9 Heart Block Dysrhythmias

Learning Outcomes

- **9.1** Describe the various heart block dysrhythmias.
- **9.2** Analyze first-degree atrioventricular (AV) block and its effect on the patient, including basic patient care and treatment.
- **9.3** Analyze second-degree atrioventricular (AV) block, Mobitz I, and its effect on the patient, including basic patient care and treatment.
- **9.4** Analyze second-degree atrioventricular (AV) block, Mobitz II, and its effect on the patient, including basic patient care and treatment.
- **9.5** Analyze third-degree atrioventricular (AV) block and its effect on the patient, including basic patient care and treatment.

Key Terms

blocked or nonconducted impulse
cardiac output parameters
dissociative

9.1 Introduction to Heart Block Dysrhythmias

In heart block rhythms, the electrical current has difficulty traveling along the normal conduction pathway, causing a delay in or absence of ventricular depolarization. The degree of blockage depends on the area affected and the cause of the delay or blockage. There are three levels of heart blocks, known as first-degree, second-degree, and third-degree or complete heart block.

Checkpoint Question (LO 9.1)

1. What happens in the heart during a heart block dysrhythmia?

9.2 First-Degree Atrioventricular (AV) Block

First-degree AV block is a *delay* in electrical conduction from the SA node to the AV node, usually around the AV node, which slows or delays an electrical impulse from traveling to the ventricular conduction system. See Figure 9-1. This is reflected by a longer-than-normal PR interval as shown in Figure 9-2. The condition is similar to being in a traffic jam. You still arrive

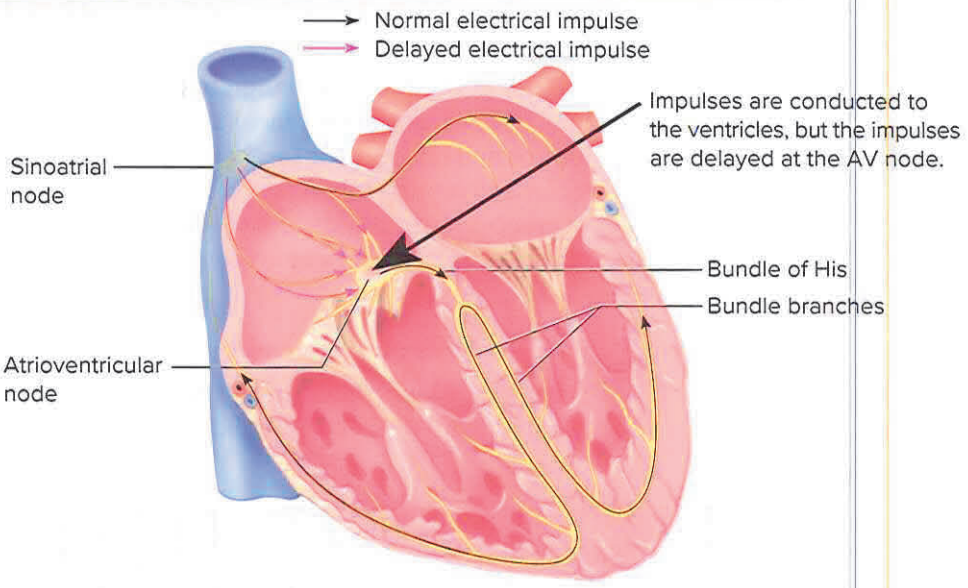


Figure 9-1 Electrical impulse transmission in first-degree AV block.

Figure 9-2 First-degree AV block.

at your destination, but it takes you longer to get there. Electrical current from the SA node still stimulates ventricular depolarization, but the time the impulse takes to arrive in the ventricles is longer than normal.

Criteria for Classification

- ***Rhythm:*** The regularity between the P-P interval and the R-R interval is constant.
- ***Rate:*** The rate of the atria and ventricles is usually within normal limits of 60 to 100 beats per minute.
- ***P wave morphology:*** The P waves will have the same morphology and shape. Each QRS complex has a P wave before it. There is the same number of P waves as QRS complexes.
- ***PR interval:*** The PR interval is greater than 0.20 second.
- ***QRS duration and morphology:*** The QRS duration and morphology are within normal limits of 0.06 to 0.10 second.

Interpret-TIP

First-Degree AV Block

With first-degree atrioventricular block, the PR interval is constant and measures greater than 0.20 second.

cardiac output parameters Observation guidelines used to assess the blood supply to the vital organs of the body to maintain normal function includes measurements such as blood pressure, pulse, respirations, and blood oxygen saturation (SpO_2).

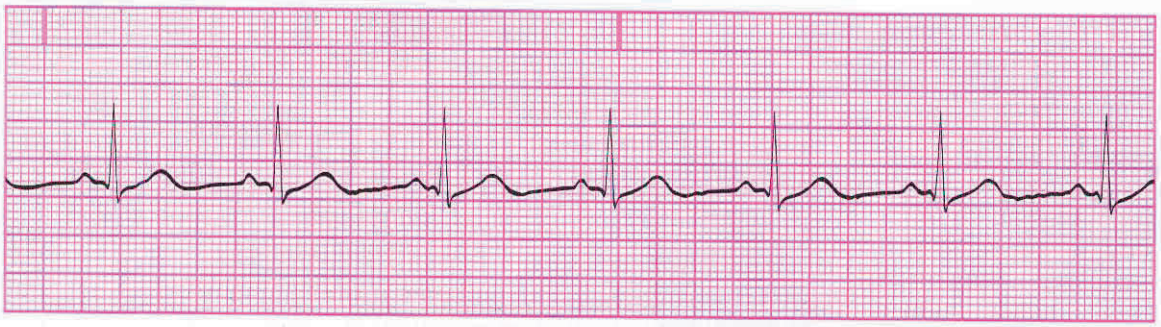
How the Patient Is Affected and What You Should Know

The patient will be able to maintain normal cardiac output consistent with the underlying rhythm. No change in the patient should occur from this AV block alone as long as all other measuring parameters are within the normal range. Monitor and observe for further degeneration and development of other heart blocks and report if they occur. It is important to observe the **cardiac output parameters**—to assess the blood supply to the vital organs—and to determine how well the patient is tolerating the dysrhythmia.

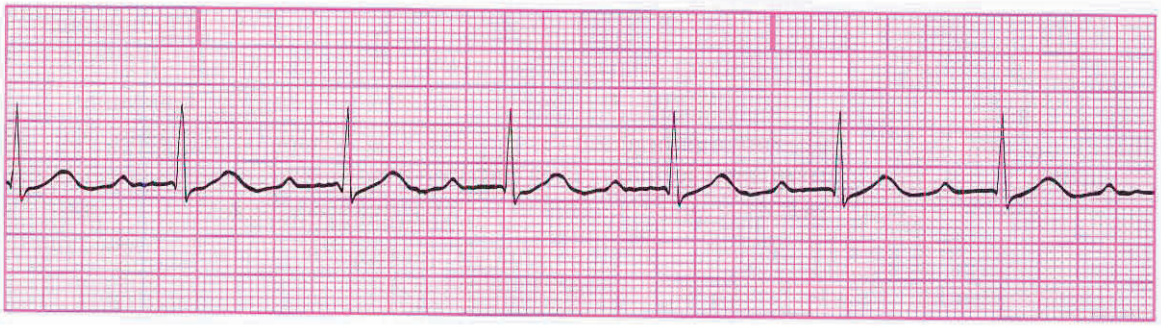
Checkpoint Question (LO 9.2)

Using the criteria for classification, select the rhythm that most closely resembles first-degree AV block.

A.



B.



1. Which distinguishing feature(s) led you to make the selection?

_____

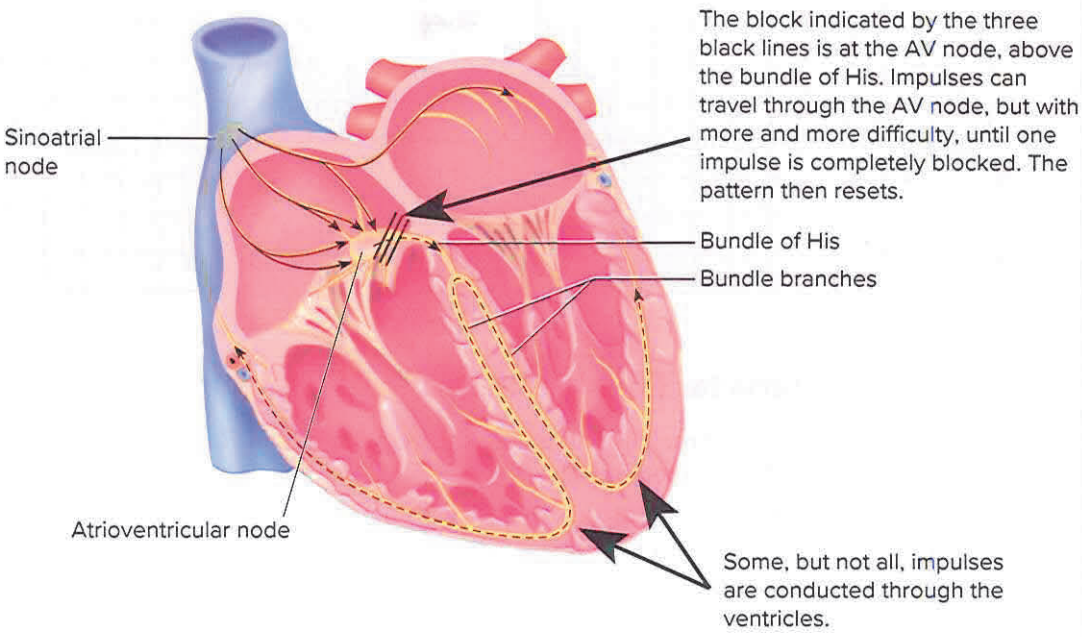
_____

_____

9.3 Second-Degree Atrioventricular (AV) Block, Type I (Mobitz I or Wenckebach)

There are two types of second-degree heart blocks: second-degree type I and second-degree type II. This category of heart block has some blocked or nonconducted electrical impulses from the SA node to the ventricles at the

Figure 9-3 Electrical impulses in second-degree AV block, Mobitz type I.



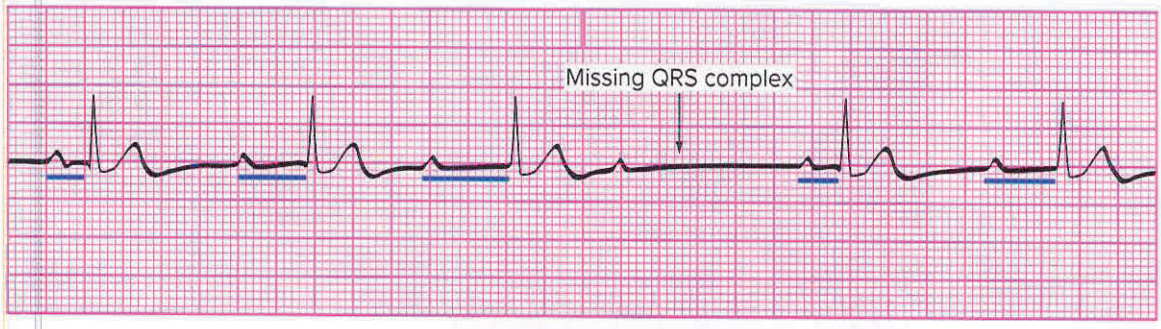
blocked or nonconducted impulse Impulse occurs too soon after the preceding impulse, causing a period when no other impulses can occur in the ventricles.

atrioventricular junction region (see Figure 9-3). A **blocked or nonconducted impulse** occurs too soon after the preceding impulse, causing a period when no other impulses can occur in the ventricles. As a result, there are missing QRS complexes. As with all heart blocks, the impulses from the atria are regular, but depending on which type of second-degree block is present, the conduction through the AV node may be delayed and at some point blocked in a pattern, or the impulse may be blocked entirely, resulting in missing QRS complexes.

Note: R-R intervals are irregular in Mobitz Type I and sometimes in Mobitz Type II due to second-degree heart block's unpredictable nature.

There are currently two known types of second-degree heart blocks. The first was discovered by Dr. Woldemar Mobitz, a German internist, in the early twentieth century. Dr. Karel Frederik Wenckebach further investigated the rhythm and was able to identify a similar blockage pattern, but it was different from the one Dr. Mobitz observed. The rhythm Dr. Wenckebach observed was specifically labeled second-degree atrioventricular block, Mobitz I, but it is often referred to as a Wenckebach rhythm. It is caused when diseased or injured atrioventricular node tissue conducts the electrical impulse to the ventricular conduction pathway with increasing difficulty, causing an increasing delay in time until one of the atrial impulses fails to be conducted or is blocked. After the blocked ventricular impulse, the atrioventricular node resets itself and handles the next impulse more quickly, but then the impulses again encounter increasing difficulty until another atrial impulse is blocked. This pattern repeats itself. Notice in Figure 9-4 that the PR interval becomes longer and longer until a QRS complex is missed (blocked).

Figure 9-4 Second-degree AV block, Mobitz I (Wenckebach).



Criteria for Classification

- ***Rhythm:*** The P-P interval is regular. The R-R interval is irregular due to the blocked impulse(s).
- ***Rate:*** The atrial rate is within normal limits. The ventricular rate is slower than the atrial rate.
- ***P wave morphology:*** The P wave morphology is normal size with an upright P wave. There is a P wave for every QRS complex, but there are extra P waves.
- ***PR interval:*** The PR interval varies from one measurement to the next. The PR interval becomes progressively longer with each subsequent conducted P wave until the QRS complex is blocked. The next PR interval is short, and then the cycle begins again.
- ***QRS duration and morphology:*** The QRS duration and morphology should be within normal limits of 0.06 to 0.10 second.

Interpret-TIP

Second-Degree AV Block, Mobitz I (Wenckebach)

A Mobitz I rhythm has a cyclical prolonging PR interval until the QRS is blocked. Then the cycle resets and begins again (irregular ventricular response).

How the Patient Is Affected and What You Should Know

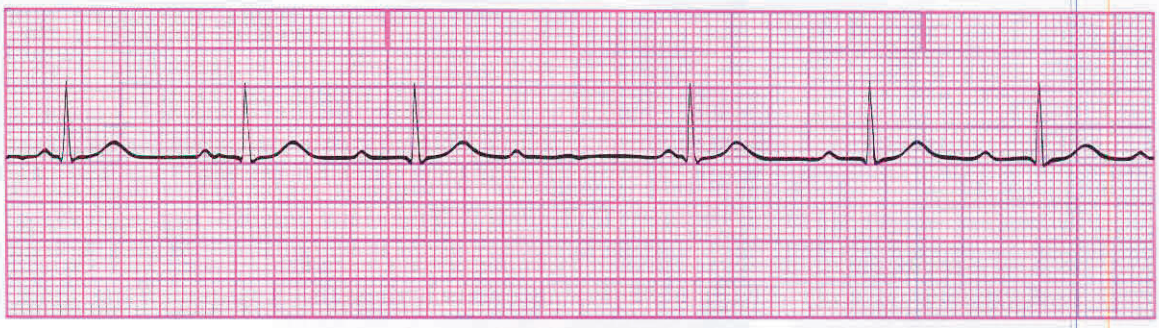
The patient may or may not exhibit symptoms of decreased cardiac output, depending on the rate of ventricular contraction. As this rate decreases and reaches levels of 40 beats per minute or lower, the patient will show signs and symptoms of low cardiac output. This rhythm is usually due to inflammation around the atrioventricular node, and it is often a temporary condition that will resolve itself and return to a normal heart rhythm.

Because treatment is based on how the patient is tolerating the rhythm, the patient is observed for signs and symptoms of low cardiac output. If hypotension and bradycardia occur, atropine is given. If the patient is unresponsive to atropine, heart pacing is started to stabilize the patient. If the patient is on any beta blockers, calcium channel blockers, or digoxin, the dose of these medications is reduced or discontinued. All patients with second-degree AV block type I should be admitted and monitored.

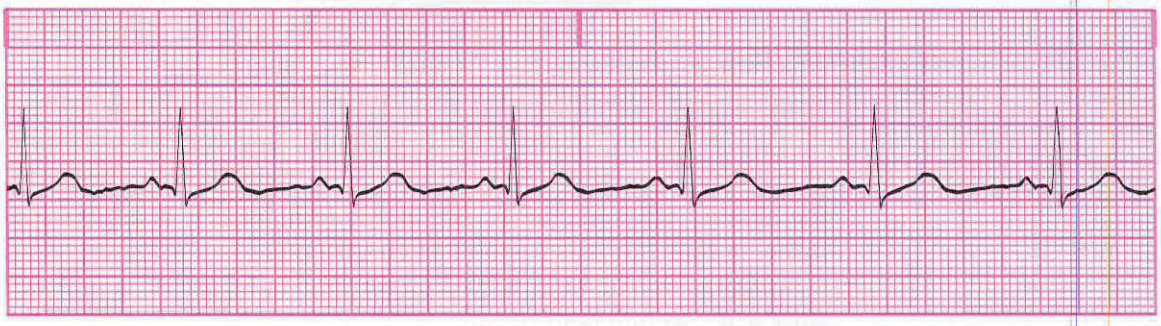
Checkpoint Question (LO 9.3)

Using the criteria for classification, select the rhythm that most closely resembles second-degree AV block, type I.

A.



B.



1. Which distinguishing feature(s) led you to make the selection?

_____

_____

9.4 Second-Degree Atrioventricular (AV) Block, Type II (Mobitz II)

Second-degree atrioventricular block, Mobitz II, is often referred to as the classical heart block because it was the first rhythm observed to have an occasionally blocked complex (Figure 9-5). The atrioventricular node selects which electrical impulses it will block (see Figure 9-6). Occasionally,

Figure 9-5 Second-degree AV block, type II (Mobitz II).

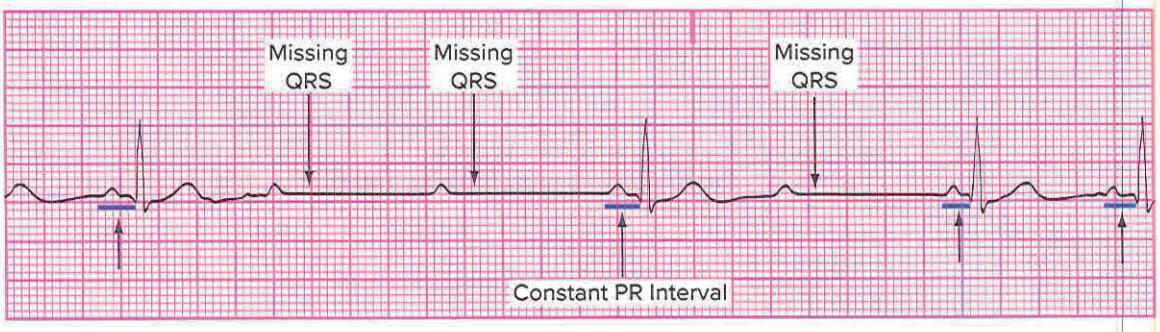
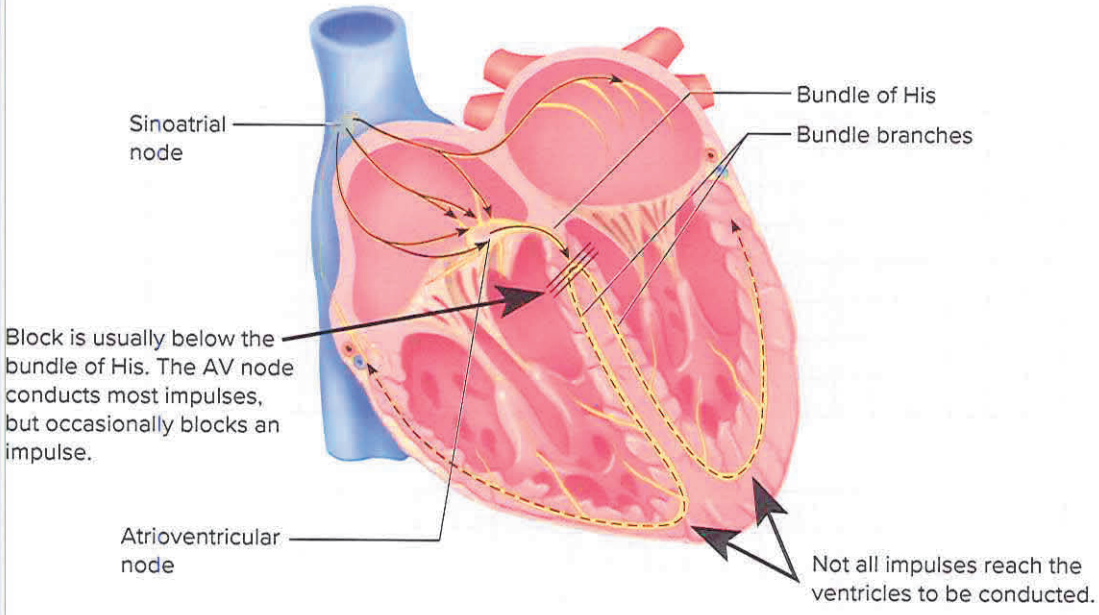


Figure 9-6 Electrical impulses in second-degree AV block, Mobitz type II.



the blocked QRS complexes will occur in a pattern. It might be seen as two, three, or four P waves between each QRS complex. When second-degree type II occurs in this fashion, it is often referred to by the ratio of P waves to each QRS (e.g., second-degree type II 2:1 or second-degree type II 3:1). When in doubt, refer to the Interpret-TIP for this dysrhythmia. There is usually no pattern or reason for the dropping of the QRS complex. This dysrhythmia frequently progresses to third-degree atrioventricular block.

Criteria for Classification

- ***Rhythm:*** The P-P interval is regular. The R-R interval may or may not be irregular due to the unpredictable nature of the blocked impulse(s). R-R intervals are occasionally in a pattern.
- ***Rate:*** The atrial rate is within normal limits. The ventricular rate is slower than the atrial rate. The atrial and ventricular rates are not the same.
- ***P wave morphology:*** The P wave morphology will be normal, with a normal size and upright wave. There is at least one P wave for every QRS complex, and there are more P waves than QRS complexes.
- ***PR interval:*** The PR interval is normal and constant with each conducted beat.
- ***QRS duration and morphology:*** The QRS duration and morphology should be within normal limits of 0.06 to 0.10 second.

Interpret-TIP

Second-Degree AV Block, Mobitz Type II

QRS complexes are missing, but, wherever a P is with the QRS complex, the PR interval always measures the same.

TABLE 9-1 Differences Between Second-Degree Heart Blocks

Type of Heart Block	PR Interval	Etiology	Treatment
Second-degree AV block, Type I (Mobitz I or Wenckebach)	Increases steadily from one complex to the next until an impulse is blocked, then resets	Temporary	May resolve itself; observe cardiac output and wait until the PR intervals vary and the blocked QRS complexes occur
Second-degree AV block, Type II (Mobitz II or classical block)	Constant PR interval throughout the rhythm strip	Chronic and more critical	Can quickly lead to a complete heart block, a life-threatening situation that needs immediate attention: call 911 or Code Blue. Transcutaneous pacing may be placed on standby. The use of this device may be directly related to the speed of ventricular depolarization or the frequency of blocked QRS complexes. Either of these circumstances may dramatically affect cardiac output.

How the Patient Is Affected and What You Should Know

Observe the patient for signs and symptoms of low cardiac output, because this rhythm frequently progresses very quickly to a third-degree atrioventricular block, or complete heart block (CHB), usually within seconds. Recognition of the classical block pattern versus the Wenckebach pattern is essential. See Table 9-1 for differences between second-degree heart blocks. The classical (Mobitz II) block is more critical and can quickly lead to a complete heart block and a life-threatening situation. When your patient is experiencing second-degree heart block, Mobitz II, you should immediately report it to a licensed practitioner; and, if trained, you should prepare for a Code Blue and application of a temporary external pacemaker.

Think It Through

Mobitz I versus Mobitz II

To quickly determine the difference between a second-degree, Mobitz I (type I, or Wenckebach) and a second-degree, Mobitz II (classical) AV block, first look for missing QRS complexes. Once this is determined, analyze the PR interval of the rhythm. If the PR interval is in a progressively pronging pattern, followed by a missing QRS, then it is second-degree type I (Wenckebach). If the PR interval remains the same, then it is second-degree type II.

Remember the mnemonic "Lengthen, Lengthen, drop equals Wenckebach."

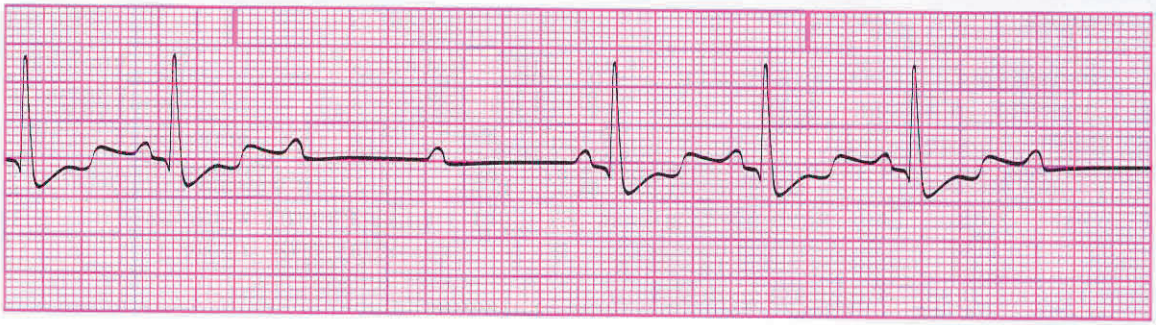
Both rhythms should be reported; however, second-degree type II is a highly unstable dysrhythmia and is a critical condition. Second-degree type I is typically a much more stable rhythm; it is usually transient with a low degree of conversion to complete heart block.

What does the mnemonic "Lengthen, Lengthen, drop equals Wenckebach" mean?

Checkpoint Question (LO 9.4)

Using the criteria for classification, select the rhythm that most closely resembles second-degree AV block type II.

A.



B.

1. Which distinguishing feature(s) led you to make the selection?

_____

_____

9.5 Third-Degree Atrioventricular (AV) Block (Complete)

Third-degree atrioventricular block is also known as *third-degree heart block* or *complete heart block* (CHB). All electrical impulses originating above the ventricles are blocked and prevented from reaching the ventricles (see Figure 9-7). There is no correlation between atrial and ventricular depolarization. As a result, the P-P and R-R intervals are noticeably and suspiciously **dissociative.** Although the intervals are regular when measured, the atria and ventricles fire at completely different rates, resulting in a variable PR interval. This is due to the block. The ventricular rate is slower than the atrial rate. This is the only heart block rhythm that might have buried P waves. This is due to the two separate pacemakers governing the atrial and ventricular activity (Figure 9-8).

dissociative Not related at all; the atria and the ventricles beat entirely independently of each other.

Figure 9-7 Electrical impulses in third-degree heart block. A pacemaker would be required.

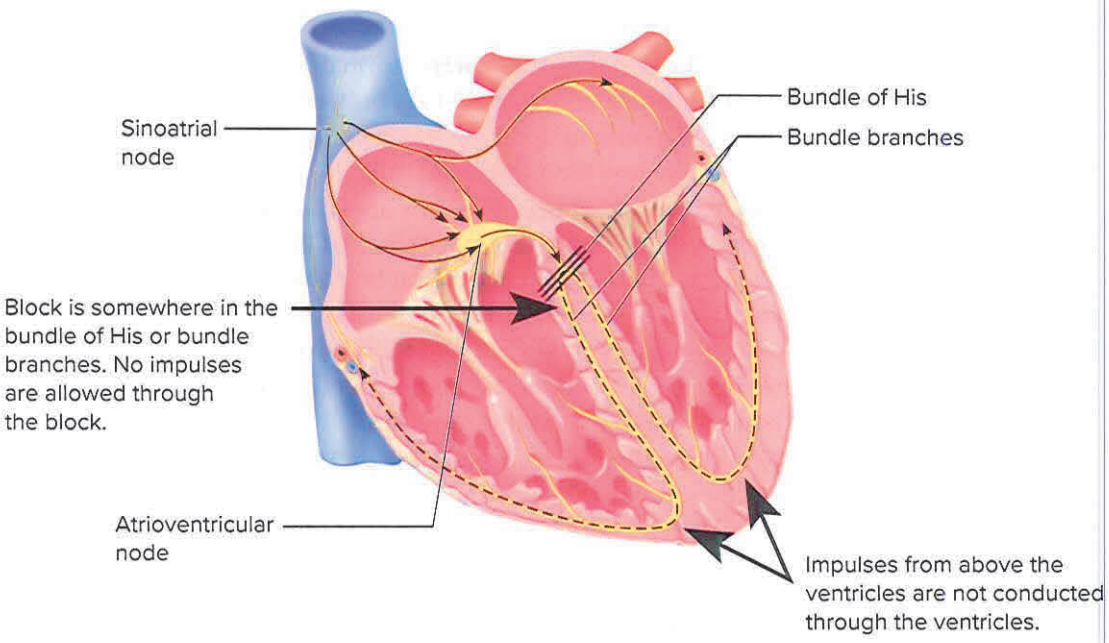
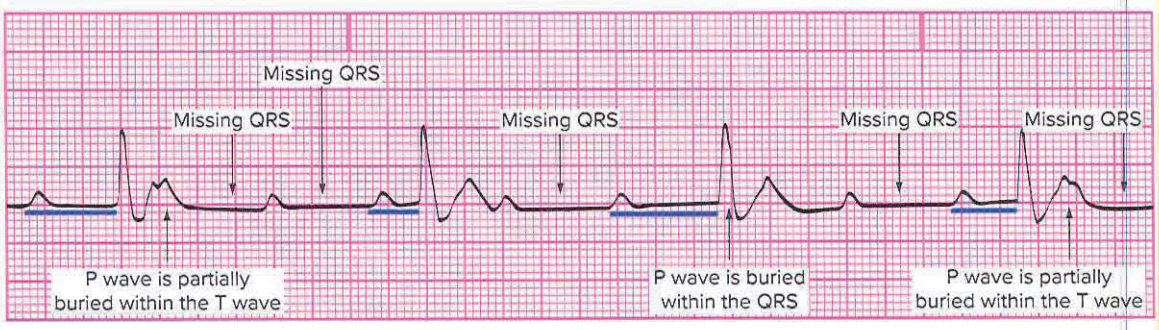


Figure 9-8 Third-degree AV block (complete heart block).



The rate of the ventricular response and the morphology of the QRS complex depend on the level of the block. If the block is low in the ventricular conduction system, the pacemaker comes from the slow (20 to 40 beats per minute) Purkinje network. The QRS complex in this instance would measure 0.12 second or greater.

If the block is higher in the conduction system and the impulse causing ventricular depolarization is coming from the area of the AV junction (bundle of His), then the rate is likely to be 40 to 60 beats per minute and the QRS complex will present with a normal, narrow appearance measuring 0.06 to 0.10 second. The ventricular rate and QRS morphology are keys indicating the level of the heart block.

Criteria for Classification

- ***Rhythm:*** The P-P interval is regular. The R-R interval is also regular, but the P-P and R-R intervals are different.
- ***Rate:*** The atrial rate is within normal limits of 60 to 100 beats per minute. The ventricular rate is slow, between 20 and 40 or 40 to 60 beats per minute, depending upon the pacemaker site. (Either way, the ventricular rate will be less than the atrial rate.)
- ***P wave morphology:*** P waves are of normal size and morphology, but the location may be buried within the QRS, either before or after the QRS complex. There is no correlation between the P waves and the QRS complex. More P waves will be noted than QRS complexes, and not every P wave will have a QRS complex following it.
- ***PR interval:*** PR intervals are variable due to the atrial and ventricular tissue depolarizing at different rates.
- ***QRS duration and morphology:*** The QRS duration and morphology are the same, but the measurements may be either within normal limits or wide, depending on the area of the blockage.

Interpret-TIP

Third-Degree (Complete) Heart Block

In third-degree atrioventricular block, the P-P and R-R intervals are regular (constant), but the atria and ventricles are firing at different rates. This is the only heart block in which the P waves can be buried inside a QRS complex or T wave.

How the Patient Is Affected and What You Should Know

With a complete heart block, the atria and the ventricles are electrically separated from one another. The atria and ventricles fire at different rates because different pacemaker sites are initiating depolarization of those areas of the heart. This condition results in a loss of atrial kick. Due to the loss of atrial kick and reduced ventricular rate, the patient often exhibits signs and symptoms of low cardiac output. The slower ventricular rate increases the likelihood that the patient will be unconscious and require immediate medical intervention.

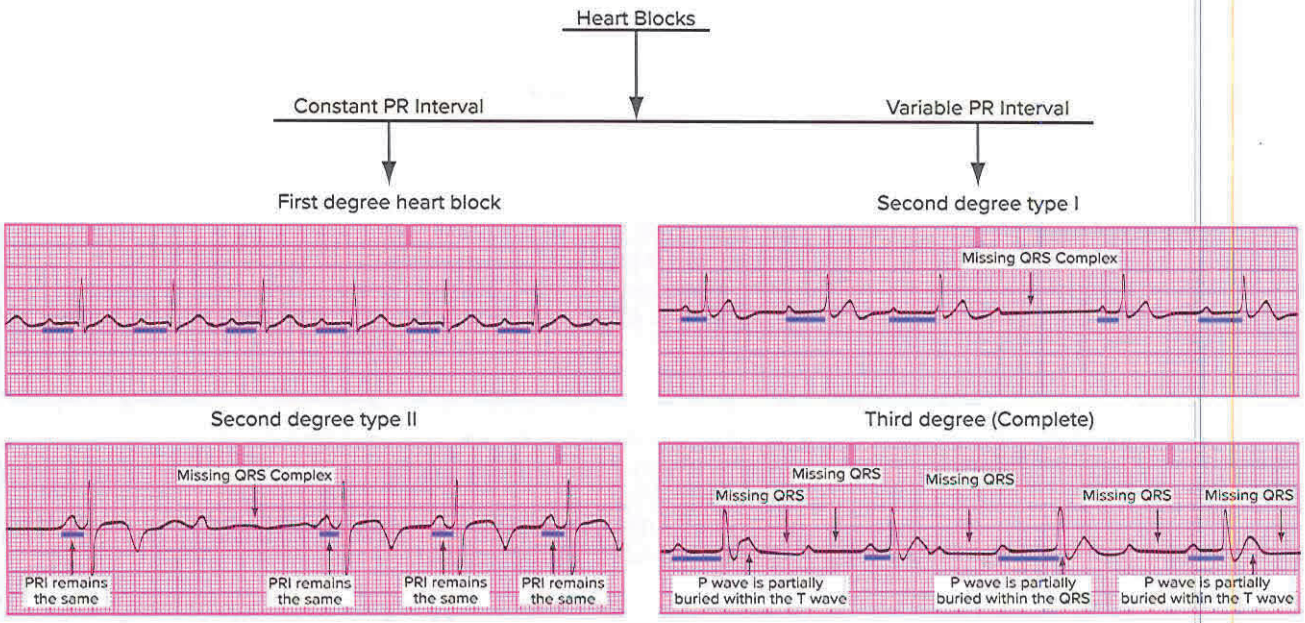
When the patient is in third-degree AV block, your first responsibility is to observe the patient for signs and symptoms of low cardiac output. If the patient displays any signs and symptoms, notify a licensed practitioner immediately.

It may be necessary to initiate a cardiac arrest, rapid response, or Code Blue alarm. A temporary pacemaker should be available and ready for application as deemed necessary by the licensed practitioner. All rhythm strips should be mounted and identified in the patient's medical record as documentation of the dysrhythmia.

Comparing Heart Blocks

Understanding the differences between the different heart block dysrhythmias is essential. Figure 9-9 shows a comparison so you can identify the distinguishing characteristics of each.

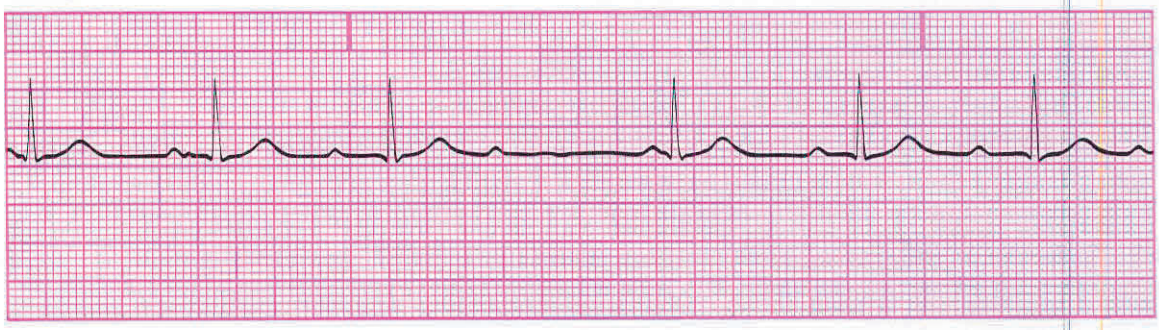
Figure 9-9 Distinguishing features of heart block types.



Checkpoint Question (LO 9.5)

Using the criteria for classification, select the rhythm that most closely resembles third-degree AV block (complete heart block).

A.



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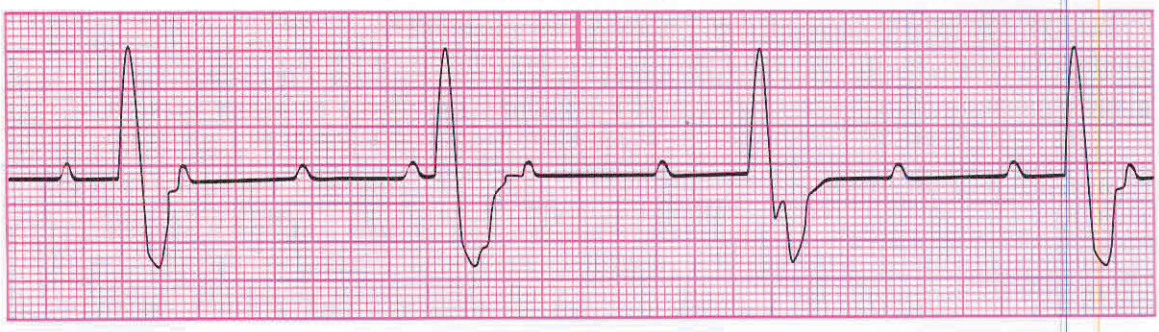


1. Which distinguishing feature(s) led you to make the selection?

Chapter Summary

Learning Outcomes	Summary	Pages
9.1 Describe the various heart block dysrhythmias.	In heart block rhythms, the electrical current has difficulty traveling along the normal conduction pathway, causing a delay in or absence of ventricular depolarization. The degree of blockage depends on the area affected and the cause of the delay or blockage. The P-P interval is regular with all heart blocks. There are three levels of heart blocks.	**204**
9.2 Analyze first-degree atrioventricular (AV) block and its effect on the patient, including basic patient care and treatment.	First-degree AV block is a delay in electrical conduction from the SA node to the AV node, usually around the AV node, which slows the electrical impulses as they travel to the ventricular conduction system. Observe and monitor the cardiac output parameters to determine how well the patient is tolerating this rhythm.	**204–206**
9.3 Analyze second-degree atrioventricular (AV) block, Mobitz I, and its effect on the patient, including basic patient care and treatment.	Second-degree heart block type I displays a progressive prolongation of the PR interval until the QRS complex is blocked (nonconducted), then the pattern resets in a repetitious manner. This is typically a very stable dysrhythmia. If the third QRS complex is blocked once, then the third complex will always be blocked. Treatment is based upon how the patient is tolerating the rhythm so the patient should be closely monitored.	**206–209**
9.4 Analyze second-degree atrioventricular (AV) block, Mobitz II, and its effect on the patient, including basic patient care and treatment.	Second-degree atrioventricular block, Mobitz II, is often referred to as the "classical" heart block. The atrioventricular node selects which electrical impulses it will block. No pattern or reason for the dropping of the QRS complex exists. Frequently, this dysrhythmia progresses to third-degree atrioventricular block.	**209–212**
9.5 Analyze third-degree atrioventricular (AV) block and its effect on the patient, including basic patient care and treatment.	Third-degree atrioventricular block is also known as *third-degree heart block* or *complete heart block (CHB)*. All electrical impulses originating above the ventricles are blocked and prevented from reaching the ventricles. There is no correlation between atrial and ventricular depolarization. In third degree atrioventricular block, the P-P and R-R intervals are regular (constant) but firing at different rates. Close monitoring and observation is needed. Cardiac arrest may occur and a temporary pacemaker may need to be inserted.	**212–215**

Chapter Review

Multiple Choice

Circle the correct answer.

1. Which heart block rhythm has the distinguishing feature of a PR interval that measures greater than 0.20 second and measures the same duration each time? (LO 9.2)
   a. First-degree heart block
   b. Second-degree type I
   c. Second-degree type II
   d. Third-degree heart block

2. Which of the following heart block dysrhythmias is identified by a repetitious prolonging PR interval pattern after each blocked QRS complex? (LO 9.3)
   a. First-degree heart block
   b. Second-degree type I
   c. Second-degree type II
   d. Third-degree heart block

3. Which of the following heart block dysrhythmias is identified by missing QRS complexes and a consistent PR interval measurement? (LO 9.4)
   a. First-degree heart block
   b. Second-degree type I
   c. Second-degree type II
   d. Third-degree heart block

4. Which of the following heart block dysrhythmias is identified by regular P-P and R-R intervals that are firing at two distinctly different rates? (LO 9.5)
   a. First-degree heart block
   b. Second-degree type I
   c. Second-degree type II
   d. Third-degree heart block

5. P-P intervals are _____ with all heart block dysrhythmias. (LO 9.2–9.5)
   a. irregular
   b. absent
   c. regular
   d. progressively prolonged

6. QRS complexes that measure 0.12 second or greater with a rate between 20 and 40 beats per minute indicate that the impulses causing ventricular depolarization are coming from the _____. (LO 9.5)
   a. SA node
   b. interatrial pathways
   c. AV node
   d. Purkinje fibers (ventricles)

7. What is the typical heart rate range for first-degree heart block? (LO 9.2)
   a. 20–40 beats per minute
   b. 40–60 beats per minute
   c. 60–100 beats per minute
   d. 100–150 beats per minute

8. Frequent nonconducted QRS complexes are likely to cause signs of _____. (LO 9.3, 9.4, 9.5)
   a. high cardiac output
   b. low cardiac output
   c. kidney failure
   d. congestive heart failure

9. Which heart block dysrhythmia has regular P-P and R-R intervals with both having the same rate? (LO 9.2)
   a. First-degree heart block
   b. Second-degree type I
   c. Second-degree type II
   d. Third-degree heart block

10. Which heart block dysrhythmia is known as the "classical" heart block? (LO 9.4)
   a. First-degree heart block
   b. Second-degree type I
   c. Second-degree type II
   d. Third-degree heart block

Short Answer

11. Name the heart block rhythms described in this chapter. Which one is most serious? (LO 9.2–9.5)

_____

_____

12. How can you tell the difference between a Mobitz I and Mobitz II heart block? (LO 9.3, 9.4)

_____

_____

13. What should you do if the patient has a third-degree heart block? (LO 9.5)

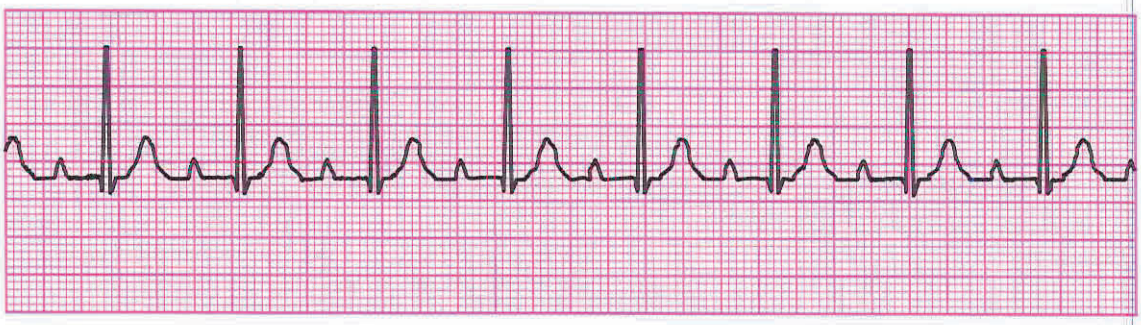
_____

_____

Critical Thinking Application *Rhythm Identification*

Review the dysrhythmias pictured here and, using the criteria for classification provided in the chapter as clues, identify each rhythm and provide what information you used to make your decision. (LO 9.2–9.5)

14.

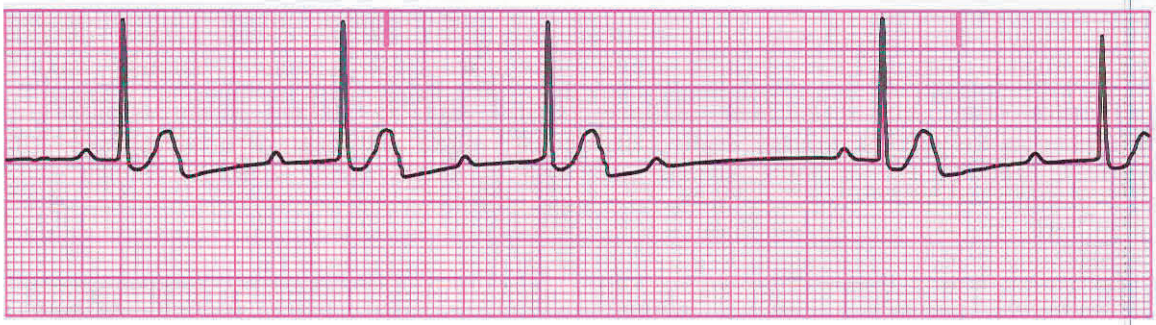


Rhythm (regular or irregular): _____ PR interval: _____

Rate: _____ QRS: _____

P wave: _____ Interpretation: _____

15.

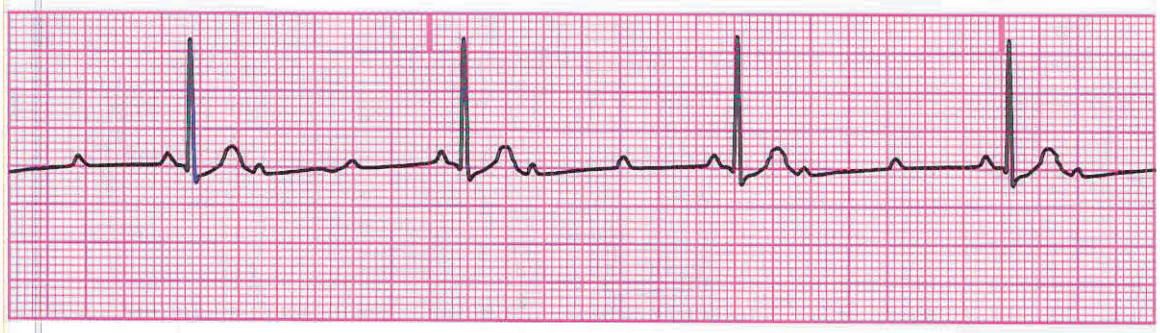


Rhythm (regular or irregular): _____ PR interval: _____

Rate: _____ QRS: _____

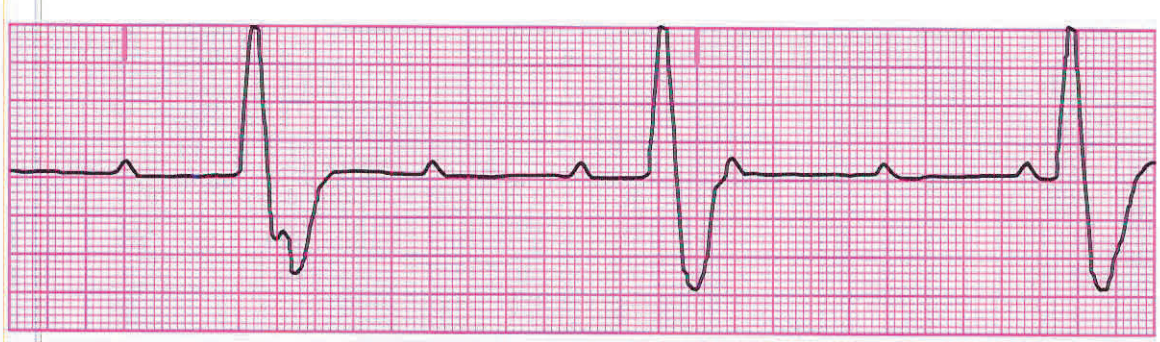
P wave: _____ Interpretation: _____

16.



Rhythm (regular or irregular): _____ PR interval: _____
Rate: _____ QRS: _____
P wave: _____ Interpretation: _____

17.

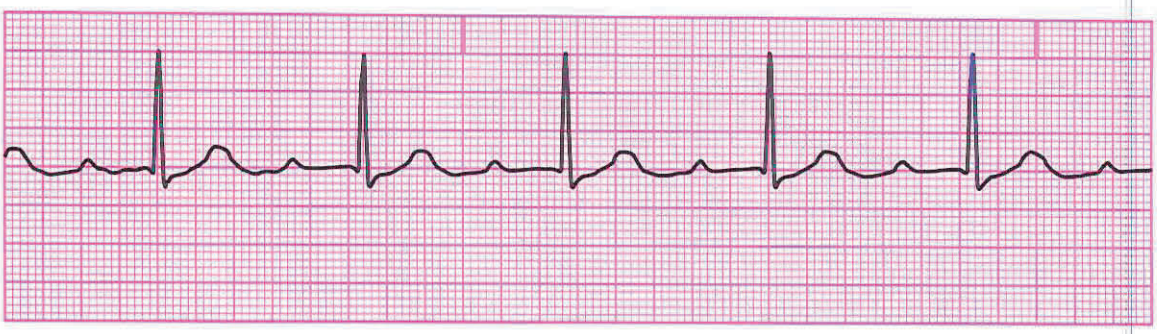


Rhythm (regular or irregular): _____ PR interval: _____
Rate: _____ QRS: _____
P wave: _____ Interpretation: _____

18.

Rhythm (regular or irregular): _____ PR interval: _____
Rate: _____ QRS: _____
P wave: _____ Interpretation: _____

19.



Rhythm (regular or irregular): _____ PR interval: _____

Rate: _____ QRS: _____

P wave: _____ Interpretation: _____

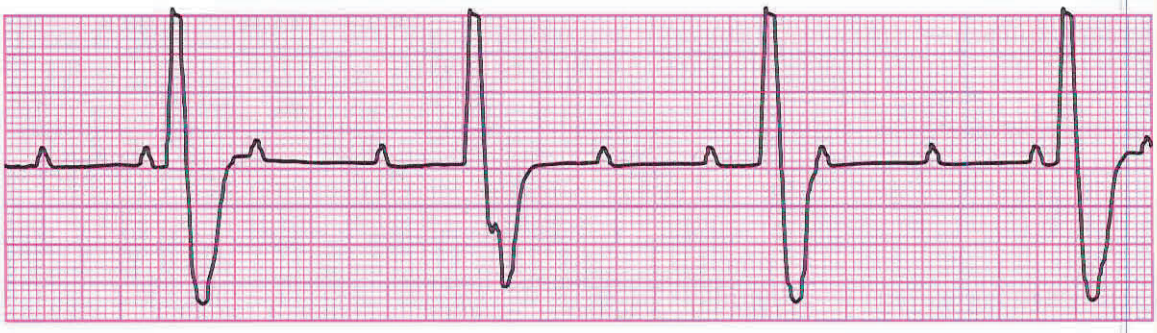
20.

Rhythm (regular or irregular): _____ PR interval: _____

Rate: _____ QRS: _____

P wave: _____ Interpretation: _____

21.

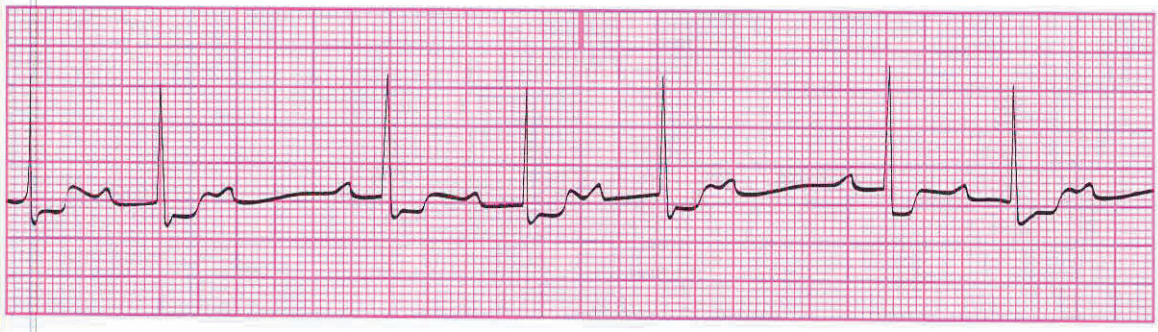


Rhythm (regular or irregular): _____ PR interval: _____

Rate: _____ QRS: _____

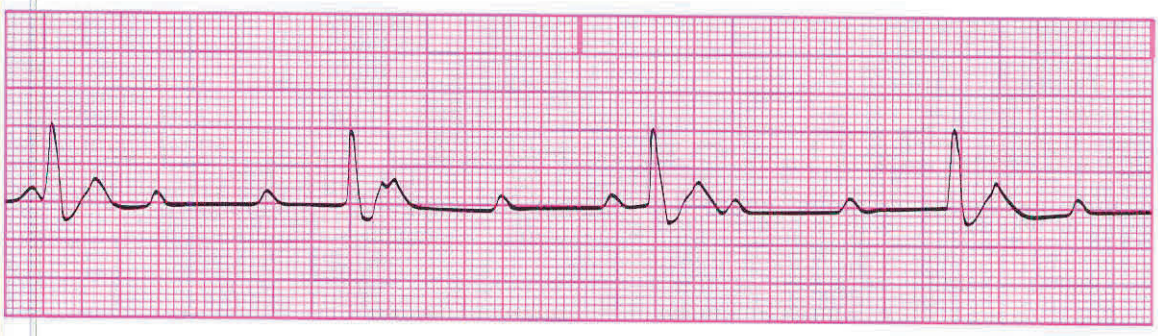
P wave: _____ Interpretation: _____

22.



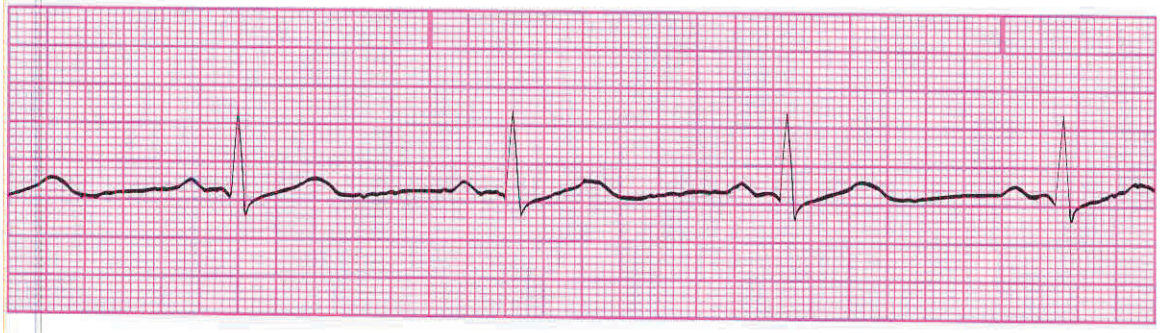
Rhythm (regular or irregular): _____ PR interval: _____
Rate: _____ QRS: _____
P wave: _____ Interpretation: _____

23.



Rhythm (regular or irregular): _____ PR interval: _____
Rate: _____ QRS: _____
P wave: _____ Interpretation: _____

24.



Rhythm (regular or irregular): _____ PR interval: _____
Rate: _____ QRS: _____
P wave: _____ Interpretation: _____

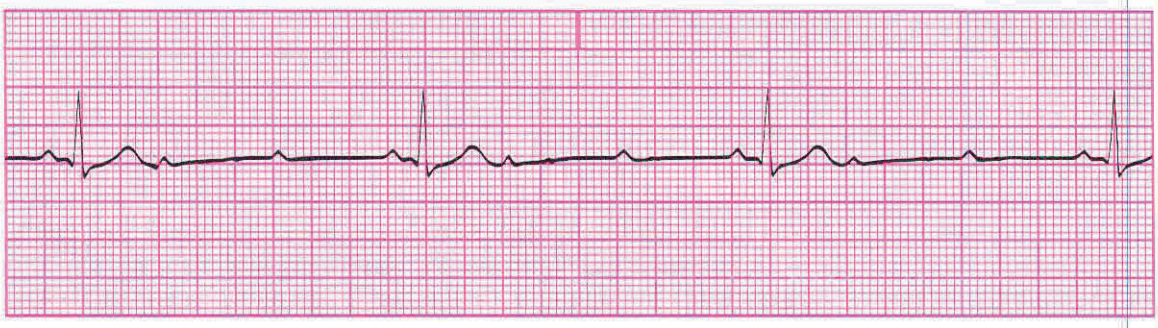
25.

Rhythm (regular or irregular): _____ PR interval: _____

Rate: _____ QRS: _____

P wave: _____ Interpretation: _____

26.



Rhythm (regular or irregular): _____ PR interval: _____

Rate: _____ QRS: _____

P wave: _____ Interpretation: _____

Now that you have completed the material in the textbook, go to Connect and complete any chapter activities you have not yet done.