

**CardiOCARE****Newsletter**

## Editorial

***Prof. Dimitrios Fotiadis (Coordinator, UOI)***

The CARDIOCARE project has entered its 3rd year. During the last months, CARDIOCARE progressed according to the plan producing high quality deliverables and achieving key milestones. Regarding the clinical study, the patient recruitment process has started in all clinical centres (UOI, NKUA, BOCOC, IEO, KSBC, IOL). The analysis of the retrospective data is progressing, and several data mining and Artificial Intelligence models have been developed. Furthermore, in the last months continuous technical refinement has been performed in the CARDIOCARE mobile application; the ePsyncHeart and eHealthHeart. Sufficient work has also been done regarding the finalization of the CARDIOCARE integrated platform.

In this newsletter, we present five EU projects for breast cancer with which CARDIOCARE has created synergies with.

You can visit our [website](#) for more details. You are also welcome to share your comments on our social networks.

## Enjoy the reading!



CardiOCARE has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 945175 - This publication reflects only the author's view and the Commission is not responsible for any use that may be made of the information it contains

<https://cardiocare-project.eu/>

## The BOUNCE project: Predicting effective adaptation to breast cancer to help women to BOUNCE back

*Dr. Paula Poikonen-Saksela MD, PhD, University of Helsinki - Coordination of BOUNCE*



The goal of the BOUNCE project is to build prediction models and related decision support tools to become available to clinicians aspire to support resilience in breast cancer survivors and help them remain in the workforce and enjoy a better quality of life. The consortium consists of clinicians including psychologists and oncologists, and a technical team of modelers and IT experts. The core data source of BOUNCE is a prospective pilot study that took place in four different countries, namely Finland, Portugal, Israel, and Italy. The collected data consist of psychological questionnaires and information on socio-demographic background, lifestyle, and medical records. The generated models can predict patients' mental health and global quality of life, as complementary resilience outcomes. Also, different trajectories of patient well-being during the 18-month follow-up period were identified. The results are being disseminated widely in the academic community and in different stakeholders, including clinicians, patient organizations, and cancer societies. Commercial as well as internal exploitation of the BOUNCE tool are possible in the future.

BOUNCE has approached several clinical centers and the feedback received so far is very positive, BOUNCE results have been appreciated as an opportunity to further develop the care path and operational models. Relying on BOUNCE models, customized interventions can be offered, if applicable. A significant observation highlighted by BOUNCE concerns a sizeable group of patients who appear to be resilient at the time of diagnosis but develop persistent signs of poor mental health thereafter. Systematic resilience prediction would help especially this group, as their problems might not be detected otherwise.

BOUNCE also provides information about resilience through ongoing scientific publication and dissemination activities. The BOUNCE tool is a digital instrument for professionals, but digital services to be used by patients have also been generated as a part of BOUNCE. Data collection in the prospective pilot was performed mainly digitally through the Noona platform where BOUNCE data collection questionnaires were embedded. The first version of the BOUNCE tool was tested in Helsinki and digital intervention paths were developed for patients together with psychologists, physiotherapists, and nutrition therapists. Notably, the COVID-19 pandemic has further emphasized the importance of digital services during the last two years. During the project, lessons learnt about resilience in early breast cancer have been created as well. Moreover, BOUNCE data is a rich and unique source for further research into various aspects of resilience. The BOUNCE consortium actively continues the established collaboration, and already many BOUNCE partners have jointly participated in new research calls with proposals inspired by the BOUNCE study.

**Mutual areas of interests with CARDIOCARE** include the development of models for predicting mental health and quality of life for patients with breast cancer. BOUNCE created a model that uses socio-demographic, lifestyle, medical records data and data exported by psychological questionnaires. CARDIOCARE on the other side developed a mobile application, the ePsychHeart application that monitors patients' quality of life using data related to psychological and cognitive states, mobility and locomotion, sensory and vitality status to be used in risk stratification models of cardiotoxicity and quality of life. Moreover, behavioural, and psychological interventions are delivered via eHealth applications to improve intrinsic capacity and quality of life.

More information about the project on the website: <https://www.bounce-project.eu/>

Project duration: 01/11/2017 – 30/04/2022

Follow the project on social networks:

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*The BOUNCE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 777167*

## The PHENOMENO project: Physical Breast Anthropomorphic Models and Technology for their Production

*Kristina Bliznakova, PhD, Marie Curie Research Fellow, Faculty of Public Health, Medical University of Varna, Bulgaria*



The main objective of the PHENOMENO project is to develop a complete technology for producing of high-quality physical breast phantoms derived from novel computational anthropomorphic breast phantoms and manufactured with novel prototyping techniques. To achieve this ambitious goal, the following key research objectives are set:

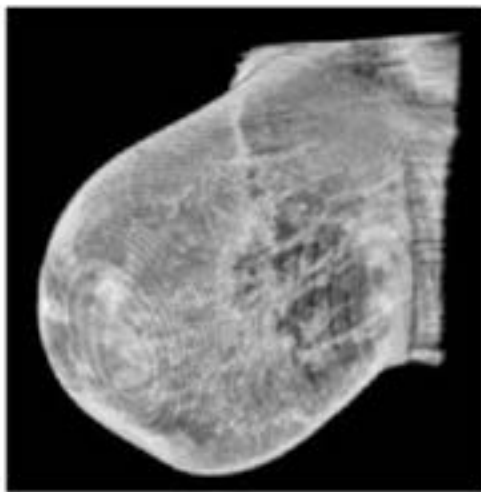
**Objective 1:** Development of a methodology for the creation of computational anthropomorphic breast phantoms based on Magnetic Resonance Imaging (MRI) patient-based examinations.

**Objective 2:** Development of a methodology and fabrication of new materials for 3D printing.

**Objective 3:** Collaborative design and development of novel methodology and a prototype of 3D printing technology with attention to breast anthropomorphic phantoms for x-ray imaging.

**Objective 4:** Validation of new materials and anthropomorphic phantoms produced with the new 3D printing technology.

The consortium is composed of three SMEs: two from Greece and one from Bulgaria with a unique expertise in rapid prototyping technology, micro-CT, material characterisation, embedded design for medical devices and two academic institutions: from Italy and Bulgaria with expertise in modelling and use of anthropomorphic phantoms, software development and clinical validation and evaluation. The project results are related to new methodology for design of anthropomorphic breast phantoms, new methodology for producing materials, and a methodology for development of a prototype of complete equipment and relevant technology for the fabrication of realistic breast phantoms, representing both health and cancerous tissues. An application in x-ray imaging is targeted. The first results are shown below, where the computational breast is created from patient MRI image, while the breast physical phantom is manufactured with a new technology.



**Computational  
breast, based on MRI**



**Physical breast, based on  
the computational phantom**

**Mutual areas of interests with CARDIOCARE** include the use of computational modelling in breast cancer research. PHENOMENO develops a methodology for creating computational breast phantoms based on MRI images. CARDIOCARE on the other side develops novel computational tools, providing image processing, -omics analysis, modelling and machine learning capabilities for powerful multi-scale risk stratification and prediction, to retrieve and analyse the CARDIOCARE integrated knowledge base.

More information about the project on the website: <https://phenomeno.eu/>

Project duration: 01/05/2021 – 30/05/2025

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*The PHENOMENO project has received funding from the European Union's H2020 research and innovation programme under the Marie Skłodowska-Curie GA No 101008020*

## The QUSTom project: Revolutionizing Breast Cancer Diagnosis and Screening

*María Paz Baghetti O., Dissemination Project Officer, Computer Applications in Science and Engineering (CASE) Department, Barcelona Supercomputing Center, Spain*



QUSTom project aims to introduce a new medical imaging modality based for the first time on ultrasound and supercomputing, which will complement or even replace current techniques that use X-rays, such as mammograms. Unlike other methods for diagnosing breast cancer, QUSTom's technology ensures complete patient safety, as it does not use any type of radiation. Furthermore, it promises superior image quality and enhanced tumour monitoring, among other advantages.

A novel aspect of QUSTom project's technology lies in developed algorithms which simultaneously provide detailed images of the patient's tissue alongside their associated uncertainty levels, showing how reliable the information is pixel by pixel. The project also incorporates concepts such as multimodal imaging and real 3D imaging, which is an unprecedented combination in ultrasound breast imaging. These algorithms, which are developed using supercomputing, are inspired by others that have proven effective in completely different research areas such as the analysis of the earth's subsurface.

The QUSTom project is a collaborative effort between six partners: Arctur, Barcelona Supercomputing Center, Karlsruhe Institute of Technology, Imperial College London, Vall d'Hebron Research Institute - VHIR, and FrontWave Imaging (spin-off of BSC and Imperial College London). This collaboration brings together a varied team of experts, including physicists, engineers, operations specialists, and radiologists.

QUSTom is a part of the Pathfinder Open programme of the European Innovation Council (EIC). This initiative is funded by the European Union's Horizon Europe Framework Programme, which aims to support disruptive ideas and projects with substantial international potential.

**Mutual areas of interests with CARDIOCARE** include the use of imaging data in breast cancer research. QUSTom will create a technology, a new imaging modality, for the diagnosis of breast cancer that is patient-safe, with superior image quality and enhanced tumour monitoring. CARDIOCARE on the other side uses imaging data (i.e., mammography, echocardiography) along with other type of data (e.g. clinical, -omics, data from wearables etc.) to develop novel cost-effective risk-stratification and healthcare models to improve the management of the elderly multi-morbid breast

More information about the project on the website: <https://qustom-project.eu/>

Project duration: 01/04/2022 – 31/03/2024

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*The QUSTom project has received funding from the European Union's Horizon Europe research and innovation programme under the Grant Agreement N° 101046475*

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*The QUSTom project has received grant funding from United Kingdom Research and Innovation ("UKRI") under the UK Government's Horizon Europe Guarantee with UKRI Reference No. 10038375*

## The 4D PICTURE Project: Design-based Data-Driven Decision-support Tools: Producing Improved Cancer Outcomes Through User-centred Research

*Prof. Barbara Perić, MD, PhD, Dep. of Surgical Oncology, Institute of Oncology Ljubljana, Slovenia*



The EU funded 4D PICTURE project focuses on the development of the Metro Mapping methodology to redesign care paths, including novel DSTs. The vision of 4D PICTURE project is to develop data driven DSTs for patients with breast cancer, prostate cancer and melanoma. The novel DSTs will be evaluated to ensure their ability to address medical, social and ethical issues.

In more detail, the main aims of the 4D PICTURE project are to:

- Improve the cancer decision-making with novel data-driven algorithms
- Develop a conversation tool for cancer patients, their significant others, their clinicians and citizens based on text mining analysis
- Apply internationally improved service design methodology "MetroMapping" to redesign care paths, integrating decision-support tools and patients' experiences, values and preferences
- Guide the policy-making by exploring the usability and applicability of the MetroMapping methodology and the decision-support tools
- Guarantee the development of ethically and socially responsible decision-support tools

4D PICTURE has a dedicated multi-disciplinary consortium, integrating health care research, data science, epidemiology, biostatistics, innovation and design research, health economics, implementation science, social sciences, and humanities. The team is based in nine countries (Austria, Belgium, Denmark, Germany, Netherlands, Slovenia, Spain, Sweden, UK).

Mutual areas of interests with CARDIOCARE include the redesign on healthcare pathways and improvement of decision-making for cancer patients. 4D PICTURE focuses not only on breast cancer, but also to prostate cancer and melanoma. CARDIOCARE on the other side aims to improve healthcare pathways and to enhance decision support for the early diagnosis and management of cardiotoxicity and declines in quality of life in breast cancer patients.

More information about the project on the website: <https://4dpicture.eu/>

Project duration: 01/10/2022 – 30/09/2027

Follow the project on social networks:

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4D PICTURE is funded by the EU research and innovation programme HORIZON 2021 (GA 101057332 — 4D PICTURE — HORIZON-HLTH-2021-CARE-05). Project is coordinated by Erasmus University Medical Center Rotterdam, the Netherlands, together with Leiden University Medical Center. This 5-year project started in Oct 1, 2022.

## The ODELIA project: Empowering Healthcare with Swarm Learning

*Katharina Krischak, Project Manager, European Institute for Biomedical Imaging Research*



The Open Consortium for Decentralized Medical Artificial Intelligence (ODELIA) is an EU-funded project poised to significantly advance healthcare using Swarm Learning (SL). Similar to federated learning, SL is a decentralized approach that enables multiple federated models to collaboratively learn from shared insights without sharing raw data. SL however does not need for a central hub or server, which is typically required for federated learning that involves aggregating federated models to update a global model. ODELIA is dedicated to harnessing the power of SL to develop artificial intelligence (AI) solutions for breast cancer detection in MRI screenings while prioritizing data privacy and fostering collaboration.

In an age where data privacy is paramount, ODELIA offers a groundbreaking approach to AI development. By uniting institutions across Europe in a pan-European Swarm Learning Network, ODELIA facilitates secure and collaborative AI development without the need to share sensitive patient data. This ensures that patient privacy remains intact—a crucial ethical consideration in healthcare AI.

ODELIA's primary objective is to build the first open-source software framework for SL, providing an assembly line for the streamlined development of AI solutions. The project partners collaborate to develop the first clinically useful AI algorithm for the detection of breast cancer in magnetic resonance imaging (MRI), using a distributed database that exceeds all previous studies. Using SL, ODELIA aims to enhance diagnostic performance, accelerate AI development, and create robust, generalizable solutions for better healthcare outcomes.

The ODELIA project's success is expected to have far-reaching impact. It will not only deliver a useful medical application for the detection of breast cancer but also serve as a model for similar initiatives in other medical fields. By fostering secure, collaborative AI development and protecting patient data, ODELIA paves the way for a new era of healthcare innovation, thereby promoting and fostering transparency and trust in AI solutions in healthcare.

Comprising 12 partners from 8 countries, the ODELIA Consortium brings together experts in medicine, artificial intelligence, and big data. This multidisciplinary collaboration is dedicated to transforming medical AI and advancing data privacy through swarm learning. As the project unfolds, ODELIA plans to establish a marketplace for follow-up ideas, enabling the expansion of SL's potential in healthcare. Additionally, the project is developing a user-friendly platform that will allow clinicians to utilise SL-trained AI models and test them with their data, facilitating the adoption of these groundbreaking solutions.

**Mutual areas of interests with CARDIOCARE** include the use of AI models in breast cancer research. ODELIA aims to develop an AI model, based on Swarm Learning (i.e., decentralized machine learning solution), useful in clinical practice, for the diagnosis of breast cancer from MRI images. CARDIOCARE on the other side, uses deep learning methods to develop an innovative risk stratification model to improve early diagnosis and management of cardiotoxicity in breast cancer patients.

More information about the project on the website: <http://www.odelia.ai/>

Project duration: 01/01/2023 – 31/12/2027

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*ODELIA funded by the European Union under grant agreement No 101057091. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Health and Digital Executive Agency (HADEA). Neither the European Union nor the granting authority can be held responsible for them.*

## Publications

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Alexandraki A, Papageorgiou E, Zacharia M, et al. **New Insights in the Era of Clinical Biomarkers as Potential Predictors of Systemic Therapy-Induced Cardiotoxicity in Women with Breast Cancer: A Systematic Review.** *Cancers (Basel)*. 2023;15(13):3290. [doi:10.3390/cancers15133290](https://doi.org/10.3390/cancers15133290)



## Conferences

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1. Tsiouris K, Mitsis A, Grigoriadis G, et al. **Risk Stratification for Cardiotoxicity in Breast Cancer Patients: Predicting Early Decline of LVEF After Treatment.** 2023 IEEE 45th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) (Oral presentation)
2. Karanasiou G, Koumakis L, Sfakianakis S, et. al. **CARDIOCARE: An integrated platform for the management of elderly multimorbid patients with breast cancer therapy induced cardiac toxicity.** 2023 IEEE 45th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) (Poster presentation)

## CARDIOCARE Events

### Past Events

#### ESC Spring Summit 2023 (Nice, France – March, 2023)



CARDIOCARE was presented at the ESC Spring Summit 2023 at the European Heart House. Specifically, the latest developments on the management of the elderly multimorbid patient with breast cancer therapy induced cardiac toxicity were presented.

#### Panhellenic working group seminars by the Hellenic Cardiological Association (Athens, Greece – February, 2023)



Dr. Dorothea Tsekoura, NKUA presented CARDIOCARE to the Cardio-oncology Team Session in the [Panhellenic working group seminars](#) by the Hellenic Cardiological Association.



## 45th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2023) (Sydney, Australia – July, 2023)

CARDIOCARE participated in [EMBC 2023](#) with the abstract “CARDIOCARE: an integrated platform for the management of elderly multimorbid patients with breast cancer therapy induced cardiac toxicity” was presented in the poster session of the conference. Moreover, the abstract “Risk Stratification for Cardiotoxicity in Breast Cancer Patients: Predicting Early Decline of LVEF After Treatment” was presented (oral presentation) in the Biomedical & Health Informatics Theme.



## 1st Congress on Heart and Cancer 2023 (Athens, Greece – July, 2023)

Dr. Dorothea Tsekoura, NKUA presented CARDIOCARE, its vision, and objectives at the 1st Congress of Heart and Cancer 2023. The congress was organized by the Department of Cardiology, Athens University Hospital “Attikon”.



## ESC Congress 2023 (Amsterdam, Netherlands – August, 2023)

CARDIOCARE participated in the [ESC Congress 2023](#) with a special talk to ESC TV Connect entitled “How to improve cardio-oncology care in Europe“. Prof. Gerasimos Filippatos, NKUA, and Dr. Katerina Naka, UOI, discussed on how to improve the cardiovascular care of patients with cancer.



### CARDIOCARE Symposium in IPOS 2023 (Milan, Italy – September 2023)



The CARDIOCARE consortium organized a Symposium entitled “An interdisciplinary ecosystem for the psychosocial and behavioral management of Cardiotoxicity in elderly breast cancer patient: the CARDIOCARE project” within [IPOS 2023](#).

### Panhellenic Congress of Molecular Oncology & Targeted Therapy 2023 (Ioannina, Greece – September 2023)



CARDIOCARE participated in the [Panhellenic Congress of Molecular Oncology & Targeted Therapy](#) by organizing a roundtable discussion on how to depict cardiotoxicity and unearthing under-esteemed chemotherapy related morbidities in breast cancer. The CARDIOCARE integrated platform and the eHealth applications were presented along with the experience from the clinical centers in Italy, Sweden,

### InnoHealth Forum 2023 (Larissa, Greece – September, 2023)



CARDIOCARE participated in the [InnoHealth Forum 2023](#) with a stand and a presentation on the vision and the objectives of the project. Moreover, a brief description of the CARDIOCARE retrospective and prospective study was presented, as well as the eCRF system, the CARDIOCARE mobile apps and the platform.



### **2nd International Virtual Conference on Cancer Research and Oncology (online – October, 2023)**

CARDIOCARE was presented in the 2nd International Virtual Conference on Cancer Research and Oncology.

### **“Pink the City 2023” event (Patras, Greece – October 2023)**

CARDIOCARE participated in the [“Pink the City 2023”](#) event organized by the Hellenic Association of Women with breast cancer “Alma Zois Patras”. The aim of the event was to raise awareness of breast cancer, early identification signs and symptoms of breast cancer.



### **Forthcoming Events**

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#### **3rd International Conference on Cancer Science and Therapy (online, December 2023)**

Dr. Alexia Alaxandraki, BOCOC will present CARDIOCARE at the 3rd International Conference on Cancer Science and Therapy.

#### **IEEE International Conference on Bioinformatics and Biomedicine (IEEE BIBM 2023) (Istanbul, Turkey – December 2023)**

Dr. Kostas Tsiouris, UOI will present a paper entitled “CARDIOCARE platform: A beyond the state of the art approach for the management of elderly multimorbid patients with breast cancer therapy induced cardiac toxicity” in the 7th Edition of the Workshop on Processes and Algorithms for Healthcare and Life Quality Improvement.

#### **7th Hellenic Congress Oncology (Thessaloniki, Greece – April 2024)**

CARDIOCARE will organize a round table on Cancer and Cardiotoxicity in the 7th Hellenic Congress Oncology.

## Other news

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### ESCAPE Newsletter

The ESCAPE project (H2020, GA 945377) hosted an article about the CARDIOCARE project. Follow [the link](#) to view the article.

### Podcast #1: Cardiotoxicity in elderly breast cancer patients

The first podcast of CARDIOCARE is available on the [YouTube channel](#) of the project. In this podcast, Dr. Keramida, NKUA, and Dr. Tsekoura, NKUA, discussed about the cardiotoxicity in elderly breast cancer patients. Follow [the link](#) to listen to the podcast.

### ESC Press Release

A press release was prepared during the ESC Congress 2023 on August, 2023 entitled “How to avoid heart damage in women receiving breast cancer treatment”. Follow [the link](#) to view the article.

### Article by Hospital Healthcare Europe

An article by Hospital Healthcare Europe was published on August 2023 with the title “EU-funded project to reduce cardiac damage from breast cancer therapy set to launch clinical trial”. Follow [the link](#) to view the article.

### CARDIOCARE plenary meeting

The CARDIOCARE plenary meeting took place on 4-5 September 2023 in Milan, Italy. This was the second physical meeting of the project, during which the progress and the various issues for the implementation of the project were discussed.



## CARDIOCARE People

### *Dr. Andri Papakonstantinou (KSBC)*

Dr. Andri Papakonstantinou, MD, is a PhD and Senior Consultant in breast and sarcoma oncology. She is the Head of the Unit for Breast cancer, endocrine tumors and sarcoma Oncology, at Karolinska Comprehensive Cancer Center and a Postdoctoral Researcher with a Swedish Society for Medical Research (SSMF) Fellowship.

She holds a PhD in the field of breast cancer, with special focus on the side effects of breast cancer therapies and an MSc in Clinical trials. She is a founding member of the cardio-oncology group at the Karolinska University Hospital. She is involved in clinical trials in breast cancer and sarcoma at Karolinska University Hospital as local principal or sub-investigator. She is member in international societies such as ESMO, CTOS, ASCO and the SSG and member of the ESMO Public Policy Committee.



### *Dr. Athos Antoniadis (STREMBLE)*



Dr. Athos Antoniadis is the founder, CEO and Head of Research at STREMBLE Ventures Ltd, a contract research company in the biotech domain. His research focuses on Bioinformatics and Computational Biology method development targeting both the discovery of novel drug targets as well as the progression of existing compounds through the drug development pipeline. He holds leadership positions in large international consortia and projects including in 4 ongoing European Commission funded projects, 3 ongoing clinical trials, 5 ongoing international clinical studies and several smaller research projects funded by research institutions or industry. Apart from his Stremble affiliation he also actively collaborates with scientific management roles in his “alma mater” team at University of Cyprus.





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