Cardiac Arrhythmias: Keeping Up With the Beat – Advances in Medical Management

Dr. Melissa Kagarise

Objectives

- Review the anatomy and physiology of the heart and its electrical conduction system.
- Differentiate tachycardic and bradycardic arrhythmias, including atrial fibrillation.
- Identify pharmacologic and nonpharmacologic interventions in the treatment of cardiac arrhythmias.
- Identify the pharmacist’s role in supporting patients’ cardiovascular health through evidence-based patient education strategies.

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Arrhythmia
• Irregularity or loss of rhythm as a result of abnormal electrical conduction through the heart
  • Atrial Arrhythmias
  • Ventricular Arrhythmias
  • Bradycardia
  • Tachycardia

Anatomy

Physiology
• NA+, K+, Ca+, Cl-
  • Influx of ions controls contractile functions
  • Receptors within cardiac muscle
    • Beta-adrenergic
    • Alpha-adrenergic
    • Muscarinic

Electrical Conduction

Normal Pacemaker 60-100 bpm

1  2  3
40-60 bpm
4  20-40 bpm
Diagnosis

- History
  - Mode of onset
  - Mode of termination
  - Drug & dietary history
  - Past medical history
  - Physical examination
- Diagnostic studies
  - Electrocardiogram (EKG/ECG)

Electrocardiogram (ECG/EKG)

Bradycardia

- Heart rate < 60bpm
- Etiology
  - Fibrosis
  - Loss of blood flow
  - Medications

[Heart rate image]

[Diagram of cardiac pathways]
**Bradycardia, cont.**
- Symptoms
  - Asymptomatic, syncope
- Treatment
  - Pharmacologic
    - Atropine
  - Surgical
    - Pacing

**Tachyarrhythmias**
- Heart rate > 100 bpm
- Atrial
  - Sinus tachycardia/SVT
  - Atrial flutter
  - Atrial fibrillation
- Ventricular
  - Ventricular tachycardia
  - Ventricular flutter
  - Ventricular fibrillation

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**Sinus Tachycardia (SVT/PSVT)**
- Heart rate 100-180 bpm with regular rhythm
- Etiology
  - Normal response to exercise or catecholamine response
  - Fever, anxiety, hypovolemia
  - Hyperthyroidism, anemia, PE, MI, heart failure, COPD
  - Stimulants

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**Sinus Tachycardia, cont. (SVT/PSVT)**
- Symptoms
  - Palpitations, CP, SOB
- Treatment
  - Non-pharmacologic
    - Treatment of underlying cause
    - Vagal stimulation
  - Pharmacologic
    - Adenosine 6 or 12mg injection
    - Beta-blocker
    - Calcium channel blocker
  - Surgical
    - Catheter ablation
Atrial Fibrillation

- Heart rate 400-600 bpm rate and rhythm are irregular

Etiology
- HTN, CAD, MI, mitral valve disease
- Lung disease, pneumonia, hyperthyroid, heart surgery
- ETOH, stimulants, drugs
- Albuterol, Theophyline

Atrial fibrillation, cont

- Symptoms
  - Palpitations
  - Fatigue
  - Dyspnea, effort intolerance
  - Lightheadedness

Management
- Rate control
- Rhythm control
- Thromboembolism prevention
- Pacing, surgical intervention

Rate vs Rhythm Control

<table>
<thead>
<tr>
<th>Study</th>
<th>Rate Control</th>
<th>Rhythm Control</th>
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<tbody>
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<td>STAF – Major Events</td>
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<td>9%</td>
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Rate Control

- Beta-blockers (Propranolol, Atenolol, Metoprolol)
  - Caution in asthma, heart failure, hypotension
  - **Propranolol** 10-30mg 3-4 times daily before meals and at bedtime
  - **Side effects (SE)** – bradycardia, heart failure, hypotension, dizziness, fatigue, bronchospasm, skin reactions, hyperglycemia

- Calcium channel blockers (Verapamil, Diltiazem)
  - Contraindication with severe LVD, SSS, heartblock
  - **Verapamil** 240-480mg/day in 3-4 divided doses
  - **SE – dizziness, hypotension, H/A, CHF, fatigue, bradycardia**

- Digoxin
Rhythm Control

- **Class I**
  - Lengthen refractory period of myocardium through alteration in sodium
    - Flecaïnide, Propafenone

- **Class II: Beta-blockers**
  - Reduce sympathetic excitation to the heart

- **Class III**
  - Lengthen the action potential duration
    - Sotalol, Amiodarone, Dofetilide, Dronedarone*

- **Class IV: Calcium channel blockers**
  - Block calcium entering myocardium and prolongs refractory period in the AV node

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Flecainide (Tambocor)

- **Class IC antiarrhythmic**
  - Avoid in patient with heart failure or ischemic heart disease
  - Contraindicated in chronic atrial fibrillation
  - **Flecainide** 50mg twice daily titrate up to max 300mg daily
  - **Interactions**
    - May potentiate Beta-blockers
  - **Adverse reactions**
    - Mild neurologic effects
    - Hypotension and bradycardia
    - Dizziness, fatigue, GI upset, proarrhythmias

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Propafenone (Rythmol)

- **Class IC antiarrhythmic**
  - Avoid in patients with heart failure or ischemic heart disease
  - Avoid with bradycardia, hypotension and bronchospastic disorders
  - **Rythmol** 150mg every 8 hours titrating up to 225mg every 8 hour
  - **Rythmol SR** 225mg every 12 hours may increase to max 425mg every 12 hours
  - **Adverse reactions**
    - Proarrhythmias, GI upset, dizziness, heart failure, bradycardia

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Sotalol (Betapace)

- **Class III antiarrhythmic and is a non-selective Beta-blocker**
  - Avoid in patients with LV hypertrophy and heart failure
  - **Sotolol** 80mg twice daily titrate to max 320mg/daily (640mg/day for refractory)
  - **Adverse reactions**
    - Torsade de pointes, bradycardia, fatigue, hypotension, GI upset, dizziness
  - Initiate in setting where patients EKG can be monitored as well as creatinine clearance
Amiodarone (Cordarone)
- Class III antiarrhythmic
- **Amiodarone** 200mg bid usual maintenance dose
- Interactions
  - Additive bradycardia, AV block with Beta-blockers and Ca channel blockers, some interaction with antibiotics
- Adverse reactions
  - Pulmonary inflammation/fibrosis, ARDS, proarrhythmias, hepatotoxicity, optic changes, thyroid disorders, malaise, GI upset
- Must follow: CMP, TFT, LFT, EKG, CXR, PFT, ocular exams

Dronedarone (Multaq)
- Properties similar to Amiodarone but lacks the iodine influence that may be responsible for toxicity
- Contraindications
  - Heart Failure or block, use with ketoconazole, clarithromycin, macrolides
- **Dronedarone** 400mg twice daily with meals
- Adverse reactions
  - Bradycardia, torsades de pointes, GI upset, rash, increase serum creatinine, increases digoxin levels

**To achieve Sinus Rhythm**

- No heart disease
  - Dronedarone
  - Flecainide
  - Propafenone
  - Sotalol
  - Amiodarone
  - Dofetilide or Ablation

- HTN
  - Yes
  - Dronedarone
  - Flecainide
  - Propafenone
  - Sotalol
  - Amiodarone or Ablation

- CAD
  - Yes
  - Dofetilide
  - Dronedarone
  - Sotalol...
  - Amiodarone or Ablation

- Heart failure
  - Yes
  - Dronedarone
  - Flecainide
  - Propafenone
  - Sotalol...
  - Amiodarone or Ablation

Antithromobolytic Therapy
- CHADS criteria
  - Cardiac failure, HTN, Age, DM, Stroke
- ASA 81mg-325mg/daily
- Warfarin (Coumadin)
  - Dosing varies to achieve INR of 2.3
  - Adverse reactions- increased risk of bleeding, skin/tissue necrosis, purple toes syndrome, GI upset, H/A
  - Interactions- foods, ETOH, NSAIDS, ASA, ginko biloba, ginseng, St. John's Wort
  - Antidote for overdose- Vit K
Antithromobolytic Therapy, cont
- Clopidogrel (Plavix) 75mg once daily
  - Option if patient at higher stroke risk is unable to take Warfarin
  - Combine with ASA
- Dabigatran (Pradaxa) 150mg twice daily
  - Direct thrombin inhibitor
  - Adverse effects
    - Bleeding – no antidote
    - GI complaints, dyspepsia
  - Interactions
    - Rifampin and St. John's wort can reduce levels
  - Cost

Cardioversion/Ablation

Ventricular Fibrillation
- Heart rate 150-300 severe irregularity, fatal within 3-5 minutes
- Etiology
  - CAD, terminal event
  - Hypoxemia
  - Post MI
- Symptoms
  - Faintness, LOC, seizures, apnea, death
- Management
  - Basic cardiac life support, Shock (AED), ICD for prevention
Research

- Statins - antiplatelet effects and reduction of fibrinogen
- Omega 3
- Rivaroxaban (Xarelto) oral anticoagulant

Questions?

- The only way to keep your health is to eat what you don’t want, drink what you don’t like, and do what you’d druther not. ~Mark Twain

- Thank You.