

The AMPS Insider

An AMPS LLC Magazine

The AMPS Insider is a quarterly magazine dedicated to all AMPS' partners and customers. Published by AMPS, it provides news and information about AMPS' products and initiatives.

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Executive Overview

Deep learning analysis of electrocardiogram for risk prediction of drug-induced arrhythmias and diagnosis of long QT syndrome. Product News. The new AMPS CTO.

Editorial

Once more AMPS collaborated to a very interesting research project, this time related to deep learning and diagnosis of long QT syndrome, which lead to a publication on the European Heart Journal. The Abstract reads:

Aims: Congenital long-QT syndromes (cLQTS) or drug-induced long-QT syndromes (diLQTS) can cause torsade de pointes (TdP), a life-threatening ventricular arrhythmia. The current strategy for the identification of drugs at the high risk of TdP relies on measuring the QT interval corrected for heart rate (QTc) on the electrocardiogram (ECG). However, QTc has a low positive predictive value.

Methods and results: We used convolutional neural network (CNN) models to quantify ECG alterations induced by sotalol, an IKr blocker associated with TdP, aiming to provide new tools (CNN models) to enhance the prediction of drug-induced TdP (diTdP) and diagnosis of cLQTS. Tested CNN models used single or multiple 10-s recordings/patient using 8 leads or single leads in various cohorts: 1029 healthy subjects before and after sotalol intake (n = 14 135 ECGs); 487 cLQTS patients (n = 1083 ECGs: 560 type 1, 456 type 2, 67 type 3); and 48 patients with diTdP (n = 1105 ECGs, with 147 obtained within 48 h of a diTdP episode). CNN models outperformed models using QTc to identify exposure to sotalol [area under the receiver operating characteristic curve (ROC-AUC) = 0.98 vs. 0.72, $P \leq 0.001$]. CNN models had higher ROC-AUC using multiple vs. single 10-s ECG ($P \leq 0.001$). Performances were comparable for 8-lead vs. single-lead models. CNN models predicting sotalol

exposure also accurately detected the presence and type of cLQTS vs. healthy controls, particularly for cLQT2 (AUC-ROC = 0.9) and were greatest shortly after a diTdP event and declining over time ($P \leq 0.001$), after controlling for QTc and intake of culprit drugs. ECG segment analysis identified the J-Tpeak interval as the best discriminator of sotalol intake.

Conclusion: CNN models applied to ECGs outperform QTc measurements to identify exposure to drugs altering the QT interval, congenital LQTS, and are greatest shortly after a diTdP episode.

You will find the full article here: [DOI: 10.1093/eurheartj/ehab588](https://doi.org/10.1093/eurheartj/ehab588)

Products News

The new release of CER-S (v4.3) with a number of improvements including, optimized multi-day reporting, increased limit for standard analysis on long recordings, and superimposition display, awaits CE and FDA clearance. This version greatly improves the already certified version with an enhanced graphic interface which provides a smooth and faster editing of automatically detected arrhythmic events.

Looking forward

We are at work on:

- The new version of ViewEcg Web, that shows the display of ECG traces in real-time nears completion with an expected release in the next quarter.
- The integration of CineECG (<https://www.ecg-excellence.com/2960/0/products/general/0/cineecg>) in CalECG for enhanced ECG reporting with an expected release in the next quarter.

AMPS News

We have made important staff changes in our organization this past quarter. Most importantly we are very pleased to

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announce the promotion of Giampietro Spagna, one of the first engineers to join the AMPS staff almost 20 years ago, to Chief Technical Officer. As CTO, he reports directly to our President and Chief Scientist Fabio Badilini. Giampietro will be responsible for all the technical activities at AMPS, including development, services, certification, and customer support. We congratulate Giampietro on his promotion and wish him success in his new role.



Giampietro Spagna

Secondly, in addition to the staff currently in the team Giampietro will also benefit of the help of our latest recruit: Alessandro Lopopolo. Alessandro joined the AMPS team at the beginning of September and holds a Master of Computer Science from the University of Milano.

Alessandro, besides his proven knowledge in programming languages and work experience, has already demonstrated he is a team player and secured his position among the core of the AMPS team.



Alessandro Lopopolo

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