Abstract: **P574**

**Accuracy of wrist-worn heart rate monitors for chronotropic assessment in atrial fibrillation**

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**Topic(s):**
m-Health

**Citation:**

Introduction: Wrist-worn fitness and heart rate (HR) monitors are increasingly popular. Previous studies in healthy participants with sinus rhythm (SR) have yielded variable results depending on HR, activity levels and device tested. A paucity of data exists on their accuracy in atrial fibrillation (AF) in ambulatory patients.

Purpose: we sought to assess the HR accuracy of 2 commercially available smart watches (Fitbit Charge HR [FB] and Apple Watch Series 3 [AW]) compared with Holter monitoring in an ambulant patient cohort.

Methods: Patients aged > 18 years referred for 24-hour Holter monitoring were prospectively recruited. The Holter monitor was the criterion measure. Each patient was randomly allocated to either a FB or AW along with their Holter monitor. The study protocol was approved by the institutional review board.

Statistical analysis: Pearson (r) correlation coefficients and Bland-Altman comparison with 95% limits of agreement (LoA) were evaluated to assess criterion validity and agreement between the smart watch and Holter ECG-HR. Bias was the calculated mean difference between the smart watch and ECG-HR. A ± 10-beat different between Holter-HR and SW-HR was used as a clinically relevant range to establish the accuracy of HR estimation by SW.

Results: Across all devices, 53,288 hear rate values were recorded from 32 patients. Twenty six patients were in persistent AF and six were in SR. Twelve patients wore the FB while 20 wore the AW. In the FB arm, nice patient were in persistent AF and three in SR. In the AW arm, persistent AF was the rhythm in seventeen and SR in three. Patients in SR demonstrated overall strong agreement compared to Holter monitoring (Mean Bias <1 beat, LoA -11 to 11 beats) and a correlation coefficient of 0.87 (p <0.001). In AF, both devices underestimated HR measurements (Overall Bias -9 beats, LoA -41 to 23, r=0.60, p<0.001). The AW had lower bias and narrower LoA compared to FB (-5 beats vs -13 beats, LoA -31 to 21 beats vs -50 to 22 beats). Using a ± 10-beat range against ECG-HR for clinical accuracy, both the AW and FB performed satisfactorily in SR with 95.2% of AW and 92.2% of FB HR readings considered valid. In AF, however, the AW-HR readings were within the ± 10-beat threshold in 76.5% of the time compared with only 56.1% of FB readings.

Conclusion: In ambulatory patients, smart watches were accurate in HR estimation when compared to Holter monitor in SR; however tended to underestimate HR in AF. Further improvements in device technology are needed before the widespread consumer adoption of this nascent technology for chronotropic assessment in arrhythmias.
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Bland-Altman plots showing agreement between smartwatch compared with reference Holter electrocardiography (ECG) for heart rate (HR) estimation in AF (Panel A) and SR (Panel B). Red horizontal line represents the mean difference (bias) between the two measures and black horizontal lines are the 95% limits of agreement (LoA). Values below 0 on the y-axis indicate that the SW HR was lower than the Holter ECG while those above indicate that the SW HR was higher.