Cardiac Meds

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Pharmacokinetics	Pharmacodynamics
Refers to how drug is:	*Refers to:*
Absorbed, delivered, metabolized & excreted	Drug's specific action Clinical effects

Distrobution routes

Parenteral: Injection, IV, sub-cutaneous, inhalational, transdermal

Enteral: (GI system - most common) oral, rectal, sublingual

ANTIARRHYTHMICS

CLASS I: Na CHANNEL BLOCKERS

Lidocaine (Xylocaine)

Use:	Acute PVC's, Ventricular arrhythmias after MI
Action:	Slows myocardial conduction (↓ refractory period)
Adverse effects:	Dizziness, CNS disturbances, nausea

Propafenone (Rhythmol)

Use:	Acute PVC's & V Tach (VT)
Action:	Slows repolarization
Adverse effects:	Arrhythmogenic during exercise (bradycardia-type issues), defibrilation problems

CLASS II: BETA BLOCKERS (most common cardiac med)

Characteristics:

- β1 receptors: Affinity for epinepherine & norepinepherine

Non-selective Beta Blockers (Block β1 & β2 receptors)

Propanolol, Inderol, Carvedilol

Use:	Angina, HTN, arrhythmias
Action:	Slow down conduction through myocardium & cause smooth muscle relaxation
Adverse effects:	↓Q, bradycardic dysrhythmias, bronchospasm, cold extremities, masking of hypoglycemia

Selective Beta Blockers

Metoprolol (Lopressor), Atenolol, Bisoprolol, Acebutolol

Use:	Same as non-selective beta blockers
Action:	Same as non-selective beta blockers
Adverse effects:	Same as non-selective, but fewer peripheral side effects because only active at β1 receptors

CLASS III: ANTIARRHYTHMICS (more potent)

- * Used almost exclusively for ventricular arrhythmias *
- β1 receptors: Affinity for epinepherine & norepinepherine

Amiodarone (Cardarone, Pacerone), Sotalol

- * Used in ICU when pt codes, etc. (not on for long term) *

Use:	Ventricular arrhythmias
Action:	Prolonges repolarization so it slows down HR
Adverse effects:	Pulmonary toxicity, liver damage

NITRATES

Sublingual nitroglycerine, Nitrolingual spray

Use:	Acute chest pain/rescue
Action:	Smooth muscle relaxation
Adverse effects:	Ischemic headache, hypotension, may induce bronchospasm in some due to vasodilation

- * Nitro patches & ointments are for prevention of angina, not for rescue*

PATCHES:

- ***Transderm Nitro***
- ***Nitrodisc***
- ***Nitrodur***
- ***Minitan***

OINTMENTS:

Nitrol	***Nitro-bid***
Use:	Prevention of chest pain/angina
Action:	Same as sublingual nitro
Adverse effects:	Hypotension, drug tolerance

CARDIAC GLYCOSIDES

- Creates a sympathetic response
- +ve inotropic effect = ↑ myocardial contractile force
- Dromotropic effect = ↓ conduction velocity @ AV node & therefore leads to ↑ filling time

Digitalis, Digitoxin, Digoxin

Use:	CHF, atrial arrhythmias, a-fib 2° to AV node delay
Action:	Improve myocardial contractility by ↑ $[Ca]^{2+}$, ↓ end diastolic pressure, ↓ AV node conduction leading to ↑ filling time
Adverse effects:	Digitalis toxicity, GI disturbances, CNS disturbances, fatigue, ST segment depression, arrhythmia, PVC's, VT, bradycardia

THROMBOLYTIC AGENTS

Streptokinase

Use:	Acute MI to re-establish coronary blood flow
Action:	Facilitate dissociation/break up blood clot
Adverse effects:	Hemorrhage

Recombinant tPT, Retrovase

Use:	Acute MI (same as streptokinase)
Action:	Same as streptokinase
Adverse effects:	Hemorrhage

ANTICOAGULANTS (blood thinners - short or long-term)

Heparin (used short-term via IV or subcutaneous shot)

Use:	Prevent and treat thromboembolism
Action:	Inhibit clot formation
Adverse effects:	Hemorrhage, hemarthorsis (bleeding into joint)

Warfarin (Coumadin) (long-term version of Heparin)

Use:	Same as Heparin
Action:	Blocks vitamin K & other clotting agents
Adverse effects:	Hemorrhage, hemarthorsis (bleeding into joint)

PT/PTT/INR (tests)

NOTE:	With Heparin & Coumadin, clotting times must be measured to ensure proper dosing
PT	**Prothrombin Time**
	Normal value: 12 - 15 seconds
	(Measures extrinsic pathway & means of clotting)
PTT	**Partial Prothromboplastin Time**
	Normal value: 30-70 seconds
	(Measures intrinsic pathway & means of clotting)
INR	**International Normalized Ratio**
	Normal value: 2-3 ng/L for prophylactic treatment
	Measures difference between PTT and PT

Low Molecular Weight Heparin (Lovenox)

Use:	Prevent & treat thromboembolism
Action:	De-activates thrombin to prevent fibrin clot
Adverse effects:	Small chance of hemorrhage (doesn't affect clotting time, so PT & INR not needed)

Asprin (ASA), Plavix, Effient, ReoPro

Use:	Prevent clot formation
Action:	Prohibit platelet induced thrombus
Adverse effects:	Mild gastric irritation (mostly with asprin) but does not prohibit platelet function

CALCIUM CHANNEL BLOCKERS

- ↑ Ca^{2+} in cell = more Na^{+} coming into cell = more excitability

Cardizem, Nifedipine (Procardia), Nicardipine (Cardene), Amlodipine (Norvasc), Verapimil (calan)

Use:	HTN, myocardial ischemia, coronary artery spasm, angina, atrial tachycardia, diastolic dysfunction
Action:	Inhibit Ca^{2+} influx into cardiac & smooth muscle, prevent vasoconstriction, ↓ myocardial contractility & slows conduction
Adverse effects:	Bradycardia, orthostatic hypotension & peripheral edema

DIURETICS

Furosemide (Lasix, Natrecor)

Use:	CHF (due to fluid overload), HTN & peripheral edema
Action:	↑ renal excretion of fluid & electrolytes
Adverse effects:	Hypokalemia & fluid depletion that may cause ectopicarrhythmias, hypotension, gastric distrubances & cramping/spasm

SYMPATHETIC STIMULATORS

Dobutamine, Dopamine, Norepinepherine

Use:	Post cardiac event
Dopamine:	↑Q & BP. Good for CHF w/ resultant hypotension
Dobutamine:	↑ Ca^{2+} in cell, leads to ↑ SA node firing, AV node conduction & contractility
Use:	Prolong effect of sympathetic action, leading to ↑ myocardial contraction & BP
Adverse effects:	Chest pain, feelings of dyspnea. **CAUTION:** Try to wean pt's off ASAP as can cause receptor desensitization

VASODILATORS

Venodilators:	↓preload by ↓ing volume to ↑length tension-relationships ***(nitrates)***
Arterodilators:	Afterload reduction ***Hydralazine (Apresoline), Minoxidil (Loniten)***
Use:	HTN, CHF (Congestive heart failure)
Action:	Direct vasodilation to ↓ peripheral resistance
Adverse effects:	Orthostatic hypotension, ↑ HR

ACE INHIBITORS

- * Typically end in "pril"
- * Can also be used in pt's w/o failure but who have low EF

Capoten, Zestril, Vasotec, Accupril, Lotensin, Monopril, Lisinopril

Use:	CHF, HTN, ventricular remodelling (after acute MI)
Action:	Inhibit angiotensin converter enzyme so extra fluid isn't absorbed (sodium)
Adverse effects:	Minor GI disturbances, skin rashes & dry mouth

ANGIOTENSIN II RECEPTOR BLOCKERS (ARBs)

- * Statins/anti-lipid medications

Niacin

Use:	↓ LDL & triglyceride levels
Action:	↓ LDL synthesis
Adverse effects:	Cutaneous vasiodilation

Pravachol (Provastatin), Lipitor (Atorvastatin), Zocor, Crestor

Use:	↓ cholesterol
Action:	↓ production of LDL
Adverse effects:	Mild GI disturbance, minor myalgia (typically in lower extremities)

PHASES OF CARDIAC REHAB

Phase I	(In-patient-acute) - Averages 3 - 5 days
Phase II	Sub-acute, early out-pt. Can last up to 12 weeks
Phase III	Maintenance

CONTRADINDICATIONS FOR EXERCISE

- Unstable angina
- Resting HR > 120 @ rest
- Resting SBP > 200 mmHg
- DBP > 100 mmHG or DBP <60 mmHg
- Atrial or ventricular tachycardia, frequent PVC's, multi-focal PVC's, PVC's that ↑ w/ exercise or resting S-T segment depression of > 2mm, 3° heart block
- Blood glucose < 70mg/dL (hypo) or > 300mg/dL (hyper)
- Significant medical problems

GUIDELINES TO STOP EARLY MOBILIZATION OF COMPLICATED MI OR HIGH-RISK PATIENTS

- Development of serious arrhythmias
- Drop in BP > 20 mmHg
- **Signs of intolerance to activity:**
  - Diaphoresis
  - Severe SOB
  - Chest pain (CP)
  - HR rate rise of > 20 BPM (for phase I of rehab)

PACEMAKER CODE

First letter:	Indicates chamber being placed
Second letter:	Indicates chamber being sensed
Third letter:	Indicates the response to sensing
Fourth letter:	Indicates the programability
Fifth letter:	Indicates an anti-tachyarrhythmia function

DIAGNOSTIC TESTS/LAB VALUES

BLOOD COUNT

Hematocrit:	*Males:*	40-54%
	Females:	37-47%
Hemoglobin:	*Males:*	13 - 18 g/dL
	Females:	12 - 16 g/dL
WBC Count:	Normal:	4,500 - 11, 000

ELECTROLYTE BALANCE

K^{+}	> 5.0 mmol/L = hyperkalemia → bradycardia	
K^{+}	< 3.5 mmol/L = hypokalemia → tachycardia	
Na^{+}	Normal:	136 - 143 mmol/L
Ca^{2+}	Normal:	4.45 - 5.3 g/dL

DIAGNOSTIC TESTS

1. **EKG** (12 lead) (specific arrhythmias, MI, disease progression/regression
2. **Holter Monitor** (24 hr) (used after syncope or repeated arrhythmias)
3. **Echocardiography** (US of heart, shows valve function, ventricular size, etc).
4. **Coronary angiography** (AKA Angiogram) (via radial or femoral artery)
5. **Thalium Stress Test** (detects myocardial perfusion) (looks @ ischemia)
6. **PET** (Positron Emission Topography) (3-D bloodflow view)
7. **Trans Esophageal Echocardiogram** (TEE) (see posterior wall)
8. **MUGA** (Multigated Aquisition Imaging or Gated Pool Imaging)
9. **Graded Exercise Stress Test** (Bruce, Naughton-Balke & more)

Friendly reminder: Grind hard! You've got this!!

HYPERLIPIDEMIA CLINICAL Dx

Triglycerides:	> 185 mg/dL
Cholesterol:	> 240 mg/dL
HDL's:	< 35 mg/dL
Ratio:	Ratio = Total cholesterol/HDL (A ratio > 4.5 = hyperlipidemia)