A systematic approach for ECG analysis

5 steps to read a rhythm strip:

1: Measure the HR
   60 to 100? - Normal
   Below 60? - Bradycardia
   Above 100? - Tachycardia

2: Is it regular or irregular?

3: Identify the waves (P-QRS-T)
   - Is there a P wave before every QRS complex?
   - Is there a QRS wave after every P wave?
   - Is there a T wave after every QRS complex?
   - Any waves dropped?
   - Shape and sizes?

4: Measure the P-R interval (0.12 to 0.20msec)
   - Duration less than 5 - small squares
   - Is it prolonged?
   - Shortened?
   - Does it vary?

5 Measure the QRS duration (0.10 msec)
   Duration less than 3 - small squares?

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10 steps to read a 12 lead ECG strip:

1: All waves are negative in lead aVR - This means the leads are on the right way round

2: All ST start isoelectric except in VI & V2 - where it may be elevated (not > 1mm) The normal ST then curves gently in the direction of the f wave and should not remain exactly horizontal (sometimes called plane depression which can indicate ischaemia).

3: The PR interval should between 0.12 to 0.20msec (less than 5 - small squares) - A longer PR implies AV block, a shorter PR may indicate a vulnerable to supraventricular condition.

4: The QRS complex should not exceed 0.10 msec (3 small squares) - A wider QRS is sometimes seen in healthy people but may represent an abnormality of intraventricular condition.

5: The QRS and T waves tend to have the same general direction in standard leads (I, II, III, aVR, aVL, aVF) For example if the QRS in a aVL is dominantly positive than the T wave in that lead should also be positive, slightly disparities are likely to be normal.

6: The R wave in the precordial leads grows from VI to V4

7: The QRS is mainly upright in I & aVF - otherwise there is axis deviation,

8: The P wave is upright in III & V2 to V6 - By implication they may be flat or negative in other leads.

9: There is no Q wave or only a q < 0.04 (1 small square) in width in I, II & V2 to V6 - A narrow q is expected in V6 and represents the early septal activation,

10: The T wave is upright in III & V2 to V6 -The end of the T wave should not dip below the baseline - this is sometimes seen in unstable ischaemia.

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T wave morphology

- Normal
- Biphasic
- Bifid/notched
- Broad/slow
- Flat

Nonspecific ST-T wave abnormalities

- Hyperkalemia
- Repolarization variant
- Ischemia
- Strain
- Prolonged QT interval

**Complete LBBB**

- **Diagnostic Criteria**
  - QRS duration >120 msec (adults), >100 msec (4-16 years old), >90 msec (<4 years old)
  - Wide notched R waves in leads that face the LV free wall (V5-V6, I, and aVL)
  - Absent Q waves in I, V5-V6 (there may be a small q wave in aVL)
  - R wave peak time >60 msec in leads V5-V6
  - Secondary ST-T wave abnormalities (opposite direction to the mean QRS complex)
    - Note: Positive concordance (positive T waves in leads with upright QRS complexes) may be normal but negative concordance is never normal
  - Wide S waves in the right precordial leads (V1) - Large rS (57%) or QS (33%)
  - QRS axis may be leftward, rightward, superior, or normal

<table>
<thead>
<tr>
<th>Lead I</th>
<th>Lead aVF</th>
<th>Result</th>
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<tbody>
<tr>
<td>left</td>
<td>right</td>
<td>Normal axis</td>
</tr>
<tr>
<td>right</td>
<td>left</td>
<td>Left axis deviation</td>
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<tr>
<td>left</td>
<td>right</td>
<td>Right axis deviation</td>
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<tr>
<td>right</td>
<td>left</td>
<td>Extreme right axis deviation</td>
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