**Automated cardiac arrest DETECTion based on wrist-derived PPG signals: preliminary results of the DETECT-1 study in patients with induced circulatory arrests**

*Edgar R.[1], Scholte N.[2], Ebrahimkheil K.[3], Brouwer M.[1], Beukema R.[1], van Mieghem N.[2], Yap S.[2], Rodwell L.[4], Ronner E.[5], Boersma E.[2], Stas P.C.[3], van Royen N.[1], Bonnes J.L.[1]*

1. Department of Cardiology, Radboud University Medical Center, Nijmegen, the Netherlands
2. Department of Cardiology, Erasmus Medical Center, Rotterdam, the Netherlands
3. Corsano Health, The Hague, the Netherlands
4. Radboud Institute for Health Sciences, Health Evidence, Section Biostatistics, Nijmegen, the Netherlands
5. Department of Cardiology, Reinier de Graaf hospital , Delft, the Netherlands

***Purpose of the study***

Automated cardiac arrest detection and alarming is a potential solution to shorten treatment delays after out-of-hospital cardiac arrest (OHCA). Especially for patients with unwitnessed cardiac arrests this could improve survival. In the DETECT project, an existing wristband is further developed to enable automated cardiac arrest detection and alarming during daily life using multiple sensors including wrist-derived photoplethysmography (PPG) signals. We present preliminary results of the DETECT-1 study in which a PPG-based cardiac arrest detection algorithm is being developed using patient data of induced circulatory arrests.

***Methods***

Adult patients were equipped with a PPG-wristband during transcatheter aortic valve implantation (TAVI), subcutaneous implantable cardioverter defibrillator (ICD) implantation or ventricular tachycardia (VT) ablation. Routine practice circulatory arrests were induced by means of rapid ventricular pacing with aortic balloon inflation (TAVR), ventricular fibrillation induction during defibrillation testing (s-ICD) or VT induction (VT ablation). Continuous ECG and arterial blood pressure were monitored as reference signals. The algorithm was trained and improved through multiple iterations of the dataset, i.e. after every 50 patients with circulatory arrest events. Sensitivity and false positive rate was reported.

***Results***

A total of 141 patients was studied, yielding 148 circulatory arrest events, and 115 hours of non-cardiac arrest data. The first and second versions of the algorithm (n=75 and n=66) yielded sensitivity of 100%, and 4 (in 3 patients) and 6 (in 5 patients) false positive alarms. The algorithm detected all spontaneous cardiac arrest events (n=4) that occurred during TAVR procedures.

***Conclusions***

Automated detection of induced circulatory arrest using wrist-derived PPG signals is feasible with excellent sensitivity and a relatively low false positive rate. Further study is needed to translate findings to spontaneous circulatory arrests and to minimize false positive alarms. When available, this innovative technology has the potential to markedly improve survival after OHCA.