

# Pitching Session

Call 7- Topic 1: Improving clinical management of heart disease from early detection to treatment

Number	First Name	Last Name	Job Position	Organization	Title of the Presentation
1	Sanne	NAUTS	Senior Scientist	Philips	Diagnostic imaging and monitoring of Common Cardiac Diseases
2	Christelle	SAINT SARDOS	Sr Director Government Affairs and Access Policy	Edwards Lifesciences	Heart Clinical Pathway Enhancement in Europe
3	Raquel	CUNHA	Clinical Project Manager	Clinical Academic Center - Braga (2ca-Braga)	Revolutionizing clinical management: Smart skin patches for long-term and minimally invasive monitoring of patients at risk of heart failure
4	Jonas	MARCELLO	Head Of Department	Fraunhofer IESE	Radar based heart monitoring
5	Francoise	CHARBIT	Health Programme Manager	Cea	Non-invasive and personalised monitoring of physiological and biochemical parameters
6	Melike	ÇOLAK	Machine Learning Engineer	Bites	Presenting Artificial Intelligence Expertise in Heart Disease Diagnosis
7	Normunds	DAUDIŠS	Innovation & Partnerships	Health Tech Innovations   Nd Group	Scalable & Customisable Remote Care Platform for Heart Disease
8	Yvan	DEVAUX	Head of Cardiovascular Research Unit	Luxembourg Institute of Health	Improving clinical management of heart disease from early detection to treatment
9	Ivett	JAKAB	Research Project Manager	Yaghma B.V.	AI Impact Assessment in healthcare
10	Pavel	KOSYREV	CEO	Nova Group Global 1969 Slu	Nova Cardio
11	Juha	KOTIMAA	Senior Scientist	Vtt Technical Research Centre of Finland Ltd	Immunoassay platforms for diagnostics
12	Iordanis	KOUTSOPOULOS	Professor	Athens University of Economics And Business	Responsible AI and Advanced Digital Tools for Heart Disease management
13	Mirosław	KWASNIEWSKI	CEO	Imagene.Me	GenoCardia: Integrative Management Platform for Genetically Predisposed Cardiovascular Conditions
14	Lokman	LIV	Researcher/Head of Electrochemistry Laboratory	Tubitak	Producing Electrochemical (Bio)sensors and a Voltammetry Instrument
15	Grégoire	MERCIER	Cofounder	Kanopymed	PREDIC: AI-powered clinical decision making to prevent hospitalizations in patients with chronic heart failure
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# IHI Call Days | Call 7

Topic 1: Improving clinical management of heart disease from early detection to treatment

## Diagnostic imaging and monitoring of Common Cardiac Diseases

**Jouke Smink**, Principal Clinical Scientist (Cardiac MRI)

[jouke.smink@philips.com](mailto:jouke.smink@philips.com)

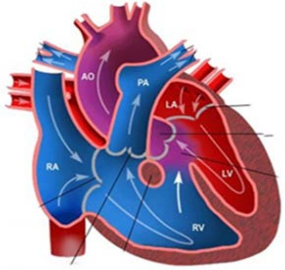
**Sanne Nauts**, Senior Scientist (Patient Experience & Workflow)

[sanne.nauts@philips.com](mailto:sanne.nauts@philips.com)



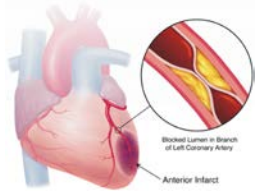
# Diagnostic imaging and monitoring of Common Cardiac Diseases

- Scalable solution for the assessment of cardiac anatomy and function.
- Any cardiac disease, but with a focus on the most common cardiac diseases (e.g., structural and coronary heart disease, arrhythmias and heart failure).
- Any patient, including:
  - Fragile patients (e.g., elderly patients, oncology patients who require careful handling);
  - Patients with implanted devices;
  - Anxious patients.
- Easy operation by any operator.



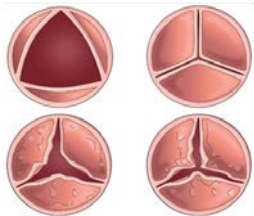
## Congenital

Children born with wrong connections, holes between chambers or missing chambers



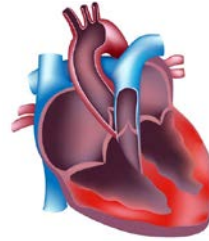
## Coronary artery

Arteries that supply oxygen and blood to the heart become narrow (“ischemic heart disease”)



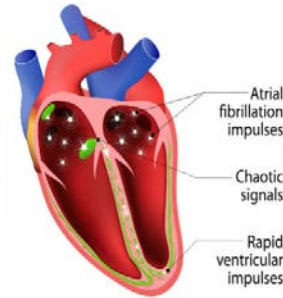
## Structural

Valves do not work well and become leaky



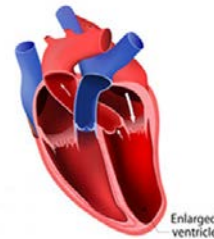
## Heart Muscle

Heart wall becomes thick or heart becomes enlarged (cardiomyopathy/myocarditis)



## Arrhythmia

Electrical problems causing irregular heart beats



## Heart Failure

Heart does not have enough strength to pump

# Competing modalities: CT and ultrasound



# Patient Experience

“Some big padding was put across my chest and I was **strapped onto the table** (which I hated).”<sup>1</sup>

“I immediately felt like I was being **loaded into a tiny coffin**”

“Ugh having an MRI is like being inside of a **fax machine**”<sup>1</sup>



# Ease-of-use for staff



# Stress in Cardiac MR

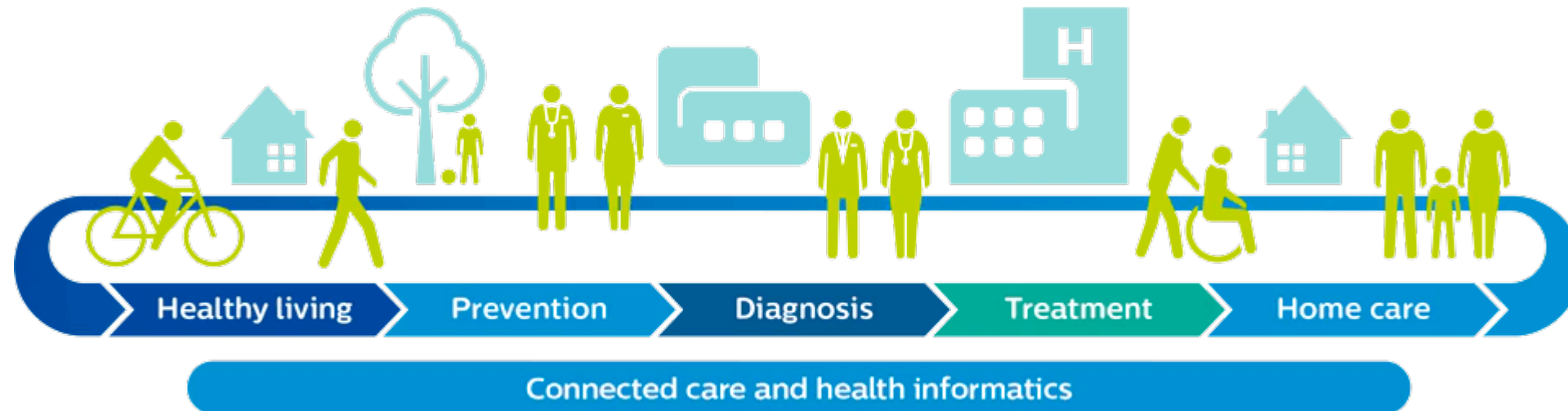




# Added value

- Access to high-quality diagnostic cardiac images for clinical trials, leading to the improved and accelerated development of novel therapies and delivery systems.
- Ability to develop personalized treatment options based on the results of the MRI scan.
- Early detection and diagnosis of cardiac diseases could lead to improved market access for therapies and a well-rounded understanding of cardiac disease management.

# Expertise and resources offered and needed

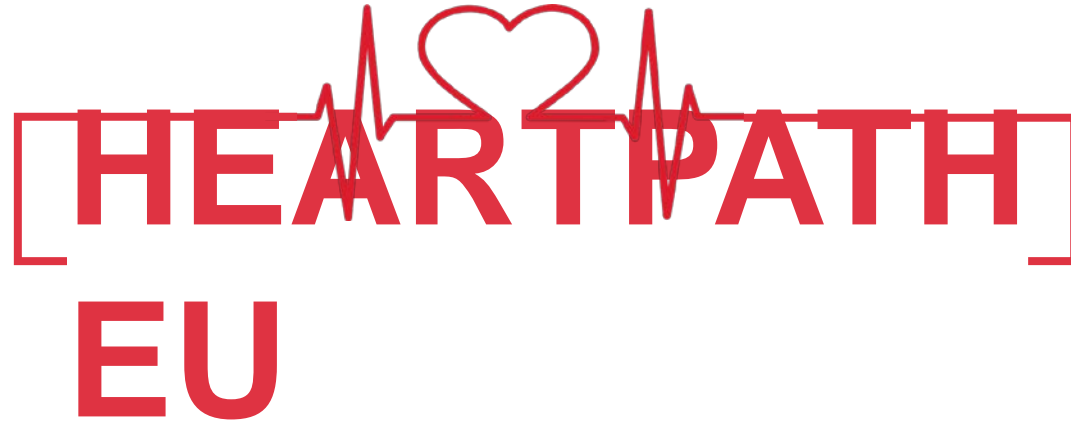


- We offer expertise on diagnosis, workflow and patient experience.
- We are looking for partners working on prevention & treatment.

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# [HEARTPATH] EU

## Heart Clinical Pathway Enhancement in Europe

Call 7 - Topic number 1

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 Edwards Lifesciences

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**Debra Umlauf**

 GE HealthCare

Email: [Debra.Umlauf@gehealthcare.com](mailto:Debra.Umlauf@gehealthcare.com)

# Cardiovascular Heart diseases: A growing disease burden for Europe



## CVD

36% of all deaths  
60 million people affected  
282 Billion € per year

CVD cause premature deaths (before 65y) among men (24%) and women (17%)



## SHD

14 million patients today.  
Every year 50 000 Europeans die from Heart Valve Disease only.

## AFib

1 in 3 EU individuals at index age of 55 years is subject to Afib.



## SHD

A growing burden with ageing society.  
20 million patients by 2040.

## AFib

12 million EU patients aged 65+ by 2040.

# Current challenge: a fragmented and suboptimal CVD patient pathway



## Low awareness at patient at primary care levels

84% of EU citizens are not aware of SHD symptoms.

## Suboptimal detection, with significant inequalities

Only 28% of 65+ patients have regularly auscultation. Unequal access to echocardiographers



Lack of integration of multi-modal data and care teams



## Non-standardized referral driving delay in treatment

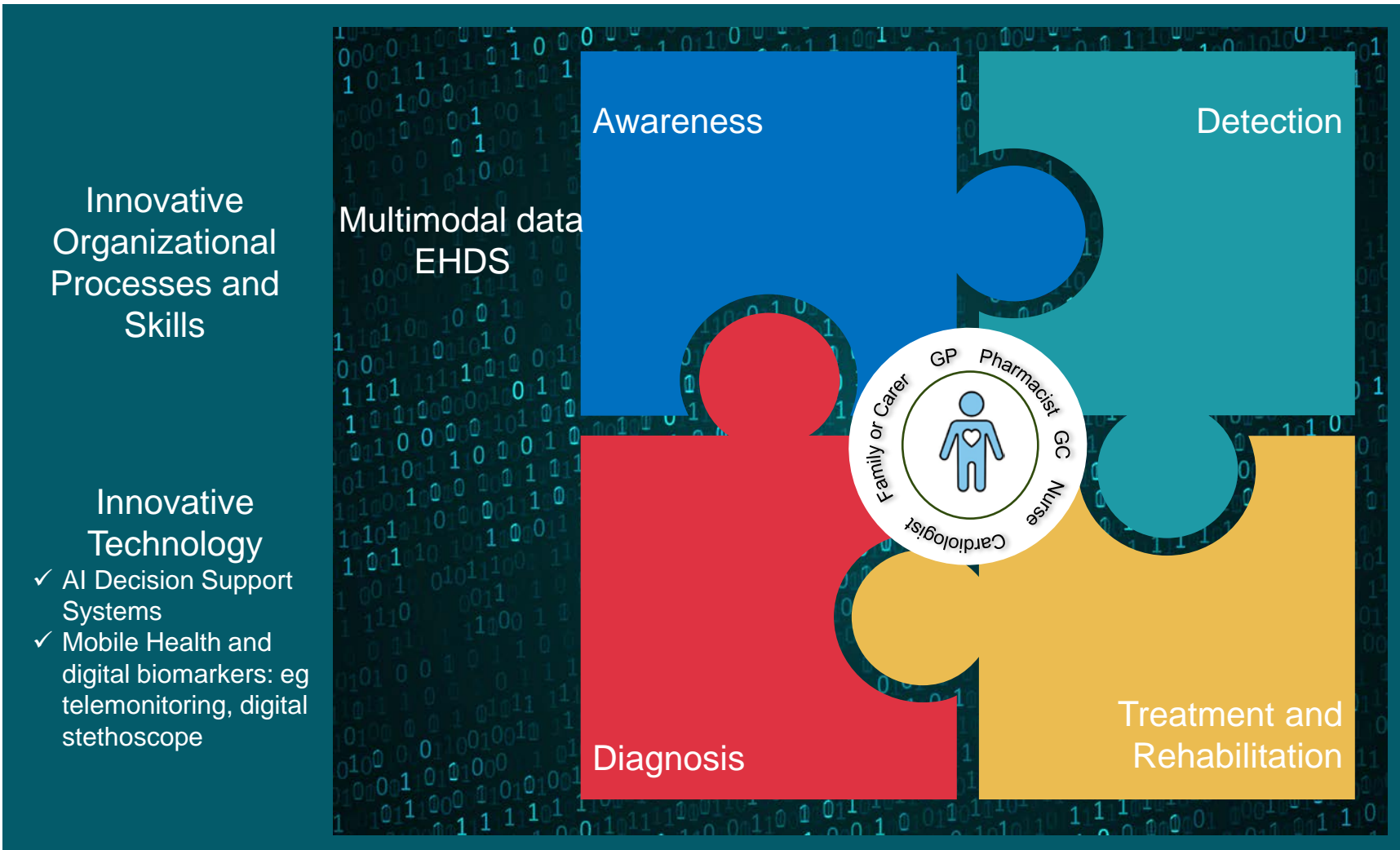
If not treated properly, 1 out of 2 diagnosed patients with severe SHD will die after 2 years..

## Inequalities in Treatment and limited healthcare capacity

4 out of 5 patients suffering from severe forms of SHD are not treated.



# Our Vision



Reducing the burden of heart diseases will be possible only reaching a strong integrated clinical management in EU.

The development and testing of innovative approaches and technology solutions will be essential to optimize the care pathway, for the benefits of both patients and health care systems.

# Objective: leverage innovation to integrate and optimize the CVD patient pathway



## OBJECTIVES

- Test novel **secondary prevention strategies** improving risk stratification models and self-empowerment of individuals and population at scale
- Translate **organizational innovation** in novel healthcare system-centric approaches to maximize efficiency, support HCPs and ensure equitable patient access to treatment
- Large scale adoption of innovative technology** (e.g. AI powered detection tools or remote monitoring) in patient-centric solutions to maximise the clinical outcome of treatment and to offer a rehabilitation that keep patients connected with their care teams.
- Validate novel approaches to improve and integrate the **management of SHD and Afib (AS) along the patient's pathway**
- Design and validate a **scalable** and **sustainable blueprint** for an improved and integrated CVD clinical management (taking into considerations socio-economics aspects and regulatory implications)



# Type of consortium partners to be involved



**New detection, diagnostic and treatment solutions providers and data analysis experts (AI-powered clinical decision tools, advanced imaging),**

**....In SHD, AFib – and in (some of the) other areas**



**Innovative processes and organization for an optimized patient pathway, Cardiology Clinical Partners. Primary care entities, patient's organisation**



**Economic evaluation and regulatory experts**

*Coronary Artery Disease, Heart Failure*

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# IHI Call Days | Call 7 | Topic 1

● **Revolutionizing clinical management:  
Smart skin patches for long-term and  
minimally invasive monitoring of patients  
at risk of heart failure**

Raquel Cunha

raquel.cunha@ccabraga.org

Organisations:  ZCA Braga  
Centro Clínico Académico

 LABRISE  
Laboratory for Research  
and Innovation in Sensors  
and Engineering



Marketplace opportunity:



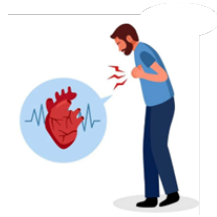
Participant profile:



 innovative  
health  
initiative

# Challenges

## Heart Failure (HF)



64 M people worldwide



179 hospitalised/ day



50% mortality  
rate within 5 yrs

# Objectives

Enable long-term monitoring of patients at HF risk



Healthcare centers



At-Home Monitoring



Severity and Mortality



Annual Healthcare Cost

Hospitalizations  
Outpatient visits  
Invasive procedures



Clinical management of HF

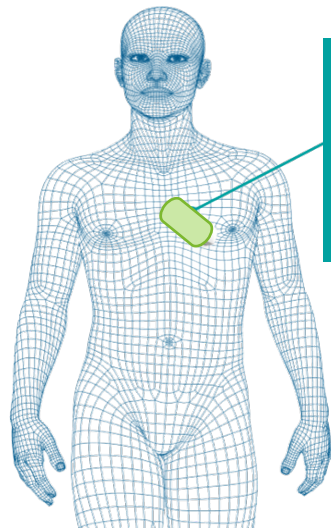
Adjust medication prescriptions  
before exacerbations



Patient empowerment

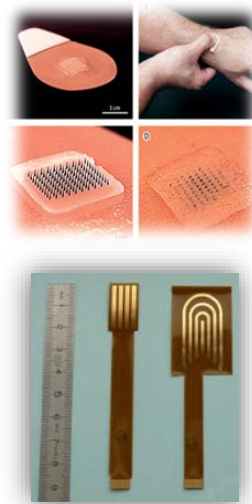
# Our solution

Smart skin patches for long-term and minimally invasive monitoring of patients at risk of HF



Wearable device for monitoring specific clinical parameters in HF patients

- ✓ Protein Biomarkers
- ✓ Vital signs
- ✓ Bioimpedance



Long-term monitoring

At-home monitoring

Comfortable

Easy-to-use

Compact

Minimally-invasive

## Activities

- Producing a wearable device
- Data fusion and exploitation
- Testing and clinical validation under the Regulation (EU) 2017/745

# Expertise and resources offered



- Clinical research center
- Support products' development
- Piloting, testing and clinical validation under the Regulation (EU) 2017/745



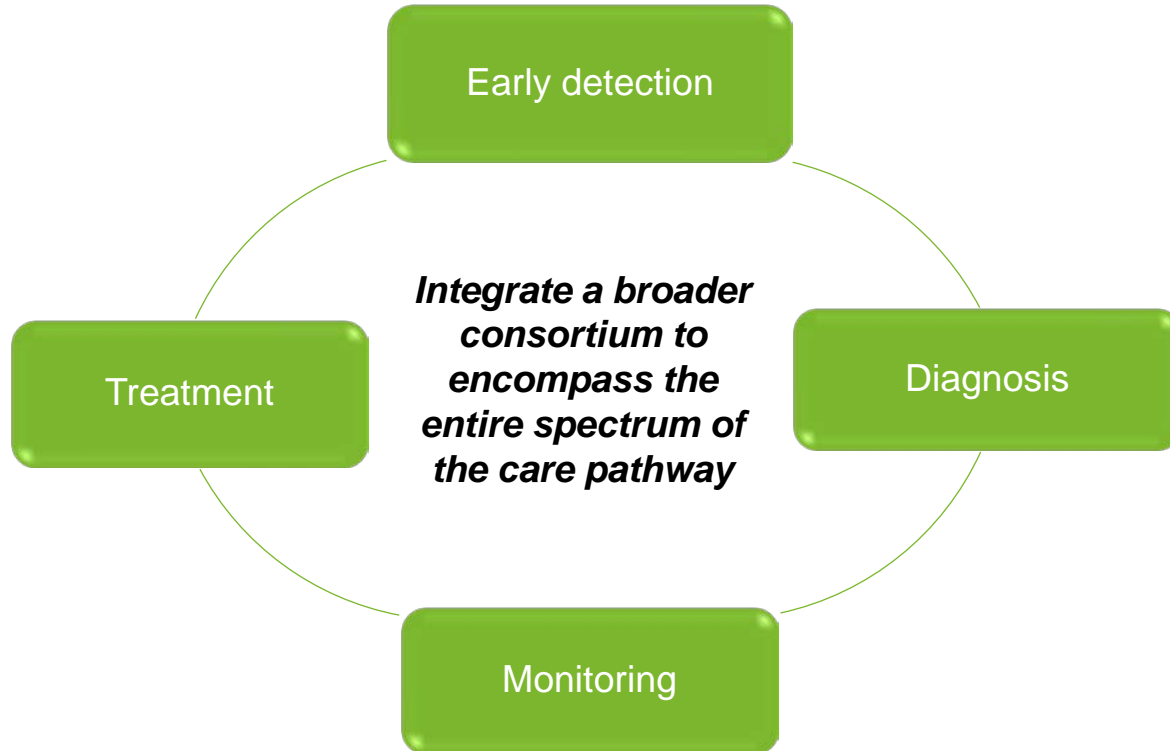
- Research center
- Synthesis of biomimetic materials
- Development and testing of sensing devices



- Research and technical organization
- Electronic sensor printing platform
- Stretchable wearable substrates and micro-structuration, including microneedles and multimodal approaches (PPG, ECG, bioimpedance...)
- System architecture and signal analysis
- Data fusion

Contribution  
to objectives  
II, III, VIII

# Expertise requested



## INDUSTRY & CONTRIBUTING PARTNERS

- Software development
- AI algorithms for personalized care
- Additional features into the patch
- End-user for device integration and certification
- Digital health and telemonitoring platform

## PUBLIC PARTNERS

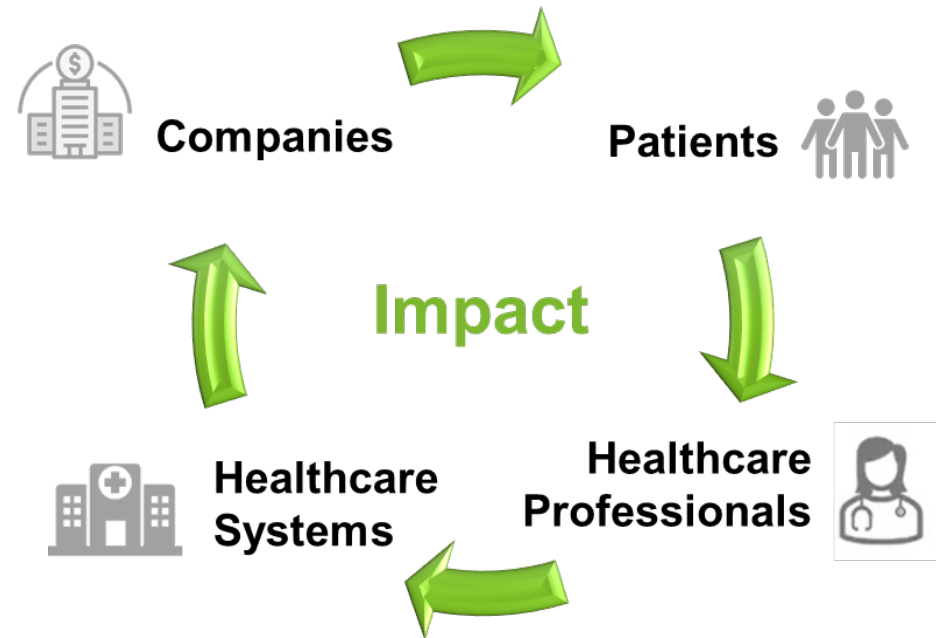
- European healthcare centers

## REGULATORS

## PATIENT ORGANIZATIONS

# Expanding our consortium: Seeking industry and public partners for innovative collaboration!

Join us in advancing innovation and making a lasting impact on the clinical management of heart disease, from early detection to treatment!





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# IHI Call Days | Call 7

- Topic 1: Improving clinical management of heart disease from early detection to treatment

## Radar based heart monitoring

Contact person name: Dr. Jonas Marcello  
Organisation: Fraunhofer IESE  
E-mail: [jonas.marcello@iese.fraunhofer.de](mailto:jonas.marcello@iese.fraunhofer.de)

**Marketplace opportunity:**

<https://ihi-call-days.ihi.b2match.io/marketplace/opportunities/UGFydGljaXBhdGlvbk9wcG9ydHVuaXR5Ojg4Njc3>

**Profile:**

<https://ihi-call-days.ihi.b2match.io/participations/207544>

# Challenges and objectives

- Huge manual effort to monitor patients in hospitals
  - Some patients are difficult to monitor via ECG (dementia, children, burns)
  - Remote monitoring not possible in real-time
- 
- Use Radar to measure pulse, heart function, ECG contactless
  - Easy installation without expert knowledge
  - Real-time analysis and abnormality detection even at home
- 
- Less effort for health staff, no wiring necessary
  - Seamless and continuous monitoring in hospitals or at home

# Main activities

- Develop and improve Radar to fit in shoebox
- Integrate embedded chips for in-place data analysis
- Develop trustworthy ML/AI algorithms to improve sensitivity and abnormality detection
- Identify blockages, e.g. thrombosis
- Develop standardized API (FHIR) for real-time data exchange

# Expertise and resources offered

- Research:
  - Fraunhofer\* (IESE, IZM, IMW, IZI-BB)
  - SetLabs
  - TU Hamburg Harburg
- Healthcare provider
  - Charité Berlin
- Industry
  - Infineon\* (Radar technology)
  - Bechtle\* (Distribution, IT service provider)

\* IKOP - in-kind contributions to operational activities

\*\* IKAA - in-kind contribution to additional activities

# Expertise requested

- Hospital or other healthcare providers for prototyping the Radar
- Ethical aspects and Ethic vote
- SME or industry partners
  - Signal processing
  - Wireless technology
  - Medical device manufacturer
  - Medical device distributor
  - Regulatory aspects

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- Topic 3 - Improving clinical management of heart disease from early detection to treatment

## Non-invasive and personalised monitoring of physiological and biochemical parameters

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Organisation: CEA-Leti

E-mail: [francoise.charbit@cea.fr](mailto:francoise.charbit@cea.fr)

Link to:

- [Marketplace opportunity](#)
- [Participant profile](#)





# Our proposal

- 3 innovative **sensing solutions** to improve clinical decision-making in heart disease management
- Adapt treatment, increase efficiency, get faster results...
- **...And improve patients comfort** through simple, frequent and/or continuous measurement of key cardiac biomarkers,.
- Suitable in all care settings (primary, ambulatory, hospital + home care)
  
- Public technological research made available for industry (TRL4-6) with advanced, robust, scalable solutions
  
- **We can provide a whole WP to implement innovative sensing solutions, among which our(s)**
  
- See also our pitch on topic 3 (biomarkers) by [Caroline Desvergne](#)



# Our proposal

## Examples of outcomes...

Early detection and monitoring of **hypotensive side effects** of HF treatments  
**Hypertension monitoring** in real life conditions for SHD early detection

Frequent measurement of **NT-proBNP, cortisol**...for early detection, secondary prevention, monitoring of treatments

Fully automated, fast, high sensitivity-specificity analyses of **NT-proBNP** for ACS and HF in **primary care**

1

2

3

## ...thanks to our solutions

Comfortable, cuffless measurement of **blood pressure** and other parameters  
**Wearable multimodal sensor**

**Wearable and real-time analysis** of metabolites, proteins, hormones in **interstitial fluid (ISF)**

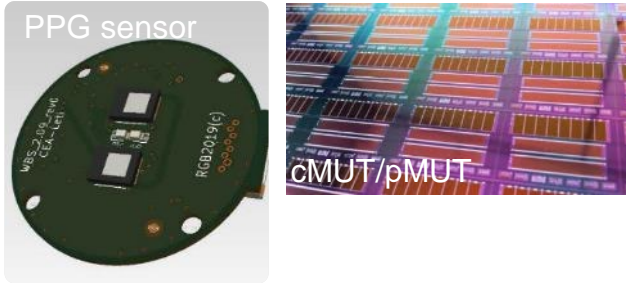
**Sensing patch of microneedles**

**Point-of-care** diagnostic device

**Microfluidic integrated system**  
incl. sample prep/amplification

# Main activities

## 1 Cuffless blood pressure



Integrated multimodal component for cardiac monitoring

### Physiological model



Good predictivity based on ECG and PPG –on-going clinical study

### Other parameters

Stress (GSR/EDA, skin temp), HR and SpO<sub>2</sub> (PPG), Respiratory rate, pCO<sub>2</sub> (IR), cerebral activity (EEG-fNirs)



Energy supply - embedded controller

Communication hub

## 2 Interstitial fluid sampling and analysis



CEA-Leti polymer-based biocompatible microneedles

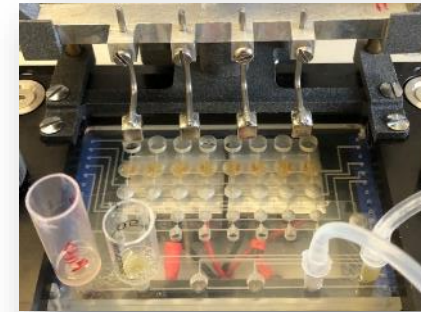


Painless  
Resorbable  
High resolution  
Scalable



Xsensio (SME) Lab-on-skin™ for NT-proBNP detection

## 3 Integrated protocol on a microfluidic chip



Fully automated and miniaturised analytical chain  
Sample preparation  
+  
Amplification  
+  
Detection

Sensitivity > ELISA  
Enlarged dynamic range  
Thrombin-troponin pM range < 2 h  
NTproBNP on-going  
Multiplex analysis



# Expertise and resources offered

- Electronics, sensors, algorithms and AI based software, microfluidics, biochemistry, specific biomaterials, preclinical/clinical (200 p)
- Main deliverable: CE-mark compliant **prototypes** for clinical feasibility during project
  - 1 by **10-50 patients**
  - 2
  - 3 ~100 microfluidic cartridges for 2 PoC sites
- *Results to be detailed by our experts*
- *As a public research organisation, we cannot bring in-kind contribution*

## Our partners on IHI platform

- Clinicians in cardiology and ICU @ [CHU Montpellier](#), [CHU Grenoble](#), [CHU Saint Etienne](#), [AP-HP](#) (FR)
- Luxembourg Institute of Health – [Y. Devaux](#)
- [Inserm Transfert](#) (FR)
- Partnering SMEs:
  - [Let it Care \(FR\)](#) Digital biomarkers for chronic diseases monitoring
  - [Xsensio \(CH\)](#) Microneedle-based analysis in ISF

**Micro-nano technologies for health**  
Human, animal and environmental health



Our last report [here](#)



**innovative health initiative**

# Pitching Session

Today 23 January 2024, 14:30 – 16:00 Brussels time

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# IHI Call Days | Call 7

Topic 1 : Improving clinical management of heart disease from early detection to treatment

## Presenting Artificial Intelligence Expertise in Heart Disease Diagnosis

Contact person name: Melike Çolak

Organisation: BİTES

E-mail: [melike.colak@bites.com.tr](mailto:melike.colak@bites.com.tr)

Link to:

- [Marketplace opportunity](#)
- [Participant profile](#)



# Challenges and objectives



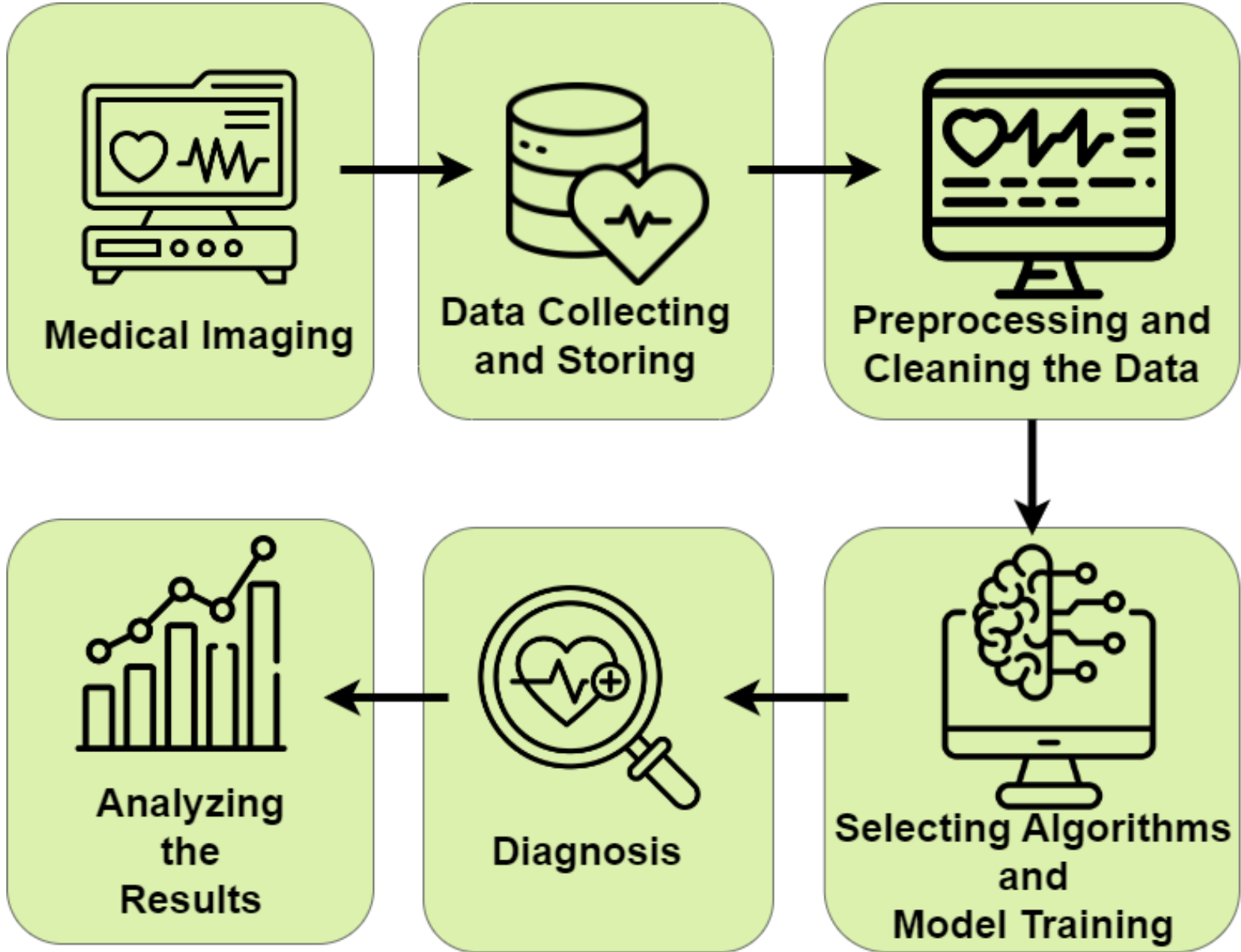
- According to the World Health Organization (WHO), cardiovascular disease (CVD) is the leading cause of death worldwide, accounting for nearly **31%** of all fatalities each year.
- CVDs cause more than **17 million deaths per year**, with a projected **increase to 23 million by 2030**.
- The distribution of CVD mortality is a major problem, with medium and low-income nations accounting for **75%** of the total.



- CVD therapy imposes a significant financial burden, including diagnostic and drug expenditures.
- The worldwide cost of CVD therapy in low- and middle-income countries is **expected to be over 3.8 trillion dollars** between 2011 and 2025.



- Traditional techniques to cardiac treatment frequently need an in-depth understanding of individual cardiac diseases and a significant learning curve for manual analysis, resulting in limits.
- **Machine learning-based approaches** have emerged as a possible alternative, with an emphasis on feature extraction and signal classification, notably for arrhythmia identification and automated **ECG signal processing**.



# Main Activities



# Expertise and resources offered

- **Statistical and Mathematical Skills:** Possesses a team of expert engineers and mathematicians.
- **Expertise in Various Data Formats:** Proficient in handling different types of datasets including Medical images, CSV files, sensors and time series data.
- **Machine Learning Model Development:** Specialized in creating a range of machine learning models.
- **Marketplace Impact:** Significant influence in the industry due to the team's extensive experience.
- **Diverse AI Algorithms Knowledge:** Proficient in various AI algorithms such as MLP (Multi-Layer Perceptron), CNN (Convolutional Neural Networks), RNN (Recurrent Neural Networks), LSTM (Long Short-Term Memory), Transformers, etc.
- **Experience in AI-Driven Projects:** Demonstrated success in developing projects powered by AI.
- **Contribution through Collaboration:** Promotes the use of advanced statistical methods in various projects.

# Expertise requested

- Data providers according to the specific topic.
- Medical professionals who expertise us in analyzing the medical data.
- Multi-stakeholder project management.

By taking inspiration from the expertise of BITES, we are certainly eager to join a consortium, and accordingly, we are ready to make significant contributions to the fields of **machine learning** and **data analysis**.

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# IHI Call Days | Call 7

- **Scalable & Customisable Remote Care Platform for Heart Disease** 

Contact person name: **Normunds Daudiss**

Organisation: **Health Tech Innovations | ND group**

E-mail: [normunds@daudiss.com](mailto:normunds@daudiss.com)

Link to:

- [Marketplace opportunity](#)
- [Participant profile](#)



# About Me

● For the last 7 years...

Improving clinical management of heart disease  
from early detection to treatment

Affordable  
Available  
Accessible



Connect on LinkedIn



# Scalable & Customisable Remote Patient Monitoring Platform

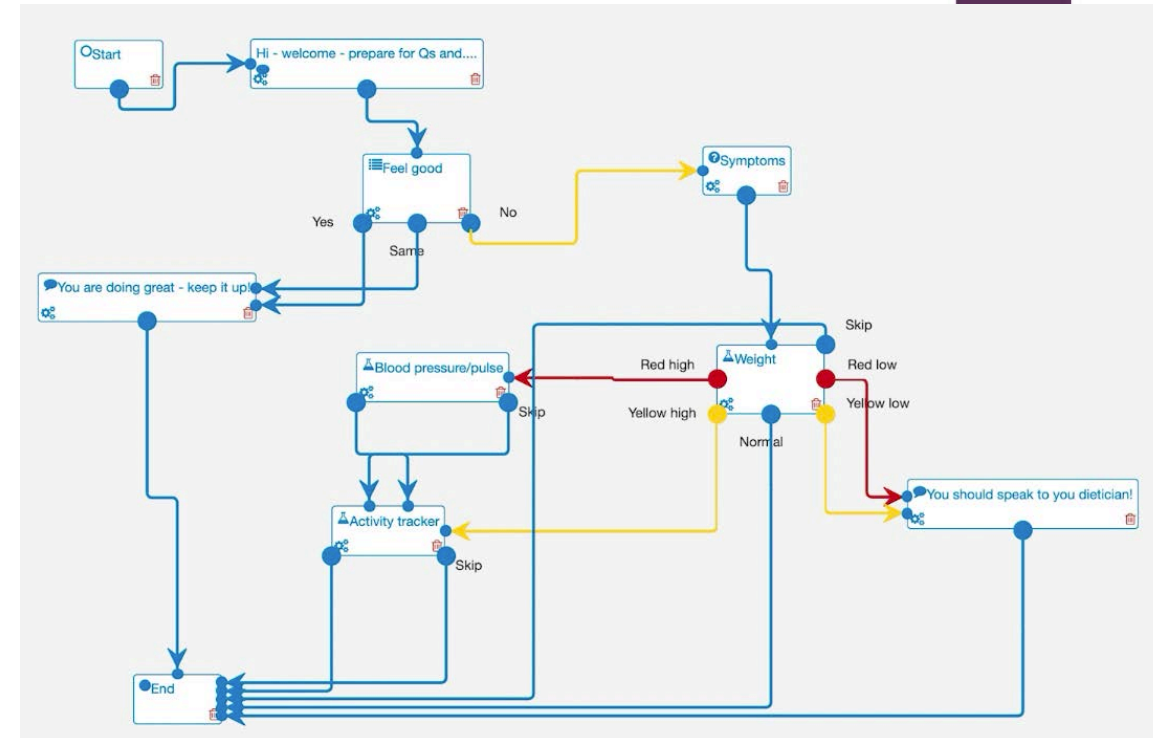
- Backbone of the solution.  
Demonstrated **35% savings** in real-life CVD use case.
- Addressing Call needs.  
Early detection + treatment management.
- Innovative Edge.  
Prediction & AI integrations.



# Scalable & Customisable Remote Patient Monitoring Platform

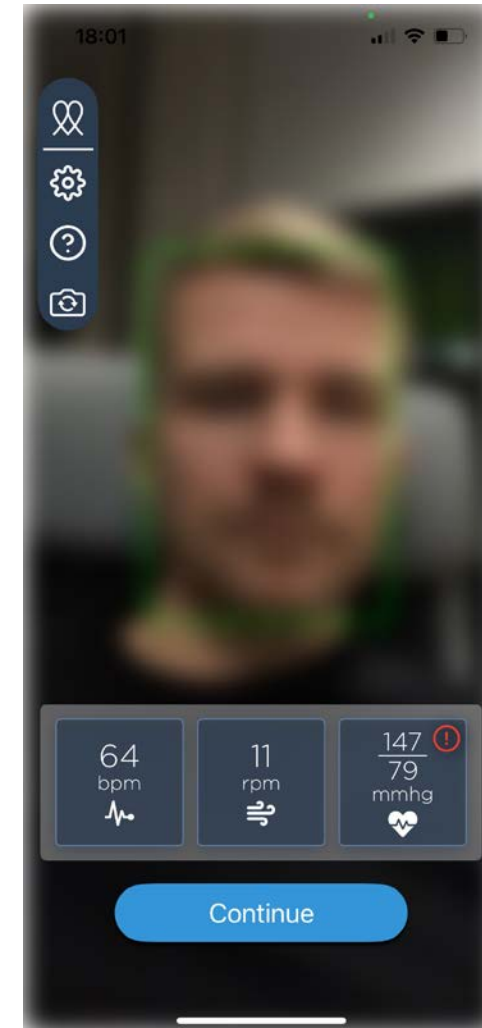
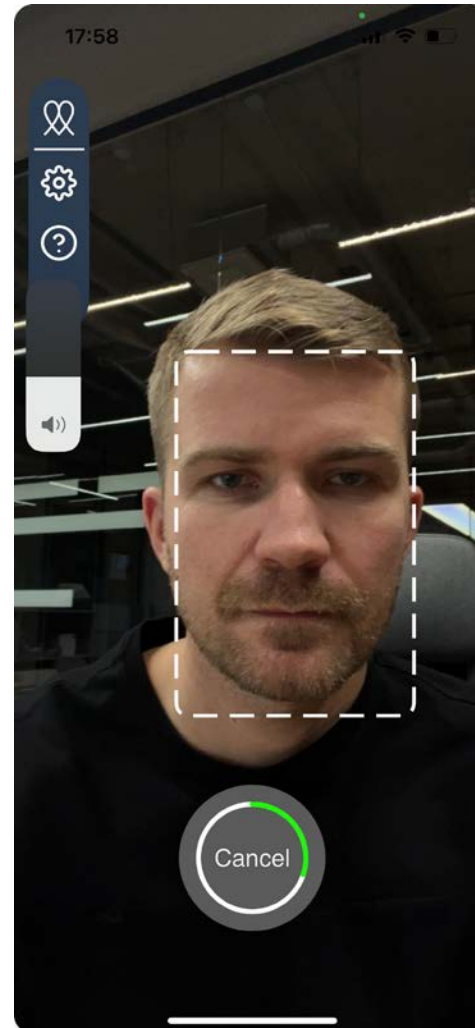


- 10 years in deployment. 10 countries.
- High level automation. 1 Nurse = Hundreds of patients.
- Custom pathway builder for Heart Disease needs.
- Any connected devices.



# Innovative Edge

- Selfie-camera based vital sign monitoring.
- HR, Respiration, Blood pressure. \*Oxygen + Afib



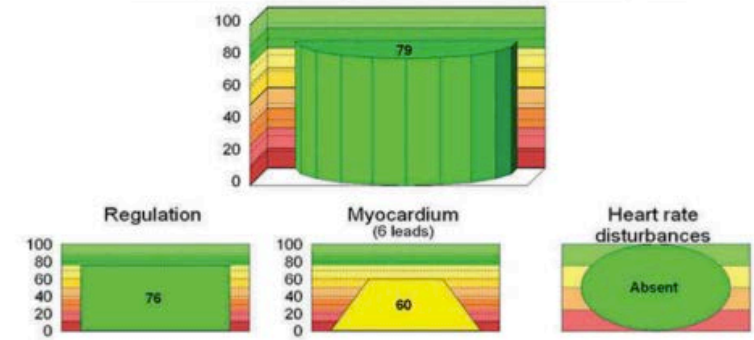


# Innovative Edge

- Automated ECG / HRV analytics.
- More than 300 biomarkers from ECG (Stress, Emotions, Fatigue)
- Personal baseline calculation.
- Prediction scores.



Universal code: Complex indicator of functional state



Heart Rate Variability		
Immediate control of the regulation	80	Normal
HR (bpm)	77	Normal
SDNN (ms)	44	Normal
RMSSD (ms)	27	Slightly reduced
Stress - index	181	Slightly increased
Triangular index	12.5	Normal
PNM50 (%)	5	Moderately reduced
<b>Condition of regulation reserves</b>	<b>72</b>	<b>Mild disorder</b>
Autonomic balance 1 (LF/HF)	5.14	Severe predominance of sympathetic
Autonomic balance 2 (IAE)	281	Normal
General level of bioenergy (TP)	3434	Slightly increased
Activity of vasomotor centers of regulation	23	Normal
Activity of subcortical centers	3	Normal
Entropy	0.51	Normal
Fractal index	0.99	Normal
<b>Integral indicators</b>	<b>83</b>	<b>Normal</b>
Functional state	3	Moderate functional stress
<b>Complex indicator of regulation</b>	<b>76</b>	<b>Normal</b>
State of myocardium (6 leads)		
Immediate control of condition of myocardium	47	Moderate disorder
Integral indicator of ST-T form (lead I)	86	Normal
Integral indicator of ST-T form (lead II)	65	Mild disorder
Integral indicator of ST-T form (lead III)	28	Moderate disorder
Integral indicator of ST-T form (lead AvL)	10	Significant disorder
Integral indicator of ST-T form (lead AvF)	49	Moderate disorder
Index of ECG phases ratio	28	Moderate disorder
<b>Condition of myocardium reserves</b>	<b>74</b>	<b>Mild disorder</b>
Amplitude-areas index (lead I)	62	Mild disorder
Amplitude index (lead II)	62	Mild disorder
Amplitude index (lead III)	85	Normal
Amplitude index (lead AvR)	100	Normal
Amplitude index (lead AvL)	40	Moderate disorder
Amplitude index (lead AvF)	86	Normal
Index of ECG intervals duration	91	Normal
<b>Myocardial Index of stationarity</b>	<b>99</b>	<b>Normal</b>
<b>Advanced ECG analysis (6 leads)</b>	<b>87</b>	<b>Normal</b>
QRS-T angle in the frontal plane	16	Normal
Alpha QRS angle in the frontal plane	78	Vertical position of QRS axis
<b>Complex indicator of condition of myocardium (6 leads)</b>	<b>60</b>	<b>Mild disorder</b>
Heart Rate Disturbances		
Heart Rate Disturbances		Absent
Conclusion		
Universal code: Complex Indicator of FS	79	Normal

# Innovative Edge

- Every IHI Call requires data governance to be aligned with the **European Health Data Space (EHDS)**.
- Data Consent as a Service: Blockchain based sensitive data governance by an NGO.
- Part of EU funded initiatives

**DATA** for **GOOD**  
FOUNDATION



## Certificate of Award

This certificate confirms the award of  
MyData Operator 2023 status to

**DATA for GOOD**  
**Foundation**





# Let's Improve the Life of Heart Disease Patients.

- Partner: Looking for a consortium to join.
- Our offering:
  - Innovative, Scalable and Affordable Tech & Advisory
  - Dissemination & Communication (Synergy exploration & PR)
  - KOL from our network (ESC, AHA), CVD Patient Organizations (Latvia, UK)



**Get in touch!**

Normunds Daudiss | [normunds@daudiss.com](mailto:normunds@daudiss.com)

Connect on  
LinkedIn

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LUXEMBOURG  
INSTITUTE  
OF HEALTH

**Yvan Devaux, PhD, FESC**

**Head, Cardiovascular Research Unit,  
Luxembourg Institute of Health**

Past-chair, EU-CardioRNA COST Action, 250+ members  
Vice-chair, EU-AtheroNET COST Action, 350+ members  
Coordinator, H2020 COVIRNA project, MSCA IFs  
Partner, Horizon Europe HealthyW8, IMI2 Cardiateam

IHI call days  
Pitching session  
Jan 23, 2024

# Luxembourg Institute of Health

- Who: public research center
- Why: improve personalized healthcare
- What: multiple diseases including heart and brain
- How: discovery and validation of novel biomarkers and treatments



# IHI 2024 - Call 7

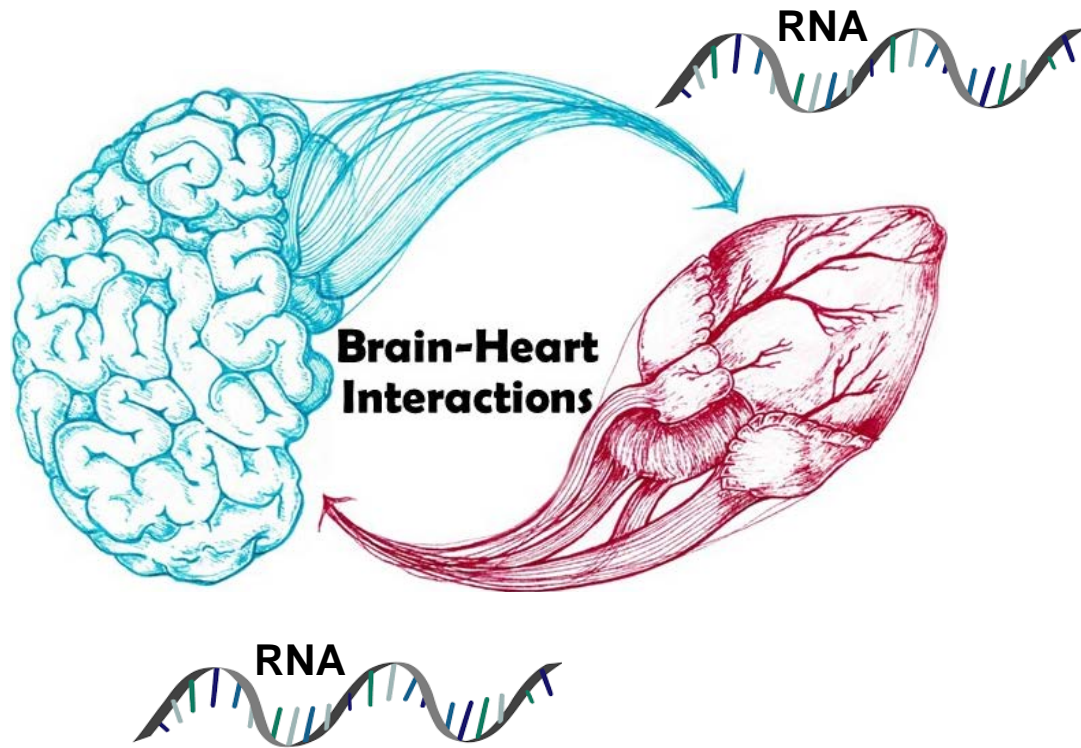


IHI Call Days



- **Topic 1**: Improving clinical management of heart disease from early detection to treatment
- **Topic 3**: Clinical validation of biomarkers for diagnosis, monitoring disease progression and treatment response

Focus



Diagnosis  
(biomarker)

Disease  
monitoring  
(biomarker)

Treatment  
(therapeutic  
target)

Improved  
clinical  
management

Improved  
outcome



**Call 7 topics 1 and 3:** Improving clinical management of heart disease from early detection to treatment; clinical validation of biomarkers for diagnosis, monitoring disease progression and treatment response





# Know-how and techniques

- RNA biomarkers
  - Messenger RNAs, microRNAs, long noncoding RNAs, circular RNAs, RNA modifications
  - Discovery with sequencing
  - Validation with qPCR in large patient cohorts
  - Nanopore sequencing and LC-MS for RNA methylation
- RNA treatments
  - Wet-lab
  - Gain- and loss-of function (siRNAs, gapmeRs, plasmids)
- Bioinformatics and statistics



## Further interests

➤ **Multimodal approaches**

- Blood-based biomarkers
- Imaging data
- Digital data (wearables, smartwatch, smartphone Apps)
- Clinical data

➤ **Multiple types of disease**

- Cardiovascular
- Metabolic
- Inflammatory
- Neurological (Parkinson)
- LongCOVID



# Intellectual property

## ➤ Patents

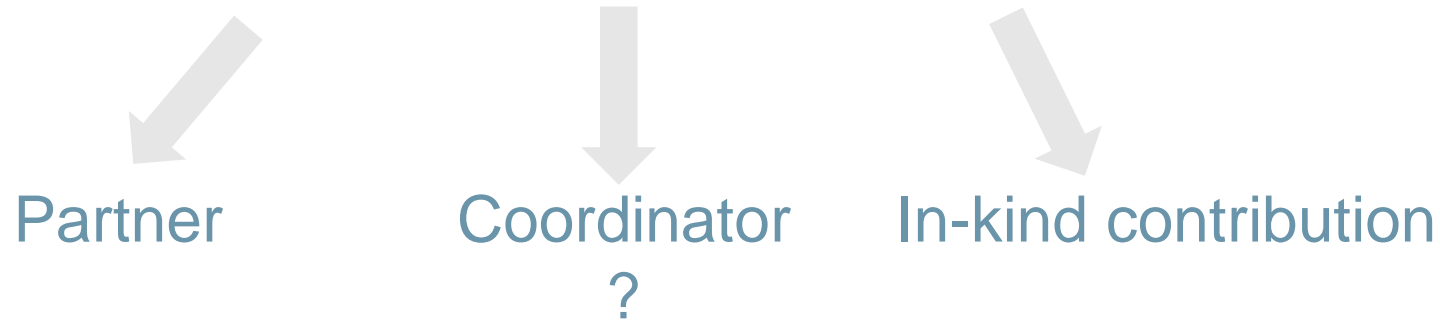
- Compositions and Methods for Evaluating Heart Failure (miRNAs), WO2014083081
- Biomarkers for heart failure (circRNAs), WO2017046203
- Diagnostic, prognostic and therapeutic uses of long noncoding RNAs for pathologies and toxicities inducing heart disorders (lncRNAs), WO2018229046
- Novel circular RNAs biomarkers for heart failure (circRNAs-2), WO2018220185
- Diagnostic methods on renal recovery in individuals suffering from acute kidney injury and suitable biomarkers therefor (miRNAs), WO2021259970

## ➤ Licenses

- Licensing of patent WO2018229046 with a private company: Firalis SA, Huningue, France.
- Licensing of patent WO2021259970 to Heinrich-Heine Universitat Dusseldorf, Germany.

Thank you

## OPEN FOR



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# IHI Call Days | Call 7

- Topic 1: Improving clinical management of heart disease from early detection to treatment

## AI Impact Assessment in Healthcare

Contact person name: Ivett Jakab

Organisation: YAGHMA B.V. (NL)

E-mail: [ij@yaghma.nl](mailto:ij@yaghma.nl)

Link to:

- Marketplace opportunity: [IHI Call Days | Participations \(b2match.io\)](https://b2match.io/IHI-Call-Days-Participations)
- Participant profile: [IHI Call Days | Participations \(b2match.io\)](https://b2match.io/IHI-Call-Days-Participations)

# YAGHMA Challenges and objectives

As artificial intelligence (AI) and digital transformation are getting widely introduced, concerns about their impact on society and environment arise.

To address the concerns of end-users, policy makers and other stakeholders, YAGHMA provides **trustworthy and neutral assessment of the impact of AI/digital health projects.**

```
Q_temp=J temp-S temp; % potentially new minimum
usedeleents=[]; % take already assigned grid points out
investigation_point=zeros (agentsofeachtype,on_max);
t_prepareAgents=cputime-t_kstart;
for i=1:agentsofeachtype
    t_AgentStart=cputime;
    % agent # i
    agentnumber=i;
    i_index=1;
    [~, K minPOS] sort(K temp,'ComparisonMethod','abs');
    element=find(K minPOS(i));
    if isnan(K temp(element find))==0
        while sum(usedeleents==element find)>0
            element=find(K minPOS(i+i_index));
            i_index=i_index+1;
        end
        usedeleents=[usedeleents,element find];
        investigation_point((i-1)*typesofagents+agentnumber,:)=zeros(1,on_max);
        % there is an max dimensions
        for dim=1:on_max
            investigation_point((i-1)*typesofagents+agentnumber,dim)=mod(
                ceil(element find/((grid elm)^(dim-1))), (grid elm)); % there is
                grid elm elements in all dimensions
        end
        investigation_point((i-1)*typesofagents+agentnumber,
            investigation_point((i-1)*typesofagents+agentnumber,:)=0)-grid elm;
    else
        sprintf('there is NaN choice')
    end
    t_agent((i-1)*typesofagents+agentnumber)=cputime-t_AgentStart;
    % agent # i
end
```

# YAGHMA Impact Assessment

YAGHMA strives to understand and describe the **complex changes** that digital health and AI are bringing about for our healthcare system, societies and environment.

We use this knowledge to mindfully **assess, predict and monitor** the broader intentional and non-intentional impact of digital solutions, Artificial Intelligence (AI) systems, innovative policies and other activities that realize the potential of the digital transitions.





# YAGHMA Our healthcare projects



**Horizon Europe LUCIA 2023-2027:**  
'Understanding lung cancer risk factors and their impact assessment'



**Horizon Europe REALM 2023-2027 :**  
'Creating a collaborative evaluation framework of software for medical and healthcare use'

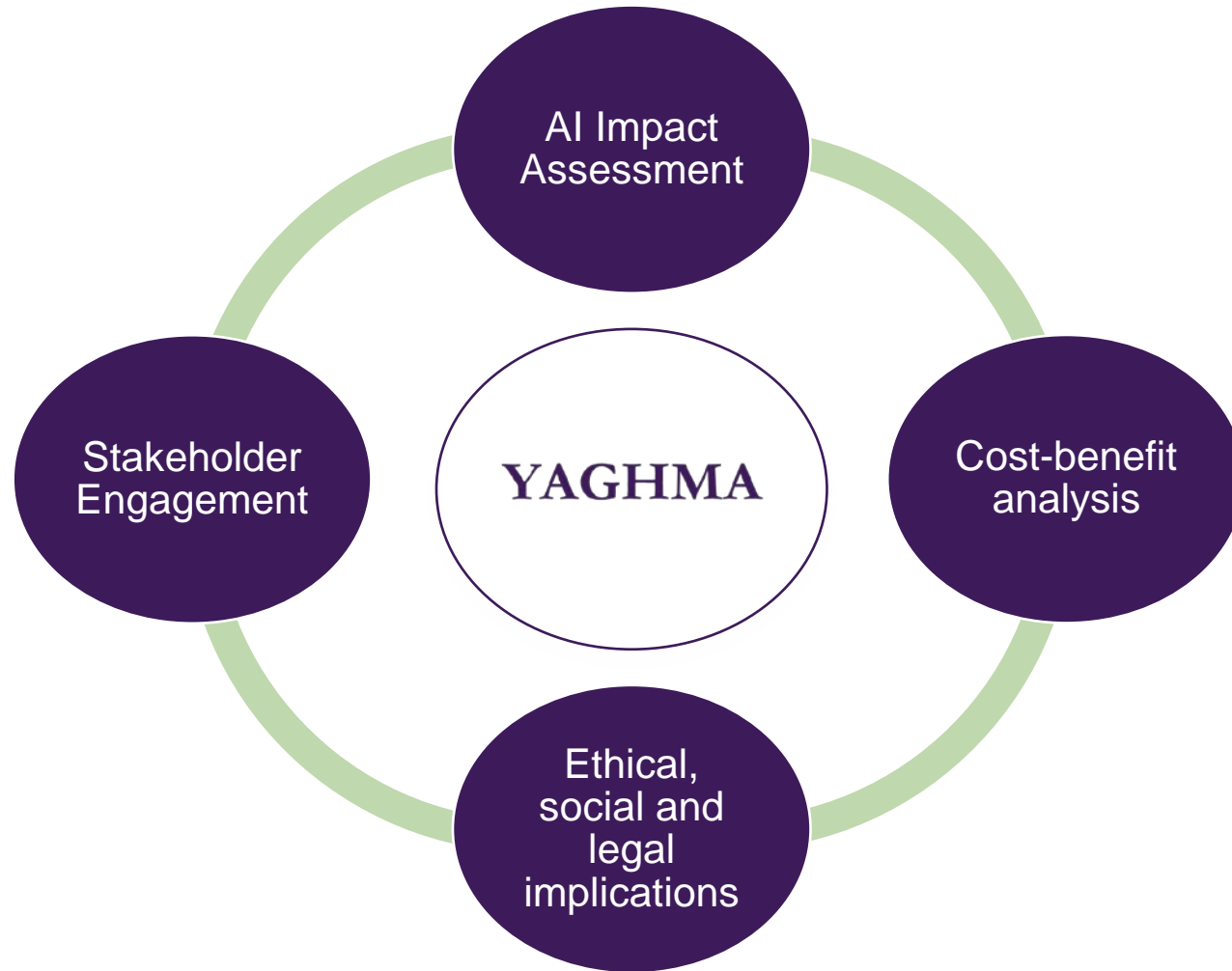
# YAGHMA How YAGHMA helps

In our healthcare-related Horizon Europe projects we

- assess the **ethical, social and legal implications (ELSI)** of new technologies evaluated or developed by the consortium, as well as
- using our AI Impact Assessment Framework
- conducting **cost-benefit analysis** and
- organising **stakeholder engagement** activities.

Health technologies assessed involve **medical devices** (e.g. sensors), **software** for healthcare use (e.g. diagnosis and clinical decision-making support algorithms) and **new policies** (e.g. prevention program with the use of AI).

# How YAGHMA can help your project



# YAGHMA Keep in contact

We are happy to brainstorm about your project idea and how we could add value.

Name: Ivett Jakab

E-mail: [ij@yaghma.nl](mailto:ij@yaghma.nl)

Feel free to email us.



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# IHI Call Days | Call 7

- Improving clinical management of heart disease from early detection to treatment

## Nova Cardio

Contact person name: Pavel Kosyrev

Organisation: Nova

E-mail: [pk@letsnova.com](mailto:pk@letsnova.com)

Link to:

- Marketplace opportunity: <https://ihi-call-days.ihi.b2match.io/participations/320941/opportunities>
- Participant profile: <https://www.linkedin.com/in/pavel-kosyrev-44a79347/>

# Nova Cardio

Nova Cardio is a personal cardiovascular health monitoring device with a mobile app. The device allows a 30-second measurement recording of ECG and PPG, which are then analysed to identify cardiovascular parameters if they are within the norms and generate personalised insights and lifestyle recommendations.



# Challenges and objectives

- 1. Improved Early Detection Rates:** With Nova Cardio, a significant increase in the early detection of cardiovascular anomalies can be expected, leading to timely interventions and reduced complications.
- 2. Enhanced Patient Engagement and Self-Management:** Patients using Nova Cardio can actively participate in their health management, leading to better adherence to treatment and lifestyle modifications.
- 3. Streamlined Healthcare Processes:** Integration of Nova Cardio into existing healthcare systems can streamline workflows, reduce the need for tests, and facilitate quicker decision-making by healthcare professionals.
- 4. Data-Driven Healthcare Decisions:** The wealth of data gathered by Nova Cardio can be used for advanced research in cardiovascular health, leading to more informed and effective treatment strategies.
- 5. Economic Impact:** By reducing the need for frequent hospital visits and advanced interventions through early detection and management, Nova Cardio can contribute to significant cost savings in healthcare.



# Main activities

- 1. Collaborating with Medical Professionals:** Partnering with doctors to develop and adapt cardiovascular treatment protocols and methodologies that maximize the benefits of Nova Cardio for personalized patient care.
- 2. Conducting Joint Research:** Working with academic and research institutions for studies and clinical trials using Nova Cardio's data.
- 3. Engaging Patient Advocacy Groups:** Collaborating with groups to educate and raise public awareness about heart health and Nova Cardio.
- 4. Developing Training Programs:** Creating comprehensive training for healthcare professionals on the use of Nova Cardio.
- 5. Policy Advocacy and Engagement:** Working with policymakers and regulatory bodies to advocate for the adoption of advanced monitoring devices in healthcare.
- 6. Implementing Data Sharing Protocols:** Establishing secure data sharing and privacy compliance mechanisms.
- 7. Launching Community Health Initiatives:** Starting community programs for heart disease awareness, prevention, and screenings using Nova Cardio.
- 8. Conducting Economic Evaluations:** Performing cost-benefit analyses to demonstrate the economic impact of implementing Nova Cardio in healthcare systems.

# Expertise and resources offered

- **Cardiovascular Health Medical Team Expertise:** A strong foundation in cardiovascular medicine, with a team of medical experts specializing in cardiology.
- **Biomedical Engineering and Device Development:** Proficiency in developing and refining health monitoring devices, specifically in the areas of ECG and PPG technologies, demonstrating a deep understanding of the technical aspects of cardiovascular health monitoring tools.
- **Data Analysis and Software Development:** Expertise in handling, analyzing, and interpreting complex health data, coupled with the development of user-friendly software solutions, such as the mobile app associated with Nova Cardio, that facilitate easy access and understanding of health metrics for both patients and healthcare providers.
- **Device Manufacturing:** We are ready to provide as many devices as needed for the purposes of achieving the expected outcomes of the given call.

# Expertise requested

- 1. Pharmaceutical / Biotech / Medical Device Companies:** Large corporations for potential collaborations in comprehensive health solutions, including medication adherence monitoring in relation to cardiovascular health.
- 2. Cardiovascular Research Centers:** Academic or independent institutions specializing in cardiovascular research, for collaboration on clinical trials, data analysis, and advanced research projects.
- 3. Healthcare Providers and Networks:** Hospitals, clinics, and health networks for piloting Nova Cardio in clinical settings, providing real-world feedback, and integrating the device into standard care protocols.
- 4. Regulatory and Compliance Experts:** Specialists in healthcare regulations and compliance, to navigate the evolving regulatory landscape and ensure continuous compliance of Nova Cardio.

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# IHI Call Days | Call 7

- **Topic 1:** Improving clinical management of heart disease from early detection to treatment.

## Immunoassay platforms for diagnostics

**Kotimaa Juha**

Senior Scientist

VTT Technical Research Centre of Finland Ltd

[juha.kotimaa@vtt.fi](mailto:juha.kotimaa@vtt.fi)

<https://www.vttresearch.com/en>

Link to:

- <https://ihi-call-days.ihi.b2match.io/participations/207884/opportunities>
- <https://ihi-call-days.ihi.b2match.io/participations/207884>



# Challenges and objectives

- **VTT Technical Research Centre of Finland Ltd** provides research and innovation services and information for domestic and international customers and partners, both in private and public sectors.
- **Challenge:** Development of biomarkers towards clinical and patient centric diagnostics requires multidisciplinary approaches from assay development to sensing technologies and manufacturing
- **Solution:** VTT offers a pipeline for developing patient-centric diagnostics with assay and detection technology development with manufacturing capability for pre-commercial product validation.

**VTT** Discovery & Development



**VTT** Assay Platforms



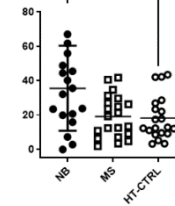
**VTT** Manufacturing



Analytical and Clinical validation



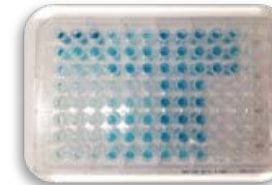
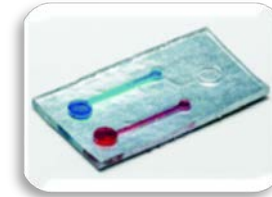
Qualification



# Main activities

VTT Biosensors provide comprehensive pipeline for diagnostics applications for the clinic and point-of-care:

- **Antibody discovery**
  - Conventional (protein antigens)
  - Proprietary technology for non-conventional targets (drugs, toxins, hormones)
- **Assay platforms**
  - Conventional immunoassays, homogenous/single step immunocomplex assays
  - Lateral flow assays, microfluidics, multiplexed protein & antibody microarrays
- **Detection methodologies and their development**
  - SPR, colorimetric, luminescence, fluorescence, FRET, electrochemical
- **Manufacturing**
  - Recombinant proteins
  - Integrated microfluidics, lateral flow assays
  - Diagnostics platforms and wearables



# Expertise and resources offered

- ISO9001:2015 framework
- Multidisciplinary research organization with focus on customer and partner success
- Proprietary and cutting edge technologies
- VTT biosensors is part of
  - **MedPhab** (<https://medphab.eu/>) and **PrintoCent** (<https://www.printocent.net/>) consortiums, network of +50 companies from start-ups to SMEs, larger companies and research institutes

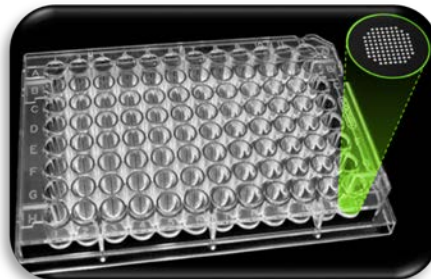
Heterologous protein manufacturing



Device and sensor technology



Sensor platform development



Integrated microfluidics



Roll-to-roll printing



 **PrintoCent**

 **innovative  
health  
initiative**



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# IHI Call Days | Call 7

● Topic 1: Improving clinical management of heart disease from early detection to treatment

## Responsible AI and Advanced Digital Tools for Heart Disease management

Contact person name: **Jordanis Koutsopoulos**

Organisation: **Athens University of Economics and Business / Department of Informatics**

E-mail: **[jordan@aueb.gr](mailto:jordan@aueb.gr)**

Link to:

- Marketplace opportunity: <https://ihi-call-days.ihi.b2match.io/participations/323834/opportunities>
- Participant profile: <https://ihi-call-days.ihi.b2match.io/participations/323834>



# Challenges and objectives

- Call 7 – Topic 1
- Heart disease management: different phases
  - Early detection
  - Diagnosis
  - Treatment progress monitoring
  - Disease management
- Unique challenges
  - Multi-scale & multi-modal data
  - Streaming data
  - Continual monitoring → need for model adaptation
  - Need for interpretability of AI results
  - Need for multi-scale representation of cardiac functionalities

## Threads

- Responsible AI
- 83 ● Learning from diverse and sparse data
- Digital Twins

# Main activities and expertise (1)

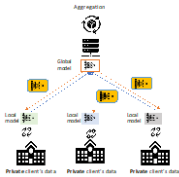
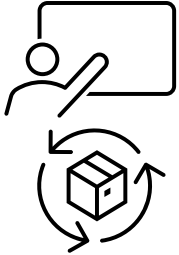
- THREAD 1: Responsible AI

- **Explainable AI** → satisfy “right to explanation”

- **Continual Learning** → learn from continually evolving data, streaming data: Machine Learning model adaptation

- **Federated Learning** → train AI models out of distributed data, without data leaving their location, adhere to privacy preservation

- **Personalization**



# Main activities and expertise

- THREAD 2: Learning from diverse DATA
  - **Multi-modal AI**: images, sound, medical records, genetics,...
  - Learning from Human Feedback
    - **Reinforcement Learning from Human Feedback (RLHF)**
  - **Generative AI, Self-supervised Learning** → data augmentation to overcome data scarcity
- THREAD 3: Digital Twins
  - **Digital Twin & AI integration** → representation of cardiac function at different levels/scales
  - **Digital Twin & LLM integration** → advanced forms of personal digital assistants

# Expertise and resources offered

- Research Group from **Athens University of Economics and Business**, Department of Informatics
- Verticals: Health, Energy, Wireless networks, Security/Forensics, Agriculture
- Coordinator of PRE-ACT HE project: <https://preact-horizoneurope.eu/> (Prediction of Radiotherapy side effects for cancer patients using XAI)
- **Seek to join consortia under formation on topics above to contribute ideas and aid in proposal writing**
- Also interested in Call 6/Topic 2 (recommendations from real data) and Call 7/Topic 3 (biomarkers)
- E-mail: [jordan@aueb.gr](mailto:jordan@aueb.gr)
- **If you are bringing in-kind contributions (IKOP\* and IKAA\*\* for Private members, cash or in-kind contributions for Contributing Partners), state it clearly. - NO**

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# IHI Call Days | Call 7

*Improving clinical management of heart disease  
from early detection to treatment*

## **GenoCardia: Integrative Management Platform for Genetically Predisposed Cardiovascular Conditions**

Contact person: Miroslaw Kwasniewski

Organisation: IMAGENE.ME

E-mail: [miroslaw.kwasniewski@imagene.me](mailto:miroslaw.kwasniewski@imagene.me)

<https://ihi-call-days.ihi.b2match.io/participations/325454/opportunities>

<https://ihi-call-days.ihi.b2match.io/participations/325454>



# Challenges and objectives

**GenoCardia addresses several key challenges in managing genetically predisposed cardiovascular conditions:**

- ❖ **Early identification and characterization:** Utilizing genome sequencing for proactive detection and detailed analysis of cardiovascular risks.
- ❖ **Integrated data for personalized patient management:** Combining genetic, biomedical, and behavioral data for comprehensive, tailored patient management.
- ❖ **Enhanced patient care:** Focusing on precision care and lifestyle interventions, aligned with individual genetic profiles to improve quality of life.

## **Expected Impact:**

- ✓ **Patients:** Better outcomes through early detection and customized health strategies.
- ✓ **Healthcare systems:** Reduced advanced cardiovascular complications, easing healthcare burdens.
- ✓ **Research:** Patient data enhances understanding of genetic heart diseases, aiding in new treatment development.
- ✓ **Communities:** Healthier populations through effective management of genetic risks, prevention, and education.

# Main activities

CONNECTED SERVICES  
and EXTERNAL DATA  
COLLECTION

DATA ANALYSIS  
and INTEGRATION

DNA SEQUENCING

PATIENT NAVIGATION  
and SUPPORT

TELECONSULTATIONS  
and CLINICAL SUPPORT

The planned project is founded upon the enhancement of the **IMAGENE.ME LIFE Platform**, which serves as the core framework for our innovative approach to personalized healthcare management

## Technology integration and collaborative partnerships:

- Integrating wearable tech for patient monitoring and telemedicine for accessible care.
- Partnering with research, pharma and digital health firms to align treatments with genetic profiles.
- Strengthening the platform's infrastructure to enhance data security, robustness and compliance with current regulatory and ethical standards.

## Patient-centric approach:

- Emphasizing patient education and active community engagement to better understand patient needs.
- Integrating patient feedback into the platform to facilitate continuous improvement.

## Outcome-oriented research:

Implementing clinical trials to validate the effectiveness of new treatments and the platform itself.  
Utilizing data analytics to make evidence-based enhancements to the platform and its services.

**IMAGENE.ME LIFE Platform**

# Expertise and resources offered

## Advanced genetic analysis and data interpretation:

Extensive expertise in advanced genetic analysis, particularly in whole genome and exome sequencing, complemented by certified diagnostic procedures.

## Highly specialized team:

Comprising over 30 experts skilled in integrating complex biomedical and behavioral data, our team includes biotechnologists, bioinformaticians, data analysts, IT developers, diagnosticians, and clinical geneticists.

## Digital Health solutions development:

IMAGENE.ME has a strong background in developing digital health solutions including IMAGENE.ME *LIFE* Personal Genomics Platform.

## Personalized medicine and patient care:

The team's expertise extends to personalized medicine, focusing on customizing prevention strategies and guiding patients based on their genetic and biomedical profiles.

## Collaboration and partnership building:

IMAGENE.ME excels in establishing key collaborations with healthcare providers, academic researchers, tech firms, and advocacy groups, including **cardiology teams at Medical University of Bialystok and Medical University of Warsaw**, and a strategic partnership with DIAGNOSTYKA, Poland's leading diagnostic service provider within joint Longevity+ initiative.



MEDICAL UNIVERSITY  
OF BIALYSTOK

WARSZAWSKI UNIWERSYTET MEDYCZNY



Diagnostyka+



# Expertise requested

## GenoCardia project partner profiles

### SMEs:

- **Digital Health tech:** Health apps, patient management, telemedicine.
- **Biotech:** Advanced testing technologies.
- **Data security:** Cybersecurity and regulatory compliance.

### Large companies:

- **Pharmaceuticals:** Drug development for cardiovascular treatments.
- **Medical devices:** Wearable health monitors, diagnostic tools.
- **Healthcare IT:** EHR systems, AI in healthcare analytics.

### Research Institutes:

- **Cardiovascular research:** Disease and treatment research.
- **Public health:** Population health studies, preventive medicine.

### Other Partners:

- **Healthcare providers:** Clinical trials, data collection.
- **Patient advocacy groups:** Community outreach, patient support.
- **Regulatory experts:** Compliance, ethics, privacy.
- **Lifestyle experts:** Nutrition, exercise, mental health programs.

# Pitching Session

Today 23 January 2024, 14:30 – 16:00 Brussels time

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13	Miroslaw	KWASNIEWSKI	CEO	Imagene.Me	GenoCardia: Integrative Management Platform for Genetically Predisposed Cardiovascular Conditions
14	Lokman	LIV	Researcher/Head of Electrochemistry Laboratory	Tubitak	Producing Electrochemical (Bio)sensors and a Voltammetry Instrument
15	Grégoire	MERCIER	Cofounder	Kanopymed	PREDIC: AI-powered clinical decision making to prevent hospitalizations in patients with chronic heart failure
16	Pedro	MORENO-SANCHEZ	Postdoctoral Research Fellow	Tampere University	Trustworthy AI for cardiovascular diseases detection
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# IHI Call Days | Call 7

● **Topic 1:** Improving clinical management of heart disease from early detection to treatment

**Topic 3:** Clinical validation of biomarkers for diagnosis, monitoring disease progression and treatment response

## *Producing Electrochemical (Bio)sensors and a Voltammetry Instrument*

Contact person name: Lokman LIV

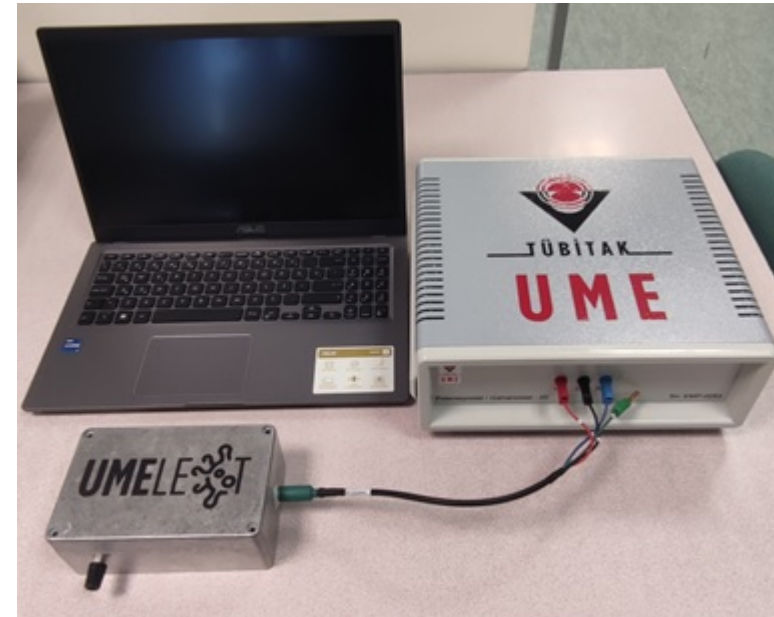
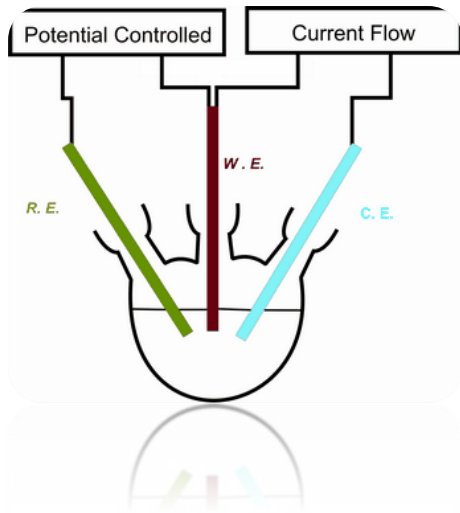
Organisation: TÜBİTAK NATIONAL METROLOGY INSTITUTE (TÜBİTAK UME)

E-mail: lokman.liv@tubitak.gov.tr

<https://ihi-call-days.ihi.b2match.io/participations/192907>

<https://ihi-call-days.ihi.b2match.io/participations/192907/opportunities>

# Introduction



Voltage + Ampere + Metry

Voltammetry

Briefly, **voltammetry** can be defined as an electrochemical technique in which the current is measured against the applied voltage.

# Expertise and resources offered

Biosensors and Bioelectronics 192 (2021) 113497

Contents lists available at ScienceDirect

Biosensors and Bioelectronics

journal homepage: [www.elsevier.com/locate/bios](http://www.elsevier.com/locate/bios)



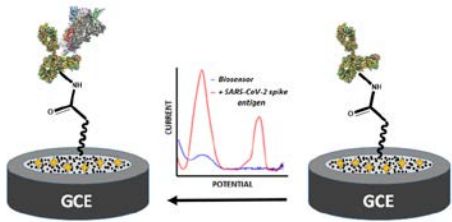
A rapid, ultrasensitive voltammetric biosensor for determining SARS-CoV-2 spike protein in real samples

Lokman Liv<sup>a,\*</sup>, Gizem Çoban<sup>a</sup>, Nuri Nakiboğlu<sup>b</sup>, Tanıl Kocagöz<sup>c</sup>

<sup>a</sup> Electrochemistry Laboratory, Chemistry Group, The Scientific and Technological Research Council of Turkey, National Metrology Institute, (TUBITAK ÜME), 41470 Gebze, Kocaeli, Turkey

<sup>b</sup> Department of Chemistry, Faculty of Arts and Sciences, Balıkesir University, 10145, Balıkesir, Turkey

<sup>c</sup> Department of Medical Microbiology and Medical Biotechnology, Açıbaden University, 34752, İstanbul, Turkey



Diamond & Related Materials 132 (2023) 109622

Contents lists available at ScienceDirect

Diamond & Related Materials

journal homepage: [www.elsevier.com/locate/diamond](http://www.elsevier.com/locate/diamond)



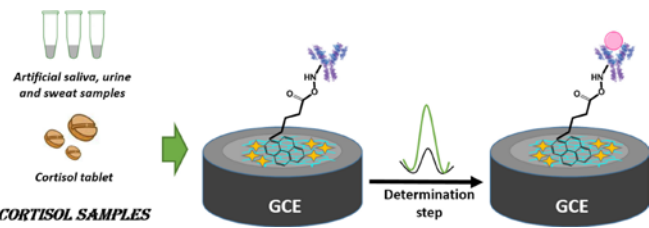
Electrochemical biosensing of cortisol in a hormone tablet and artificial bodily fluids

Nursel Olgaç<sup>a,b</sup>, Erman Karakuş<sup>c</sup>, Yücel Şahin<sup>b,c</sup>, Lokman Liv<sup>a,\*</sup>

<sup>a</sup> Electrochemistry Laboratory, Chemistry Group, The Scientific and Technological Research Council of Turkey, National Metrology Institute, (TUBITAK ÜME), 41470 Gebze, Kocaeli, Turkey

<sup>b</sup> Yildiz Technical University, Faculty of Arts and Science, Department of Chemistry, 34210 İstanbul, Turkey

<sup>c</sup> Organic Chemistry Laboratory, Chemistry Group, The Scientific and Technological Research Council of Turkey, National Metrology Institute, (TUBITAK ÜME), 41470 Gebze, Kocaeli, Turkey



CORTISOL SAMPLES

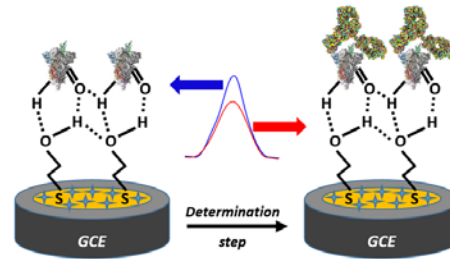
Analytical and Bioanalytical Chemistry  
https://doi.org/10.1007/s00216-021-03752-3

RESEARCH PAPER

Electrochemical biosensing platform based on hydrogen bonding for detection of the SARS-CoV-2 spike antibody

Lokman Liv<sup>1</sup> · Mellsa Yener<sup>1</sup> · Gizem Çoban<sup>1</sup> · Şevval Arzu Can<sup>1</sup>

Received: 1 October 2021 / Revised: 19 October 2021 / Accepted: 25 October 2021  
© Springer-Verlag GmbH Germany, part of Springer Nature 2021



Microchemical Journal 195 (2023) 109425

Contents lists available at ScienceDirect

Microchemical Journal

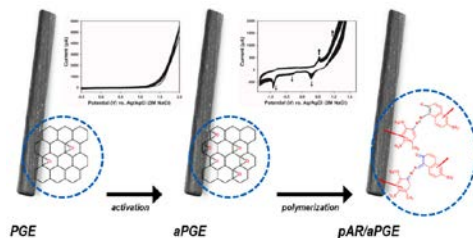
journal homepage: [www.elsevier.com/locate/microc](http://www.elsevier.com/locate/microc)



A facile poly(allura red) film for signal-amplified electrochemical sensing of dopamine and uric acid in human plasma and urine

Lokman Liv

Electrochemistry Laboratory, Chemistry Group, The Scientific and Technological Research Council of Turkey, National Metrology Institute, (TUBITAK ÜME), 41470 Gebze, Kocaeli, Turkey



Analyst

PAPER

ROYAL SOCIETY OF CHEMISTRY

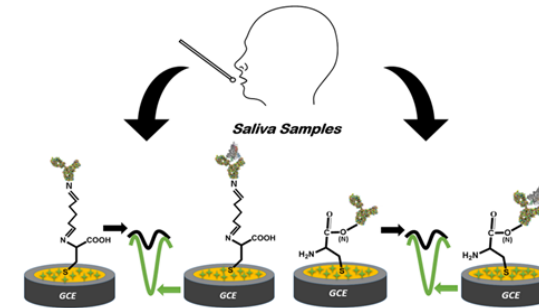
View Article Online  
View Journal

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Cite this: DOI: 10.1039/d2an01225a

Development and characterisation of cysteine-based gold electrodes for the electrochemical biosensing of the SARS-CoV-2 spike antigen†

Nursel Olgaç,<sup>a,b</sup> Yücel Şahin<sup>a,b</sup> and Lokman Liv<sup>a,\*</sup>



Microchemical Journal 197 (2024) 109784

Contents lists available at ScienceDirect

Microchemical Journal

journal homepage: [www.elsevier.com/locate/microc](http://www.elsevier.com/locate/microc)

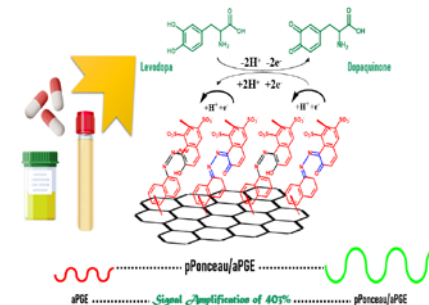


Ponceau polymer film for electrocatalytic sensing of levodopa in human serum, urine, and pharmaceutical formulation

Lokman Liv<sup>a,\*</sup>, Zeynep Demirel<sup>a,b</sup>

<sup>a</sup> Electrochemistry Laboratory, Chemistry Group, The Scientific and Technological Research Council of Turkey, National Metrology Institute, (TUBITAK ÜME), 41470 Gebze, Kocaeli, Turkey

<sup>b</sup> Kocaeli University, Faculty of Engineering, Department of Chemical Engineering, 41380 İzmit, Kocaeli, Turkey



aPGE ..... Signal Amplification of 405% ..... pPonceau/pPGE

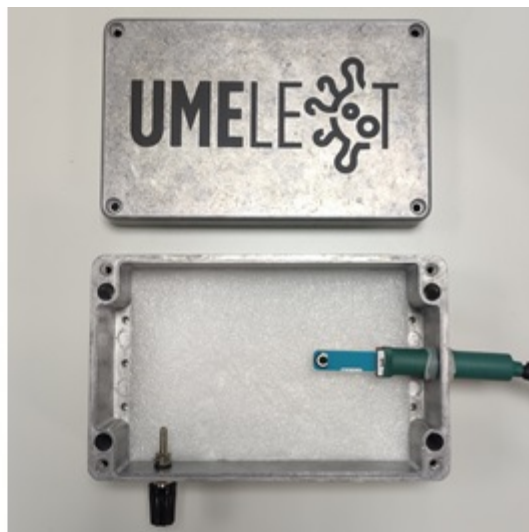
innovative health initiative



# Expertise and resources offered

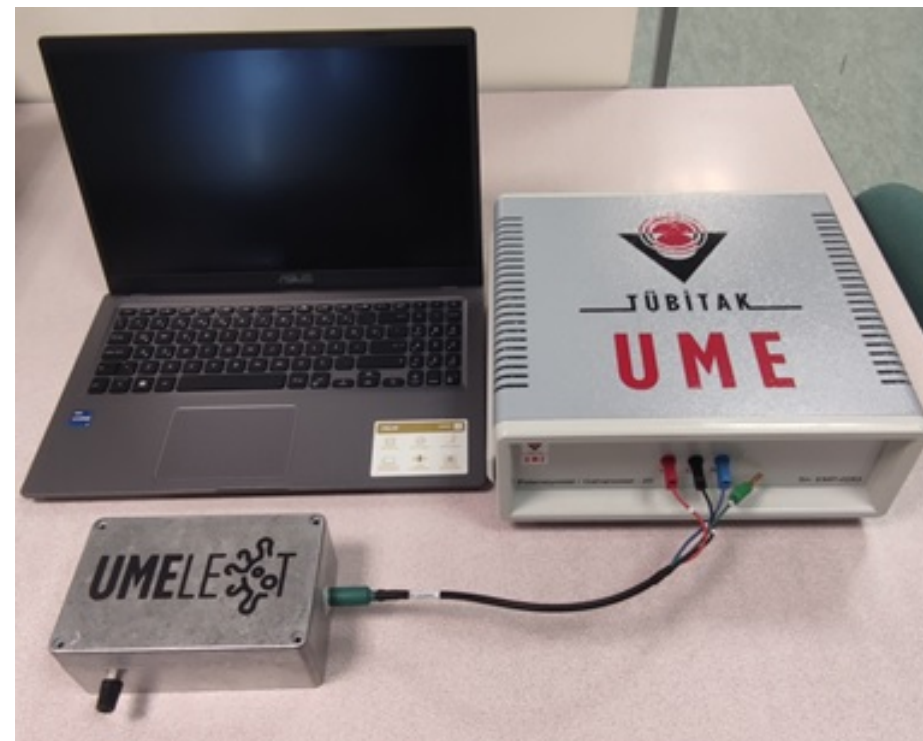


*Device Front-Panel*



*Sensor Supporting Material  
(3.4 x 1.0 x 0.05 cm)*

*Faraday Cage*



*PC Controlled Voltammetry  
Instrument*



*Sensor & Device Connection  
Cable*

# Expertise and resources offered

*I think this is something worth mentioning...*



Talanta  
Volume 253, 1 February 2023, 124009



## The critical experimental aspects for developing pathogen electrochemical biosensors: A lesson during the COVID-19 pandemic

Chen Ma <sup>a</sup>, Dingnan Lu <sup>a, b</sup>, Huihui Gan <sup>a</sup>, Zhiyuan Yao <sup>a</sup>, David Z. Zhu <sup>a, c</sup>, Jiayue Luo <sup>a, b</sup>, Qiang Fu <sup>d</sup>, Pradeep Kurup <sup>b</sup>

<sup>a</sup> Department of Civil and Environmental Engineering, Ningbo University, Zhejiang, China

<sup>b</sup> Department of Civil and Environmental Engineering, University of Massachusetts Lowell, One University Ave., Lowell, MA, 01854, USA

<sup>c</sup> Department of Civil and Environmental Engineering, University of Alberta, Edmonton, AB, T6G 1H9, Canada

<sup>d</sup> Department of Biomedical Engineering and Biotechnology, University of Massachusetts Lowell, One University Ave., Lowell, MA, 01854, USA

Received 27 June 2022, Revised 6 October 2022, Accepted 11 October 2022, Available online 14 October 2022, Version of Record 24 October 2022.



‘It should be mentioned that as one of the most active research teams, ***Dr. Lokman Liv*** and his co-workers have consecutively reported the remarkably stable performance of using the argon atmosphere to preserve the sensitivity of biosensors [44,47,63,64], which allows them to be stored for a long-term at room temperature (i.e., 25 °C) or even at higher summer temperature (i.e., 37 °C).’

# Expertise requested

- Regarding Topic 1 and Topic 3:
- If a sensor system similar to the antigen-antibody interaction is to be designed, research institutes/hospitals that can provide analyte-specific materials will be useful. For example, if a specific protein of a virus is to be determined, materials such as peptides and antibodies specific to it must be provided. Then, we can design a sensor by immobilizing them onto the electrode surface.
- Hospitals that will provide real samples for analysis will be helpful.
- Research institutes experienced in actual sample processing (deprotenation, removal of unwanted non-analyte substances, etc.) will be very beneficial.



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**Liv Research Group - @livresearchgroup**



Focus to the future with metrology



TÜBİTAK NATIONAL METROLOGY INSTITUTE

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# Pitching Session

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11	Juha	KOTIMAA	Senior Scientist	Vtt Technical Research Centre of Finland Ltd	Immunoassay platforms for diagnostics
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# IHI Call Days | Call 7

- topic 1: Improving clinical management of heart disease from early detection to treatment.

## **PREDIC: AI-powered clinical decision making to prevent hospitalizations in patients with chronic heart failure**

Contact person name: Dr Gregoire MERCIER

Organisation: KanopyMed

E-mail: [gmercier@kanopymed.com](mailto:gmercier@kanopymed.com)

Link to:

- Marketplace opportunity: <https://ihi-call-days.ihi.b2match.io/participations/322525/opportunities>
- Participant profile: <https://ihi-call-days.ihi.b2match.io/my>

# Challenges and objectives

- **Pain points:**

- Chronic Heart Failure is the leading cause of unplanned hospital admission in Europe;
- 1 in 5 patient is readmitted 90 days after discharge;
- Personalizing post-discharge pathway to the readmission risk is promising, but lack of actionable data prevents generalization.

- **Objectives:**

- To define personalized patients' pathways according to the readmission risk;
- To implement PREDIC, an AI-powered clinical decision support tool in several hospitals;
- To conduct a randomized controlled trial to assess the impact of the PREDIC-based strategy.

- **Impacts:**

- Patients will benefit from personalized post-discharge pathways;
- PREDIC will be adapted to several countries and settings;
- Demonstration of a triple impact: clinical, organizational, and economic (incl. improved QoL, medical time saving, reduced readmission rate and length of stay).



# Main activities

- **WP1: Coordination** and dissemination
  - **WP2: Adaptation of PREDIC** to other countries and setting in a European interoperability framework (OMOP)
  - **WP3:** Definition of several **patients' post-discharge pathways** tailored to the admission risk, in close collaboration with health care professionals and patient's representatives
  - **WP3:** RCT
  - **WP4:** Assessment of the **clinical, organizational, and economic impact** of PREDIC
- Describe the main activities of your proposed project / proposal

# Expertise and resources offered

- **Partners:**
  - **Company:** KanopyMed, development and validation of AI-powered decision support tools;
  - Several French **public and private hospitals** willing to participate in the RCT;
  - A **CRO** specialized in digital health;
  - A **Scientific Advisory Board**
- **In-kind contribution (IKOP): PREDIC, a clinically validated AI-powered decision support tool**

# Expertise requested

- **Hospitals** in other countries willing to participate in the RCT;
- **Research institutes** with a focus on the assessment of the clinical, organizational, and economic impact of digital medical devices;
- **Companies** developing interoperability and integration platforms/tools dedicated to the hospital data ecosystem.



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# IHI Call Days | Call 7

● Topic 1: Improving clinical management of heart disease from early detection to treatment

## Trustworthy AI for cardiovascular diseases detection

Contact person name: Pedro A. Moreno-Sánchez

Organisation: Tampere University

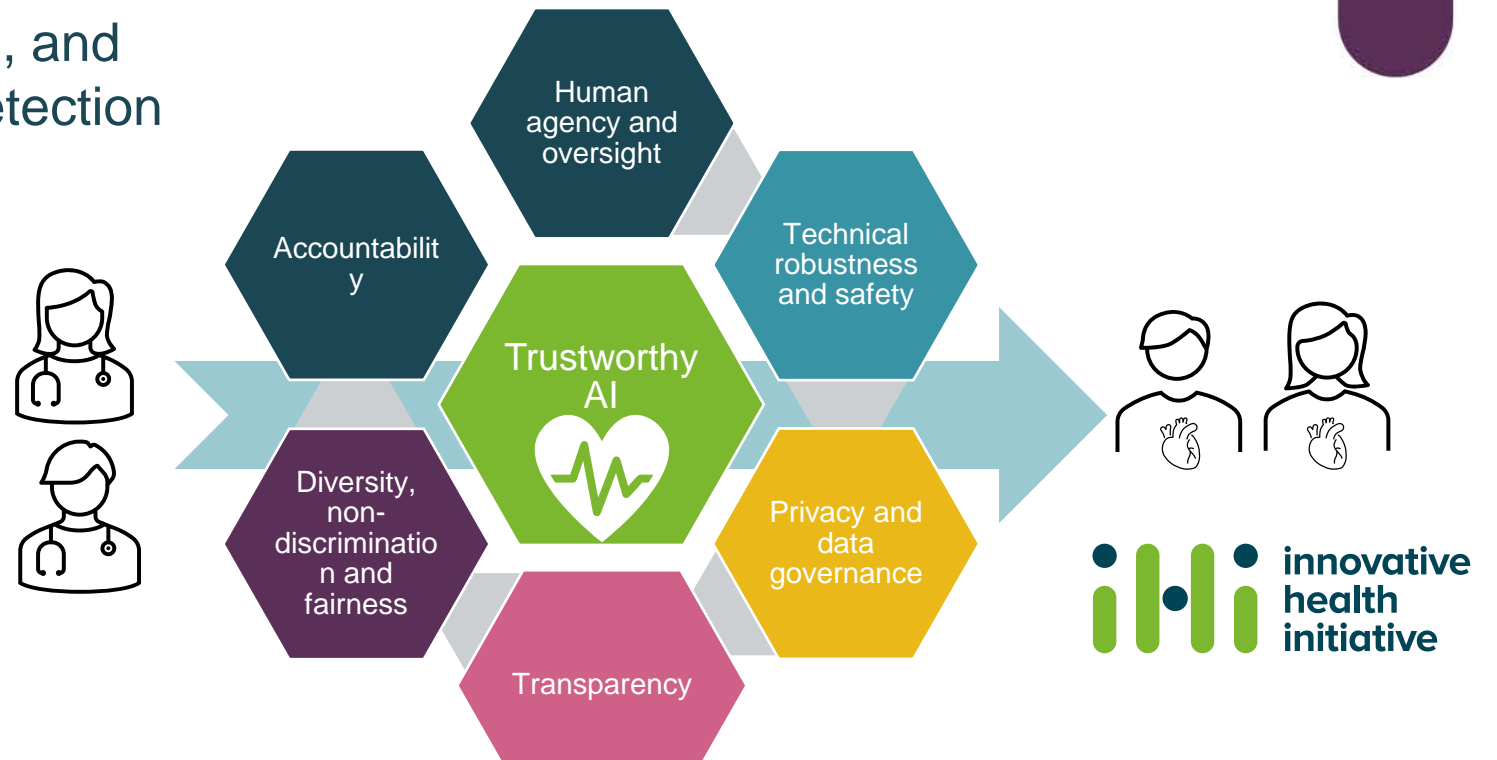
E-mail: [pedro.morenosanchez@tuni.fi](mailto:pedro.morenosanchez@tuni.fi)

Link to:

- Marketplace opportunity: <https://ihi-call-days.ihi.b2match.io/marketplace/opportunities/UGFydGljaXBhdGlvbk9wcG9ydHVuaXR5Ojg5MDI4>
- Participant profile: <https://ihi-call-days.ihi.b2match.io/participations/193750>

# Challenges and objectives

- AI as a driver for diagnosing, prediction and treatment of cardiovascular diseases (CVD) through clinical data, biosignals (ECG) or medical images.
- Complex AI models (deep learning, ensembles) have a black-box behavior that impacts on AI systems adoption by healthcare professionals and patients.
- **Objective:** To design, develop, and evaluate AI models for CVD detection compliant with Trustworthy AI requirements.



# Main activities

- Addressing explainability and transparency in CVD prediction models.
- Ensuring bias avoidance and non-discrimination in data collection and data handling procedures.
- Promoting human-in-the-loop approaches for oversight of CVD prediction model performance.
- Assessment of Trustworthy AI requirements throughout the whole project life-cycle considering user engagement.
- Discovering of new data-driven biomarkers for diagnosis and prognosis of CVD.
- Multilevel stratification for CVD management and prediction
- Federated learning architectures to ensure privacy and data governance during training and testing of the models
- Offering edge-computing approaches to improve the accessibility of CVD prediction models for end-users (healthcare professionals and patients)

# Expertise and resources offered to consortium/coordinator



- Decision Support for Health research group
  - Trustworthy AI for Healthcare Lab
  - European projects:
    - *PerCard*: Personalised Prognostics and Diagnostics for Improved Decision Support in Cardiovascular Diseases
    - *SMASH-HCM*: Stratification, Management, and Guidance of Hypertrophic Cardiomyopathy Patients using Hybrid Digital Twin Solutions



- Digital Health platform
  - BioSignals Lab
  - Big Data Lab, Deep Learning Lab
  - European projects:
    - *COMPASS-NMD*: Federated AI Models for new patients stratification strategies of neuromuscular disorders.

- Valuable and strong connections with academic/industrial/clinical partners in CVD field and healthcare providers of our region (Finland and Spain).
- No in-kind contributions.





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# IHI Call Days | Call 7

## Heart disease Horus ML



Contact person name: Jesús Prada Alonso

Organisation: Horus ML

E-mail: [jesus.prada@horusml.com](mailto:jesus.prada@horusml.com)

Link to:

- <https://ihi-call-days.ihi.b2match.io/marketplace/opportunities/UGFydGIjaXBhdGlvbk9wcG9ydHVuaXR5Ojg4ODA3>
- <https://ihi-call-days.ihi.b2match.io/participations/322750>

# Challenges and objectives

- **Horus ML** arises **seeking to respond to the need of** companies specialized on **Artificial Intelligence and Machine Learning in the health** sector.
- We are a company dedicated to creating **personalized products** based on a **collaborative workflow with our clinical partners**.
- Our main focus is on projects with a high **R+D+i** component **in the clinical-care field**, including cardiology.



# Expertise and resources offered

- Horus Atero: Early **detection** of **atherosclerosis** in **primary care** by applying **Deep Learning** models to echocardiograms and **retinography** images.
- Horus Echonet: A product based on **Deep Learning** techniques for automatic **echocardiogram analysis and calculation of LVEF**.
- Horus CardioMonitor: **Remote monitoring** of patients with **heart failure** based on **IoT** and **Machine Learning**, including Large Language Models, **LLM**, **agents**.



# Expertise requested

- **We have developed** several **AI-based solutions** regarding detection, monitoring and treatment of **heart diseases**.
- **Looking for a consortium** where we could contribute with these or other AI-based solutions.



# Pitching Session

Today 23 January 2024, 14:30 – 16:00 Brussels time

Number	First Name	Last Name	Job Position	Organization	Title of the Presentation
1	Sanne	NAUTS	Senior Scientist	Philips	Diagnostic imaging and monitoring of Common Cardiac Diseases
2	Christelle	SAINT SARDOS	Sr Director Government Affairs and Access Policy	Edwards Lifesciences	Heart Clinical Pathway Enhancement in Europe
3	Raquel	CUNHA	Clinical Project Manager	Clinical Academic Center - Braga (2ca-Braga)	Revolutionizing clinical management: Smart skin patches for long-term and minimally invasive monitoring of patients at risk of heart failure
4	Jonas	MARCELLO	Head Of Department	Fraunhofer IESE	Radar based heart monitoring
5	Francoise	CHARBIT	Health Programme Manager	Cea	Non-invasive and personalised monitoring of physiological and biochemical parameters
6	Melike	ÇOLAK	Machine Learning Engineer	Bites	Presenting Artificial Intelligence Expertise in Heart Disease Diagnosis
7	Normunds	DAUDISS	Innovation & Partnerships	Health Tech Innovations   Nd Group	Scalable & Customisable Remote Care Platform for Heart Disease
8	Yvan	DEVAUX	Head of Cardiovascular Research Unit	Luxembourg Institute of Health	Improving clinical management of heart disease from early detection to treatment
9	Ivett	JAKAB	Research Project Manager	Yaghma B.V.	AI Impact Assessment in healthcare
10	Pavel	KOSYREV	CEO	Nova Group Global 1969 Slu	Nova Cardio
11	Juha	KOTIMAA	Senior Scientist	Vtt Technical Research Centre of Finland Ltd	Immunoassay platforms for diagnostics
12	Iordanis	KOUTSOPOULOS	Professor	Athens University of Economics And Business	Responsible AI and Advanced Digital Tools for Heart Disease management
13	Miroslaw	KWASNIEWSKI	CEO	Imagene.Me	GenoCardia: Integrative Management Platform for Genetically Predisposed Cardiovascular Conditions
14	Lokman	LIV	Researcher/Head of Electrochemistry Laboratory	Tubitak	Producing Electrochemical (Bio)sensors and a Voltammetry Instrument
15	Grégoire	MERCIER	Cofounder	Kanopymed	PREDIC: AI-powered clinical decision making to prevent hospitalizations in patients with chronic heart failure
16	Pedro	MORENO-SANCHEZ	Postdoctoral Research Fellow	Tampere University	Trustworthy AI for cardiovascular diseases detection
17	Jesús	PRADA ALONSO	CEO	Horus ML	Heart disease
18	Leonhard	RIEHLE	Chief Medical Officer	Noah Labs	Developing a Voice-based Digital Biomarker to Detect Decompensation in Chronic Heart Failure using Machine Learning
19	Alessandro	SBRIZZI	Associate Professor	University Medical Center Utrecht	Fast single cardiac MRI sequence
20	Harald H.H.W.	SCHMIDT	Professor, Head of Department	Maastricht University - Pharmacology and Personalised Medicine	Redefining heart-related diseases mechanistically to enable precision, curative therapy and prevention
21	Jyri	SEPPÄ	CEO	Sonai Health Oy	All-In-One heart monitor to measure critical heart functions with a single scan
22	Tomas	VETROVSKY	Associate Professor	University Of Hradec Kralove	Integrating Wearable and Ubiquitous Sensors for Advanced Heart Disease Management

# IHI Call Days | Call 7

- ## Improving clinical management of heart disease from early detection to treatment

Developing a Voice-based Digital Biomarker to Detect Decompensation in Chronic Heart Failure using Machine Learning

Contact person name: Dr. med. Leonhard Riehle (Chief Medical Officer)  
Organisation: Noah Labs  
E-mail: [leonhard.riehle@noah-labs.com](mailto:leonhard.riehle@noah-labs.com)  
Link to: [Marketplace opportunity](#)  
[Participant profile](#)

# Heart Failure Decompensation is a Vicious Cycle That Remains a Huge Challenge to break

## Chronic Heart Failure (CHF)

- Chronic & usually irreversible
- Unstable equilibrium



## Acute Decompensated HF (ADHF)

- Life threatening → hospitalization
- Vicious cycle: decompensation spirale



\$60 bn

US Heart Failure costs



50-75 %

of Heart Failure costs are due to hospitalizations

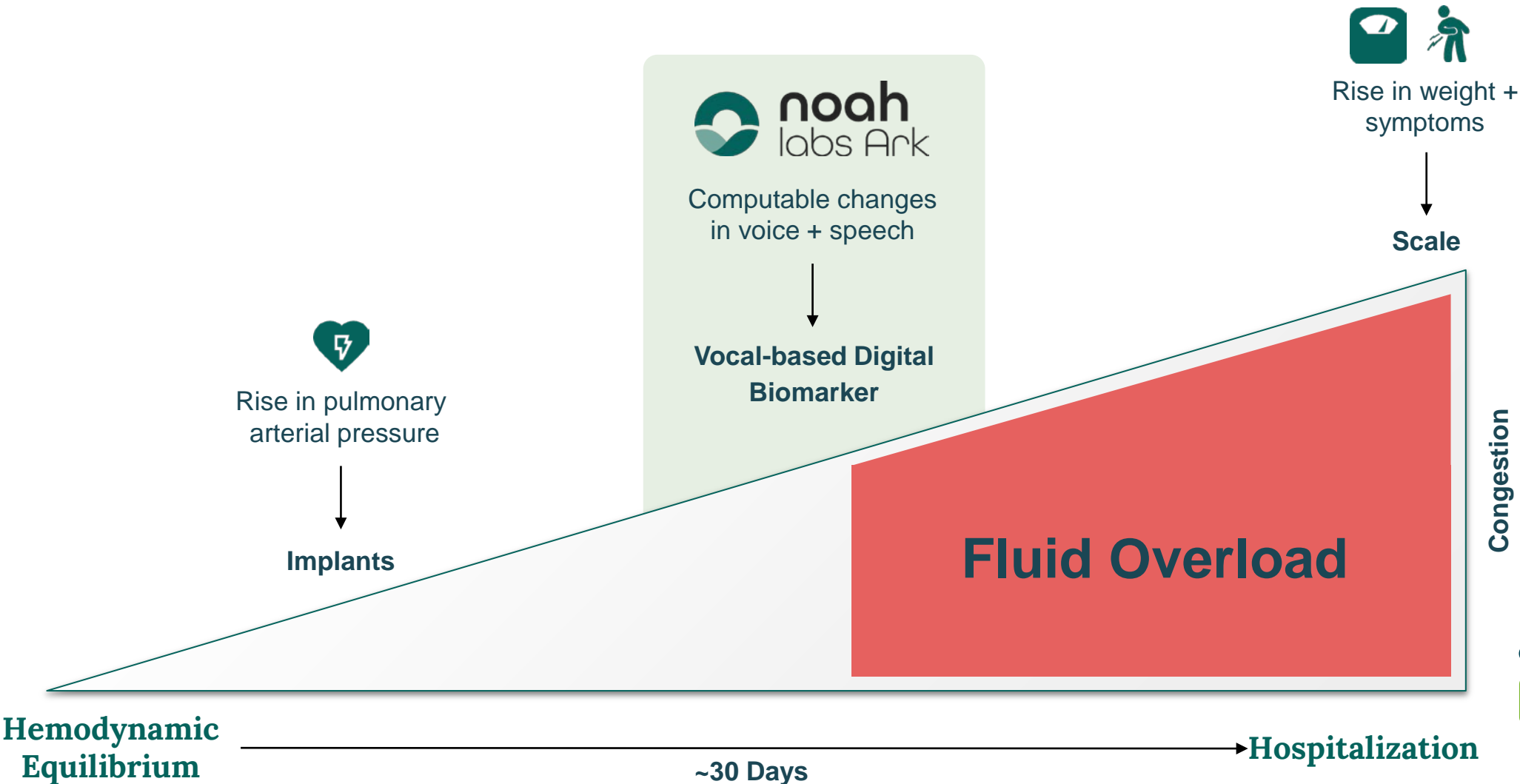


1 year lost

life expectancy decreases with every hospitalization

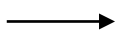


# A Voice-based Biomarker to Detect Pulmonary Edema Early on Solves this Challenge



# Trained Model on +10,000 Labelled Voice Samples with a Patented Technology Using Deep Learning

Daily Recording



Acoustic Model



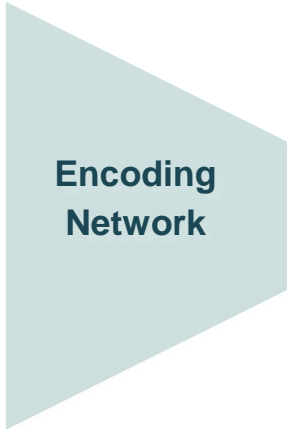
Voice Biomechanics



Baseline Comparison



1st patent filed



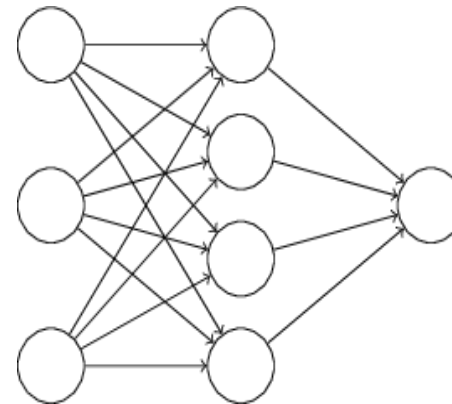
Encoding Network

Feature Embedding



- ✓ Bronchophony
- ✓ Pectoriloquy
- ✓ Egophony
- ✓ +20 more

Prediction Network



Cardiac Congestion

# Expertise and Consortium Partners we are Seeking

## Desired partners:

- University Clinics and other Research Institutions for large-scale clinical trials
- Public or Private organizations with interest and know-how in voice and ML- research
- Industry partners with know-how in remote patient monitoring
- Patient organizations with focus on cardiovascular disease

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# IHI Call Days | Call 7

- Topic 1: Improving clinical management of heart disease from early detection to treatment

## Fast single cardiac MRI sequence

Contact person name: **prof.dr. Birgitta Velthuis, dr. Alessandro Sbrizzi** (ass. professor)

Organisation: Imaging dept., **University Medical Center Utrecht**, The Netherlands

E-mail: [b.k.velthuis@umcutrecht.nl](mailto:b.k.velthuis@umcutrecht.nl); [a.sbrizzi@umcutrecht.nl](mailto:a.sbrizzi@umcutrecht.nl)

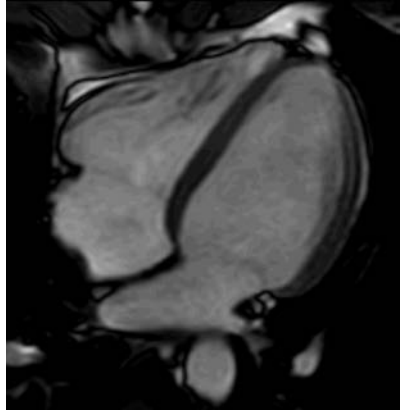
Link to:

- Marketplace opportunity: <https://ihi-call-days.ihi.b2match.io/participations/192439/opportunities>
- Participant profile

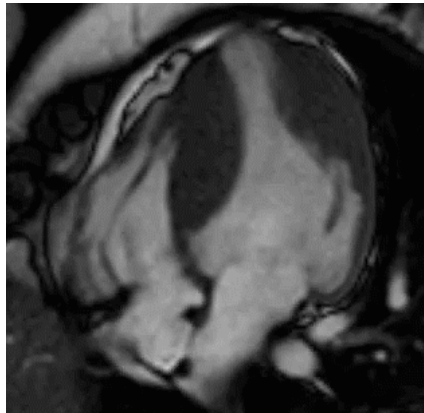
# Challenges and objectives – Topic 1

- **Improving clinical management of heart disease from early detection to treatment**
  - Early diagnosis in genetic cardiomyopathies (concealed phase).
  - Early detection cardio-toxic effect of cancer treatment
  - **Impact:** Early detection enables early treatment strategies to prevent progression of heart failure (HF) + cardiac arrest (OHCA)

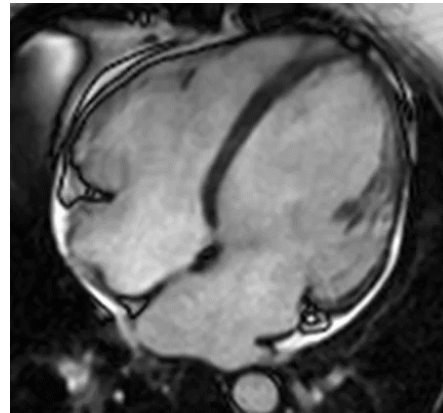
# Cardiomyopathies (CMP) on cardiac MRI



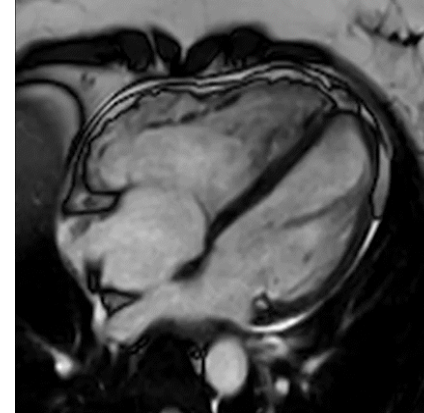
Normal



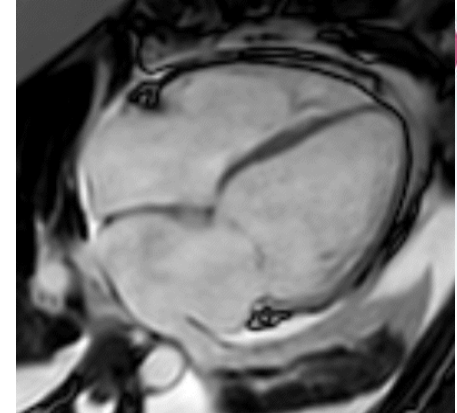
Hypertrophic  
CMP



Dilating  
LV CMP



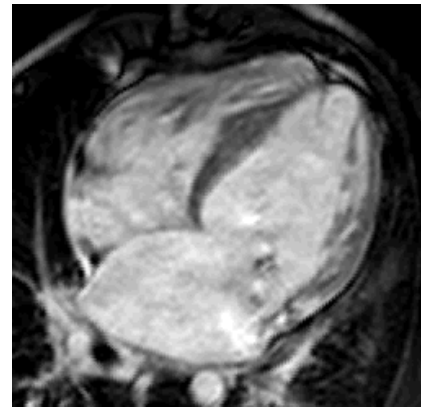
Arrhythmogenic  
RV CMP



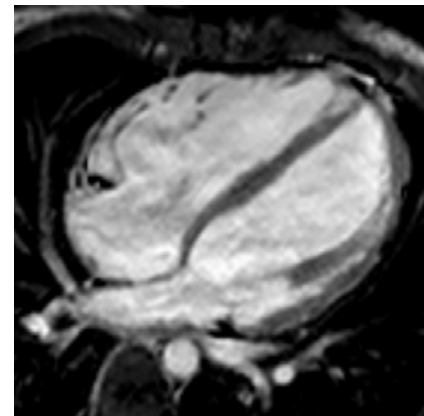
Chemotherapy  
cardiotoxic CMP



OHCA 28 yo



HF 13 yo



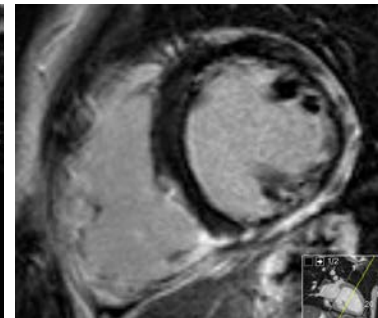
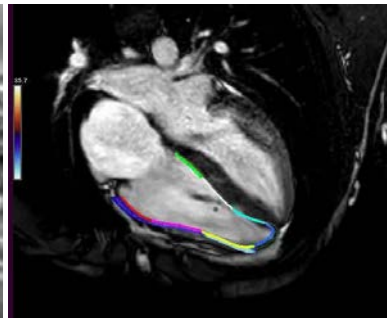
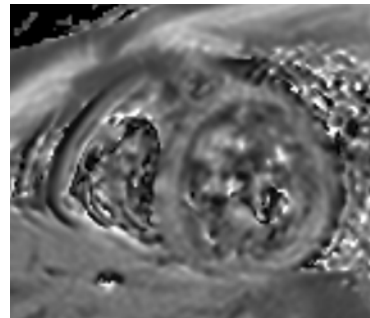
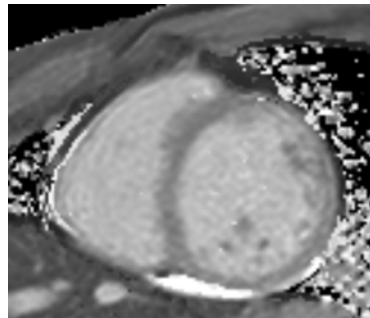
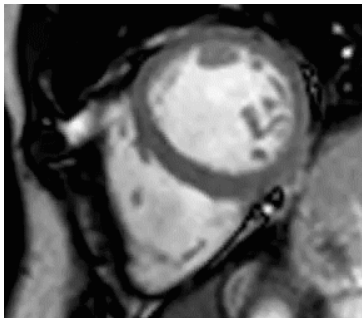
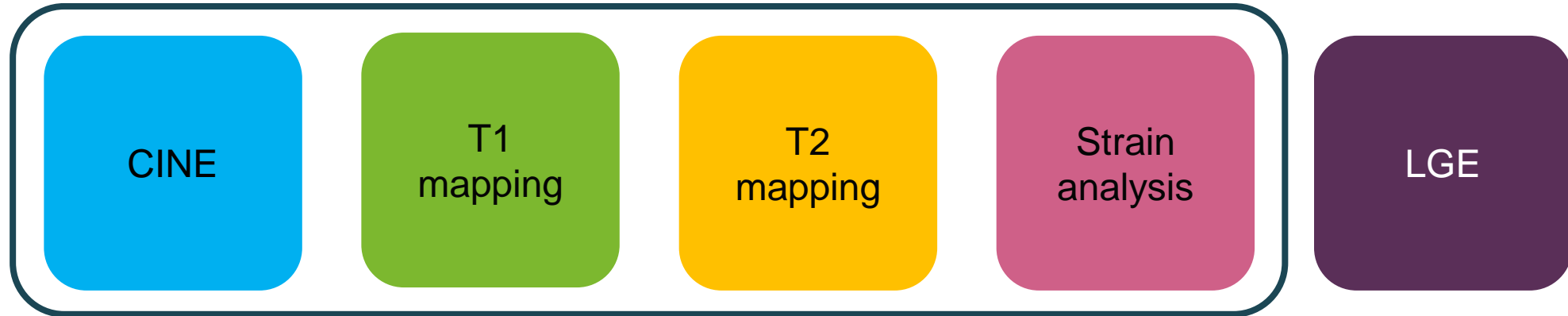
OHCA 16 yo

# Motivation & Impact

- Optimised hospital workflow for a sustainable healthcare workforce
  - Limited availability MRI and long table time for patients
  - Staff shortages: too few technicians trained in cardiac MRI
  - **Impact:** 5D fully-automated free-breathe 10-minute single MRI sequence is patient- and technician-friendly, shortens acquisition time and increases MRI availability



# Methods: Cardiac MRI (CMR) sequences in cardiomyopathies



# Proposition

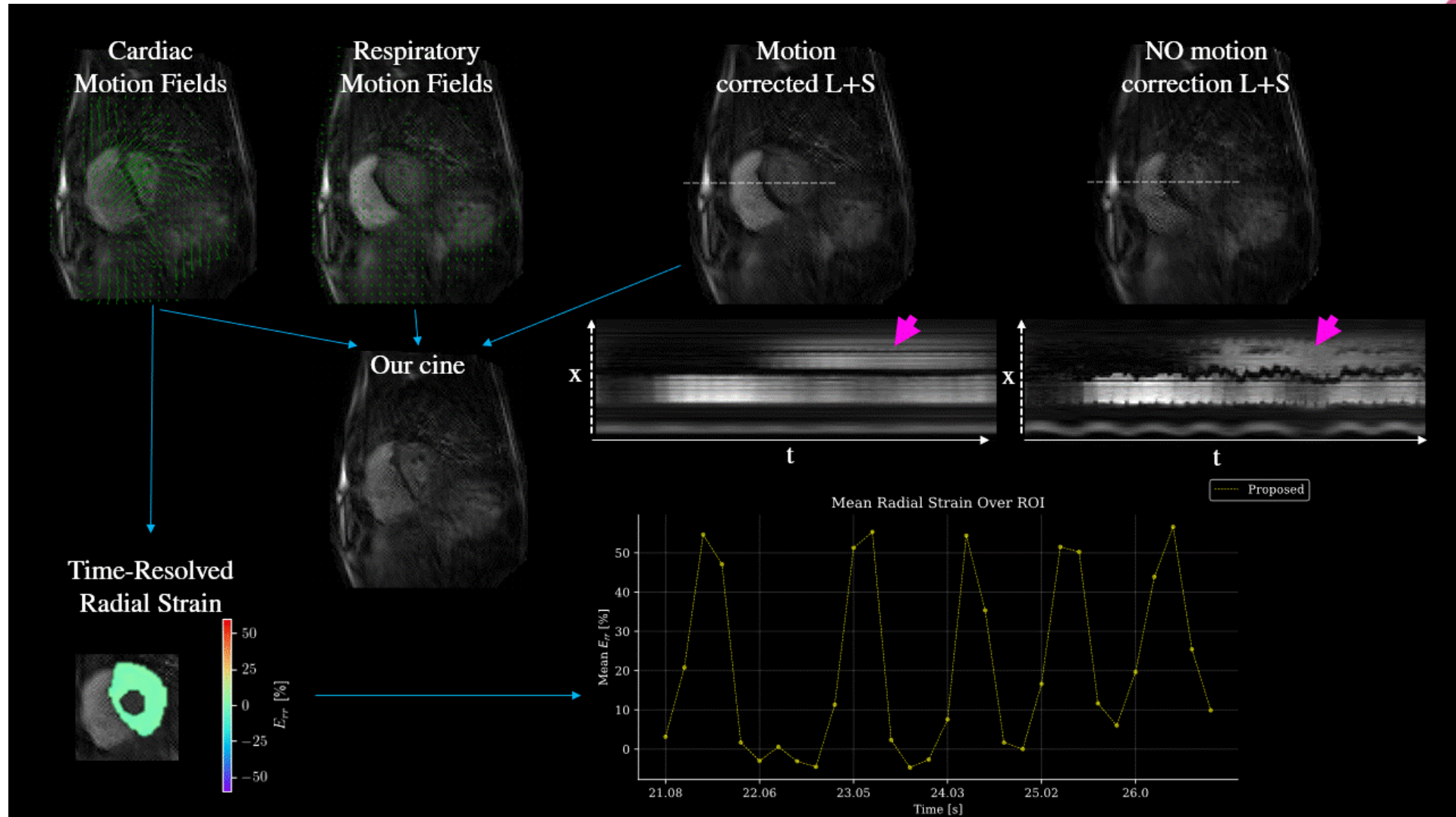
- Clinical validation of biomarkers for diagnosis, monitoring disease progression and treatment response
  - **T1 + T2 mapping** and **strain** imaging requires baseline and **follow-up** values to detect patient specific changes
  - **Changes** in T1/T2 mapping and strain occurs **earlier** than ventricle function and volume changes

# Main activities

- Develop and validate 5D fully-automated free-breathe 10-minute single cardiac MRI sequence for ventricle volumes, function, strain, T1 and T2 mapping
  - Solve problems with scan time, scan and technician availability.
  - Innovations in cardiac imaging suitable for IHI.
  - Potential results and expected impact:
    - Short robust cardiac MR imaging protocol for regular follow-up
    - Personal cardiac numbers from baseline to follow-up for early detection and monitoring
    - Personalize cardiac disease management in at-risk individuals

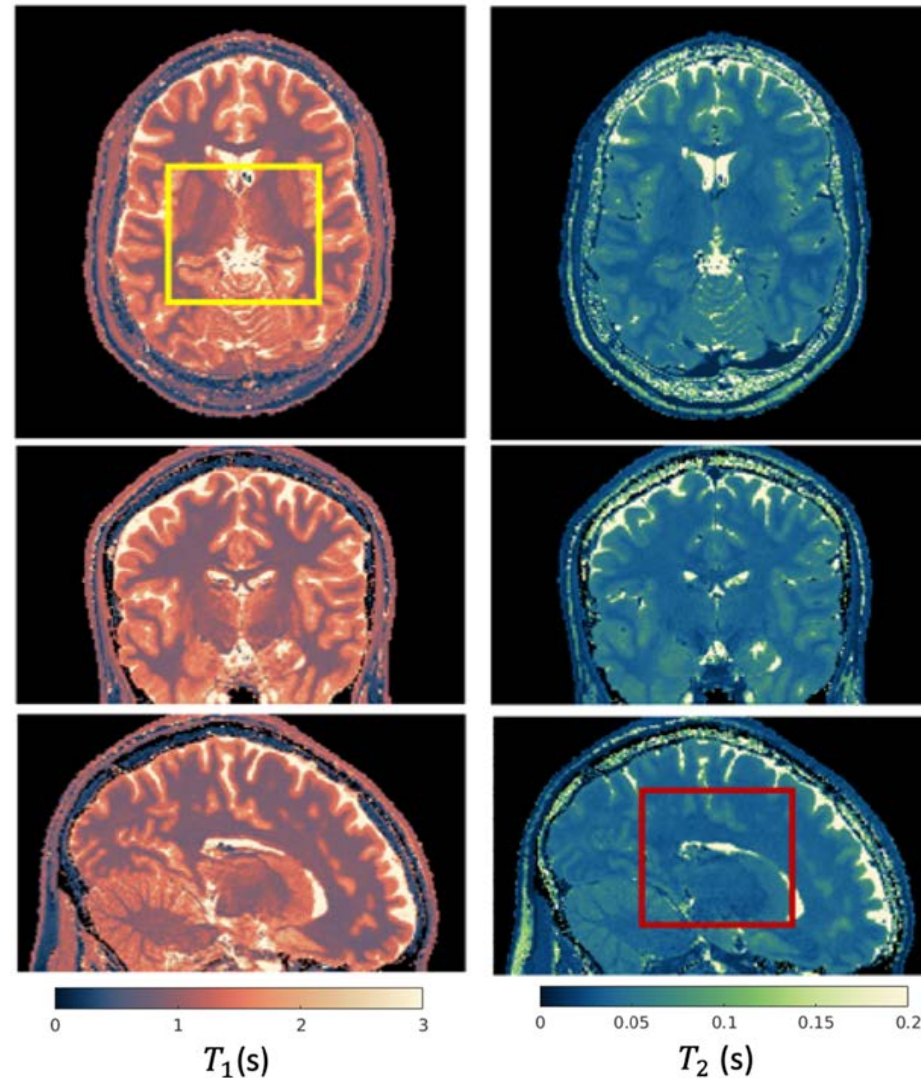
# Technology 1: Cardiac MR-MOTUS

Free breathing, time-resolved (ECG-free) volumes, 1<sup>st</sup> pass perfusion and strain



# Technology 2: 3D MR-STAT

Five minutes whole brain T1, T2 & P.D. at 1 mm<sup>3</sup>



# Proposed approach

- Both methods (cardiac MR-MOTUS and 3D MR-STAT) relies on the same strategy
- Model-based inversion of k-space data acquired with time efficient protocols
- **Proposed approach: Combine both methods into one single acquisition/reconstruction**
- Extract 4D time-resolved dynamic and 3D quantitative information
- Output: T1 & T2 maps, strain, cine volumes

# Expertise and resources offered

- Expert radiologists in genetic and acquired cardiomyopathies
- Expert technologists / engineers in innovative MRI imaging
- Center of excellence for genetic cardiomyopathy and oncology (hundreds of (pediatric) patients each year)



# Expertise requested

- MRI manufacturers with strong development and research branch
- Imaging software companies with AI expertise for post-processing
- [OPTIONAL] Device companies. Single scan cardiac MRI can help guide interventions





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# IHI Call Days | Call 7

- Improving clinical management of heart disease from early detection to treatment

Redefining heart-related diseases mechanistically to enable precision, curative therapy and prevention

Contact person name: Prof. Harald H.H.W Schmidt

Organisation: Maastricht University - Pharmacology and Personalised Medicine

E-mail: [hschmidt@ppmlab.net](mailto:hschmidt@ppmlab.net)

Link to:

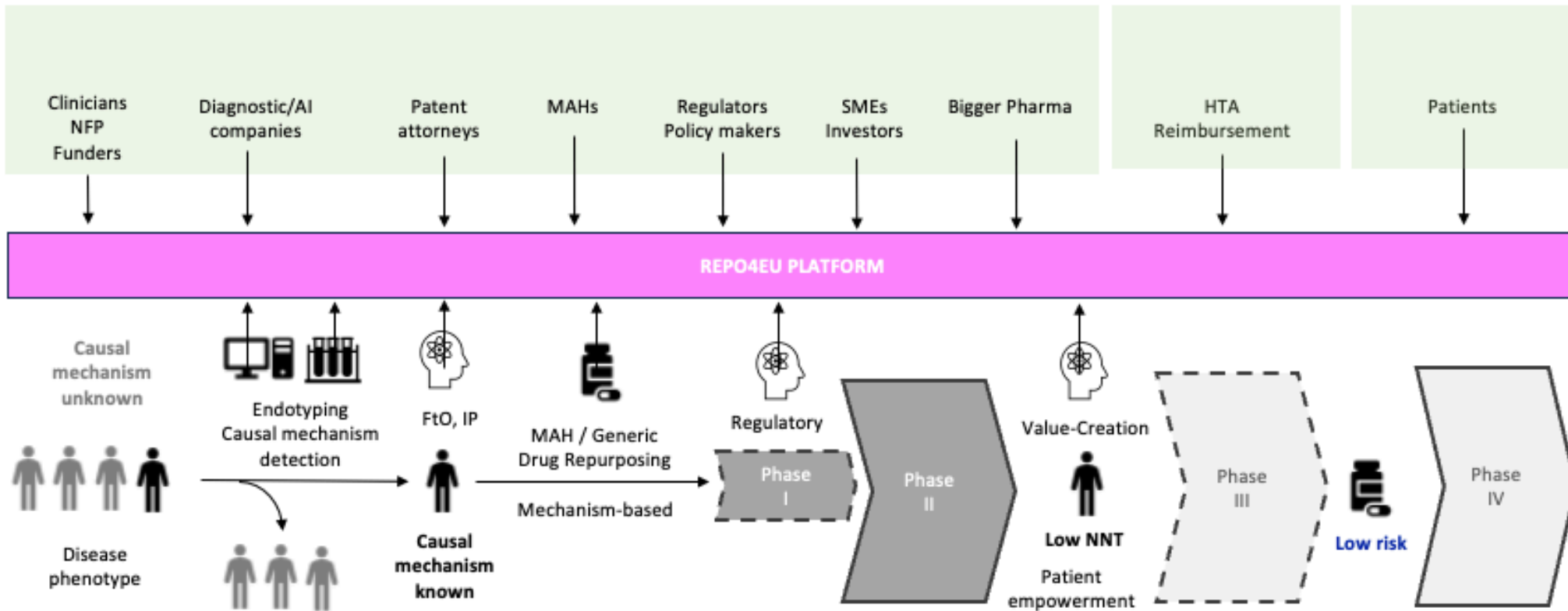
- [Marketplace opportunity](#)
- [Participant profile](#)

# Challenges and objectives

- To redefine heart diseases no longer by symptoms in organs, which currently allows only symptom-based imprecise diagnosis and ineffective therapy.
  - **We do not understand** the molecular causes of heart disease
  - We will improve the clinical management of heart disease from early detection to treatment by
    - Identifying causal molecular mechanisms and subtypes
    - Discovering low-cost, point-of-care blood-based **diagnostics**
    - Designing high-precision phase IIa/b clinical **drug repurposing** PoC trials
  - Potential results and expected impacts include
    - **Curing** instead of treating heart disease
    - Detect early and monitor the risk of heart disease for **prevention**



# Workflow and stakeholders



# Expertise and resources offered

- Drug repurposing platform [REPO4EU](#)
  - Bioinformatics for causal signaling module identification
  - Diagnostics discovery and biobank validation for clinical trial
  - Network Pharmacology strategy
- 
- **IKOP\*: Platform access**
  - **IKAA\*\*: Diamond open access publication in ‘Network Medicine’ and ‘Drug Repurposing’**

\* IKOP - in-kind contributions to operational activities

\*\* IKAA - in-kind contribution to additional activities

# Expertise requested

- SMEs
  - Diagnostics
  - ML
- Large companies
  - Pharma
  - Medical Devices, Workflows
- Research Institutes
  - Biobanks, e.g., BBMRI, UKBiobank
  - HTA experts and authorities
  - Clinical Research Centres, e.g., INCLIVA
- Other
  - Patient organisations
  - Regulators
  - Patent lawyers



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# All-In-One heart monitor to measure critical heart functions with a single scan

Jyri Seppä

Sonai Health Oy

[jyri.seppa@sonai.fi](mailto:jyri.seppa@sonai.fi)

Marketplace: <https://ihi-caldays.ihi.b2match.io/marketplace/opportunities/UGFydGljaXBhdGlvbk9wcG9ydHVuaXR5Ojg5MDI1>

Participant profile: <https://ihi-call-days.ihi.b2match.io/participations/322596>





# Sonai accelerates the cardiac evaluation process

<b>Device Features</b>	Innovative device integrating microphones, ECG, ultrasound and motion sensors.
<b>Easy-to use</b>	Scan takes just 2 minutes, can be performed by nurse or doctor.
<b>Target Users</b>	Primary care, emergency care and first aid.
<b>Quick Assessment</b>	Sonai provides superior heart sound evaluation, measures hearts volume movement and estimates ejection fraction.
<b>Data</b>	Simultaneous data collection from 4 auscultation points. Cloud storage utilizing advanced algorithms and machine learning.
<b>Key Benefits</b>	<p><b>Quality:</b> Improved initial patient evaluation.</p> <p><b>Efficiency:</b> Faster process, cost-effective.</p> <p><b>Precision:</b> Only refers patients with genuine needs for further analyses.</p> <p><b>Follow-up:</b> Enhanced patient monitoring, comparing results to previous measurements.</p> <p><b>Connectivity:</b> Cloud solution enables remote analyses and telemedicine.</p>



# Main activities

- Sonai is presently conducting the first clinical trial, expecting results in Q2/2024.
- These findings, along with Key Opinion Leader feedback, will be used as input for the development of the next version of the solution.
- Goals for 2025: Finalize the next device version, run larger clinical study and navigate the regulatory pathway.
- As Sonai's solution aligns seamlessly with Call 7, we hope to join a consortium where our expertise will contribute significant value.

# Expertise and resources offered

- Our highly experienced team brings together a range of competencies, including world-class know-how on sensor technology, data-analyses, ability to introduce disruptive solutions to the market, medical expertise and marketing skills.
- Cooperation network possesses skillful expertise in research and development, user interfaces and usability.

The infographic is organized into three horizontal sections. The top section features five individual team members, each with a circular portrait, name, title, and a list of their 15+ years of experience. The middle section, titled 'ADVISORS', shows four individuals with their names, titles, and affiliations. The bottom section, titled 'PARTNERS', is divided into four categories: Medical Partners, R&D Partners, Regulatory and IPR Partners, and Funding Partners, each with a grid of partner logos.

**Team Members:**

- Jyri Seppä**  
CEO, M.Sc (Econ)  
35 years experience: Leadership, New business, Marketing and sales
- Arto Kotimaa**  
CMO, MD  
20 years experience: Private and public healthcare, Emergency Room
- Heikki Seppä**  
CTO, PhD, Professor  
45 years experience: Science and technology, Sensor solutions, Medical innovations
- Cain Santhan**  
Data analyst  
5 years experience: Medical data analysis, Signal processing, BioMed engineering, Artificial Intelligence
- Antti Kotimaa**  
CCO, PhD  
15 years experience: Health R&D, Project management, Medical regulation

**ADVISORS:**

- Pia Sulin**  
Experienced Pharma Executive  
Helsinki University
- Tero Pinola**  
Distinguished Cardiologist  
Wellbeing County Solte
- Pekka Tammela**  
Entrepreneur and Investor  
Board Member of Revenio Oy
- Marko Parkkinen**  
Entrepreneur and Investor  
CEO of Seedi Oy

**MEDICAL PARTNERS:** OYS (Oulu University Hospital), Health Incubator, KUOPIO HEALTH

**R&D PARTNERS:** SADI innovations, cortex, design, VTT, muRata (Innovator in Electronics)

**REGULATORY AND IPR PARTNERS:** kasve, moosedoq

**FUNDING PARTNERS:** Elinkeino-, ikä- ja ympäristökeskus, BUSINESS FINLAND, ib (invent baltics), GSD LABS

# Expertise requested

- We are seeking partners to support ongoing product development, contribute to clinical trials and to help establish networks with Key Opinion Leaders (KOLs).



# Pitching Session

Today 23 January 2024, 14:30 – 16:00 Brussels time

Number	First Name	Last Name	Job Position	Organization	Title of the Presentation
1	Sanne	NAUTS	Senior Scientist	Philips	Diagnostic imaging and monitoring of Common Cardiac Diseases
2	Christelle	SAINT SARDOS	Sr Director Government Affairs and Access Policy	Edwards Lifesciences	Heart Clinical Pathway Enhancement in Europe
3	Raquel	CUNHA	Clinical Project Manager	Clinical Academic Center - Braga (2ca-Braga)	Revolutionizing clinical management: Smart skin patches for long-term and minimally invasive monitoring of patients at risk of heart failure
4	Jonas	MARCELLO	Head Of Department	Fraunhofer IESE	Radar based heart monitoring
5	Francoise	CHARBIT	Health Programme Manager	Cea	Non-invasive and personalised monitoring of physiological and biochemical parameters
6	Melike	ÇOLAK	Machine Learning Engineer	Bites	Presenting Artificial Intelligence Expertise in Heart Disease Diagnosis
7	Normunds	DAUDISS	Innovation & Partnerships	Health Tech Innovations   Nd Group	Scalable & Customisable Remote Care Platform for Heart Disease
8	Yvan	DEVAUX	Head of Cardiovascular Research Unit	Luxembourg Institute of Health	Improving clinical management of heart disease from early detection to treatment
9	Ivett	JAKAB	Research Project Manager	Yaghma B.V.	AI Impact Assessment in healthcare
10	Pavel	KOSYREV	CEO	Nova Group Global 1969 Slu	Nova Cardio
11	Juha	KOTIMAA	Senior Scientist	Vtt Technical Research Centre of Finland Ltd	Immunoassay platforms for diagnostics
12	Iordanis	KOUTSOPOULOS	Professor	Athens University of Economics And Business	Responsible AI and Advanced Digital Tools for Heart Disease management
13	Miroslaw	KWASNIEWSKI	CEO	Imagene.Me	GenoCardia: Integrative Management Platform for Genetically Predisposed Cardiovascular Conditions
14	Lokman	LIV	Researcher/Head of Electrochemistry Laboratory	Tubitak	Producing Electrochemical (Bio)sensors and a Voltammetry Instrument
15	Grégoire	MERCIER	Cofounder	Kanopymed	PREDIC: AI-powered clinical decision making to prevent hospitalizations in patients with chronic heart failure
16	Pedro	MORENO-SANCHEZ	Postdoctoral Research Fellow	Tampere University	Trustworthy AI for cardiovascular diseases detection
17	Jesús	PRADA ALONSO	CEO	Horus ML	Heart disease
18	Leonhard	RIEHLE	Chief Medical Officer	Noah Labs	Developing a Voice-based Digital Biomarker to Detect Decompensation in Chronic Heart Failure using Machine Learning
19	Alessandro	SBRIZZI	Associate Professor	University Medical Center Utrecht	Fast single cardiac MRI sequence
20	Harald H.H.W.	SCHMIDT	Professor, Head of Department	Maastricht University - Pharmacology and Personalised Medicine	Redefining heart-related diseases mechanistically to enable precision, curative therapy and prevention
21	Jyri	SEPPÄ	CEO	Sonai Health Oy	All-In-One heart monitor to measure critical heart functions with a single scan
22	Tomas	VETROVSKY	Associate Professor	University Of Hradec Kralove	Integrating Wearable and Ubiquitous Sensors for Advanced Heart Disease Management

# IHI Call Days | Call 7

● Improving clinical management of heart disease from early detection to treatment

## Integrating Wearable and Ubiquitous Sensors for Advanced Heart Disease Management

Contact person name: Tomas Vetrovsky

Organisation: University of Hradec Kralove, Czech Republic

E-mail: [tomas.vetrovsky@gmail.com](mailto:tomas.vetrovsky@gmail.com)

Link to:

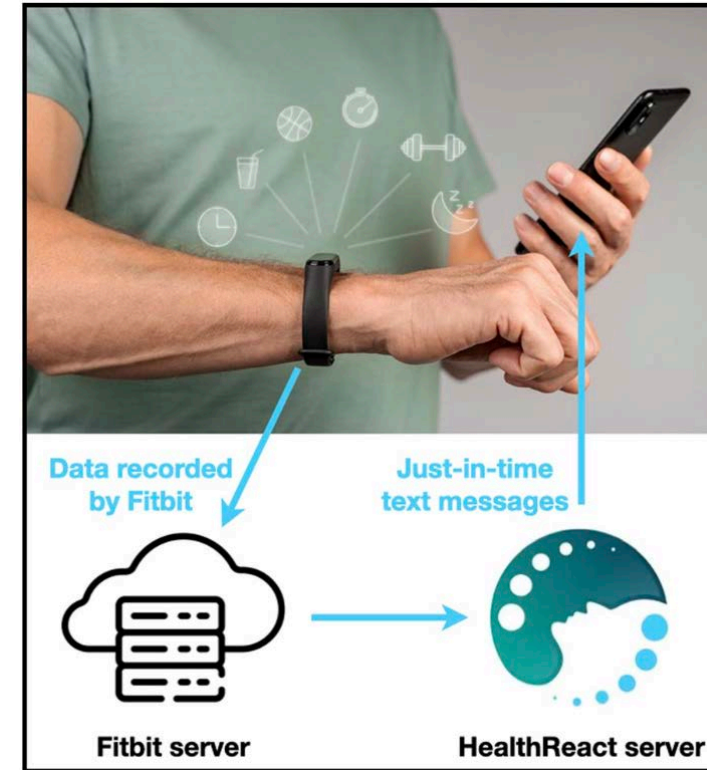
- [Marketplace opportunity](#)
- [Participant profile](#)

# Challenges and objectives

- **Problem:** Underutilization of continuous health data from daily life, which holds the key to earlier detection, monitoring, and treatment adjustment. Additionally, these data present an opportunity to craft patient-centric solutions (e.g., just-in-time interventions).
- **Potential Results:** A scalable platform for real-time sensor data analysis, leading to:
  - better monitoring of HF progression, providing early signs of decompensation
  - improved post-surgical recovery monitoring for patients undergoing CABG
  - enhanced early detection of atrial fibrillation
  - improved management of hypertension in primary care settings
  - personalized lifestyle recommendations for those at risk of coronary heart disease
- **Expected Impact:** Improved patient outcomes and significant reductions in healthcare costs.

# Main activities

- **Sensor Data Integration:** Fuse wearable and environmental sensor data streams (HRV, movement and physical activity, sleep, air pollution and many more).
- **Context-Rich Data:** Real-time analysis to prompt data-triggered patient surveys (event-based Ecological Momentary Assessment) to enrich sensor data with patient-reported context.
- **Digital Biomarker Algorithms:** Develop algorithms for early diagnosis, disease tracking (recovery, progression, decompensation, treatment effect), and prognostic assessment.
- **Just-in-Time Interventions:** Personalize interventions using algorithm-evaluated real-time data to trigger self-management prompts (e.g., sedentary behavior, stress-reduction) or an alert to seek medical attention.





# Expertise and resources offered

- **HealthReact:** mHealth platform integrating a diverse array of wearable and environmental sensors
  - **own ballistography-enabled pads** for continuous HRV, respiration rate, etc.
  - activity trackers
  - sleep monitors
  - glucose monitors
  - air pollution sensors
  - scalable for future expansions (ECG patches, blood pressure sensors).
- **HealthReactPlus:** Triggers event-based surveys and just-in-time intervention prompts for both patients and healthcare professionals.
- Skilled analysis team proficient in data analysis and **machine learning techniques**.
- Proven track record in managing large-scale (n = 600) **international cohorts** (project [WEALTH](#), funded under the European Horizon 2020 Pathway).
- Experience with various **clinical populations**, including heart failure patients ([Circulation 2024](#)).



# HealthReact

- Report meal/snack/beverage
- Morning survey
- Daily survey 1
- Daily survey 2
- Daily survey 3
- Daily survey 4
- Daily survey 5
- Evening survey
- Activity survey A
- Activity survey B

Total 12 entries

Valid from ⓘ 23.03.2023 08:05:49

Valid to ⓘ 31.12.2023 11:05:49

Type of assigned questionnaire Contextual

Expiration (minutes) ⓘ 15

Probability of assigning ⓘ 1.0

Users v

Groups Active Study x v

Questionnaires ⓘ Activity survey B x v

Count per day ⓘ 2

Max back - start rules ⓘ 1

Max back - end rules ⓘ 0

Minimal interval (minutes) ⓘ 90

Set custom time intervals ⓘ

**Time intervals**

Start of the interval	End of the interval	Interval meaning	Actions
14:00	20:00	Time of evaluation v	

[+ Add interval](#)

**Contextual rules ⓘ**

Record type	Operator	Threshold	Function	Window ⓘ	Sub-window length ⓘ	Number windc
STEPS_value v	<= v	0.0	AVG v	1200	60	30
HR_value v	> v	30.0	AVG v	1200	60	20

[+ Add start rule](#)

Action n) v

Actions

- 15
- 15
- 15
- 15
- 15
- 15
- 15
- 15
- 15
- 15

# Expertise requested

- We seek a coordinator or consortium partners adept at utilizing a wealth of data from wearable and environmental sensors, aimed at crafting digital biomarkers for early diagnosis, disease course monitoring, treatment impact evaluation, prognostic analysis, and personalized interventions.





Thank you for your attention

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