

# **Sudden cardiac death multiparameter risk stratification aided by computed ECG processing**

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## The aim:

The recent research into parameters derived from ECG provides an increasing number of coefficients for stratifying sudden cardiac death (SCD) risk. However, the analyses that are based on each individual parameter yield poor positive predictive values and also high ratio of false positive and false negative diagnoses. Furthermore, the values of the individual parameters are vulnerable to the influence of pharmacological and reperfusion treatment. It is postulated that a more suitable approach is to perform a multiparameter test in which parameters from different tests would be combined into an improved single SCD risk stratification marker. The aim of this work is to develop a software for multiparameter ECG analysis for SCD risk stratification.

## Materials and methods:

The developed software enables loading and visualizing ECG data stored in various formats (binary, text, etc.). A user can choose a part or an entire recording for analysis. The parameters that can be computed from ECGs include: T-wave alternans (TWA) voltage and ratio, heart rate variability (HRV) low to high frequency ratio (LF/HR), heart rate turbulence (HRT) slope and onset. TWA parameters are identified using the traditional spectral method and by the Poincaré mapping method. HRV spectral analysis is computed from autoregressive moving average models and periodograms. HRV time domain analysis is also provided. HRT coefficients are determined by means of the Schmidt method. Algorithms for identifying baroreflex sensitivity (BRS) and QT/RR slope are under development. A number of ECG preprocessing methods can be applied prior to signal analysis. These include: QRS detection, denoising and base-line wander removal. The current version of the software is written in Matlab and the HRV analysis module is a standalone Java application. The recent study was carried out on the clinical data from the 12-lead, 500Hz Medea ECG recordings, multiparameter Finometer registrations and Physionet online ECG signal repository.

## Results and conclusions:

The developed software provides a valuable computing and graphical tool enabling comparison of a number of different tests for SCD risk stratification. The parameters are computed simultaneously for validation of the results. The program is being constantly upgraded with new parameters and new algorithms being added. The final version of the software will be a platform independent Java application.