Arrhythmias

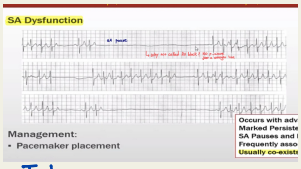
MNEMONIC

Management options for atrial fibrillation—

ABCD

Anticoagulate
β-blockers to control rate
Cardiovert/**C**alcium channel blockers
Digoxin (in refractory cases)

TABLE 2.1-3. Bradyarrhythmias and Conduction Abnormalities

Type	Etiology	Signs/Symptoms	ECG Findings	Treatment
Sinus bradycardia acceptable in athletes	Normal response to cardiovascular conditioning Can also result from sinus node dysfunction, β-blocker or CCB excess; therefore, it is important to review medications	May be asymptomatic, but may also present with lightheadedness, syncope, chest pain, or hypotension	Sinus rhythm Ventricular rate < 60 bpm narrow QRS Regular Slow HR Normal PR interval (3-5 small Boxes)	None if asymptomatic and rate > 40 bpm; atropine may be used to ↑ heart rate symptomatic: 2. B. Agonist: Dopamine isoproterenol Pacemaker implant is the definitive treatment in severe cases
First-degree AV block	Can occur in normal individuals; associated with ↑ vagal tone, β-blocker or CCB use	Asymptomatic	PR interval > 200 msec 0.2 sec = > 1 Large Square No Dropped QRS	Same as Sinus Bradycardia.
Second-degree AV block (Mobitz type I/ Wenckebach)	Drug effects (digoxin, β-blockers, CCBs) or ↑ vagal tone; right coronary ischemia or infarction	Usually asymptomatic	Progressive PR lengthening until a dropped beat occurs; the PR interval then resets	Same None if asymptomatic Stop the offending drug Atropine as clinically indicated
Second-degree AV block (Mobitz type II)	Results from fibrotic disease of the conduction system or from acute, subacute, or prior MI	Occasionally syncope; frequent progression to third-degree AV block	Unexpected dropped beat(s) without a change in PR interval Fixed Prolonged PR interval	Pacemaker placement (even if asymptomatic)
Third-degree AV block (complete)	No electrical communication between the atria and ventricles	Syncope, dizziness, acute heart failure, hypotension, cannon A waves	P > QRS No relationship between P waves and QRS complexes Complete Dissociation QRS < Narrow → if from the Junction/ bundle of His Wide → if from the Ventricle	Pacemaker placement Medical Emergency
Sick sinus syndrome/ tachycardia-bradycardia syndrome	Heterogeneous disorder that leads to intermittent supraventricular tachyarrhythmias and bradyarrhythmias SVT in advanced Age	2° to tachycardia or bradycardia; AF and thromboembolism may occur → syncope, palpitations, dyspnea, chest pain, TIA, and/or stroke	 Tachy Brady Pause	Most common indication for pacemaker placement Anticoagulate in atrial fibrillation/flutter to prevent systemic emboli

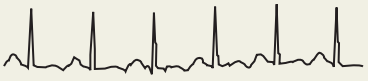
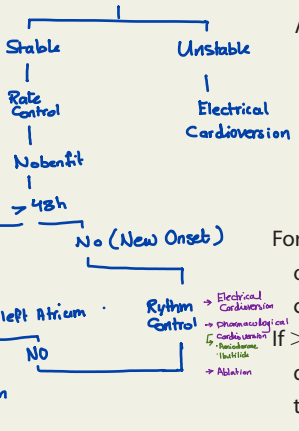
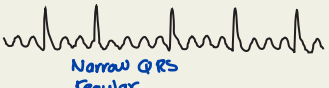
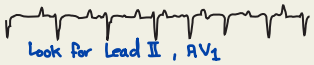
KEY FACT

Patients with persistent tachyarrhythmia (narrow- or wide-complex) causing hemodynamic instability should be managed with immediate synchronized cardioversion.

TACHYARRHYTHMIAS

Tables 2.1-4 and 2.1-5 outline the etiologies, clinical presentation, and treatment of common supraventricular and ventricular tachyarrhythmias.

TABLE 2.1-4. Supraventricular Tachyarrhythmias

Type	Etiology	Signs/Symptoms	ECG Findings	Treatment
		Atrial		
Sinus tachycardia	Normal physiologic response to fear, pain, and exercise Can also be 2° to hyperthyroidism, volume contraction, infection, or PE	Palpitations, shortness of breath  Narrow QRS Regular Tachy >100 ↙ P wave	Sinus rhythm Ventricular rate > 100 bpm	Treat the underlying cause β Blocker Ivabradine Ablation (End Game)
Atrial fibrillation (AF) Paroxysmal <48h Persistent >7 days Long Persistent >1 Year Permanent Forever	Acute AF—**PIRATES:** **P**ulmonary disease **I**schemia **R**heumatic heart disease **A**nemia/**A**trial myxoma **T**hyrotoxicosis or Hypothyroid **E**thanol Holiday Heart Syndrome **S**epsis Chronic AF—HTN, CHF Most often caused by ectopic foci within the pulmonary veins ← Re-entry	Often asymptomatic and incidental but can present with shortness of breath, chest pain, dizziness, fatigue, or palpitations. May present with congestive heart failure, cardiogenic shock, or devastating cerebrovascular accident Physical exam reveals an irregular pulse  Narrow QRS No P wave Irregular	No discernible P waves, with variable and irregular QRS response (Narrow)  Stable → Rate Control → No benefit → >48h → YES → TEE → thrombus in left Atrium → YES → Anticoagulation 3 weeks; NO → Rhythm Control (Electrical Cardioversion; Pharmacological: Class Ia/Ic/III Amiodarone, Ibutilide; Ablation) Unstable → Electrical Cardioversion No (New Onset)	For chronic AF, initial therapy: Rate control with β-blockers (↓BP), CCBs, or digoxin (BP not affected → Good for PT with Low BP) Anticoagulate with warfarin or novel oral anticoagulant (NOAC) for patients with CHA_2DS_2-VASc score ≥ 2 (0 – Platelet Only; 1 – Female; 1 – For other Cause) (AFib w/: mechanical Valve; Severe mitral Stenosis; LVAD; [Warfarin is a must]) For unstable AF, or new-onset AF (of < 2 days) cardiovert If > 2 days or unclear duration, must get TEE to rule out atrial clot
Atrial flutter easy for Ablation	Circular movement of electrical activity around the atrium (macro circuit) at a rate of approximately 300 times per minute	Usually asymptomatic but can present with palpitations, syncope, and lightheadedness  Narrow QRS Regular No P wave	Regular rhythm; "sawtooth" appearance of P waves can be seen (Rarely.) The atrial rate is usually 240–320 bpm, and the ventricular rate is ~150 bpm	Anticoagulation, rate control, and cardioversion guidelines as in AF above Ablation is Favorable Here
Multifocal atrial tachycardia	Multiple atrial pacemakers or reentrant pathways; associated with COPD,* hypoxemia	May be asymptomatic. At least three different P-wave morphologies  Look for Lead II, AV_1	Three or more unique P-wave morphologies; rate > 100 bpm Irregular, Narrow QRS] Like Af But there is P wave	Treat as AF ~~but avoid β-blockers because of chronic lung disease (if present)~~ Oxygenation (Best one) → Avoid electrical Cardioversion even if Unstable

(continues)

TABLE 2.1-4. Supraventricular Tachyarrhythmias *(continued)*

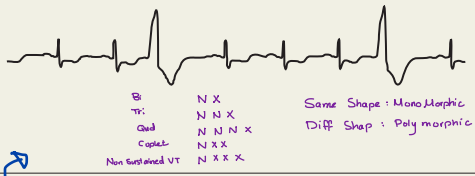
Type	Etiology	Signs/Symptoms	ECG Findings	Treatment
Atrioventricular Junction				
Atrioventricular nodal reentry tachycardia (AVNRT)	A reentry circuit in the AV node depolarizes the atrium and ventricle nearly simultaneously	Palpitations, shortness of breath, angina, syncope, lightheadedness	Rate 150–250 bpm; P wave is often buried in QRS or shortly after	Cardiovert if hemodynamically unstable. Vagal maneuvers (eg, carotid massage, Valsalva, ice immersion (dive reflex). IV Adenosine if vagal maneuver fails
Atrioventricular reentrant tachycardia (AVRT)	An ectopic connection between the atrium and ventricle that causes a reentry circuit Seen in WPW	Palpitations, shortness of breath, angina, syncope, lightheadedness	A retrograde P wave is often seen after a normal QRS	Except for WPW, same as that for AVNRT WPW listed separately below
Wolff-Parkinson-White (WPW) syndrome	Abnormal fast accessory conduction pathway from atria to ventricle (Bundle of Kent)	Palpitations, dyspnea, dizziness, and rarely cardiac death	Characteristic delta wave with widened QRS complex and shortened PR interval (see Figure 2.1-8)	Observation for asymptomatics Acute therapy is procainamide or amiodarone SVT gets worse after CCBs, BB or digoxin (dangerous in WPW). Radiofrequency catheter ablation is curative
Paroxysmal atrial tachycardia	Rapid ectopic pacemaker in the atrium (not sinus node)	Palpitations, shortness of breath, angina, syncope, lightheadedness	Rate > 100 bpm; P wave with an unusual axis before each normal QRS	Adenosine can be used to unmask underlying atrial activity by slowing down the rate

KEY FACT

Use the **CHA_2DS_2-VASc** scoring system to estimate stroke risk in atrial fibrillation, and anticoagulate with NOAC (eg, dabigatran, rivaroxaban, apixaban, and edoxaban) or warfarin (used with metal valves or mitral stenosis) for a score of 2 or more:

- **C**HF (1 point).
- **H**TN (1 point).
- **A**ge ≥ 75 (2 points).
- **D**iabetes (1 point).
- **S**troke or TIA history (2 points).
- **V**ascular disease (1 point).
- **A**ge 65–74 (1 point).
- **S**ex **c**ategory (female) (1 point).

TABLE 2.1-5. Ventricular Tachyarrhythmias

Type	Etiology	Signs/Symptoms	ECG Findings	Treatment
Premature ventricular contraction (PVC)	Ectopic beats arise from ventricular foci. Associated with hypoxia, fibrosis, ↓ LV function, electrolyte abnormalities, and hyperthyroidism	Usually asymptomatic but may lead to palpitations 	Early, wide QRS not preceded by a P wave PVCs are usually followed by a compensatory pause	Treat the underlying cause If symptomatic, give β-blockers or, occasionally, other antiarrhythmics
Ventricular tachycardia (VT)	Can be associated with CAD, MI, and structural heart disease	Nonsustained VT (lasts < 30 seconds) is often asymptomatic; sustained VT (lasts > 30 seconds) can lead to palpitations, hypotension, angina, and syncope Can progress to VF and death 	Three or more consecutive PVCs; wide QRS complexes in a regular rapid rhythm; may see AV dissociation	Cardioversion if unstable. Antiarrhythmics (eg, amiodarone, lidocaine, procainamide) if stable
Ventricular fibrillation (VF)	Associated with CAD and structural heart disease Also associated with cardiac arrest (together with asystole)	Syncope, absence of BP, no pulse 	Totally erratic wide-complex tracing	Immediate electrical defibrillation and ACLS protocol
Torsades de pointes	Associated with long QT syndrome, proarrhythmic response to medications, hypokalemia, congenital deafness, and alcoholism	Can present with sudden cardiac death; typically associated with palpitations, dizziness, and syncope 	Polymorphous QRS; VT with rates between 150 and 250 bpm	Give magnesium initially and cardiovert if unstable Correct hypokalemia; withdraw offending drugs

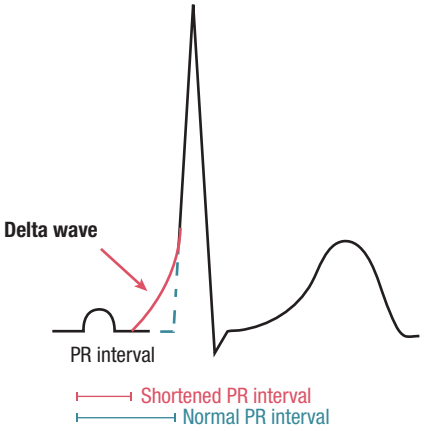


FIGURE 2.1-8. Ventricular tachyarrhythmias. Characteristic delta wave with widened QRS complex and shortened PR interval in WPW. (Reproduced with permission from USMLE-Rx.com.)