Diagnostic accuracy of smartwatches for automated atrial fibrillation detection over time: insights from the basel wearable study

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Background: The first smart-watch (SW) able to record a single lead ECG (SL-ECG) with automated atrial fibrillation (AF) detection algorithm was introduced 2018. Multiple other manufacturers followed. While manufacturers claim to continuously improve their devices’ algorithm, little is known about the impact on diagnostic accuracy on AF detection over time in a real-world cohort of patients.

Purpose: To assess if the diagnostic accuracy of algorithm-based AF detection of 5 smart devices has improved over time.

Methods: In this prospective study, consecutive patients undergoing electrophysiological procedures in a tertiary referral center were included between April 2021 to May 2023. Each participant received a 12-lead ECG and 5 SL-ECGs with different smart devices (AliveCor KardiaMobile, Apple Watch 6, Fitbit Sense, Samsung Galaxy Watch 3 and Withings ScanWatch). All SW were continuously updated for newest software or firmware as recommend by the manufacturers. The SW rhythm classification was compared to manual cardiologist-based interpretation of SL-ECGs. The change in number of inconclusive SL-ECGs by manufacturer’s algorithm were investigated over time via Cochran-Armitage test for trend and illustrated over time via logistic regression.

Results: 247 participants were included (30% female, mean age 66.3 [IQR: 57-74] years) resulting in a total of 1’235 SL-ECGs. Among these, 202 SL-ECGs (16%) were labeled as inconclusive by at least one smart-device. Inconclusive rates for individual SW ranged from 15% to 19%. When comparing the first and last quintile of patients in the study period, the inconclusive rates for the KardiaMobile were 14% vs. 6%, for the Apple Watch 14% vs. 6%, for the Fitbit Sense 20% vs. 14%, for the Samsung Galaxy 18% vs. 10% and for the Withings ScanWatch 22% vs. 14%, respectively. When assessed continuously over time, we observed a trend towards fewer inconclusive tracings, without reaching statistical significance (Figure 1).

Conclusion: Over 26 months, inconclusive tracings of 5 SW didn’t significantly decrease despite frequent software updates in a real-world patient cohort. Larger, long-term cohorts are needed to assess if automated AF detection has significantly improved over time.

Figure 1

![Inconclusive SL-ECG over time](image-url)