Why are they called Beta Blockers?

WRHA Pharmacy Technician Education Day
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Pharmacy Manager & Heart Failure Pharmacist
Learning Objectives:
On your mark, get set, go ….

• Review of pharmacology associated with sympathetic nervous system
• Compare and contrast the different beta blockers on the WRHA Formulary
• Review the common indications for oral/IV beta blockers
• Why do we use so much glucagon for a beta blocker overdose?
• To help you maintain consciousness at the end of the day!
• The Autonomic Nervous System
• Blue = parasympathetic
• Red = sympathetic

http://en.wikipedia.org/wiki/Autonomic_nervous_system
Autonomic Nervous System

- Sympathetic Nervous System
  - Epinephrine
    (Adrenalin)

- Parasympathetic (Cholinergic) Nervous System
  - Acetylcholine
Sympathetic Nervous System

- Epinephrine “Fight or Flight Response”
- Receptor types = Alpha and Beta:
  - $\alpha_1$: vascular smooth muscle contraction
    - Stimulation results in vasoconstriction
    - Increased blood pressure (think “squeezing”)
  - $\beta_1$: heart
    - Increased heart rate
  - $\beta_2$: lungs & skeletal blood vessels
    - Results in bronchodilation & vasodilation
Parasympathetic Nervous System

- “Rest and digest” “Feed & breed” “Rest & restore”
- Acetylcholine (Cholinergic)
- 2 types of receptors: Nicotinic (skeletal muscle) & muscarinic (smooth muscle)
- S - salivate
- L - lacrimate
- U - urinate
- D - deficate, decreased heart rate, decreased breathing
- G - increased GI motility
- E - erection, eye (pupillary constriction)

Info courtesy of Peg Holt R.N.
Beta Blockers in a Nutshell

- Block the effects of Epinephrine during times of stress (physical or emotional)
- Lower heart rate
- Reduce the force of contraction
- Lower blood pressure
- When combined with alpha blockers (e.g. Carvedilol & Labetalol) they are good antihypertensives
What is “Beta-Blocked”??
Beta Blockers

• Nonselective β-blockers act at both β1 & β2 receptors
• Cardioselective β-antagonists block β1 receptors
• Lower B.P. but do not induce postural hypotension because the α-receptors usually remain functional (vasculature remains normal)
• Exceptions: Carvedilol & Labetalol (also act on α receptors)
• Used in treatment of angina, hypertension, cardiac arrhythmias, acute myocardial infarction, heart failure, glaucoma, etc.
## WRHA Formulary Beta Blockers

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Brand Name</th>
<th>Class Name</th>
<th>Sub-Class</th>
<th>AHFS</th>
<th>Form</th>
<th>Strength</th>
<th>Dispensing Notes</th>
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<tbody>
<tr>
<td>atenolol</td>
<td>Tenormin</td>
<td>cardiac</td>
<td>beta</td>
<td>24:24</td>
<td>tablet</td>
<td>25, 50 &amp; 100 mg</td>
<td></td>
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<tr>
<td>bisoprolol</td>
<td>Monocor</td>
<td>cardiac</td>
<td>beta</td>
<td>24:24</td>
<td>tablet</td>
<td>5 &amp; 10 mg</td>
<td></td>
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<tr>
<td>carvedilol</td>
<td>Coreg</td>
<td>cardiac</td>
<td>beta</td>
<td>24:24</td>
<td>tablet</td>
<td>3.125, 6.25 &amp; 12.5 mg</td>
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<tr>
<td>esmolol</td>
<td>Brevibloc</td>
<td>cardiac</td>
<td>beta</td>
<td>24:24</td>
<td>injection</td>
<td>10 mg/mL - 10 mL</td>
<td>250 mg/mL -10 mL ampoule discontinued.</td>
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<tr>
<td>labetalol</td>
<td>Trandate</td>
<td>cardiac</td>
<td>beta</td>
<td>24:24</td>
<td>injection</td>
<td>5 mg/mL - 20 mL</td>
<td></td>
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<tr>
<td>labetalol</td>
<td>Trandate</td>
<td>cardiac</td>
<td>beta</td>
<td>24:24</td>
<td>tablet</td>
<td>100 &amp; 200 mg</td>
<td></td>
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<tr>
<td>metoprolol</td>
<td>Betaloc</td>
<td>cardiac</td>
<td>beta</td>
<td>24:24</td>
<td>tablet</td>
<td>50 &amp; 100 mg</td>
<td></td>
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<tr>
<td>metoprolol</td>
<td>Lopresor</td>
<td>cardiac</td>
<td>beta</td>
<td>24:24</td>
<td>sustained release tablet</td>
<td>100 &amp; 200 mg</td>
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<tr>
<td>metoprolol</td>
<td>Betaloc</td>
<td>cardiac</td>
<td>beta</td>
<td>24:24</td>
<td>injection</td>
<td>1 mg/mL - 5 mL</td>
<td></td>
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<td>nadolol</td>
<td>Cardigard</td>
<td>cardiac</td>
<td>beta</td>
<td>24:24</td>
<td>tablet</td>
<td>80 mg</td>
<td></td>
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<tr>
<td>propranolol</td>
<td>Inderal</td>
<td>cardiac</td>
<td>beta</td>
<td>24:24</td>
<td>tablet</td>
<td>10, 40 &amp; 80 mg</td>
<td></td>
</tr>
<tr>
<td>propranolol</td>
<td>Inderal</td>
<td>cardiac</td>
<td>beta</td>
<td>24:24</td>
<td>injection</td>
<td>1 mg/mL - 1 mL</td>
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<tr>
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<td>Sotacor</td>
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<td>beta</td>
<td>24:24</td>
<td>tablet</td>
<td>80 &amp; 160 mg</td>
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</table>
Beta Blockers

B-Blockers (t½)

Non-Selective (Beta 1 & 2)
- Propranolol (3-5h)
- Nadolol* (20-24h)

Beta 1 Selective
- Metoprolol (3-7h)
- Atenolol* (6-9h)
- Bisoprolol* (9-12h)
- Esmolol (9 minutes)

* Denotes dose may need adjustment in renal dysfunction

From Lexi-Comp Drug Information Handbook
Beta Blockers- ACLS 2005 Guidelines

- Administer to all possible pts with acute myocardial infarction and unstable angina
- Effective antianginal and antifibrillatory agent
- Adjunct to fibrinolytic (reduce nonfatal reinfarction & recurrent ischemia)
- Convert to normal sinus rhythm or to slow ventricular response in narrow complex tachycardia
- Reduce myocardial ischemia and damage in AMI with heart rate/blood pressure
- For emergency antihypertensive therapy for hemorrhagic and acute ischemic stroke (Labetolol)
Beta Blocker Dosing (Angina, MI)

- **Metoprolol**
  - initial IV dose: 5 mg slow IV every 2-5 min, to a total of 15 mg
  - usual oral dose: 25-50 mg po BID
  - Not uncommon to see q6h for 48 hours post MI (short acting)
  - Maximum dose: 400 mg /day

- **Atenolol**
  - no IV form available in Canada
  - usual oral dose: 50 mg po OD
  - Maximum dose: 100 mg /day (may be given OD or BID)

- **Bisoprolol**
  - Usual oral dose 2.5-5 mg OD
  - Maximum dose: 20 mg/day

From Lexi-Comp Drug Information Handbook
Esmolol’s Claim to Fame - \( t_{\frac{1}{2}} \) of 9 minutes

<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>ALTERNATE NAMES</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antihypertensive, Beta Adrenergic Blocking Agent</td>
<td>Brevibloc</td>
<td>1 of 2</td>
</tr>
</tbody>
</table>

**ADMINISTRATION POLICY:**
Administration restricted to nurses in ICMS, ICCS, Heart Cath Lab, PARR

**DOSAGE:**

**Usual:**

**Loading Dose:** 500 mcg/kg IV Push followed by a maintenance dose.

**Maintenance Dose:** Initially 50 mcg/kg/min, then increase by 50 mcg/kg/min increments up to 300 mcg/kg/min at no greater than 4 minute intervals. NOTE: Repeat loading dose before each rate increase.

**Maximum Single Dose:** 500 mcg/kg IV Push

**Maximum Daily Dose:** N/A - Titrate to desired response.
Carvedilol (Coreg)

- Antianginal, antihypertensive, nonselective β-blocker
- Indications: HF, ↑BP, post MI with left ventricular dysfunction
- Heart failure (HF): initial dose, 3.125 mg po BID for 2 weeks
- Titration: dose doubled every 2 wks to highest dose tolerated
- HF: max dose, 25 mg po BID
- HF: max dose, weight ≥ 85 kg = 50 mg po BID

Micromedex (DrugDex) & Epocrates
Labetalol

• α/ nonselective β-blocker primarily used as antihypertensive
• Supplied as 5 mg/mL 20 mL vials & oral tablets
• **Usual IV Dose:**
  • **IV Bolus:** 5-20 mg initially, followed by 10-40 mg at 10 minute intervals until desired blood pressure achieved.
  • **IV Continuous:** 0.5 – 2mg/min (30-120mg/h)
• **Maximum Single Dose:** 40mg
• **Maximum Daily Dose:** 300mg
• Usual Oral Dose: 100 mg po BID initially
  • 200-400 mg BID  max dose 2.4 g/day

SBH Parenteral Drug Manual & Epocrates
Sotalol

• Actually more correctly known as a Class III antiarrhythmic
• Non-selective beta blocker
• Has similar properties to amiodarone
• Useful in dealing with both atrial and ventricular abnormalities in heart rhythm
• “Start low and go slow”
Adverse Reactions (as listed for Metoprolol)

- Cardiovascular: hypotension, heart block, heart failure, chest pain, cold extremities
- CNS: dizziness, fatigue, depression, confusion, headache, insomnia, sleep disturbance, nightmares
- Respiratory: SOB, bronchospasm & wheezing
- Endocrine: decreased libido
- GI: nausea, vomiting, diarrhea & constipation
- Dermatology: pruritis, rash, photosensitivity
- Ocular: blurred vision & visual disturbances
- Otic: tinnitus

From Lexi-Comp Drug Information Handbook
Beta Blocker Overdose – Physical Findings

- Bradycardia,
- Hypotension,
- Low cardiac output, cardiac failure, cardiogenic shock & asystolic death
- Bronchospasm and respiratory depression.
- Changes in mental status, convulsions, and coma have also been described.
- Hypoglycemia
Glucagon

- effective agent for reversing symptomatic bradycardia and hypotension caused by beta-adrenergic blocker overdose
- the proposed mechanisms for the positive inotropic and chronotropic effects of glucagon are an increased production of cyclic adenosine monophosphate and increased intracellular levels of calcium. These effects are independent of the beta-adrenergic receptor.
Questions & Time to Relax!