



PREMED

Policy / procedure / document

Subject: PhEDECs™ Syllabus
“The Prehospital and Emergency Department ECG Course”

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PhEDECs™ – The Prehospital and Emergency Department ECG Course

At PREMED we are passionate about delivering excellent education that is both interesting and meaningful to attendees. Additionally, we recognise that attendees will come from a varied professional background with a range of clinical experience.

To best meet the learning requirements of attendees we have developed the following syllabus, informed by the Society for Cardiological Science and Technology's Diploma in ECG Interpretation (SCST DipECG) syllabus¹, a variety of online courses²³, and academic texts⁴⁵.

PhEDECs™ comprises three levels, appropriate for a variety of learners, and covers a range of learning outcomes (detailed below) incorporating elements of the diagnostic approach to ECGs, underlying anatomy and physiology, rhythm interpretation, and associated treatment.

Additionally, a number of standalone sessions are available covering more focussed topics.

¹ SCST (2018). *SCST Diploma in ECG Interpretation preparation course*. [[Online](#)].

² ECGwaves.com (2020). *Clinical ECG Interpretation*. [[Online](#)].

³ Acadoodle (2020). [[Online](#)].

⁴ Grauer (2014). *ECG Pocket Brain*. 4th Edn. Florida: KG/EKG Press.

⁵ Smith *et al* (2002). *The ECG in Acute MI*. Philadelphia: Lippincott Williams & Wilkins.

PhEDeCs™ – level 1

Duration: one day (six hours)

When to perform an ECG

Practical considerations

- Medical clerking
- Repeat ECGs and dynamic changes

Anatomy

- Heart location in chest
- Coronary arteries overview
- Conduction system overview

Physiology

- “Electrically powered mechanical pump”
 - Journey of an oxygen molecule

Electrophysiology

- Journey of an electrical impulse

ECG characteristics

- Positive and negative deflections
- Electrode placement
- Unipolar vs bipolar leads
- Derivation of the standard 12-lead ECG

The normal ECG

- Basic measurements
- Waveform components
 - Waves
 - Intervals (with normal ranges)
 - Segments
- Basic arrhythmias
 - (Supraventricular) tachycardias overview / recognition
 - Bradycardias overview / recognition
 - AV blocks overview / recognition
 - BB blocks overview / recognition
 - VT
 - VF
- Axis deviation
- Normal sinus rhythm

Ischaemia and infarction

- Angina
- Infarction
 - Physiology of TWI and ST deviation
 - Evolution of an STEMI⁶
 - Dynamic changes

⁶ Smith *et al* (2002). *The ECG in Acute MI*. Philadelphia: Lippincott Williams & Wilkins. p 7.

PhEDeCs™ – level 2

Duration: one day (eight hours)

Practical considerations

- Clinical correlation
- Accuracy (Sensitivity, Specificity, PPV, NPV) / pre- and post-test probability

Anatomy

- Coronary arteries and conduction system recap
- Anatomical variants
 - Age
 - Activity
 - Body build
 - Ethnic origin
 - Athleticism
 - Dextrocardia

Physiology

- Dominant LCx / 'wraparound' LAD

Electrophysiology

- Cardiac cell architecture
 - Conduction vs contractile cells
- Cardiac action potential
 - Electromechanical coupling (domino analogy)
- Ectopic foci

ECG characteristics

- De- and re-polarisation vectors
- Right-sided and posterior leads

Features and measurements

- Bazett's formula⁷
- BER

Arrhythmias overview

- Sinus arrhythmia
- VT
- SVT
 - AF
 - Re-entry patterns
 - A flutter
 - AVNRT
 - AVRT
- Bradyarrhythmias
 - SSS
 - Escape rhythms
 - Ventricular standstill

Conduction defects

⁷ MD+Calc (no date). *Corrected QT Interval (QTc)*. [[Online](#)].

- Fascicular blocks
 - Unifascicular
 - Bifascicular
 - 'Incomplete trifascicular'
 - Trifascicular⁸
- Introduction to SADS patterns
 - Long QT
 - Brugada
 - CPVT
 - WPW

Ischaemia and infarction

- The OMI Manifesto⁹
- Changes associated with infarction
- Sgarbossa¹⁰ and Smith-modified Sgarbossa Criteria¹¹

Hypertrophy

- LVH
- RVH

Miscellaneous

- Pericarditis
- PE
- Pacemakers
- ICDs

⁸ Burns (2020). "Trifascicular block". *Life in the Fast Lane*. [[Online](#)].

⁹ Meyers (2018). "Down with STEMI – The OMI Manifesto". *EMCrit*. [[Online](#)].

¹⁰ Sgarbossa (1996). "Electrocardiographic diagnosis of evolving acute myocardial infarction in the presence of left bundle-branch block". *N Eng J Med*. 334(8). [[Online](#)].

¹¹ Meyers *et al* (2015). "Validation of the modified Sgarbossa criteria for acute coronary occlusion in the setting of left bundle branch block: A retrospective case-control study". *American Heart Journal*. 170(6). [[Online](#)].

PhEDeCs™ – level 3

Duration: two days (six + eight hours)

Day one

Practical considerations

- Safe discharge and referral

Anatomy

- Coronary arteries and conduction system recap
- Anatomical variants recap

Physiology

- Collateral blood flow
- Ischaemic conditioning
- Pre-excitation syndromes (WPW, LGL)

Electrophysiology

- Ion flow and abnormalities
- Wigger's diagram¹²

Arrhythmias

- Wandering atrial pacemaker
- AVRT
 - Orthodromic
 - Antidromic
- Accelerated junctional rhythm

Conduction defects

- Abberancy
 - VT vs SVT¹³
- Accelerated idioventricular rhythm
- CPVT
- TdP
- V flutter
- VF

¹² Mitchell and Wang (2014). "Expanding application of the Wiggers diagram to teach cardiovascular physiology". *Adv Physiol Educ.* 38(2). [[Online](#)].

¹³ Burns (2020). "VT versus SVT". *Life in the Fast Lane.* [[Online](#)].

Day two

Ischaemia and infarction

- MI physiology
 - Types (1–5)¹⁴
- MI electrophysiology
 - Smith's types (1–4)¹⁵

Features and measurements

- Subtle Anterior STEMI calculation¹⁶

Hypertrophy

- LAH
- RAH

Miscellaneous

- Pericardial effusion / tamponade
- Myocarditis
- Atrial septal defect

Cardiomyopathies

- HCM
- DCM
- ARVC

Metabolic, endocrine, and electrolyte abnormalities

- Hypothermia
- Hypothyroidism / hyperthyroidism
- Hypokalaemia / hyperkalaemia
- Hypocalcaemia / hypercalcaemia
- Hyperventilation
- Digitalis therapy and digoxin toxicity

Ion channelopathies

- Long QT syndrome
- Brugada pattern / syndrome

Extracardiac abnormalities

- Stroke
- SAH
- Muscular dystrophy
- Friedrich's Ataxia

¹⁴ Zafari (2019). "What are the types of myocardial infarction (MI, heart attack), and how is each defined?". *Medscape*. [[Online](#)].

¹⁵ Smith *et al* (2002). *The ECG in Acute MI*. Phil: Lippincott Williams & Wilkins. pp 5–8.

¹⁶ Driver *et al* (2017). "A new 4-variable formula to differentiate normal variant ST segment elevation in V2-V4 (early repolarization) from subtle left anterior descending coronary occlusion - Adding QRS amplitude of V2 improves the model". *Journal of Eletrocardiology*. 50(5). [[Online](#)].

PhEDeCs™ – Dysrhythmias

Duration: one day (six hours)

Anatomy

- Conduction system overview

Physiology

- “Electrically powered mechanical pump”
- Pre-excitation syndromes (WPW, LGL)

Electrophysiology

- Journey of an electrical impulse
- Cardiac cell architecture
 - Conduction vs contractile cells
- Cardiac action potential
 - Electromechanical coupling (domino analogy)
- Ectopic foci
- Ion flow and abnormalities
- Wigger’s diagram¹⁷

ECG characteristics

- De- and re-polarisation vectors

Features and measurements

- Bazett’s formula¹⁸

Arrhythmias

- Wandering atrial pacemaker
- Accelerated junctional rhythm
- SVT
 - AF
 - Re-entry patterns
 - A flutter
 - AVNRT
 - AVRT
 - Orthodromic
 - Antidromic
- Bradyarrhythmias
 - SSS
 - Escape rhythms
 - Ventricular standstill

¹⁷ Mitchell and Wang (2014). “Expanding application of the Wiggers diagram to teach cardiovascular physiology”. *Adv Physiol Educ.* 38(2). [[Online](#)].

¹⁸ MD+Calc (no date). *Corrected QT Interval (QTc)*. [[Online](#)].

PhEDeCs™ – Ischaemia and Infarction

Duration: one day (six hours)

Anatomy

- Heart position and coronary arteries overview

Physiology

- “Electrically powered mechanical pump”
 - Journey of an oxygen molecule
- Dominant LCx / ‘wraparound’ LAD
- Collateral blood flow and ischaemic conditioning

ECG characteristics

- De- and re-polarisation vectors
- Right-sided and posterior leads

Ischaemia and infarction

- Angina
- Infarction
 - Physiology of TWI and ST deviation
 - Evolution of an STEMI¹⁹
 - MI physiology
 - Types (1–5)²⁰
 - MI electrophysiology
 - Smith’s types (1–4)²¹
 - Dynamic changes
 - The OMI Manifesto²²
 - Changes associated with infarction
 - Sgarbossa²³ and Smith-modified Sgarbossa Criteria²⁴
 - Subtle Anterior STEMI calculation²⁵
 - Mimics
 - Hypertrophy

¹⁹ Smith *et al* (2002). *The ECG in Acute MI*. Philadelphia: Lippincott Williams & Wilkins. p 7.

²⁰ Zafari (2019). “What are the types of myocardial infarction (MI, heart attack), and how is each defined?”. *Medscape*. [[Online](#)].

²¹ Smith *et al* (2002). *The ECG in Acute MI*. Phil: Lippincott Williams & Wilkins. pp 5–8.

²² Meyers (2018). “Down with STEMI – The OMI Manifesto”. *EMCrit*. [[Online](#)].

²³ Sgarbossa (1996). “Electrocardiographic diagnosis of evolving acute myocardial infarction in the presence of left bundle-branch block”. *N Eng J Med*. 334(8). [[Online](#)].

²⁴ Meyers *et al* (2015). “Validation of the modified Sgarbossa criteria for acute coronary occlusion in the setting of left bundle branch block: A retrospective case-control study”. *American Heart Journal*. 170(6). [[Online](#)].

²⁵ Driver *et al* (2017). “A new 4-variable formula to differentiate normal variant ST segment elevation in V2-V4 (early repolarization) from subtle left anterior descending coronary occlusion - Adding QRS amplitude of V2 improves the model”. *Journal of Electrocardiology*. 50(5). [[Online](#)].

Silas Houghton Budd
– Director

A handwritten signature in black ink, appearing to be 'S. H. Budd', written in a cursive style. The signature is located in the lower-left portion of a rectangular box.