Interpretation of Normal EKGs

The first step in gaining skill in EKG interpretation is to recognize what is “normal”. Review the steps and associated questions before moving on to an analysis of a few normal EKG tracings.

Remember that “normal” can vary significantly. Not all tracings considered normal will look exactly alike.

- Basics
  - Does the patient’s name and DOB match the information on the EKG?
  - What is the patient’s age and sex?
  - Does the EKG have good technical quality—lead placement, skin prep, calibration, no artifacts?
  - How does the EKG compare to any prior EKGs from this patient?

- Rhythm
  - Is the rhythm regular or irregular?
  - Can you see atrial activity?
  - Is there a P-QRS relationship?

- Rate
  - Calculate the heart rate using sequencing or 6-second strip method.
  - Is the rate normal, 60–100 bpm?
  - Is the rate bradycardic, < 60 bpm?
  - Is the rate tachycardic, > 100 bpm?

- P-wave
  - Is the P-wave upright in lead II?
  - Is the P-wave negative in lead V1?

- PR, QRS, QT Intervals
  - Is the PR interval 0.12–0.20 seconds? If not, is it prolonged or shortened?
  - Is the QRS complex ≤ 0.10 seconds, or is it wider?
  - Is the corrected QT interval normal?

- QRS, ST-T Changes
  - Is a Q-wave present?
  - Is the Q-wave normal (< 0.04 seconds wide and < 1/3 the height of the QRS complex)?
  - If abnormal (pathologic) Q-waves are present, in which anatomic distribution?
  - Is the QRS complex amplitude normal or increased?
  - Do you see evidence of left ventricular hypertrophy?
  - Is the ST segment elevated, depressed, or isoelectric? Does the ST segment indicate ischemia or injury?
  - Is the T-wave upright or inverted?

- Abnormal Patterns
  - Do you see any evidence of arrhythmias?
  - Do you see any evidence of ischemia or myocardial infarction?
  - Do you see any evidence of conduction disturbances?
This image is a normal EKG tracing. Apply each step by asking the questions and calculating the intervals, then compare your interpretation to the table.

### Basics
This image does not include data about the patient, so there is nothing to verify in that respect. The image does not show any evidence of technical issues such as lead placement, skin prep, calibration, or artifacts.

### Rhythm
The rhythm is consistent and regular. P-waves are visible. Every P-wave is followed by a QRS complex and every QRS complex is preceded by a P-wave.

### Rate
The heart rate is approximately 90 bpm, which is within the normal range.

### P-wave
Upright P-waves are visible in lead II and the P-wave is biphasic in V1. (This suggests right atrial enlargement, which is beyond the scope of this course.) The P-wave is always upright in lead II, suggesting normal SA activation and proper lead placement.

### Intervals
The PR interval is 0.16 seconds and is normal. The QRS complex is 0.12 seconds and is normal, as is the QT interval. To correctly measure the QTc interval, a chart that compares heart rate with QT interval is needed; otherwise, utilize the machine’s calculations.

### Changes
Q-waves are present, have a width < 0.04 seconds, and are visibly less than 1/3 the height of the QRS complex. There is a deep Q-wave in lead III. While this Q-wave is not particularly wide, it may represent a prior inferior infarct. QRS amplitude is normal, and no evidence of left ventricular hypertrophy exists. The ST segment is isoelectric and the T-wave is upright.

### Patterns
No abnormal patterns of arrhythmia, ischemia, acute myocardial infarction, or conduction disturbances appear.

### Interpretation
NSR, with possible old inferior wall MI
Here is another normal EKG to analyze. Use the steps in the system, then compare your analysis to the table.

**Basics**
This image also does not include data about the patient, so there is nothing to verify in that respect. The image shows no evidence of technical issues such as lead placement, skin prep, calibration, or artifacts.

**Rhythm**
The rhythm is consistent and regular. P-waves are visible. Every P-wave is followed by a QRS complex and every QRS complex is preceded by a P-wave.

**Rate**
The heart rate is approximately 75 bpm, which is within the normal range.

**P-wave**
Upright P-waves are visible in lead II and biphasic P-waves, which are a normal variation, show in V1.

**Intervals**
The PR interval is 0.16 seconds and is normal. The QRS complex is 0.08 seconds and is normal, as is the QT interval at 0.38 seconds, not rate-corrected.

**Changes**
Q-waves are present, have a width < 0.04 seconds, and are visibly less than 1/3 the height of the QRS complex. QRS amplitude is normal, and no evidence of left ventricular hypertrophy exists. The ST segment is isoelectric and the T-wave is upright.

**Patterns**
No abnormal patterns of arrhythmia, ischemia, myocardial infarction, or conduction disturbances appear.

**Interpretation**
NSR
Analyze this EKG tracing using the steps in the system, then compare your analysis to the table.

### Basics
This image also includes no data about the patient, so there is nothing to verify in that respect. The image does not show any evidence of technical issues such as lead placement, skin prep, calibration, or artifacts.

### Rhythm
The rhythm is consistent and regular. P-waves are visible. Every P-wave is followed by a QRS complex and every QRS complex is preceded by a P-wave.

### Rate
The heart rate is approximately 85 bpm, which is within the normal range.

### P-wave
Upright P-waves are visible in lead II and biphasic (normal variation) P-waves show in V1.

### Intervals
The PR-interval is 0.18 seconds and is normal. The QRS complex is 0.08 seconds and is normal, as is the QT interval.

### Changes
There are no significant Q-waves present. QRS amplitude is normal, and no evidence of left ventricular hypertrophy exists. The ST segment is isoelectric and the T-wave is upright.

### Patterns
No abnormal patterns of arrhythmia, ischemia, myocardial infarction, or conduction disturbances appear.

### Interpretation
NSR