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AI-based platform enables faster ambulatory ECG analysis with equivalent clinical accuracy compared to traditional solution

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BACKGROUND: Analysis of Holter recordings may be challenging and time-consuming, therefore requiring significant clinical resources in order to achieve a high quality diagnosis. Such resources depend largely on the qualifications of the person conducting the analysis and the duration of the recordings. A novel Holter analysis platform has been developed, based on deep neural networks trained with a dataset of one million ECGs, to allow fast and reliable Holter recording analysis.

PURPOSE: The goal of this study was to compare performance of the artificial intelligence (AI)-based Holter analysis platform with a traditional one used on a daily basis in hospitals. The main endpoints evaluated were duration to complete the analysis as well as diagnostic accuracy, when platforms are used by highly qualified electrophysiologists (EPs).

METHODS: For this prospective evaluation, a total of 98 Holter (24-hour) recordings were selected from a large Holter dataset of one centre, with a relatively high prevalence of electrical rhythm and conduction disorders. Three EPs analysed all tracings, in a random fashion, using independently both the AI-based and traditional analysis platforms. All three EPs had no previous experience with the AI-based platform, except for an introductory 6-hour training session. Two EPs had multiple years of experience with the traditional platform, while one EP had none. For each tracing, in addition to the analysis duration, diagnostic accuracy was evaluated through the analysis of the presence or absence of predefined cardiac dysrhythmias and conduction disorders (prevalence): pauses (19.4%), ventricular tachycardia (VT, 24.5%), atrial fibrillation (AF, 30.6%), high grade atrioventricular block (AVB, 9.2%) and burden of premature ventricular complex larger than 10% (PVC, 27.6%). Definite diagnostics were established by an expert EP after a careful examination of all available analysis reports.

RESULTS: Time required for the AI-based analysis was on average 47% shorter compared to the traditional platform (5.28 min vs 9.97 min, $p < 0.0001$). This difference was the largest for the EP with no previous experience in Holter analysis, with 54% less time required for analysis (5.87 min vs 12.75 min, $p < 0.0001$). Regarding accuracy to detect electrical disorders, there was no statistically significant differences between AI-based and traditional platforms (AF:

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99.2% vs 98.3%, Pause: 100% vs 100%, PVC: 98.4% vs 100%, VT: 94.5% vs 94.8%, AVB: 100% vs 100%).

CONCLUSION: Our preliminary novel findings suggest that the AI-based platform may be highly accurate in detecting cardiac electrical abnormalities, with significant time savings compared to the traditional platform, even for users with no previous experience with the AI-based platform. An AI-based Holter analysis platform may contribute to a broader and more resource-efficient adoption of Holter monitoring.

Figure: Comparison of Holter analysis duration