

Evaluating smartphone based photoplethysmography as a screening solution for atrial fibrillation: A digital tool to detect AF?

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Introduction

- Atrial Fibrillation (AF) is the most common heart rhythm disorder with a prevalence of 1-2%, with many health consequences, such as stroke and heart failure.
- Screening initiatives have been world wide employed to detect atrial fibrillation
- Screening is based on using hardware tools based on electrocardiographical recordings
- Recently camera based photoplethysmography shows promising application in the area of ease of use, ubiquitous and scalable applications for heart rate and heart rhythm analysis

Methods

- A screening event was organised in a multi-center context where participants presented themselves
- Screening was done using a:
 - Single lead ECG device (Alivecor, 30 sec) measured between both hands
 - Camera based photoplethysmography (FibriCheck, 60 sec) using the finger tip on the smartphone camera
- Demographic and background questionnaires were obtained
- If one of the devices indicated an irregularity a 12-lead ECG was taken and revised by a cardiologist on site



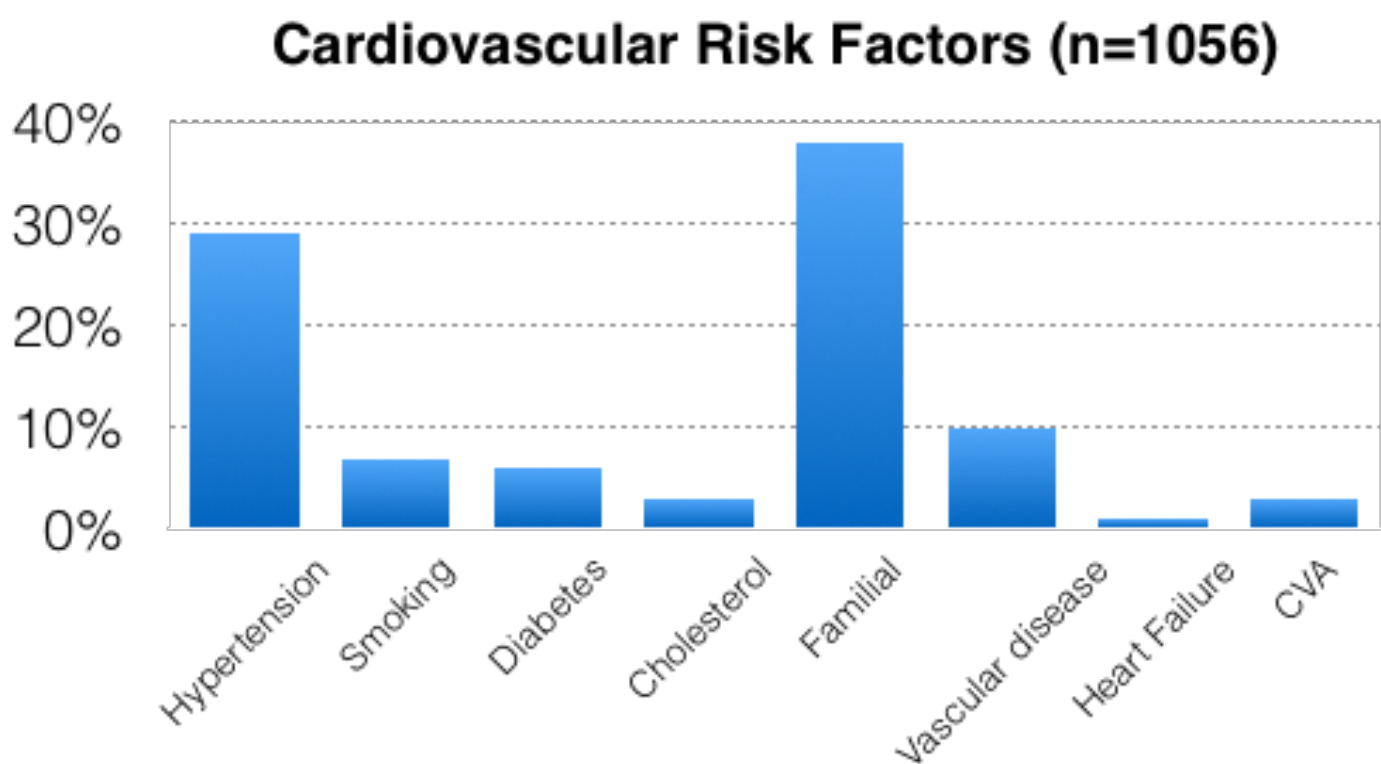
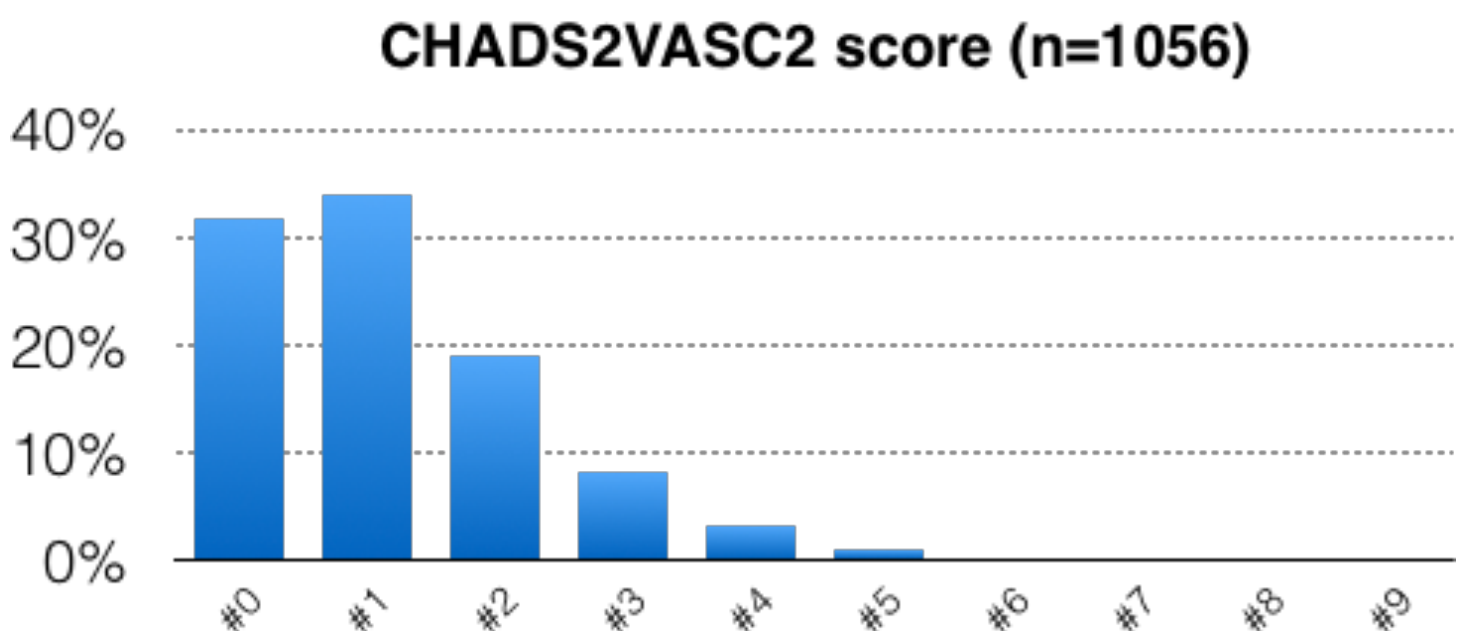
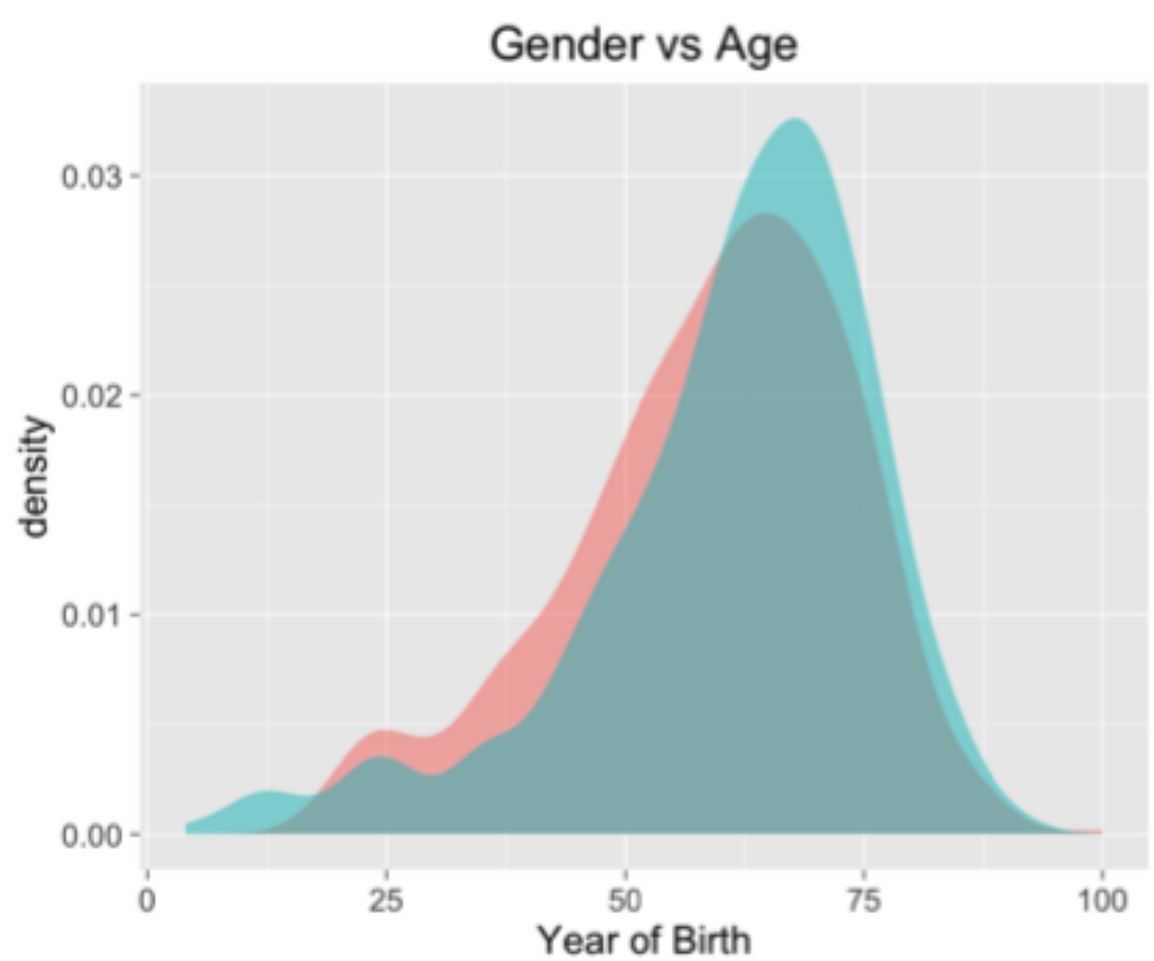
Objective

To compare the performance between photoplethysmography (PPG) and single lead ECG based smartphone applications during a national incentivized screening initiative

Results

- 1056 patients were screened, 41% was male. The overall mean age was 59 ±15 years
- In total 8 AF cases were identified, 1026 regular sinus rhythms, 22 irregular rhythms (i.e. bigeminy, ectopic beats,...)

| Baseline demographics | |
|-----------------------|-------------|
| # of participants | n=1056 |
| Sex (male) | 433 (41%) |
| Age | 59±15 years |
| BMI | 26±10 |
| AF-cases detected | 8 |
| Regular rhythms | 1026 |
| Irregular rhythms | 22 |
| Chads2Vasc2 AF cases | 3±1.25 |



| Alivecor | FibriCheck |
|--|---|
| Q1: Quality performance between smartphone based screening devices | |
| (100% data) 4.3% | (100% data) 5.1% |
| Q2: Diagnostic capability of the automated algorithm for AF discrimination | |
| (89% data) Sens/Spec/Acc 100%/99.6%/99.8% | (92% data) Sens/Spec/Acc 100%/97.2%/98.6% |
| Q3: Diagnostic capability of the entire application | |
| (100% data) Sens/Spec/Acc 100%/88.65%/94.32% | (100% data) Sens/Spec/Acc 100%/90.87%/95.4% |
| Q4: Diagnostic capability for automated irregular rhythm detection (event recording) | |
| (96% data) Sens/Spec/Acc 66%/93.1%/79.5% | (94% data) Sens/Spec/Acc 80%/97%/88.5% |

Conclusion

The use of a smartphone application based on PPG in a screening setting resulted in good results compared to a single lead ECG device. This opens the perspective for future work and applications to employ camera based systems in the context of screening and monitoring of atrial fibrillation

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