Cardiac Arrhythmias: Clinical Assessment, ECG Diagnosis and Emergency Management Online Course

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Learning Outcomes

At the completion of the course the participants should be able to:

1. Describe the key principles in clinical assessment of the patient presenting with a cardiac arrhythmia
2. Identify the ECG features of sinus rhythm
3. Identify the key factors used to classify an arrhythmia
4. Outline the initial priorities in the management of the patient with an arrhythmia
5. List the differential diagnosis for irregular tachycardia
6. Describe the ECG characteristics of a broad complex tachycardia
7. List the differential diagnosis for bradycardia

Summary of the e-Learning Program
The e-learning is interactive and requires the clinician to consider a series of blood gases and identify key abnormalities. The mastery quiz incorporates both formative and summative assessment components. There are 6 topics with a total course time of 10 hours.

The nine topics are:

1. Core Principles: Cinical Approach to Cardia Arrhythmias
2. Arrhythmia ECG Diagnosis
3. Narrow Complex Tachycardia
4. Irregular Tachycardia
5. Broad Complex Tachycardia
6. Severe Bradycardia

Outline of the Program

1. Core Principles: Clinical Approach to Cardiac Arrhythmias

Module summary: The central principle for managing cardiac arrhythmias is to always look at the patient first and interpret the ECG in the context of the patient. This approach will avoid serious error and enable early recognition of life threatening cardiac arrhythmias. The ECG is like a map that shows the reader the origin and path of the depolarisation wave through the heart's structures (atrium, AV node, His Purkinjie fibres and ventricles). Once a person learns to read this "map" abnormalities in the origin, conduction or repolarisation can be readily described. In this first topic we explore the clinical assessment of the patient presenting with an arrhythmia and some of the basic concepts underlying the ECG interpretation of arrhythmias.

Interaction/Assessment:

- Clinical Casebook: Clinical Assessment
- Topic Quiz – Module 1 (a)

ECG Physiology: Depolarisation: In normal sinus rhythm the depolarisation begins in the sinus node and spreads through the atrium, AV node and His-Purkinjie fibres to the ventricles triggering contraction of the ventricles. As the depolarisation wave proceeds through the heart it produces sequential changes on the ECG resulting in the PQRST complex. Disruption to this orderly sequence of depolarisation results in changes to the PQRST complex allowing interpretation of the conduction sequence and pattern of abnormal conduction. This module describes the movement of depolarisation wave through the heart and associated ECG changes and identifies common abnormalities in conduction.

Interaction/Assessment:

- Clinical Casebook: Pathophysiology
- Topic Quiz – Module 1 (b)

2. Arrhythmia ECG Diagnosis

Module summary: ECG diagnosis requires the same skills as a detective. It begins with a careful search for clues, a recognition of common patterns and finally a narrowing down of the causes to one or two likely possibilities. Building on a foundation the basic ECG physiology, the module focuses attention on developing an understanding of the relationship between depolarisation / repolarisation and the ECG waveform, classifying arrhythmias into one of four categories and considering the differential diagnosis within each of these categories. This will provide a firm foundation for the ECG diagnosis of Cardiac Arrhythmias in your clinical practice.

Interaction/Assessment:

- Reading: Approach to Cardia Arrhythmias
- Video eTutorial: Approach to Cardia Arrhythmias
- Clinical Casebook: Diagnosis
- Video eTutorial: Arrhythmia ECG Cases Part 1
- Video eTutorial: Arrhythmia ECG Cases Part 2
- Topic Quiz – Module 2

3. Narrow Complex Tachycardia

Module summary: One of the most common cardiac rhythms seen in the emergency patient is narrow complex tachycardia. In most cases this will be a sinus tachycardia, recognisable by the presence of a normally shaped P wave before each QRS complex. In these cases the tachycardia is a clinical sign associated with the underlying disease process such as infection, dehydration, respiratory distress or pain. Management in these cases focuses on identifying and treating the underlying cause.
In some patients the tachycardia is due to a cardiac arrhythmia arising from the atrium (eg Atrial flutter), the AV junction (eg re-entry SVT) or ventricles (eg Ventricular tachycardia) and requires treatment with either anti-arrhythmic drugs or electrical cardioversion. In the following modules we focus on one type of tachycardia "Narrow Complex Regular Tachycardia". In the first casebook we consider the differential diagnosis and ECG features that assist to determine the origin of the rhythm and in the second casebook we explore management of Supraventricular Tachycardia (SVT).

Interaction/Assessment:

- Case Simulation: Narrow Complex Tachycardia (1)
- Case Simulation: Narrow Complex Tachycardia (2)
- Topic Quiz – Module 3

4. Irregular Tachycardia

Module summary: The four major considerations in a patient with an irregular tachycardia are atrial fibrillation, atrial flutter with variable block, frequent atrial premature beats and multifocal atrial tachycardia.
Atrial fibrillation occurs when there are multiple areas of the atrial myocardium continuously discharging and contracting. The ECG is characterised by a fibrillating baseline and an irregular ventricular response usually around 170 to 180 / minute. In the stable patient there are two management approaches : (1) *Rate control* for chronic AF and acute AF that has persisted > 48 hours and (2) *Chemical and / or electrical cardioversion* for acute AF of less than 48 hours.

Interaction/Assessment:

- Case Simulation: Irregular Tachycardia (1)
- Case Simulation: Irregular Tachycardia (2)
- Topic Quiz – Module 4

5. Broad Complex Tachycardia

Module summary: In this topic we explore the problem of the patient with a regular broad complex tachycardia. The most serious diagnosis in this category is Ventricular Tachycardia, a Red Flag Arrhythmia associated with a high risk for serious underling heart diseases and/or deterioration to cardiogenic shock or cardiac arrest. Early diagnosis and intervention is critical. The most commonly used agents for managing the patient with stable VT are Amiodarone, Lignocaine and Procainamide. In the unstable patient immediate synchronised cardioversion is indicated beginning usually with 100 J in an adult and increasing if subsequent shocks are required.

Interaction/Assessment:

- Case Simulation: Broad Complex Tachycardia (1)
- Case Simulation: Broad Complex Tachycardia (2)
- Topic Quiz – Module 5

6. Severe Bradycardia

Module summary: Bradycardia is defined as a ventricular rate of < 60 / min. Bradycardia is commonly found in athletes, patients on β blockers and calcium antagonists and vasovagal syncope (fainting) but may be marker for serious illness including drug toxicity, hypothermia, hypothyroidism, ischaemic heart diseases and raised intracranial pressure. Bradycardia is caused by one of three principle mechanisms : Sinus Bradycardia, Sinus node dysfunction (sick sinus syndrome) and AV nodal block. The module describes the ECG characteristics, differential diagnosis and clinical management of bradycardia.

Interaction/Assessment:

- Case Simulation: Severe Bradycardia
- Topic Quiz – Module 6

7. Final Post Course Assessment

Final Course Quiz (1)
Final Course Quiz (2)