EMERGENCY PHARMACOLOGY I & II

Advanced Cardiac Life Support

Seminole Community College

Based on the Guidelines 2000 for Cardiopulmonary Resuscitation & Emergency Cardiovascular Care

International Consensus on Science

Pharmacology I

Antiarrhythmic Drugs

ADENOSINE (Adenocard)

- **Mechanism of Action - Adenosine is a endogenous purine nucleoside that depresses AV node and sinus node activity.**
- **Since most common forms of PSVT involve a reentry pathway including the AV node, Adenosine is effective in terminating these arrhythmias.**

ADENOSINE (Adenocard)

- **Mechanism of Action cont.- if arrhythmia does not involve a reentry pathway including Atrial Fibrillation or Flutter, Atrial or Ventricular Tachycardias, Adenosine will not be effective in terminating these arrhythmias.**
- **If this is the case Adenosine may cause AV or Ventricular blocks.**

ADENOSINE (Adenocard)

- **INDICATIONS - Used in the treatment of Paroxysmal Supraventricular Tachycardia (PSVT) including PSVT in WPW syndrome.**

ADENOSINE (Adenocard)

- **PRECAUTIONS: Adenosine produces a short lived pharmacologic response because it is rapidly metabolized by enzymatic degradation in the blood and tissues.**
- **The half-life is approximately 5 seconds or less.**

ADENOSINE (Adenocard)

- **PRECAUTIONS: Side effects are common but usually short lived; Flushing, dyspnea, chest pain and transient sinus bradycardia and ventricular ectopy after termination of PSVT.**
- **<u>Should not</u> be used diagnostically for stable, wide complex tachycardias of unknown type (this is a new guideline).**

ADENOSINE (Adenocard)

- **DOSAGE - 6 mg rapid bolus over 1-3 seconds. Followed by 20 ml flush. A brief period of Asystole (up to 15 seconds) may occur after rapid administration.**
- **After 1-2 minutes give 12 mg, may repeat a second 12 mg after 1 - 2 minutes. IV should be in anticubital fossa. 92% conversion usually after the first 12 mg dose.**

Amiodarone Hydrochloride (Cordarone)

- **Mechanisms of Action: effects on sodium, potassium, and calcium channels, also with alpha and beta blocking properties.**
- **Lengthens the cardiac action potential (antisympathetic action). Negative dromotropic effects on SA node and AV node.**
- **It has vasodilatory affects that decrease cardiac workload and myocardial oxygen consumption.**

Amiodarone Hydrochloride (Cordarone)

- **Indications: preferred treatment for atrial and ventricular arrhythmias. Used prior to Lidocaine.**
- **Treatment and prophylaxis of frequently recurring ventricular fibrillation and hemodynamically unstable ventricular tachycardia in patients refractory to other agents.**
- **Ventricular rate control of rapid atrial arrhythmias in patients with severely impaired left ventricular function when digitalis is ineffective.**

Amiodarone Hydrochloride (Cordarone)

- **Indications: ventricular rate control due to accessory pathway conduction in preexcited atrial arrhythmias.**
- **Adjunct to electrical cardioversion of refractory PSVT's and atrial tachycardia.**

Amiodarone Hydrochloride (Cordarone)

- **Effective for the control of hemodynamically stable VT, polymorphic VT, and wide-complex tachycardia of uncertain origin.**
- **Used after defibrillation and epinephrine in cardiac arrest due to persistent VF or VT.**

Amiodarone Hydrochloride (Cordarone)

- **Contraindications: hypersensitivity, cardiogenic shock, sinus bradycardia, 2nd or 3rd degree block.**
- **Hypotension most common side effect.**
- **Treatment with fluid and temporary pacing can correct hypotension due to Amiodarone in the field!**

Amiodarone Hydrochloride (Cordarone)

- **Dosage: in cardiac arrest due to pulseless VT or VF 300 mg rapid infusion diluted in 20 to 30 ml of saline or D^5W. Followed by 150 mg every 3-5 mins until arrhythmia is suppressed.**
- **Arrhythmias with a pulse: 150 mg over ten minutes followed by 1mg/min infusion for 6 hours. Repeat 150 mg if necessary to a maximum daily (24 hrs)dose of 2.2 grams.**
- **Maintenance infusion: 0.5 mg/min maximum daily dose of 2.2 grams.**

Amiodarone Hydrochloride (Cordarone)

- **Administration difficulties:**
  - **Contained in an ampule must use filtered needle to draw up.**
  - **Must be drawn up slowly because bubbles will occur if drawn rapidly (soap-like solution).**
  - **Must be given rapidly and only once.**
  - **Many side effects.**
  - **150 mg/ampule, must draw up two ampules.**
  - **Expensive approximately $175.00 per 300 mg dose.**

ATROPINE SULFATE

- **Mechanism of Action: Parasympatholytic drug which enhances both sinus node automaticity, and AV node conduction by reversing cholinergic-mediated affects. Inhibits the release of acetylcholine from the vagus nerve.**

ATROPINE SULFATE

- **Indications: Ventricular Asystole, Conduction disturbances (Symptomatic 1st or 2nd degree type 1 AV blocks), Symptomatic bradycardia, slow pulseless electrical activity.**

ATROPINE

- **Precautions:**
  - **Tachydysrhythmias.**
  - **Increased myocardial oxygen consumption**
  - **Use with caution in the presence of acute myocardial ischemia associated with acute myocardial infarction.**
  - **Do not push slowly as paradoxical bradycardia may occur.**
  - **Less than 0.5 mg can cause a further slowing of the rate.**

ATROPINE

- **Precautions: do not use when bradycardia from AV block at the His-Purkinje level Mobitz (type) II or 3rd degree (complete) heart block with new wide-QRS complexes is suspected.**
- **Atropine can rarely accelerate sinus rate and AV node conduction.**

ATROPINE

- **Dosage:**
  - **Asystole & Slow PEA 1 mg IVP and repeated every 3-5 mins if asystole persists.**
  - **Bradycardia & AV Blocks 0.5 mg - 1.0 mg every 3 - 5 mins.**
  - **ET administration: 2.0 - 2.5 mg diluted in 10 ml NS.**
  - **Maximum dose: 3 mg (0.04 mg/kg) complete vagolytic dose.**
  - **Less than 0.5 mg causes paradoxical bradycardia.**
- **Maximum dose should be reserved for asystolic cardiac arrest only, this is due to the increase in myocardial oxygen demand!**

PROPRANOLOL, METOPROLOL, ATENOLOL, ESMOLOL

- **Mechanism of Action - Beta blocking agents attentuate the effects of circulating catecholamines by blocking their ability to bind to beta receptors.**
- **Reduces heart rate, blood pressure, myocardial contractility and therefore myocardial oxygen consumption.** ***Decreases (depresses) the pumping function of the heart.***

PROPRANOLOL, METOPROLOL, ATENOLOL, ESMOLOL

- **Mechanism of Action – benefits in patients with acute coronary syndromes, including patients with non-Q wave MI and unstable angina.**
- **Therefore beta blockers should be administered in these patients under these conditions!**

PROPRANOLOL, METOPROLOL, ATENOLOL, ESMOLOL

- **Indications - Primary indication is to control recurrent ventricular tachycardia ventricular fibrillation and supraventricular arrhythmias.**
- **Precautions: Hypotension, Congestive heart failure and bronchospasm.**
- **Dosage - Varies with desired effect. Currently not used in the field!**

BRETYLIUM TOSYLATE (Bretylol)

- **Indications – no longer indicated for treatment of ventricular arrhythmias, due to the decrease in availability and it's documented ineffectiveness.**
- **Has been removed from all algorhythms.**

VERAPAMIL & DILTIAZEM (Calan - Isoptin, Cardizem)

- **Mechanism of Action - Both are calcium channel blocking agents that slow conduction and increase refractoriness in the AV node. These actions terminate reentrant arrhythmias that require AV nodal conduction.**

VERAPAMIL & DILTIAZEM (Calan - Isoptin, Cardizem)

- **Verapamil is a negative inotropic agent that causes a reduction in myocardial oxygen requirement. May also control ventricular response in A-Fib, A-Flutter, or multifocal Atrial Tachycardia.**

VERAPAMIL & DILTIAZEM (Calan - Isoptin, Cardizem)

- **Indications - Used in the treatment of Paroxysmal Supraventricular Tachycardia (PSVT) narrow complex and ventricular rate control in Atrial Fibrillation. However, Adenosine is the drug of choice.**

VERAPAMIL & DILTIAZEM (Calan - Isoptin, Cardizem)

- **Precautions - Possible hemodynamic compromise. Should not be used in WPW syndrome or impaired heart function.**
- **Calcium is used for possible overdose of Verapamil or other Calcium channel blocker.**

VERAPAMIL & DILTIAZEM (Calan, Isoptin, Cardizem)

- **Dosage:**

  Verapamil: 2.5 - 5.0 mg IV over 2 minutes. Repeat doses of 5 - 10 mg every 15 to 30 minutes to a maximum of 30 mg.

  Diltiazem: 0.25 mg/kg over 2 minutes followed by 0.35 mg/kg. Produces less myocardial depression than Verapamil.

DISOPYRAMIDE

- **Mechanism of Action: antiarrhythmic agent that acts to slow conduction velocity, and prolongs the effective refractory period (similar to Procainamide).**
- **Potent anticholinergic, negative inotropic, and hypotensive effects.**
- **Not used in the field!**

FLECAINIDE

- **Mechanism of Action: potent sodium channel blocker with significant conduction-slowing effects.**
- **Indications: ventricular arrhythmias and for patients in supraventricular arrhythmias with structural heart disease. IV version (not approved in U.S.) has corrected A-fib, Ectopic A-tachycardia, A-flutter.**
- **Precautions: must be administered slowly, bradycardia, hypotension, and neurological abnormalities.**

IBUTILIDE

- **Mechanism of Action: short-acting antiarrhythmic drug. Effective by prolonging the action potential duration and increasing the refractory period of cardiac tissue.**
- **Indications: acute pharmacologic conversion of Atrial flutter or A-Fib when electrical cardioversion has failed.**

IBUTILIDE

- **Dosage: Adults over 60 kg, IV 1 mg/10 ml over 10 minutes. Repeat if unsuccessful 1mg/10ml over 10 minutes.**
- **If under 60 kg administer 0.01 mg/kg and repeat in second dose.**
- **Precautions: minimal effects on the heart rate and BP. However. May cause ventricular proarrhymias especially when there is an impaired LV.**

ISOPROTERENOL(Isuprel)

- **Mechanism of Action - Isoproterenol is a pure beta adrenergic agent. Potent**

  inotropic and chronotropic agent that increases cardiac output and myocardial oxygen demand.

  Isoproterenol can increase myocardial ischemia and exacerbates arrhythmias.

ISOPROTERENOL(Isuprel)

- **Indications - Refractory torsades de pointes (Chemical overdrive pacing) and immediate control of hemodynamically significant bradycardia especially in the denervated hearts of heart transplant patients. However, *not the treatment of choice, used until a pacemaker, atropine, dobutamine is available and has failed.***

ISOPROTERENOL(Isuprel)

- **Precautions - ventricular ectopy and dysrhythmias. Electronic pacing preferred!**
- **Dosage - 2 to 10 mcq/min titrated to effect. 1 mg/250 ml fluid infusion.**

LIDOCAINE (Xylocaine)

- **Mechanism of Action - Suppresses ventricular arrhythmias by decreasing the automaticity of phase 4 depolarization. Depresses conduction in reentrant pathways. Elevates fibrillation threshold. Decreases excitability of ischemic tissue.**

LIDOCAINE

- **Indications: Used in the treatment of:**
  - **VF/ Pulseless VT that persists after defibrillation and epinephrine (Class Indeterminate).**
  - **Control of hemodynamically compromising PVC's (Class Indeterminate).**
  - **Hemodynamically stable VT (Class IIb)**
- **Lidocaine is the second choice medication behind other alternate agents: Amiodarone, Procainamide, Sotalol)**

LIDOCAINE

- **Precautions - Routine prophylactic administration is no longer recommended in uncomplicated acute MI or ischemia without PVC's.**
- **Toxic - therapeutic balance is delicate.**

LIDOCAINE

- **Dosage – In cardiac Arrest**
- ***Initial dose of 1.0 - 1.5 mg/Kg***
- ***Additional boluses of 0.5 - .75 mg/Kg repeat in* 3 - 5 minutes; maximum total dose of 3 mg/Kg.**
- **The more aggressive dosing approach is recommended in cardiac arrest (1.5mg/kg).**

LIDOCAINE

- **Dosage – In V-Tach with a pulse or other ventricular ectopic beats 0.5 – 0.75 mg/Kg, 3 mg/Kg maximun dose.**
- **Infusion: 2-4 mg/min**
- **Mix 1 Gm in 250 ml NS or 2 Gm in 500 ml.**

LIDOCAINE

- **In Patients older than 70 years old, and in those with Hepatic dysfunction should receive the initial normal loading dose.**
- **The maintenance infusion should be reduced by 50%.**
- ***Infusion rate of 1 - 4 mg/minute (class indeterminate).***

LIDOCAINE

- **Special Considerations:**
- **Endotracheal Dose: 2 – 4 mg/kg**
- **Reappearance of arrhythmias during a constant infusion of Lidocaine should be treated with a small bolus dose (0.5 mg/kg).**

LIDOCAINE

- **Toxic reactions and Side effects:**
  - **Slurred speech**
  - **Altered consciousness**
  - **Muscle twitching**
  - **Seizures**
  - **Bradycardia**

MAGNESIUM SULFATE

- **Mechanism of Action -**

  Magnesium deficiency is associated with cardiac arrhythmias, symptoms of cardiac insufficiency, and sudden cardiac arrest.
- **Hypomagnesemia can precipitate refractory V-Fib.**

MAGNESIUM SULFATE

- **Indications - Used in the treatment of Ventricular Fibrillation / Ventricular Tachycardia after full doses of Amiodarone and Lidocaine have failed to convert rhythm. Treatment of choice for Torsades de pointes.**

MAGNESIUM SULFATE

- **Should only be used when arrhythmias may be caused by Magnesium deficiency or Torsades de Pointes.**
- **Dosage - 1 to 2 grams loading dose mixed in 10 ml of solution and administered over 1 to 2 minutes.**

PROCAINAMIDE (Pronestyl)

- **Mechanism of Action – supresses both atrial and ventricular arrhythmias. Acceptable for the pharmacological conversion of supraventricular arrhythmias (particularly A Fib and A Flutter) to sinus rhythm (class IIa).**

PROCAINAMIDE (Pronestyl)

- **Supresses ventricular ectopy similar to Lidocaine. Recommended when Amiodarone and Lidocaine is contraindicated or it has failed to suppress ventricular ectopy.**

PROCAINAMIDE (Pronestyl)

- **Increases ventricular fibrillation threshold. Shortens effective refractory period of the AV node, lengthens refractory period in bundle of his.**

PROCAINAMIDE (Pronestyl)

- **Indications - Secondary to Amiodarone and Lidocaine in the field. Used when both medications have failed to suppress the life threatening ventricular arrhythmias. Suppresses PVC's and recurrent V-tach, V-fib.**

PROCAINAMIDE (Pronestyl)

- **Precautions - Contraindicated in Torsades de Pointes, hypotension after rapid injection. Adverse ECG effects. Use caution in acute MI.**

PROCAINAMIDE (Pronestyl)

- **DOSAGE - Infusion of 30 mg/min until one of the following is observed:**
  - **1. Arrhythmia is suppressed**
  - **2. Hypotension ensues**
  - **3. QRS widens by 50%**
  - **4. Total of 17 mg/kg administered (1.2 gm/70kg)**
- **Maintenance Infusion rate: 1 – 4 mg/minute**

PROPAFENONE

- **Mechanism of Action: Antiarrhythmic agent with significant conduction-slowing and negative inotropic effects with additional non-selective beta blocking properties.**
- **Used in U.S. orally only for treatment of supraventricular and ventricular arrhythmias in patients without structural heart disease.**

PROPAFENONE

- **Indications: ventricular arrhythmias and for patients in supraventricular arrhythmias with structural heart disease. IV version (not approved in U.S.) has corrected A-fib, Ectopic A-tachycardia, A-flutter.**
- **Dosage: No field dose**

SOTALOL

- **Mechanism of Action: prolongs action potential duration like Amiodarone, and increases cardiac tissue refractoryness.**
- **Used in U.S. orally only for treatment of supraventricular and ventricular arrhythmias in patients without structural heart disease.**
- **Dosage: No field dose**

Pharmacology II

Agents to Optimize Cardiac Output and Blood Pressure

EPINEPHRINE (Adrenolin)

- **Mechanisms of Action**: **Naturally occurring catecholamine with both Alpha and Beta adrenergic properties (Sympathomimetic agent).**
- **Greatest benefit from alpha adrenergic stimulating properties.**

EPINEPHRINE (Adrenolin)

- **Mechanisms of Action**:
  - **Increases myocardial and cerebral blood flow during CPR**
  - **Increased systemic vascular resistance**
  - **Increased arterial blood pressure**
  - **Increased heart rate (Chronotropic effects)**
  - **Increased myocardial contraction (Inotropic effect). Increased automaticity**
  - **Increased myocardial oxygen requirement**

EPINEPHRINE (Adrenolin)

- **Indications: "First Agent in All Forms of Cardiac Arrest"**
  - **Improves V-Fib conversion, PEA, May restore electrical activity in Asystole.**
  - **Vasopressor agent for symptomatic bradycardia (not first line drug).**
- **Vasopressin may be substituted in the V-fib algorhythm.**

EPINEPHRINE (Adrenolin)

- **Precautions: May precipitate or excerbate myocardial ischemia. Do not mix with alkaline solutions. Ventricular ectopy in digitalized patients.**
- **Remember the increase in Myocardial Oxygen Demand!**

EPINEPHRINE (Adrenolin)

- **Dosage:**
  - **1 mg of 1: 10,000 solution IVP every 3-5 minutes followed by 20 ml flush.**
  - **ET administration: 2 - 2.5 mg in 10 ml.**
  - **Infusion: 1 mg in 250 ml, dose 1 mcq/min.**

VASOPRESSIN

- **Mechanism of Action: naturally occurring antidiuretic hormone that acts as a non-adrenergic peripheral vasoconstrictor.**
- **Indications: May be substituted for Epinephrine in the V-fib / V-tach without a pulse algorithm (class IIb).**

VASOPRESSIN

- **Mechanism of Action: during a short duration of V-Fib, during CPR increased coronary perfusion pressure, and vital organ blood flow.**
- **Vasopressin does not increase myocardial oxygen demand because of the lack of beta adrenergic stimulation.**
- **Vasopressin remains intact during acidosis.**

VASOPRESSIN

- **Half-life 10 – 20 minutes**
- **Dosage: 40 U (units) IVP**
- **May follow up with Epinephrine after 10 – 20 minutes of initial administration.**
- **May later be used for PEA and Asystole.**
- **Inexpensive to purchase and easy to administer.**

NOREPINEPHRINE (Levophed)

- **Mechanism of Action - Naturally occurring catecholamine that is a potent alpha receptor agonist and vasoconstrictor. Causes a great increase in myocardial oxygen demand and will exacerbate myocardial ischemia.**

NOREPINEPHRINE (Levophed)

- **Indications – (None in the field) Treatment for hemodynamically significant hypotension that is refractory to other sympathomimetic amines. Should be considered as a last and temporary measure.**

NOREPINEPHRINE (Levophed)

- **Precautions - Increases myocardial oxygen requirement and will exacerbate ischemia. If drug infiltrates 5 to 10 mg of Phentolamine should also be infiltrated to prevent tissue necrosis and sloughing.**
- **Dosage - 0.5 - 1.0 mcq/minute titrated to effect. 4 mg placed in 250 ml D^5W.**

DOPAMINE (Intropin)

- **Mechanism of Action - A chemical precursor of norepinephrine that has both alpha and beta actions, and stimulates dopaminergic receptors in a dose dependant fashion.**
- **Dopamine stimulates the heart through beta receptors.**

DOPAMINE (Intropin)

- **Indications: usually reserved for hypotension that occurs with symptomatic bradycardia or post cardiac arrest. Goal BP 90 mm Hg.**
- **Precautions: dose dependant, higher doses may have a profound negative impact on the heart. Do not use in the same IV lines as Bicarbonate, may inactivate. Extreme tissue destruction if IV infiltrates.**

DOPAMINE (Intropin)

- **Other Precautions - SVT or ventricular arrhythmias. MAO inhibitors may potentiate the effects of dopamine, use 1/10th the normal dose. Alkaline solutions inactivate dopamine. Must be tapered off, use central line due to risk of infiltration causing severe damage.**

DOPAMINE (Intropin)

- **Dosage: in low doses 1-2 mcq/Kg/min produces vasodilation of renal, mesenteric, and cerebral arteries by stimulation dopaminergic receptors.**
- **At midrange doses 2 - 10 mcq/Kg/min produces cardiovascular effects (Beta).**

DOPAMINE (Intropin)

- **At higher doses 20 mcq/Kg/min produce hemodynamic effects similar to norepinephrine (peripheral arterial vasoconstriction).**

DOPAMINE

- **Field Dosage -**

  5 mcq/Kg/min titrated to effect. Final recommended dose dosage range is 5 - 20 mcq/kg/min.

  Dopaminergic effect: 1 – 2 mcq/kg

  Beta effect: 2 –10 mcq/kg

  Alpha effect: 10 – 20 mcq/kg

DOBUTAMINE (Dobutrex)

- **Mechanism of Action - synthetic sympathomimetic amine that exerts its potent inotropic effects by stimulating beta-1 and alpha adrenergic receptors in the myocardium and blood vessels.**
- **Dobutamine has beneficial hemodynamic effects and its lack of norepinephrine release minimize its effects on myocardial oxygen demand. DOES NOT PRODUCE RENAL AND MESENTERIC VASODILATION LIKE DOPAMINE.**

DOBUTAMINE (Dobutrex)

- **Indications - Treatment of pulmonary congestion and severe systolic heart failure.**
- **Precautions - High doses may cause myocardial ischemia, SVT and V-tach.**
- **Dosage - 2 to 20 mcq/Kg/min.**

AMRINONE (Inocor)& MILRINONE

- **Mechanism of Action - Rapid-acting inotropic agent who net effects are similar to dobutamine. Cardiac output increases and peripheral vascular resistance and preload are diminished.**
- **Indications - Severe congestive heart failure refractory to diuretics or cardiogenic shock.**

AMRINONE (Inocor)& MILRINONE

- **Precautions - May induce or worsen myocardial ischemia, and ventricular ectopy.**
- **Dosage - 0.75 mg/Kg every 2 - 3 minutes followed by 5 to 15 mcq/Kg/min infusion.**

CALCIUM CHLORIDE

- **Mechanism of Action - Although Calcium ions play a critical role in myocardial contractile performance and impulse formation, however studies have not shown benefit from the use of calcium and in fact may be detrimental.**

CALCIUM CHLORIDE

- **Indications - Hyperkalemia, Hypocalcemia and channel blocker toxicity (verapamil) class IIb.**
- **Dosage - 2 mg - 4 mg/Kg repeat if necessary in 10 minute intervals.**

DIGITALIS

- **Mechanism of Action - Rapid-acting inotropic agent who net effects are similar to dobutamine.**
- **Cardiac output increases and peripheral vascular resistance and preload are diminished.**
- **Extremely limited use in Emergency Cardiac Care.**

DIGITALIS

- **Indications – decreases ventricular rate in Atrial flutter and Atrial fibrillation. No longer preferred method.**
- **Precautions - May induce or worsen myocardial ischemia, and ventricular ectopy (all lethal forms of dysrhythmias have occurred).**
- **Dosage - 10 - 15 mcq/Kg every 2 - 3 minutes followed by 5 to 15 mcq/Kg/min infusion.**

NITROGLYCERINE

- **Mechanism of Action - Organic nitrate that relaxes vascular smooth muscle**
- **Indications - Primary indication is to relieve Angina Pectoris, initial treatment of choice for ischemic-type pain or chest discomfort.**
- **Parenteral choice for the treatment of congestive heart failure, management of uncomplicated MI.**

NITROGLYCERINE

- **Precautions: Hypotension, Headache.**
- **Dosage - 0.3 mg - 0.4 mg every 3 - 5 minute intervals if discomfort is not relieved.**
- **Infusion - 50 or 100 mg / 250 ml, rate 10 to 20 mcg/min increased by 5 – 10 mcg every 5 - 10 mins until desired clinical response.**

SODIUM NITROPRUSSIDE

- **Mechanism of Action - Sodium Nitroprusside is a potent peripheral vasodilator, effects are seen immediately and cease within minutes after infusion is discontinued.**

SODIUM NITROPRUSSIDE

- **Indications - Parenteral treatment of choice for severe heart failure and hypertensive emergencies when immediate reduction of peripheral resistance is necessary.**
- **Nitroglycerine is preferred because it is less likely to lower coronary perfusion pressure, and likely to increase perfusion to the myocardium.**

SODIUM NITROPRUSSIDE

- **Precautions - Hypotension is the most common adverse reaction seen with nitroprusside. Hypotension may precipitate myocardial ischemia, infarction or stroke.**
- **Dosage - 0.1 to 5 mcq/Kg/min titrated to effect. Mix 50 - 100 mg/250 ml D5W.**

SODIUM BICARBONATE

- **Mechanism of Action - Sodium Bicarbonate reacts with the hydrogen ions in the blood to form carbon dioxide and water to buffer metabolic acidosis.**

SODIUM BICARBONATE

- **Indications - Used during cardiac resuscitation only after defibrillation, effective CPR, Endotracheal intubation, hyperventilation with 100% oxygen and more than one dose of epinephrine.**
- **May be used with the following preexisting conditions:metabolic acidosis, hyperkalemia, or tricyclic or phenobarbital overdose.**

SODIUM BICARBONATE

- **Precautions - The major problem is that NaHCO3 has a high carbon dioxide content, the CO2 crosses rapidly into the cells causing an increase in intracellular hypercarbia and acidosis especially in myocardial and cerebral cells. Bicarbonate crosses much more slowly.**
- **Other problems include: Hypernatremia and a shift in the oxyhemoglobin saturation curve preventing O2 release to the tissues. Metabolic Alkalosis. Do not mix with catecholamines.**

SODIUM BICARBONATE

- **Dosage - 1 mEq/Kg initially, 0.5 mEq/Kg dose every 10 minutes thereafter.**
- **Should be guided by blood gases if possible. Use after the first ten minutes in cardiac arrest, however not recommended by the AHA.**

DIURETICS (Furosemide)

- **Mechanism of Action - Rapidly acting potent diuretic that inhibits the reabsorption of sodium in the renal loop of henle. Has a direct venodilating effect in patients with pulmonary edema onset approximately 5 minutes. Diuresis occurs later.**

DIURETICS (Furosemide)

- **Indications - Treatment of pulmonary edema associated with left ventricular failure.**
- **Precautions - Dehydration, hypotension, eletrolyte depletion in coronary heart disease.**
- **Dosage: 0.5 - 1.0 mg/Kg initially IV slowly over 1 - 2 minutes.**

MORPHINE

- **Mechanism of Action - Narcotic analgesic - manifests analgesic and hemodynamic effects, increasing venous capacitance and reduces systemic vascular resistance, reduces preload, relieving pulmonary congestion. Reduces intramyocardial wall tension, which decreases myocardial oxygen requirements. Reduces anxiety.**

MORPHINE

- **Indications - Drug of choice in treatment of pain and anxiety associated with AMI and in the Treatment of acute pulmonary edema.**
- **Precautions - Respiratory depression, hypotension. Overdose can be corrected with IV Naloxone (Narcan) 0.4 -0.8 mg.**

MORPHINE

- **Dosage - 1 mg - 3 mg IV slowly over 1 to 5 minutes until the desired effect is achieved.**

THROMBOLYTIC AGENTS
(Anistreplase, Streptokinase, Alteplase)

- **Mechanism of Actions - Activate both soluble plasminogen and surface bound plasminogen to plasmin. Pharmacolgic thrombolysis occurs when surface-bound plasminogen is converted to surface bound plasmin which digests fibrin and dissolves the clot.**

THROMBOLYTIC AGENTS
(Anistreplase, Streptokinase, Alteplase)

- **Indications -** ***Should be initiated immediate after the onset of chest pain (within 6-12 hours, ideally within 6 hours).***
- **Precautions - Bleeding is the major complication as a result of thrombolytic therapy. Various contraindications for this type of therapy.**
- **Dosage - Varies with type of drug used.**
- **New Fibrolytic Agents now used: Ativase.**

SYMPTOMATIC BRADYCARDIA

- ***Remember the following sequence:***

1st line -	***Atropine (except high block)***
2nd line -	***Pacemaker***
3rd line -	***Dopamine***
4th line -	***Epinephrine***

The End

- **This Microsoft PowerPoint presentation was prepared by Rob Holborn Ed.D, EMT-P, Seminole Community College.**
- **The presentation was prepared by using the textbook: Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care: International Consensus on Science and the 1998 National EMT-Paramedic Curriculum**