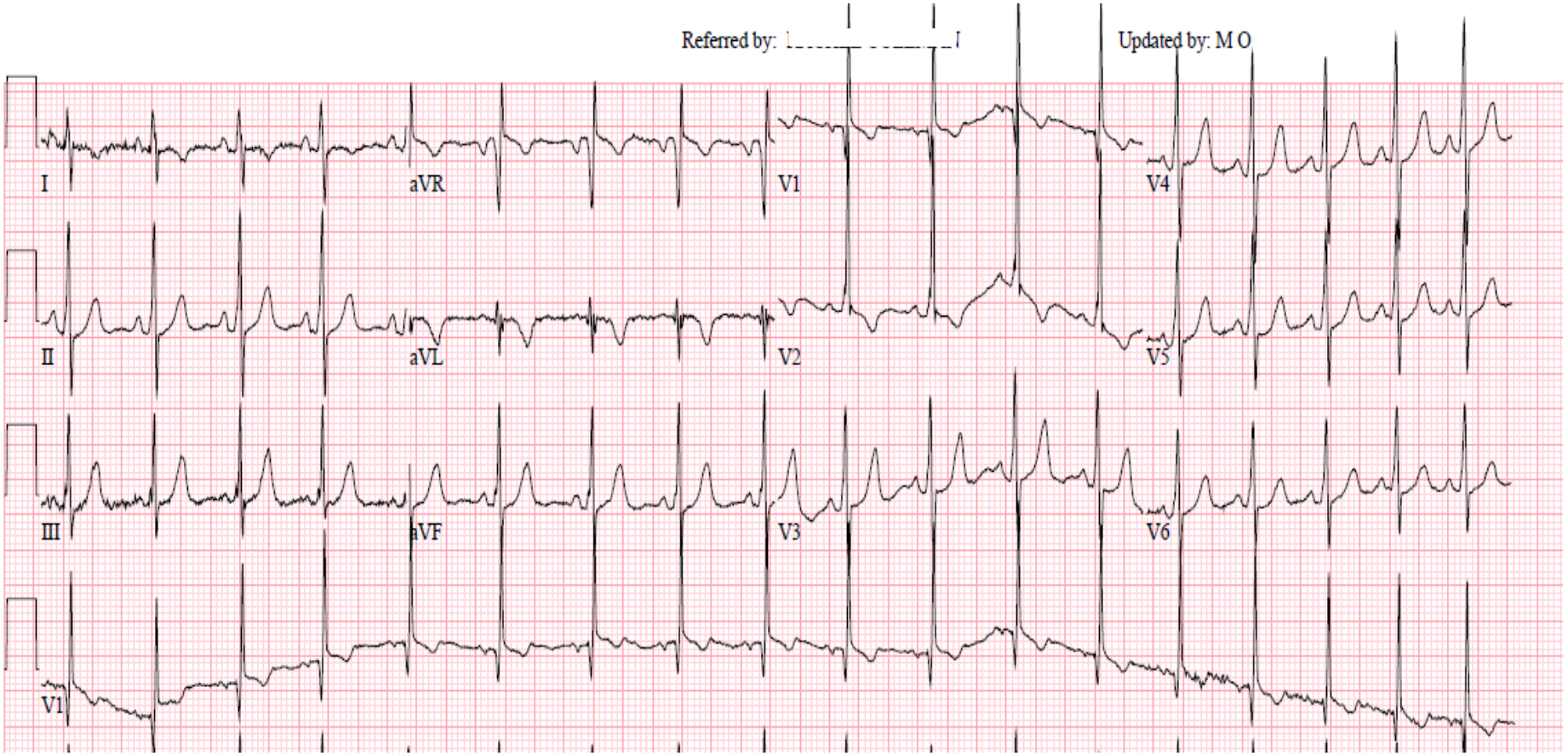
You are seeing a 2 week old child in the emergency department with poor feeding and mild respiratory distress. You obtain an oxygen saturation, which is low at 84%. No murmur is present. You obtain the following EKG.

1) Please review the criteria for RVH and LVH. Are either of these present?
2) Name at least 2 cyanotic defects that present with no murmur and this kind of EKG.
3) Would you begin PGE1 infusion in the ED immediately?



RVH and LVH criteria

Table 2
ECG criteria for ventricular and atrial hypertrophy

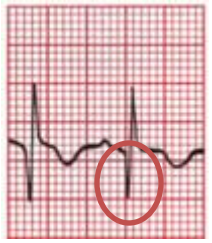
Right ventricular hypertrophy
R wave greater than the 98th percentile in lead V1 (see Table 1)[a]
S wave greater than the 98th percentile in lead I or V6 (see Table 1)
RSR′ pattern in lead V1, with the R′ height being greater than 15 mm in infants younger than 1 year of age or greater than 10 mm in children older than 1 year of age
Q wave in lead V1
Left ventricular hypertrophy
R-wave amplitude greater than 98th percentile in lead V5 or V6 (see Table 1)
R wave less than 5th percentile in lead V1 or V2 (see Table 1)
S-wave amplitude greater than 98th percentile in lead V1 (see Table 1)
Q wave greater than 4 mm in lead V5 or V6
Inverted T wave in lead V6
Right atrial enlargement
Peaked P wave in leads II and V1 that is higher than 3 mm in infants younger than 6 months of age and greater than 2.5 mm in infants older than 6 months of age
Left atrial enlargement
P-wave duration greater than 0.08 seconds in a child younger than 12 months of age or greater than 10 ms in children 1 year and older
P wave minimal or plateau contour
Terminal or deeply inverted P wave in lead V1 or V3R

The presence of any of these is suspicious for hypertrophy. It is not necessary for all of the criteria to be met.

[a] qR wave pattern in V1 may be seen in 10% of normal newborns.

1) Please review the criteria for RVH and LVH. Are either of these present?

This EKG shows RVH, based on the deep Q waves (see the red circle, which shows a Q wave on a sample EKG) and very tall R waves in lead V1 and V2, which indicate elevated right sided forces.



Other criteria for RVH include upright T waves in a baby (not present here) and prominent right axis deviation (often non-specific in babies, not present here).

2) Name at least 2 cyanotic defects that present with no murmur and this kind of EKG.

The absent murmur and cyanosis suggest possible atresia (not stenosis, which would be noisy) of a major outflow tract. In addition, the presence of RVH implies that the RV is NOT hypoplastic and also probably under a lot of strain/pressure. Thus, one would need to consider severe coarctation of the aorta (with blood backing up and causing RV strain), hypoplastic left heart syndrome, and also tetralogy of Fallot with pulmonary atresia

The other possibility would be total anomalous pulmonary venous connection with obstruction at the IVC or SVC junction, with also causes RVH and no murmur.

3) Would you begin PGE1 infusion in the ED immediately?

Tough call. However, it's unlikely the child has TAPVC (which could worsen with PGE1), so it's probably a good call to start it if definitive diagnosis will take a long time (e.g. if you are at an outside hospital or remote from cardiac care). In any event, this child requires rapid transport to a tertiary care center.

BONUS NOTE:
We now screen all babies for cyanotic heart defects in the Memorial nursery, by checking their pulse ox prior to discharge! Please review the protocols there if you happen to rotate there!