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Assessment and Management of Fetal Tachycardia

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Disclosures

- I have no financial disclosures or conflicts of interest.

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Outline

- Defining the issue
- Assessment of fetal tachycardia
- Management strategies
- Outcomes

Fetal tachycardia

- Fetal arrhythmia complicates 2-3% of all pregnancies
  - SVT accounts for ~2/3 of arrhythmias
- High incidence of fetal heart failure, prematurity and death
- In the presence of hydrops, perinatal mortality: 20-35%

Assessment of Tachycardia

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Fetal Electrocardiography

- Fetal ECG signals are ***not*** reliable
- Weak signal with low signal-to-noise ratio
- Maternal ECG contributes to this noise, precluding reliable assessment of fetal electrical activity

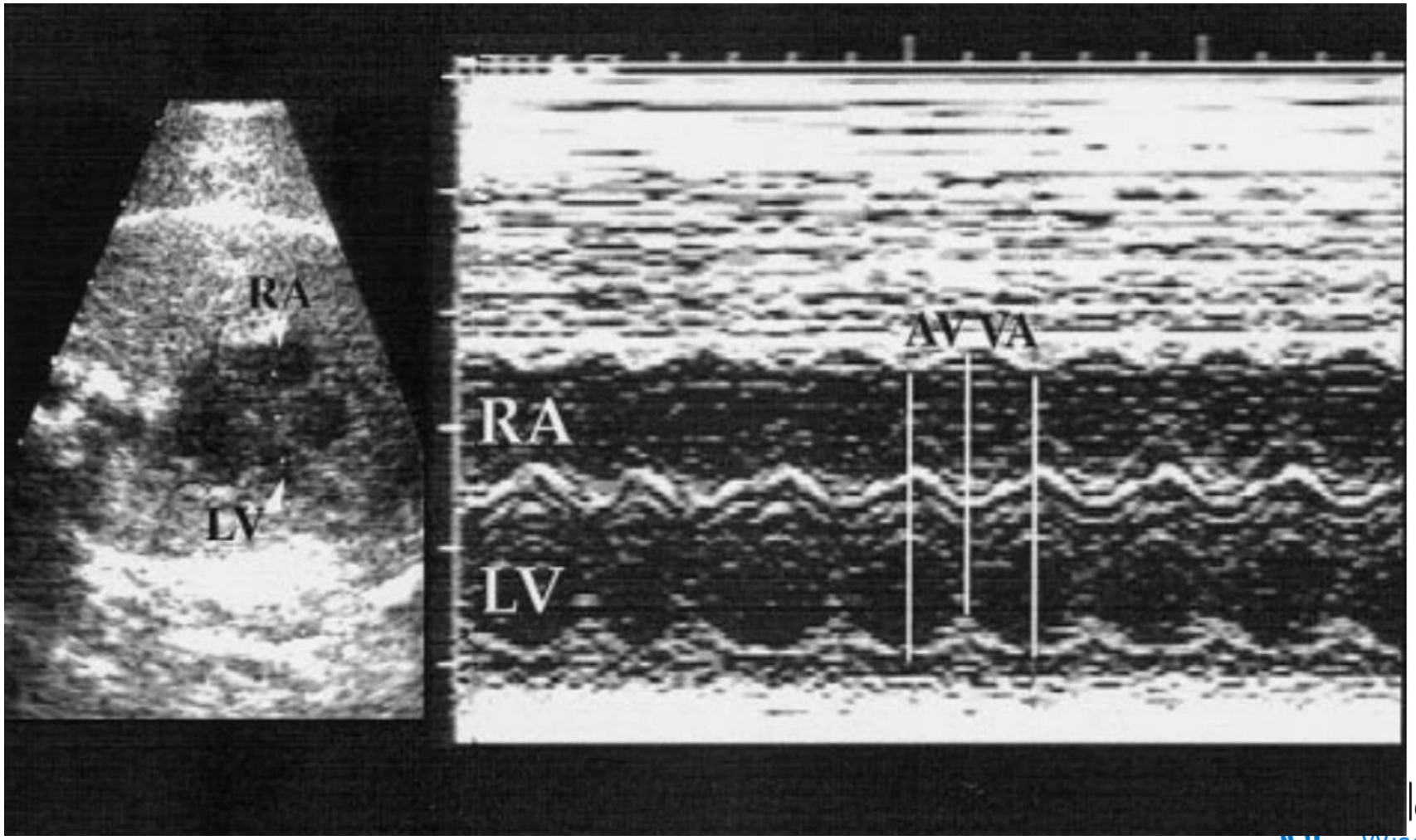
Fetal Echocardiography

- M-mode (motion mode)
  - Provides excellent temporal and spatial resolution
- Doppler assessment
- AV and VA intervals

M-mode

- Relationship between timing of atrial and ventricular contraction
  - Cursor positioned across a structure moving with atrial contraction and one with ventricular contraction
- Rapid assessment of A:V relationship
- Assessment of AV/VA intervals is possible

M-mode: AV and VA intervals



Fouron et al, Obstet Gynecol 2000;96: 732–6.

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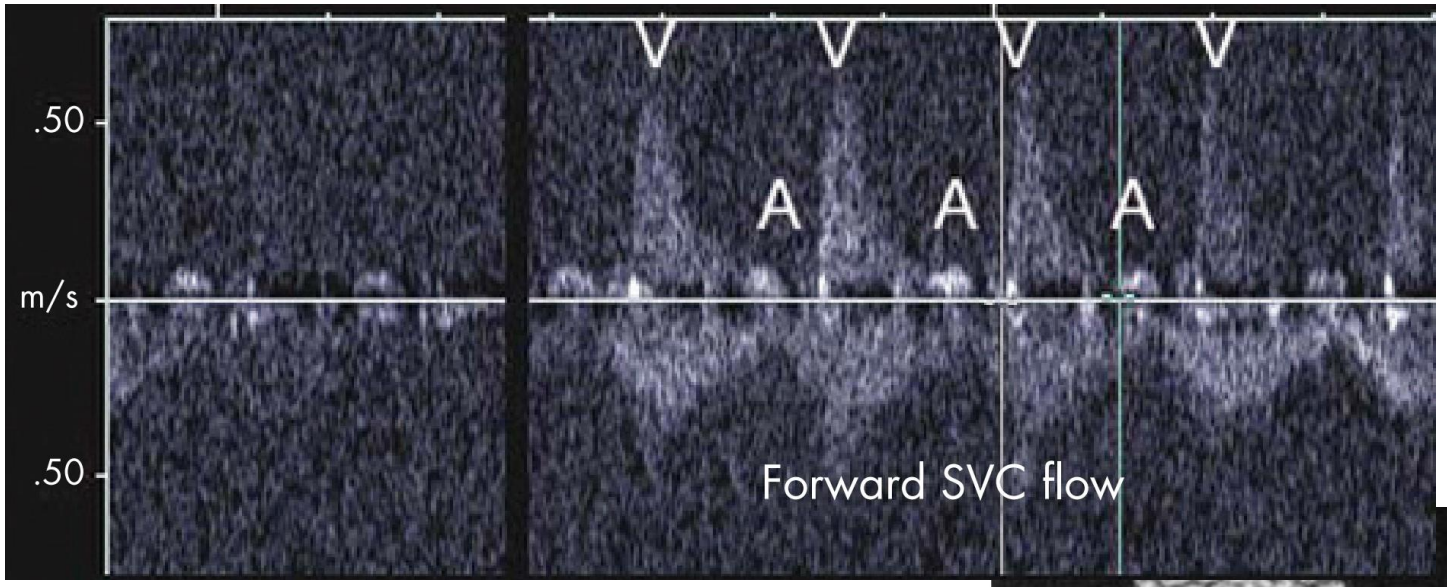
Pulsed Wave Doppler

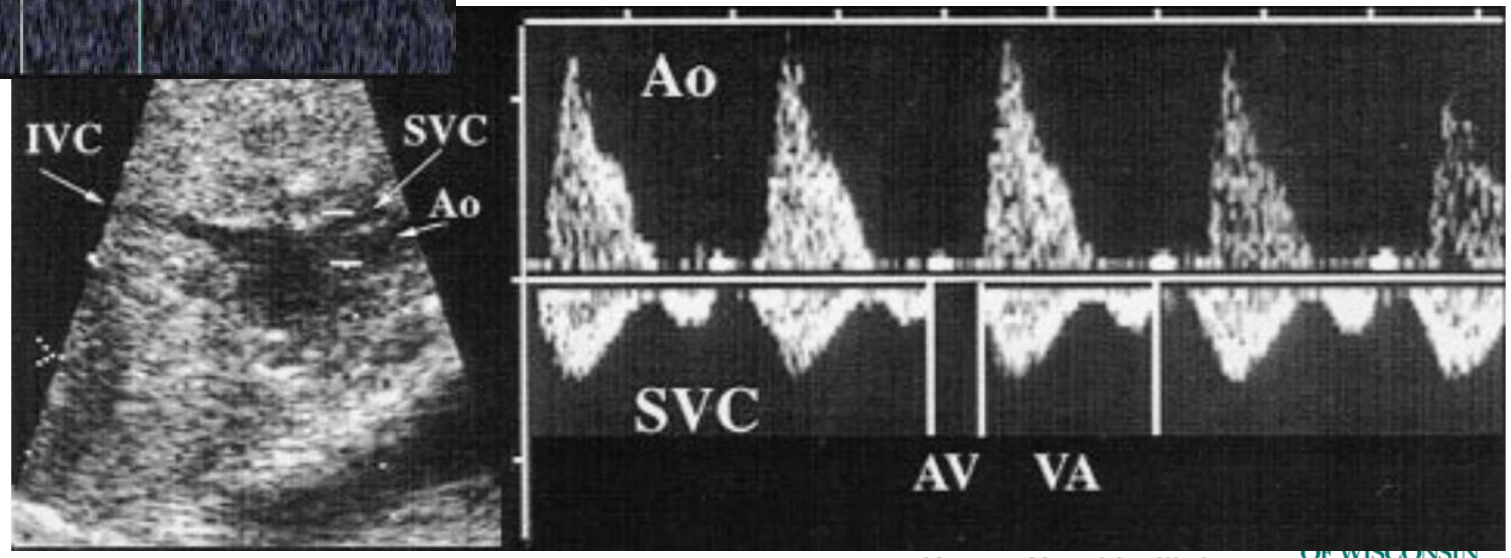
- Heart rate and variability

- Relationship of atrial and ventricular contractions
  - Inflow and outflow Doppler
    - Mitral and aortic valves
  - SVC and ascending aortic Doppler

Pulsed Wave Doppler



Hornberger, Heart 2007;93:1294–1300.



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Fetal Magnetocardiography

- Surface sensors are utilized to record the weak magnetic fields generated by cardiac electrical activity
- Maternal noise is subtracted to yield detailed waveforms and electrical intervals essential for diagnosis of fetal arrhythmias
- Reliable tracings beginning as early as 20 weeks gestation
- Few centers with appropriate skilled personnel
  - Dr. Janette Strasburger

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Diagnosis of Fetal Tachycardia

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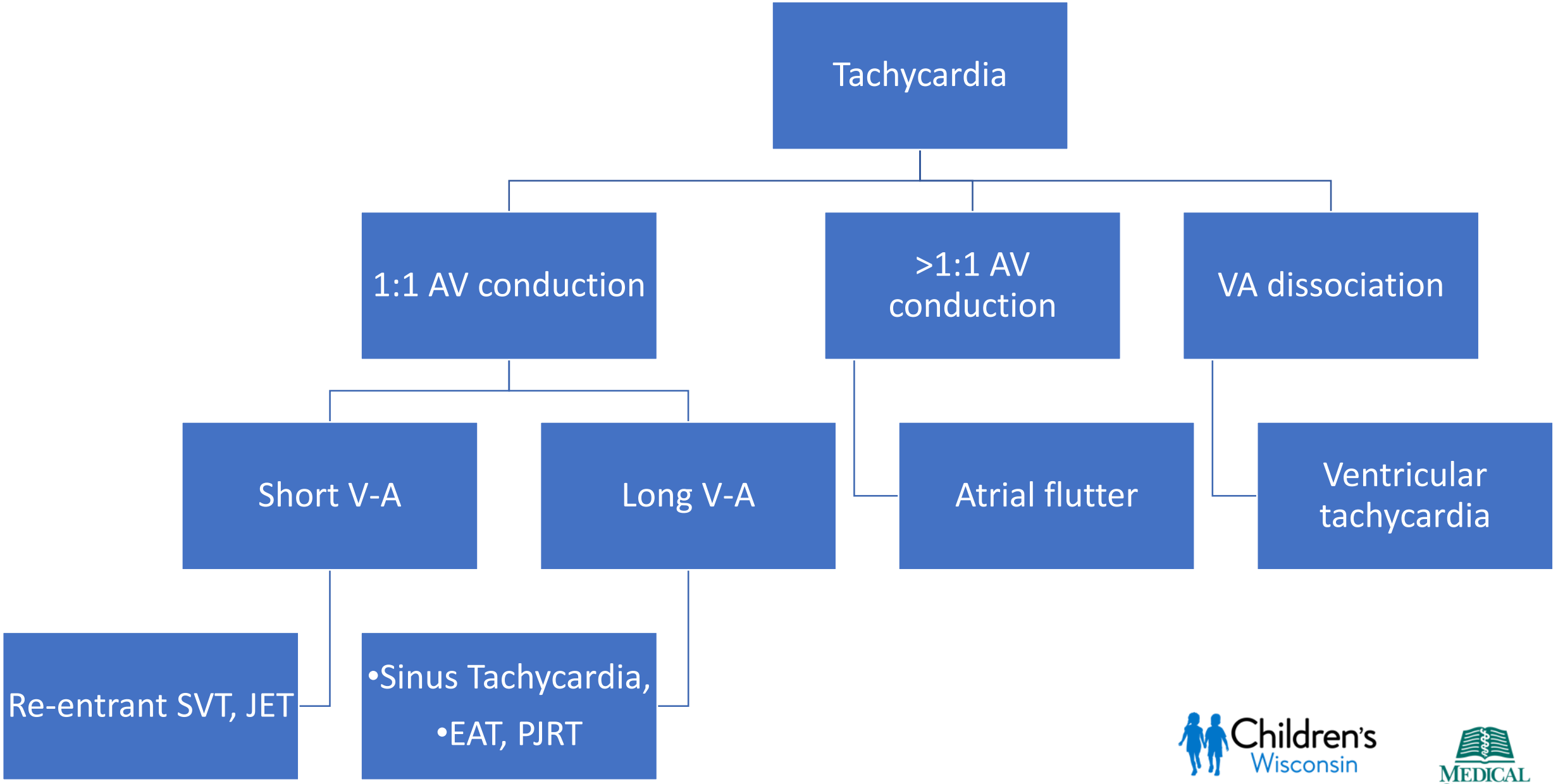

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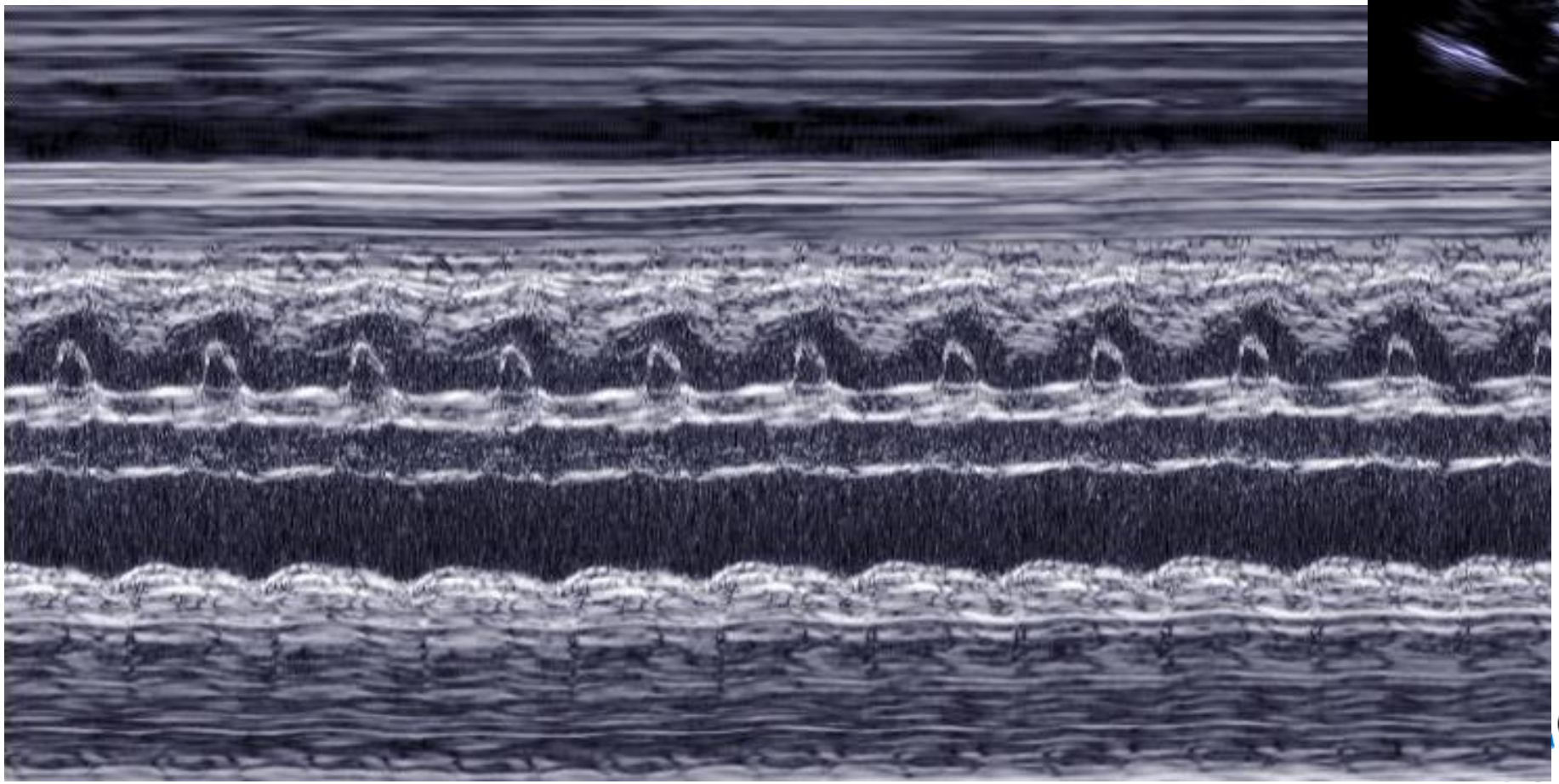
Re-entrant SVT

- Secondary to an accessory atrioventricular pathway
  - Normal antegrade conduction through the AV node with rapid, retrograde conduction through the accessory pathway
  - Short VA interval
- Rapid onset and termination of tachycardia
- 1:1 A-V conduction with minimal variability and rates 220-280bpm
- Commonly first identified at 24-32 weeks gestation

Re-entrant SVT

V

A



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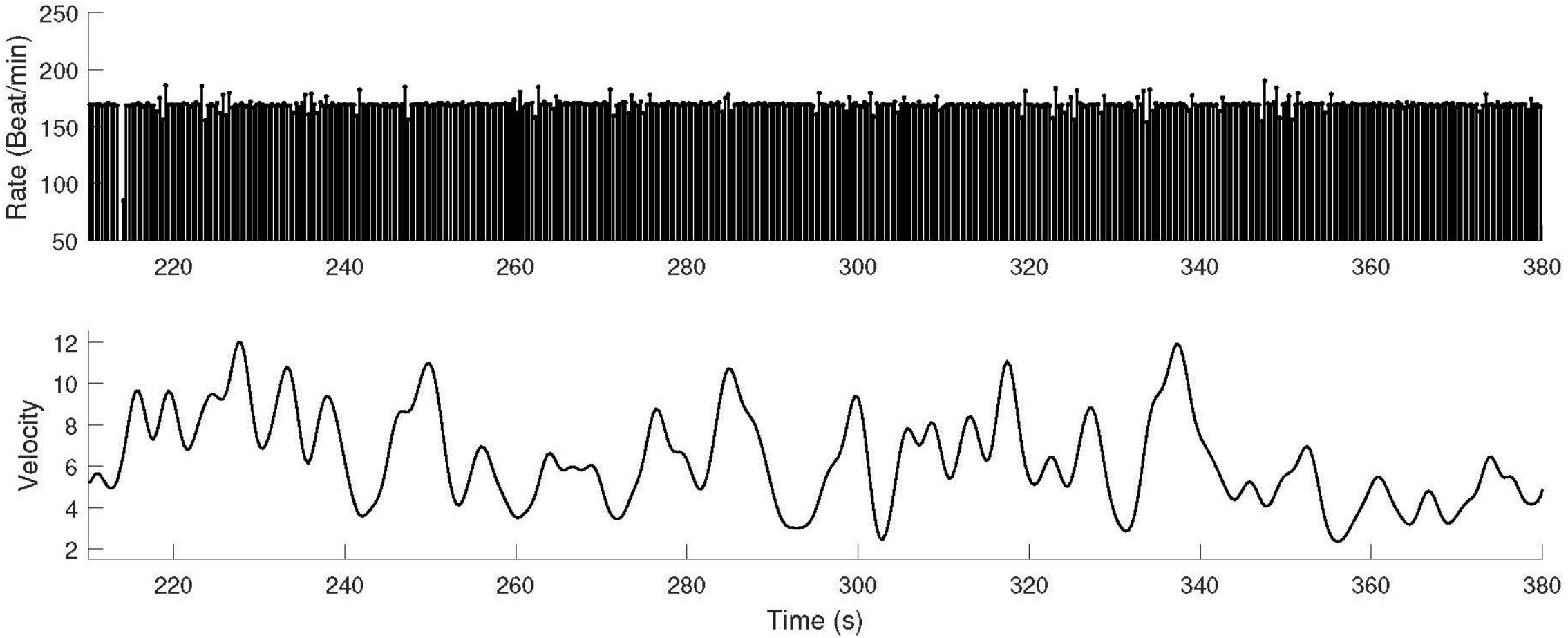
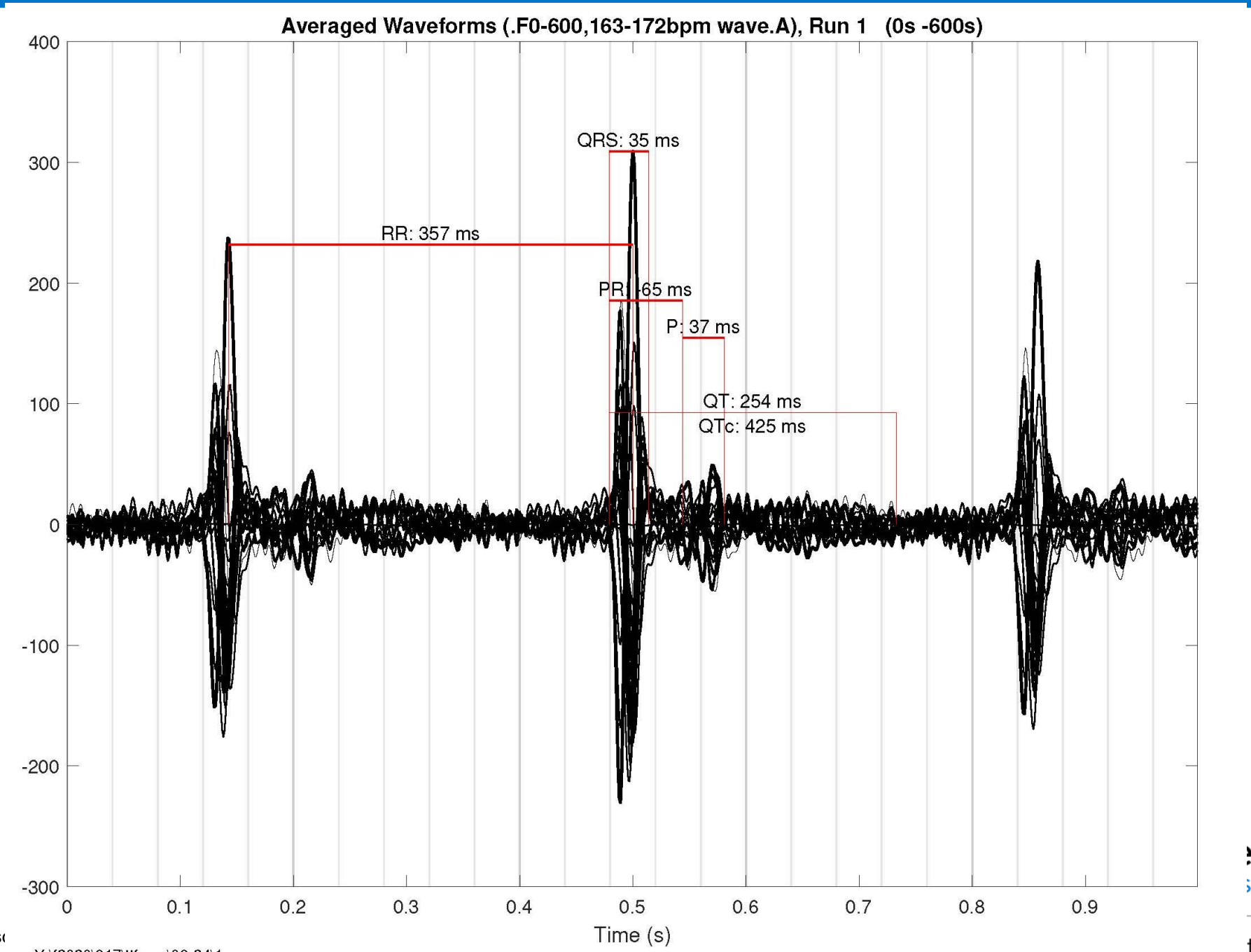
Junctional Ectopic Tachycardia

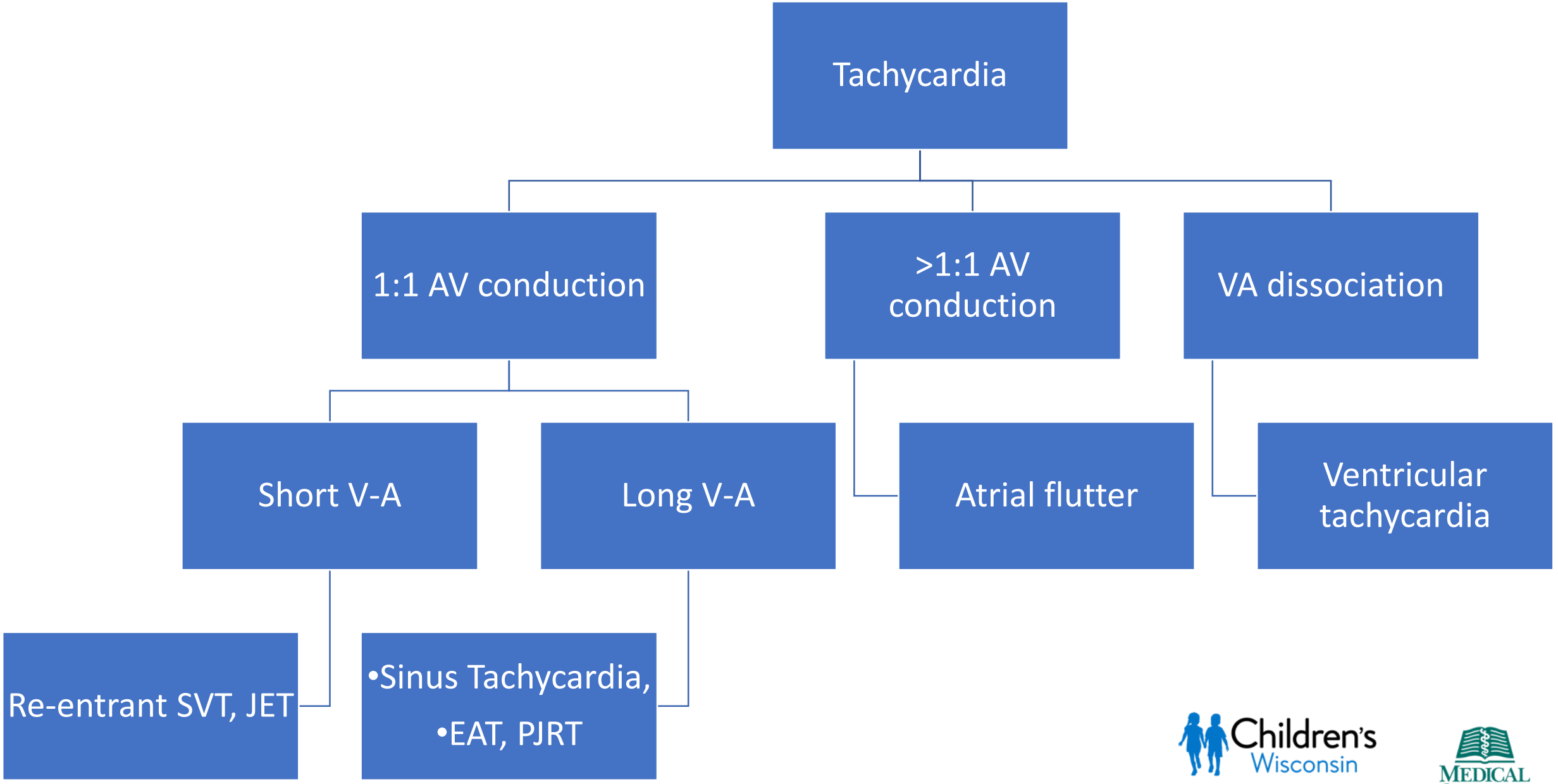
- Typically, slower rate than re-entrant SVT

- Etiology:
  - Idiopathic/Congenital
  - Autoimmune mediated

Junctional Ectopic Tachycardia







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Sinus Tachycardia

- 1:1 AV conduction with variability
- Rates typically range from 180-200bpm
- Sinus tachycardia is a symptom and identification of underlying etiology is essential
  - Anemia
  - Infections
  - Thyroid

Long VA Tachyarrhythmia

- Typically, more challenging to treat than re-entrant (short VA) SVT
  - Ectopic atrial tachycardia
  - Permanent Junctional Reciprocating Tachycardia (PJRT)

Outcomes of sustained fetal tachyarrhythmias after transplacental treatment

Raphael Bartin, MD,[*§] Alice Maltret, MD,[†§] Muriel Nicloux, MD,[‡§] Yves Ville, MD,[*§‖]
Damien Bonnet, MD,[†§‖] Julien Stirnemann, MD[*§‖]

- Single center review of patients with fetal tachyarrhythmia who underwent transplacental therapy

- Of those resistant to therapy, EAT and PJRT accounted for 44%

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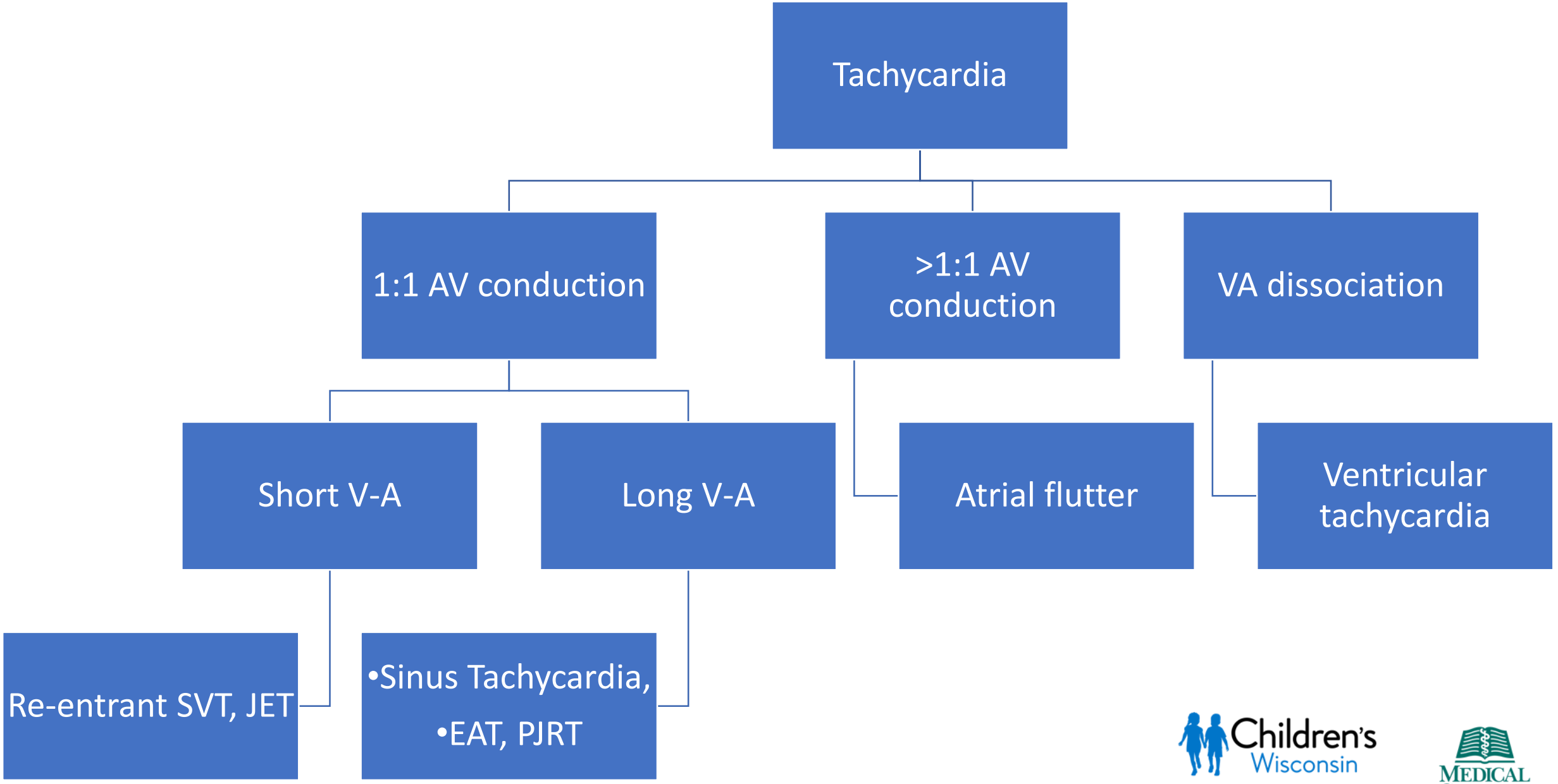

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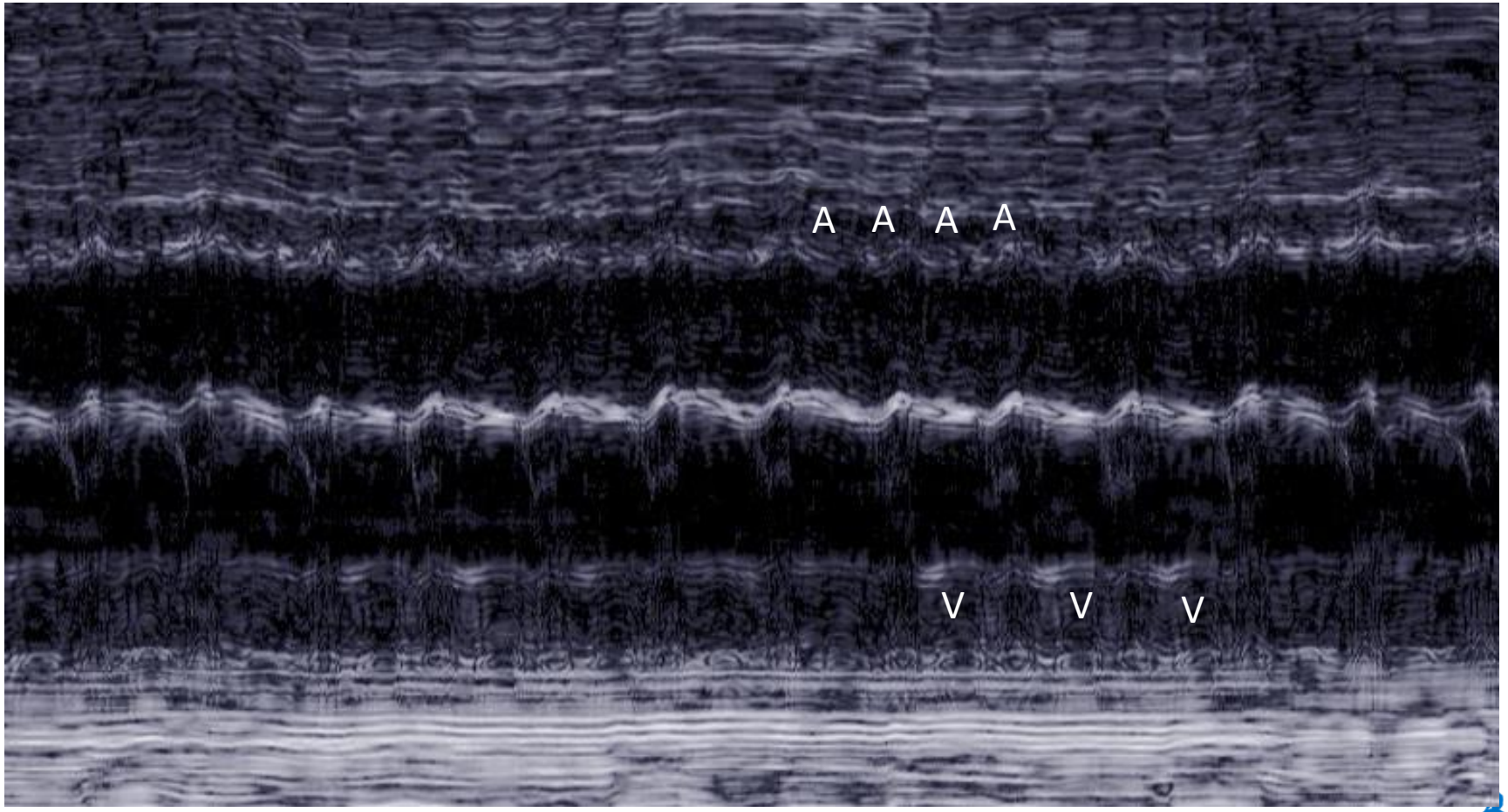
Atrial Flutter

- Intra-atrial re-entrant circuit
- Hallmark of tachyarrhythmia is >1:1 AV conduction
- Atrial rates typically between 300-500 bpm

Atrial Flutter



A

V

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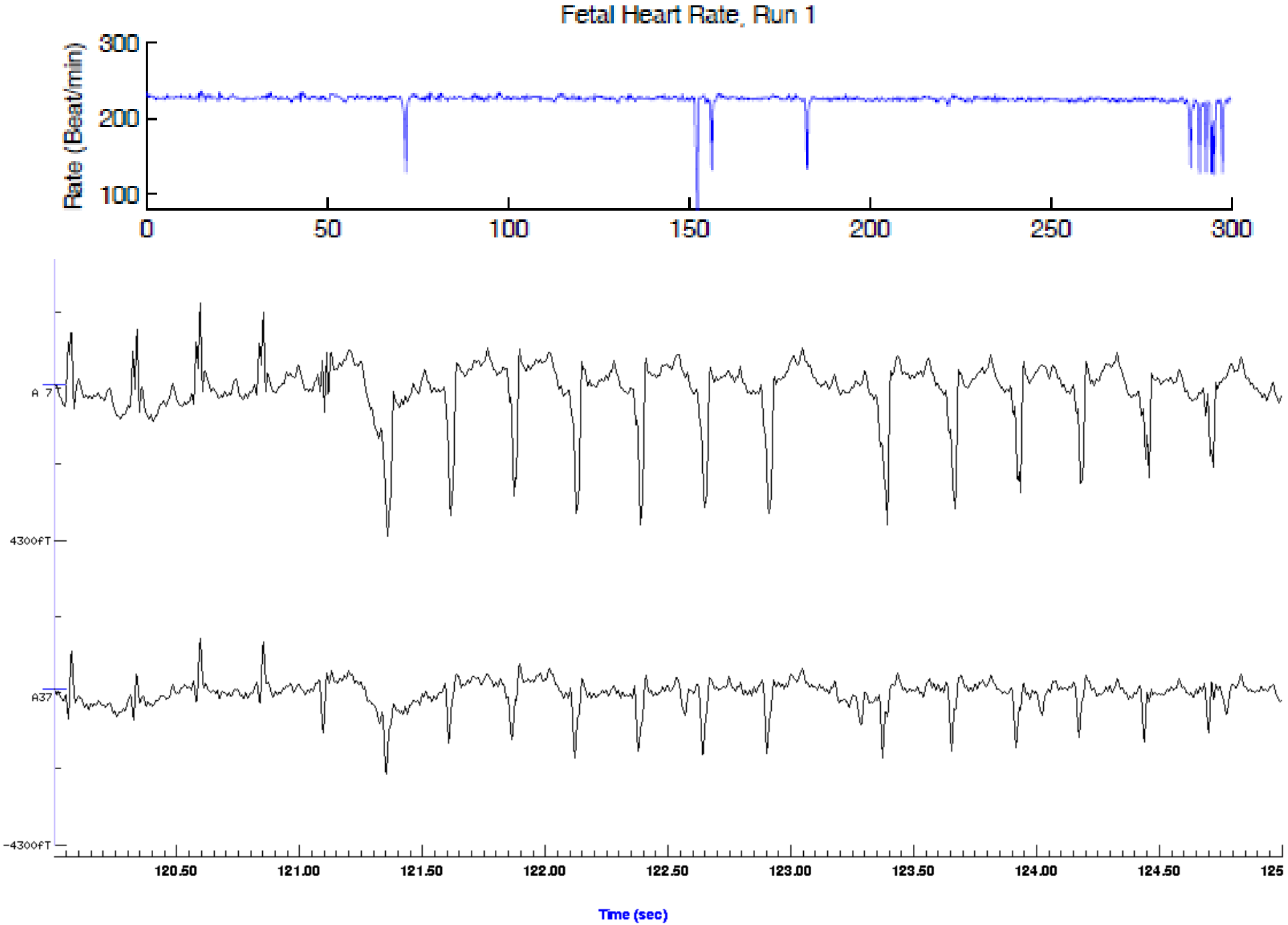

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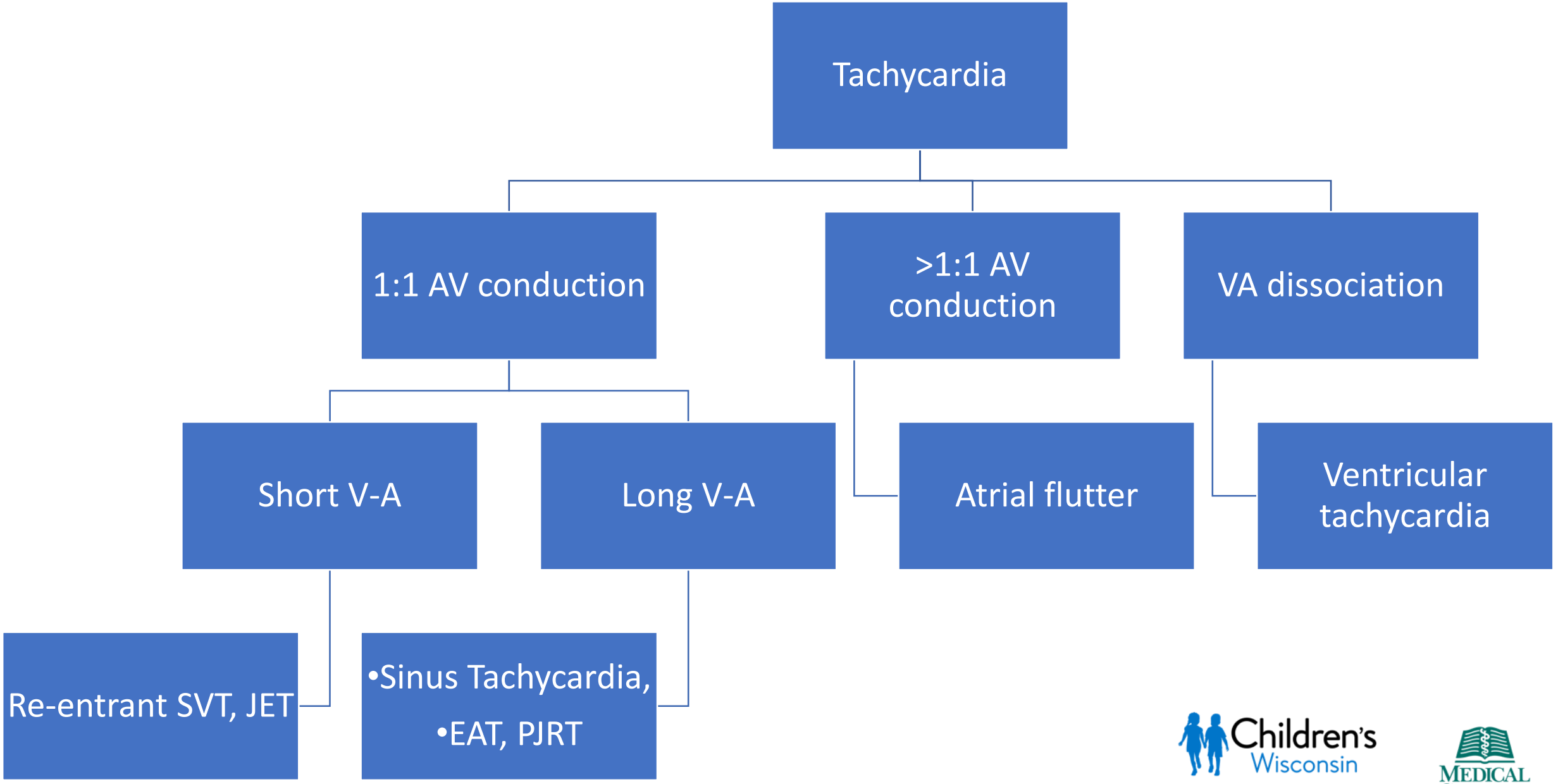

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Ventricular Tachycardia

- Complete VA dissociation
  - More V's than A's
- Ventricular rates can be quite variable
- Other considerations: Long QT syndrome

Treatment


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Goals of Treatment

- Primary Goal: Prevent or reverse fetal hydrops and ventricular dysfunction
- Rhythm control is not necessary to avoid hydrops
- If rhythm control cannot be achieved, rate control should become the goal

Antiarrhythmic Medications

- Digoxin
- Propranolol
- Flecainide
- Sotalol
- Propafenone
- Verapamil
- Amiodarone

Digoxin

- Most commonly reported agent for fetal SVT.
- Well absorbed in the absence of hydrops, achieving therapeutic levels in 3-5 days.
- Conversion in <20% of SVT in the setting of hydrops

Maternal side effects:

- Nausea
- Headaches
- Dizziness
- Visual disturbances

- Monitoring with ECG and serum levels

Flecainide

- Class IC antiarrhythmic
- Increasing evidence of efficacy for treatment of fetal SVT.
- Well absorbed, achieving therapeutic levels in ~3 days.

Maternal side effects:

- Dizziness
- Vision changes
- Nausea/abdominal pain
- Constipation

- Toxicity may yield QRS prolongation and proarrhythmic state

Sotalol

- Class III antiarrhythmic
- Retrospective studies suggest greater rates and earlier conversion of atrial flutter

Maternal side effects:

- Nausea/vomiting
- Dizziness/lightheadedness

- Toxicity may yield QTc prolongation.
  - Care to avoid/minimize other QT prolonging medications.

FAST Trial

- **F**etal **A**trial Flutter and **S**upraventricular **T**achycardia (FAST) Therapy trial

- 3 prospective randomized controlled sub-studies
  - Atrial flutter without hydrops
    - Digoxin vs. sotalol
  - SVT without hydrops
    - Digoxin vs. flecainide
  - SVT with hydrops
    - Digoxin + sotalol vs. digoxin + flecainide

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Conclusions

- Fetal echocardiography remains the gold standard for assessment of fetal tachycardia.
- FMCG can provide additional diagnostic details to inform treatment.
- FAST Therapy Trial results may inform our transplacental therapeutic strategies in the future.

Questions?

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