

# Interpreting AV (Heart) Blocks: Breaking Down the Mystery

## 2 Contact Hours

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## Purpose

The purpose of this course is to discuss the essentials of atrioventricular block rhythms to identify the differences between the degrees. Some review of basic ECG interpretation will be included, as well as causes of the blocks.

*This course focuses on AV block interpretation. Standard lead selection, placement, tracings, treatment, and lethal arrhythmias are not covered in this course. If you need to review these topics, please refer to the Telemetry Interpretation and Lethal Arrhythmias: Advanced Rhythm Interpretation courses on [RN.com](#).*

## Learning Objectives

*After successful completion of this course, you will be able to:*

1. Describe the basic electrophysiology of the heart.
2. Identify basic components of an ECG strip.
3. Describe the causes of atrioventricular heart blocks.
4. Distinguish between the degrees of heart blocks by identifying rhythm strips.

## Introduction

Telemetry interpretation is an important skill for nurses in many patient care areas. Lethal arrhythmias may be readily identified, but other rhythms may not be as easily recognized. Atrioventricular (AV) blocks may not be commonly encountered in patient care. Breaking down the components of the different blocks is valuable to interpret the various AV blocks.

The terms AV Block and Heart Block are synonymous. AV Block is the most current and most correct term, but you may still hear “Heart Block” used in clinical practice.

## Review: Electrophysiology of the Heart

Two distinct components must occur for the heart to be able to contract and pump blood. These components are: **(1) An electrical impulse and (2) A mechanical response to the impulse.**

1. The **electrical impulse** tells the heart to beat through automaticity. Automaticity means that these specialized cells within the heart can discharge an electrical current without an external pacemaker or stimulus from the brain via the spinal cord. The electrical (conductive) cells of the heart initiate electrical activity.
2. The **mechanical beating or contraction** of the heart occurs after the electrical stimulation. When the mechanical contraction occurs the person will have both a heart rate and a blood pressure.

Specific mechanical (contracting) cells respond to the stimulus and of the electrical cells and contract to pump blood.

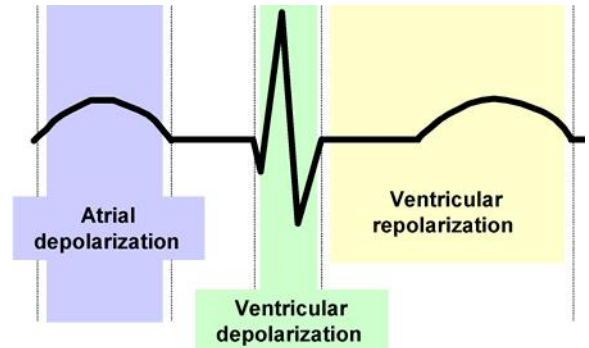
## Review: Depolarization & Repolarization

In a cardiac cell, two primary chemicals provide the electrical charges: sodium ( $\text{Na}^+$ ) and potassium ( $\text{K}^+$ ). In the resting cell, most of the potassium is on the inside, while most of the sodium is on the outside. This results in a negatively charged cell at rest (the interior of the cardiac cell is negative or polarized at rest). When depolarized, the interior cell becomes positively charged and the cardiac cell will contract.

Since the polarized or resting cell has the negative charge on the inside at rest, depolarization occurs when potassium and sodium move across the cell membrane and the inside of the cell becomes positively charged. As depolarization occurs, the change in membrane voltage triggers contraction of the cell.

Depolarization moves a wave through the myocardium. As the wave of depolarization stimulates the heart's cells, they become positive and begin to contract. This cell-to-cell conduction of depolarization through the myocardium is carried by the fast moving sodium ions.

Repolarization is the return of electrical charges to their original state. This process must happen before the cells can be ready to conduct again.



### Knowledge Check 1

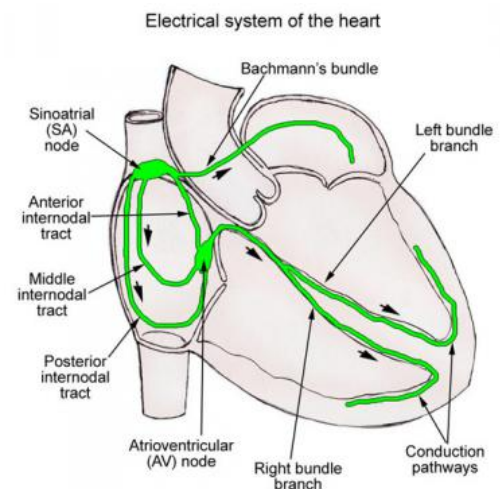
**Repolarization is defined as:**

- A. The positive charge of cells.
- B. The system of conduction.
- C. **The return of electrical charges to their original state. (correct)**

## Review: The Cardiac Conduction System

The specialized electrical cells in the heart are arranged in a system of pathways called the conduction system. These specialized electrical cells and structures guide the wave of myocardial depolarization.

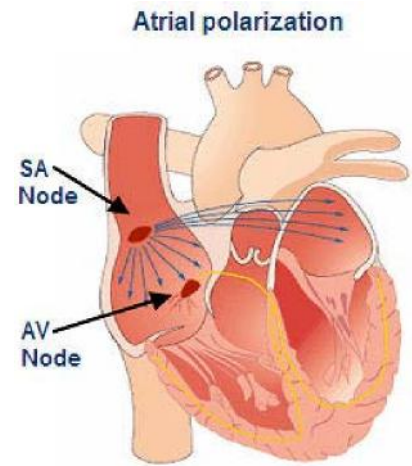
The conduction system consists of the sinoatrial node (SA node), atrioventricular node (AV node), bundle of His (also called the AV junction), right and left bundle branches, and Purkinje fibers.



## Review: The Sinoatrial (SA) Node

The sinoatrial node (also called the SA node or sinus node) is a group of specialized cells located in the posterior wall of the right atrium. The SA node normally depolarizes or paces more rapidly than any other part of the conduction system. It sets off impulses that trigger atrial depolarization and contraction.

The SA node normally fires at a rate of 60-100 beats per minute. After the SA node fires, a wave of cardiac cells begin to depolarize. Depolarization occurs throughout both the right and left atria (similar to the ripple effect when a rock is thrown into a pond). This impulse travels through the atria by way of inter-nodal pathways down to the next structure, which is called the AV node.



## Review: The Atrioventricular (AV) Node and AV Junction

The next area of conductive tissue along the conduction pathway is at the site of the atrioventricular (AV) node. This node is a cluster of specialized cells located in the lower portion of the right atrium above the base of the tricuspid valve. The AV node itself possesses no pacemaker cells.

The AV node has two functions. The first function is to DELAY the electrical impulse in order to allow the atria time to contract and complete the filling of the ventricles. The second function is to receive an electrical impulse and conduct it down to the ventricles via the AV junction and bundle of His.

## Review: The Bundle of His

After passing through the AV node, the electrical impulse enters the bundle of His (also referred to as the common bundle). The bundle of His is located in the upper portion of the intraventricular septum and connects the AV node with the two bundle branches.

If the SA node becomes diseased or fails to function properly, the bundle of His has pacemaker cells that are capable of discharging at an intrinsic rate of 40-60 beats per minute. The AV node and the bundle of His are referred to collectively as the AV junction. The bundle of His conducts the electrical impulse down to the right and left bundle branches. The bundle branches further divide into Purkinje fibers.

## Review: The Purkinje Fibers

At the terminal ends of the bundle branches, smaller fibers distribute the electrical impulses to the muscle cells, which stimulate contraction. This web of fibers is called the Purkinje fibers.

The Purkinje fibers penetrate 1/4 to 1/3 of the way into the ventricular muscle mass and then become continuous with the cardiac muscle fibers. The electrical impulse spreads rapidly through the right and left bundle branches and Purkinje fibers to reach the ventricular muscle, causing ventricular contraction, or systole.

The Purkinje fibers within the ventricles also have intrinsic pacemaker ability. This third and final pacemaker site of the myocardium can only pace at a rate of 20-40 beats per minute.

Notice that the further you travel away from the SA node, the slower the backup pacemakers

become. If you only have a heart rate of 30 (from the ventricular back-up pacemaker), blood pressure will likely be low and the patients will likely be quite symptomatic.

### Knowledge Check 2

The conduction system of the heart includes the SA node, the AV node and:

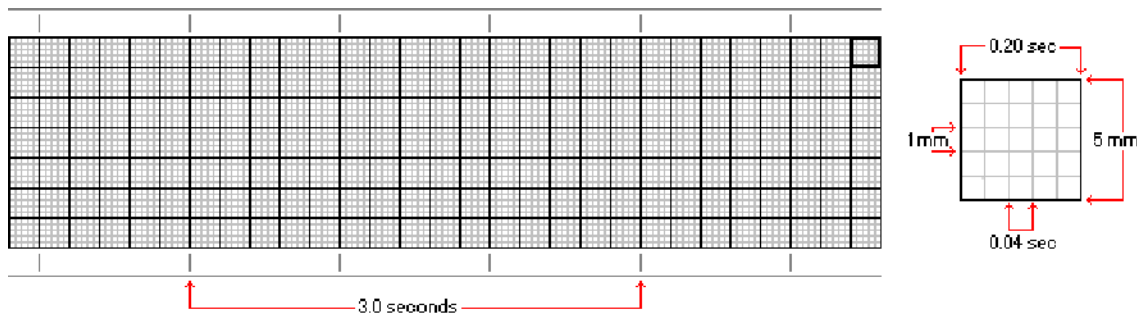
- A. Bundle of His
- B. Right and left bundle branches
- C. Purkinje fibers
- D. All of the above (correct)

### ECG: Review of the Basics

Before jumping in to interpreting AV blocks, a quick review of the basics for ECG strips is needed. The ECG is a recording of the electrical impulses produced by the heart. The ECG strip is standardized, with time measured in seconds along the horizontal axis. Each **small** square is 1 mm in length and represents **0.04** seconds. Each **larger** square is 5 mm in length and therefore represents **0.20** seconds.

The body acts as a giant conductor of electrical currents. The tracing recorded from the electrical activity of the heart forms a series of waves and complexes that have been arbitrarily labeled (in alphabetical order) the P, Q, R, S, and T waves.

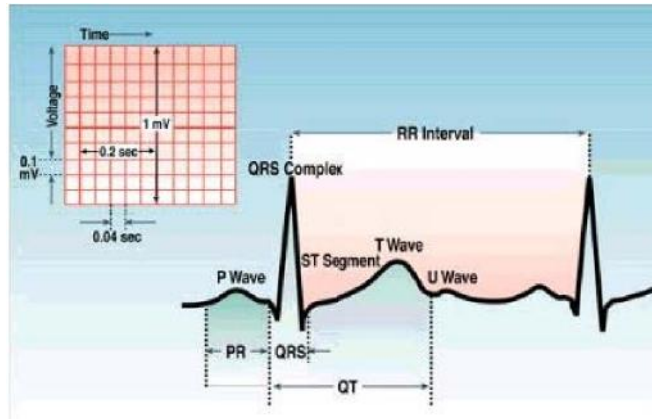
The “six second method” can be used with either regular or irregular rhythms and provides a rough estimate (but not precise) of heart rate. Print a 6 second strip, count the number of R waves in a six second strip and multiply by 10. For example, if there are seven (7) R waves in a six second strip, the heart rate is approximately 70 or  $(7 \times 10 = 70)$ .



## ECG: The P Wave

Electrical impulses originating from the SA node are represented on the ECG with a waveform called a P wave. The P wave is generated after the SA node fires and depolarizes the right and left atria. The beginning of the P wave is recognized as the first upward deflection from the baseline. It resembles a small upward “hill” or “bump” and once completed, returns to the ECG baseline.

### Normal ECG Waveforms and Intervals



## ECG: The PR Interval

When the impulse leaves the atria and travels to the AV node it encounters a slight delay. The tissues of the node do not conduct impulses as fast as the other cardiac electrical tissues. This means that the wave of depolarization will take a longer time to get through the AV node. On the ECG this is represented by a short period of electrical inactivity called the **PR interval**.

The PR interval extends from the beginning of the P wave (the beginning of atrial depolarization) to the onset of the QRS complex (the beginning of ventricular depolarization). The PR interval (or time travel from SA to AV nodes) is **between 0.12 to 0.20 seconds**. It **should not exceed 0.20 seconds** as measured on ECG graph paper where each small square represents 0.04 seconds. It is actually only measured from the beginning P to the beginning of the Q wave (think of it as a “P to Q measurement” despite the fact that it is called a PR interval).

Changes in conduction through the AV node are the most common cause of changes in the PR interval. The P to R interval is important in identification of heart blocks.

## ECG: The QRS Complex

The ventricular depolarization is shown on the ECG by a large complex of three waves: the **Q**, the **R**, and the **S** waves. Together, these three waves are called the **QRS complex**. The QRS voltage or amplitude is much higher than the height of the P wave. This is because ventricular depolarization involves a greater muscle mass and creates a larger complex.

Following the P wave, the Q wave is the first negative or downward deflection. The R wave is the first positive or upward deflection following the P wave. The negative wave following the R wave is known as the S wave.

Each QRS complex can look a bit different. In fact, some QRS complexes are lacking a Q wave or

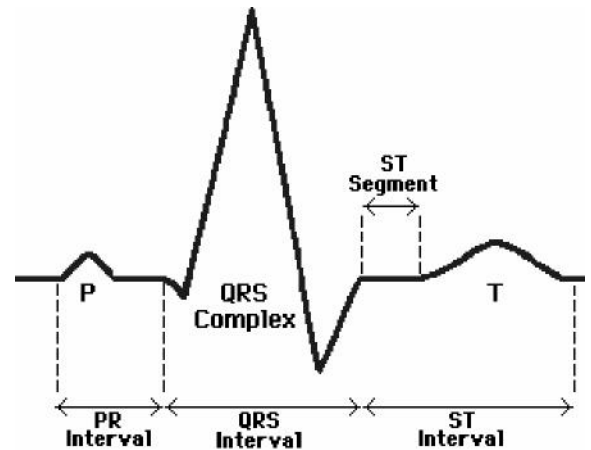
others may lack the S wave. Regardless of the appearance, they are always generically called the “QRS” and still indicate depolarization of the ventricles.

The upper limit of normal duration of the QRS complex is **less than 0.12 seconds** or three small boxes. Place one leg of your caliper on the beginning of the Q wave and place the other leg of the caliper on the S wave where it meets the ST segment.

### ECG: ST Segment and T Wave

The ST segment begins at the end of the S complex and ends with the onset of the T wave. The ST segment represents the early part of repolarization of the ventricles. The ST segment normally sits on the baseline or isoelectric line. It is also normal if the ST segment is slightly elevated or below the isoelectric line (no greater than one millimeter in either direction).

Ventricular repolarization is represented on the ECG by a T wave. The beginning of the T wave is identified at the point where the slope of the ST segment appears to become abruptly or gradually steeper. The T wave ends when it returns to the isoelectric baseline.



### ECG: Steps to Rhythm Interpretation

1. **Rate:** Calculate the heart rate (HR) or note the HR from the monitor.
2. **Regularity:** Measure the regularity or rhythm of the R waves.
3. **P-wave Examination:** Is there one P wave before each QRS? (there should be)
4. **P to R Interval:** Measure the P to R interval - Is it within normal limits? It is consistent?
5. **QRS Width:** Measure the duration of the QRS complex.

#### Knowledge Check 3

A normal PR interval is:

- A. 0.04 seconds
- B. Less than 0.12 seconds
- C. **Between 0.12 and 0.20 seconds (correct)**

### Atrioventricular Blocks

An atrioventricular (AV) block arises when atrial depolarization does not reach the ventricle or when there is a delay in atrial depolarization conduction. There are three degrees of AV block:

- First degree
- Second degree (Type 1 & Type II)
- Third degree



When learning and attempting to memorize information, the use of acronyms, mnemonics, or analogies are useful. For the discussion of AV blocks, the analogy of a bus driver will be used. The bus driver is the P wave, the PR interval is how long it takes to get to the bus stop, and the QRS complex are the passengers that are picked up on the bus. The use of visual depictions of the bus along the bus route will help identify AV blocks on ECG strips.

## Symptoms of AV Blocks

Signs and symptoms depend on the type of AV block that is occurring.

First-degree AV block rarely causes symptoms.

Symptoms of second- and third-degree AV block include:

- Fainting
- Dizziness
- Fatigue
- Shortness of breath
- Chest pain

## First Degree AV Block

Unlike its name (which can be confusing), first-degree AV block is not an actual “block,” but rather a delay in conduction at the AV node. Therefore, first-degree AV block is simply a delay in passage of the impulse from atria to ventricles. This conduction delay usually occurs at the level of the AV node.

Remember that in normal sinus rhythm, the time it takes the SA node to fire, depolarize the atria and transmit to the AV node is  $< .20$  seconds. In first degree AV block the patient has a PR interval of  $> .20$  seconds.

**Rate:** Not affected; varies depending on the underlying rhythm

**Regularity:** Regular

**P-Waves:** Upright and normal. One P precedes every QRS

**PR Interval:** Prolonged ( $>0.2$  seconds) and is constant

**QRS Duration:** Not affected ( $\leq 0.12$  seconds)

## Causes of First Degree AV Block

- Drug therapy (digoxin, beta-adrenergic blockers or calcium channel blockers, or antiarrhythmic drugs such as amiodarone)
- Post-MI
- Chronic degenerative disease of the atrial conduction system (seen with aging)
- Hypo- or hyperkalemia
- Increased vagal tone

## Sinus Rhythm with First Degree AV Block



**Rate:** approximately 80

**Regularity:** Atrial rhythm regular, ventricular rhythm regular

**P wave:** each P wave is followed by a QRS complex

**PR interval:** > 0.2

**QRS:** Normal, < 0.12

## Treatment: First Degree AV Block

A priority of the nurse is to observe for lengthening PR intervals or development of more serious heart blocks.

### Potential Treatments:

- Treatment for first-degree heart block is usually unnecessary as it is typically asymptomatic.
- Treatment typically aims to correct the underlying cause. If it is caused from drug therapy, then adjust or remove the medication. If it is a potassium imbalance, then it needs to be corrected.
- Consult with physician if PR interval is lengthening. Discuss holding medications which slow AV node conduction, such as beta-blockers or calcium channel blockers

## Second Degree AV Blocks

There are two categories of second-degree heart block. Type I, often referred to as Wenckebach, and the other is called Type II. In both types, the impulse originates in the sinus node, but is conducted through the AV node in an intermittent fashion. Simply stated, not every P wave will be followed by QRS complex. In second-degree heart blocks, some impulses are conducted and others are not. The cause of the non-conducted P waves is related to intermittent AV nodal block. The difference between the two second-degree blocks is related to the pattern in which the P waves are blocked.

### Two Types of Second Degree AV Blocks

Second Degree AV Block – Type I (Wenckebach)

Second Degree AV Block – Type II

## Second Degree AV Block Type I - Wenckebach

**Second-degree AV block-Type I** is unique in that it has three different names, and all three are used interchangeably: **Second Degree AV Block-Type I**, **Mobitz I** or **Wenckebach**. Do not let this confuse you; all three names mean the SAME rhythm.

We will refer to Second Degree AV Block Type I as “Wenckebach” for the remainder of this course. Wenckebach is characterized by a **progressive prolongation of the PR interval** (so the key to diagnosing this rhythm is by careful examination of each PR interval). The SA node is healthy and fires on time, thus the P to P intervals are regular. Impulses traveling through the AV node take longer and longer to fully conduct until one impulse is completely blocked. The SA node continues to fire right on time (regular P to P intervals) and the cycle of prolongation of PR intervals continues as the pattern is repeated.

## Second Degree AV Block Type I - Wenckebach

The repetition of this pattern results in “group beating,” (e.g. three conducted sinus beats with progressively lengthening PR intervals and a fourth sinus beat that is NOT followed by a QRS). Beats that are successfully conducted have a normal QRS width. Because QRS complexes are periodically dropped, the ventricular rhythm is irregular.

This block almost always occurs at the level of the AV node (rarely at the bundle of His or bundle branch level), is typically a transient rhythm, and prognosis is good.



**Rate:** Depends on the underlying atrial rate. Atrial regular; Ventricular rate is slightly slower. Typically between 60-90 bpm

**Regularity:** Regularly irregular; Atrial regular. Ventricular irregular

**P-Waves:** More P-waves than QRS complexes, associated with each conducted QRS complex.

**PR Interval:** Progressively lengthens until a QRS complex is dropped. After the blocked beat, the cycle starts again

**QRS Duration:** Not affected ( $\leq 0.12$  seconds)

## Causes of Second Degree AV Block Type I - Wenckebach

- Drug therapy (digoxin, beta-adrenergic blockers, calcium channel blockers, amiodarone)
- CAD
- New MI – seen more commonly with acute inferior wall infarctions
- Rheumatic fever
- Increased vagal tone
- Hyperkalemia
- Myocarditis

## Sinus Rhythm with Second Degree AV Block Type I - Wenckebach



**Rate:** approximately 50-75 – irregular

**Regularity:** Atrial rhythm regular, ventricular rhythm irregular

**P wave:** each P wave is NOT followed by a QRS complex

**PR interval:** increasing with each beat and then a P wave occurs without a QRS

**QRS:** Normal, < 0.12

## Treatment: Second Degree AV Block Type I - Wenckebach

As a nursing priority, assess the patient for possible causes and monitor blood pressure, pulse, and other vital signs.

### Potential Treatments:

- Treatment is not typically required.
- Asymptomatic: Observation and monitoring only. If PR interval is lengthening, consult with physician for holding drugs that can slow AV node conduction.
- Symptomatic: On a rare occasion, atropine and/or temporary pacing may be considered.

### Knowledge Check 4

Characteristics of a second degree Type I, or Wenckebach, include:

- A. Widened QRS complex
- B. Progressive lengthening of the PR interval, with a dropped QRS complex (correct)**
- C. A consistent delayed PR interval

## Second Degree AV Block Type II

**Second degree AV block Type II** (previously called **Mobitz II**), occurs below the level of the AV node, either at the bundle of His (uncommon) or the bundle branches (common). A hallmark of this type of second-degree AV block is that there is a pattern of conducted P waves (with a constant PR interval), followed by one or more non-conducted P waves. The PR interval does not lengthen before a dropped beat.

Remember that the P waves that are successful in conducting through have a constant PR interval. Since the SA node is firing in a regular pattern, the P to P intervals again march through in a regular pattern (P-P is regular). Since not all P waves are conducted into the ventricles, the R to R intervals will be irregular and the ventricular response (HR) may be in the bradycardia range.

When the block occurs at the bundle of His, the QRS may be narrow since ventricular conduction is not disturbed in beats that are not blocked. If the blockage occurs at the level of the bundle branches, conduction through the ventricles will be slower therefore creating a wider QRS complex (>0.12 seconds).

Type II is associated with a poorer prognosis, and complete heart block may develop. Causes are usually associated with an acute myocardial infarction, severe coronary artery disease or other types of organic lesions in the conduction pathway. The patient's response to the dysrhythmia is usually related to the ventricular rate.

**Rate:** Depends on the underlying atrial rate and the ratio of conducted complexes. Atrial regular; ventricular rate is typically  $\frac{1}{4}$  to  $\frac{1}{2}$  the atrial rate (depending on the amount of blockage in conduction) **Regularity:** Regular, regularly irregular, or irregular (based on the ratio of conducted complexes). Atrial regular (P-P is regular). Ventricular irregular

**P-Waves:** Upright and normal. Some P waves are not followed by a QRS (more Ps than QRSs).

**PR Interval:** The PR interval for conducted beats will be constant across the strip

**QRS Duration:** Not affected; >0.12 seconds for conducted beats

## Causes of Second Degree AV Block Type II

- Age related degenerative changes in the conduction system
- New MI- seen more commonly with acute anterior wall infarctions
- Post cardiac surgery or complication arising with cardiac catheterization
- Note: not typically a result of increased vagal tone or drug effects

## Second Degree AV Block Type II



**Rate:** Ventricular approx 30; atrial approx 110

**Regularity:** Atrial rhythm regular, ventricular rhythm

regular **P wave:** each P wave is NOT followed by a QRS

**PR interval:** Consistent when followed by a QRS;  $< 0.2$

**QRS:** Normal,  $< 0.12$

## **Treatment: Second Degree AV Block Type II**

As a nursing priority, assess the patient for possible causes and monitor blood pressure, pulse, and other vital signs.

**Note: Type II has the potential to suddenly progress to complete AV block (third degree AV block) or ventricular standstill; have a temporary pacemaker nearby!**

### **Potential Treatments:**

- Asymptomatic: Observation and monitoring only. Hold drugs that can slow AV node conduction. Notify physician. Obtain supplies for pacing should this become necessary.
- Symptomatic: If symptomatic bradycardia is present, temporary pacing is initiated. Administer a dopamine infusion if patient is hypotensive.

**Note: Atropine must be used with great caution (if at all) with this rhythm. Atropine will increase the sinus node discharge, but does not improve conduction through the AV node, (the location of this block is lower in the conduction system). Acceleration of the atrial rate may result in a paradoxical slowing of the ventricular rate, thereby decreasing the cardiac output.**

## **Third Degree AV Block**

Third-degree AV block is also called Complete Heart Block. This type of dysrhythmia indicates complete absence of conduction between atria and ventricles (the atria and the ventricles are not communicating with one another). The atrial rate is always equal to or faster than the ventricular rate in complete heart block. The block may occur at the level of the AV node, the bundle of His, or in the bundle branches.

Remember that the rhythm strip reflects two separate processes that are taking place. The SA node continues to control the atria and typically fires at a rate of 60- 80 bpm. Since the atria and the ventricles are not communicating, one of the two remaining back-up intrinsic pacemakers will take over. Either the junction will pace the ventricles (rate 40-60 bpm) or the back-up ventricular pacer will discharge (rate 20-40 bpm).

On the ECG, you will see normal P waves marching regularly across the strip. The P-P intervals are regular. You will also see QRS complexes at regular intervals. The unique feature is that the P waves and the QRS complexes will not be “talking to each other.” There is no relationship between the P and the QRS waveforms. The PR interval will be totally inconsistent and you may even see P waves superimposed in the middle of QRS complexes. There will be more P waves than QRS complexes (because the intrinsic rate of the sinus node is faster than either the junctional or ventricular rates).

**Rate:** Atrial rate will be independent of ventricular rate. Atrial rate is normal. Ventricular rate is slower. 40-60 bpm if back-up pacer is from the junction or 20-40 bpm if back-up pacer is from the ventricles.

**Regularity:** Atrial rate will be regular, ventricular rate will be regular. P-P is regular; R-R is regular (but the two are independent functions)

**P-Waves:** Upright and normal. Present and disassociated from the ventricular activity

**PR Interval:** Non-existent; No relationship between the P and the QRS waves.

**QRS Duration:**  $\leq 0.12$  seconds if controlled by the junction;  $>0.12$  seconds if paced by the ventricle.



## Causes of Third Degree AV Block

- Drug therapy (digoxin, beta-adrenergic blockers, calcium channel blockers, amiodarone)
- New MI – seen more commonly with acute inferior wall infarctions
- Increased vagal tone
- Hyperkalemia
- Myocarditis or rheumatic heart fever
- Post cardiac surgery or complication arising with cardiac catheterization

## Third Degree AV Block



**Rate:** Ventricular- approx. 30; atrial approx. 60

**Regularity:** Atrial rhythm regular, ventricular rhythm regular

**P wave:** normal, disassociated from the QRS waves

**PR interval:** irregular

**QRS:** Normal, < 0.12

## Treatment: Third Degree

As a nursing priority, assess the patient for possible causes and monitor blood pressure, pulse, and other vital signs. Assess for syncope, palpitations, or shortness of breath.

Hypotension may occur due to a low ventricular rate. For patient safety, lie your patient down to prevent syncope and potential falls.

## Potential Treatments:

- *Asymptomatic:* Notify physician. Observation and monitoring only. Hold drugs that can slow AV node conduction. Anticipate and obtain supplies for pacing should this become necessary.
- *Symptomatic:* Notify physician. If symptomatic bradycardia is present, administer atropine and prepare for temporary pacing. Atropine may be effective if the QRS is narrow (AV node level of block), but it has little or no effect on wide QRS (bundle-branch level) third-degree block rhythms. Administer a dopamine infusion if patient is hypotensive.

## A Note on Pacemakers

Second degree AV Block Type II and Third-degree AV Block usually require temporary and/or permanent pacemakers. A second degree Type II with a wide QRS complex indicate diffuse

Material Protected by Copyright conduction system disease and is an indication for pacing even in the

absence of symptoms. Type II with a wide QRS may degenerate into third-degree AV block, which is another reason to consider permanent pacing.

#### **Knowledge Check 5**

**The main characteristic of a third degree AV block is:**

- A. A regular P-P interval
- B. Prolonged PR interval with some P waves without QRS complexes
- C. No correlation between the P waves and the QRS complexes (correct)**

## Practice #1



**Rate:**

**Regularity:**

**P-Waves:** PR

**Interval:** QRS

**Duration:**

**What type of block is this?**

## Practice #1 (answer)

**Rate:** 30 bpm

**Regularity:** P-P is regular; R-R is regular (but the two are independent functions) **P-**

**Waves:** Upright and normal. Present and disassociated from the ventricular activity

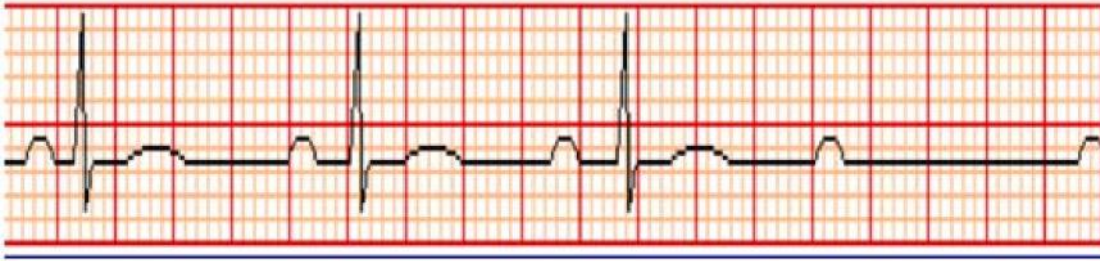
**PR Interval:** Non-existent; No relationship between the P and the QRS waves.

**QRS Duration:**  $\leq 0.12$  seconds

**Answer:** This is a third degree AV block

## Practice #2

Note: This is a 3 second strip, rather than a standard 6 second strip



**Rate:**

**Regularity:**

**P-Waves:**

**PR Interval:**

**QRS Duration:**

**What type of block is this?**

## Practice #2 (answer)

Note: This is a 3 second strip, rather than a standard 6 second strip

**Rate:** 60 bpm

**Regularity:** Regularly irregular; Atrial regular. Ventricular irregular

**P-Waves:** More P-waves than QRS complexes, associated with each conducted QRS complex

**PR Interval:** Progressively lengthening until a QRS complex is dropped.

**QRS Duration:**  $\leq 0.12$  seconds

**Answer:** This is a second degree AV block Type I, Wenckebach

### Practice #3



**Rate:**

**Regularity:**

**P-Waves:** PR

**Interval:** QRS

**Duration:**

**What type of block is this?**

### Practice #3 (answer)

**Rate:** 60 bpm

**Regularity:** Atrial regular (P-P is regular). Ventricular irregular

**P-Waves:** Upright and normal. Some P waves are not followed by a QRS (more Ps than QRSs)

**PR Interval:** The PR interval for conducted beats will be constant across the strip

**QRS Duration:**  $>0.12$  seconds for conducted beats

**Answer:** This is a second degree AV block Type II

## Practice #4



**Rate:**

**Regularity:**

**P-Waves:** PR

**Interval:** QRS

**Duration:**

**What type of block is this?**

### Practice #4 (answer)

**Rate:** Variable; 50-80

**Regularity:** Irregular

**P-Waves:** Upright and normal. Some P waves are not followed by a QRS

**PR Interval:** Variable; increasing with each beat and then a P wave occurs with no QRS following

**QRS Duration:** < 0.12 seconds

**Answer:** This is Second Degree AV Block Type I, Wenckebach

## Practice #5



**Rate:**

**Regularity:**

**P-Waves:** PR

**Interval:** QRS

**Duration:**

**What type of block is this?**

### Practice #5 (answer)

**Rate:** 30 bpm

**Regularity:** Regular

**P-Waves:** Upright and normal. One P precedes every

QRS **PR Interval:** Prolonged (>0.2 seconds) and is

constant **QRS Duration:**  $\leq 0.12$  seconds

**Answer:** This is a bradycardia, with first degree AV block.

## Practice #6



**Rate:**  
**Regularity:**  
**P-Waves:** PR  
**Interval:** QRS  
**Duration:**

**What type of block is this?**

### **Practice #6 (answer)**

**Rate:** less than 20

**Regularity:** P-P is regular, R-R is regular (but the two are independent functions) **P-**

**Waves:** Upright and normal. Present and disassociated from the ventricular activity

**PR Interval:** Non-existent; No relationship between the P and the QRS waves

**QRS Duration:** < 0.12 seconds

**Answer:** This is third degree AV block

**\*Atrial and Ventricular signals are firing independently of each other.**



## Practice #7



**Rate:**

**Regularity:**

**P-Waves:**

**PR Interval:**

**QRS Duration:**

**What type of block is this?**

### Practice #7 (answer)

**Rate:** < 30 bpm

**Regularity:** Atrial regular, ventricular regular

**P-Waves:** Upright and normal. Some P waves are not followed by a QRS

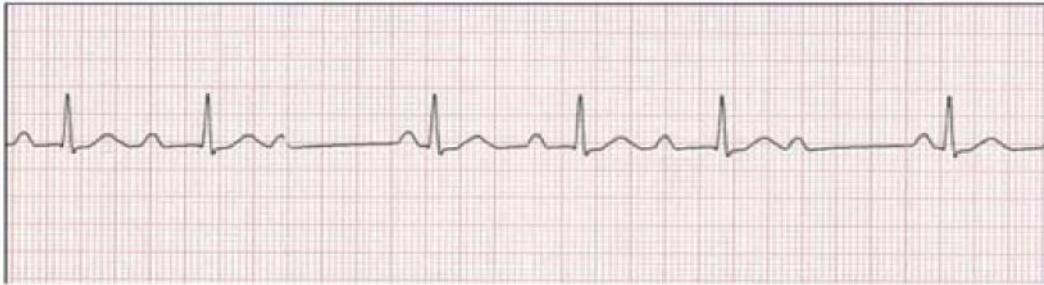
**PR Interval:** The PR interval for the conducted beats is consistent across the strip

**QRS Duration:** < 0.12 seconds

**Answer:** This is second degree AV block Type II

\*Remember: A hallmark of this type of second-degree AV block is that **there is a pattern of conducted P waves (with a constant PR interval), followed by one or more non-conducted P waves**. The PR interval does not lengthen before a dropped beat.

## Practice #8



**Rate:**

**Regularity:**

**P-Waves:**

**PR Interval:**

**QRS Duration:**

**What type of block is this?**

### Practice #8 (answer)

**Rate:** Variable, from 50-75 bpm

**Regularity:** Irregular

**P-Waves:** Upright and normal. Some P waves are not followed by a QRS

**PR Interval:** Variable; increasing with each beat and then a P wave occurs with no QRS following

**QRS Duration:** < 0.12 seconds

**Answer:** This is Second Degree AV Block; Type I, Wenckebach

### Review of AV Blocks

- **First-Degree AV Block:** PR interval greater than 0.20
- **Second-Degree AV Block Type I, Wenckebach:** Progressively lengthening PR interval until one P wave is not followed by QRS
- **Second-Degree AV Block Type II:** More P waves than QRS complexes; each QRS has a P wave preceding it; PR interval is consistent
- **Third-Degree AV Block:** P-P interval is regular; R-R interval is regular (but the two are independent functions). There is no relationship between P waves and QRS complexes, therefore there is no PR interval

# Decision Tree



## **Conclusion**

AV blocks are not necessarily encountered on a daily basis with patient care, and can be a common area of difficulty in identifying the strips. Breaking down the components of the strips and relating them to analogies can be helpful to determine the differences between the degrees of blocks. Repeatedly viewing, reviewing, and interpreting these strips will assist in solidifying the knowledge of AV blocks.

## **Resources**

[Click here](#) to view a short voice-over PowerPoint presentation on identification of 2nd and 3rd degree AV blocks. (URL to presentation: <http://live.rxschool.com/p18429677/> )

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## **Additional Resources**

University of Utah-School of Medicine.  
Alan E. Lindsay ECG Learning Center  
<http://ecg.utah.edu/outline>

ECG Library  
Jenkins, J & Gerrend, S. (2002)  
<http://www.ecglibrary.com/ecghome.html>

[www.americanheart.org](http://www.americanheart.org)

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