ECGs 3: identifying cardiac rhythms

In this article...
- Signs and symptoms of cardiac arrhythmias
- Identifying common arrhythmias using a six-step analysis
- Common causes of the condition

Patients who are acutely ill, or at risk of becoming so, are not always nursed in critical care. Developing skills in basic observation and electrocardiogram monitoring enables nurses to care for these patients in a safe and efficient manner.

This article is the last in a three-part series. The first two discussed the indications and nursing responsibilities for ECG monitoring; the elements of a normal ECG rhythm; and a structured, six-step approach to ECG rhythm analysis. This article applies this approach to rhythm strips to identify the rhythms; and possible causes are discussed.

Cardiac arrhythmias
Cardiac arrhythmias are a common indication of both acute and chronic illness. The effects on the patient may be unnoticeable but a cardiac arrhythmia can lead to a life-threatening cardiac arrest. Signs or symptoms of cardiac arrhythmias include:
- Shock;
- Syncope or fainting;
- Myocardial ischaemia;
- Heart failure (Resuscitation Council (UK), 2011).

If a patient shows any of these symptoms, the arrhythmia should be treated as an emergency. The most common causes of cardiac arrhythmias are:
- Hypoxia;
- Electrolyte imbalance;
- Acidosis;
- Cardiac ischaemia (Resuscitation Council (UK), 2011).

These conditions must be corrected alongside management of the arrhythmia.

Rhythm analysis
The Resuscitation Council (UK) six-step approach (2011) to rhythm analysis (Box 1) should allow nurses to define a rhythm in enough detail to decide on action. How to identify common ECG rhythms using the approach is explained below.

Rhythm strip 1
1. Is electrical activity present? Yes.
2. What is the ventricular (QRS) rate? There are eight QRS complexes in 30 small squares; 8 x 10 = 80.
3. Is the QRS rhythm regular or irregular? The QRS rhythm appears regular.
4. Is the QRS width normal or broad/prolonged? The QRS width is less than three small squares so is not broad or prolonged.
5. Are atrial activity (P waves) present? P waves are evident so atrial activity is present. The P wave morphology (shape) is constant.
6. How is atrial activity related to ventricular activity? A P wave precedes each QRS complex throughout the rhythm strip. The distance between the P wave and the QRS complex is less than one large square (0.2 seconds).

This is consistent throughout the strip, meaning there is normal atrial activity followed by normal ventricular activity. This is a normal sinus rhythm but normal electrical activity does not necessarily mean there is cardiac output. This can occur in pulseless electrical activity – the heart’s electrical impulses can be seen on the monitor but the patient is in cardiac arrest and immediate resuscitation is required. As normal sinus rhythm can be present in any acute illness, patients must always be assessed before ECG analysis.

Rhythm strip 2
1. Is electrical activity present? Yes.
2. What is the ventricular (QRS) rate? The QRS rate is not distinguishable.
3. Is the QRS rhythm regular or irregular? The QRS rhythm is not distinguishable.
4. Is the QRS width normal or broad/prolonged? The QRS width is not distinguishable.
5. Are atrial activity (P waves) present? There are no recognisable P waves.
6. How is atrial activity related to ventricular activity? There are no recognisable P or QRS waves. This rhythm is ventricular fibrillation (VF); it can usually be recognised on a cardiac monitor or ECG machine. A patient in VF cannot generate a pulse and should be treated immediately with defibrillation in line with the Resuscitation Council (UK) algorithm for adult advanced life support (2010a). Causes of VF are outlined in Box 2; if the patient is successfully defibrillated, post-resuscitation care should include identifying the cause of the arrhythmia to prevent it recurring.

Rhythm strip 3
1. Is electrical activity present? Yes.
2. What is the ventricular (QRS) rate? There are 12 QRS complexes in 30 small squares: 12 x 10 = 120.
3. Is the QRS rhythm regular or irregular? The QRS rhythm is irregular. This is identified by marking the QRS on another strip of paper and moving it along the rhythm.
4. Is the QRS width normal or broad/prolonged?
Cardiac arrest should be confirmed and meaning the patient is in cardiac arrest. Hypothermia and hypovolaemia and acidosis required if no adverse signs are present as clinicians only. Senior medical review is still this should be undertaken by senior clinicians for managing tachyarrhythmia but Council (UK) (2010b) has produced guide-
lines for managing tachycardia but Council (UK) (2011). The Resuscitation


diagnosis requires a 12-lead ECG. Causes of narrow complex tachycardia include car-
diac ischaemia and digoxin toxicity (Box 3). Patients should be observed for adverse
signs and assessed using the airway, breathing, circulation, disability, exposure
(ABCDE) framework (Resuscitation Council (UK), 2011). The Resuscitation
Council (UK) (2008) has produced guidelines for managing tachyarrhythmia but
this should be undertaken by senior clinicians only. Senior medical review is still
required if no adverse signs are present as patients may deteriorate over time.

Rhythm strip 4
1. Is electrical activity present?
There is no electrical activity present. Proceeding to the other steps is futile as this rhythm strip represents asystole, meaning the patient is in cardiac arrest. Cardiac arrest should be confirmed and immediate resuscitative measures commenced in line with the Resuscitation Council (UK) (2008) algorithm for adult advanced life support.

Asystole and cardiac arrest can be caused by hypoxia, tension pneumothorax and cardiac tamponade (Box 4). Identifying the cause of the asystolic rhythm is integral to resuscitation management.

Conclusion
Cardiac arrhythmias are common signs of acute and chronic illness. They can have subtle or extremely serious effects. Basic ECG analysis is aided by the structured, six-step approach but specific diagnosis should only be made using a 12-lead ECG. While the aetiology of cardiac arrhythmias can be multifactorial, the common causes should be considered and treated first.

The patient should be assessed using the ABCDE framework to identify adverse signs of cardiac arrhythmias; treatment should be initiated accordingly.

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Table: Six Steps to Rhythm Analysis

- Is there any electrical activity present?
- What is the ventricular (QRS) rate?
- Is the QRS rhythm regular or irregular?
- Is the QRS width normal or broad/prolonged?
- Is atrial activity (P waves) present?
- How is atrial activity related to ventricular activity?

Source: Resuscitation Council (UK) (2011)

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Table: Ventricular Fibrillation Causes
- Acute coronary syndromes
- Hypertensive heart disease
- Valve disease
- Drugs, such as antiarrhythmics, tricyclic antidepressants or digoxin
- Inherited cardiac diseases
- Acidosis
- Abnormal electrolyte concentrations, for example of potassium, magnesium and calcium
- Hypothermia
- Electrocution

Source: Resuscitation Council (UK) (2011)

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Table: Narrow Complex Tachycardia Causes
- Cardiac ischaemia
- Digoxin toxicity
- Re-entry conduction pathways
- Electrolyte/metabolic imbalance
- Acidosis

Source: Resuscitation Council (UK) (2011)

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Table: Asystole and Cardiac Arrest Causes
- Hypoxia
- Hypovolemia
- Hypothermia
- Hypo/hyperkalemia or other electrolyte or metabolic imbalance
- Tension pneumothorax
- Cardiac tamponade
- Toxicity (poisoning)
- A thromboembolic event

Source: Resuscitation Council (UK) (2011)

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Source: Resuscitation Council (UK) (2011)