CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Onkar S. Sandhu

Project Number

33252

Project Title

iPhone Acquired Heart Rhythm: Is It Reliable for Clinical Diagnosis?

Abstract

Objectives/Goals

To validate an iPhone acquired heart rhythm could be reliable for clinical diagnosis of cardiac arrhythmias.

Methods/Materials

Materials: General Electric 12-Lead Electrocardiogram, Electrodes for Electrocardiogram, Electrocardiogram gel, AliveCor Heart Monitor iPhone case, AliveCor iPhone Application.
Methods: 105 consecutive patients in a mixed unselected cardiac out patient population first underwent a conventional 12-Lead ECG. Within minutes, each patient underwent a Lead I ECG rhythm recording using iPhone based AliveCor Application. IPhone ECG rhythm strips were uploaded to the HIPPA secure AliveCor Server for subsequent interpretation by two experienced cardiologists blinded to the rhythm diagnosis of the 12-lead EKG.

Results

A total of 105 patients were studied. Of these, 92 had normal sinus rhythm, 9 had atrial fibrillation, 2 had a junctional rhythm, and 2 had a paced rhythm by a 12 lead electrocardiograph. An 83.8 percent correlation, 14.3 percent indeterminate, and a 1.9 percent different diagnosis rate from the AliveCor heart monitor compared to the 12 lead EKG was obtained. For sinus rhythm, an 88 percent correlation, an 11 percent indeterminate rate, and a 1 percent different diagnosis rate for AliveCor recordings was recorded. For atrial fibrillation, 67 percent accordance, a 22 percent indeterminate, and an 11 percent different diagnosis rate was from AliveCor recordings were noted.

Conclusions/Discussion

The 83.8 percent correlation supports the hypothesis that the AliveCor Heart Monitor can be used for clinical diagnosis. Furthermore, the AliveCor Heart Monitor could be used for community screenings worldwide. Our findings suggest the AliveCor Application can be used to recognize previously undiagnosed atrial fibrillation, allowing early initiation of anticoagulant to prevent stroke. The 16.2 percent of all cases that had either an indeterminate or inaccurate diagnosis from the AliveCor heart monitor compared to the 12 lead EKG indicates a substantial portion of patients with technical errors, preventing any interpretation of the AliveCor electrocardiograph. We find that the most common cause of indeterminate rhythm by AliveCor is the presence of baseline artifacts. These artifacts are produced buy a combination of movement, muscle tremor, and poor contact. We found use of alcohol swabs and electrode gel on patient hands and AliveCor sensors limit baseline artifacts.

Summary Statement

Determining whether an iPhone acquired heart rhythm is reliable for clinical diagnosis.

Help Received

105 patients were gathered, tested, and diagnosed using lab equipment at California Heart Medical Associates under the supervision of Dr.Sanjay Srivatsa and Dr.Bipin Joshi.

Preliminary