

# BECA: Activating the Chain of Survival for Unwitnessed Out-of-Hospital Cardiac Arrest

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# BECA: ACTIVATING THE CHAIN OF SURVIVAL FOR UNWITNESSED OUT-OF-HOSPITAL CARDIAC ARREST

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## ABSTRACT

Out-of-hospital cardiac arrest (OHCA) is a major health problem and occurs in individuals of all ages, sexes, ethnicities, and socioeconomic positions. Within the European Union, the incidence is estimated to be around 343.000 cases per year [1], with an overall survival rate of 10% [2]. It is essential that the chain of survival, i.e., alarming and early basic and advanced life support, is started as soon as possible. Unfortunately, 40% of the cases has no witness to start this chain of survival [3], which decimates the chance of survival.

In our project, BEating Cardiac Arrest (BECA), we aim to develop a prototype device that can detect OHCA and start the chain of survival, even when no witnesses are present. By using a smartwatch that measures blood volume (using photoplethysmography) and accelerometric data at the wrist, we aim to detect circulatory arrest. After OHCA detection, GPS location can be sent over a mobile connection to a Dutch citizen-responder system, which will act as a link to citizen-responders and emergency medical services.

Several clinical studies will be conducted to acquire data that is used for development and validation of the OHCA detection method. In the first study, 60 healthy volunteers will be asked to simulate OHCA several times by stopping movement and inflating a blood pressure cuff on the side where the smartwatch is carried. Secondly, a group of 30 patients with an implantable cardioverter defibrillator (ICD) is followed over a longer period to capture clinically occurring OHCA episodes. Lastly, 50 patients will be studied during either a ventricular tachycardia (VT) ablation or a subcutaneous ICD implantation, in which ventricular tachycardia/fibrillation is induced as part of clinical practice. With these groups, we aim to approximate the group of OHCA victims as good as possible. Other works will include a target group study, as well as studies into the ethical and psychological aspects of the technology.

By investigating the technical, clinical, societal, economic, psychological, and ethical aspects, this project will increase the chance of adoption by the medical community. For this reason, a consortium is formed consisting of academic partners (from the areas of cardiology, engineering, psychology, behavioral sciences, ethics), a large MedTech company, and a technology provider for citizen-responder systems.

## REFERENCES

- [1] Empana, J.-P., Lerner, I., Valentin, E., Folke, F., Böttiger, B., Gislason, G., Jonsson, M., Ringh, M., Beganton, F., Bougouin, W., Marijon, E., Blom, M., Tan, H., & Jouven, X. (2022). Incidence of Sudden Cardiac Death in the European Union. *Journal of the American College of Cardiology*, 79(18), 1818–1827.
- [2] Myerburg, R. J. (2014). Initiatives for improving out-of-hospital cardiac arrest outcomes. *Circulation*, 130(21), 1840–1843.
- [3] Straus, S. M. J. M., Bleumink, G. S., Dieleman, J. P., Lei Van Der, J., Stricker, B. H. C., & Sturkenboom, M. C. J. M. (2004). The incidence of sudden cardiac death in the general population. *Journal of Clinical Epidemiology*, 57(1), 98–102.