Palpitations: Detecting and Managing Cardiac Arrhythmias

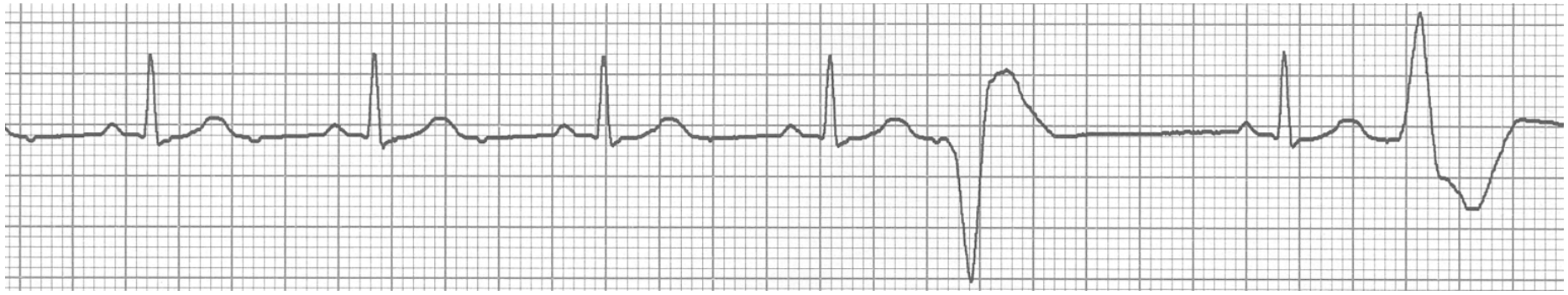
What are Palpitations?

Palpitations

- Frequent symptom in the general population
- One of the most common presentations to general practice and emergency departments.
- Second most common reason for primary healthcare referrals to cardiologists.

Palpitations

- Defined as the awareness of abnormal heartbeat
- Patient description may vary:
  - Skipping
  - Irregular beating of the heart.
  - “Flip-flops”
  - “Start and Stops”
  - Pounding sensation in the chest or neck.
  - Rapid fluttering
  - “Racing”
  - Rapid pulsation



Premature Ventricular Contractions

Palpitations

- Defined as the awareness of abnormal heartbeat
- Patient description may vary:
  - Skipping
  - Irregular beating of the heart.
  - “Flip-flops”
  - “Start and Stops”
  - Pounding sensation in the chest or neck.
  - Rapid fluttering
  - “Racing”
  - Rapid pulsation

Palpitations

- Palpitations are a symptom and not a diagnosis
- Clinicians should seek to identify the underlying cause.
- Most likely a symptom of benign underlying disease
- Maybe a sign of life-threatening conditions.

Potential Causes of Palpitations

Cause	Possible Contributors
Extracardiac stimulation of the vagus nerve	Elevations of catecholamines and glucocorticoids associated with stress and anxiety
Pronounced sympathetic response as a consequence of an organic medical condition	• Hypoglycemia • Hypoxia • Heart failure
Hyperdynamic circulation	• Valvular incompetence • Thyrotoxicosis • Hypercapnia • Hyperthermia
Abnormal heart rhythms	• Atrial fibrillation • Ectopic beats • Ventricular arrhythmias • Heart block

Palpitations in the Primary Care Setting – Wilken, Joel Med Clin N Am 100 (2016) 981–989

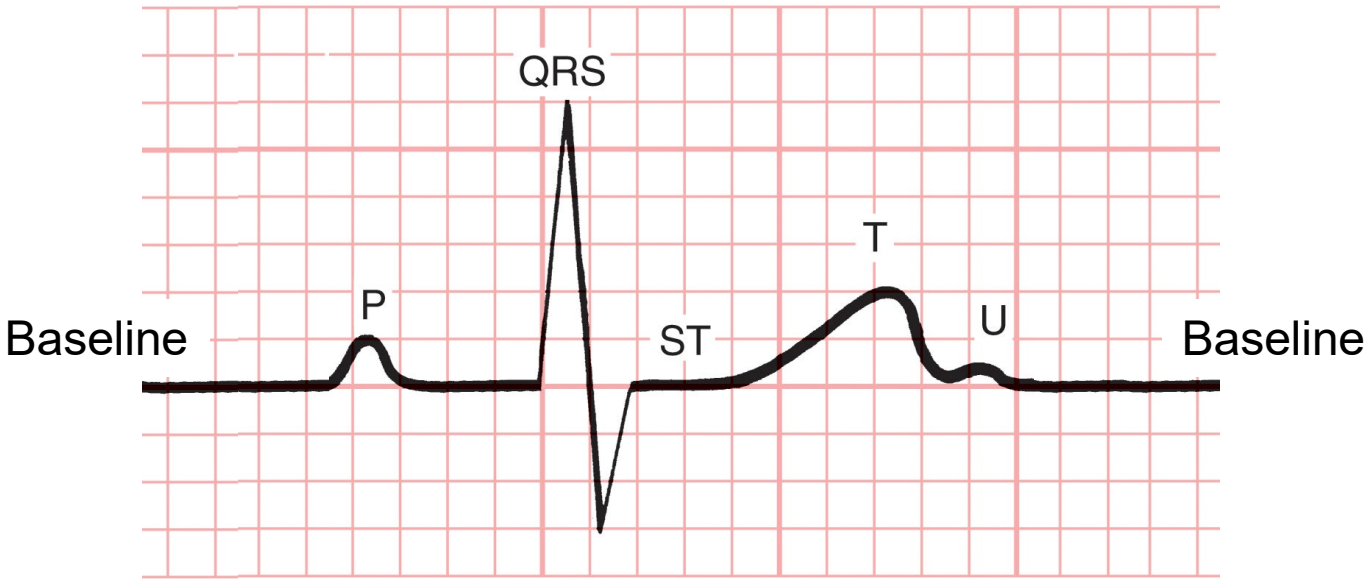
Palpitations

- History and physical examination are important in the assessment of patients with palpitations
- 12-lead electrocardiogram (ECG) or bedside monitor on presentation is the gold standard of diagnosis.
- Ambulatory Holter (24–48-hour) monitor can be helpful if symptoms intermittent

What Arrhythmias may present with Palpitations?

Rhythm Strip Interpretation Primer

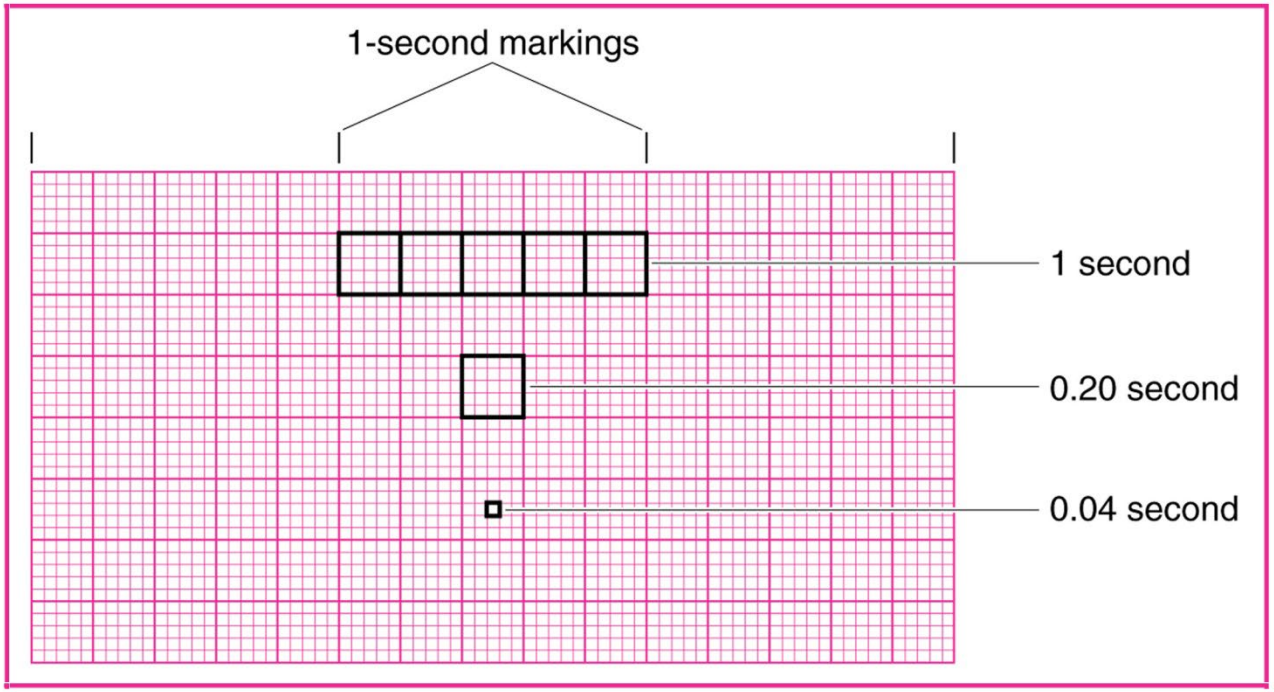
EKG Waves and Complexes

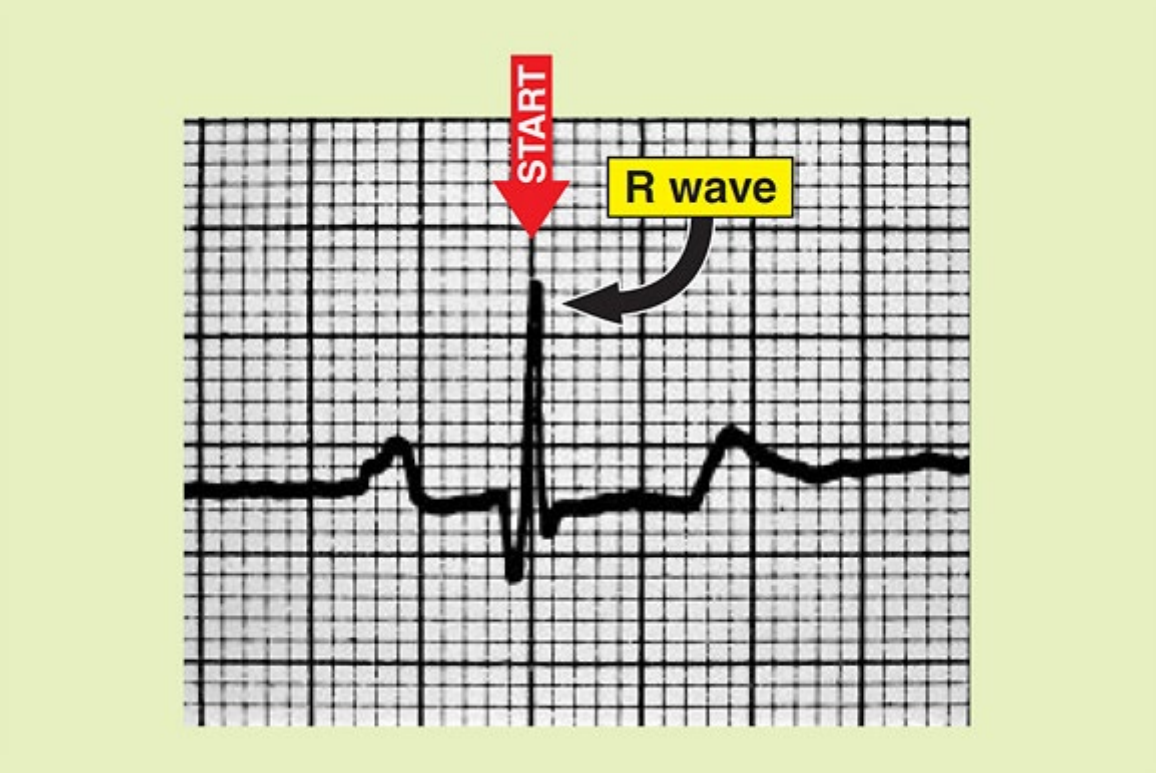


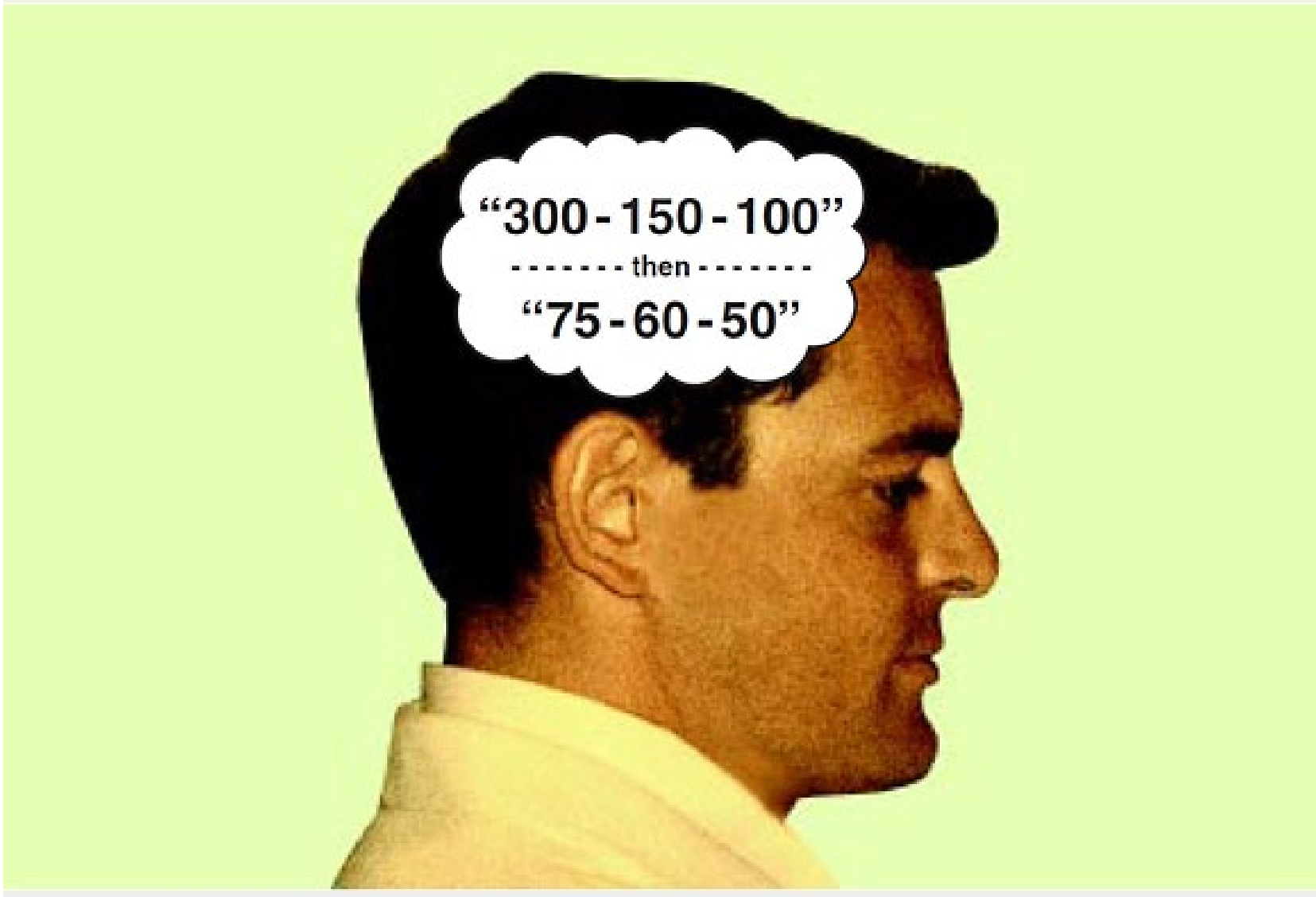
- P wave: Atrial depolarization
- QRS complex: Ventricular depolarization
- T wave: Ventricular repolarization
- U wave: Late ventricular repolarization (*Not usually seen*)

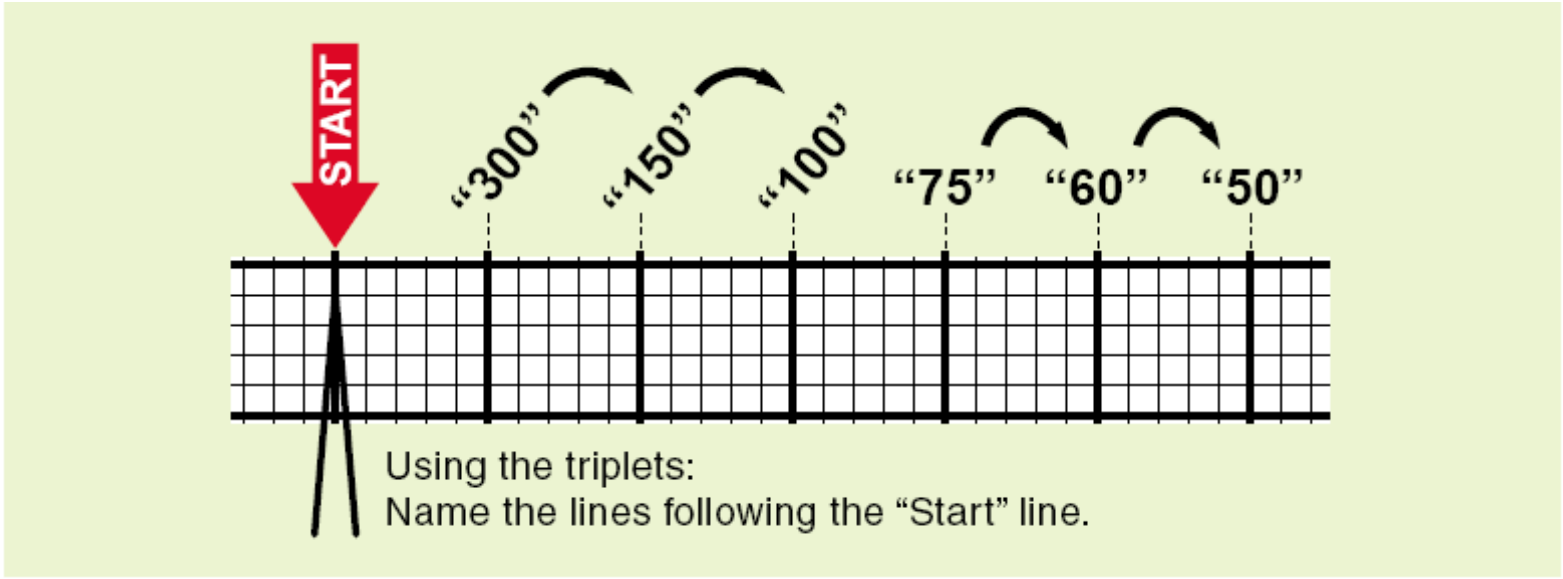
Goldberger's Clinical Electrocardiography
2024 Chapter 2; Pages 7-11

EKG Paper



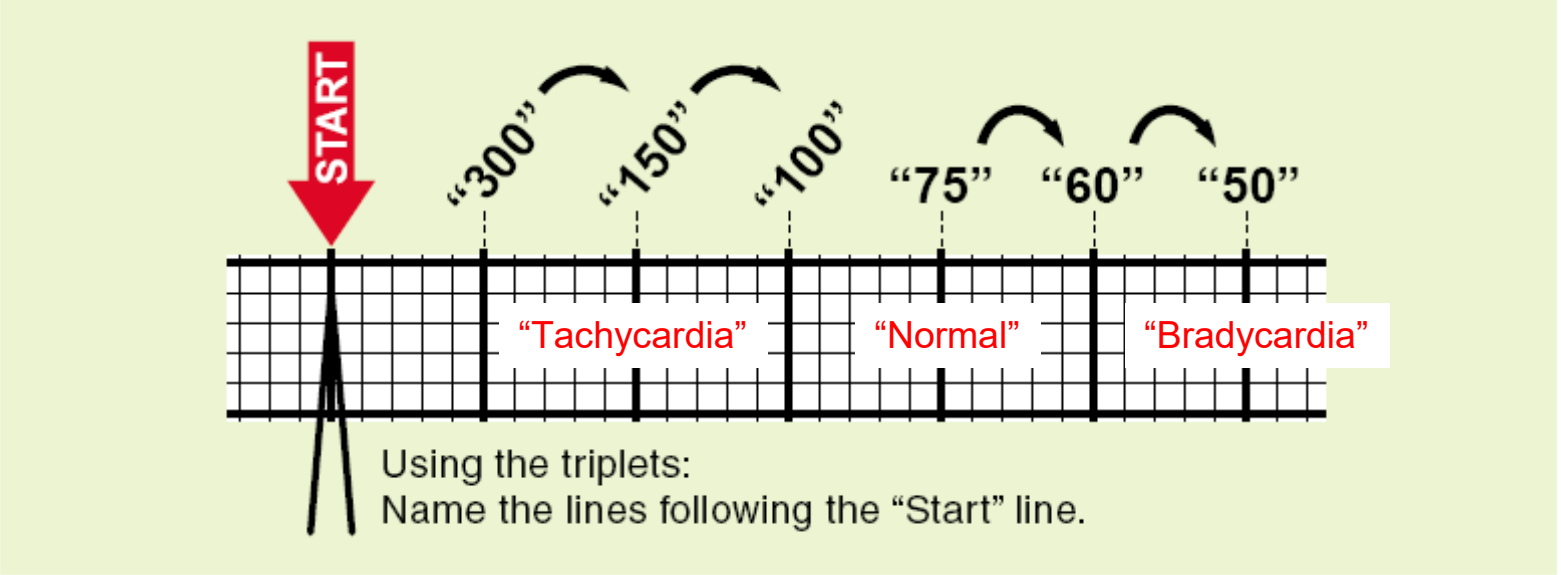


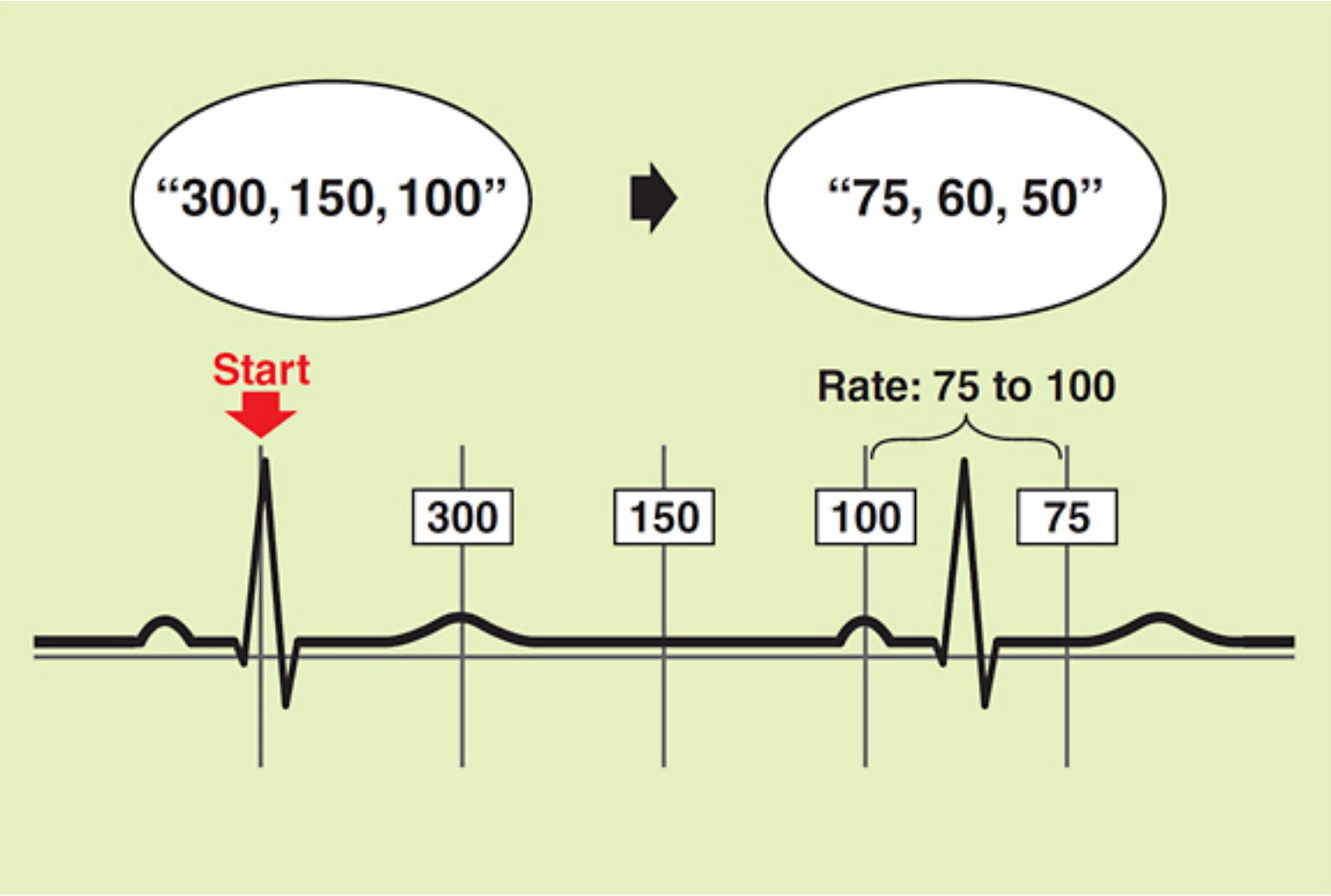




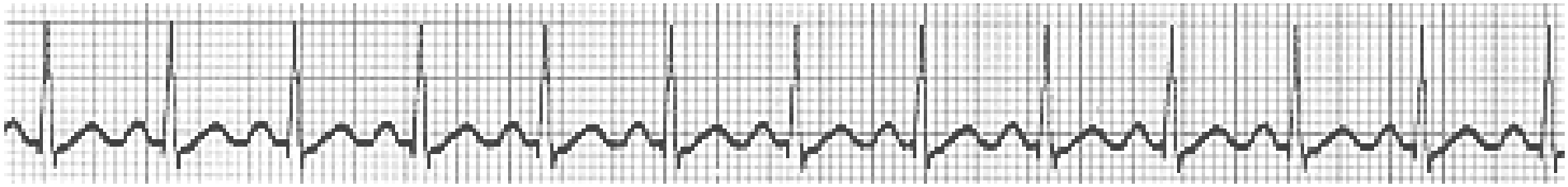
What is Normal?

- Heart rate between 60–100
- Heart rate < 60 is a *bradycardia*
- Heart rate > 100 is a *tachycardia*





What Arrhythmias may present with Palpitations?



A

A. Supraventricular tachycardia
B. Atrial flutter
C. Sinus tachycardia
D. Second degree - Mobitz 2
E. Normal sinus rhythm

NOTES

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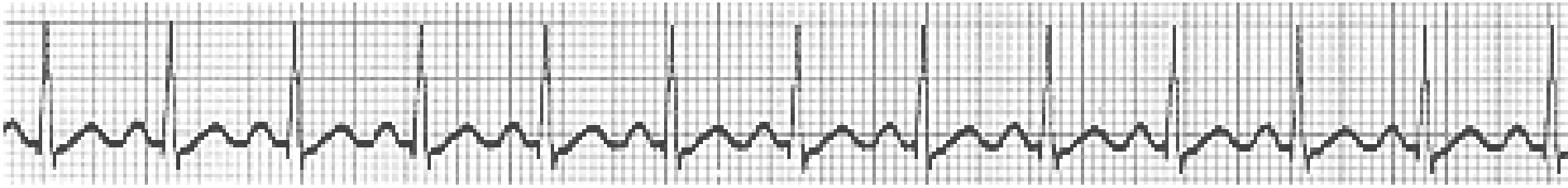
Sinus Tachycardia

Sinus Tachycardia

Etiology

- Sort out “why?”
- Physiologic
  - Exercise
  - Anxiety
  - Fever
  - Hyperthyroidism
  - Anemia
  - Hypoxia
  - Hypovolemia
  - Pregnancy

Normal Sinus Rhythm



Sinus Tachycardia

Sinus Tachycardia

Treatment

- First address underlying physiologic cause
- Consider B-Blocker only as temporary measure
  - Slow heart rate while treating hyperthyroidism
  - Avoid in hypoxemia

A

A. Accelerated junctional rhythm
B. Atrial flutter with high grade block
C. Sinus bradycardia
D. Second degree - Mobitz 2
E. Normal sinus rhythm

NOTES

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Sinus Bradycardia

Sinus Bradycardia

Etiology

- Physical Conditioning (Athletes)
- Sleep (benign) / Sleep Apnea
- Hypothyroidism
- Medications
  - B-blockers / Calcium channel blockers (except DHP)
  - Clonidine
  - Digoxin
  - Antiarrhythmics
  - Antidepressants (fluoxetine)
- Acute Myocardial Infarction
- Sick Sinus Syndrome

Sinus Bradycardia

Treatment

- First Address underlying physiologic cause
  - Titrate off medications that may be responsible
  - Screen for hypothyroidism
- Determine if hemodynamically stable
  - Stable BP / Asymptomatic = no therapy needed
  - Hypotensive / syncope / lightheadedness
    - Atropine as temporary measure in ER/CCU
    - Temporary pacemaker
    - Permanent pacemaker if remains unresolved

A. NSR with Premature Atrial Contraction (PAC)
B. NSR with Premature Junctional Contraction
C. NSR with Premature Ventricular Contraction
D. Atrial Fibrillation
E. none of the above

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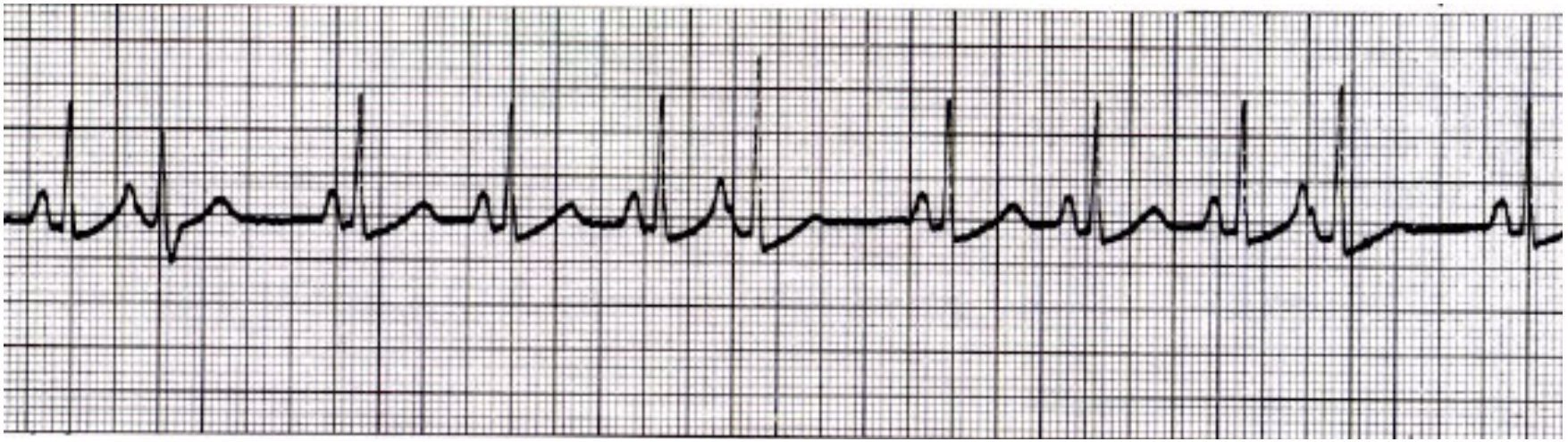
Premature Atrial Contractions

Premature Atrial Contractions (PACs)

- Contractions of the atria that are triggered by the atrial myocardium but have not originated from the sinoatrial node (SA node).
- Also commonly referred to as:
  - atrial premature complexes (APCs)
  - premature supraventricular complexes
  - premature supraventricular beat
- Caused by an assortment of medical diseases, structural abnormalities, pharmaceuticals, and non-regulated compounds.
  - Over-the-counter cold medications
  - Caffeine / chocolate
  - “recreational” drugs



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Premature Atrial Contractions (PACs)

Treatment / Management

- Treatment of PACs depends on the symptomatology, triggers, and associated structural heart conditions.
- Typically, only patients with symptomatic PACs require treatment.
- After appropriate identification of triggers or underlying structural cardiac conditions, therapy starts by reassuring patients that PACs are typically benign and can be controlled by avoiding triggers.
- In patients with persistent symptoms despite avoidance of triggers, further therapy is indicated, starting with medications.

Pharmacologic Management

- Beta-adrenergic blockers
  - relatively safe at low doses
  - first-line treatment in symptomatic patients if conservative measures fail
  - The role of calcium channel blockers to treat PACs is not well defined
- Class IA, Class IC, and Class III antiarrhythmic agents
  - all can suppress the PAC origin
  - infrequently used only after careful consideration of their pro-arrhythmogenic nature

Class IA - Disopyramide, procainamide, quinidine
Class IC - Flecainide, propafenone
Class III - Amiodarone, dofetilide, ibutilide, sotalol
Class IV - Nondihydropyridine calcium channel blockers (diltiazem and verapamil)

A

A. Supraventricular tachycardia
B. Atrial flutter
C. Sinus tachycardia
D. Atrial fibrillation with uncontrolled response
E. Mobitz II heart block

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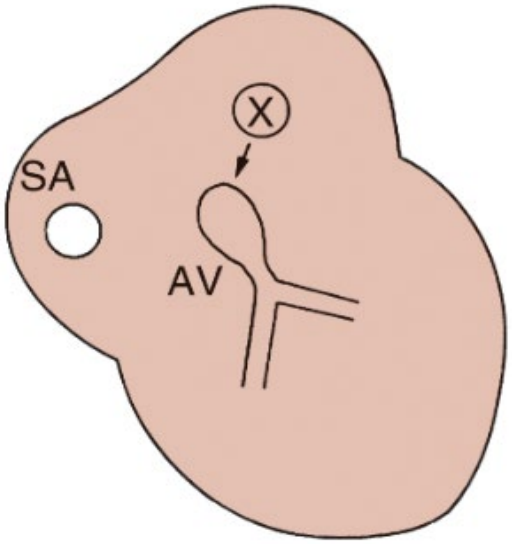
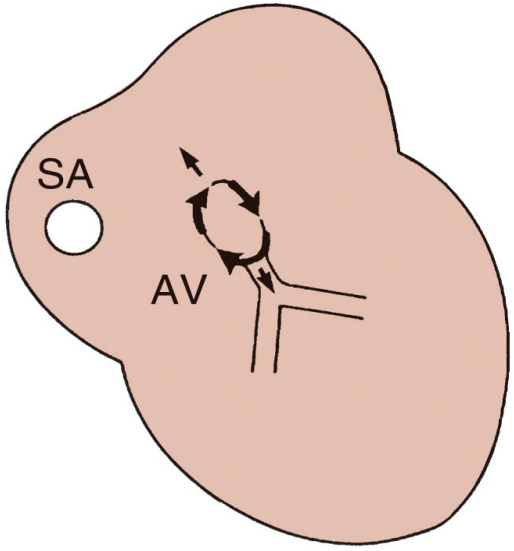
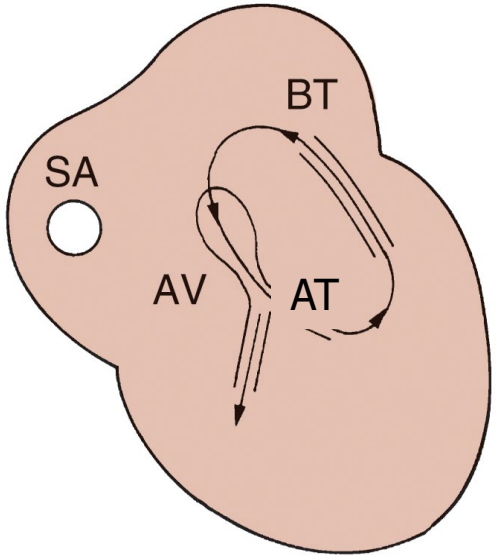
Paroxysmal Supraventricular Tachycardia

Atrial Tachycardia (AT)	Atrioventricular nodal reentrant Tachycardia (AVNRT)	Atrioventricular reentrant Tachycardia (AVRT)
		
Triggered or automatic firing from an ectopic atrial focus. *Accounts for 10% of SVTs*	Reentry using distinct pathways within the AV node; *Accounts for 60-70% of SVTs*	Reentrant circuit involving the AV node and an extranodal accessory pathway

Goldberger's Clinical Electrocardiography
2024 Chapter 14; Pages 142-157

Atrial Tachycardia

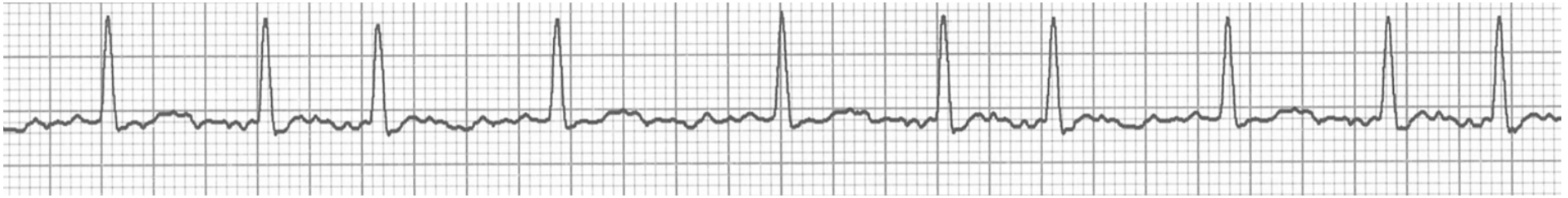
Atrial Tachycardia

Etiology

- A form of Supraventricular Tachycardia (SVT)
- Can occur in patients with both anatomically normal and anatomically abnormal hearts.
- Due to reentrant pathway variations
  - Originate in the orifices of the vena cava, coronary sinus, and pulmonary veins.
- Secondary to a triggering event or conditions
  - Hypoxia
  - Catecholamine release
  - Alcohol
  - Drug use

Atrial Tachycardia
Treatment

- Try parasympathetic (vagal) maneuvers first
  - Carotid sinus massage / Valsalva
- Adenosine (IV) – preferred initial therapy in ER
- B-blocker (IV)
- Verapamil or Diltiazem (IV)
  - Caution! Do not combine with *B-blocker* (may result in complete heart block)
- If patient is hemodynamically compromised = proceed with Synchronized DC Countershock



A

A. Atrial fibrillation
B. Atrial flutter
C. Sinus tachycardia
D. Second degree - Mobitz 1
E. Sinus rhythm with blocked PACs

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Atrial Fibrillation

Atrial Fibrillation

Management Goals

- Reversion to sinus rhythm
- Maintenance of sinus rhythm
- Slowing the ventricular rate in persistent or permanent atrial fibrillation
- Prevention of systemic embolization and stroke, both at the time of reversion and in patients chronically

Atrial Fibrillation

Management Goals

- Control the ventricular rate (< 100 bpm) by slowing AV node conduction
  - Diltiazem (IV drip or oral) or verapamil
  - B-blocker (metoprolol)
  - Digoxin
- Prevention of systemic embolization and stroke, both at the time of reversion and in patients chronically
- Reversion to sinus rhythm
  - Pharmacological cardioversion
  - Synchronized DC cardioversion if hemodynamically compromised (hypotensive) or if patient is not responding to pharmacologic agents
- Maintenance of sinus rhythm

Atrial Fibrillation

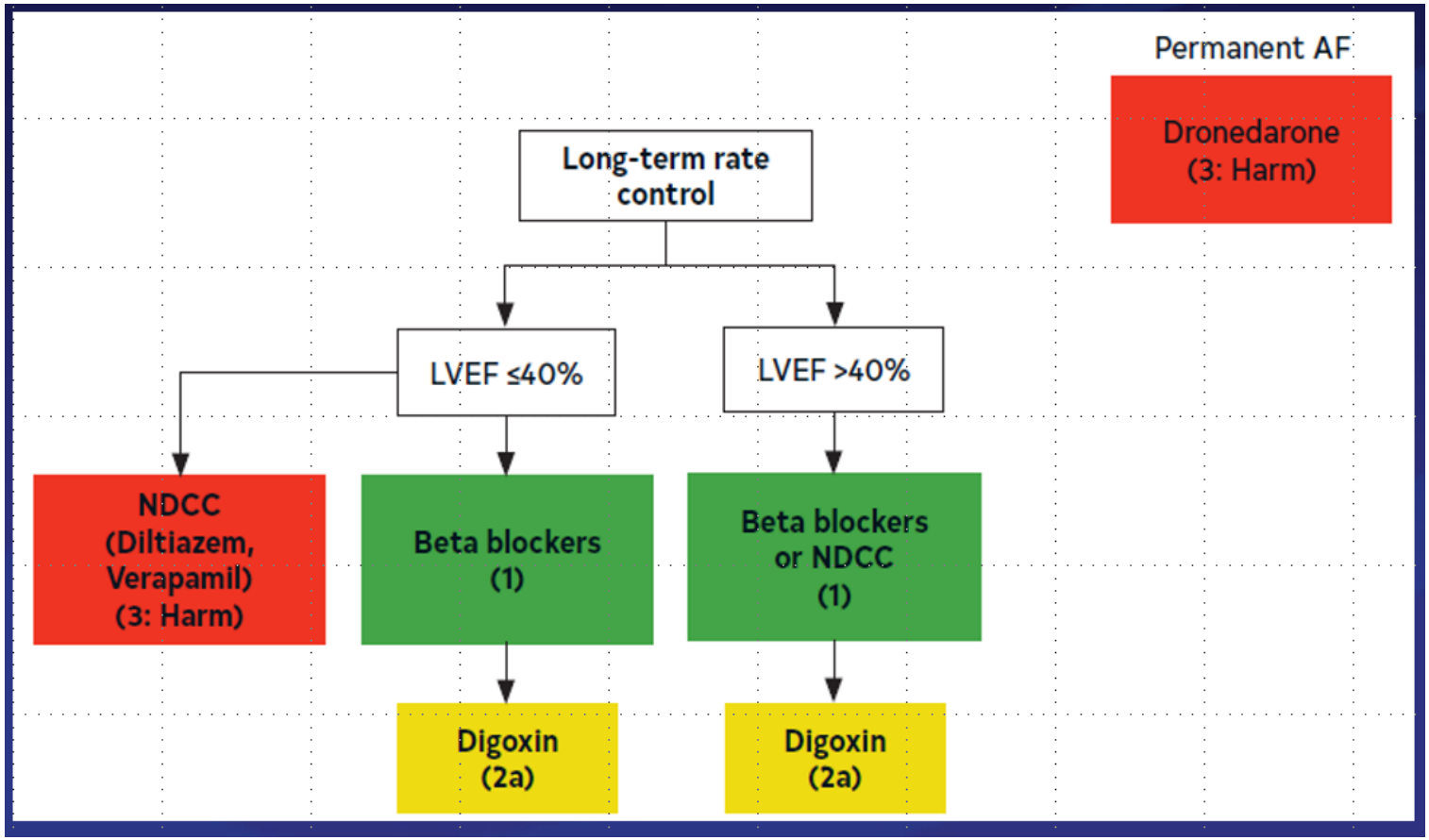
Slowing Ventricular Rate

Action	nifedipine	verapamil	diltiazem	beta blocker vasoconstricting atenolol/metoprolol	beta blocker vasodilating carvedilol/nebivolol	digoxin	adenosine
Left Ventricular Function	0	↓	0 / ↓	↓↓	↓↓	0	0
Heart Rate	0 / ↑	↓	↓↓	↓↓↓	↓↓	0 / ↓	↓↓
AV Conduction	0	↓↓↓	↓↓	↓↓	↓↓	↓↓	↓↓↓
Afterload	↓↓↓	↓↓	↓	0	0 / ↓	0	0
Preload	0 / ↓	0	0	0	0	0	0
Coronary Vasodilation	+++	++	++	- -	0 / +	0	++

Atrial Fibrillation with a Controlled Ventricular Response

Atrial Fibrillation

Long Term Rate Control in Permanent AF



Atrial Fibrillation

Maintenance of Sinus Rhythm after AF

Vaughan Williams classification of AADs used for the treatment of atrial fibrillation or flutter
Class IA - Disopyramide, procainamide, quinidine
Class IC - Flecainide, propafenone
Class III - Amiodarone, dofetilide, ibutilide, sotalol
Class IV - Nondihydropyridine calcium channel blockers (diltiazem and verapamil)

Atrial Fibrillation

Prevention of systemic embolization

- Determine risk of TIA / Stroke
  - Calculate CHA_2DS_2VASc Score
    - Congestive heart failure - 1 point
    - Hypertension – 1 point
    - Age ≥75 years – 1 point
    - Diabetes mellitus – 1 point
    - History of transient ischemic attack or stroke - 2 points
    - Vascular disease – 1 point
    - Age ≥ 65 years to 74 years – 1 point
    - Sex category (female) – 1 point
  - Determine Annual Thrombotic Risk
    - ≥ 2% per year = CHA_2DS_2VASc Score ≥ 2 in men and ≥ 3 in women
    - ≥ 1% but < 2% = CHA_2DS_2VASc Score ≥ 1 in men and ≥ 2 in women

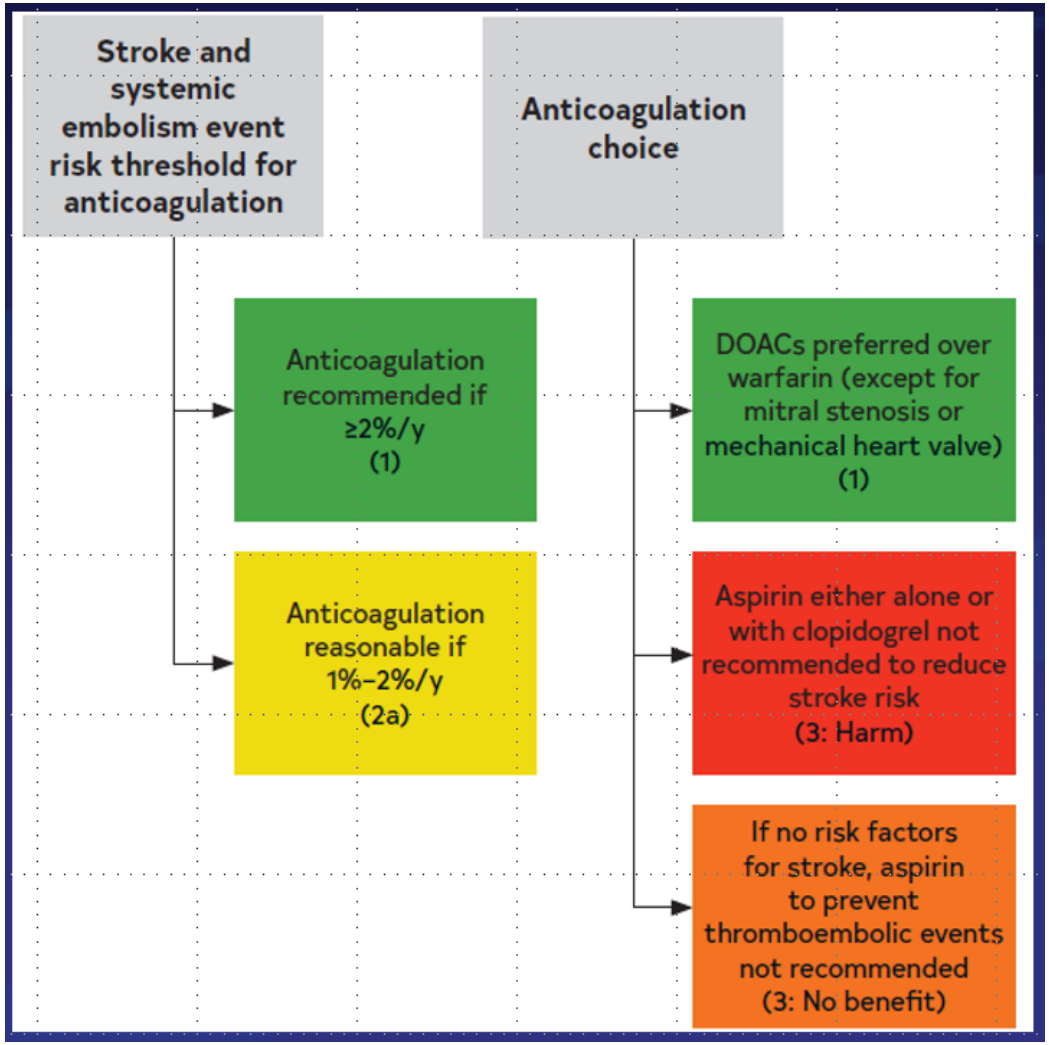
Atrial Fibrillation

Anticoagulant Recommendations

REVISED!!!

- Anticoagulant recommendation based on risk
  - CHA_2DS_2VASc Score = 0 points → ASA or no therapy
  - CHA_2DS_2VASc Score = 1 points → ASA or anticoagulation
  - CHA_2DS_2VASc Score = $\geq$ 2 points → full anticoagulation

Antithrombotic Options for Patients with AF



Prevention of systemic embolization

- Anticoagulants
  - Warfarin (Coumadin)
    - requires routine INR monitoring
  - Novel Oral Anticoagulant (NOACs)
    - Non-Vitamin K Antagonist
    - Do not require routine INR monitoring
      - rivaroxaban (brand names include Xarelto)
      - dabigatran (brand names include Pradaxa)
      - apixaban (brand names include Eliquis)
      - edoxaban (brand names include Lixiana)

A

A. Supraventricular tachycardia
B. Atrial flutter
C. Sinus tachycardia
D. Second degree - Mobitz 2
E. NSR with blocked PACs

NOTES

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Atrial Flutter

Atrial Flutter with 2:1 AV Block

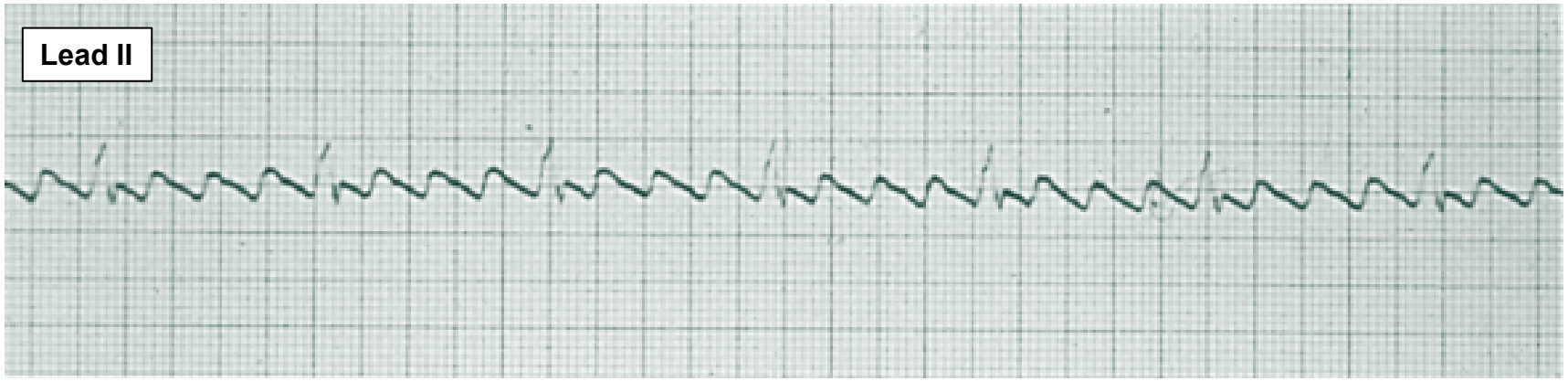
A

Atrial Flutter

Management Goals

- Control the ventricular rate (< 100 bpm) by slowing AV node conduction
  - Diltiazem (IV drip or oral) or verapamil
  - B-blocker (metoprolol)
  - Digoxin
- Prevention of systemic embolization and stroke, both at the time of reversion and in patients chronically
- Reversion to sinus rhythm
  - Pharmacological cardioversion
  - Synchronized DC cardioversion if hemodynamically compromised (hypotensive) or if patient is not responding to pharmacologic agents
- Maintenance of sinus rhythm

Atrial Flutter with Higher Grade AV Block



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Atrial Flutter

Management Goals

- Control the ventricular rate (< 100 bpm) by slowing AV node conduction
  - Diltiazem (IV drip or oral) or verapamil
  - B-blocker (metoprolol)
  - Digoxin
- Prevention of systemic embolization and stroke, both at the time of reversion and in patients chronically
- Reversion to sinus rhythm
  - Pharmacological cardioversion
  - Synchronized DC cardioversion if hemodynamically compromised (hypotensive) or if patient is not responding to pharmacologic agents
- Maintenance of sinus rhythm

Atrial Flutter

Pharmacologic Cardioversion and Maintenance of Sinus Rhythm

Vaughan Williams classification of AADs used for the treatment of atrial fibrillation or flutter
Class IA - Disopyramide, procainamide, quinidine
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Class IV - Nondihydropyridine calcium channel blockers (diltiazem and verapamil)

A

A. NSR with intermittent BBB
B. Ventricular escape beats
C. Second degree – Mobitz 1
D. Second degree – Mobitz 2
E. Normal sinus rhythm with PVC

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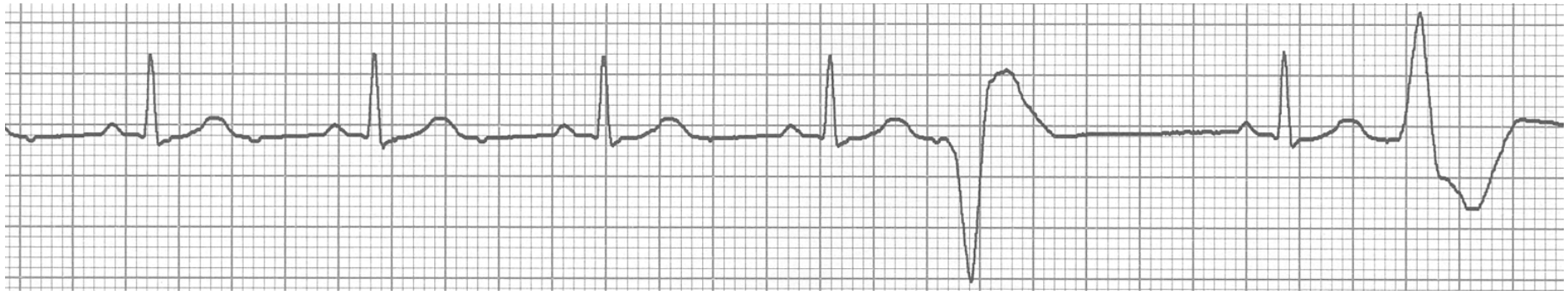
Premature Ventricular Contraction (PVC)



Premature Ventricular Contractions (Multifocal PVCs)

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Premature Ventricular Contractions

Premature Ventricular Contractions (PVCs)

- Potential Mechanisms
  - Triggered activity
  - Automaticity
  - Re-entry
- Possible relationships with PVC frequency:
  - Smoking
  - Alcohol
  - Exercise
    - Overall appears to be a relationship between more exercise and fewer PVCs
    - Possible increase in PVCs with intensive and long-term exercise in highly trained athletes

Treatment / Management

- Patients with low PVC burden and normal ejection fraction
  - Reassurance alone may be reasonable
  - Counsel on stopping smoking
  - Consider trial of caffeine and alcohol avoidance
- Low risk patients with highly symptomatic PVCs
  - Discuss with patient if symptoms are bothersome enough that they would be willing to try a medication
  - Consider B-blocker (metoprolol / atenolol) as first line agent
  - Nondihydropyridine Calcium channel blocker (diltiazem or verapamil)
  - Referral to cardiologist if patient does not respond to above

Treatment / Management

- Patients with low ejection or structural heart disease
  - Referral to cardiologist for evaluation and treatment
- Catheter ablation may be preferred in some cases
- Other pharmacologic options that do carry some risk
  - Flecainide / Propafenone
    - Generally well tolerated
    - Avoid in patients with coronary artery disease
  - Sotalol
    - Effective choice in patients with coronary artery disease
    - Requires careful monitoring of QT interval
  - Amiodarone
    - can be safely administered in the setting of severely reduced EF
    - less preferable in younger patients due to associated side effects
  - Mexiletine
    - Rarely used - less effective than other antiarrhythmics or catheter ablation

Palpitations: Detecting and Managing Cardiac Arrhythmias

Thank You !