D·Heart

A new cost-effective smartphone based electrocardiographic device for the screening of migrants in mobile clinic

Abstract

Introduction: The Global Burden of Diseases, Injuries, and Risk Factors Study 2010 confirms cardiovascular diseases as the leading cause of death worldwide. Moreover, in low-income and middle-income countries, socioeconomic inequality and cultural factors play a role both in the development of risk factors and in the access to care. Recently, new migration trends has evolved, bringing a geographic redistribution of persons, chiefly from Sub-Saharan Africa and Middle-East to Europe. These intertwined demographic and health transitions expose them to new health regimes, and the stress of relocation itself may introduce its own health consequences. However, no data on cardiovascular health of this defined population are available nowadays.

The D-Heart Electrocardiograph has been developed for iOS and Android operative systems, enabling the acquisition of surface electrical signals through 5 electrodes (3 peripheral leads, 3 agumented leads and 1 precordial (V5) lead) connected to a portable hardware that streams via Bluetooth the trace to the smartphone.

Such device allows low-cost, immediate and accurate electrocardiographic screening especially in the out of hospital setting.

The potential impact of this technology as a screening strategy especially during migration emergencies opens several different new perspectives in the help and assistance that NGOs might operate in such settings.

Design and Main Objectives: The present study is a prospective study. The main objective is to determine the prevalence of minor and major ECG abnormalities in a large cohort of migrants from three different settings in which Intersos operates: a mobile-clinic in Italy, an outpatient clinic in Crotone and in a refugees camp in Northen-Greece.

Methods: Each patient, during the routine visit provided by Intersos, if the Intersos medical personnel would consider it as appropriate, would have an ECG screening performed by D-Heart after signing the Informed Consent.

Each ECG would be stored anonymously with a specific ID, nationality and age of the patient. The data would available only to the researchers and the Intersos medical personnel and stored in a protected database.

Subsequently, each ECG would be analyzed by two independent, blind and impartial observers and stratified according to a score, validated by Del Cre et al. Int Journ Card 2012 based on 9 criteria:

1 — Presence of a non sinusal cardiac rhythm (es. Atrial fibrillation, supraventricular tachycardia, atrial flutter);

2 —Length of QRS ≥110ms;

3 — Presence of fascicular block, in particular Left Anterior Heamiblock (LAE), Left Boundle Branch Block (LBBB, defined as QRS>120 ms togheter with R wide R wave and monofasic in DI or V5 and absence Q wave in DI or V5), Right Bundle Branch Block (RBBB, defined as QRS>120 ms together with 'slurred' S wave in DI or V5) alone or in association with LAE or AVB);

4 —ST/T Segment Anomalies, defined as asymmetric inversion of T waves ≥0.1mV in two or more leads; ST segment depression ≥ 0.1 mV to 0.08 s from j point, or 'giant' negative T waves > 10 mm in profondità;

5 —ST/T Segment Elevation ≥ 0.2 mV;

6 —Corrected QT interval prolongation following Bazett Formula ($QTc=QT/\sqrt{(RR)}$) up to 440 ms for males and 460 for females;

7 — Presence of Pathologic Q waves (defined as Q waves > 0.04 ms and deeper >3 mm);

8 — Absence of physiologic Q waves in DI and V5;

9 — Presence of Atrioventricular Block of any degree.

The ECG would be subdivided in 4 groups:

Group 1: ECG normal (0 Criteria);

Group 2: ECG slightly abnormal (1-3 Criteria);

Group 3: ECG moderately abnormal (4-6 Criteria);

Group 4: ECG markedly abnormal (7-9 Criteria).

Patients Selection: Inclusion Criteria:

1) Patient willing to sign the Informed Consent;

2) Age more than 18.

Number of patients to be enrolled

The present study would require 250 individuals.