Dysrhythmia Recognition

This pocket reference gives nurses quick and convenient information about dysrhythmia recognition, including:

- Steps for ECG rhythm analysis
- Risk factors for common dysrhythmias
- Waveform characteristics of common dysrhythmias
- Images of various dysrhythmias

Additional Resources: AACN Practice Alerts for Dysrhythmia Monitoring in Adults and for ST-Segment Monitoring at: http://www.accn.org and type in search box: Dysrhythmia Monitoring or ST Segment Monitoring. AACN's eLearning course on ECG Interpretation at: https://www.aacn.org/education/online-courses

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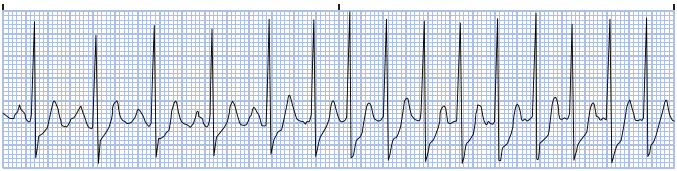
Dysrhythmia Recognition

ECG Rhythm Analysis	
Determine the atrial and ventricular regularity	a. Is the P-P interval consistent? b. Is the R-R interval consistent?
Determine the atrial and ventricular rates	a. Are they the same? b. Is the rate > 100 beats/min? (tachycardia) c. Is the rate < 60 beats/min? (bradycardia)
Identify P waves	a. Are P waves present? If not, what atrial activity is seen? b. Do the P waves all look the same? c. Is every P wave followed by a QRS complex?
Measure the P-R interval	a. Is the P-R interval within normal limits (0.12-0.20 sec)? b. Is the P-R interval the same for each ECG complex?
Identify the QRS complex	a. Are QRS complexes present? b. Do the QRS complexes all look the same? c. Is there 1 and only 1 P wave before each QRS complex?
Measure the QRS interval	a. Is the QRS interval within normal limits (0.04-0.10 sec)? b. Is the QRS interval the same for every ECG complex?

Dysrhythmia Descriptions

Atrial Tachycardia

When it occurs episodically and/or suddenly, it is called paroxysmal atrial tachycardia (PAT)



Risk Factors:

- Most common dysrhythmia in childhood
- Anxiety or fatigue
- Caffeine
- Tobacco
- Alcohol
- Valvular heart disease
- Sympathomimetic drugs
- Digoxin toxicity
- Cardiomyopathy

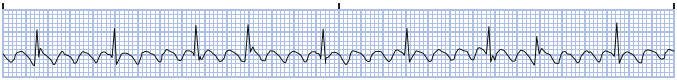
Rate Characteristics:

- **Atrial:** 3 or more consecutive ectopic atrial beats at 120-250 beats/min. Rarely exceeds 250 beats/min
- **Ventricular:** varies, depending on AV conduction ratio

Rhythm:

- **Atrial:** regular
- **Ventricular:** regular or irregular based on AV conduction ratio and type of atrial tachycardia
- **P waves:** may be hidden in preceding T wave, usually upright and preceding each QRS
- **P-R interval:** consistent, but may be normal, short, or long, depending on ectopic atrial site.
- **QRS interval:** 0.04-0.10 sec; may be wide if aberrant conduction is present
- **P:QRS ratio:** 1 P for every QRS complex, unless conduction block occurs

Atrial Flutter



Risk Factors:

- Ischemic heart disease
- Hypoxia
- Acute myocardial ischemia/infarction
- Digoxin toxicity
- Mitral or tricuspid valve disease
- Thyrotoxicosis
- Heart failure
- Alcoholism
- Chronic lung disease
- Hypertension
- Diabetes
- Cardiac surgery
- Pulmonary embolism

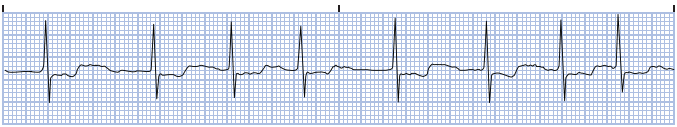
Rate Characteristics:

- **Atrial:** 250-350 beats/min
- **Ventricular:** 60-175 beats/min

Rhythm:

- **Atrial:** regular
- **Ventricular:** regular or irregular based on degree of AV conduction
- **P waves:** not identifiable
- **Flutter waves (F waves):** uniform (sawtooth or picket-fence appearance)
- **P-R interval becomes F-R interval:** may be consistent or may vary
- **QRS interval:** 0.04-0.10 sec; aberration can occur
- **P:QRS ratio:** varies depending on degree of AV block

Atrial Fibrillation



Risk Factors:

- Athletic training
- Family history
- Advanced age
- Sleep apnea
- Ischemic heart disease
- Hypertension
- Hypoxia
- Cardiomyopathy
- Digoxin toxicity
- Thyroid disease
- Mitral or tricuspid valve disease
- Heart failure
- Pulmonary disease
- After cardiac surgery
- Atherosclerotic heart disease
- Acute MI
- Congenital heart disease
- Nonprescription cold remedies

Atrial Fibrillation (cont.)

Rate Characteristics:

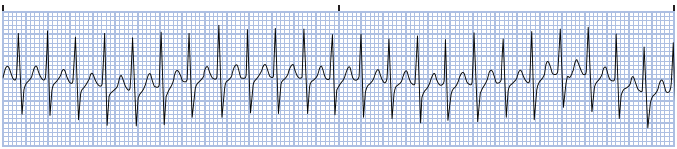
- **Atrial:** cannot be determined
- **Ventricular:** depends on degree of conduction at AV node; uncontrolled AF, > 100 beats/min; controlled AF, 60-100 beats/min

Rhythm:

- **Atrial:** wavy or coarse baseline
- **Ventricular:** irregular
- **P waves:** indiscernible
- **P-R interval:** indiscernible
- **QRS interval:** 0.04-0.10 sec; aberration can occur
- **P:QRS ratio:** unable to determine

Supraventricular Tachycardia

Defined as any rhythm with a rate faster than 100 that originates above the ventricles; can include sinus tachycardia, atrial tachycardia, atrial flutter, and junctional tachycardia. The term is also meant to describe a regular, narrow QRS tachycardia in which the exact mechanism cannot be determined from the surface ECG.



Risk Factors:

- Same for atrial dysrhythmias and junctional dysrhythmias
- AV nodal reentry tachycardia (AVNRT) and circus movement tachycardia (CMT) each can occur when an accessory pathway is present.

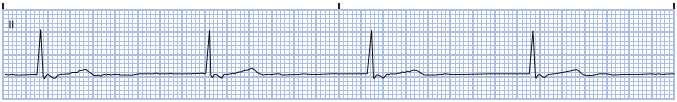
Rate Characteristics:

- **Atrial:** not always discernible; 140-250 beats/min
- **Ventricular:** 140-250 beats/min

Rhythm:

- **Atrial and ventricular:** regular
- **P waves:** may not be visible, may be hidden in QRS complex or T wave
- **P-R interval:** not measurable
- **QRS interval:** 0.04-0.10 sec, unless aberrancy or bundle branch block
- **P:QRS ratio:** 1 P for every QRS; may vary based on degree of AV block

Junctional Rhythm



Risk Factors:

- Athletic training
- Rheumatic heart disease
- After cardiac surgery
- Valvular disease
- SA node disease
- Hypoxia
- Related to some medications, such as β-blockers and calcium-channel blockers, and to digoxin toxicity
- Acute MI, especially inferior wall
- Increased parasympathetic tone

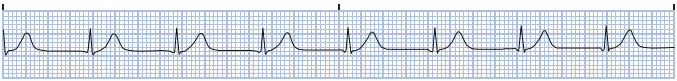
Rate Characteristics:

- **Atrial:** if P waves present, 40-60 beats/min
- **Ventricular:** 40-60 beats/min

Rhythm:

- **Atrial and ventricular:** regular
- **P waves:** inverted in leads II, III, and aVF; occurs before or after QRS or not visible and hidden in QRS because conduction is retrograde through the atria and normal through the ventricles
- **P-R interval:** < 0.12 sec when inverted P is before QRS
- **QRS interval:** 0.04-0.10 sec
- **P:QRS ratio:** 1 P for every QRS, if P wave is present
- **NOTE:** This rhythm occurs when normal sinoatrial node rate slows or fails to initiate beats

Accelerated Junctional Rhythm



Risk Factors:

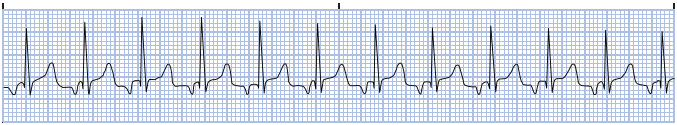
- Increased automaticity of AV node
- Digoxin toxicity
- Acute myocardial ischemia/infarction
- Isoproterenol infusion
- Athletic heart (benign finding)
- Cardiac surgery or procedures near AV node

Rate Characteristics:

- **Atrial:** if P waves present, 60-100 beats/min
- **Ventricular:** 60-100 beats/min

Rhythm: same as Junctional Rhythm

Junctional Tachycardia



Risk Factors:

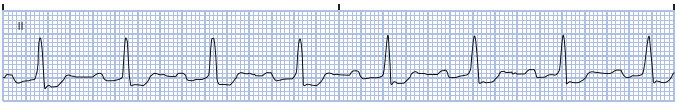
- Myocardial ischemia
- After cardiac surgery
- More common in children

Rate Characteristics:

- **Atrial:** if P waves present, > 100 beats/min
- **Ventricular:** > 100 beats/min

Rhythm: same as Junctional Rhythm

1st Degree AV Block



Risk Factors:

- Coronary artery disease
- Rheumatic heart disease
- Medications (eg, digoxin, β-blockers, calcium-channel blockers, antidysrhythmics, magnesium)
- Electrolyte imbalances
- Intrinsic AV node disease
- Myocarditis
- Acute MI, especially inferior MI
- Athletic training

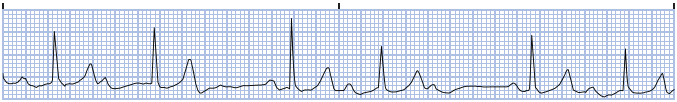
Rate Characteristics: usually 60-100 beats/min, if underlying rhythm is sinus

Rhythm:

- **Atrial and ventricular:** regular
- **P waves:** consistent
- **P-R interval:** prolonged > 0.20 sec and constant. Conduction is delayed through the AV node.
- **QRS interval:** 0.04-0.10 sec, unless bundle branch block
- **P:QRS ratio:** 1 P wave for every QRS

Dysrhythmia Descriptions (cont.)

2nd Degree AV Block (Type I)



Risk Factors:

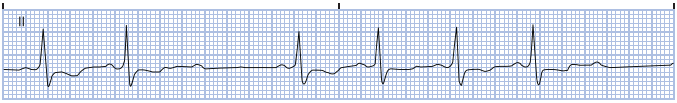
- Increased parasympathetic tone
- Coronary heart disease
- Medications (eg, digoxin, β-blockers, calcium-channel blockers, antidysrhythmics)
- Acute anterior or inferior MI
- Aortic and mitral valve disease and valve surgery
- Atrial septal defects and corrective congenital heart surgery
- Inflammatory diseases: endocarditis, myocarditis, rheumatic fever, Lyme disease
- Amyloidosis, hemochromatosis, and sarcoidosis
- Cardiac tumors, malignant lymphomas, and multiple myeloma
- Electrolyte disturbances: hyperkalemia, hypermagnesemia
- Thyroid and adrenal gland dysfunction
- Rheumatoid arthritis and other collagen vascular diseases

Rate Characteristics: usually 60-100 beats/min, if underlying rhythm is sinus

Rhythm:

- **Atrial:** regular
- **Ventricular:** irregular
- **P waves:** normal
- **P-R interval:** progressively increases; the P-R interval preceding the pause is longer than the one following the pause.
- **QRS interval:** normal unless bundle branch block
- **P:QRS ratio:** more P waves than QRS complexes
- **NOTE:** Type I is characterized by a progressive prolongation of the P-R interval. Ultimately, the atrial impulse is blocked, a QRS complex is not generated, and there is no ventricular contraction. Appears as a P wave without a QRS, then the cycle repeats itself.

2nd Degree AV Block (Type II)



Risk Factors: same as Type I

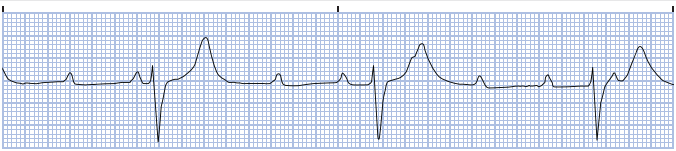
Rate Characteristics: can occur at any rate; atrial rate > ventricular rate. If many beats are blocked, rate will be slow

2nd Degree AV Block (Type II) (cont.)

Rhythm:

- **Atrial:** regular
- **Ventricular:** may be regular or irregular based on the frequency of the block
- **P waves:** normal
- **P-R interval:** constant before each conducted ventricular beat
- **QRS interval:** usually wide (> 0.10 sec) if the block is at the bundle of His or lower
- **P:QRS ratio:** more P waves than QRS; conduction ratios vary from 2:1 to only occasional blocked beats
- **NOTE:** Type II is characterized by an unexpected nonconducted atrial impulse and has a higher incidence of progression to complete AV block.

3rd Degree AV Block (Complete heart block)



Risk Factors:

- Extensive conduction system disease
- Coronary heart disease
- Acute myocardial ischemia/infarction
- Progressive familial cardiac conduction defect
- Cardiac surgery
- Congenital heart disorders
- Medications (eg, digoxin, β-blockers, calcium-channel blockers, antidysrhythmics)
- Inflammatory diseases: endocarditis, myocarditis, rheumatic fever, Lyme disease
- Amyloidosis, hemochromatosis, and sarcoidosis
- Cardiac tumors, malignant lymphomas, and multiple myeloma
- Neuromuscular disease
- Toxins

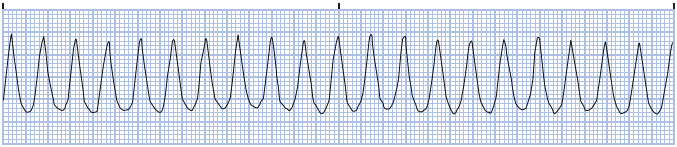
Rate Characteristics:

- **Atrial:** usually 60-100 beats/min
- **Ventricular:** 20-60 beats/min

Rhythm:

- **Atrial:** regular; no relationship to ventricular rhythm
- **Ventricular:** regular; no relationship to atrial rhythm
- **P waves:** normal
- **P-R interval:** varies, no relationship to the QRS complexes
- **QRS interval:** narrow if ventricles are controlled by a junctional pacemaker; wide if ventricles are controlled by a ventricular pacemaker
- **P:QRS ratio:** more P waves than QRS complexes
- **NOTE:** The hallmark of 3rd degree AV block is that there is no relationship between the P waves and QRS complexes.

Ventricular Tachycardia



Risk Factors:

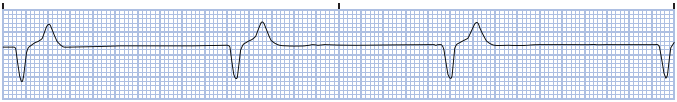
- Ischemic heart disease
- Acute myocardial ischemia/infarction
- Cardiomyopathy
- Valvular heart disease
- R-on-T phenomenon
- Proarrhythmic effects of many medications, especially sympathomimetics
- Congenital heart disorders
- Inherited conduction disorders
- Electrolyte imbalances
- Illicit drugs
- Sarcoidosis, amyloidosis, systemic lupus erythematosus, hemochromatosis, and rheumatoid arthritis
- Arrhythmogenic right ventricular dysplasia
- Cardiac tumors
- Cardiac surgery
- Heart failure

Rate Characteristics: ventricular > 100 beats/min and usually not > 220 beats/min

Rhythm:

- **Atrial:** not discernable
- **Ventricular:** monomorphic (QRS complexes have the same shape) is usually regular; polymorphic (QRS complexes vary randomly in shape) can be irregular.
- **P waves:** usually absent; if present, P waves are not associated with QRS and may be buried in the QRS
- **P-R interval:** not measurable
- **QRS interval:** wide (> 0.10 sec), bizarre appearance
- **P:QRS ratio:** not discernable
- **ST/T wave:** has polarity that is opposite to the QRS complex
- **NOTE:** A group of 3 or more PVCs in a row at a rate ≥100 beats/min constitutes ventricular tachycardia.

Idioventricular Rhythm



Risk Factors:

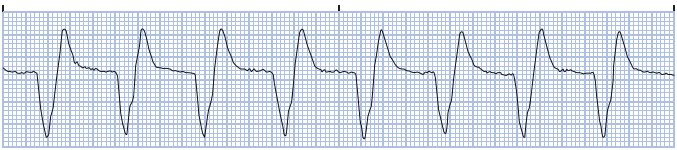
- Acute myocardial ischemia/infarction
- Postresuscitation rhythm
- Digoxin toxicity
- Metabolic imbalances

Rate Characteristics: ventricular 20-40 beats/min

Rhythm:

- **Atrial:** difficult to discern or absent
- **Ventricular:** usually regular
- **P waves:** no P waves associated with QRS complexes, or they are absent
- **P-R interval:** not measurable
- **QRS interval:** > 0.10 sec, often notched, bizarre appearance
- **P:QRS ratio:** absent or variable if seen
- **ST/T wave:** opposite direction of QRS complexes
- **NOTE:** Do not treat with antidysrhythmics.

Accelerated Idioventricular Rhythm



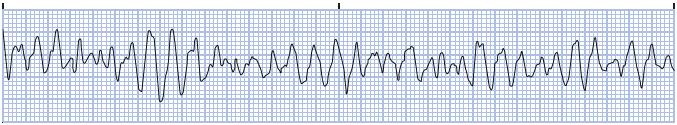
Risk Factors:

- Related to enhanced automaticity of the ventricular tissue and slowing of the SA node
- Acute myocardial ischemia/infarction
- Digoxin toxicity
- Reperfusion of damaged myocardium after thrombolysis
- Dilated cardiomyopathy
- Myocarditis

Rate Characteristics: ventricular 40-100 beats/min

Rhythm: same as Idioventricular Rhythm

Ventricular Fibrillation



Risk Factors:

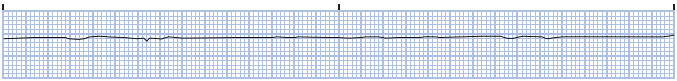
- Previous episode of ventricular fibrillation
- Cardiomyopathy
- Congenital heart defect
- Acute MI
- Untreated ventricular tachycardia
- R-on-T premature ventricular contractions
- Electrolyte imbalances
- Electrical shock
- Hypothermia
- Proarrythmic effects of antidysrhythmic and other medications

Rate Characteristics: indeterminate

Rhythm: completely erratic and irregular

- **P waves:** absent
- **P-R interval:** absent
- **QRS interval:** no formed QRS complexes seen; rapid irregular undulations without any specific pattern
- **P:QRS ratio:** none
- **NOTE:** There is no pulse with this rhythm, because the ventricles are not contracting.

Asystole



Risk Factors:

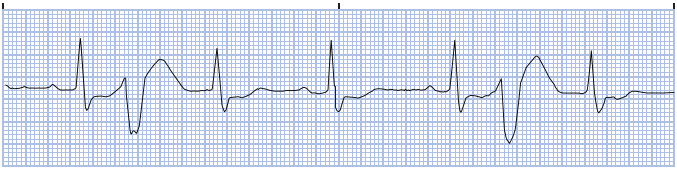
- Extensive myocardial damage
- Ischemia/infarction
- Traumatic cardiac arrest
- Acute respiratory failure
- Ventricular aneurysm
- Countershock
- Hypoxia
- Electrolyte imbalances

Rate Characteristics: none

Rhythm:

- **Atrial:** if P waves are present, may be regular or irregular
- **Ventricular:** none
- **P waves:** may be present if the sinus node is functioning
- **P-R interval, QRS interval, and P:QRS ratio:** none
- **NOTE:** Must verify the rhythm in 2 or more leads.

Premature Ventricular Contraction (PVC)



Risk Factors:

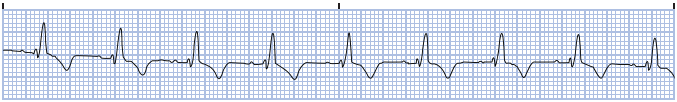
- Can be a normal occurrence
- Stress or exercise
- Acute coronary syndromes
- Heart failure
- Hypoxia
- Electrolyte imbalance, most often hypokalemia and/or hypomagnesemia
- Acid-base imbalance
- Stimulants such as caffeine or tobacco

Rate Characteristics: Rate will depend on underlying supraventricular rhythm

Rhythm:

- **Atrial and ventricular:** will be irregular due to one or more early QRS-T
- **P waves:** usually no P associated with PVC, although it is possible for impulse to trigger retrograde atrial depolarization
- **P-R interval:** none; P wave either is absent or after PVC
- **QRS interval** > 0.10 sec, often notched, bizarre appearance. PVCs may be uniform in appearance if they arise from a single ventricular site (unifocal) or may have 2 or more shapes if from multiple sites (multifocal)
- **P:QRS ratio:** more QRSs than Ps
- **ST/T wave**: opposite direction of PVC complex
- **NOTE:** May occur in pairs (couplet), in patterns of every other beat (bigeminy), every third beat (trigeminy), or every 4th beat (quadrigeminy)

Bundle Branch Block (BBB)



Risk Factors:

- Underlying heart disease such as myocarditis, myocardial ischemia/infarction
- Ventricular structural changes with cardiomyopathies
- Degenerative changes in the conduction system
- Trauma to a bundle branch such as cardiac surgery or placement of an intracardiac device

Rate Characteristics: Rate will depend on underlying supraventricular rhythm

Rhythm:

- **Rhythm**, **P waves**, **P-R interval** and **P:QRS ratio** all depend on the underlying rhythm
- **QRS interval** > 0.10 sec.
- **ST/T wave:** opposite direction of last portion of QRS complex
- **NOTE:** A right BBB will have a triphasic (rsR') configuration in V1, as seen in the example; a left BBB will have a uniphasic (QS) or biphasic (rS) configuration in V1

Legend: **AF**, atrial fibrillation; **AV**, atrioventricular; **AVNRT**, atrioventricular nodal reentry tachycardia; **BBB**, bundle branch block; **CMT**, circus movement tachycardia; **ECG**, electrocardiogram; **F wave**, flutter wave; **MI**, myocardial infarction; **PAT**, paroxysmal atrial tachycardia; **PSVT**, paroxysmal supraventricular tachycardia; **PVC**, premature ventricular contraction; **SA**, sinoatrial

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