

Evaluation of an enhanced, cloud-based AF-detection algorithm based on real-world arrhythmic recordings

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BACKGROUND

Cloud-based solutions offer the ability to centrally and continuously enhance detection algorithms for arrhythmias such as Atrial Fibrillation (AF) based on generated data.

METHODS

The Coala Heart Monitor (Coala) system was evaluated by manual interpretation of 1,000 consecutive anonymous printouts of chest- and thumb-ECG waveforms, without any exclusion.

The anonymized printouts were blinded from algorithm analysis, apart from gender and age within a 10-year span.

The recordings were derived from actual Coala users in Sweden with no training, control or influence, under a defined time period. The prevalence of cardiac conditions in the user population was unknown. The blinded recordings were manually interpreted by a trained cardiologist.

The interpretation was compared with the automatic analysis performed by an algorithm in the Coala Cloud to evaluate ECG signal performance and calculate performance metrics.

An enhanced algorithm utilizing P-wave detection was then evaluated on the data set and compared with the performance metrics of the existing algorithm.

METRIC	RESULTS WITH CURRENT ALGORITHM	RESULTS WITH ENHANCED ALGORITHM
Prevalence of AF in the recordings	14.4 % (143 of 990 recordings)	14.4 % (143 of 990 recordings)
Sensitivity for detecting AF	0.972 (95% CI = 0.930 – 0.992)	0.951
Specificity for detecting AF	0.946 (95% CI = 0.928 – 0.960)	0.976
Negative predictive value (NPV) for detecting AF	0.995 (95% CI = 0.987 – 0.999)	0.992
Positive predictive value (PPV) for detecting AF	0.751 (95% CI = 0.683 – 0.812)	0.872
Accuracy	0.950	0.973

CONCLUSION

The enhanced algorithm was found to improve the Positive Predictive Value for detecting AF as compared to the existing algorithm (0.872 vs 0.751). The reduced sensitivity for the enhanced algorithm was due to 3 consecutive recordings from a single individual who had misplaced the Coala with corresponding altered morphology of the ECG signal. The recordings were still reported as having an irregular rhythm by the algorithm. The evolution demonstrates that cloud-based systems offer an ability to enhance detection accuracy by using reference data to train algorithms.

Conflict of interest: A. Olsson: Consultant to Coala Life AB, M. Samuelsson: Employed as CTO at Coala Life AB



The Coala Heart Monitor is a CE-approved Class IIa medical device solution approved for home and professional use. It's a wireless and cloud-based service developed and produced in Sweden by Coala Life AB. The 2-lead, 1-channel ECG and synchronous heart sound recording system analyzes for 10 different arrhythmias, and to help detect for murmurs. For more info, see www.coalalife.com.