The Society for Cardiological Science and Technology

Diploma in Electrocardiography

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The Society makes this award to candidates who can demonstrate the ability to accurately record and provide first line interpretation of a 12-lead resting electrocardiogram (ECG) under examination conditions. This is designed as an intermediate level award for senior cardiographers, associate physiologists, and any other practitioners wishing to advance their skills beyond Certificate level.

Candidates will be expected to demonstrate the following outcomes in practical and written examinations.

- Evaluate the indication for the test and explain the ECG abnormalities that may be associated with this
- Identify potential health and safety risks related to ECG and select appropriate strategies to minimise risks
- Recognise and address patient anxiety and recording difficulties
- Perform an accurate resting 12-lead ECG in patients of all ages according to SCST consensus guidelines
- Accurately measure standard ECG intervals and compare these with normal values
- Describe how electrical events on the ECG are related to the cardiac cycle
- Correctly identify normal and abnormal wave morphology and rhythms using standard terminology to describe these
- Explain which common cardiovascular pathologies may be associated with specific ECG abnormalities (provide a differential diagnosis)
- Identify situations when the patient requires urgent treatment and respond appropriately
- Recognise the limits of operational responsibility and when to seek assistance

Candidates should ensure that their preparation for the examination considers all points in the following syllabus.
Syllabus

(1) ANATOMY and PHYSIOLOGY OF THE CARDIOVASCULAR SYSTEM:
General structure and function of the heart, including:
- The role of the heart in the circulation
- valves and supporting apparatus
- chambers
- main coronary arteries and veins
- great veins and arteries
- pericardium

Simple anatomy and function of the specialised conduction system:
- Sinus node
- Atrioventricular node
- Bundle of His
- Left and right bundle branches
- Left anterior and posterior fascicles
- Purkinje fibres

Pathology of the cardiovascular system
Overview of the following pathological processes
- Coronary atherosclerosis
- Acute coronary occlusion
- Myocardial ischaemia
- Hypertension
- Stable angina
- Unstable angina
- Prinzmetal’s angina
- Non-ST elevation myocardial infarction
- ST-elevation myocardial infarction
- Ventricular hypertrophy
- Cardiomyopathies
- Atrial and ventricular septal defects.
- Coarctation of the aorta.
- Valvular stenosis and regurgitation
- Pericarditis

(2) ELECTROCARDIOGRAPHY:
Instrumentation
Instrumentation and basic principles of lead theory needed for the effective and safe practice of electrocardiography.

Standard recording settings and how to alter controls
- Paper speed
- Gain
- Filters
- Lead selector
- Manual/automatic operation
Care of the equipment
- Care of recording paper
- Battery maintenance
- Care of leads and cables

Electrodes
- Application of and connection to electrodes
- Care of electrodes
- Electrode positions

Lead systems
- Hexaxial reference system
- Wilson’s central terminal
- Einthoven’s triangle
- Significance of right leg (neutral) electrode

Preparation of the patient
- Explanation of the procedure at a level appropriate to the patient and obtaining oral consent
- Positioning of the patient
- Encouraging the patient to relax
- Maintaining the privacy and dignity of the patient at all times.

Practical electrocardiography
- Choice of appropriate leads for a particular patient category
- Setting of controls as appropriate for the specific recording
- Correct application and positioning of limb and chest electrodes in accordance with the Society for Cardiological Science and Technology guidelines.
- Preparation of electrode sites to give optimum electrode contact and to minimise artefact
- Recording of a resting electrocardiogram from patients of all ages using both manual and automatic mode
- Recording of the resting electrocardiogram from a patient who:
  - Is unconscious,
  - Has language or communication difficulty,
  - Is infectious or is in isolation,
  - Has a physical disability (including amputation),
- Evaluation of the recording, re-recording as appropriate
- Recognition and elimination or reduction of artefacts due to:
  - Muscle tension
  - Muscle tremor
  - Alternating current interference
  - Limb movement
  - Broken lead
  - Sweat
  - Respiratory chest movement
- Recognition of ECG findings associated with transposal of the right arm and left arm connections:
- Labelling of completed recordings as appropriate
- Cleaning, preparation and storage of equipment ready for subsequent recording, including correct decontamination and disposal procedures
Electrocardiographic interpretation: Normal features and basic measurements
- Relationship of the electrocardiogram to the electrical events of the heart
- Relationship of the electrical events to the mechanical events of the cardiac cycle
- Waveform components (P, Q, R, S, T and U)
- Definitions, measurement and normal ranges of heart rate, PR interval, QRS duration, QT interval and mean frontal plane axis
- Calculation of corrected QT interval (QTc) by Bazett’s formula
- Appearance of the normal resting electrocardiogram including R wave progression in precordial leads

Normal variations of the electrocardiogram in relation to:
- Age
- State of activity
- Body build
- Ethnic origin

The normal electrocardiogram and common abnormalities
Rhythms arising from the sinus node:
- Normal sinus rhythm
- Sinus arrhythmia
- Sinus tachycardia
- Sinus bradycardia
- Sinus arrest and sino-atrial block

Supraventricular tachyarrhythmias
- Atrial premature contractions (ectopics)
- Atrial tachycardia
- Atrial flutter
- Atrial fibrillation
- AV nodal re-entrant tachycardia
- AV re-entrant tachycardia
- Accelerated AV nodal (junctional) rhythm

Conduction abnormalities
- Ventricular pre-excitation
- Left and right bundle branch block
- Left anterior and posterior fascicular block
- 1\textsuperscript{st} degree AV block
- 2\textsuperscript{nd} degree AV block: Mobitz I (Wenckebach), Mobitz II and 2:1 block
- High grade (advanced) AV block
- 3\textsuperscript{rd} degree (complete) AV block

Rhythms arising from the ventricles
- Ventricular escape beats
- Ventricular premature beats (ectopics)
- Ventricular tachycardia
- Ventricular flutter
• Ventricular fibrillation
• Ventricular standstill

The electrocardiogram associated with an artificial cardiac pacemaker
• Identification of pacemaker stimulus on the electrocardiogram
• Unipolar and bipolar pacing
• Differentiation between atrial and ventricular pacing
• Failure to sense
• Failure to capture

Interpretation of changes in the electrocardiogram arising from abnormal cardiac conditions, including
• Myocardial ischaemia
• Myocardial infarction
• Left ventricular hypertrophy
• Right ventricular hypertrophy
• Pericarditis
• Dextrocardia
• Massive pulmonary embolism

Interpretation of changes in the electrocardiogram arising from abnormal metabolic, endocrine and electrolyte states
• Hypothermia
• Hypothyroidism
• Hyperthyroidism
• Hyperkalaemia
• Hypokalaemia

Recognition of electrocardiographic features of ion ‘channelopathies’
• Long QT syndrome
• Brugada syndrome

Recognition of electrocardiographic features associated with cardiomyopathies
• Hypertrophic cardiomyopathy
• Dilated cardiomyopathy
• Arrhythmogenic RV cardiomyopathy
• Cardiac amyloidosis