

Primary Health Care Initiatives (PHCI) Project
Contract No. 278-C-00-99-00059-00
Abt. Associates Inc.

ECG INTERPRETATION

LEARNING OBJECTIVES

- Understand the basic electrical physiology of the heart
- Identify the lead placement of the ECG electrodes, and their role in reading cardiac electrical activity
- Identify a normal QRS complex
- Correctly read the cardiac rate
- Identify irregular heart rhythms, atrial and ventricular arrhythmias
- Identify the axis quadrant of the ECG and its significance
- Identify atrial and ventricular hypertrophy
- Identify common presentation patterns of ischemia and/or infarction
- Correctly identify the presence of a life-threatening arrhythmia or infarction pattern

TEACHING STRATEGIES

- Give short presentation of basic principle (rate, rhythm, axis), then allow participants to practice on sample ECG for that specific principle
- Present and practice application of ECG interpretation in small groups

MATERIALS AND EQUIPMENT NEEDED

- If possible, ECG machine to review placement of electrodes and operation of machine
- Sample ECGs for practice by participants that demonstrate elements of normal and abnormal findings of rate, rhythm, axis, hypertrophy, and infarction
- Transparencies of ECGs to demonstrate to class significant elements
- Overhead projector, white board and markers for explanation of principles

LEARNING POINTS

Introduction:

- Electrical activity of heart
- Depolarization
- ECG leads – read as “+” charges
- Placement of ECG leads
- Looking at heart different perspectives
- QRS complex

Rate

- Technique of reverse counting of spaces (300-150-100-75-60-50)
- Tachycardia, Bradycardia

Rhythm

- Recognition of regular vs. irregular rhythm
- Important irregular rhythms

- Sinus arrhythmia – normal, related to respiration in the young
- Atrial fibrillation
- AV Block – 1st degree, complete
- Premature Ventricular Contractions (PVC) – benign
- Ventricular tachycardia
- Ventricular fibrillation

Axis

- Direction of electrical flow through heart
- Definition of vertical and horizontal electrical planes of heart
- Use of lead I and avF to localize axis into one of 4 quadrants
- Significance of axis deviation
 - Left Axis – left ventricular hypertrophy (hypertension, CHF), infarct scar
 - Right Axis – right ventricular hypertrophy (COPD), infarct scar

Hypertrophy

- Determination of atrial or ventricular hypertrophy
 - Right atrial – tall (>2 mm wide and tall) P wave lead II
 - Left atrial – biphasic P wave in V1
 - Left Ventricular – sum of height of S wave in V1 or V2, plus R wave in V5 or V6 >35 mm.
 - Right Ventricular – significant R wave in V1 or V2

Infarction

- ST segment elevation, especially II, III, and avF, and V1-6
- Note characteristic appearance of ST segment elevation; rounded upward
- Q wave in II, III, or avF
- May be evolutionary with development of chest pain – often not seen in early hours of chest pain. Important to repeat ECG over initial 12 – 24 hours
- May sometimes be ST segment depression (posterior infarction, partial thickness infarction)

CRITICAL ELEMENTS FOR REFERRAL

- All ECG interpretations should be verified by cardiologist, if possible
- Patient with any significant abnormality on ECG
- Any patient with chest pain or suspected myocardial infarction, **even if initial ECG is normal**

CRITICAL ELEMENTS FOR EVALUATION OF COMPETENCE

- Correct placement of ECG leads and use of ECG machine
- Correct and structured interpretation of:
 - Rate
 - Rhythm
 - Axis
 - Hypertrophy
 - Infarction
- Identification of abnormalities in above elements