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Handy EKG: Low-Cost ECG For Primary Care Screening In Developing Countries

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Abstract : Background: Screening cardiac conditions in primary care in developing countries can be challenging, and Honduras is not the exception. One of the main limitations is the underfunding of the Healthcare System in general, causing conventional ECG acquisition to become a secondary priority. Objective: Development of a low-cost ECG to improve screening of arrhythmias in primary care and communication with a specialist in secondary and tertiary care. Methods: Design a portable, pocket-size low-cost 3 lead ECG (Handy EKG). The device is autonomous and has Wi-Fi/Bluetooth connectivity options. A mobile app was designed which can access online servers with machine learning, a subset of artificial intelligence to learn from the data and aid clinicians in their interpretation of readings. Additionally, the device would use the online servers to transfer patient's data and readings to a specialist in secondary and tertiary care. 50 randomized patients volunteer to participate to test the device. The patients had no previous cardiac-related conditions, and readings were taken. One reading was performed with the conventional ECG and 3 readings with the Handy EKG using different lead positions. This project was possible thanks to the funding provided by the National Autonomous University of Honduras. Results: Preliminary results show that the Handy EKG performs readings of the cardiac activity similar to those of a conventional electrocardiograph in lead I, II, and III depending on the position of the leads at a lower cost. The wave and segment duration, amplitude, and morphology of the readings were similar to the conventional ECG, and interpretation was possible to conclude whether there was an arrhythmia or not. Two cases of prolonged PR segment were found in both ECG device readings. Conclusion: Using a Frugal innovation approach can allow lower income countries to develop innovative medical devices such as the Handy EKG to fulfill unmet needs at lower prices without compromising effectiveness, safety, and quality. The Handy EKG provides a solution for primary care screening at a much lower cost and allows for convenient storage of the readings in online servers where clinical data of patients can then be accessed remotely by Cardiology specialists.

Keywords : low-cost hardware, portable electrocardiograph, prototype, remote healthcare
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