



ECG Characteristics Prior to In-Hospital Cardiac Arrest

TECHNOLOGY NUMBER: 6434



OVERVIEW

Technology that monitors ECG findings to accurately predict in hospital cardiac arrest

- Empowers physicians to preemptively respond to oncoming cardiac arrest
- Yields a higher degree of sensitivity and specificity than existing methodologies

BACKGROUND

In-Hospital Cardiac Arrest (I-HCA) affects some 200,000 people yearly and has a survival rate under 30%. Although some ECG patterns are known to be associated with cardiac arrest, there are no reliable tools to predict its onset. Approximately 70% of initial rhythms in patients with I-HCA are pulseless electrical activity (PEA) and asystole, and these rhythms are associated with higher mortality rates as compared to initial rhythms of ventricular tachycardia and fibrillation. Although electrocardiogram (ECG) predictors of ventricular tachycardia and ventricular fibrillation are well-studied, ECG predictors of PEA and asystole are not.

INNOVATION

The proposed technology monitors ECG signals and uses a defined set of predictors to detect oncoming cardiac arrest. This technology predicts cardiac arrests before they occur with high sensitivity and specificity. This degree of accuracy creates a tool which will allow doctors to respond confidently and quickly to oncoming cardiac arrest, greatly improving patient survivability. The chance of survival to hospital discharge is reportedly doubled among patients who receive cardiopulmonary resuscitation (CPR) within the first minute after cardiac arrest in comparison with those who received CPR after more than a minute had elapsed. Gradual decreases in heart rate, QRS prolongation, changes in QRS morphology, and ST segment depression or elevation were the main findings prior to I-HCA with initial rhythms of PEA and asystole.

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Category

Kayvan Najarian
Software
Software & Content

Inventor

Kayvan Najarian
Kevin Ward
Mina Attin
Sharad Shandilya

Further information

Drew Bennett
andbenne@umich.edu

Innovation Partnerships Tech
Marketing Team
IPInventions@umich.edu

[View online](#)



Existing ECG monitoring systems do not adequately detect important changes prior to cardiac arrest. For instance, telemetry alarm settings do not warn of a gradual heart rate decrease from 130 to 60 beats per minute, despite the potential prognostic importance of such a change. Furthermore, periods of decreased heart rate were associated with junctional rhythms, progression of first degree to third degree atrioventricular block, and sinus bradycardia with premature atrial contractions. QRS prolongation was observed in the last hour prior to I-HCA compared to previous hours among all subjects. These predictors detected 77.6% of oncoming cardiac arrest cases, as determined through analyzing prior cardiac arrest data.

In summary, establishing the ECG predictors prior to these lethal arrhythmias through multi-center studies and creating a standard of care for using monitoring systems including access to digital data at hospitals may improve the ability to predict onset of I-HCA in high-risk patients, providing an improvement over existing clinical risk prediction methodologies.