

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

Citation for published version (APA):

Hup, R. G., Linssen, E. C., Dekker, L. R., Haakma, R., Tan, H. L., & Vullings, R. (2023). *BECA: Activating the Chain of Survival for Unwitnessed Out-of-Hospital Cardiac Arrest*. Abstract from 9th Dutch Bio-Medical Engineering Conference (BME 2023), Egmond aan Zee, Netherlands.

Document status and date:

Published: 01/01/2023

Document Version:

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.tue.nl/taverne

Take down policy

If you believe that this document breaches copyright please contact us at:

openaccess@tue.nl

providing details and we will investigate your claim.

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

Roelof G. Hup, Emma C. Linssen, Lukas R.C. Dekker, Reinder Haakma, Hanno L. Tan and Rik Vullings*

*Eindhoven University of Technology,
P.O. Box 513, 5600 MB Eindhoven
The Netherlands*

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.