This month we will be looking at a specific ECG Rhythm and its treatments and that will be a Bradycardic Rhythm or Bradycardia. This cardiac rhythm is defined as any heart rate that falls below 60 beats per minute. There also can be non-symptomatic bradycardia which indicates the patient has a slow heart rate, but does not have any symptoms of being compromised. If the patient is symptomatic, they may have altered mental status, chest pains, heart failure, seizures, syncope, shock, pale skin, diaphoresis and hemodynamic instability.

Most of us have learned at least a few ways to count the ECG rhythm to determine the patient’s heart rate. We can take a 6 second strip and count the beats on that strip and then times that by 10. In other words if there were 5 complexes, you would times that by 10 and come up with 50.

The other method is sometimes referred to as the 300 method. This is where you find a complex that is close to a line on your paper. You then go to the next line out and that would be 300… the next one would be 150…100… until you have another complex. Where that complex falls is what the heart rate would be. Above you see a normal sinus rhythm because the rate is about 70 or just below the 75 line. In the next example, the heart rate is about 38 since they are each just off the main lines on the paper.

After we assess the rate, we have to look at the rhythm itself and determine is it a sinus bradycardia or is the heart rate junctional. In the following rhythm we can see that there is a “P” wave before every QRS. So we have talked about rate, P waves and now we want to see if it is regular. Looking at the strip below, we know the rate, we can see it is regular with a P before every QRS and it is regular. For the medics and the PHRN’s in the following strips we can now look at the PR and QRS durations and figure those out as well.
Rate less than 60 bpm
Regularity regular
P waves before each QRS Complex
PR interval 0.12 - 0.20 sec
QRS duration 0.04 - 0.12 sec

In the following strip, we can see that the rhythm is slow and therefore a bradycardic rhythm, but we also note that there really are not defined “P” waves in this rhythm. Therefore the complex is coming from the junction and therefore it is a Junctional Bradycardia. The rate on a junctional will typically be below 40 beats per minute.

Rate <40 bpm
Regularity regular
P waves inverted or flat
PR interval < 0.12 sec
QRS duration usually <0.12 sec, but can be greater

We are next going to talk about some of the heart blocks since they can also be bradycardic rhythms and cause our patient to have all of the symptoms we discussed above. The first one will be a 1st Degree AV Block which is shown below. Note that there is an underlying rhythm that is Sinus, but because of the PR interval being lengthened, it is showing us that there is a conduction problem.

Prolonged conduction delay in the AV node or Bundle of His.
PRI will be greater than 0.20
There will be one P wave in front of every QRS Complex
Our next bradycardic rhythm that we are going to discuss is the 2nd Degree Heart Blocks. In these two rhythms they are very close, but there is one very distinct difference between the two which makes it easy to determine the type. In the first one which is a 2nd Degree Type I or sometimes called a Wenckebach the PR interval is getting longer until it drops a QRS complex. Another way to describe this rhythm is to look a the P and note that they are close...further...further...drop...close...further...further...drop.

Rate  Atrial Rate – normal  Ventricular Rate – Bradycardic
Regularity regular
P waves normal
PR interval progressively longer until the QRS is missed – then recaptures
QRS duration 0.04 - 0.12 sec

The next strip is the 2nd Degree Type II or known as the Classical. With this block by taking the first look you notice that the heart rate is dropping a beat. The biggest identifying factor with this one is that if there is a QRS complex...there will be a P wave and it will be the same distance from the QRS complex. Notice on the following strip there are more P’s than QRS’s, but when there is a QRS the P wave is the same distance for each one.

Rate  Atrial Rate – normal
Regularity Ventricular Rate – Bradycardic
P waves Regular ratio of 2:1, 3:1 (P waves to QRS)
PR interval Normal or prolonged when followed by a QRS Complex (P-R Interval will always be the same)
QRS duration 0.04 - 0.12 sec
The last bradycardic rhythm we will discuss is the 3rd Degree Heart Block. In this rhythm the QRS complex is beating at its rate and the P wave is beating at its own rate and the two never really match up.

<table>
<thead>
<tr>
<th>Rate</th>
<th>Atrial Rate – normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventricular</td>
<td>Ventricular Rate – Bradycardic Rate</td>
</tr>
<tr>
<td>Rate</td>
<td>Regular from P to P or QRS to QRS</td>
</tr>
<tr>
<td>Regularity</td>
<td>Regular from P to P or QRS to QRS</td>
</tr>
<tr>
<td>P waves</td>
<td>Unrelated to QRS Complex</td>
</tr>
<tr>
<td>PR interval</td>
<td>Unrelated to QRS Complex</td>
</tr>
<tr>
<td>QRS duration</td>
<td>Slower than 0.12 seconds</td>
</tr>
</tbody>
</table>

Here is another chart to possibly help you out with the blocks.

Our goal with any of the above patients would be to maintain adequate perfusion and treat the underlying cause of the rhythm. It could be a rate, pump, volume problem and causing hypoperfusion and cardiorespiratory compromise.

Some of the medical conditions that can cause our patients to have these rhythms may be an MI, hypoxia, pacemaker failure, hypothermia, athletes, increased ICP, CVA, spinal cord lesion with neurogenic shock, sick sinus syndrome, hyperkalemia, toxin exposure such as beta blockers or calcium channel blockers, organophosphates, digoxin or electrolyte disorders. If your patient is hypotensive and bradycardic, we want to correct the rate problem first unless they go into ventricular tach or ventricular fibrillation.
The following are the guidelines that are based off our McHenry Western Lake County EMS Protocols. With our initial medical care we always want to support the ABC’s and determine the need for airway management. We will apply O2 as needed to maintain an Sp02 at 94%. Place the ECG monitor on and obtain, review and transmit 12 lead ECG. If the patient has AMS we want to assess the blood glucose to rule out that they may be hypoglycemic. Start an IV or establish IO based on consideration of the need for IV fluid challenges if hypotensive and the lungs are clear.

If they are having an MI and they are alert with a gag reflex we can treat them with the Acute Coronary Syndrome protocol which calls for ASA and pain management if their systolic B/P is over 90 with fentanyl. Nitroglycerin would be contraindicated for this patient due to the bradycardic rhythm.

Remember that we also want to treat the patient with the least invasive manner possible and escalate the care as needed.

We break down the care the patient is going to receive base on their acuity and their cardiorespiratory/perfusion compromise. With a lower acuity patient we have assessed them and found the SBP to be above 90 or a Mean Arterial Pressure above 65. Whenever you have a patient with a bradycardic we want to place the transcutaneous pacing pads on the patient in the anticipation that the patient may deteriorate and need to be paced. These patients may have an MI, severe bradycardia, asymptomatic 2nd degree type II block, asymptomatic 3rd degree heart block or new onset bundle branch block or bifascicular block with an MI. Do not pace yet!

Emergent or critical patient is a time sensitive patient. These patients have moderate to severe cardiorespiratory compromise. The patients are not stable based on their slow heart rates and possible altered mental status, SBP below 90 or a MAP below 65, chest discomfort or pain, SOB, poor peripheral perfusion, weakness, fatigue, light headedness, dizziness and pre-syncope, pulmonary congestion, heart failure or pulmonary edema, escape beats or frequent PVC’s.

Our first treatment of choice is Atropine 0.5mg rapid IVP/IO q 305 minutes (max 3 mg) unless contraindicated. The contraindications for Atropine are 2nd Degree Type II or a 3rd Degree with a wide QRS, a transplanted heart patient (they lack the vagal innervation). Use with caution in a suspected ACS or MI patient. If atropine is ineffective or contraindicated, we will use Dopamine at 5mcg/kg/min and can titrate this up to a dose of 20mcg/kg/min to maintain a SBP of >90 (MAP >65).
If atropine or dopamine is ineffective or you have no vascular access, you will then go to Transcutaneous External Cardiac Pacing or TCP. The MWLCEMS protocol for pacing is:

- Select a rate of 60 beats per minute. You may adjust the rate to 70 BPM based on clinical response
- Increase the mA until you have mechanical capture and it is confirmed by palpable femoral pulses or a maximum of 200 mA.
- Evaluate BP once capture is achieved. If mechanical capture is present: continue pacing enroute; do not turn off the pacer.

If SBP >90 (MAP >65) after above intervention: Assess indications/contraindications for sedation and pain management.

Sedation: Midazolam at 2mg increments slow IV push every 2 min up to a max of 10 mg IV or IN, titrated to patient response. If IV unable and IN is contraindicated you may use IM dose of 5-10mg(0.1-0.2 mg/kg) max 10mg single dose. All routes may be repeated as needed to a total of 0mg as needed if SBP is >90 (MAP > 65) unless contraindicated. If the patient is hypovolemic, elderly, debilitated, chronic diagnosis such as CHF or COPD and/or on opiates or CNS depressants, decrease the total dose to 0.1mg/kg.

This lesson should have given you information on evaluating your bradycardic rhythm as well as the tools to determine what rhythm you are looking at. Once we have determined our rhythm, we have to look at our patient and determine if they are symptomatic or not and what the next best treatment for them will be.

Ref: MWLCEMS System Protocol 2016
Basic ECG Interpretation MWLCEMS
1) When looking at the following ECG, what does the third arrow indicate the heart rate would be? __________

![ECG Image]

2) In the bradycardic patient, if Atropine and Dopamine are ineffective your next treatment should be? _______________________________

3) To be considered a bradycardic rhythm; the heart rate must be below? ____________.

4) In a Junctional Bradycardia rhythm, what part of the EKG is flattened or inverted? ________________________________

5) Transcutaneous External Pacing is the first treatment in managing a patient in bradycardia with a SBP <90 (MAP <65).
   a. True
   b. False

6) In a 1st Degree AV Block, the PR interval will be greater than? ________________

7) Priority treatment in a moderate to severe bradycardic patient with cardiorespiratory compromise should be?
   a. Dopamine 2mcg/kg/min
   b. Atropine 0.5 mg IVP/IO q 3-5 min
   c. Transcutaneous External Pacing
   d. Dopamine 5 mcg/kg/min
8) TCP pads should be placed on patient in anticipation of clinical deterioration in what type of patients?

a. _________________________________
b. _________________________________
c. _________________________________
d. _________________________________

9) A 2nd Degree Type I is commonly referred to as a? _________________________

10) Interpret the following rhythm?

a. 1st Degree Heart Block
b. 2nd Degree Type I
c. 2nd Degree Type II
d. 3rd Degree Heart Block

If you are NOT a member of the McHenry Western Lake County EMS System, Please include your address on each optional quiz turned into our office. Our mailing address is: Northwestern Medicine – McHenry Hospital EMS, 4201 Medical Center Drive, McHenry, Illinois 60050. We will forward to your home address verification of your continuing education hours.

If you ARE a member of our EMS System, your credit will be added to your Image Trend record. Please refer to Image Trend to see your current list of continuing education credits. Any questions regarding this can be addressed to Cindy Tabert at 224-654-0160. Please fax your quiz to Cindy Tabert at 224-654-0165.