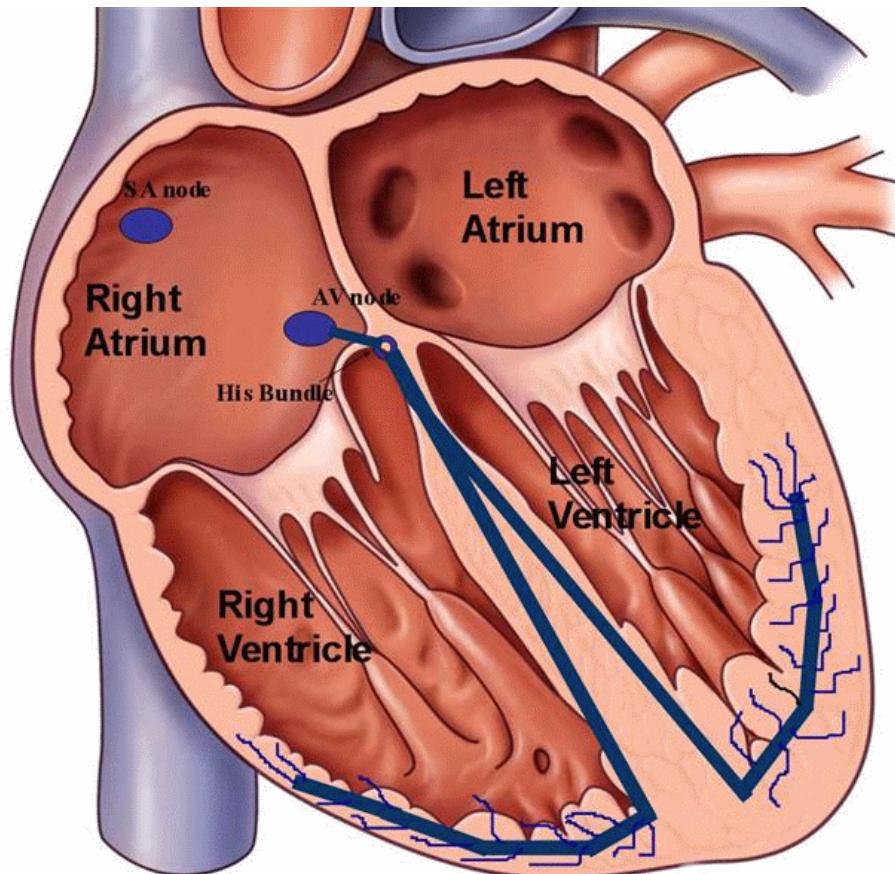


Heart Blocks

Heart Blocks Overview

- Occur when there is a partial or complete interruption in the cardiac electrical conduction system
- Interruption occurs in one of two areas:
 - Between atria and the Bundle of His
 - In ventricles between AV junction and Purkinje's fibers
- Appearance of P wave and QRS, rate, and rhythm vary based on the type of block
- Block location and patient symptoms determines whether it is lethal

Heart Blocks Overview

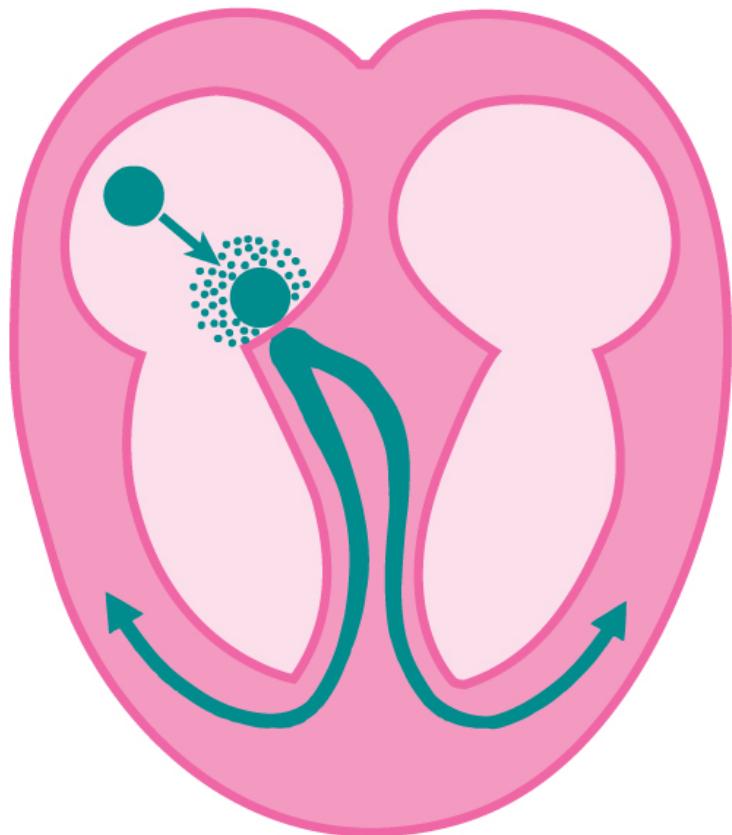


First-Degree Heart Block

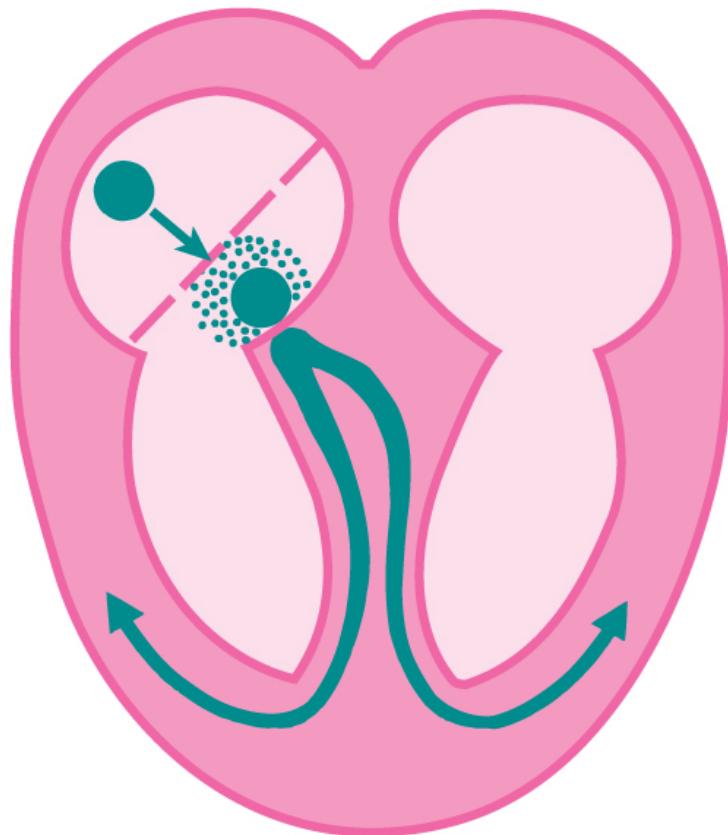
- **Caused by delay in conduction of impulse between atria and bundle of His**
 - Delay occurs when there is partial interruption or slowing in conduction of impulse through AV junctional area
- **Not a true block, but simply a delay**
 - Seen on monitor as prolonged PR interval (>0.20 second)

First-Degree Heart Block

Normal conduction

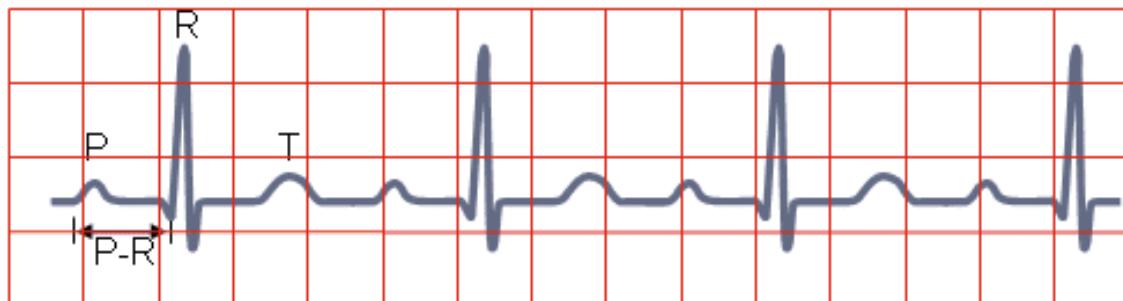
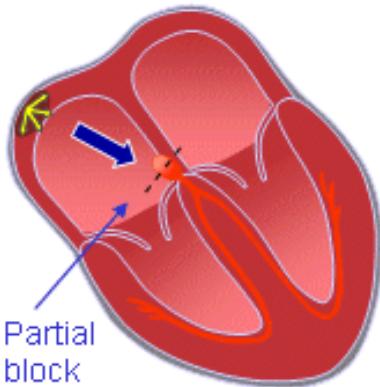


Abnormal conduction



First-Degree Heart Block

A-V BLOCK, FIRST DEGREE
Atrioventricular conduction lengthened



P-wave precedes each QRS-complex but interval is > 0.2 s

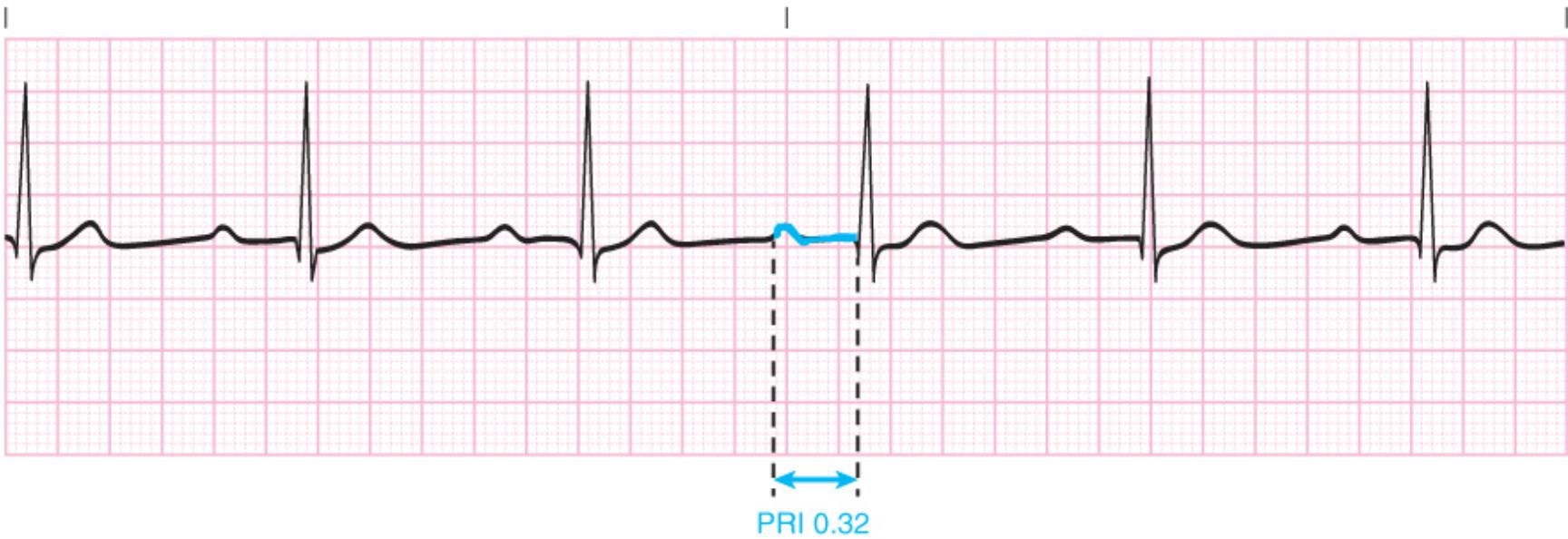
First-Degree Heart Block

- **P wave before every QRS**
 - P to P and R to R intervals usually regular
- **Rate may be:**
 - Normal
 - Bradycardic
 - Tachycardic
- **When describing a rhythm containing a first-degree heart block, identify the underlying rhythm first**
 - **Example: Sinus bradycardia with first-degree heart block**

First-Degree Heart Block

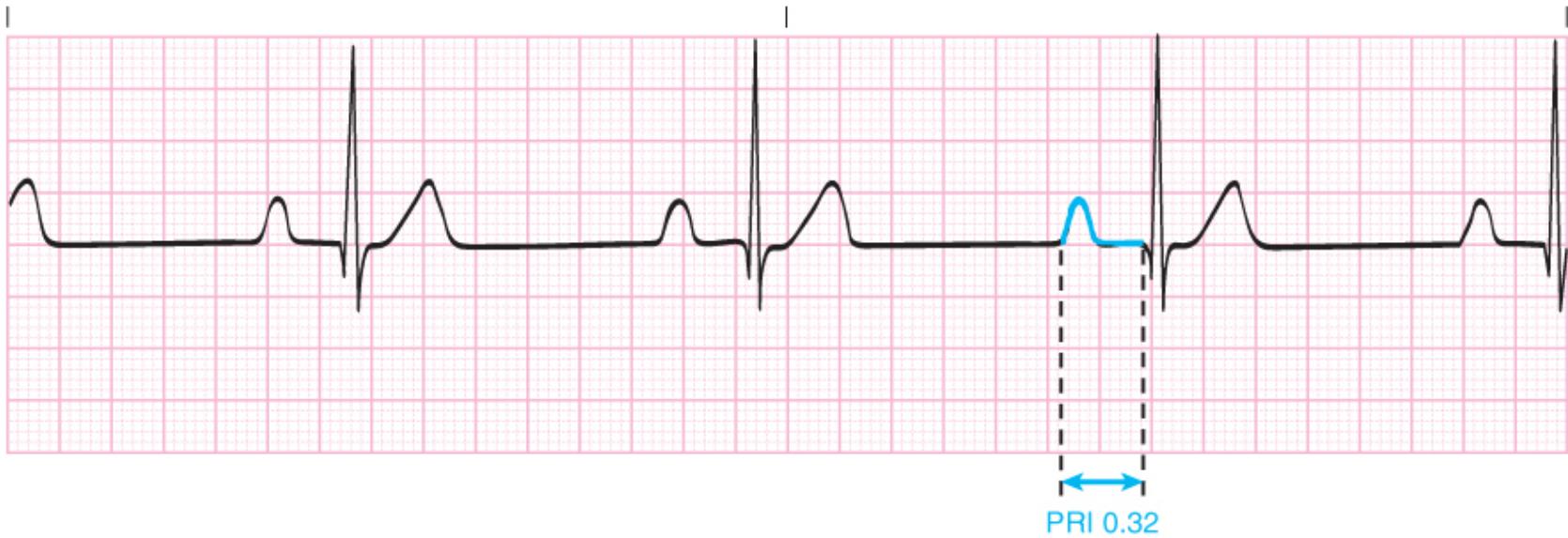
- Not usually a serious dysrhythmia but may indicate damage to myocardium
 - Assess patient, especially if this is a recent change in patient's electrical conduction system
- May be caused by MI or medications such as beta-blockers

First-Degree Heart Block



PR interval greater than 0.20 second: The delay is seen on the monitor screen or rhythm strip as a prolonged PR interval.

First-Degree Heart Block



Sinus bradycardia with first-degree heart block: PR interval, 0.32 second; heart rate, 40 beats/min.

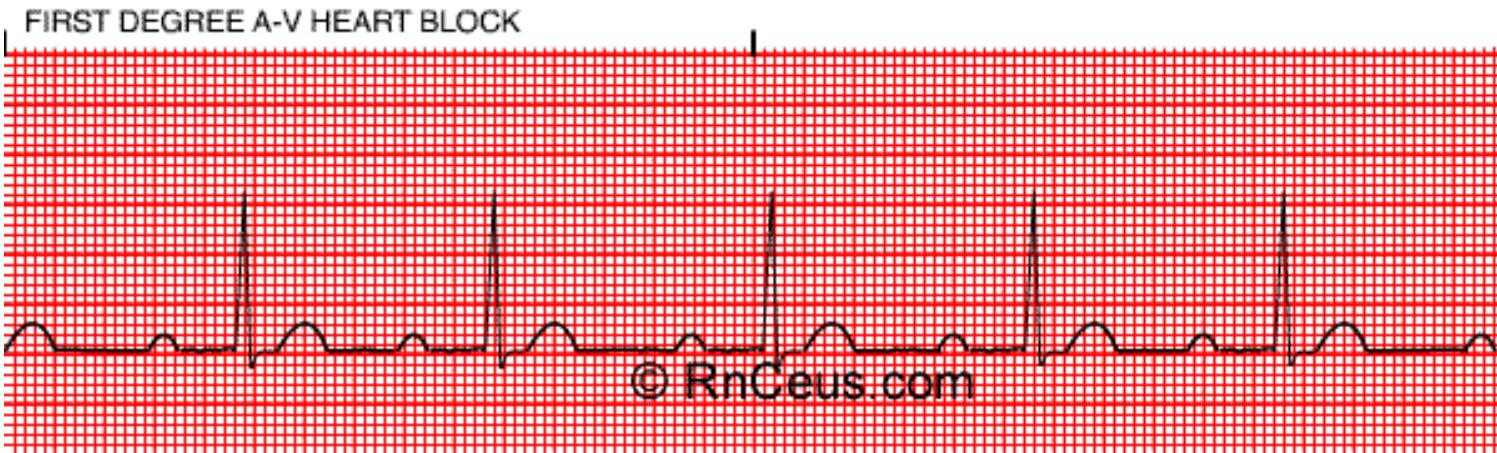
First-Degree Heart Block



First-Degree Heart Block



First-Degree Heart Block



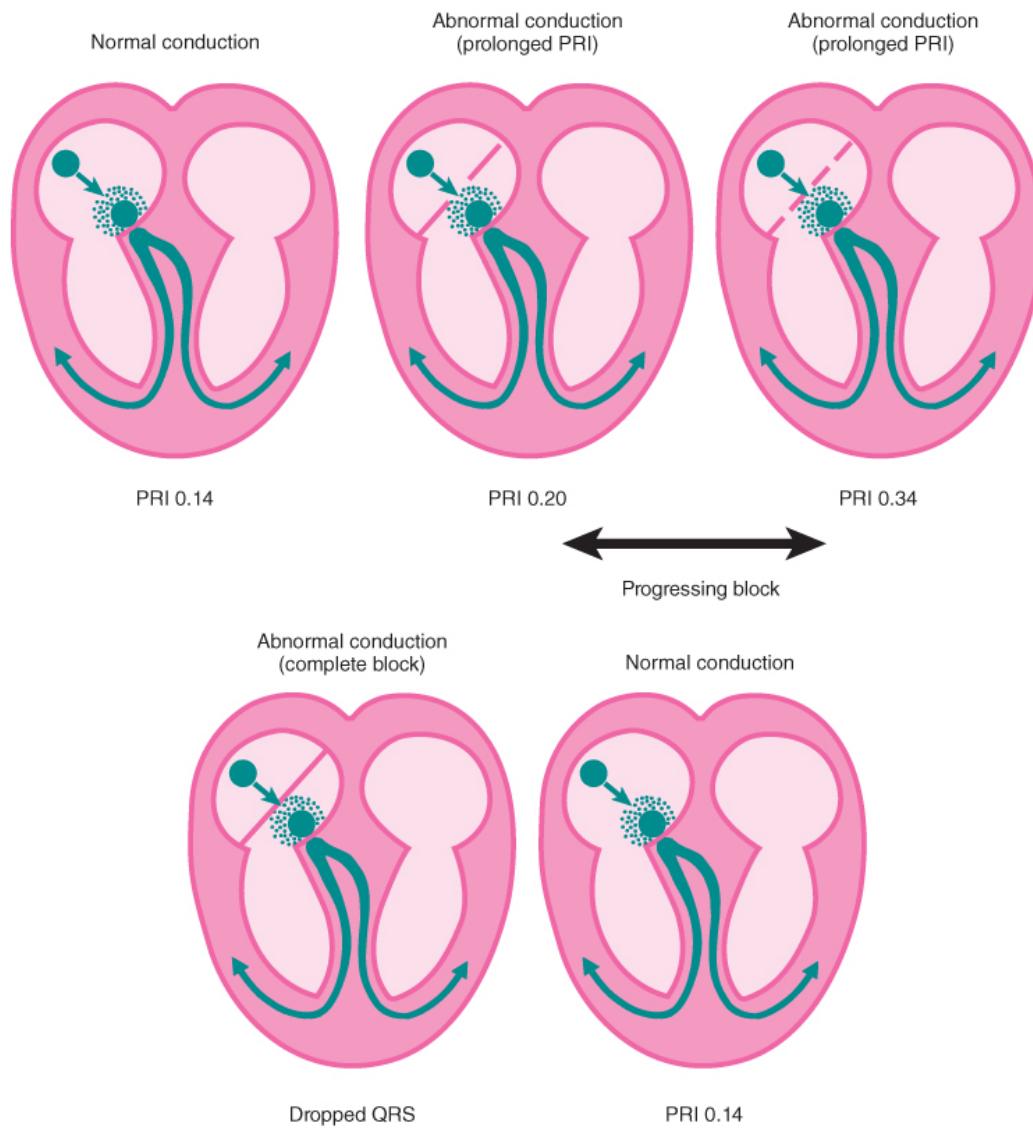
Second-Degree Heart Block

- **Occur when there is an interruption in conduction of impulse at or below AV junctional area**
- **Two types:**
 - Type I
 - Type II

Second-Degree Heart Block, Type I

- Also known as Mobitz I, Wenckebach, Classic
- Characterized by progressive lengthening of PR interval until loss of QRS complex
 - See P wave but not QRS
- Progressive heart block that occurs when impulse traveling from atria is interrupted at the AV junction, slowing conduction to the ventricles
- Interruption becomes longer with each impulse, delaying depolarization of ventricles (progressively delayed conduction) until interruption completely blocks the electrical conduction to the ventricles

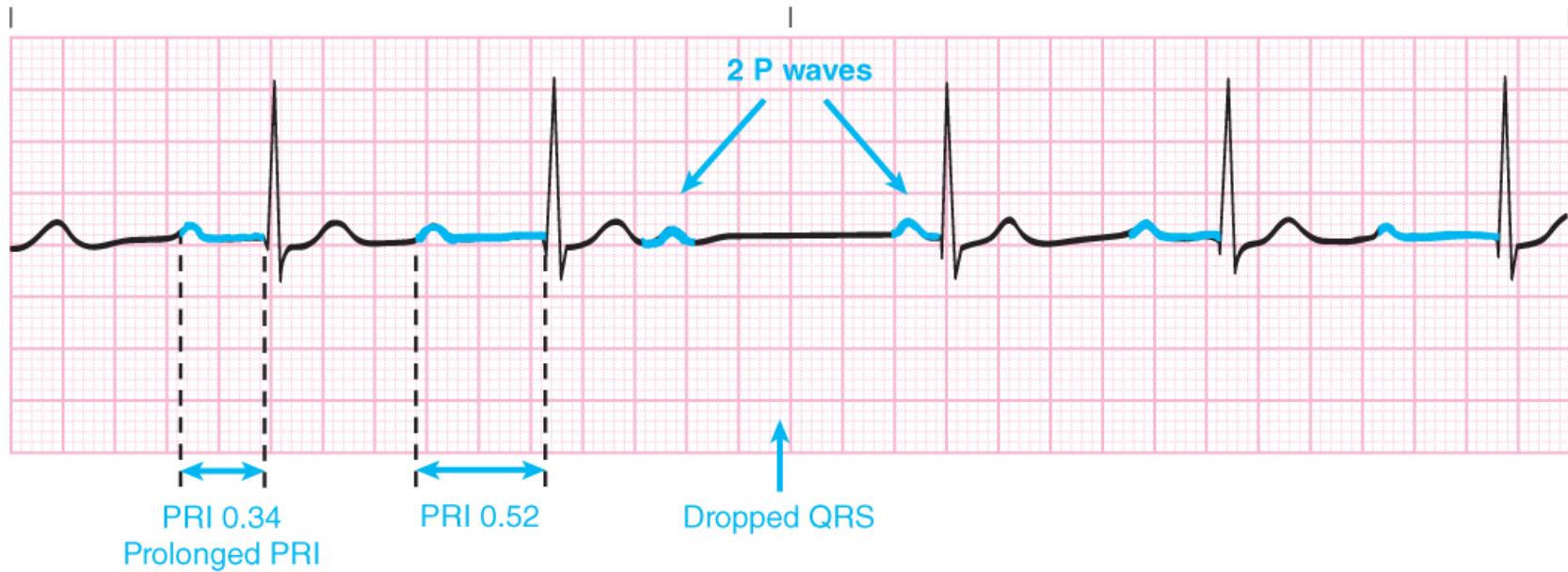
Second-Degree Heart Block, Type I



Second-Degree Heart Block, Type I

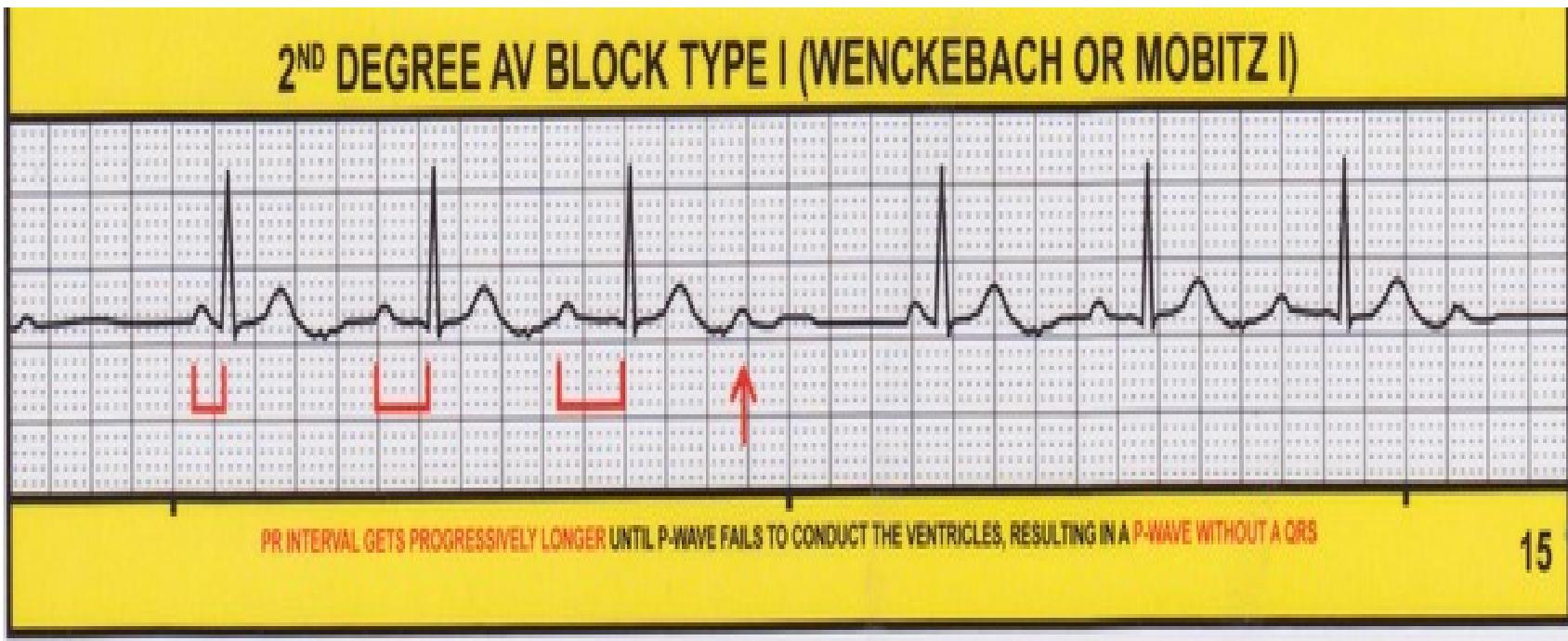
- PR interval immediately following dropped QRS returns to normal duration then begins to lengthen again
 - Pattern is repeated throughout dysrhythmia
- P wave occurs before every QRS and is same size and shape
- While PR interval gets longer, R-R intervals regular until QRS dropped
 - Overall rhythm is irregular and rate may vary

Second-Degree Heart Block, Type I



Second-degree heart block, type I: atrial heart rate, 60 beats/min; ventricular heart rate, 50 beats/min (bradycardic rate).

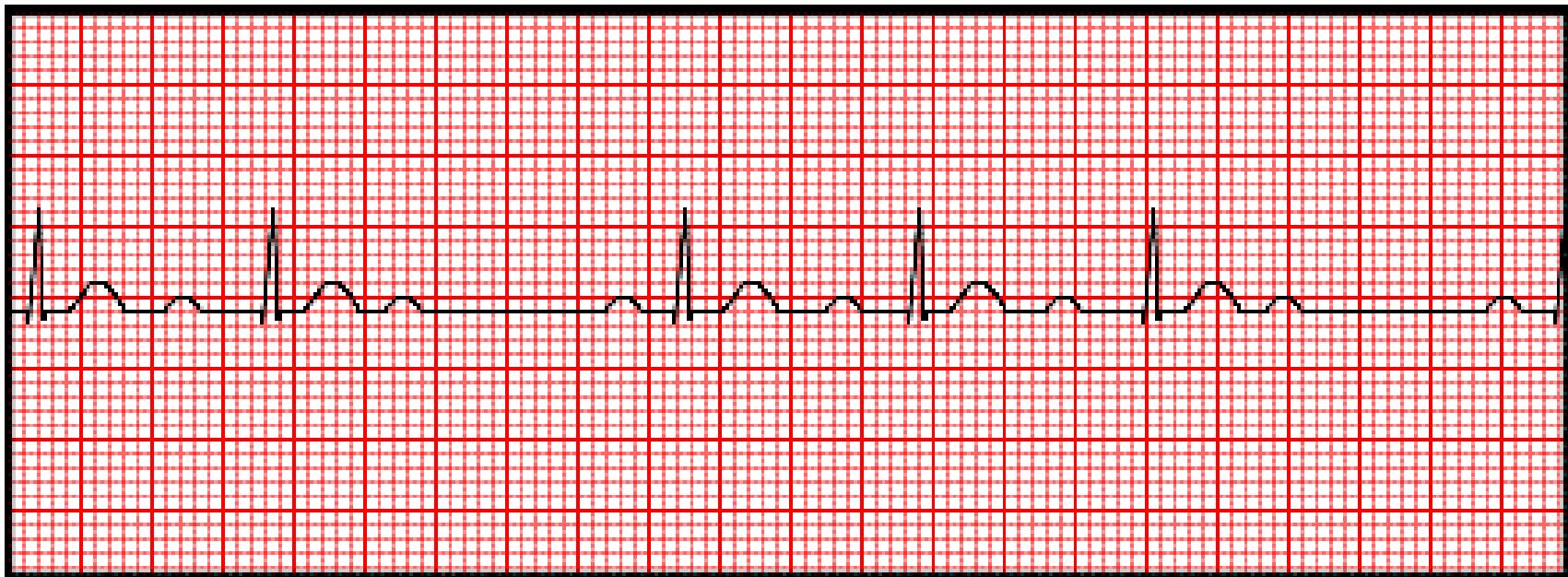
Second-Degree Heart Block, Type I



Second-Degree Heart Block, Type I



Second-Degree Heart Block, Type I



Second-Degree Heart Block, Type I



Second-Degree Heart Block, Type I

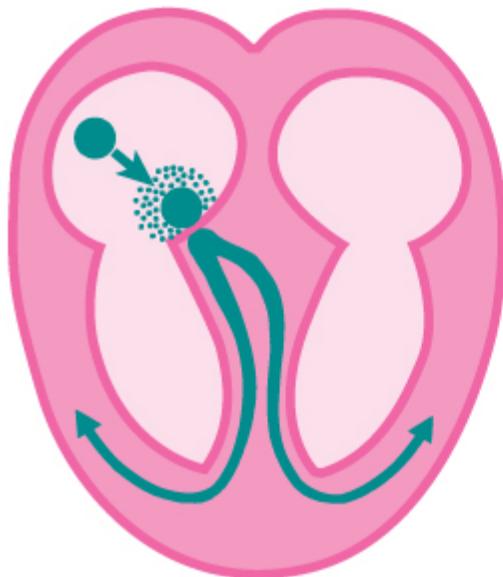
- **Not a lethal dysrhythmia but watch to see if patient becomes medically unstable**
 - Patient assessment is necessary to determine patient tolerance of dysrhythmia
 - May become unstable due to bradycardic rate, recent injury to cardiac muscle, or prior illness
- **May be serious when it indicates recent change in electrical conduction system following injury to cardiac muscle**
- **May be caused by infection, MI, or drug toxicity**

Second-Degree Heart Block, Type II

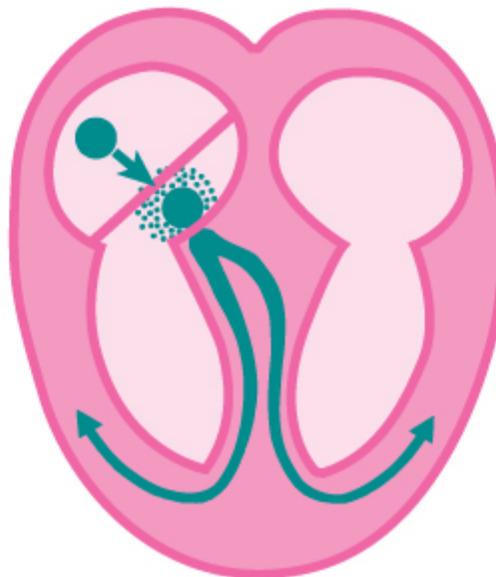
- **Also known as Mobitz II**
- **Occurs when there is an intermittent interruption in electrical conduction system near or below the AV node**
 - **Interruption not progressive but occurs suddenly and without warning**
 - Interruption known as intermittent heart block
 - Impulse does not get to the ventricles (completely blocked)

Second-Degree Heart Block, Type II

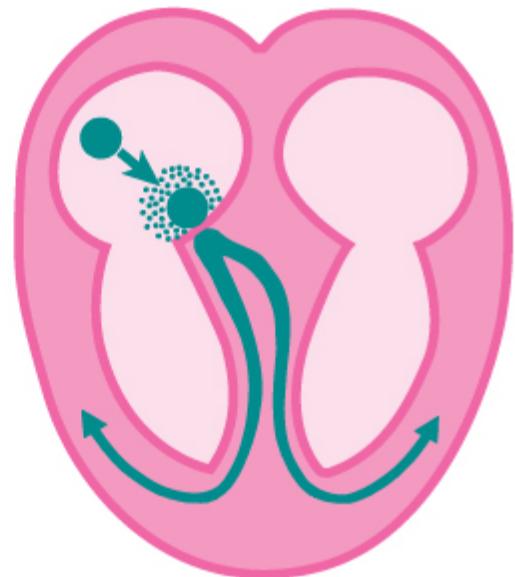
Normal conduction



Intermittent conduction block



Normal conduction



Dropped QRS

Second-Degree Heart Block, Type II

- **P wave before every QRS**
 - All P waves same size and shape
- **QRS follows every P wave until QRS is dropped (absent)**
- **PR intervals of underlying rhythm may be normal or prolonged**
- **Although QRS usually 0.04-0.12 second, complex will be wider if block occurs low in bundle branches**

Second-Degree Heart Block, Type II

- **Can occur in any rhythm that has a P wave followed by a QRS**
 - P to P intervals always regular
 - R to R intervals regular or irregular
 - Overall rhythm usually irregular and rate varies
- **Determine ratio of P waves to QRS to help determine severity of block**
 - 2 P waves before 1 QRS = 2:1 block/ratio
 - 3 P waves before 1 QRS = 3:1 block/ratio

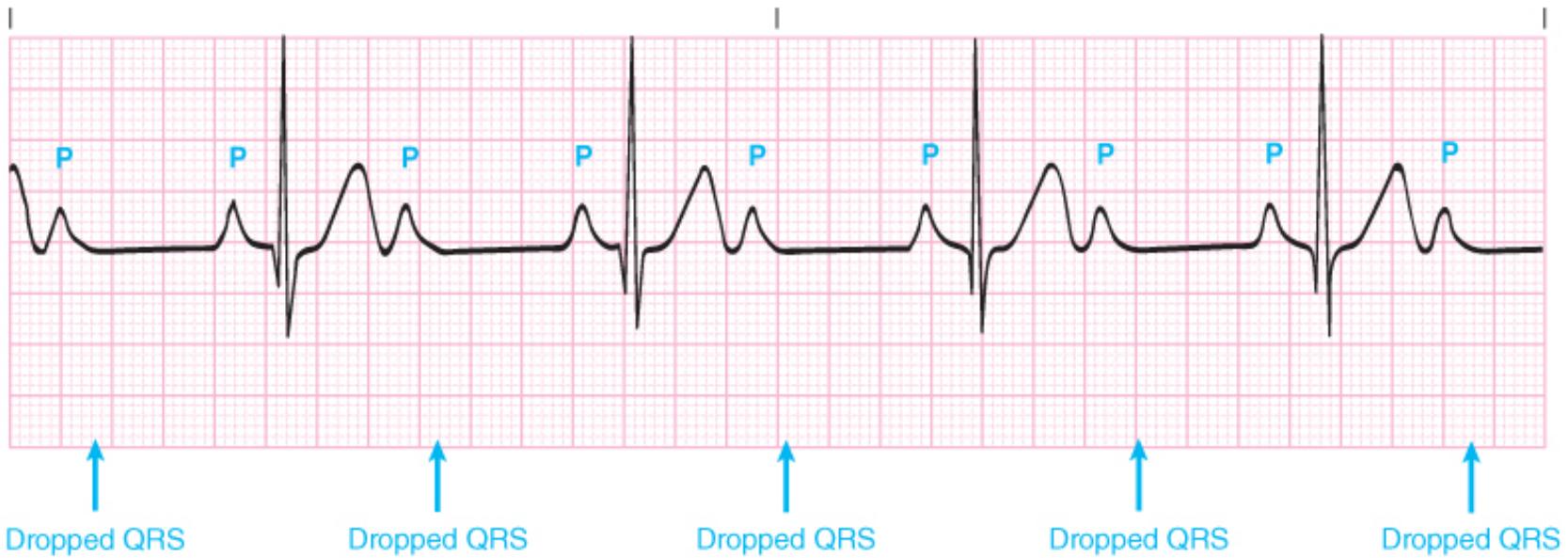
Second-Degree Heart Block, Type II

- **Determine frequency of occurrence**
 - May be in a pattern or random
 - No pattern = more serious as block is irregular
 - Becomes more serious as ratio of P waves to QRS increases or if ratio varies
- **Can be life threatening due to increased irritability of myocardium and may lead to more serious block, like third-degree heart block**
- **If block severe enough, VR may become bradycardic**
 - VR < 40 ipm usually not sufficient to maintain adequate circulation to vital organs of body

Second-Degree Heart Block, Type II

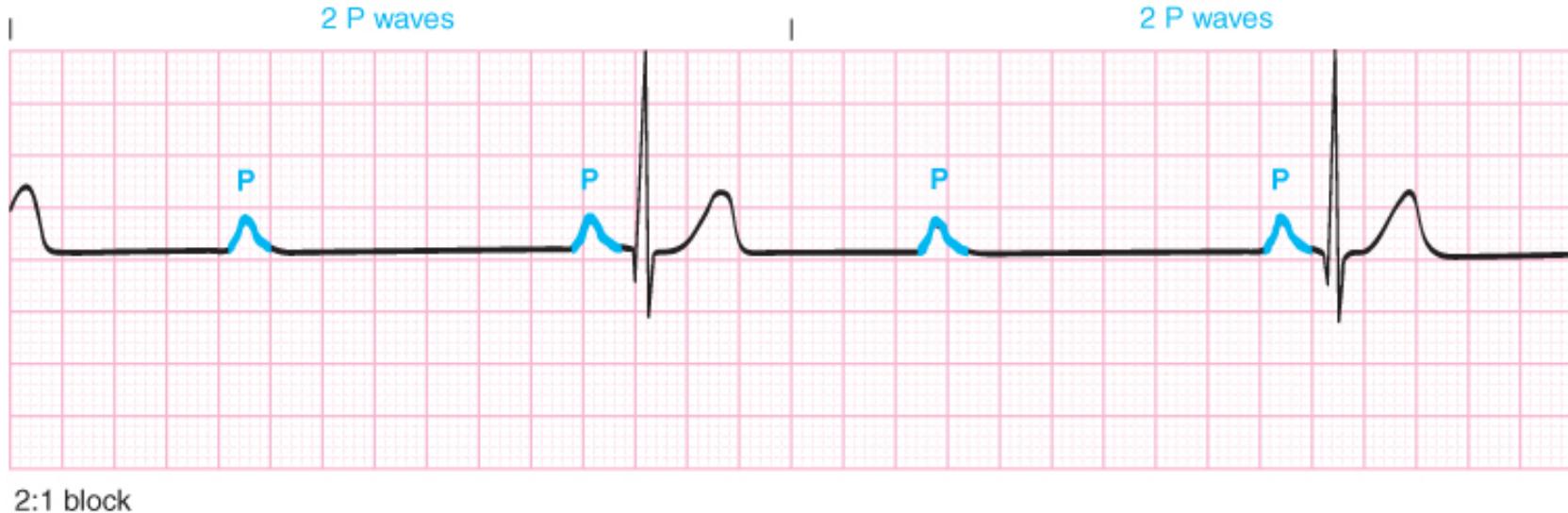
- **Frequent assessment very important to determine patient tolerance of dysrhythmia**
- **May be caused by MI, heart disease, or drug toxicity**

Second-Degree Heart Block, Type II



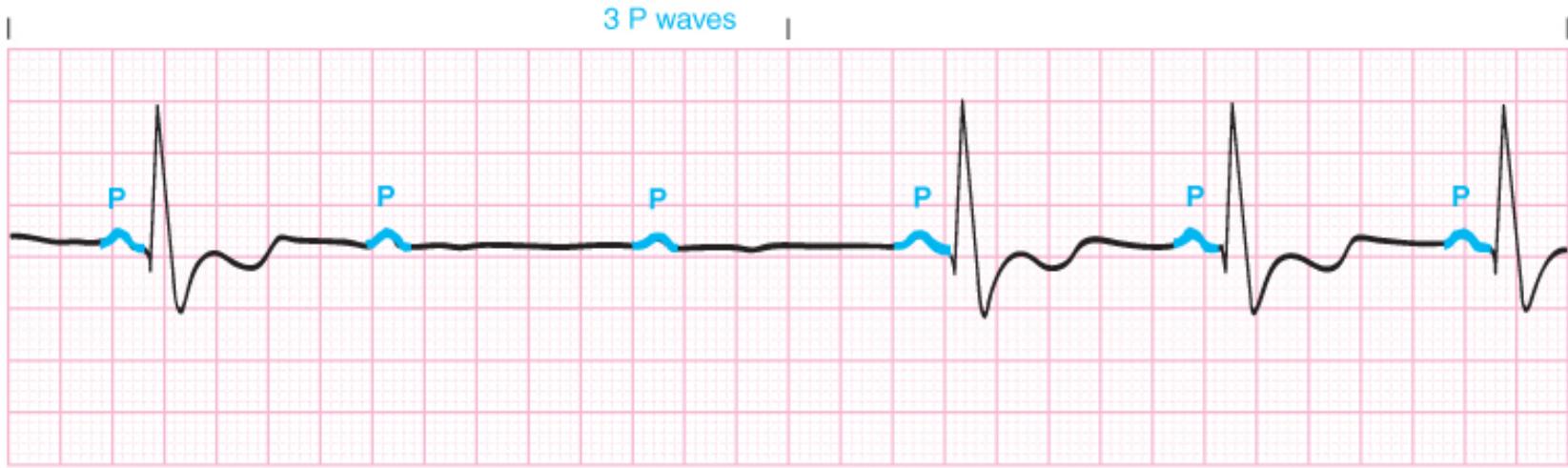
Sinus rhythm with a second-degree heart block, type II (Mobitz II), with a 2:1 block/ratio: atrial heart rate, 90 beats/min; ventricular heart rate, 40 beats/min with bradycardic rate.

Second-Degree Heart Block, Type II



Second-degree heart block, type II (Mobitz II), with a 2:1 block/ratio: atrial heart rate, 40 beats/min; ventricular heart rate, 20 beats/min with bradycardic rate (notice peaked P waves).

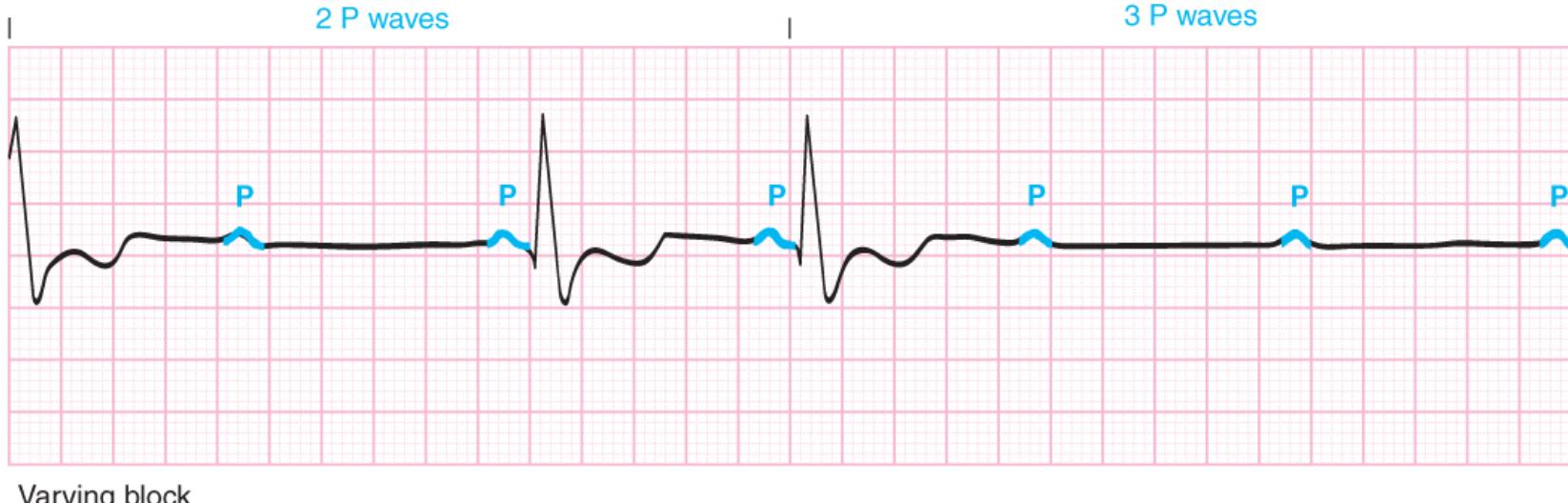
Second-Degree Heart Block, Type II



3:1 block

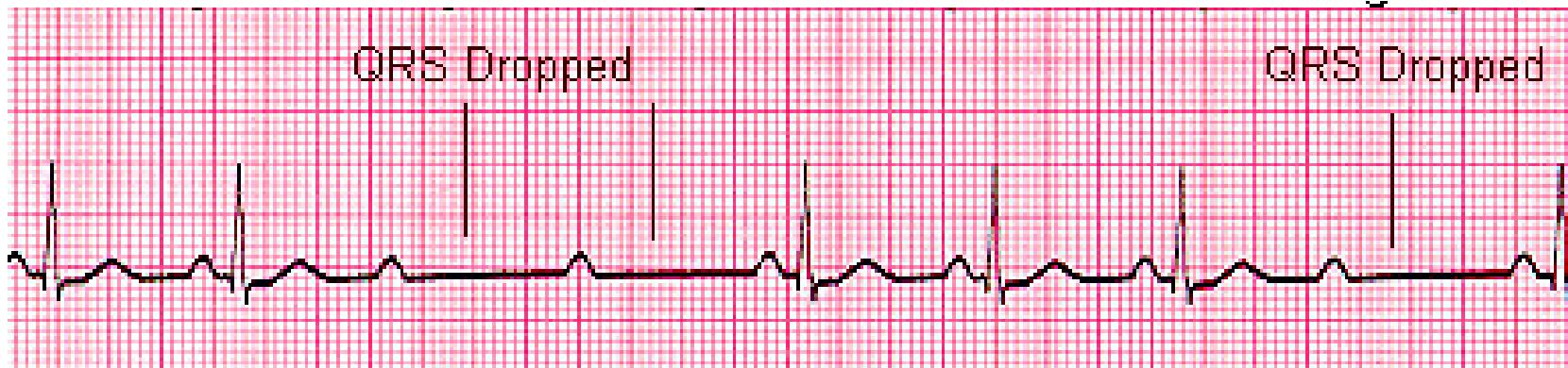
Second-degree heart block, type II, with a 3:1 block/ratio, possible bundle branch block: atrial heart rate, 60 beats/min; ventricular heart rate, 40 beats/min with bradycardic rate.

Second-Degree Heart Block, Type II

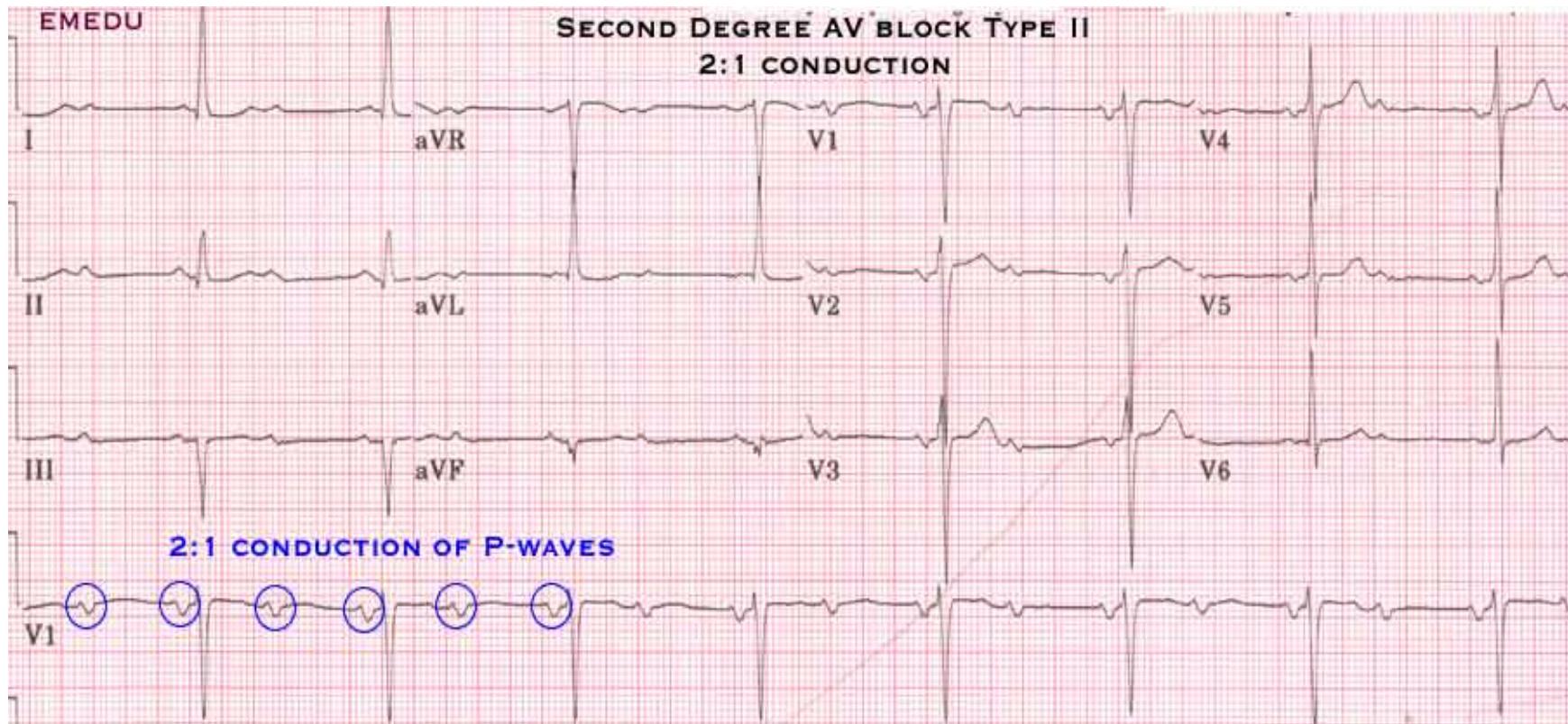


Second-degree heart block, type II, with a varying block/ratio: atrial heart rate, 60 beats/min; ventricular heart rate, 30 beats/min with bradycardic rate.

Second-Degree Heart Block, Type II



Second-Degree Heart Block, Type II



Second-Degree Heart Block, Type II

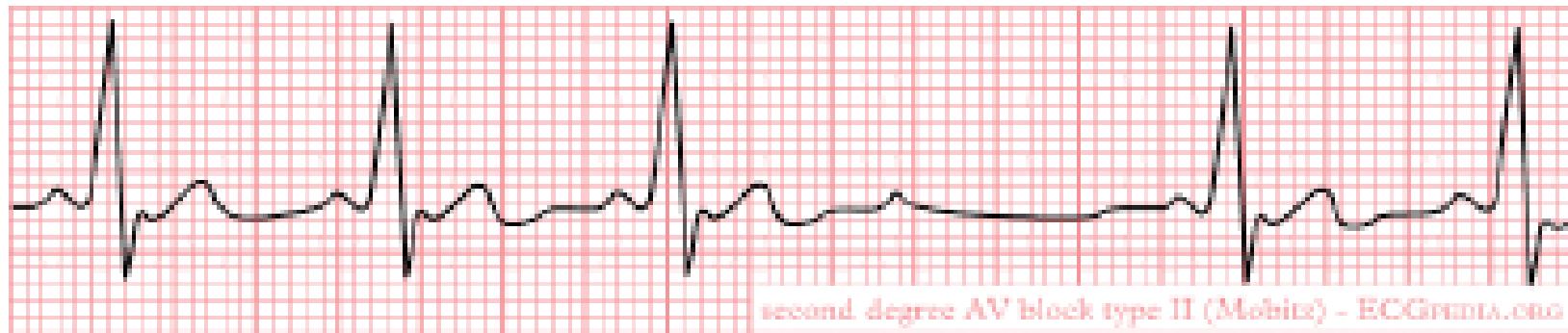
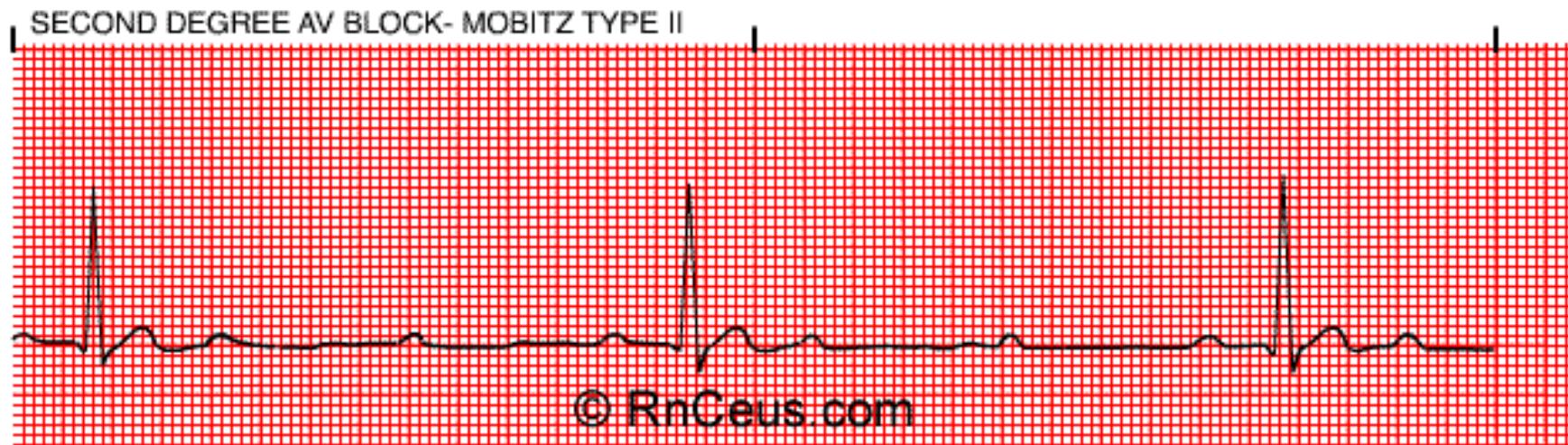


FIGURE 2. ECG of a patient with Mobitz type II atrioventricular block showing uniform PR intervals, wide QRS complexes, and uniform R-R intervals.

Second-Degree Heart Block, Type II

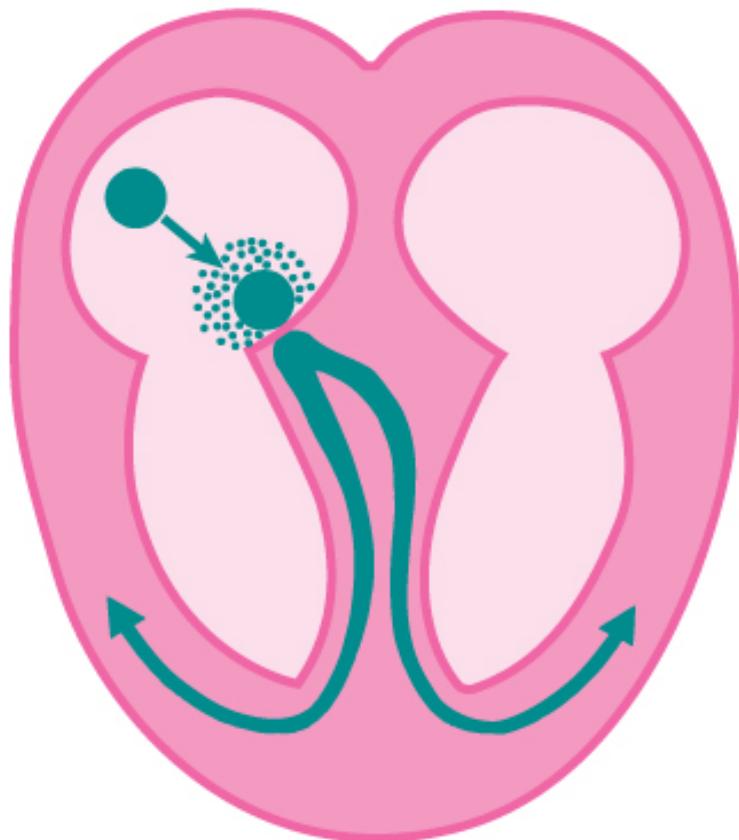


Third-Degree Heart Block

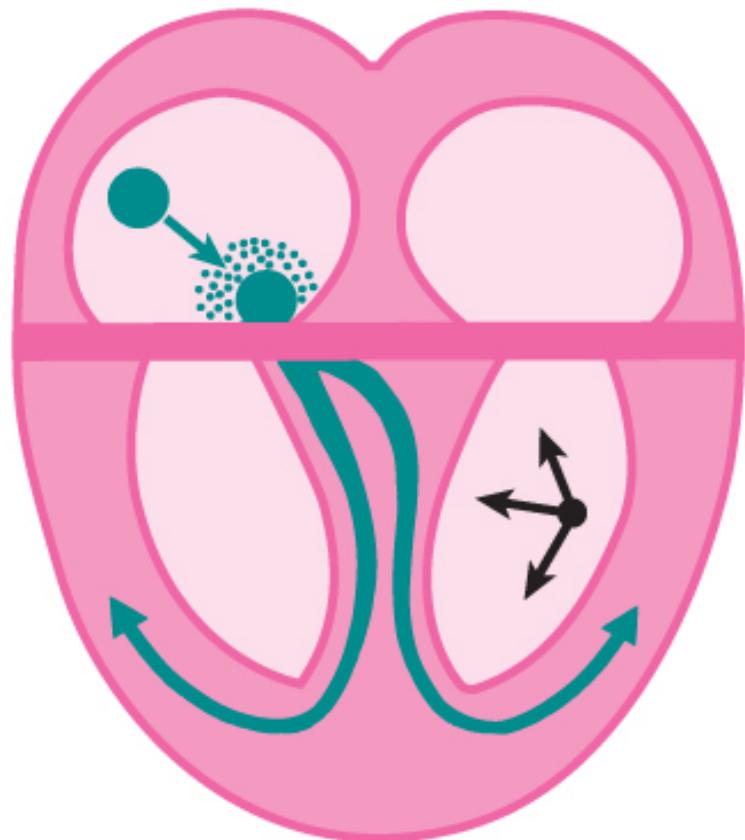
- **Also known as Complete Heart Block or Complete AV dissociation**
- **Occurs when impulse is completely blocked between atria and ventricles**
 - Interruption usually between AV junction and bundle of His
- **Impulse causes depolarization of atria, but is blocked before reaching the ventricles**

Third-Degree Heart Block

Normal conduction



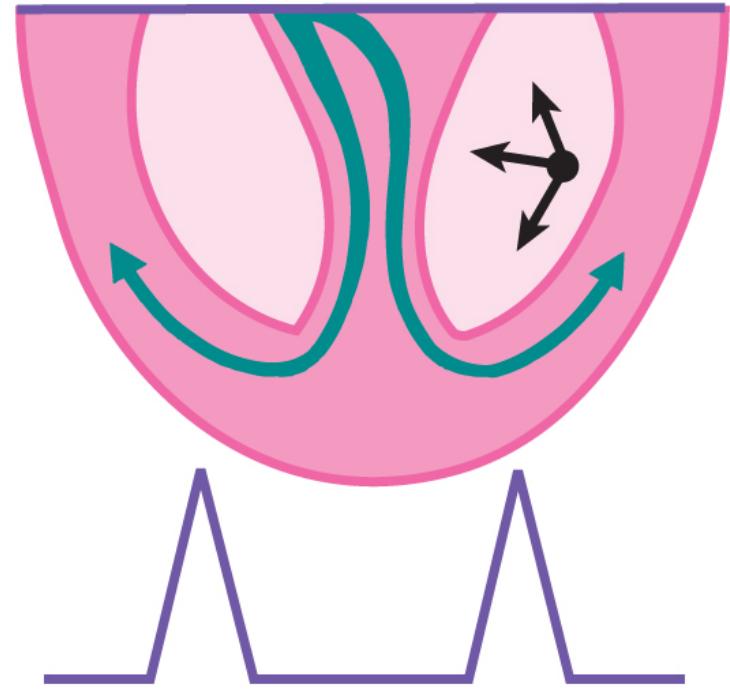
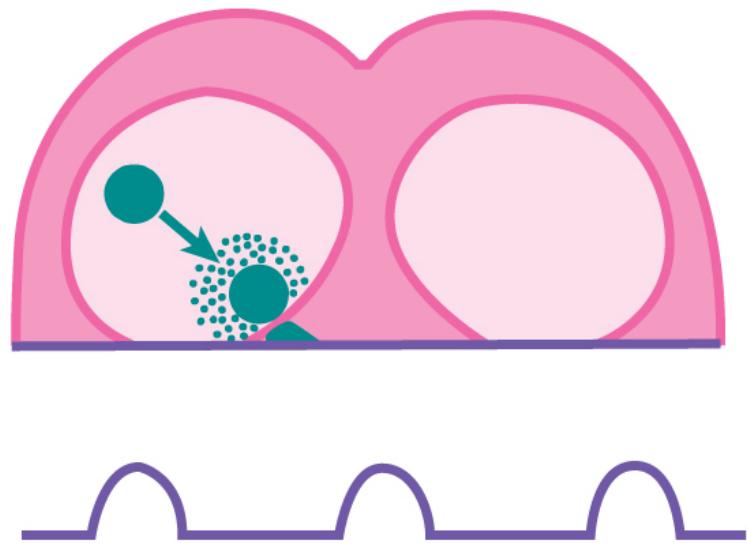
Abnormal conduction



Third-Degree Heart Block

- Due to this interruption, ventricular muscle initiates its own impulses to cause cardiac muscle contraction
- Atria and ventricles function independently like they were 2 separate hearts
- P waves and QRS present on rhythm strip as well as what looks like PR intervals that are constantly changing in length

Third-Degree Heart Block



Third-degree heart block with separate atrial and ventricular responses.

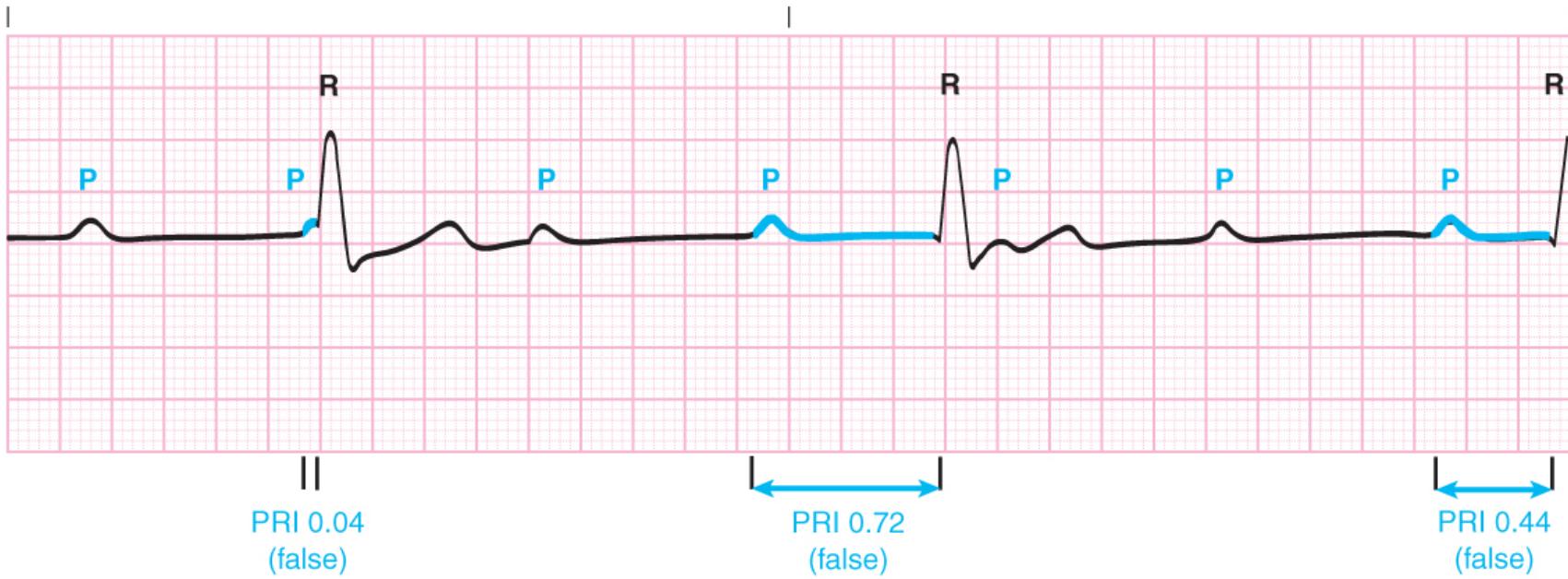
Third-Degree Heart Block

- **PR intervals often do not become progressively longer**
 - No dropped beat in third-degree heart block
- **No relationship between P waves and QRS, so no true PR interval**
- **P waves usually same size and shape, although some may be hidden in a QRS or in a T wave, changing the appearance**

Third-Degree Heart Block

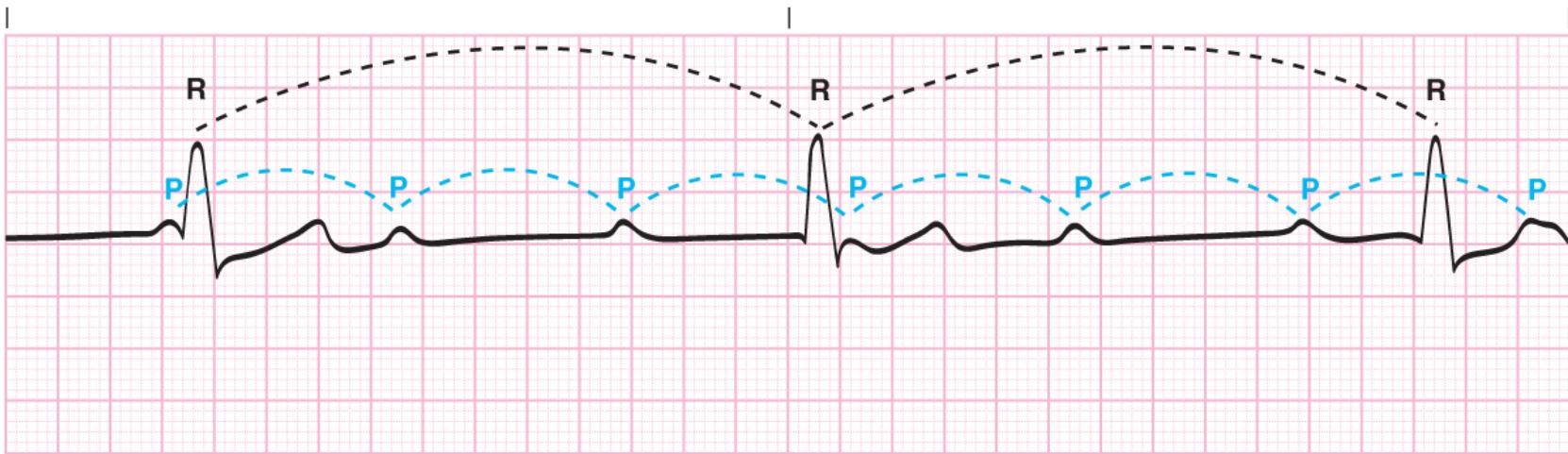
- **QRS can be normal or wide depending on where they originate**
 - If block in AV junction, QRS 0.04-0.12 second
 - If block in bundle of His or ventricles, usually wide (> 0.12 second) and bizarre in appearance but usually same size and shape
- **P-P and R-R intervals equal independently but P-P usually not equal to R-R**

Third-Degree Heart Block



Separate P waves and QRS complexes of third-degree heart block: atrial heart rate, 70 beats/min; ventricular heart rate, 20 to 30 beats/min with bradycardic rate.

Third-Degree Heart Block



Third-degree heart block: atrial heart rate, 70 beats/min; ventricular heart rate, 30 beats/min with bradycardic rate.

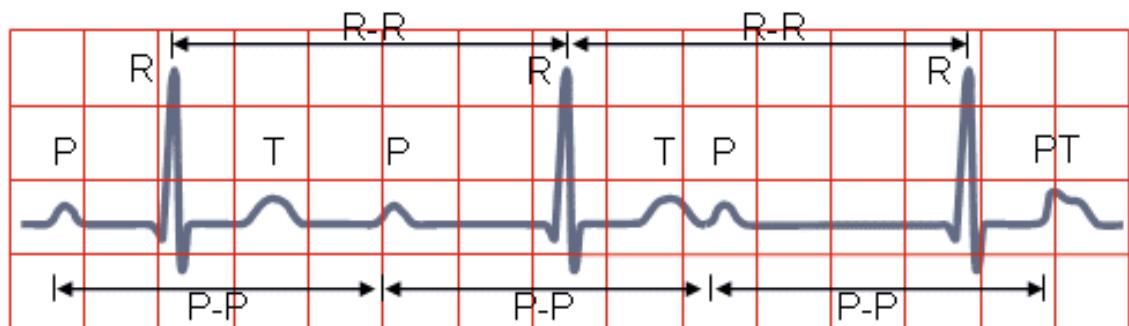
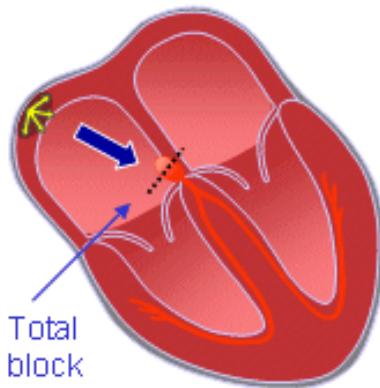
Third-Degree Heart Block

- **Atrial rate = 60 to 100 ipm**
- **Ventricular rate = 20 to 40 ipm**
- **This is a life threatening dysrhythmia as it can result in slow HR, low BP, and poor perfusion**
 - May progress to asystole
- **May be lethal if VR is so slow and inefficient that heart can't maintain life-sustaining cardiac output**
- **Often caused by MI or severe heart disease**

Third-Degree Heart Block

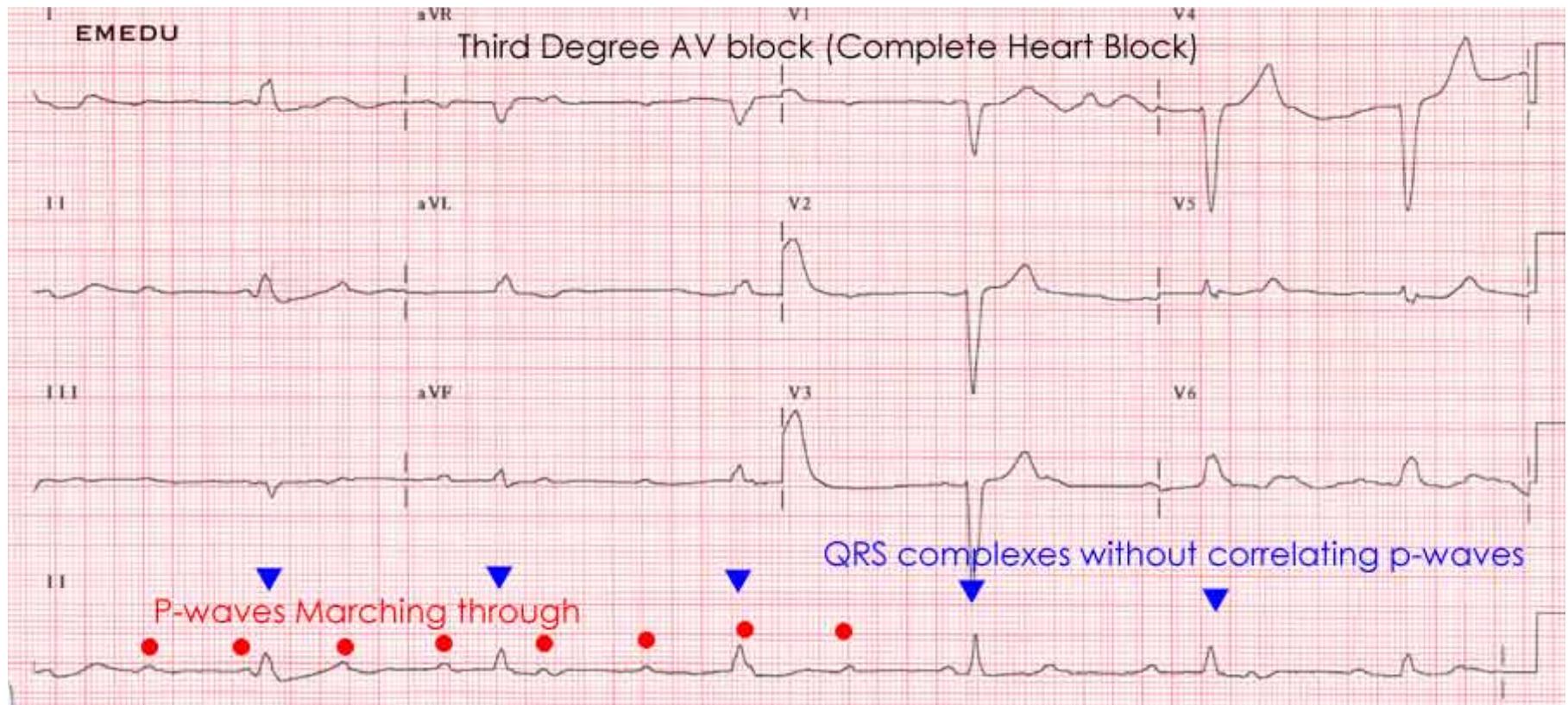
A-V BLOCK, THIRD DEGREE

Impulses originate at AV-node and proceed to ventricles
Atrial and ventricular activities are not synchronous



P-P interval normal and constant,
QRS complexes normal, rate constant, 20 – 55 /min

Third-Degree Heart Block



Third-Degree Heart Block



Heart Block Characteristics

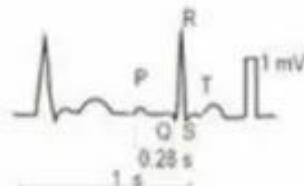
Table 5-1 Heart Block Characteristics

Block	PR Interval	R to R Interval
First degree	> 0.20 second	Usually regular (depends on underlying rhythm)
Second degree, type I	Variable (lengthens)	Irregular (dropped beat)
Second degree, type II	Constant	Constant (can be irregular if variable block/ratio)
Third degree	Variable	Constant

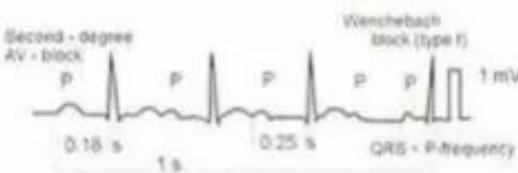
© Jones & Bartlett Learning.

"THE HEART BLOCK POEM"

If the R is far from P,
then you have a **FIRST DEGREE**.



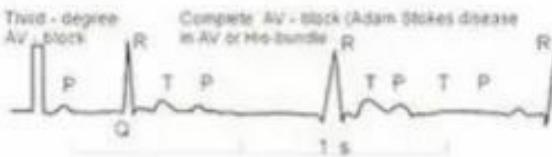
Longer, longer, longer, drop!
Then you have a **WENCKEBACH**.



If some Ps don't get through,
then you have **MOBITZ II**.



If Ps and Qs don't agree,
then you have a **THIRD DEGREE**.

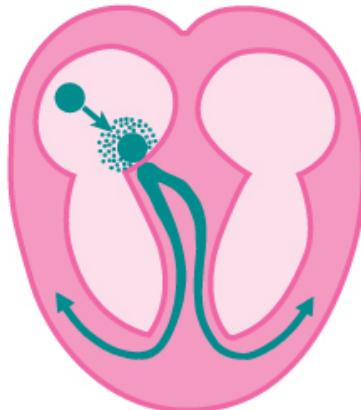


Bundle Branch Block

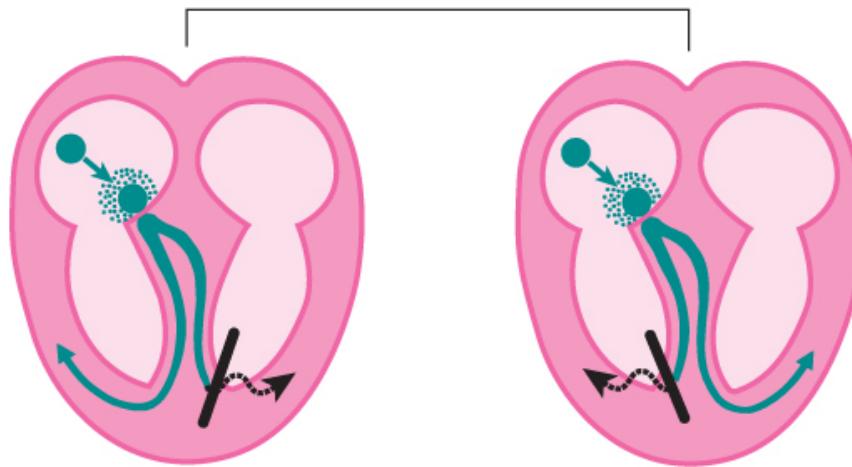
- **Not a true block**
- **Occurs when there is an interruption in cardiac electrical conduction of either the right or left bundle branch**
 - Interruption causes delay in conduction of impulse to ventricle of blocked bundle branch
- **Atria depolarize normally**
- **Impulse follows normal pathway until it reaches interruption in bundle branch**

Bundle Branch Block

Normal conduction



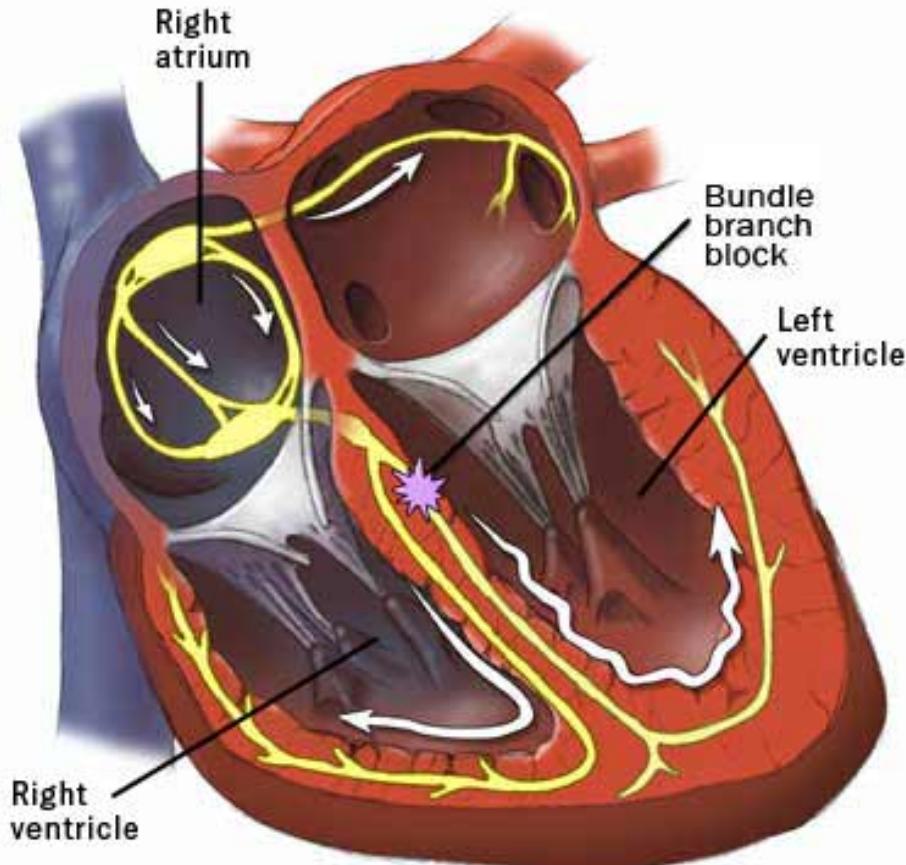
Abnormal conduction



Left BBB

Right BBB

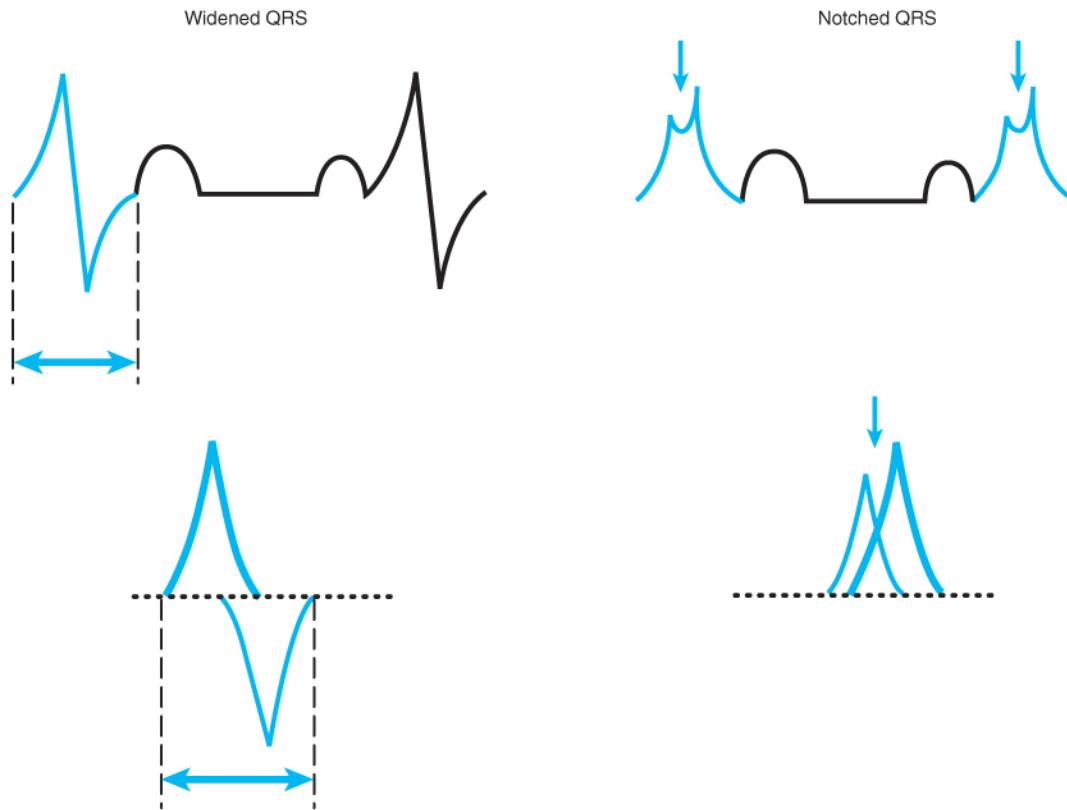
Bundle Branch Block



Bundle Branch Block

- **Interruption forces impulse to “detour” and take alternate route, making impulse travel longer**
 - Reaches ventricle of blocked branch later than ventricle of normal branch
- **Blocked ventricle depolarizes slightly later, causing 2 separate depolarizations**
 - Looks like a notched (often referred to as “rabbit ears”) or widened QRS (> 0.12 second)

Bundle Branch Block



Two types of ventricular depolarizations seen with a bundle branch block:
either a widened or notched QRS complex.

Bundle Branch Block

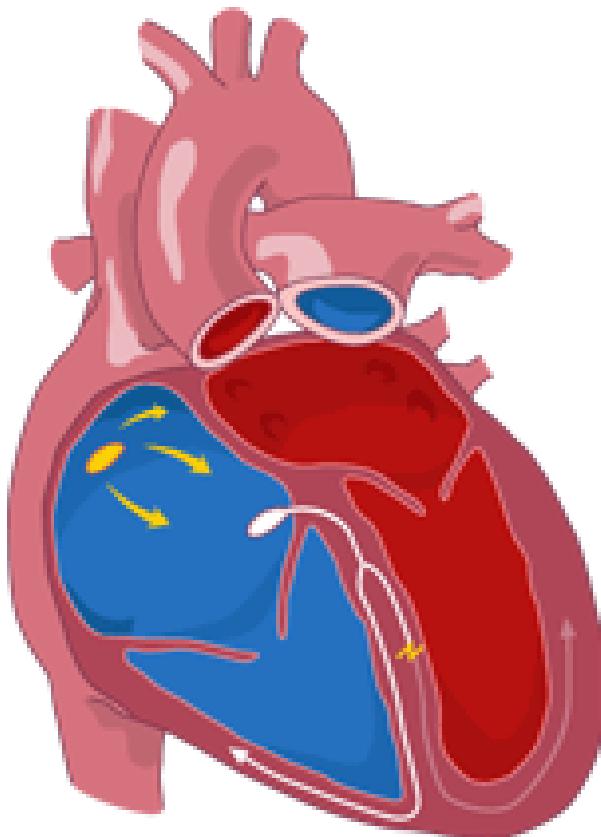
- **Can occur in any rhythm**
 - Presence of P waves and PR intervals determined by underlying rhythm
 - Do not impact rate/regularity of underlying rhythm
- **Identify underlying rhythm first**
 - Example: Sinus rhythm with possible bundle branch block
- **Have to use a 12-lead EKG showing leads V₁ and V₆ to determine presence, seriousness and location of block**
- **May be caused by MI or heart disease**

Bundle Branch Block

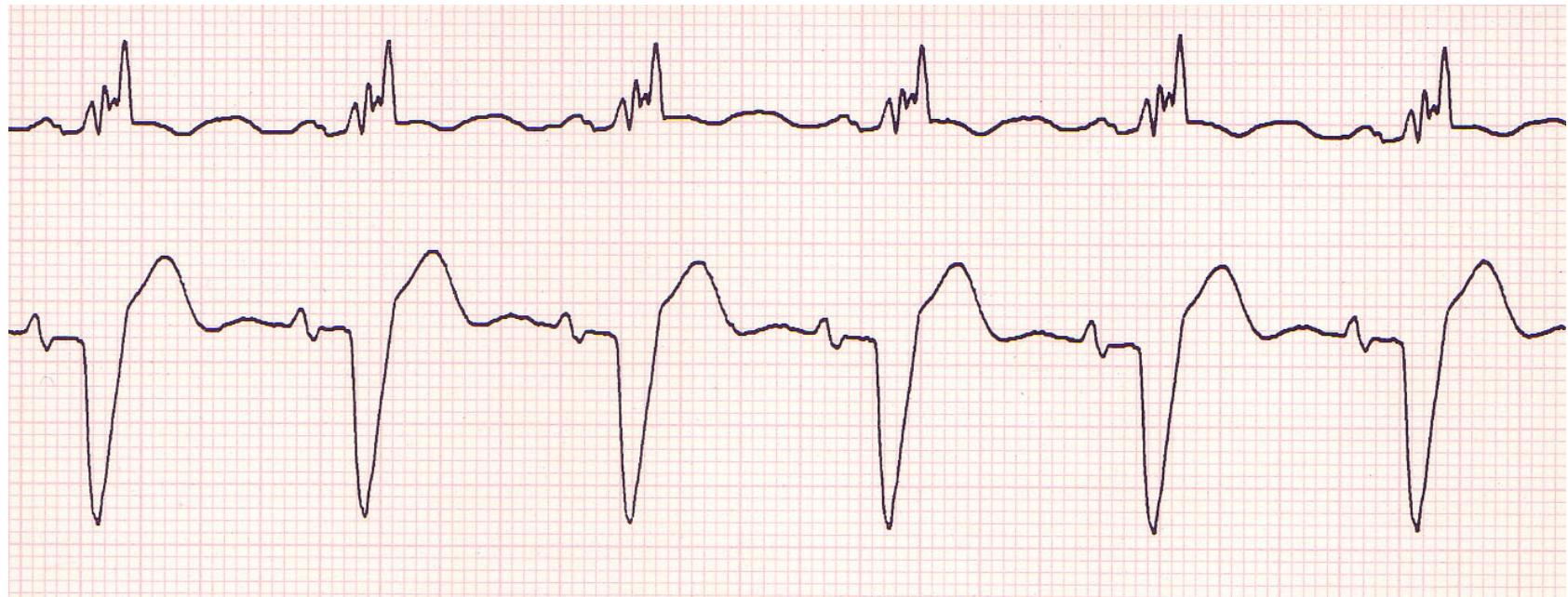


Wide and notched QRS complexes seen with possible bundle branch block (notice elevated ST segments and prolonged QT intervals).

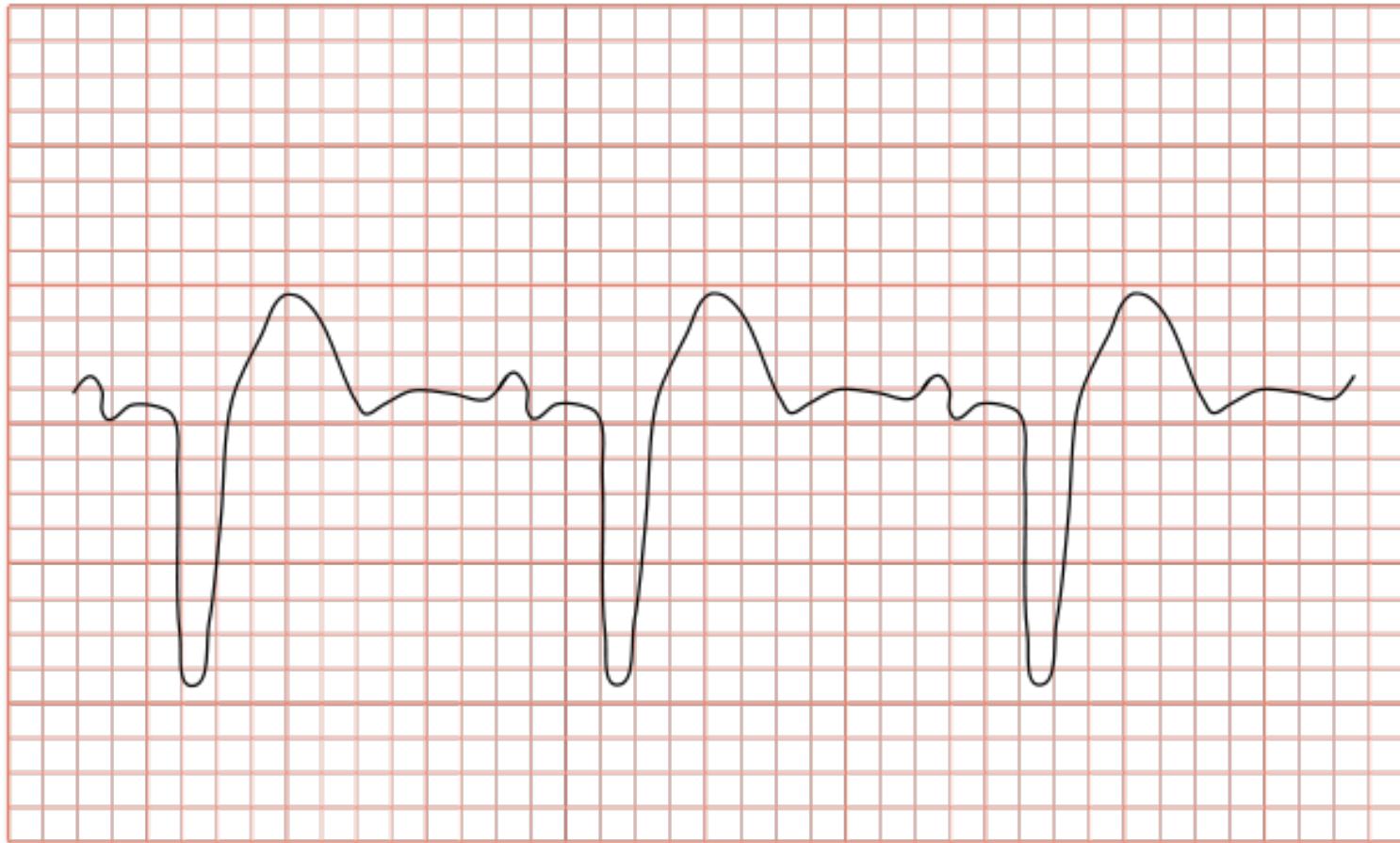
Bundle Branch Block



Bundle Branch Block



Bundle Branch Block



Review

- **First Degree Heart Block = Prolonged PR interval**
- **Second Degree Heart Block, Type I (Mobitz I, Wenckebach) = PR interval gets progressively longer until QRS gets dropped**
- **Second Degree Heart Block, Type II (Mobitz II, Classic) = PR interval regular, but QRS gets dropped suddenly**

Review

- **Third Degree Heart Block = No correlation between P waves and QRS**
- **Bundle Branch Block = Notched (“rabbit ears”) or widened QRS**