ACCURATE DETECTION OF AF USING A SMARTPHONE REMAINS UNCERTAIN: A SYSTEMATIC REVIEW AND META-ANALYSIS

Simrat Gill, Karina Bunting, Claudio Santini, Victor R. Cardoso, Hae Won Uh, Narges Ghoreishi, Georgios Gkoutos, Folkert Asselbergs, MJC Eijkemans, Dipak Kotecha.

University of Birmingham, UK; Bayer AG, Global Epidemiology, Berlin, Germany; University Medical Center Utrecht, Heidelberglaan 100, 3584 CX Utrecht, Netherlands.

10.1136/heartjnl-2020-BCS.63

Introduction Early diagnosis of atrial fibrillation (AF) is essential to reduce complications such as stroke, and improve patient quality of life. Novel screening techniques using smartphone camera photoplethysmography (PPG) can be used for AF detection, but their clinical applicability remains unclear. Our aim was to assess the diagnostic accuracy of smartphone PPG compared to conventional ECG for AF detection.

Methods We performed a systematic review of MEDLINE, EMBASE, Cochrane library, and other databases (1980-October 2019), including any study or abstract where smartphone finger-tip PPG was compared with a reference ECG (1, 3 or 12-lead). Outcomes were sensitivity (SE), specificity (SP), positive and negative predictive value (PPV; NPV) and overall accuracy. Bivariate hierarchical random effects meta-analysis was performed for studies with confidence intervals for SE and SP, and funnel plots were used to identify publication bias. Study quality was assessed using the established QUADAS-2 tool by two independent graders.

Results 1350 publications were screened, of which 17 studies were included in the systematic review (7 full text publications and 10 abstracts), providing 21 comparisons of accuracy for AF detection. Most studies were based in secondary care and small (range n=33 to 1095), with a total of 5469 participants including 1384 with AF. Only 4 studies were multi-centre. Smartphone applications used were Cardiio Rhythm, Fibricheck, Preventicus and Heartbeats, with 7 studies not specifying the tool used. Overall SE and SP for AF detection were high, ranging from 76 to 100%, and 85 to 100% respectively. PPV ranged from 54 to 100% and NPV from 77 to 100%, with overall accuracy between 61 and 99%. The meta-analysis included 12 comparisons from 10 studies (n=2714; 936 with AF). The pooled SE was 93% (95% CI 90-96%) and SP 97% (95-99%); Figure A. QUADAS-2 assessment demonstrated poor quality of studies overall, with a high or unclear risk of bias in at least one domain for all studies. There was clear evidence of publication bias; Figure B.

Conclusions PPG offers the potential for large scale, non-invasive, patient-led screening of AF. However, current evidence is limited to biased, low quality studies often with unrealistic results for AF detection. These are insufficient to advise clinicians on the true value of current smartphone PPG technology.

Conflict of Interest EU grant -BigData@Heart EU/EFPIA IMI

A MULTIPLE BLOOD BIOMARKER MODEL FOR IDENTIFYING PATIENTS WITH PREVALENT AF

Winnie Chua, Victor Cardoso, Yanish Purmah, Harry Crijns, Ulrich Schotten, Eduard Guasch, Moritz Sinner, Stephane Hatem, Barbara Casadei, Luis Mont, Peter Kastner, Andre Ziegler, Georgios Gkoutos, Paulus Kirchhof, Larissa Fabritz.

University of Birmingham; Cardiovascular Research Institute Maastricht (CARIM); Hospital Clinic de Barcelona; Institute of Biomedical Research August Pi Sunyer (IDIBAPS); Ludwig-Maximilians University; IHU-ICAN Institute of Cardiometabolism and Nutrition; University of Oxford; Roche Diagnostics GmbH; Roche Diagnostics International

10.1136/heartjnl-2020-BCS.64

Background Biomarkers reflecting different biological pathways have been associated with atrial fibrillation (AF). These discoveries motivate the consideration of a multiple biomarker model in the context of AF screening to improve detection.

Objective We assessed a selection of clinical characteristics and biomarkers known to be associated with AF as established in literature, to identify a mechanism-based combination of markers for simplifying patient selection for screening.
Methods and Results 1485 patients presenting acutely to hospital (median age [Q1, Q3] 69 [60, 78] years; 60% male; 45% with AF) with either diagnosed AF or ≥2 CHA2DS2-VASc risk factors (silent AF ruled out by 7-day ECG monitoring) were analysed. From EDTA plasma, 12 known cardiovascular biomarkers selected from published literature were quantified at a single centre on a high-throughput platform (Roche Diagnostics GMBH, DE). After adjustment for known confounders (age, sex, BMI, eGFR, heart failure, stroke/TIA, hypertension status), 6 biomarkers remained univariately associated with increased odds of AF (BMP10, ANG2, NTproBNP, IGFBP7, FGF23, CA125; see Figure). A model which simultaneously considered clinical characteristics and biomarkers was developed in a discovery cohort (n = 933) randomly sampled from all included patients (60:40 discovery:validation) and subsequently validated on the remaining patients (n = 552) using both logistic regression and machine learning methodologies for comparison. Using regression with backward statistical selection, an optimism-adjusted model of Age, Sex, BMI, BMP10, ANG2, and FGF23 was found to discriminate between patients with and without AF with an area under the ROC curve, AUC, of 0.743 [95% confidence interval, 0.712, 0.775], corroborated by machine learning (AUC 0.760 [95%CI 0.746, 0.764]). In a sensitivity analysis using biomarker quartiles instead of absolute values, an additional biomarker was selected: NTproBNP.

Conclusion In our analysis of known markers of AF, a combination of 3 simple clinical characteristics (Age, Sex, BMI) and 3 biomarkers (BMP10, ANG2, and FGF23) robustly discriminated between patients with diagnosed AF and sinus rhythm patients with cardiovascular risks in both discovery and validation cohorts. Biomarkers implicate pathways related to inflammation (BMP10), fibrosis (FGF23) and hypoxia (ANG2), known to be associated with AF. Prospective studies can examine if AF screening with multiple biomarkers has the potential of identifying patients who could benefit from further ECG monitoring.

Conflict of Interest None.