Benzos’, Blockers, Coma & Cardiac Arrest

What’s a Nurse to do?
Objectives

- Review of ACLS Algorithms for Cardiac Arrest Management
- Discuss the toxicology of Beta Blocker Poisoning
- Describe the clinical symptoms of Beta Blocker Poisoning
- Outline the management of Beta Blocker Poisoning
Case Study

- Ms. X found collapsed comatose and pulseless
- CPR started by Fire Department
- EMS arrives she is bradycardiac, agonal breathing and cool
- Treatment: epinephrine, atropine and intubated
- Return of spontaneous circulation and transported to RAH ER.
- Vital Signs
  - SB of 40, BP 150/98, Temp 31.5
- CT scan
  - Negative
- Transported to ICU in stable condition
ICU Admission

- Arrival SB of 30, cool and pale.
- Dopamine infusion
- Transfer to bed
- First assessment no pulses
- Code Blue called @ 1355 hours
- You are the code team leader what is your first priority?
Ms. X @1415 hours

- 4 Cycles of CPR
- Rhythm alternating between PEA and Asystole
  - ABG: 7.26/36/255/15.6
- Medications given:
  - Epinephrine, Atropine, NABicarb, CaCL, D50W and MG
- ROSC @ 1412, SBP of 60.
  - Dopamine increased to 20mcq/kg/min
- Loss Pulse at 1415 TCP no capture, CPR resumed
<table>
<thead>
<tr>
<th><strong>H’s</strong></th>
<th><strong>T’s</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypovolemia</td>
<td>Toxins</td>
</tr>
<tr>
<td>Hypoxia</td>
<td>Tamponade Cardiac</td>
</tr>
<tr>
<td>Hydrogen ion</td>
<td>Tension Pneumothorax</td>
</tr>
<tr>
<td>Hypo/Hyperkalemia</td>
<td>Thrombosis (Coronary or Pulmonary)</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>Trauma</td>
</tr>
<tr>
<td>Hypothermia</td>
<td></td>
</tr>
</tbody>
</table>
Hypothermia Algorithm

Moderate Hypothermia
30 °C to 34 °C

Passive Rewarming  |  Active truncal only

Core Temp > 30°C

Continue CPR  |  IV medications at longer intervals

Active Internal Rewarming

Warm IV Fluids  |  Warm Oxygen
Ms. X 1415 to 1500 hours

- PEA to SB with pulse
  - Epinephrine, atropine and epinephrine infusion @ 10 mcq
- SG transvenous pacemaker
  - Rate of 80 MA 10 with capture  BP 75/35
- Continues to hypothermic
  - 3 liters of warmed saline
- Refractory hypotension
  - Epinephrine 20 mcq, Dopamine 20 mcq and Levo 40 mcq
Post Resuscitation Care

• History
  – Hypothyroidism

• Admission Blood work
  – Troponin < 0.10, TSH 6.47, Liver enzymes elevated

• Cardiology Consult
  – ECHO: EF of 30% with hypokinetic wall motion
  – Normal ECG
  – Cardiac cause ruled out
History

- Family arrives at hospital
- Update on patient’s condition
- Obtain further history
- Overdose of Propranolol and Benzodiazepines
Beta-Blockers

- Management of hypertension, ischemic heart disease, heart failure, arrhythmia
- Also used for migraine headache, portal hypertension and aortic dissection
- Off label: Alcohol withdrawal, antipsychotic, aggressive behavior, anxiety and PTSD
- In US 3% of all overdoses from CV drugs. Of that 3% 37% are from Beta-blockers and Calcium Channels
- 5th leading cause of death in overdoses.
Adrenergic Receptors

- Metabotropic protein coupled receptors
- Targets of catecholamines
  - Norepinephrine and epinephrine
- Sympathetic response
  - Fight and flight
- 2 types of receptors
  - Alpha and Beta
- Alpha
  - Vasoconstriction of arteries and veins. Decreased motility of GI tract
Beta Receptors

- Beta 1
  - Heart
  - Increase heart rate, AV conduction and contractility
- Beta 2
  - Bronchial, peripheral vascular smooth muscle and heart
  - Vasodilation and bronchodilation
- Beta 3
  - Adipose tissue and heart
  - Thermogenesis, decreased contractility and lypolysis
Effect of Beta blocker

• Decreases cellular levels of cAMP
• Depressed myocardial contractility
• Decreased automaticity in pacemaker cells
• Systemic effects
  • Bronchoconstriction
  • Impaired gluconeogenesis
  • Decreased insulin release
Membrane Stabilizing Activity (MSA)

- Inhibit fast sodium channels
- Greatest influence on adverse cardiovascular effect
- Clinical Symptoms include
  - Seizures, coma
  - Hypotension
  - Widened QRS and Ventricular dysrhythmias
Lipophilicity

- Rapidly cross the blood brain barrier
- Predispose to seizures and delirium
- Beta blockers with low lipid solubility and no membrane stabilizing effects are safer.
Intrinsic Sympathomimetic Activity (ISA)

• Partial agonist effect results in less bradycardia and hypotension.
• ISA agents cause less bronchoconstriction
• Overdose receptor selectivity is lost
• Propranolol is a Beta 1 and Beta 2 with high lipid solubility and sodium channel blocking leading to adverse cardiovascular and neurologic complication
Toxicology

• Cellular toxicity effected by
  • Membrane stabilizing activity
  • Lipophilicity
  • Intrinsic sympathomimetic activity

• Complications related:
  • Excessive beta adrenergic blockage on cardiac conduction
Beta Blocker Overdose

• Diagnosis
  • Based on history and clinical presentation
  • Assays for beta blockers are not routine
• Differentials for unexplained bradycardia and hypotension
  • Beta blockers, calcium channel blockers, digoxin and clonidine
  • Opioids, sedative hypnotics and organophosphates
  • Hyperkalemia, hypothermia, cardiac ischemia, myxedema coma, intracranial hemorrhage and SSS
Clinical Presentation

• Profound bradycardia and hypotension
  • Myocardial depression and cardiogenic shock
• Mental status changes
  • Delirium, coma and seizure
• Hyperkalemia, hypoglycemia and bronchospasm
Clinical Management

• ABC’s
• Atropine
• Glucagon
• IV Calcium salts
• Catecholamines
• High dose insulin and glucose infusion
• Other
Glucagon

- 1st line antidotal treatment
- Hormone synthesized and secreted by pancreas
- Activates adenylate cyclase at different site from beta adrenergic agents
- Increase in cAMP
- Improves heart rate
- Slow bolus and then infusion
Catecholamines

- Stimulate adrenergic receptors and increasing concentration of cAMP.
- Beta blockers block the adrenergic receptors.
- Causes poor response to catecholamines
  - Higher than normal doses are required to maintain MAP.
- Isoproterenol a beta adrenergic agonist.
Insulin and Glucose

- Beta blocker interfere with myocyte metabolism
- Beta blocker inhibit pancreatic insulin release
- Reduces available glucose
- Decreases cardiac output
- Insulin improve metabolism with myocyte and improves inotropy
Other Treatments

- Calcium
  - Improves hemodynamics by increasing inotropy
- Sodium Bicarbonate
  - Counteracts propranolol effects on cardiac sodium channel
- Magnesium
- Pacing
- GI decontamination
- Hemodialysis
Other Treatments

• Lipid emulsion therapy
  • Used in poisoning of lipophilic medications
  • Binds the lipophlic drug
  • Useful in hemodynamically unstable patients
• Phosphodiesterase
  • Inhibit the breakdown of cAMP
Ms. X

- Pacing and Catecholamine infusions
- Glucagon infusion
- Insulin infusion
- Calcium
- Respiratory failure from aspiration requiring tracheostomy
- To ward on September 25
- Home on October 2