This is an ECG from a 9 year old seen in the Emergency Department with a history of loss of consciousness with apparent seizures (new onset).

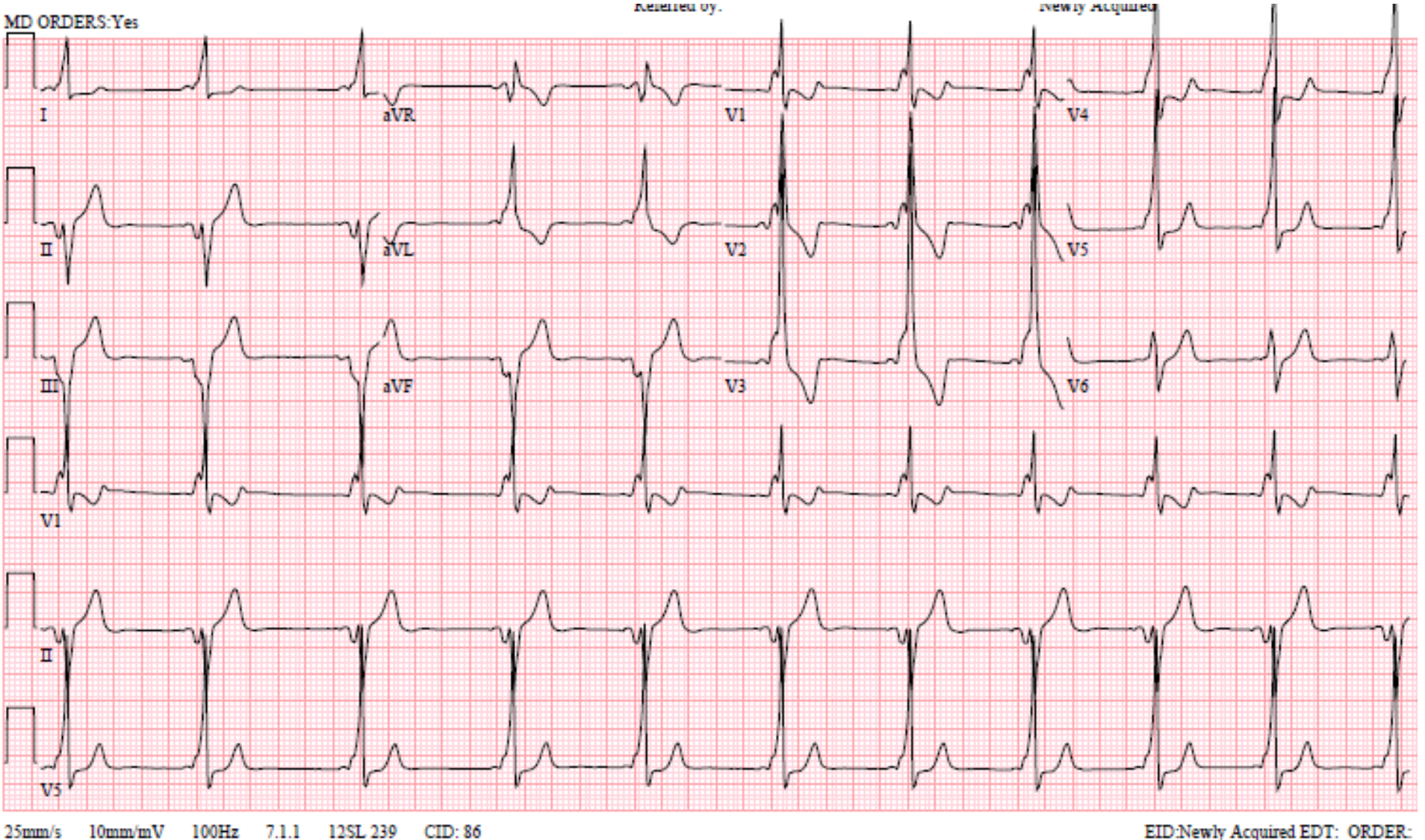
1) What is the rhythm? Is there anything unusual about it (think intervals)? (1 point)

2) What diagnosis does this ECG reveal? (1 point)

3) Is the ECG diagnosis potentially related to the patient's presenting symptoms? If so, what is the mechanism of LOC/seizures? (1 point)

4) Presuming the patient's symptoms are related to the ECG diagnosis, which of the following is the most appropriate therapy (1 point):

a) Immediate synchronized cardioversion with 0.5-1J/kg; b) Immediate administration of IV adenosine through a large bore IV; c) Administration of oral beta blockers; d) Referral for electrophysiology study and ablation therapy; e) Waiting and watching?



1) What is the rhythm? Is there anything unusual about it (think intervals)? (1 point) The rhythm is sinus, but the PR interval is very short. The QRS seems to arise directly from the P wave. A short PR interval should make you think of a particular diagnosis…

2) What diagnosis does this ECG reveal? (1 point)
This ECG shows Wolff Parkinson White syndrome. The classic findings are a short PR interval and a delta wave. This combination of findings is also known as "preexcitation." It occurs as the electrical signal from the depolarizing atria crosses over to the ventricles via an "accessory pathway," which is an extra piece of conduction tissue that allows electricity to flow from atria to ventricles or vice versa. The electrical signal through the accessory pathway is not typically slowed-down the way it typically is when it travels through the AV node. As a result, the ventricles begin to depolarize, but not via the rapid His-Purkinje system. Instead, they begin to depolarize from myocyte to myocyte, which stretches the QRS out and would ultimately look like a ventricular premature beat. However, the electrical signal from the AV node then travels down the His-Purkinje system and depolarizes the remainder of the ventricular tissue in the typical way, resulting in the latter part of the QRS complex looking quite normal. The delta wave represents the disorganized ventricular depolarization that happens in the early part of the QRS.

3) Is the ECG diagnosis potentially related to the patient's presenting symptoms? If so, what is the mechanism of LOC/seizures? (1 point)
The worrisome mechanism for LOC in this patient is the development of atrial fibrillation with rapid conduction down the accessory pathway, resulting in ventricular fibrillation. Afib occurs more frequently in WPW patients for reasons we don't understand. If the accessory pathway conducts rapidly, this can be a very dangerous situation. Many studies have been done on this and the risk of sudden death in a person with WPW is somewhere between 0 and 0.6% per patient per year. We know it's higher than 0% and is probably a bit lower than 0.6%, but those are the extremes based on the medical literature.
Supraventricular tachycardia in WPW usually does not result in syncope/seizures.

4) Presuming the patient's symptoms are related to the ECG diagnosis, which of the following is the most appropriate therapy (1 point):
d) Referral for electrophysiology study and ablation therapy
As the patient isn't in a reentrant tachycardia at the time of the ECG, there's no need to cardiovert them. Beta blockers probably do not decrease the risk of sudden death in this patient. Knowledge of a possible aborted sudden death episode in a patient with WPW warrants an ablation procedure. Many people will opt to treat asymptomatic WPW patients with ablation because of the risk of sudden death.