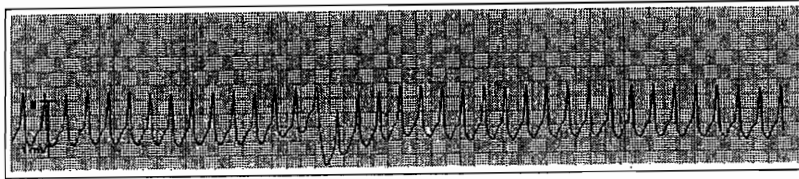


# **PALS ECG Rhythm Pre-Test**

**PALS Written 2006 Pre-Course Self- Assessment  
2006 American Heart Association**



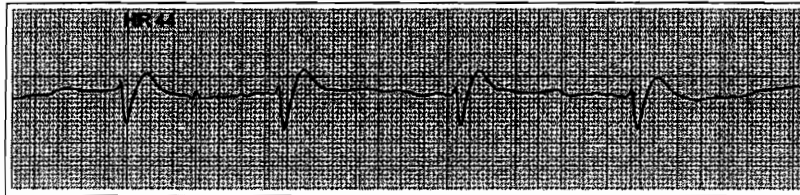
# ECG Rhythm Review



Identify the rhythm with the single best answer. Clinical clues: heart rate 214/min

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
- Asystole
- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
- Torsades de pointes
- VF converted to organized rhythm after successful shock delivery (defibrillation)

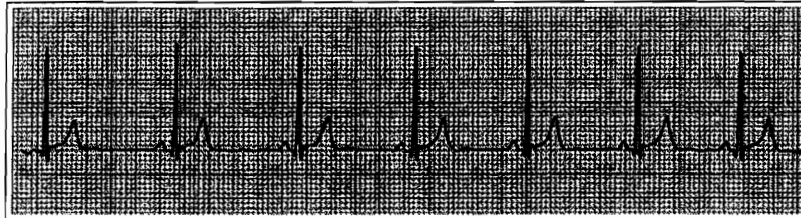
2.



Identify the rhythm with the single best answer. Clinical clues: no detectable pulses

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
- Asystole
- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
- Torsades de pointes
- VF converted to organized rhythm after successful shock delivery (defibrillation)

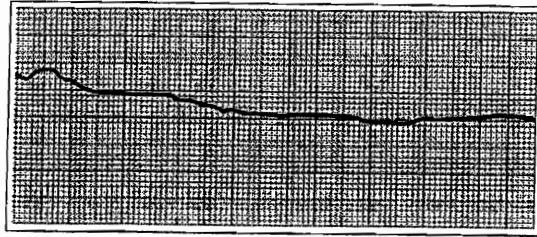
3.



Identify the rhythm with the single best answer. Clinical clues: age 8 years; heart rate 50/min

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
- Asystole
- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
- Torsades de pointes
- VF converted to organized rhythm after successful shock delivery (defibrillation)

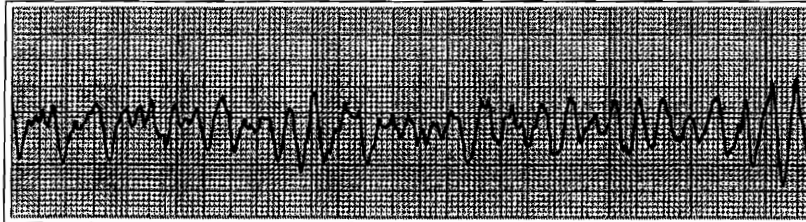
4.



Identify the rhythm with the single best answer. Clinical clues: no detectable pulses

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
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- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
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- VF converted to organized rhythm after successful shock delivery (defibrillation)

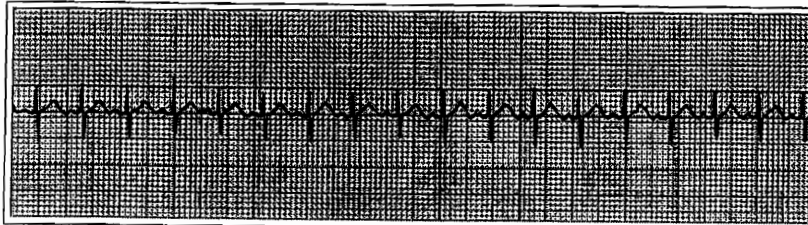
5.



Identify the rhythm with the single best answer. Clinical clues: no consistent heart rate detected; no detectable pulses

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
- Asystole
- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
- Torsades de pointes
- VF converted to organized rhythm after successful shock delivery (defibrillation)

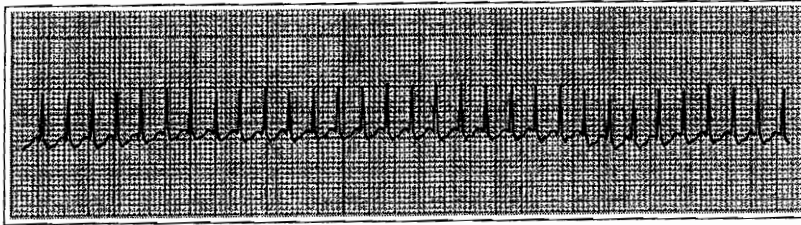
6.



Identify the rhythm with the single best answer. Clinical clues: age 3 years; heart rate 180/min

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
- Asystole
- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
- Torsades de pointes
- VF converted to organized rhythm after successful shock delivery (defibrillation)

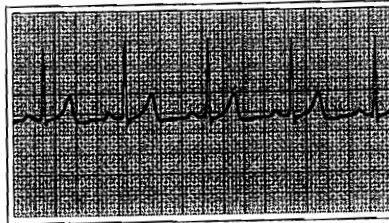
7.



Identify the rhythm with the single best answer. Clinical clues: heart rate 300/min

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
- Asystole
- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
- Torsades de pointes
- VF converted to organized rhythm after successful shock delivery (defibrillation)

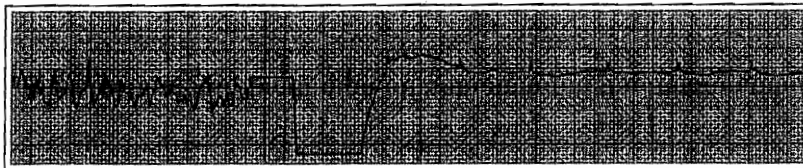
8.



Identify the rhythm with the single best answer. Clinical clues: age 8 years; heart rate 75/min

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
- Asystole
- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
- Torsades de pointes
- VF converted to organized rhythm after successful shock delivery (defibrillation)

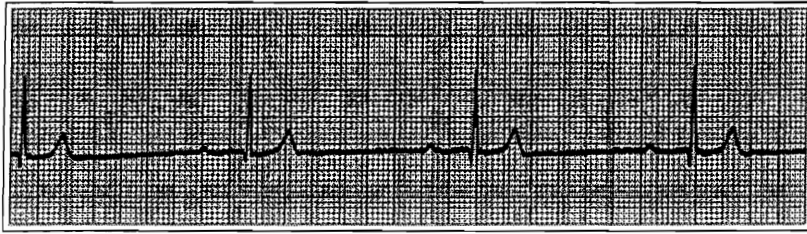
9.



Identify the rhythm with the single best answer. Clinical clues: initial rhythm associated with no detectable pulses

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
- Asystole
- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
- Torsades de pointes
- VF converted to organized rhythm after successful shock delivery (defibrillation)

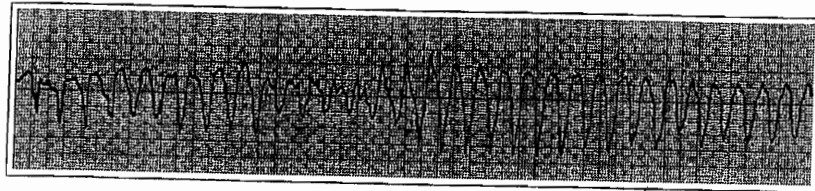
10.



Identify the rhythm with the single best answer. Clinical clues: age 9 months; heart rate 38/min

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
- Asystole
- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
- Torsades de pointes
- VF converted to organized rhythm after successful shock delivery (defibrillation)

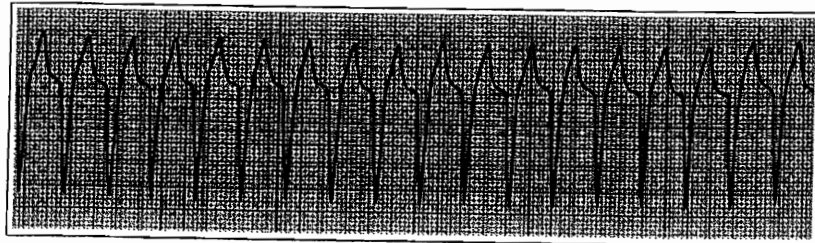
11.



Identify the rhythm with the single best answer. Clinical clues: heart rate 200/min; no detectable pulses

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
- Asystole
- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
- Torsades de pointes
- VF converted to organized rhythm after successful shock delivery (defibrillation)

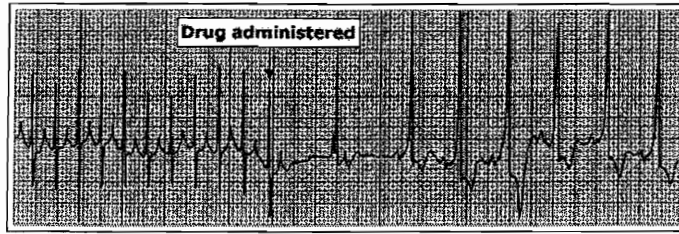
12.



Identify the rhythm with the single best answer. Clinical clues: heart rate 150/min

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
- Asystole
- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
- Torsades de pointes
- VF converted to organized rhythm after successful shock delivery (defibrillation)

13.



Identify the rhythm with the single best answer. Clinical clues: initial rhythm associated with heart rate 300/min

- Normal sinus rhythm
- Sinus tachycardia
- Sinus bradycardia
- Supraventricular tachycardia (SVT)
- Wide-complex tachycardia
- Ventricular fibrillation (VF)
- Asystole
- Pulseless electrical activity (PEA)
- SVT converting to sinus rhythm with adenosine administration
- Torsades de pointes
- VF converted to organized rhythm after successful shock delivery (defibrillation)



## PALS Written 2006 Precourse Self-Assessment

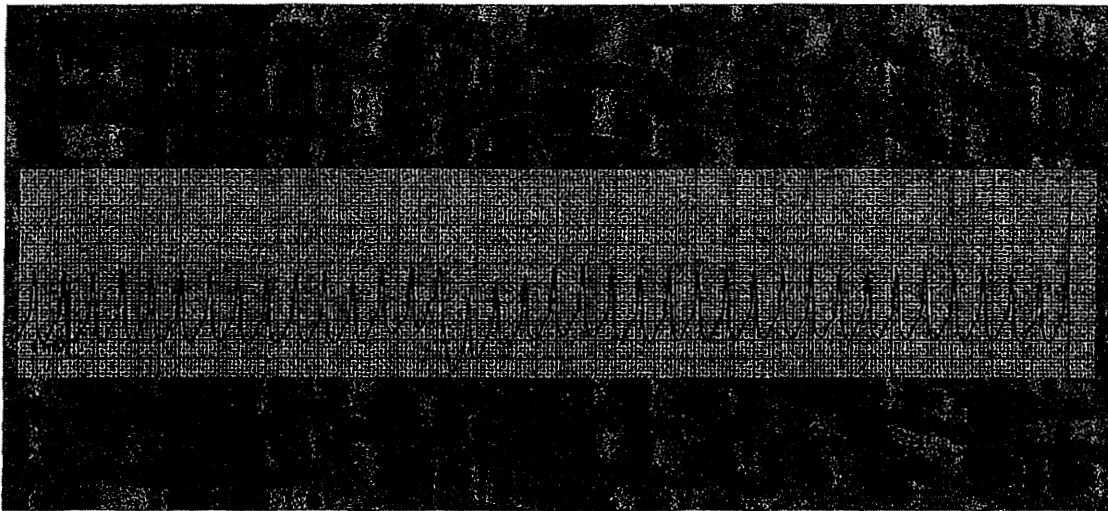
### ECG Rhythm Identification Answer Sheet

Pediatric Rhythms (core PALS rhythms A to H; non-core rhythms I to M):

- A. Normal sinus rhythm
- B. Sinus tachycardia
- C. Sinus bradycardia
- D. Supraventricular tachycardia (SVT)
- E. Wide-complex tachycardia; presumed ventricular tachycardia (monomorphic)
- F. Ventricular fibrillation (VF)
- G. Asystole
- H. Pulseless electrical activity (PEA)
  
- I. SVT converting to sinus rhythm with adenosine administration
- J. Wide-complex tachycardia (in a child with known aberrant intraventricular conduction; this is SVT with aberrant conduction)
- K. First-degree AV block
- L. Torsades de pointes (polymorphic ventricular tachycardia)
- M. VF converted to organized rhythm after successful shock delivery (defibrillation)

Rhythms 1 to 8: Core PALS Rhythms (select single best answer from rhythms A to H)

#### Rhythm 1 (clinical clue: heart rate 214/min)



**Correct answer is E:** Wide-complex tachycardia; presumed ventricular tachycardia (monomorphic)

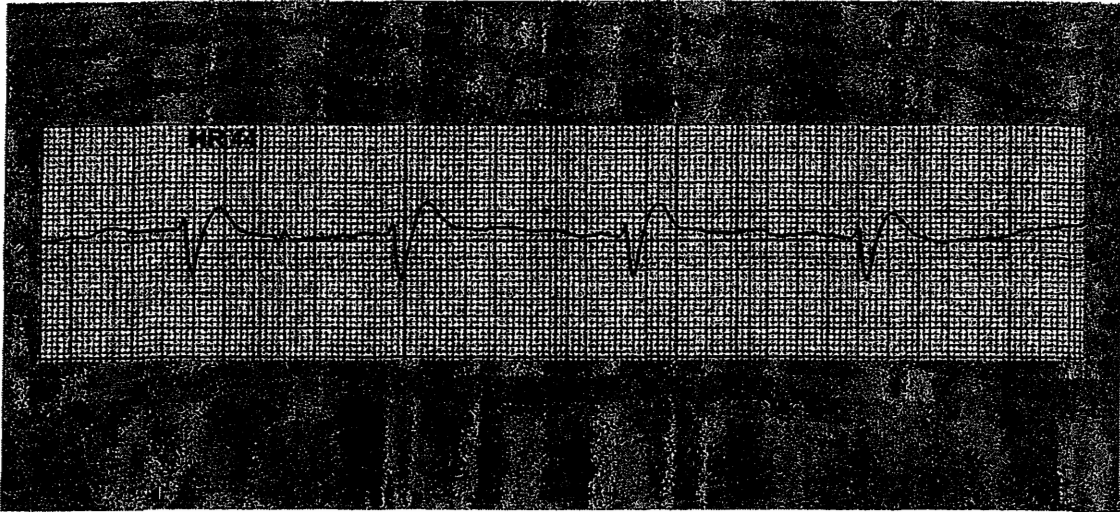
Pediatric ECG tip: Ventricular tachycardia is a sustained series of wide QRS complexes (ie, ventricular depolarizations) typically at a rate of at least 120/min. This VT can be further classified as monomorphic because all complexes have the same appearance. If

this rhythm is observed in a child with no history of aberrant intraventricular conduction and no aberrant conduction apparent on 12-lead ECG, the rhythm should be presumed to be ventricular tachycardia.

***For further information: see the PALS Provider Manual Chapter 6: Recognition and Management of Bradyarrhythmias and Tachyarrhythmias and Chapter 7: Recognition and Management of Cardiac Arrest.***

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**Rhythm 2 (clinical clues: heart rate 44/min; no detectable pulses)**



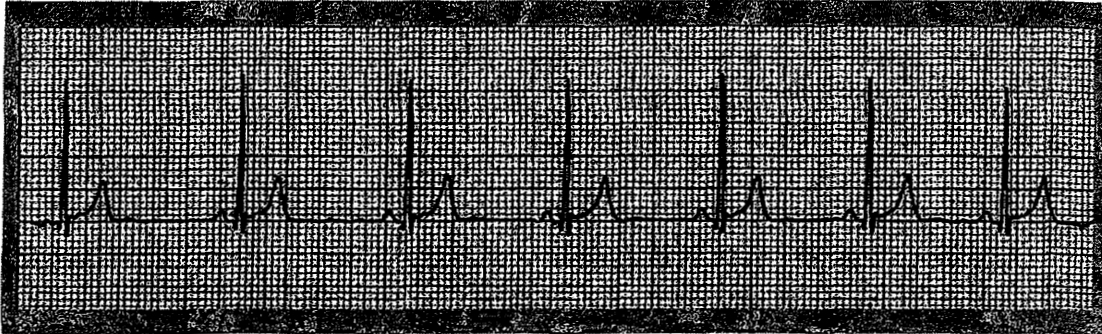
**Correct answer is H: Pulseless electrical activity (PEA)**

Pediatric ECG tip: In the absence of detectable pulses, this organized rhythm is one of the cardiac arrest rhythms—Pulseless electrical activity (PEA) (PEA). It is treated using the asystole/PEA portion of the PALS Pulseless Arrest algorithm. This particular rhythm may be described as an *idioventricular escape rhythm* (an escape rhythm originating from a slow ventricular pacemaker during periods of significant sinus bradycardia or high-grade AV block). It is characterized by wide QRS complexes, and it is often seen in the setting of a severely hypoxic-ischemic myocardium.

***For further information: see the PALS Provider Manual Chapter 6: Recognition and Management of Bradyarrhythmias and Tachyarrhythmias.***

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**Rhythm 3 (clinical clues: age 8 years; heart rate 50/min)**



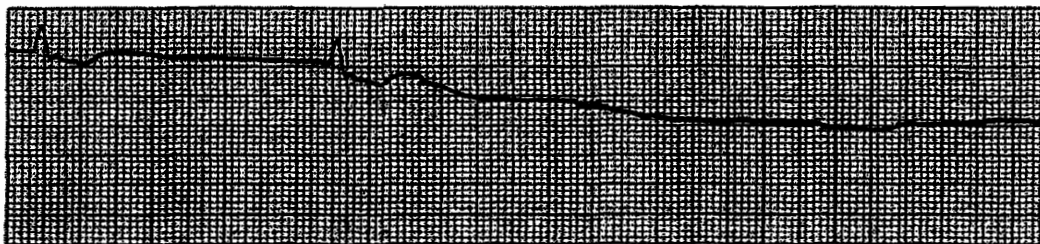
**Correct answer is C:** Sinus bradycardia.

Pediatric ECG tip: Sinus bradycardia is characterized by a sinus rhythm with a rate that is slower than normal for the patient's age. P waves and QRS complexes are usually normal in appearance; the QRS is narrow.

*For further information: see the PALS Provider Manual Chapter 6: Recognition and Management of Bradyarrhythmias and Tachyarrhythmias.*

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**Rhythm 4 (clinical clue: no detectable pulses)**



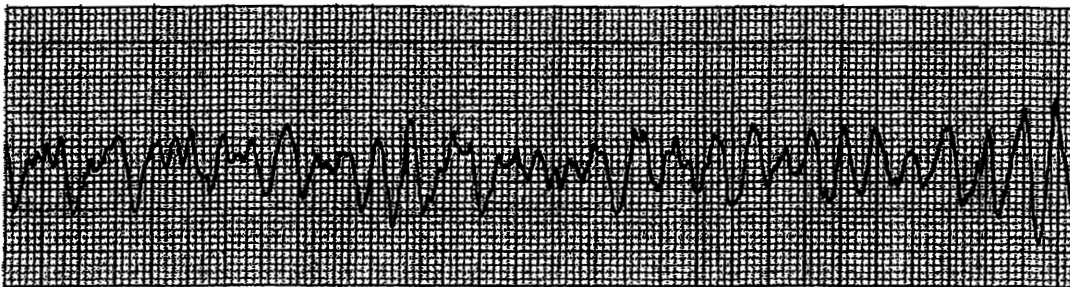
**Correct answer is G:** Asystole

Pediatric ECG tip: Asystole is the absence of ventricular depolarization (ie, cardiac standstill). It may be preceded by an agonal (usually wide-complex) bradyarrhythmia (see an example of this in Rhythm 2). When you observe this rhythm in a child who is unresponsive, apneic, and pulseless, you should begin compressions and ventilations (CPR) immediately. Of course, if you are uncertain whether the rhythm is asystole, confirm the flat-line rhythm in 2 perpendicular leads but do not delay CPR for an unresponsive, apneic child.

*For further information: see the PALS Provider Manual Chapter 7: Recognition and Management of Cardiac Arrest.*

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**Rhythm 5 (clinical clue: no consistent heart rate detected; no detectable pulses)**



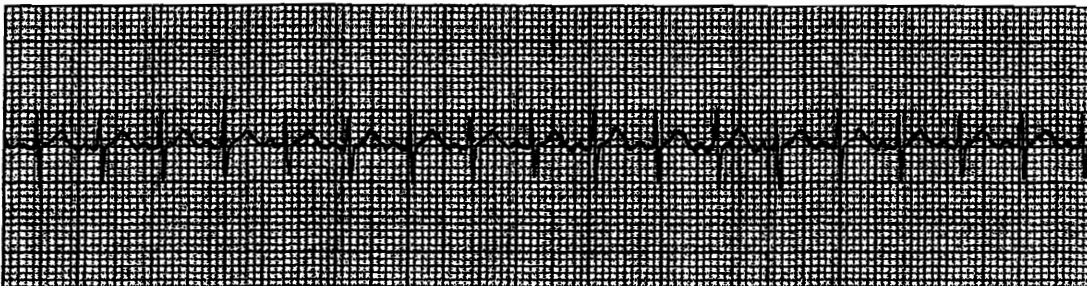
**Correct answer is F: Ventricular fibrillation**

Pediatric ECG tip: Ventricular fibrillation (VF) is characterized by a rapid, irregular waveform of varying size and configuration. VF begins as a coarse, irregular deflection and then deteriorates to a fine, irregular pattern. If no CPR and no shocks are provided, this rhythm will eventually progress to asystole.

*For further information: see the PALS Provider Manual Chapter 7: Recognition and Management of Cardiac Arrest.*

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**Rhythm 6 (clinical clues: age 3 years; heart rate 188/min)**



**Correct answer is B: Sinus tachycardia**

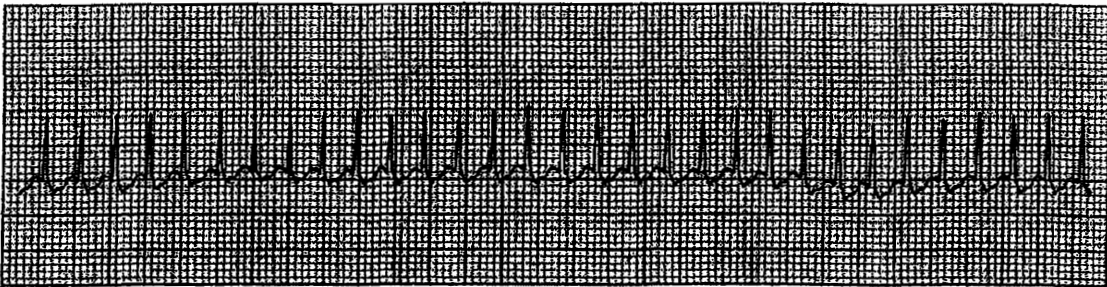
Pediatric ECG tip: Sinus tachycardia is characterized by a normal sequence of impulse

formation and conduction with a rate faster than normal for the patient's age. P waves precede each QRS complex; the QRS is typically narrow.

***For further information: see the PALS Provider Manual Chapter 6: Recognition and Management of Bradyarrhythmias and Tachyarrhythmias.***

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**Rhythm 7 (clinical clue: heart rate 300/min)**



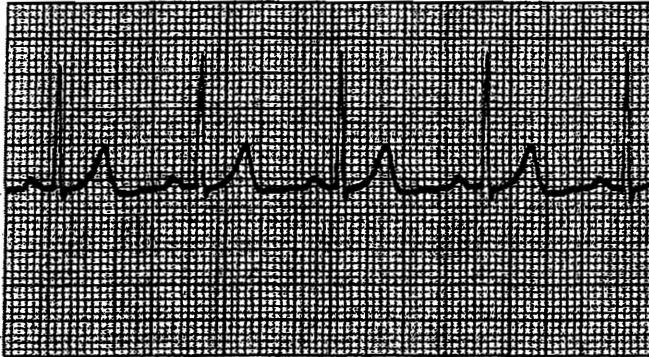
**Correct answer is D: Supraventricular tachycardia**

Pediatric ECG tip: Supraventricular tachycardia is characterized by the following: no beat-to-beat variability with activity or stimulation; heart rate typically >220/min in infants and >180/min in children; absent or abnormal P waves; and usually narrow QRS complexes. Wide-complex tachycardia with poor perfusion is probably ventricular in origin, but one pediatric case series and clinical experience note that it may be supraventricular with aberrant intraventricular conduction.

***For further information: see the PALS Provider Manual Chapter 6: Recognition and Management of Bradyarrhythmias and Tachyarrhythmias.***

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**Rhythm 8 (clinical clues: age 8 years; heart rate 75/min)**

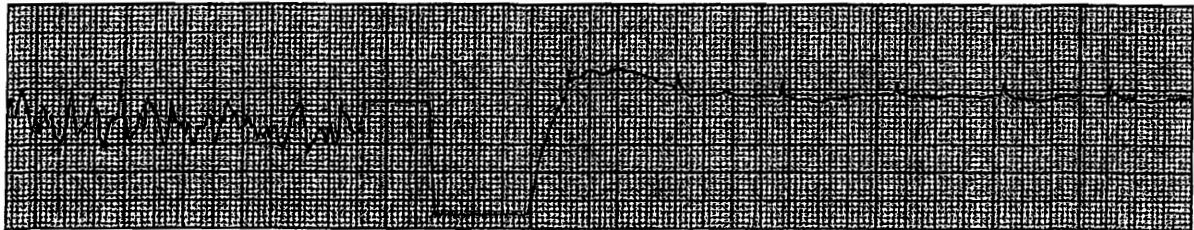


**Correct answer is A:** Normal sinus rhythm

Pediatric ECG tip: All rhythms originating in the sinoatrial (sinus) node are characterized by the following: P waves preceding each QRS complex; regular PR interval; all of the P waves are upright and have the same appearance. The QRS complexes are narrow in this strip. In normal sinus rhythm, the heart rhythm is regular, heart rate is normal for the patient's age, and the rate changes with activity.

**Rhythms 9 to 13: Non-core Rhythms**

**Rhythm 9 (clinical clue: initial rhythm associated with no detectable pulses)**

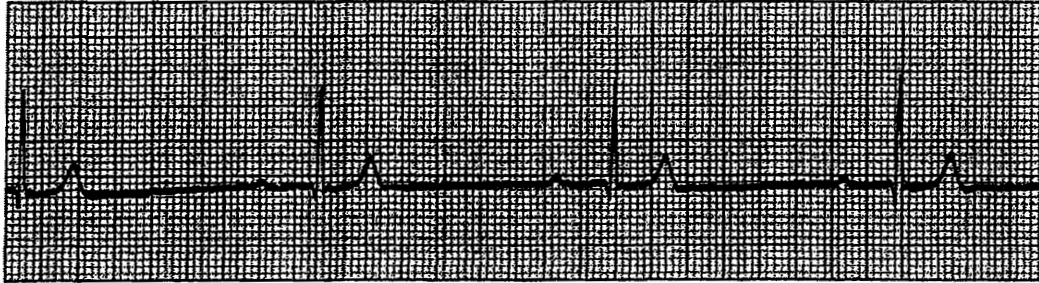


**Correct answer is M:** Ventricular fibrillation converted to organized rhythm after successful shock delivery (defibrillation)

Pediatric ECG tip: The probability of successful defibrillation is greater the higher the amplitude of the VF waveform (ie, when the VF waveform is "coarse"). The probability of successful defibrillation decreases as the amplitude of the VF waveform decreases (ie, the VF waveform becomes more "fine"). Fine VF is consistent with an ischemic myocardium that has exhausted its oxygen supply and energy substrates.

**For further information: see PALS Provider Manual Chapter 7: Recognition and Management of Cardiac Arrest**

**Rhythm 10 (clinical clues: age 9 months; heart rate 38/min)**



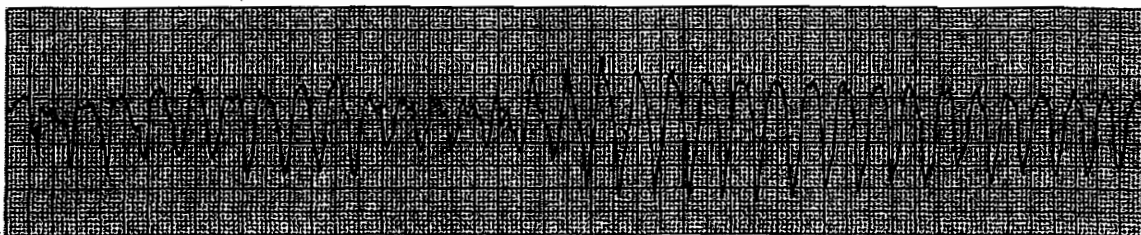
**Correct answer is C and K:** Sinus bradycardia with first-degree AV block

Pediatric ECG tip: There is an atrial depolarization (P wave) before each QRS complex, but the rate is less than 60/min, so this defines sinus bradycardia in an infant or child. First-degree AV block represents a delay in conduction through the AV node. The PR interval is prolonged beyond the upper limit of normal for the patient's age and heart rate. In this strip the QRS complexes are narrow. Every P wave is followed by a QRS complex, so the heart block is first degree. (Note that this example of first-degree AV block is associated with sinus bradycardia. In the clinical setting children may have one or more rhythm disturbances at the same time.)

**For further information: see the PALS Provider Manual Chapter 6: Recognition and Management of Bradyarrhythmias and Tachyarrhythmias.**

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**Rhythm 11 (clinical clues: heart rate 200/min; no detectable pulses)**



**Correct answer is L:** Torsades de pointes (polymorphic ventricular tachycardia)

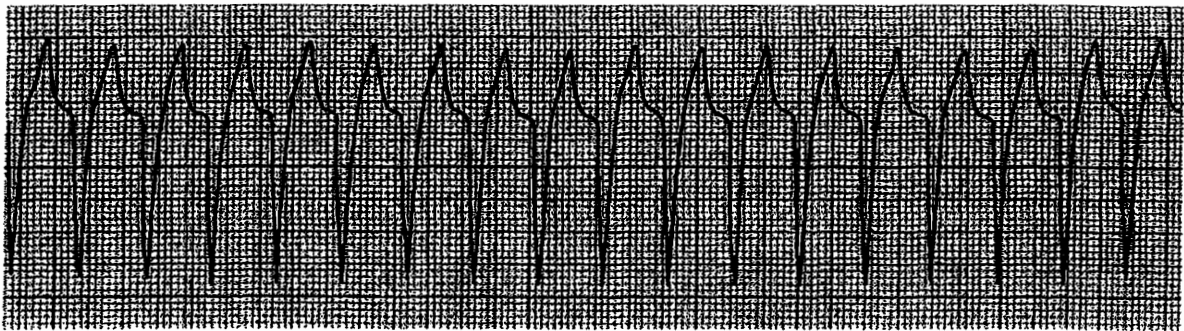
Pediatric ECG tip: Torsades de pointes ("twisting of the points") is a distinctive form of polymorphic VT. It is characterized by QRS complexes that change in amplitude and polarity in a cyclic pattern so that they appear to rotate around an isoelectric line. The ventricular rate can range from 150 to 250/min. Characteristically when the patient was in sinus rhythm, torsades de pointes is associated with a markedly prolonged QT interval. (This QT interval cannot be measured during the tachycardia.) Even if the patient with torsades has pulses

initially, the patient will quickly become pulseless. Any pulseless VT is a cardiac arrest rhythm, and it is treated with CPR and attempted defibrillation. Torsades is also treated with IV magnesium according to the VF/pulseless VT portion of the PALS Pulseless Arrest Algorithm.

***For further information: see the PALS Provider Manual Chapter 6: Recognition and Management of Bradyarrhythmias and Tachyarrhythmias and Chapter 7: Recognition and Management of Cardiac Arrest.***

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**Rhythm 12 (clinical clue: heart rate 150/min)**



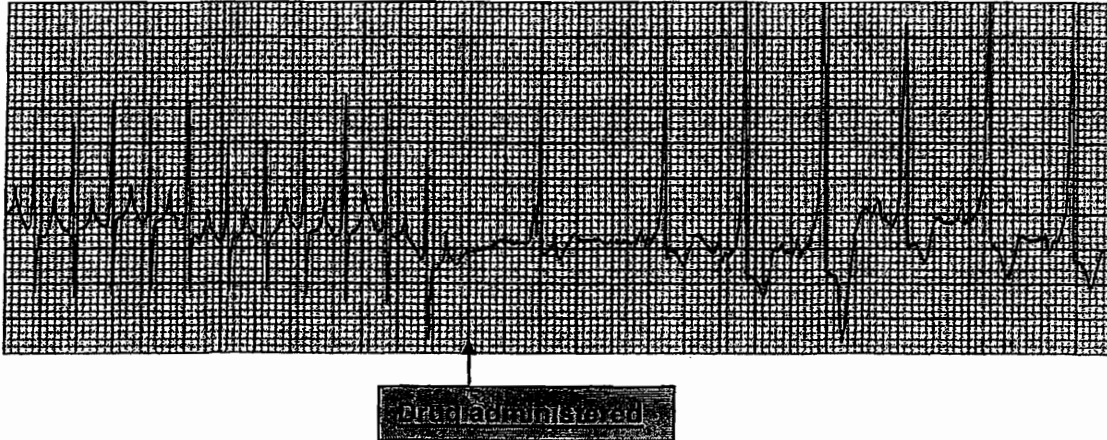
**Correct answer is J:** Wide-complex tachycardia (in child with known aberrant intraventricular conduction, this is SVT with aberrant conduction)

Pediatric ECG tip: The wide QRS complex seen in this strip is supraventricular tachycardia with aberrant intraventricular conduction, which may be due to abnormal bundle branch conduction (eg, preexisting bundle branch block or rate-related malfunction) or abnormal accessory pathway AV conduction (eg, as encountered in preexcitation syndromes such as that described by Wolff, Parkinson, and White). Without a 12-lead ECG or a history of known aberrant conduction, it is impossible to distinguish this rhythm from ventricular tachycardia. For this reason the provider should assume that a wide-complex tachycardia is VT unless the child is known to have aberrant conduction. Treatment is dictated by the child's clinical condition (poor perfusion versus adequate perfusion).

***For further information: see the PALS Provider Manual Chapter 6: Recognition and Management of Bradyarrhythmias and Tachyarrhythmias.***

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**Rhythm 13 (clinical clue: initial rhythm associated with heart rate 300/min)**



**Correct answer is I:** Supraventricular tachycardia converting to sinus rhythm with adenosine administration

Pediatric ECG tip: Supraventricular tachycardia is present at the beginning of this strip. SVT that involves the AV node is terminated when transient AV block is produced by adenosine. Adenosine causes transient sinus arrest or bradycardia following bolus administration, resulting in a sinus pause lasting several seconds. The subsequent rhythm has a sinus origin, but the QRS is prolonged with ST-segment depression and T-wave inversion. This rhythm disturbance may be seen with ischemic myocardium or in the setting of myocarditis or myocardial injury following heart surgery.

**For further information: see the PALS Provider Manual Chapter 6: Recognition and Management of Bradyarrhythmias and Tachyarrhythmias.**

