Blocks
## SA Node Block

### Junctional Rhythm

<table>
<thead>
<tr>
<th>Heart Rate</th>
<th>Rhythm</th>
<th>P Wave</th>
<th>PR interval (in seconds)</th>
<th>QRS (in seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-60 bpm</td>
<td>Regular</td>
<td>Inverted, absent or after QRS</td>
<td>&lt;.12</td>
<td>&lt;.12</td>
</tr>
</tbody>
</table>
Conduction Block

- If there is sometimes no QRS following P waves, indicate second degree block (regularly irregular)

- If the PR interval lengthens and then the QRS fails, indicate 2° Wenkebach type block.

- If the PR interval stays the same and then the QRS fails, indicate 2° Mobitz II type block
Heart blocks - First Degree AV block

- PR interval > 0.2 seconds
- Treatment rarely required
- Caution when introducing / titrating beta blocker and other rate reducing agents
  - Regular ECG’s to monitor !!
Second Degree AV block

- Mobitz type I – Wenckebach
- Progressive lengthening of P-R interval
  - Most patients are asymptomatic
  - May experience dizziness or syncope
  - May have chest pain if myocarditis or ischemic
  - May have history of structural heart disease.
Number 1 - Mobitz type I

Lead V₁

"Classic Wenckebach"
Complete Heart Block

Third Degree – Complete AV block

- Complete dissociation between P’s and QRS’s
  - Often bradycardic!!
- Will require pacing
With Bundle Branch Blocks you will see two changes on the ECG.

1. QRS complex widens (> 0.12 sec).
2. QRS morphology changes (varies depending on ECG lead, and if it is a right vs. left bundle branch block).
Left Bundle Branch Block

QRS duration greater than 0.12 second:
Major QRS deflection (duration) upward in
lead I and L. chest leads, downward in R. chest
leads; P and P-R interval normal.
# Left Bundle Branch Block

<table>
<thead>
<tr>
<th>P Wave</th>
<th>PR Interval (in seconds)</th>
<th>QRS (in seconds)</th>
<th>Characteristics</th>
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</thead>
<tbody>
<tr>
<td>Before each QRS, identical</td>
<td>.12 to .20</td>
<td>$\geq .12$</td>
<td>RR' in V5</td>
</tr>
</tbody>
</table>
Left Bundle Branch Block

ECG Trace:
Right Bundle Branch Block

Complete Right Bundle-Branch Block

QRS duration greater than 0.12 second:
Major QRS deflection (duration) downward in Lead I and L. chest leads, upward in R. chest leads; P and P-R interval normal.
Right Bundle Branch Blocks

What QRS morphology is characteristic?

For RBBB the wide QRS complex assumes a unique, virtually diagnostic shape in those leads overlying the right ventricle ($V_1$ and $V_2$).

“Rabbit Ears”
### Right Bundle Branch Block

<table>
<thead>
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<th>P Wave</th>
<th>PR Interval (in seconds)</th>
<th>QRS (in seconds)</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before each QRS, identical</td>
<td>.12 to .20</td>
<td>&gt;.12</td>
<td>RSR' in V1</td>
</tr>
</tbody>
</table>
Hypertrophy
Right Atrial Enlargement

To diagnose RAE you can use the following criteria:

- II $P > 2.5$ mm, or
- V1 or V2 $P > 1.5$ mm

A cause of RAE is RVH from pulmonary hypertension, hence P Pulmonale.
Right Atrial Enlargement

The P waves are tall, especially in leads II, III and avF.
Left Atrial Enlargement

P Mitrale, Duration ≥ 120 ms
Left Atrial Enlargement

- To diagnose LAE you can use the following criteria:
  - II  > 0.04 s (1 box) between notched peaks, or
  - V1  Neg. deflection > 1 box wide x 1 box deep

A common cause of LAE has been Mitral Stenosis.
The P waves in lead II are notched and in lead V1 they have a deep and wide negative component.
Right Ventricular Hypertrophy

- Septal Depolarization
- Apical Depolarization
- Ventricular Depolarization
- Terminal Depolarization

QRS

Tall R in V1 and V2; Deep S in V5, V6, and Lead I
Right Ventricular Hypertrophy

- Compare the R waves in V1, V2 from a normal ECG and one from a person with RVH.
- Notice the R wave is normally small in V1, V2 because the right ventricle does not have a lot of muscle mass.
- But in the hypertrophied right ventricle the R wave is tall in V1, V2.
Left Ventricular Hypertrophy

Why is left ventricular hypertrophy characterized by tall QRS complexes?

As the heart muscle wall thickens there is an increase in electrical forces moving through the myocardium resulting in increased QRS voltage.
Left Ventricular Hypertrophy
**Left Ventricular Hypertrophy**

*Compare these two 12-lead ECGs. What stands out as different with the second one?*

![Normal ECG](image1)

![Left Ventricular Hypertrophy ECG](image2)

**Answer:** The QRS complexes are very tall (increased voltage)
LVH
Figure 14.8 Twelve-lead ECG recording for severe left ventricular hypertrophy, particularly noticeable in leads III and aVL. (Rushmer, 1976, Fig. 8-24, p. 331, originally from Guneroth, 1965.)