

## CASE STUDY

# Development of data-driven cardiovascular disease tools with Merck & Allelica

### OVERVIEW

Allelica is partnering with Merck, a leading global healthcare and life sciences company, to develop a suite of cardiovascular disease prevention tools. Allelica will use its advanced capabilities in machine learning and genomic science to help diagnose heart failure and identify patients at high risk of cardiovascular diseases, the major cause of mortality worldwide.

### PARTICIPANTS

The Merck logo is displayed in a bold, blue, sans-serif font.

Merck is a global healthcare and life sciences company driven by a passion for research and discovery.

The Allelica logo is displayed in a blue, lowercase, sans-serif font.

Allelica is a genomic software company specialising in building scalable solutions to implement polygenic risk scores.

### THE CHALLENGE: Diagnosing heart failure

Cardiovascular diseases are the leading cause of mortality worldwide. Despite this, more people are surviving initial cardiovascular events and there is a growing pool of patients for whom secondary prevention is a major challenge. Patients who have been diagnosed with cardiovascular problems, such as atrial fibrillation, coronary artery disease and hypertension, particularly those with additional co-morbidities such as diabetes or obesity, are often at much higher risk of secondary events. Increasingly, they are also within healthcare systems and so represent a population of patients who would benefit from accurate prediction of future heart failure.

Compounding problems of secondary cardiovascular events is that heart failure in some patients can go undetected, because the symptoms are minor. In such cases, the risk of a secondary cardiovascular event is greater, particularly if the heart failure event remains undiagnosed. Data from Electrocardiograms (ECG) is one potential avenue to explore for diagnosing heart failure. ECGs are quick and easy to deploy and are routinely used during patient check ups. Currently, heart failure is diagnosed through an Echocardiogram, which is a type of ultrasound scan, but these are labour intensive and require an operator to analyse the outputs. Merck is interested in understanding whether ECG readouts could be used to diagnose heart failure.

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A second aspect to this project is to explore how genetic data can be used to identify patients at high risk of heart failure. Whilst there is undoubtedly a genetic component to cardiovascular disease risk, little research has been conducted into the genetics of the risk of secondary cardiovascular disease events.

Given Allelica's growing reputation leading polygenic risk score implementation, Merck proposed a collaboration to work on investigating ways of analysing ECG and genetic data to build products that can help identify high risk individuals at different points on their patient journeys.

## THE SOLUTION: Leveraging the power of genomics and machine learning

Allelica is leading an analysis exploring the polygenic risk of secondary heart failure using the UK Biobank resource. This part of the project aims to identify those patients who are at a higher risk of a secondary cardiovascular event in individuals who have already suffered one.

Allelica is also working with Merck to build a machine learning approach to identify the subtle difference in ECG patterns using a dataset of ECGs from patients with undiagnosed heart failure. Merck provided data from ECGs of individuals who had a heart failure and Allelica developed a proprietary machine learning algorithm which can identify the ECGs of patients who went on to develop heart failure. In addition, the specific part of the ECG pattern that looks abnormal is identified, which gives clinicians a hint as to what caused the heart failure.



## THE FUTURE

The outputs of this project will help Merck provide a data-driven approach to helping patients on their journey after a cardiovascular event. Diagnosing heart failure is important for ensuring that the correct treatment pathways are adopted, and being able to do so from an ECG opens up a new approach for cardiovascular clinicians to improve their patients' outcomes. In addition to the project providing a proof of principle that both genomic and ECG data can be used to stratify risk in cardiovascular disease patients, the tools developed will allow clinicians to more effectively guide the patient journey, connecting more deeply with those entrusted to their care.

## About Allelica

Allelica is a leading genomic software company specialising in building fast, efficient and scalable solutions to implementing polygenic risk scores. Founded in Rome in 2017, Allelica's mission is to translate the potential of genomic data into tools for researchers and clinicians.

Please [get in touch](#) for further details or to [request a demo](#) of the software.