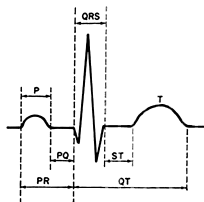


## PAEDIATRIC ELECTROCARDIOGRAPHY

Age related changes in the anatomy and physiology of infants and children produce normal ranges for electrocardiographic features that differ from adults and vary with age. Awareness of these differences is the key to correct interpretation of paediatric ECG.

Figure 1. The ECG cycle



ECG should be interpreted systematically

- Heart rate
- Rhythm
- P wave axis, amplitude, duration
- PR interval
- QRS axis, amplitude, duration
- ST segment and T waves
- QT interval and QTc  
(QTc = measured QT interval / square root of R-R interval)

Table 1. normal values for ECG in children

Age	Heart Rate (bpm)	
	Mean	Range
< 1 day	119	94 – 145
1 – 7 days	133	100 – 175
3 – 30 days	163	115 – 190
1 – 3 months	154	124 – 190
3 – 6 months	140	111 – 179
6 – 12 months	140	112 – 177
1 – 3 years	126	98 – 163
3 – 5 years	98	65 – 132
5 – 8 years	96	70 – 115
8 – 12 years	79	55 – 107
12 – 16 years	75	55 – 102

Table 2. Normal values in the paediatric ECG

Age	PR interval (ms)	QRS duration (ms)	R wave (S wave) amplitude (mm)	
			Lead V1	Lead V6
Birth	80 – 160	< 75	5 – 26 (1 – 23)	0 – 12 (0 – 10)
6 months	70 – 150	< 75	3 – 20 (1 – 17)	6 – 22 (0 – 10)
1 year	70 – 150	< 75	2 – 20 (1 – 20)	6 – 23 (0 – 7)
5 years	80 – 160	< 80	1 – 16 (2 – 22)	8 – 25 (0 – 5)
10 years	90 – 170	< 85	1 – 12 (3 – 25)	9 – 26 (0 – 4)

Table 3. QRS axis and QRS progression

Age group	ECG Characteristics
Premature infants (< 35 weeks gestation)	Left & posterior QRS axis Relative LV dominant; smaller R in V1, taller R in V6
Full term infant	Right axis deviation (30° to 180°) RV dominant Tall R in V1, Deep S in V6, R/S ratio > 1 in V1 T wave in V1 may be upright for 48 hours
1 to 6 months	Less right axis deviation (10° to 120°) RV remains dominant Negative T waves across right praecordial leads
6 months to 3 years	QRS axis < 90° R wave dominant in V6 R/S ratio ≤ 1 in V1
3 to 8 years	Adult QRS progression in praecordial leads LV dominant, Dominant S in V1, R in V6 Q wave in V5-6 (amplitude < 5 mm)

### Important normal variants

- T wave inversion of right praecordial leads (V1 – V3): normal findings from day 2 of life until late teens. An upright T wave in V1 before 8 years old is indicative of RVH
- Q wave may be present in leads I, aVL, V5 and V6 provided amplitude < 5 mm
- RSR' pattern of right praecordial leads: normal in some children provided QRS duration < 10 msec and R' amplitude < 15 mm (infants) or 10 mm (children)
- elevated J point: normal in some adolescents

### Criteria for Right Ventricular Hypertrophy

- R > 20 mm in V1 at all ages
- S > 14 mm (0 to 7 days); > 10mm (1 week - 6 mths); > 7mm (6 mths - 1 year); > 5mm (> 1 year) in V6
- R/S ratio > 6.5 (0 - 3 mths); 4.0 (3 - 6 mths); 2.4 (6 mths - 3 years); 1.6 (3 to 5 years); 0.8 (6 to 15 years) in V1
- T wave upright in V4R or V1 after 72 hrs of life
- presence of Q wave in V1

### Criteria for Left Ventricular Hypertrophy

- S > 20 mm in V1
- R > 20mm in V6
- S (V1) + R (V6) > 40mm over 1 year of age; > 30mm if < 1year
- Q wave > 4 mm in V5-6
- T wave inversion in V5-6