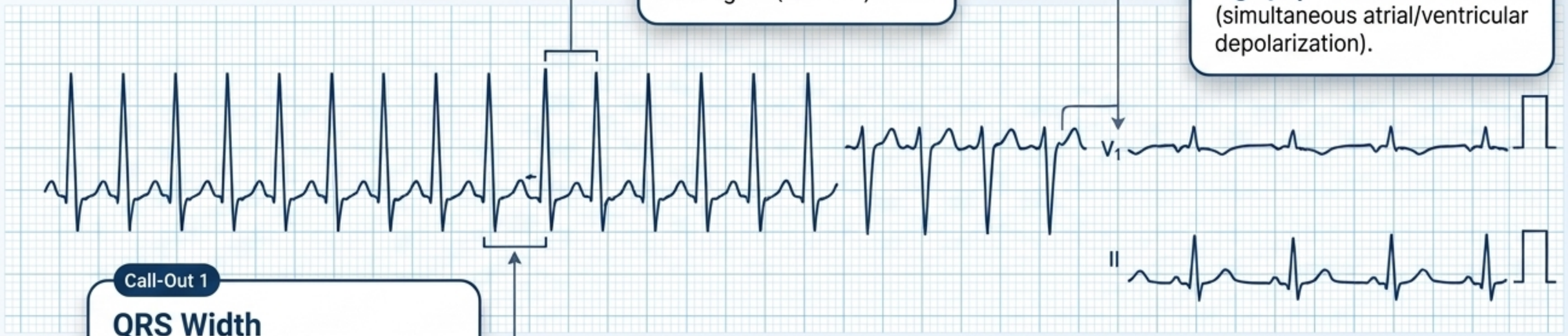
Focal AT (≈10%)



The SVT Mechanism Matrix

Mechanism	AVNRT	AVRT	Focal AT
Pathology	Re-entry within AV node	Accessory pathway	Atrial focus
Typical Age	30-50 yrs, F>M	Children / young adults	Peaks 40s-60s
P-wave in Tachycardia	Hidden in QRS (pseudo-r' in V1, pseudo-S in II/III/aVF)	Visible after QRS (short RP)	Visible before QRS (morphology differs from sinus)
Resting ECG	Normal	May show Delta wave (WPW)	Normal
Response to Adenosine	Terminates	Terminates	May terminate or reveal underlying P-waves

SVT ECG Diagnostic Decoder



Call-Out 2

RP Interval

Assess **short** RP (RP < PR) vs long RP (RP > PR).

Call-Out 3

Pseudo-r' / Pseudo-S

Subtle terminal deflections **highly specific for AVNRT** (simultaneous atrial/ventricular depolarization).

Call-Out 1

QRS Width

Narrow (<120 ms) favors typical AVNRT/orthodromic AVRT.

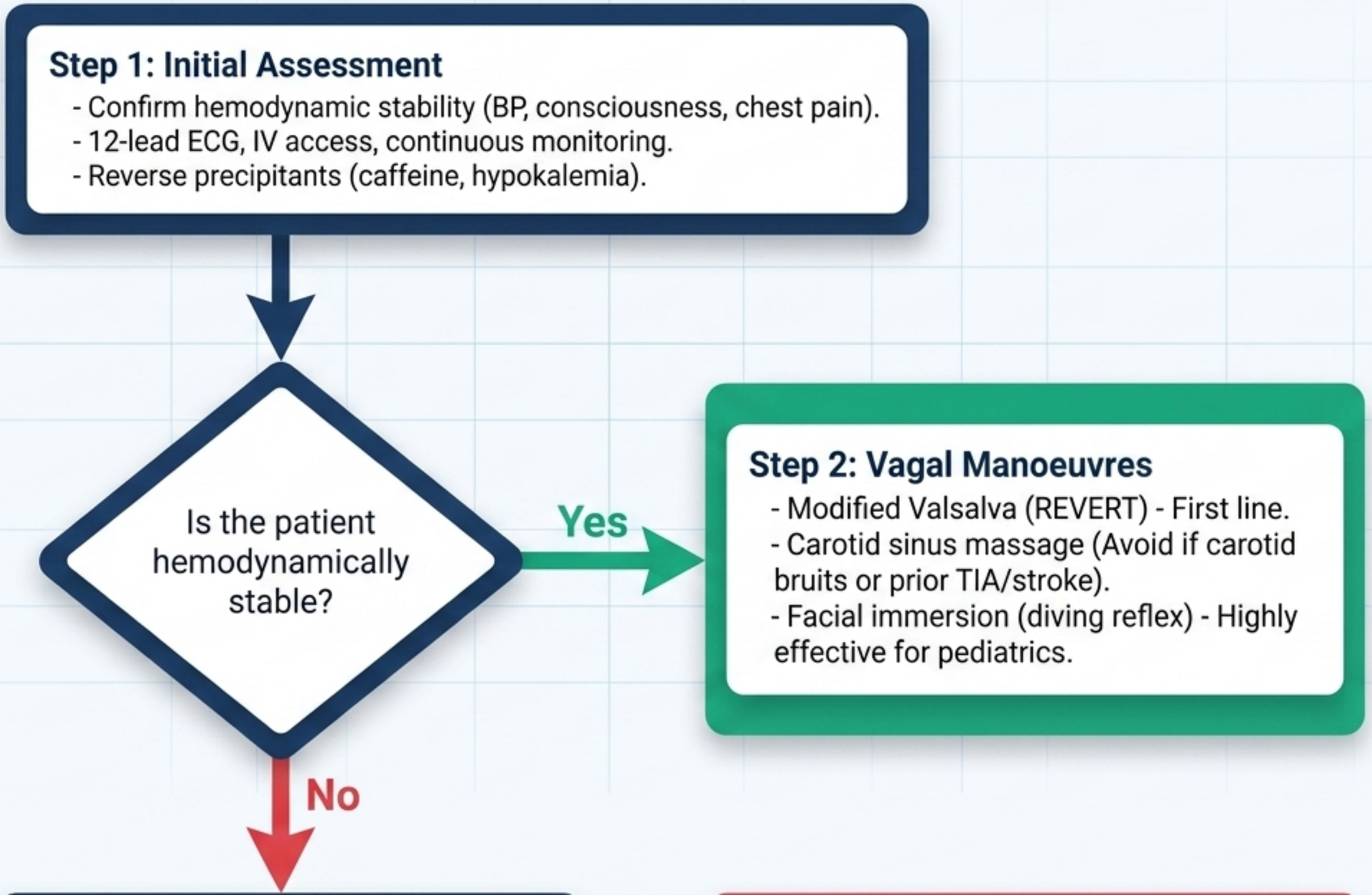
Wide (≥120 ms) indicates **antidromic AVRT, aberrancy, or pre-excited AF**.

⚠ Diagnostic Pitfall: Atrial Flutter Mimic

Do not assume all narrow-complex tachycardia is SVT.
If rate is exactly ≈150 bpm, look for sawtooth flutter waves.

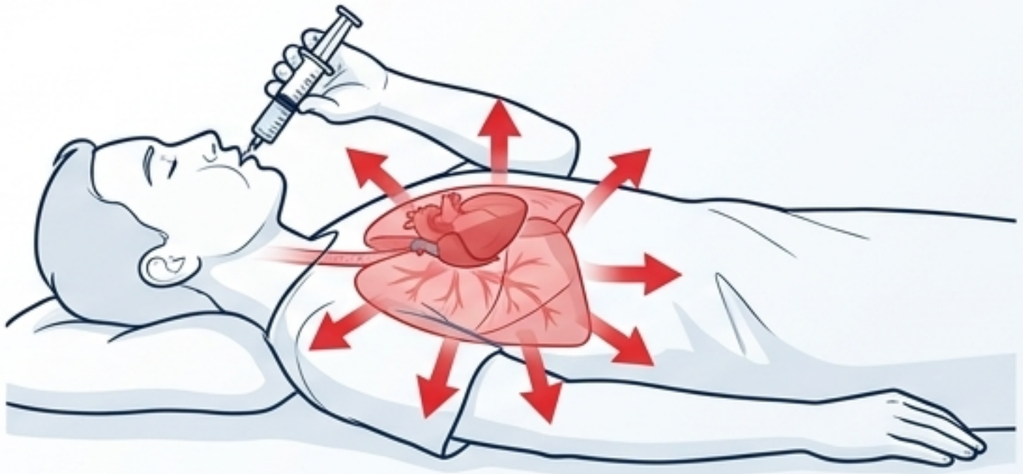
If in doubt: 6mg Adenosine transiently unmasks the atrial activity.

Acute Management Algorithm: Assessment & Vagal Phase



The REVERT Manoeuvre: Physiology of Vagal Conversion

1. Strain



40 mmHg for 15 seconds against closed glottis.
Increases intrathoracic pressure and reduces venous return.

2. Release & Elevate

45° leg raise for 15 seconds. Rapid venous return augments vagal reflex spike, terminating AV nodal re-entry.

Clinical Efficacy: **40-50% Conversion Rate** (Significantly superior to standard Valsalva at 17%).

Step 3: Pharmacological AV Nodal Blockade

Adenosine (Adenocor®)

Ultra-short acting AV nodal blocker. [PBS General Benefit]

6 mg rapid IV push → [Wait 1-2 min] → **12 mg rapid IV push** → **12 mg repeat** (Optional)

Administration

- **IV Only:** Rapid peripheral bolus via proximal vein, flush immediately with 20 mL NaCl 0.9%.
- **Pharmacokinetics:** Half-life <10 seconds.

Key Interactions

- **Dipyridamole** (potentiates -> reduce dose to 3mg).
- **Carbamazepine/Caffeine** (antagonizes).
- **Theophylline** (blocks receptor).

CONTRAINDICATED in pre-excited atrial fibrillation (WPW + AF).

Step 4 & 5: Second-Line Therapy and Cardioversion

Step 4: Second-Line Pharmacotherapy

Verapamil

- **Dose**: 5 mg IV over 2 min (repeat 5-10mg).

⚠ **Caution**: Avoid in pre-excited AF, concurrent beta-blockers, or HFrEF.

Metoprolol

- **Dose**: 2.5-5 mg IV over 2 min (max 15mg).

⚠ **Caution**: Avoid in severe asthma, decompensated HF, heart block.

Step 5: Emergency Cardioversion

Synchronised DC Cardioversion

- **Triggers**: Hypotension, altered consciousness, acute pulmonary edema, refractory SVT, pre-excited AF.
- **Protocol**: Biphasic synchronised shock. 50 J -> 100 J -> 200 J.
- Ensure **synchronization mode** to avoid **R-on-T.**

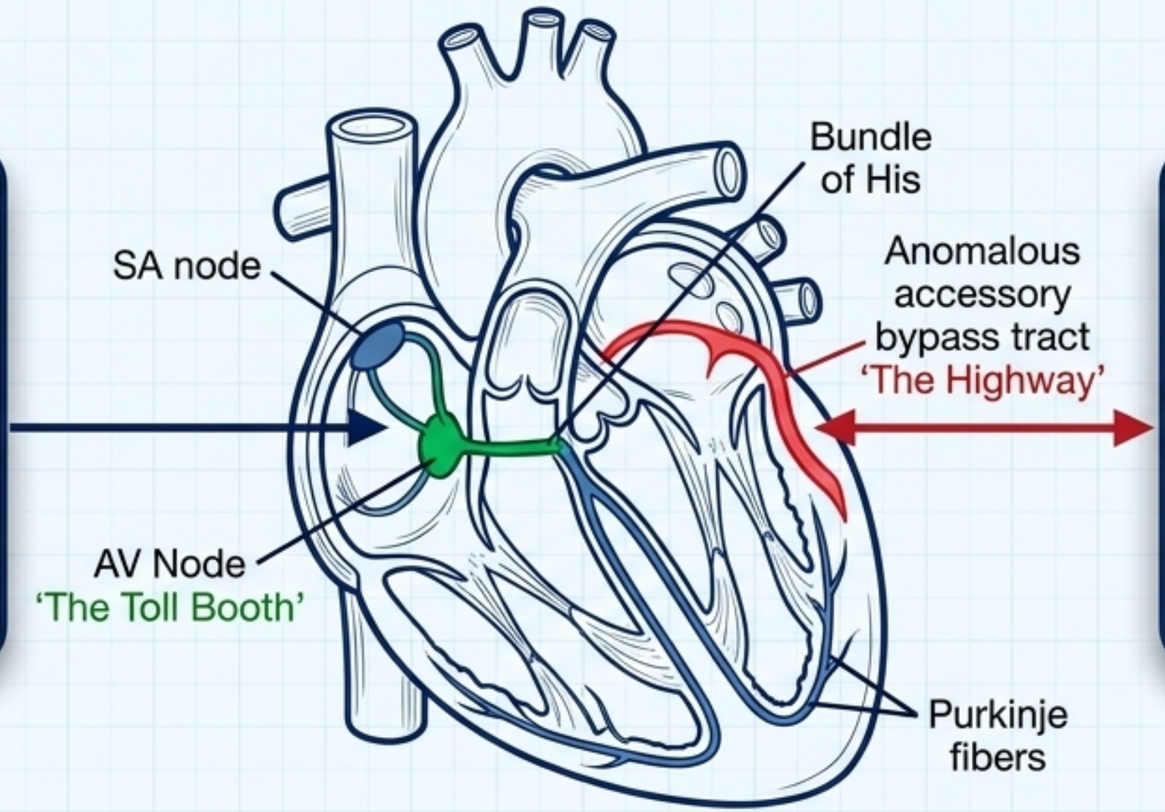
Consult Specialist: Involve cardiology for refractory SVT, structural heart disease, or pregnancy.

Pharmacological Site of Action Map

AV Nodal Blockers

Adenosine, Verapamil, Metoprolol, Digoxin.

Mechanism: Suppresses conduction through the AV node, breaking typical SVT re-entry circuits.



Accessory Pathway Blockers

Flecainide, Procainamide.

Mechanism: Slows conduction directly within the anomalous accessory pathway.

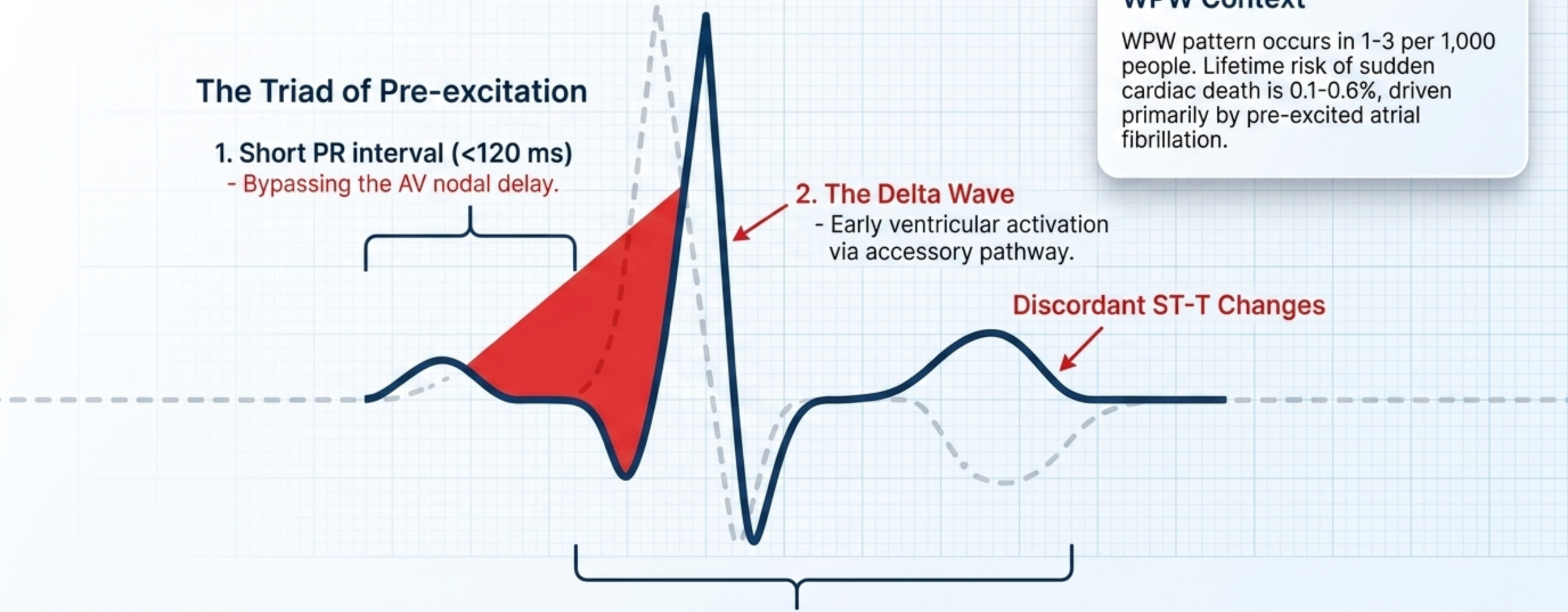
The Golden Rule of Electrophysiology:

If you block the **AV node** (the **Toll Booth**) with **Adenosine** or **Verapamil** while an **accessory pathway** (the unregulated Highway) is active during Atrial Fibrillation, **ALL** chaotic electrical impulses **bypass the node** directly into the ventricles.

Pre-Excitation ECG Decoder: Identifying WPW

The Triad of Pre-excitation

1. Short PR interval (<120 ms)
- Bypassing the AV nodal delay.



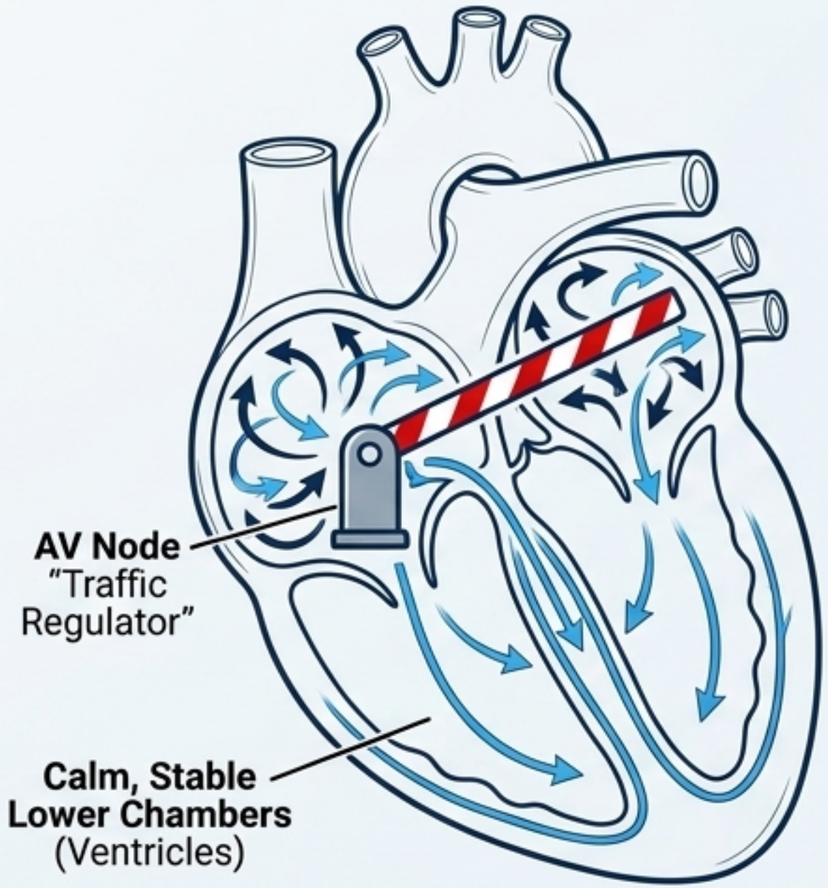
WPW Context

WPW pattern occurs in 1-3 per 1,000 people. Lifetime risk of sudden cardiac death is 0.1-0.6%, driven primarily by pre-excited atrial fibrillation.

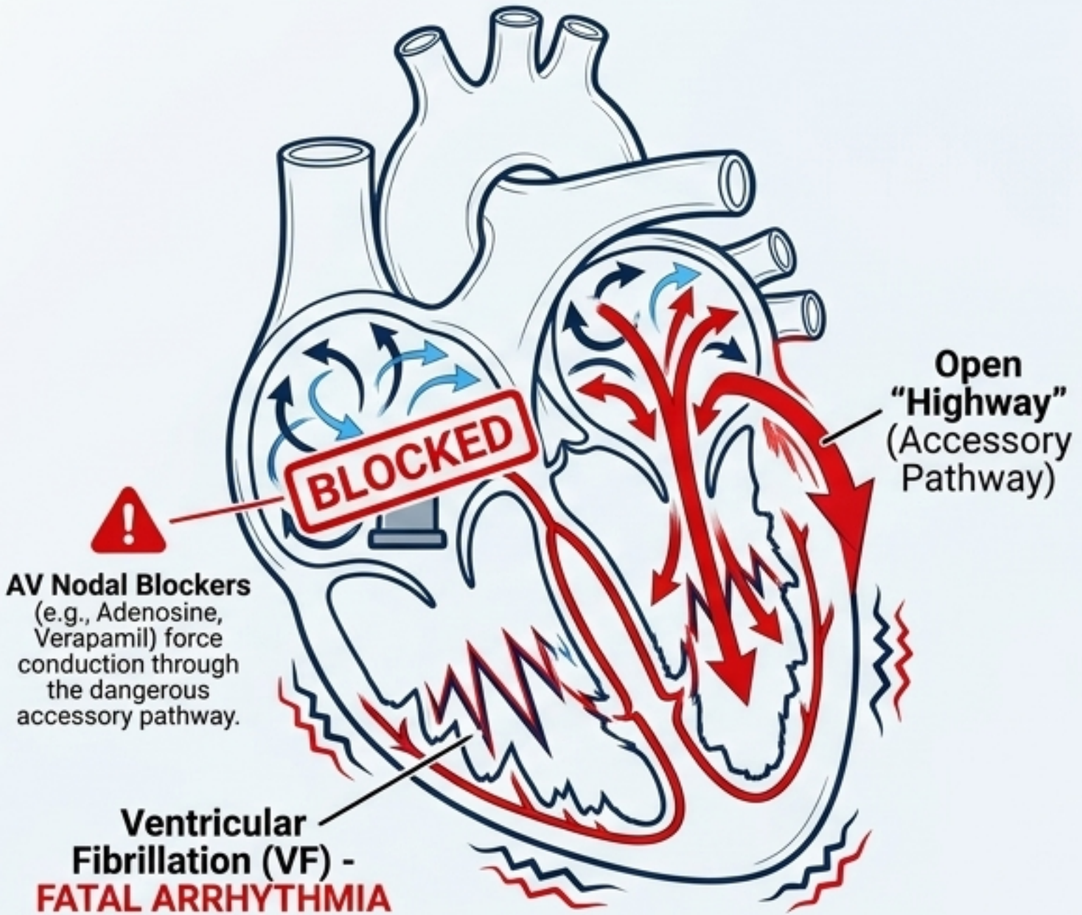
CRITICAL SAFETY WARNING: AV Nodal Blockers are **absolutely** contrandicated in **pre-excited AF.**

The Fatal Trap: Pre-Excited AF + AV Blockers

Normal Atrial Fibrillation



Pre-Excited AF + Adenosine/Verapamil



Wolff-Parkinson-White Risk Stratification

Low Risk	Intermediate Risk	High Risk
Features: - Asymptomatic incidental delta wave. - Loss of pre-excitation on exercise testing. - SPERRI >250 ms. **Action:** - Observation and education.	**Features:** - Symptomatic (SVT, presyncope). - Persistent pre-excitation on exercise. - SPERRI 250-300 ms. **Action:** - Catheter ablation strongly recommended. - Pharmacotherapy as a bridge.	**Features:** - **Syncope, aborted SCA, pre-excited AF.** - SPERRI <250 ms. - **High-risk occupations** (CASA commercial pilots require ablation). **Action:** - Urgent catheter ablation. - Restrict high-risk activities immediately.

Emergency Management: Pre-Excited AF

Pharmacological Antidote

Procainamide

Class: IA Antiarrhythmic. The drug of choice for hemodynamically stable pre-excited AF.

Dosing Protocol:
- 20 mg/min IV infusion (max 17 mg/kg or 1g).
- Cease when: Arrhythmia terminates, hypotension occurs, or QRS widens >50%.

Cautions: Monitor for hypotension.
Risk of QT prolongation/Torsades.
Active metabolite (NAPA) is renally cleared.

Electrical Antidote

Synchronised DC Cardioversion

The definitive emergency treatment for any pre-excited AF presenting with hemodynamic compromise.

STRICT RULE: Avoid Adenosine, Verapamil, Diltiazem, Digoxin, and standalone Beta-blockers.

Long-Term Maintenance: Pharmacological Dashboard

Metoprolol

25-100mg BD or
50-200mg SR daily.

First-line for AVNRT/AVRT.

Atenolol

25-100mg daily.

Requires renal adjustment (eGFR <15: max 25mg).

Verapamil (Oral)

80-120mg TDS or
180-240mg SR daily.

Reduce dose by 50% in hepatic impairment.

Flecainide

50-150mg BD.

Caution: Avoid in structural/ischemic heart disease (CAST trial). Combine with AV blocker to prevent 1:1 flutter.

Pill-in-the-Pocket Strategy

For infrequent, well-tolerated episodes:

Flecainide (150-200mg) OR **Diltiazem** (120mg) **+ Metoprolol** (50mg).

Taken only at symptom onset. **Mandates** prior in-hospital safety confirmation.

The Definitive Cure: Ablation Targets & Efficacy

SVT Mechanism	Ablation Target	Acute Success	Key Complications
AVNRT	Slow pathway (inferior to AV node)	95-98%	AV block <1%
AVRT (Concealed)	Accessory pathway	93-97%	Varies by septal location
WPW (Manifest)	Accessory pathway	92-97%	AV block <1%. (Class I indication for resuscitated arrest).
Focal AT	Mapped focal origin	85-93%	Phrenic nerve injury (lateral right atrial)

Procedural Logistics:
Performed as a day-case under conscious sedation.
Waitlists in the Australian public system average 3-12 months.

Special Populations: Pregnancy & Pediatrics

Pregnancy Management

- **Physiology:** SVT frequency increases due to blood volume and hormonal shifts.
- **Safe Interventions:** Vagal manoeuvres, Adenosine (Category B1 - no fetal accumulation), Metoprolol, Cardioversion.
- **Avoid**: Atenolol (associated with fetal growth restriction).
- **Procedure:** Ablation is universally deferred to post-delivery. Zero-fluoroscopy techniques used only if absolutely urgent.

Pediatric Adaptations

- **Physiology:** AVRT predominates. Infants often present with nonspecific poor feeding or pallor rather than palpitations.
- **Acute Reversion:** Facial immersion in cold water (diving reflex) is highly effective. Adenosine dosed at 0.1 mg/kg (max 6mg). Cardioversion at 0.5-1 J/kg.
- **Long-term Care:** Propranolol or Atenolol. Ablation typically deferred until age 4-5, as infantile SVT may spontaneously resolve by age 1.

Physiological Adjustments: Aging & Impaired Clearance

Elderly Patients

- **Presentation:** Focal Atrial Tachycardia becomes more common than AVNRT/AVRT.
- **Vulnerability:** **High risk** of hemodynamic compromise due to reduced cardiac reserve and diastolic dysfunction.
- **Safety:** Adenosine remains **safe** (no age adjustment needed).
- Beta-blockers and Verapamil require **highly careful titration**.

Renal Impairment

- **Adenosine:** **No adjustment required** (rapid intracellular metabolism via deaminase).
- **Atenolol & Sotalol:** **Mandatory dose reduction** based on eGFR. **Avoid Sotalol completely** if eGFR <10 mL/min.
- **Procainamide:** Active metabolite (NAPA) is renally cleared, necessitating **careful infusion monitoring**.

Hepatic Impairment

- **Clearance:** Metoprolol and Verapamil undergo massive first-pass hepatic metabolism.
- **Adaptation:** **Reduce Verapamil dosing by 50%**.
- **Exercise extreme caution** with Metoprolol in Child-Pugh C cirrhosis.

Aboriginal and Torres Strait Islander Health Considerations

Rheumatic Heart Disease Overlap

- Disproportionate rates of **ARF/RHD** in **NT, QLD, and WA**. RHD-related mitral valve disease drives severe atrial enlargement, precipitating complex SVT. Requires coordl. rheumatic registry follow-up.

Access & Geography

- Specialist electrophysiology is concentrated in metro centers. High reliance on telehealth and fly-in clinics. Royal Flying Doctor Service (RFDS) utilizes REVERT and Adenosine prior to aeromedical retrieval.

Medication Supply & Adherence

- **'Close the Gap'** PBS co-payments aid essential supply in remote communities. **Long-acting once-daily formulations** (e.g., Metoprolol SR) are heavily prioritized to support logistical adherence.

Cultural Safety

- **Engagement** with **Aboriginal Health Workers** and **Practitioners** (AHWPs) is a clinical necessity for culturally safe education, longitudinal follow-up, and informed procedure consent for ablation.

Post-Intervention Monitoring Blueprint

Post-Ablation Monitoring

Day 1 → **1 Month** → **3 Months** → **12 Months**

Serial ECGs to confirm complete absence of delta wave and detect recurrence.

24-hour Holter if palpitations recur.
Exercise stress test (WPW) to verify absence of pre-excitation under stress.

Pharmacotherapy Monitoring

Flecainide

- Mandatory baseline ECG and post-initiation check.
- Stop/reduce dose immediately if QRS widens >25%.
- ECHO is strictly mandatory before starting.

Sotalol

- Serial ECGs for QTc interval tracking tracking (Cease if >500ms).
- Regularly monitor K+ and Mg2+.

Conclusion:

Conclusion: **Catheter** ablation offers a **definitive**, anatomical cure. Until then, **precision pharmacology driven by exact ECG diagnosis** remains the cornerstone of SVT management.

Core References: ACC/AHA SVT Guidelines 2015 | REVERT Trial, Lancet 2015 | Med2Date 2026