NURSING MANAGEMENT OF PATIENTS WITH CARDIAC ARRHYTHMIAS

Pathophysiology of Cardiac Arrhythmias
Cardiac arrhythmias result from the following three mechanisms:
1. Disturbances in Automaticity
   This may involve a speeding up or slowing down of areas of automaticity such as the sinus node (sinus tachycardia or sinus bradycardia), the atrioventricular (AV) node, or the myocardium. Abnormal beats (more appropriately called depolarizations rather than beats or contractions) may arise through this mechanism from the atria, the AV junction, or the ventricles. Abnormal rhythms, such as atrial or ventricular tachycardia (VT), may also occur.
2. Disturbances in Conduction
   Conduction may be either too rapid or too slow. The mechanism of reentry depends on the presence of slowed conduction.
3. Combinations of Altered Automaticity and Conduction
   A simple example would be a premature atrial contraction with first degree AV block or atrial tachycardia with 3:1 or higher grades of AV block.

Nursing Management
Problem
Potential for reduced cardiac output: electrical factors affecting rate, rhythm, or conduction which impact tissue perfusion.

Outcome Criteria
Cardiac rhythm with adequate systemic perfusion will be maintained.

Nursing Interventions
1. Conduct continuous cardiac monitoring.
2. Document rhythm strip as changes in rhythm occur.
4. Assess neurological state for changes from baseline assessment.
5. Notify doctor.
6. Obtain 12-lead ECG as ordered.
7. Administer antiarrhythmics as orders.

Common Arrhythmias
Arrhythmias are grouped as follows:
1. Sinus arrhythmias
2. Atrial arrhythmias
3. Junctional arrhythmias
4. Ventricular arrhythmias
5. Atrioventricular blocks

**Sinus Arrhythmias**
Sinus arrhythmias result from disturbances in impulse discharge or impulse conduction from the sinus node.

**I. Sinus Bradycardia**
Sinus bradycardia is a sinus rhythm of less than 60 beats per minute.

*ECG Characteristics:*
- P waves: Normal in configuration and direction; one P wave precedes each QRS complex.
- PR interval: Normal (0.12 to 0.20 seconds)
- Rhythm: Regular
- Rate: Less than 60 beats/minute
- QRS complex: Normal (0.04 to 0.10 seconds)

*Etiology:*
- Normal variant in athletes, some healthy adults
- Increased vagal tone (vomiting, straining)
- Responses to digitalis, beta blockers and some calcium channel blockers

*Nursing / Medical intervention*
- Document dysrhythmia
- Monitor haemodynamic parameters
- Evaluate neurological status
- If asymptomatic: no treatment
- If symptomatic: Atropine 0.5 to 1.0 mg IV

**II. Sinus Tachycardia**
Sinus tachycardia is a sinus rhythm of more than 100 beats per minute.

*ECG Characteristics:*
- P waves: Normal in configuration and direction; one P wave precedes each QRS complex.
- PR interval: Normal (0.12 to 0.20 seconds)
- Rhythm: Regular
- Rate: Greater than 100 beats/minute
- QRS complex: Normal (0.04 to 0.10 seconds)

Etiology
- A normal response to exercise and emotion
- Pain
- Dehydration, acute blood loss and anaemia
- Fever
- Heart failure
- Hyperthyroidism
- Atropine, Isoproterenol and epinephrine

Nursing / Medical Intervention
- Document dysrhythmia
- Monitor haemodynamic parameter
- Treat underlying causes

III. Sinus Arrhythmia

Sinus arrhythmia is a sinus dysrhythmia with an irregular rhythm.

ECG Characteristics:
- P waves: Normal in configuration and direction; one P wave precedes each QRS complex.
- PR interval: Normal (0.12 to 0.20 seconds)
- Rhythm: Irregular
- Rate: Greater than 100 beats/minute
- QRS complex: Normal (0.04 to 0.10 seconds)
**Etiology:**

- Normal in healthy persons, the heart rate increases with inspiration and decreases with expiration.
- Vagal effect of certain medications such as digoxin or morphine causing irregularity of sinus pacemaker

**Nursing / Medical Intervention**

- None

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**IV. Sinus Arrest**

Sinus arrest is a sinus rhythm interrupted by an occasional, prolonged failure of the SA node to initiate an impulse. Because the atria are not stimulated to contract, an entire P-QRS-T complex is dropped.

**ECG Characteristics:**

- **P waves:** Sinus P waves present when sinus node is firing and absent during periods of sinus arrest.
- **PR interval:** Normal (0.12 to 0.20 seconds) with underlying rhythm; PR absent during pause.
- **Rhythm:** Irregular during pause
- **Rate:** Usually within normal range, but may be in the bradycardia range
- **QRS complex:** Normal (0.04 to 0.10 seconds); QRS absent during pause.

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**Etiology:**

- Vagal stimulation
- Myocardial infarction interrupting the blood supply to the sinus node
- Digitalis, beta blockers and calcium blockers
Nursing / Medical Intervention:
- Treat the underlying causes
- If haemodynamic compromise, Atropine 0.5 to 1.0 mg IV
- Pacemaker for recurrent episodes

Atrial Arrhythmias
Atrial arrhythmias result from ectopic stimuli, that is, they arise outside the SA node in either the right or left atrium. Because of the ectopic origin of the impulse, the P waves will be different in configuration from the sinus P waves.

I. Premature Atrial Contraction
Premature atrial contraction are atrial beats that arise earlier than expected. It occurs in addition to the patient’s underlying rhythm

ECG Characteristics:
- P waves: Abnormal in size, shape, or direction. P wave is usually upright (often pointed), or it may be inverted. In faster rhythms, the P wave is superimposed on the preceding T wave, hidden in the QRS complex.
- PR interval: Normal or prolonged - usually differs from that of underlying rhythm.
- Rhythm: Regular except when atrial ectopics occur, resulting in early beats.
- Rate: Normal
- QRS complex: QRS complex: Normal (0.04 to 0.10 seconds)

Etiology:
- Can occur in normal hearts
- Caffeine and alcohol
- Congestive heart failure
- Pulmonary disease
- Interruption of atrial blood supply by myocardial ischaemia or infarction
- Hypermetabolic states
Nursing / Medical Intervention:
- Usually no treatment if asymptomatic
- Treat underlying causes.
- Detect and document irregular pulse; frequent PACs may precede more serious arrhythmias such as atrial fibrillation.
- If increasing in frequency (5-6 BPM), Digitalis, quinidine, or propranolol may be indicated.

II. Paroxysmal atrial tachycardia
It is originating in an ectopic atrial focus. They start and stop suddenly, a result of the very rapid firing of an atrial ectopic focus. It usually is preceded by frequent atrial ectopics.

ECG Characteristics:
- P waves: Abnormal (often pointed); may precede the QRS, frequently obscured in preceding T wave or may be hidden in QRS complex.
- PR interval: Not measurable
- Rhythm: Regular
- Rate: 170 to 250 beats/minute
- QRS complex: Normal (0.04 to 0.10 seconds)
- Onset and termination are abrupt

Etiology:
- Sepsis
- Hyperthyroidism
- Myocarditis

Nursing / Medical Intervention:
- Detect and document a rapid, regular pulse
- Assess for signs / symptoms of diminished cardiac output
- Carotid sinus massage
- Cardioversion
- Verapamil and digitalis
III. **Atrial Flutter**

Atrial flutter is an atrial rhythm characterized by a rapid atrial rate. The rhythm is the result of a circus movement pathway (also called reentry), although enhanced automaticity has also been implicated.

*ECG Characteristics:
- P waves: Characterized by a very regular, “sawtooth” pattern.
- PR interval: Not measurable
- Rhythm: Atrial rhythm is regular, ventricular rhythm may be regular or irregular due to varying AV block.
- Rate: Atrial rate varies between 250 to 350 beats/minute, most commonly 300; ventricular rate varies depending on the amount of block at the AV node, most commonly 150 beats/minute and rarely 300 beats/minute.
- QRS complex: Normal (0.04 to 0.10 seconds)

*Nursing / Medical Intervention:*
- Detect and document dysrrhythmia
- Monitor for signs of decreased cardiac output
- Cardioversion may be necessary if cardiac output is markedly compromised
- Verapamil and beta blockers
- Quinidine and procaainamide

IV. **Atrial Fibrillation**

Atrial fibrillation is an atrial rhythm characterized by disorganized atrial activity without idcernible P waves.

*ECG Characteristics:*
- P waves: Not present; irregular P waves are often seen, and vary in size from coarse to very fine.
- PR interval: Not measurable since there are no P waves.
- Rhythm: Irregular
- Rate: Atrial rate is too rapid to determine; ventricular rate varies depending on the amount of block at the AV node.
QRS complex: Normal (0.04 to 0.10 seconds)

**Etiology:**
- Rheumatic heart disease
- Heart failure
- Myocardial infarction

**Nursing / Medical Intervention:**
- Detect and document dysrrhythmia
- Monitor for diminished cardiac output
- Digitalis, verapamil and propranolol
- Cardioversion may be necessary if the patient is haemodynamically unstable.

**Junctional Arrhythmias**
AV junctional arrhythmias originate from the area in and around the AV node. The AV node contains specialized pacemaker cells and can serve as a secondary pacemaker site if the SA node fails to function properly as the primary pacemaker, or if conduction of the electrical impulses is blocked for some reason.

**I. Premature Junctional Contraction**
A premature junctional contraction is a junctional beat that occurs prematurely. They appear before the next normally expected complex.

**ECG Characteristics:**
- **P waves:** May occur before, during, or after the QRS complex of the premature beat and are usually inverted.
- **PR interval:** Short, usually 0.10 second or less.
- **Rhythm:** Regular except for occurrence of premature beats.
- **Rate:** Variable; usually normal
- **QRS complex:** Normal (0.04 to 0.10 seconds)
Etiology:
- Myocardial infarction
- Digitalis toxicity

Nursing / Medical Intervention:
- Detect and document dysrhythmia
- Treat underlying cause

II. Junctional Rhythms

A junctional rhythm is a dysrhythmia originating in the AV junctional tissue at a rate of its inherent pacemaker. A junctional rhythm occurs as an escape or safety mechanism when higher pacemakers are not functioning or if their impulses are not getting through the AV node.

ECG Characteristics:
- P waves: Before (inverted), during, or after QRS.
- PR interval: Short, usually 0.10 second or less.
- Rhythm: Regular
- Rate: 40 to 60 beats/minute
- QRS complex: Normal (0.04 to 0.10 seconds)

Etiology:
- Digitalis toxicity
- Following inferior myocardial infarction due to disruption of blood supply to the AV node
- Heart failure

Nursing / Medical Intervention:
• Treatment is rarely required
• Atropine to increase the heart beat

III. Accelerated Junctional Rhythm

It is an arrhythmia originating in AV junction. The term “accelerated” denotes a rhythm that occurs at a rate that exceeds the inherent junctional escape rate of 40 – 60, but is not fast enough to be junctional tachycardia.

**ECG Characteristics:**

- **P waves:** Before (inverted), during, or after QRS.
- **PR interval:** Short, usually 0.10 second or less.
- **Rhythm:** Regular
- **Rate:** 60 to 100 beats/minute
- **QRS complex:** Normal (0.04 to 0.10 seconds)

**Etiology:**

- Digitalis toxicity
- Following inferior myocardial infarction due to disruption of blood supply to the AV node
- Heart failure

**Nursing / Medical Intervention:**

- Treat underlying cause

Ventricular Arrhythmias

Ventricular arrhythmias originate in the ventricles below the branching portion of the bundle of His.

I. Premature Ventricular Contraction

Premature ventricular contractions originate low in the ventricles (Below the branching bundle of His), occur earlier than the normally expected beat.

**ECG Characteristics:**

- **P waves:** VEs not preceded by P wave.
- **PR interval:** Not present before most VEs.
- **Rhythm:** Irregular because of the early beats.
- **Rate:** May be any rate.
• QRS complex: Wide, greater than 0.12 second in duration; may vary in, morphology (size, shape) if they originate from more than one focus in the ventricles.

Etiology:
• Hypoxia
• Myocardial ischaemia
• Hypokalaemia
• Acidosis

Nursing / Medical Intervention:
• Detect and document frequency of the premature beats and any patterns of occurrence
• Monitor haemodynamic parameters
• Monitor serum electrolytes
• Treat underlying cause
• Lidocaine

II. Ideioventricular rhythm
It is an arrhythmia originating in an escape pacemaker site in the ventricles, with a heart rate between 30 – 40 per minutes.

ECG Characteristics:
• P waves: Absent
• PR interval: Not measurable.
• Rhythm: Regular
• Rate: 30 – 40 beats per minute (sometimes slower)
• QRS complex: Wide, greater than 0.12 second in duration.
Etiology:
• Heart failure

Nursing / Medical Intervention:
• Atropine
• Transcutaneous pacing

III. Ventricular Tachycardia
Ventricular tachycardia refers to a paroxysm, or sustained rhythm, of three or more PVCs in a row.

ECG Characteristics:
• P waves: Usually not present.
• PR interval: Not measurable.
• Rhythm: Regular
• Rate: Ventricular rate is faster than 100 beats/minute.
• QRS complex: Wide, greater than 0.12 second in duration.

Etiology:
• Same as the causes of VEs

Nursing / Medical Intervention:
• Detect and document dysrrhythmia
• Monitor haemodynamic parameters
• Monitor serum electrolytes
• If pulseless, start CPR and deliver countershock
IV. Ventricular Fibrillation

Ventricular fibrillation is rapid, disorganized depolarization of the ventricles. Individual muscle fibers in the ventricles depolarize, but in a disorganized manner.

**ECG Characteristics:**

- **P waves:** None seen.
- **PR interval:** Not measurable.
- **Rhythm:** Irregular
- **Rate:** Rapid, uncoordinated, ineffective.
- **QRS complex:** Not formed QRS complexes seen; rapid, irregular undulations without any specific pattern.

**Etiology:**

- Myocardial infarction
- Electrolyte imbalance
- Metabolic acidosis
- Hypothermia
- Ventricular tachycardia

**Nursing / Medical Intervention**

- If dysrhythmia verified, start CPR
- Countershock

V. Ventricular Asystole / Asystole

Ventricular systole is a total absence of ventricular electrical activity, although some activity may be present in the atria.

**ECG Characteristics:**

- **P waves:** May be present if the sinus node is functioning.
- **PR interval:** Not measurable.
- **Rhythm:** None
- **Rate:** None
- **QRS complex:** Absent
Heart Block

Heart block is the general term used to describe disturbances in atrioventricular (AV) conduction. Normally the AV node acts as a bridge between the atria and the ventricles.

I. First-degree Heart Block

In first-degree AV block, the sinus impulse is conducted normally to the AV node, where it is delayed longer than usual before being conducted to the ventricles.

ECG Characteristics:

- P waves: Normal
- PR interval: Prolonged (greater than 0.20 seconds); remains constant.
- Rhythm: Regular
- Rate: Normal
- QRS complex: Normal

Etiology:

- Acute myocardial infarction
- Hyperkalemia
- Rheumatic fever
**Nursing / Medical Intervention:**
- Continue monitoring
- Treat the underlying causes

**II. Second-degree Heart Block (Mobitz type I or Wenchebach)**

It is characterized by a failure of some of the sinus impulses to be conducted to the ventricles. In this rhythm the sinus impulse is conducted normally to the AV node but each successive impulse has more and more difficulty passing through the AV node, until finally an impulse does not pass through.

**ECG Characteristics:**
- **P waves:** Normal
- **PR interval:** Progressively lengthens until a P wave occurs without a QRS. A pause follows the dropped QRS.
- **Rhythm:** Regular atrial rhythm; irregular ventricular rhythm.
- **Rate:** Ventricular rate will depend on number of impulses conducted through AV node - will be less than the atrial rate.
- **QRS complex:** Normal

**Etiology:**
- Acute infections (rheumatic fever and myocarditis)
- Normal variant

**Nursing / Medical Intervention:**
- None

**III. Second-degree Heart Block (Mobitz type II)**

It is characterized by a failure of some of the sinus impulses to be conducted to the ventricles.

**ECG Characteristics:**
- **P waves:** Normal
- **PR interval:** May be normal or prolonged - remains constant.
- **Rhythm:** Regular atrial rhythm; regular ventricular rhythm unless the AV conduction ratio varies.
- **Rate:** Ventricular rate will depend on number of impulses conducted through AV node - will be less than the atrial rate.
- QRS complex: Normal (if block located in bundle of His); wide (if block located in bundle branches).

Etiology:
- Acute MI
- Cardiomyopathy
- Severe coronary artery disease
- Degeneration of the electrical conduction system

Nursing / Medical Intervention:
- Cardiac pacing

IV. Third – degree Heart Block
There is no conduction of stimuli from the atria to the ventricles. Instead, the atria and ventricles beat independently of each other. The atria usually continue to be paced by the sinus node while the ventricles are paced by an escape pacemaker located in the AV node or in the ventricles.

ECG Characteristics:
- P waves: Normal
- PR interval: Varies greatly, no constant relationship between P waves and QRS.
- Rhythm: Regular atrial rhythm; regular ventricular rhythm.
- Rate: Ventricular rate is between 40 to 60 beats/minute if paced by AV node; 30 to 40 beats/minute if paced by ventricles.
- QRS complex: Normal (if block located at level of AV node or bundle of His); wide (if block located at level of bundle branches).
Etiology:
- Acute inferior and anterior MI
- Drug toxicity (digitalis, beta-blockers, calcium-channel blockers)
- Following cardiac surgery

Nursing / Medical Intervention:
- Cardiac pacing

References

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