

APPROACH TO PEDIATRIC TACHYCARDIA

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1. Background

a) General Presentation

Tachycardia is an abnormally rapid heart rate. In adults, this is usually defined as >100 beats per minute (bpm). In pediatrics, the normal heart rate varies with age (see Table 1). Therefore, in children, the definition of tachycardia is age dependent. Presentation varies with underlying cause, but most often the symptoms are vague and non-specific, such as “fussiness” or “difficulty feeding”.

b) Basic Anatomy and Physiology

Normal pediatric ranges for heart rate can be found in [Table 1](#). The heart receives both sympathetic (sympathetic ganglion, increases heart rate) and parasympathetic (vagus nerve, decreases heart rate) innervation. Tachycardia may result from physiologic processes that alter the sympathetic/parasympathetic tone, resulting in a sinus tachycardia. Alternatively, tachycardia may be the result of an arrhythmia: atrial fibrillation; atrial flutter; supraventricular tachycardia; or ventricular tachycardia. There are many [medications](#) that can cause tachycardia, either by leading to the release of catecholamines, or by inducing an arrhythmia.

2. Questions to Ask

- Does the child have a history of tachycardia, or a known cardiac condition?
- What is the onset and duration of the child’s current illness (if present)?
- Does the child have other symptoms, such as:
 - Chest pain
 - Palpitations

- Shortness of breath
 - Colour change
 - Syncope
 - Neurologic symptoms (e.g., change in level of consciousness)
- ❑ Does the child take any medications?
 - ❑ Does the child have any allergies?
 - ❑ Is there a family history of cardiac problems?
 - Arrhythmias
 - ❑ Does the tachycardia occur at certain times (e.g., with activity, following meals, under stress)?
 - ❑ Does the child feel hot/have a fever?
 - ❑ Has the child been vomiting or having diarrhea?
 - Has the child been drinking?
 - What is their urine output?

3. Differential Diagnosis

- ❑ Sinus Tachycardia secondary to dehydration/hypovolemia (most common), fever, hypoxia, anemia, shock, MI, pulmonary edema, hyperthyroidism, hypocalcemia, or medications
- ❑ Supraventricular Tachycardia (AV re-entry, junctional, or atrial ectopic)
- ❑ Ventricular Tachycardia
- ❑ Atrial flutter
- ❑ Atrial fibrillation

*See [Table 3](#)

4. Investigations

- a) Physical exam
 - ❑ Focus on general appearance, hydration status, vital signs, respiratory exam (retractions, increased work of breathing, crackles, wheezing), cardiac exam (dyspnea, liver size, peripheral perfusion, cyanosis, rate/rhythm, murmurs), level of consciousness.
- b) Labs
 - ❑ Electrolytes, CBC, glucose, Mg, Ca. Consider toxicology screen, thyroid function studies, blood gas.
 - ❑ Consider CXR, cardiac echo.
- c) 12 lead ECG

5. Appendix

Table 1: Pediatrics HR ranges

Age	Normal Range (Average) (bpm)
< 1 day	93-154 (123)
1-2 days	91-159 (123)
3-6 days	91-166 (129)
1-3 weeks	107-182 (148)
1-2 months	121-179 (149)
3-5 months	106-186 (141)
6-11 months	109-169 (134)
1-2 years	89-151 (119)
3-4 years	73-137 (108)
5-7 years	65-133 (100)
8-11 years	62-130 (91)
12-15 years	80-119 (85)
> 16 years	60-100

Table 2: Tachycardia inducing medications

Induce increase in catecholamine release	Induce Ventricular Tachycardia
<ul style="list-style-type: none"> ▪ amphetamines ▪ cocaine ▪ caffeine ▪ ephedrine ▪ antihistamines ▪ phenothiazines ▪ antidepressants ▪ tobacco ▪ general anesthesia ▪ theophylline 	<ul style="list-style-type: none"> ▪ tricyclics ▪ phenothiazines ▪ antiarrhythmics ▪ chloral hydrate ▪ organophosphates ▪ hydrocarbons ▪ digoxin ▪ amphetamines ▪ cocaine ▪ arsenic

Table 3: Differential diagnosis

	Sinus	Supra-Ventricular Tachycardia (reentry)	Atrial Flutter	Atrial Ectopic Tachycardia	Junctional Ectopic Tachycardia	Ventricular Tachycardia
Clinical	<ul style="list-style-type: none"> ▪ Fever ▪ Sepsis ▪ Shock ▪ CHF ▪ NE/ Epi 	<ul style="list-style-type: none"> ▪ 50% Wolff-Parkinson-White syndrome ▪ 25% Atrio-ventricular nodal reentrant 	<ul style="list-style-type: none"> ▪ 90% have dilated atria ▪ Myocarditis ▪ Digoxin toxicity 	Usually normal heart	Post cardiac surgery	<ul style="list-style-type: none"> ▪ >70% have abnormal heart ▪ Post cardiac surgery ▪ Myocarditis ▪ Long QT

		tachycardia ▪ Ebstein's anomaly				syndrome ▪ Drugs
Rate	Usually <200/min	Infants: < 300/min Children: <240/min	Atrial rate 250-400/min 2:1, 3:1, or 4:1 AV block	> 200/min	▪ Atrial rate < Ventricular ▪ Up to 300/min	Usually <250/min
P wave	Normal	▪ May be buried in QRS ▪ 60% has retrograde P wave	Regular flutter waves	Abnormal but constant	Retrograde P waves	▪ A-V dissociation ▪ Sometimes retrograde P
QRS	Normal	Normal or aberrant	Normal	Normal	Normal	Wide
Treatment	Treat underlying cause	PALS (pediatric advanced life support) algorithm	▪ Digoxin ▪ Anti-arrhythmics ▪ DC cardioversion	Anti-arrhythmics	▪ Cooling ▪ Normalize pH and volume ▪ Anti-arrhythmics	PALS (pediatric advanced life support) algorithm

References

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