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1. EXECUTIVE SUMMARY

The main goal of the HEARTEN Dissemination and Communication Plan is to raise the awareness of the project activities and communicate HEARTEN in the wide audience and in the relevant stakeholders. Towards this direction, a specific Work Package has been implemented in order to facilitate the handling of public and confidential project results and outcomes. In order to effectively and efficiently enhance the penetration of HEARTEN, different communication channels and media have been utilized. “D2.4 – HEARTEN Presentations and Promotional Material 3” presents all the actions that have been performed by the HEARTEN Consortium in the period M25-M30. Specifically, among the communication tools that have been adopted for proper and targeted information diffusion of HEARTEN are:

- **Journal publications** in the Electroanalysis Journal, Biosensors and Bioelectronics Journal, Journal of Breath Research and Microchemical Journal, in the Sensors and Actuators B: chemical Journal, in the Polymers advanced technologies Journal, etc.
- **Conference publications;** in the 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC’17), in the 30th IEEE International Symposium on Computer-Based Medical Systems (CBMS 2017), in the International Conference on Biomedical and Health Informatics (BHI 2017), in the SPIE Microtechnologies 2017 Conference, and in the Colloquium Spectroscopicum Internationale XL Conference, e.tc.
- **Project presentations** at the XX National Congress of Hospitals and Healthcare management, in Alpha Bank and Eurobank in Athens, in the 16th International Summer School on Biocomplexity, Biodesign Bioinnovation, Biomanufacturing & Bioentrepreneurship, in the 30th IEEE International Symposium on Computer-Based Medical Systems (CBMS 2017), in the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (Pittcon 2017).
- **Poster presentations** in the Informatics for Health Congress 2017, in the International Conference on Biomedical and Health Informatics (BHI 2017), in the 27th Medical Informatics Europe Conference, etc.
- **Participation in the networking session** in the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (Pittcon 2017), online presentation published in Virgen del Rocío University Hospital (VRUH) webpage, launch of a new co-working space (Taulas) based in Sanluri (Cagliari).
- **Presence and engagement in social media** (Facebook, Twitter, LinkedIn).
- **Update of HEARTEN website**

The HEARTEN partners have given emphasis in approaching the patients aiming at: (i) raising awareness of the expected outcomes and benefits of HEARTEN platform, and (ii) getting useful feedback on the approach and the willingness to use HEARTEN in their life. More specifically, the following activities focused on HF patients:

- **Direct Meetings.** (i) Meeting with the representative of the "Amici del Cuore-Pisa (Italy)" and the local association of cardiopathic and heart failure (HF) patients with about 80 members. The purpose was to communicate and make aware the patient association about the HEARTEN objective and the expected impact on improving the HF patient's management. (ii) Meeting with the "Amici del Cuore-Livorno (Italy)", a local association of cardiopathic and HF patients with about 150 members. The overall objective of this meeting was to present HEARTEN mHealth platform and further discuss the issues of HF management and how these could be resolved by the adoption of the HEARTEN platform. The above meeting complement the everyday promotion of HEARTEN in the participating hospitals (SAS, UNIFI and the collaborating University Hospital of Ioannina).
- **Contacts with patients' associations and hospitals,** such as the Hospital "Brotzu", based in Cagliari (IT) and the "St Vincents Hospital" of Dublin.
- **Creation of video** (Spanish, English version) targeting the patient population, which is available in the website and the project social media.
- **Participation in the HEALTHIO event,** where patients, healthcare professionals and enterprises meet to know the state of the art of innovation in Healthcare. The presentation of HEARTEN has been achieved through leaflets and TV material.
- **Social media** posts engaging HF patients through messages related to HF symptoms and management, etc. More specifically, Facebook and Twitter have been used to approach the Heartbeat Trust association, an Ireland's national HF charity. Heartbeat Trust was informed about the HEARTEN platform and the gained benefits of its use by the HF patients, and assisted HEARTEN in communicating the project progress and behavioural surveys through their social accounts.
- **Creation of a new flyer** for approaching and effectively communicating to the HF patients what HEARTEN is about and what are the expected benefits for the patients after the utilization of this mHealth platform for their disease management.
- **Promotion of the project behavioral survey** to reach the HF patients and analyse their expected attitude for HEARTEN adoption.

2. HEARTEN Dissemination Tools and Activities

HEARTEN has identified the key stakeholders of the proposed mHealth solution (“D2.6- Exploitation-Innovation plan 1”) and through specific methods, tools and activities is communicating the gained knowledge, the results, the benefits and the expected impact on the HF patients and the whole community. The performed dissemination activities aim at: (i) informing the (international) research community for the beyond the state-of-the-art achievements taking place in the project, (ii) raise awareness among patients on how HEARTEN could affect their lives, (iii) to inform the other stakeholders (including the clinical actors but also healthcare decision makers) on the added value and the developments of HEARTEN project. The main dissemination activities performed from M25-M30 are presented in Table 1.

Table 1: HEARTEN Dissemination Activities (M25-M30).

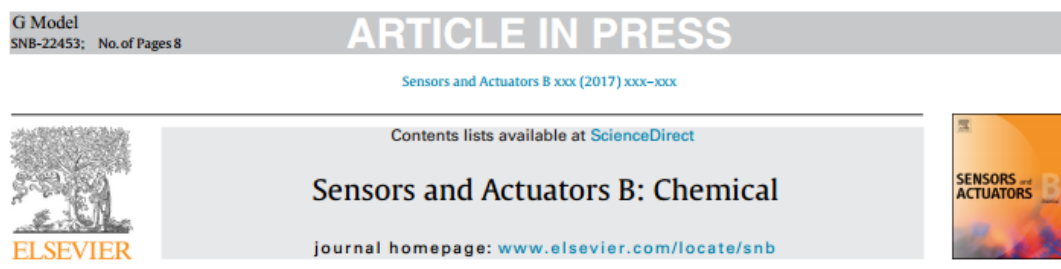
Type of activity	Journal articles		Conference papers	
Publications	8		7	
Type of activity	Project Presentations	Posters	Videos/Flyers	Other
Promotional activities	33	4	2	6

2.1 HEARTEN publications (journals, conferences, etc)

UCBL

Paper published in the Sensors and Actuators B: chemical Journal

A paper entitled “Electrochemical biosensors platform for TNF- α cytokines detection in both artificial and human saliva: Heart failure” is published in the “Sensors and Actuators B: chemical” Journal. This paper reports the development of a fully integrated electrochemical biosensor platform which can simultaneously detect varying cytokine biomarkers using eight gold working microelectrodes (WE) with high sensitivity of detection and low time of analysis.



Electrochemical biosensor platform for TNF- α cytokines detection in both artificial and human saliva: Heart failure

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Figure 1: Paper published in “Sensors and Actuators B: chemical” Journal.

The details of the paper published in the Journal “Sensors and Actuators B: Chemical” are presented in Table 2.

Table 2: Details of the paper presented in the Journal “Sensors and Actuators B: Chemical”.

Journal Title	Sensors and Actuators B: Chemical	Impact Factor	4.758
Targeted audience	Health care professionals, clinical researchers and electrochemical biosensor experts		
Paper title	Electrochemical biosensors platform for TNF- α cytokines detection in both artificial and human saliva: Herat failure.		
Volume	XXX	Date	2017

Paper published in the polymers advanced technologies Journal

A paper entitled “Tailoring of carboxyl-decorated magnetic latex particles using seeded emulsion polymerization” is published in the “Polymers advanced technologies” Journal. This paper reports on a submicron and carboxyl-functionalized magnetic latex particles that were elaborated by using seeded emulsion polymerization technique in presence of oil-in-water (o/w) magnetic emulsion as seed.

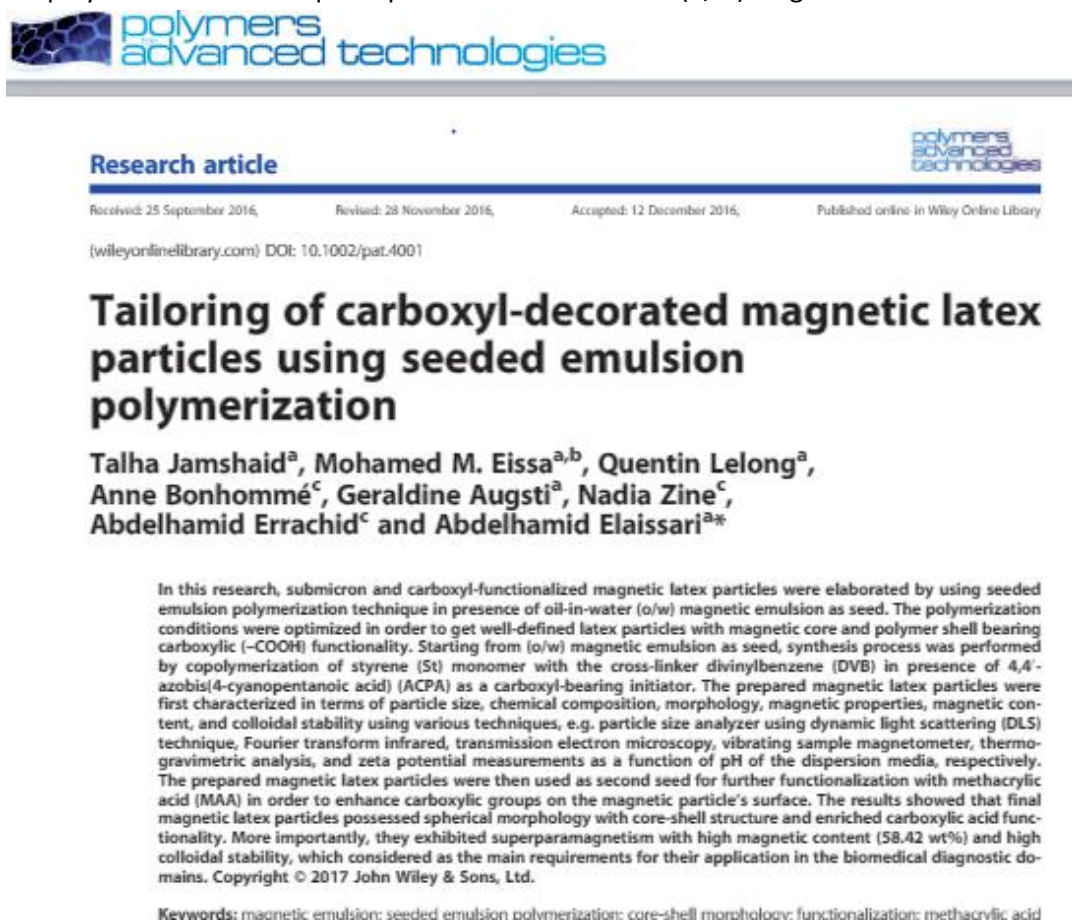


Figure 2: Paper published in the “Polymers advanced technologies” Journal.

The details of the paper published in the Journal “Polymers advanced technologies” are presented in Table 3.

Table 3: Details of the paper presented in the Journal “Polymers advanced technologies”.

Journal Title	Polymers advanced technologies	Impact Factor	1.907
Targeted audience	Sensor and nanomaterials experts		
Paper title	Tailoring of carboxyl-decorated magnetic latex particles using seeded emulsion polymerization		
Volume	DOI: 10.1002/pat.4001	Date	2017

FORTH

Paper accepted in the 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'17)

A paper entitled “A Computational Approach for the Estimation of Heart Failure Patients Status Using Saliva Biomarkers” has been prepared and was accepted in the in the 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'17). The paper concerns a computational approach that has been applied for the estimation of the severity of HF in terms of New York Heart Association (NYHA) class and the characterization of the status of the HF hospitalized patients, in acute, progressive or stable categories.

A Computational Approach for the Estimation of Heart Failure Patients Status Using Saliva Biomarkers*

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Abstract—The aim of this work is to present a computational approach for the estimation of the severity of heart failure (HF) in terms of New York Heart Association (NYHA) class and the characterization of the status of the HF patients, during hospitalization, as acute, progressive or stable. The proposed method employs feature selection and classification techniques. However, it is differentiated from the methods reported in the literature since it exploits information that biomarkers fetch. The method is evaluated on a dataset of 29 patients, through a 10-fold-cross-validation approach. The accuracy is 94 and 77% for the estimation of HF severity and the status of HF patients during hospitalization, respectively.

I. INTRODUCTION

Saliva is an informative, biological fluid that is clinically useful for providing information related to prognosis, diagnosis, monitoring and management of patients with chronic diseases. It is advantageous in terms of ease of collection and storage and it contains multiple biomarkers which can be representative of the disease stage. Currently, salivary diagnostics is an emerging field that is integrated as part of disease diagnosis and monitoring, allowing the on-time and accurate clinical decisions for improved patient care.

Amylase, Lactate, Cortisol and 8-iso-prostaglandin F2a, play a key role in the patient diagnosis and prognosis.

Uric acid is linked with the action of xanthine oxidase that is appreciated as an important contributor to both symptoms of HF as well as its progression [1]. HF is characterized by the activation of neurohormones and cytokines. The role of inflammation in HF is of significant importance since high level of cytokines results to the clinical deterioration of HF patients [2]. In patients with congestive HF, increased concentrations of cytokines have been found during acute phase [3]. Since cytokines, such as TNF- α , is known to be involved in the remodeling of the heart and in the activation of neurohormonal pathways, their levels provide useful information of the status of the disease [4]. In fact, it is well established that high TNF- α concentrations appear in patients with HF and these levels are highly correlated with the patient's functional class [5].

α -Amylase is a new biomarker for assessing the activity of the sympathetic nervous system and has been recently proved to be a prominent candidate for HF [6, 7]. Cortisol is known to affect cardiovascular risk factors, such as hypertension that in turn influence survival. Cortisol acts as mineralocorticoid receptor in the kidney and the heart and is

Figure 3: Paper accepted in the 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'17).

The details of the Conference, where the paper will be presented, are depicted in Table 4.

Table 4: Details of EMBC'17 Conference.

Conference Title	39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'17)
Location	Korea
Date	July 2017
Theme of the Conference	Smarter Technology for a Healthier World
Targeted audience	Cutting-edge biomedical and healthcare technology experts

Paper accepted in the 30th IEEE International Symposium on Computer-Based Medical Systems - IEEE (CBMS 2017)

A paper entitled “Estimation of heart failure patients’ medication adherence through the utilization of saliva and breath biomarkers and data mining techniques” has been prepared and was accepted in the 30th IEEE International Symposium on Computer-Based Medical Systems - IEEE (CBMS 2017). The objective of the paper was to estimate the medication adherence of patients with HF through the application of a data mining approach on a dataset including information from saliva and breath biomarkers. A two-staging method was applied: (i) a model for the estimation of adherence risk of a patient based on anamnestic and instrumental data, (ii) the output of the model, accompanied with data from saliva and breath biomarkers, was the input to a classification model for determining if the patient is medication adherent or not.

Estimation of heart failure patients medication adherence through the utilization of saliva and breath biomarkers and data mining techniques

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Abstract—The aim of this work is to estimate the medication adherence of patients with heart failure through the application of a data mining approach on a dataset including information from saliva and breath biomarkers. The method consists of two stages. In the first stage, a model for the estimation of adherence risk of a patient, exploiting anamnestic and instrumental data, is applied. In the second stage, the output of the model, accompanied with data from saliva and breath biomarkers, is given as input to a classification model for determining if the patient is adherent, in terms of medication. The method is evaluated on a dataset of 29 patients and the achieved accuracy is 96%.

Direct and indirect methods have been implemented for the estimation of medication adherence, with the Medication Event Monitoring System (MEMS) and measurement of drug levels in blood and urine to be the golden standard of indirect and direct methods, respectively [5]. Estimation of medication adherence has also gained the interest of researchers who performed studies in order to identify the modifiable factors associated with medication adherence and developed models for predicting adherence in adults with HF. The prediction models reported in the literature exploit

Figure 4: Paper accepted in the 30th IEEE International Symposium on Computer-Based Medical Systems - IEEE (CBMS 2017).

The details of the Conference, where the paper will be presented, are depicted in Table 5.

Table 5: Details of CBMS 2017 Conference.

Conference Title	30th IEEE International Symposium on Computer-Based Medical Systems - IEEE (CBMS 2017)
Location	Greece
Date	June 2017
Theme of the Conference	Computer-Based Medical Systems
Targeted audience	Bioinformatics, data analysts, Biomedical experts, Clinical and Healthcare Services Research experts.

Paper accepted in the International Conference on Biomedical and Health Informatics (BHI 2017)

A paper entitled “Estimation of New York Heart Association class in Heart Failure Patients Based on Machine Learning Techniques” has been prepared and was accepted in the International Conference on Biomedical and Health Informatics (BHI 2017). The paper presented an automated method for the early identification of NYHA class change in patients with HF through the employment of classification techniques. The severity of HF in terms of NYHA class was addressed as two, three and, for the first time, as four class classification problem.

Estimation of New York Heart Association class in Heart Failure Patients Based on Machine Learning Techniques*

Evanthia E. Tripoliti, *Member, IEEE*, Theofilos G. Papadopoulos, Georgia S. Karanasiou, Fanis G. Kalatzis, Aris Bechlioulis, Yorgos Goletsis, *Member, IEEE*, Katerina K. Naka, Dimitrios I. Fotiadis, *Senior Member, IEEE*

Abstract—The aim of this work is to present an automated method for the early identification of New York Heart Association (NYHA) class change in patients with heart failure using classification techniques. The proposed method consists of three main steps: a) data processing, b) feature selection, and c) classification. The estimation of the severity of heart failure in terms of NYHA class is addressed as two, three and, for the first time, as four class classification problem. Eleven classifiers are employed and combined with resampling techniques. The proposed method is evaluated on a dataset of 378 patients, through a 10-fold-cross-validation approach. The highest detection accuracy is 97, 87 and 67% for the two, three and the four class classification problem, respectively.

subtypes of HF can be estimated based on the measurement of the left ventricular ejection fraction (LVEF). The experts classify the severity of HF using either the New York Heart Association (NYHA) or the American College of Cardiology/American Heart Association Guidelines (ACC/AHA) [1] classification systems that provide useful and complementary information. ACC/AHA stages of HF emphasize on the development and progression of HF, whereas NYHA focuses on the exercise capacity of the patient and the symptomatic status of the disease [1, 2].

Although the patho-physiology of HF has been understood in great extent by the medical community, the

Figure 5: Paper accepted in the International Conference on Biomedical and Health Informatics (BHI 2017). The details of the Conference, where the paper will be presented, are depicted in Table 6.

Table 6: Details of BHI 2017 Conference.

Conference Title	Biomedical and Health Informatics (BHI 2017)
Location	Florida, USA
Date	February 2017
Theme of the Conference	Informatics for smart, precision and preventive medicine
Targeted audience	Researchers, clinicians, and industrial partners from the biomedical, life sciences, medical, and industrial communities

CSIC

Paper published in the “Electroanalysis” Journal (Joint publication with UCBL)

A paper entitled “Silicon nitride capacitive chemical sensor for phosphate ion detection based on copper phthalocyanine-acrylate-polymer” was published in the “Electroanalysis” Journal. This paper reports the development of a highly sensitive capacitance chemical sensor based on a copper-doped polymer sensitive layer for the detection of phosphate ions. A capacitance silicon nitride substrate based on an Al/Si/SiO₂/Si₃N₄ structure was used as transducer. The transducers were characterized by capacitance-voltage measurements at various frequencies. The developed sensor showed a good performance for phosphate ions detection within the range of 10⁻¹⁰ to 10⁻⁵ M with a Nernstian sensitivity of 27.7 mV/decade. The limit of detection was determined at 1 nM and the sensor was highly specific for phosphate ions when compared to other interfering ions as chloride, sulfate, carbonate and perchlorate.

Full Paper

Wiley Online Library

ELECTROANALYSIS

DOI: 10.1002/elan.201700005

Silicon Nitride Capacitive Chemical Sensor for Phosphate Ion Detection Based on Copper Phthalocyanine – Acrylate-Polymer

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Abstract: In this work, we report the development of a highly sensitive capacitance chemical sensor based on a copper *C,C,C,C*-tetra-carboxylic phthalocyanine-acrylate polymer adduct (Cu(II)TCPc-PAA) for phosphate ions detection. A capacitance silicon nitride substrate based Al–Cu/Si-p/SiO₂/Si₃N₄ structure was used as transducer. These materials have provided good stability of electrochemical measurements. The functionalized silicon-based transducers with a Cu(II)Pc-PAA membrane were characterized by using Mott-Schottky technique measurements at different frequency ranges and for different phosphate concentrations. The morphological surface of the Cu(II)Pc-PAA modified silicon-nitride based transducer was characterized by contact angle measurements and atomic force microscopy. The pH effect was also investigated by

the Mott-Schottky technique for different Tris-HCl buffer solutions. The sensitivity of silicon nitride was studied at different pH of Tris-HCl buffer solutions. This pH test has provided a sensitivity value of 51 mV/decade. The developed chemical sensor showed a good performance for phosphate ions detection within the range of 10^{–10} to 10^{–5} M with a Nernstian sensitivity of 27.7 mV/decade. The limit of detection of phosphate ions was determined at 1 nM. This chemical sensor was highly specific for phosphate ions when compared to other interfering ions as chloride, sulfate, carbonate and perchlorate. The present capacitive chemical sensor is thus very promising for sensitive and rapid detection of phosphate in environmental applications.

Keywords: Capacitive chemical sensor • phthalocyanine-acrylate • phosphate ions • Mott-Schottky

Figure 6: Paper published in “Electroanalysis” Journal.

The details of the paper published in the Journal “Electroanalysis” are presented in Table 7.

Table 7: Details of the paper presented in the Journal “Electroanalysis”.

Journal Title	Electroanalysis	Impact Factor	2.471
Targeted audience	Electrochemical sensor and chemistry experts		
Paper title	Silicon nitride capacitive chemical sensor for phosphate ion detection based on copper phthalocyanine-acrylate-polymer.		
Volume	29	Date	2017

Paper published in the “Biosensors and Bioelectronics” Journal (Joint publication with UCBL)

A paper entitled “A fully integrated electrochemical biosensor platform fabrication process for cytokines detection” was published in the “Biosensors and Bioelectronics” Journal. In this paper the developed fully integrated electrochemical biosensor platform for cytokine detection at minute concentrations was presented. Monoclonal antibodies (mAb) of anti-human IL-1b and anti-human IL-10 were electroaddressed onto gold working electrodes through functionalization with 4-carboxymethyl aryl diazonium (CMA). The electrodes were measured by electrochemical impedance spectroscopy. IL-10 and IL-1b were detected within the range of 1 pg/mL to 15 pg/mL and no interference with other cytokines was observed.

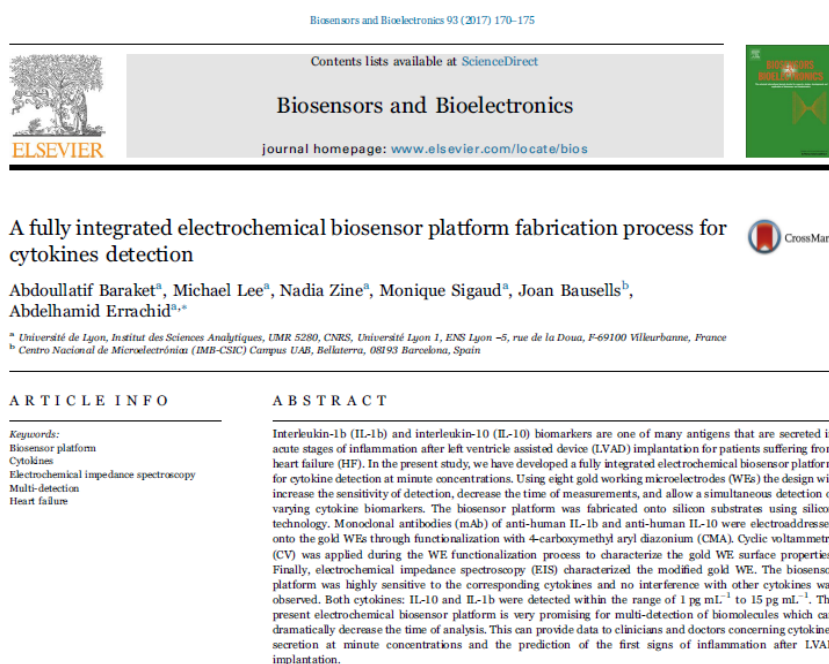


Figure 7: Paper published in “Biosensors and Bioelectronics” Journal.

The details of the paper published in the Journal “Biosensors and Bioelectronics” are presented in Table 8.

Table 8: Details of the paper presented in the Journal “Biosensors and Bioelectronics”.

Journal Title	Biosensors and Bioelectronics	Impact Factor	7.476
Targeted audience	Electrochemical sensor experts		
Paper title	A fully integrated electrochemical biosensor platform fabrication process for cytokines detection		
Volume	93	Date	2017

Paper published in the “Biosensors and Bioelectronics” Journal (Joint publication with UCBL)

A paper entitled “Novel strategy for sulfapyridine detection using a fully integrated electrochemical Bio-MEMS: Application to honey analysis” was published in the “Biosensors and Bioelectronics” Journal. This paper reports the synthesis and characterization of a novel electrochemical biosensor based on gold microelectrodes modified with a new structure of magnetic nanoparticles (MNPs) coated with poly(pyrrole-co-pyrrole-2-carboxylicacid) (Py/Py-COOH). The analyte was quantified through a competitive detection procedure with SA2-BSA antigens toward polyclonal antibody (Ab-155). Electrochemical measurements were carried out using electrochemical impedance spectroscopy. The biosensor was found to be highly sensitive and specific for SPy, with a limit of detection of 0.4 ng/L. This technique was exploited to detect SPy in honey samples by using the standard addition method.



Figure 8: Paper published in “Biosensors and Bioelectronics” Journal.

The details of the paper published in the Journal “Biosensors and Bioelectronics” are presented in Table 9.

Table 9: Details of the paper presented in the Journal “Biosensors and Bioelectronics”.

Journal Title	Biosensors and Bioelectronics	Impact Factor	7.476
Targeted audience	Electrochemical sensor experts		
Paper title	Novel strategy for sulfapyridine detection using a fully integrated electrochemical Bio-MEMS: Application to honey analysis		
Volume	93	Date	2017

Conference paper accepted in the SPIE Microtechnologies 2017 Conference (Joint publication with UCBL)

A paper entitled “Development of biosensors for non-invasive measurements of heart failure biomarkers in saliva” has been accepted in the SPIE Microtechnologies 2017 Conference. This paper presents the detection of specific biomarkers in human saliva related with HF problems, such as interleukin (IL) and Tumour Necrosis Factor- α (TNF- α). The biosensors are based on three metal layer microelectrodes (μ E) of gold, platinum and silver deposited over an oxidized silicon substrate. The surface of the golden electrodes was bio-functionalized electrochemically with monoclonal antibodies by cyclic voltammetry with 4- carboxymethyl aryl diazonium (CMA) molecules. Measurements were based on Electrochemical Impedance Spectroscopy. A high sensitivity for the detection of TNF- α is shown and good selectivity towards other cytokines such as IL-1 and IL-8.

Development of biosensors for non-invasive measurements of heart failure biomarkers in saliva

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ABSTRACT

Biomedical engineering research today is focused on non-invasive techniques for detection of biomarkers related to specific health issues ¹. Three metal layer microelectrode (μ E) sensors have been implemented to detect specific biomarkers which can be found in human saliva related with heart failure problems ² such as interleukin and Tumour Necrosis Factor- α (TNF- α), and used as highly sensitive saliva sensors. We designed specialized μ Es combining different technologies for multiple measurements aiming to a lab-on-a-chip future integration. Measurements are based to basic principles of Cyclic Voltammetry (CV) and Electrochemical Impedance Spectroscopy (EIS). Thus, certain planar technology was used involving three metal layers of gold, platinum and silver deposited over an oxidized silicon substrate following standard cleanroom procedures of lithography for the definition of μ Es, sputtering physical vapor deposition (PVD) for gold, evaporation PVD for silver and platinum, and plasma enhanced chemical vapor deposition (PECVD) for passivation layer of silicon nitride.

Keywords: saliva sensor, electronic tongue, non-invasive, biomedical, heart failure, biomarkers, biosensors

Figure 9: Paper accepted in SPIE 2017.

The details of the Conference, where the 7-pages paper will be presented, are depicted in Table 10.

Table 10: Details of the Paper accepted in the SPIE 2017.

Conference Title	SPIE Microtechnologies – Smart Sensors, Actuators, and MEMS VIII
Location	Barcelona, Spain
Date	May 2017
Theme of the Conference	Microtechnologies for sensing, including medical applications
Targeted audience	Sensor experts

UMOR

Paper published in the Journal of Breath Research

A paper entitled “Oral or nasal breathing? Real-time effects of switching sampling route onto exhaled VOC concentrations” was published in the Journal of Breath Research. This paper presented the analysis on exhaled (Volatile organic compound) VOC concentrations in real-time while switching breathing routes. Changing of the breathing routes and patterns immediately affected exhaled VOC concentrations. These changes were reproducible in both setups. In setup 1 cardiac output and acetone concentrations remained constant, while partial pressure of end-tidal CO₂ (pET-CO₂), isoprene and furan concentrations inversely mirrored tidal-volume and minute-ventilation. In Setup-2 pET-CO₂, C₂H₆S (dimethyl-sulphide), isopropanol, limonene and benzene concentrations decreased whereas, minute-ventilation, H₂S and acetonitrile increased. Isoprene and furan remained unchanged. Breathing route and patterns induced VOC concentration changes depended on respiratory parameters, oral and nasal cavity exposure and physico-chemical characters of the compounds. For using breath VOCs in diagnostic or m-health applications definition and control of sampling modality is mandatory.

Journal of Breath Research



PAPER

Oral or nasal breathing? Real-time effects of switching sampling route onto exhaled VOC concentrations

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Keywords: sampling standardisation, oral and nasal breathing, PTR-ToF-MS, breathing patterns, VOCs, physiological effects, respiratory parameters

Supplementary material for this article is available [online](#)

Abstract

There is a need for standardisation in sampling and analysis of breath volatile organic compounds (VOCs) in order to minimise ubiquitous confounding effects. Physiological factors may mask concentration changes induced by pathophysiological effects. In humans, unconscious switching of oral and nasal breathing can occur during breath sampling, which may affect VOC patterns. Here, we investigated exhaled VOC concentrations in real-time while switching breathing routes. Breath from 15 healthy volunteers was analysed continuously by proton transfer reaction time-of-flight mass spectrometry during paced breathing (12 breaths min⁻¹). Every two minutes breathing routes were switched (Setup-1: Oral → Nasal → Oral → Nasal; Setup-2: Oral_{in}Nasal_{out} → Nasal_{in}Oral_{out} → Oral_{in}Nasal_{out} → Nasal_{in}Oral_{out}). VOCs in inspiratory and alveolar air and respiratory and hemodynamic parameters were monitored quantitatively in parallel. Changing of the breathing routes

Figure 10: Paper published in the Journal of Breath Research.

The details of the paper are presented in Table 11.

Table 11: Details of the Paper published in the Journal of Breath Research

Journal Title	Journal of Breath Research	Impact Factor	4.177
Targeted audience	Experts in the analysis of exhaled breath in physiology and medicine, and the diagnosis and treatment of breath odours		
Paper title	Oral or nasal breathing? Real-time effects of switching sampling route onto exhaled VOC concentrations		
Volume	11	Date	February 2017

UNIFI

Research paper published in Microchemical Journal

A paper entitled “The effect of sampling procedures on the urate and lactate concentration in oral fluid” was published in the Microchemical Journal. The objective of this paper was to evaluate the influence of sampling procedure on the determination of uric acid and lactate in oral fluid. Samples of the non-stimulated and stimulated oral fluid were acquired from 22 healthy volunteers. Different frequencies of stimulation were obtained by moving a polyester swab within the mouth at 50, 100 and 150 min⁻¹. Three oral fluid samples were consecutively collected from a subgroup of 5 volunteers at a constant stimulation (70 min⁻¹) and at a self-selected pace to evaluate reproducibility.

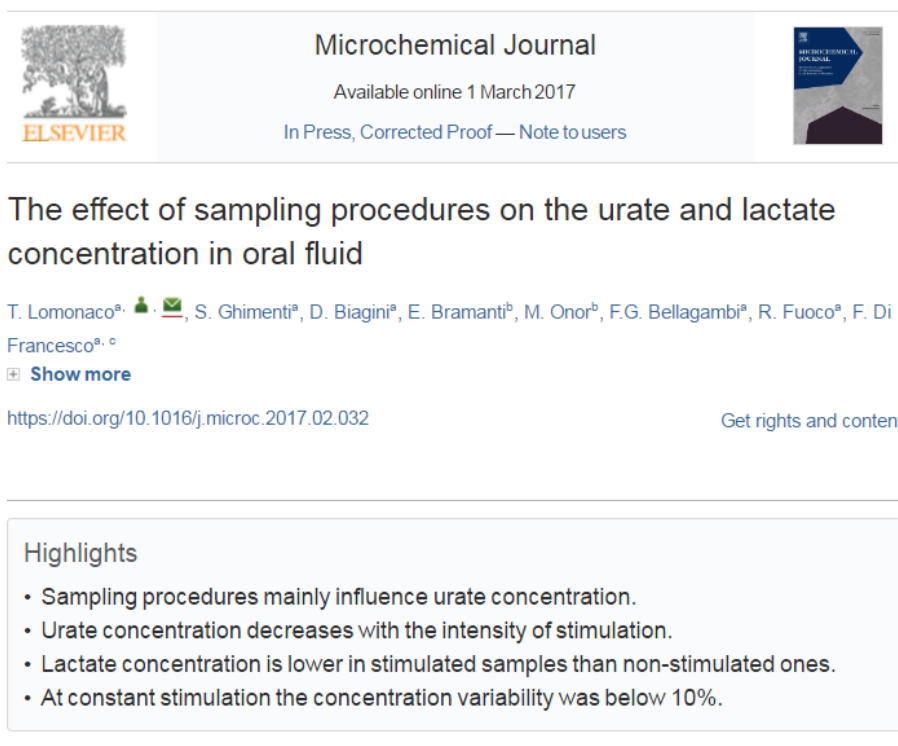


Figure 11: Paper published in Microchemical Journal.

The details of the paper are presented in Table 12.

Table 12: Details of the paper in Microchemical Journal.

Journal Title	Microchemical Journal	Impact Factor	2.893
Targeted audience	Chemical experts, Biosensor experts, Healthcare professionals		
Paper title	The effect of sampling procedures on the urate and lactate concentration in oral fluid		
Volume	In Press	Date	2017

PhD thesis (University of Pisa)

The aim of this PhD thesis was to develop and validate analytical methods for the determination of specific biomarkers in human breath and oral fluid, and to apply them for monitoring the health status of HF patients and the environmental exposure to toxic substances.



University of Pisa
Department of Chemistry and Industrial Chemistry

PhD Thesis
in Chemical Sciences and Sciences of Materials
XXIX cycle, 2014-2016

***Chemical biomarkers
in human breath and oral fluid:
Methods development and their applications
in non-invasive clinical analyses***

PhD Candidate
Francesca G. Bellagambi
University of Pisa, Italy

Figure 12: Thesis presented in the University of Pisa.

Conference papers accepted in the Colloquium Spectroscopicum Internationale XL Conference

A paper entitled "Determination of biomarkers in oral fluid for monitoring heart failure patients" was accepted in the Colloquium Spectroscopicum Internationale XL Conference. The study was focused on the development and validation of analytical methods based on UHPLC-MS/MS, spectrophotometric and immunochemical techniques to determine specific salivary biomarkers. Tumor necrosis factor- α , interleukin-10, 8-iso-prostaglandin F $_2$ - α , uric acid, aldosterone, α -amylase, lactate and cortisol in oral fluid samples were determined. Special attention was paid to the optimization of the sampling procedures and sample handling.



Determination of biomarkers in oral fluid for monitoring heart failure patients

Francesca G. Bellagambi ^{*A}, Tommaso Lomonaco ^A, Silvia Ghimenti ^A, Valentina Barletta ^B, Andreina D'Agostino ^B, Denise Biagini ^A, Mario Marzilli ^B, Maria Giovanna Trivella ^C, Fabio Di Francesco ^A, Roger Fuoco ^A

^A Dipartimento di Chimica, Università di Pisa, Via Giuseppe Moruzzi 13, 56124 Pisa, Italy; ^B Dipartimento di Patologia Chirurgica, Medica, Molecolare e dell'Area Critica, Università di Pisa, Via Paolo Savi 10, 56126 Pisa, Italy; ^C Istituto di Fisiologia Clinica, Consiglio Nazionale delle Ricerche, Via Giuseppe Moruzzi 1, 56124 Pisa, Italy.

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Figure 13: 1st Paper presented in the Colloquium Spectroscopicum Internationale XL Conference.

A second paper entitled “Determination of volatile organic compounds in human breath for monitoring heart failure patients” was accepted in the Colloquium Spectroscopicum Internationale XL Conference. The aim of this work was to develop an analytical procedure, based on Needle Trap Micro-Extraction coupled to GC-MS/MS, to determine volatile organic compounds (VOCs) in human breath.



Determination of volatile organic compounds in human breath for monitoring heart failure patients

Tommaso Lomonaco ^{*A}, Silvia Ghimenti ^A, Francesca G. Bellagambi ^A, Denise Biagini ^A, Valentina Barletta ^B, Andreina D'Agostino ^B, Doralisa Morrone ^B, Mario Marzilli ^B, Maria Giovanna Trivella ^C, Fabio Di Francesco ^A, Roger Fuoco ^A

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Figure 14: 2nd Paper presented in the Colloquium Spectroscopicum Internationale XL Conference.

A third paper entitled “On-sorbent derivatization of carbonyl compounds in exhaled breath” was accepted in the Colloquium Spectroscopicum Internationale XL Conference. The aim of this study was to develop an analytical procedure for the determination of aldehydes and ketones in breath samples by on-sorbent derivatization technique and thermal desorption coupled to GC-MS/MS. The effect of temperature and reaction time as well as the amount of PFBHA spiked into Tenax GR sorbent tubes was evaluated using a 23 full factorial design. In addition, the influence of humidity level and sampling flow rate on the collection efficiency of carbonyl into pre-coated sorbent tubes was assessed. A quantitative linear response in the range 0.1-20 ppbv, detection limits close to 50 pptv and no carry-over effect were observed.



On-sorbent derivatization of carbonyl compounds in exhaled breath

Tommaso Lomonaco ^{*A}, Andrea Romani ^A, Silvia Ghimenti ^A, Massimo Onor ^B, Denise Biagini ^A, Francesca G. Bellagambi ^A, Fabio Di Francesco ^A, Roger Fuoco ^A

^A Dipartimento di Chimica, Università di Pisa, Via Giuseppe Moruzzi 13, 56124 Pisa, Italy; ^B Istituto di Chimica dei Composti Organometallici, Consiglio Nazionale delle Ricerche, Via Giuseppe Moruzzi 1, 56124 Pisa, Italy.

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Figure 15: 3rd Paper presented in the Colloquium Spectroscopicum Internationale XL Conference.

The details of the papers are presented in Table 13.

Table 13: Details of the papers in the Colloquium Spectroscopicum Internationale XL Conference.

Conference Title	Colloquium Spectroscopicum Internationale XL
Location	Pisa Italy
Date	June 2017
Oral presentation 1	Determination of biomarkers in oral fluid for monitoring heart failure patients
Oral presentation 2	Determination of volatile organic compounds in human breath for monitoring heart failure patients
Oral presentation 3	On-sorbent derivatization of carbonyl compounds in exhaled breath
Targeted audience	Scientists from all over the dealing with fundamentals and applications in all branches of Spectroscopy.

Papers submitted in the Journal of Breath Research

A paper entitled “Determination of volatile organic compounds in exhaled breath of heart failure patients by needle trap micro-extraction coupled with gas chromatography-tandem mass spectrometry” has been submitted in the Journal of Breath Research (under review). In this paper, we report the use of needle trap micro-extraction (NTME) coupled with gas chromatography tandem mass spectrometry for the determination of VOCs in exhaled breath. The procedure was successfully applied to the analysis of exhaled breath samples from sixteen HF patients during their stay in the University Hospital of Pisa. Acetone levels measured at the admission (acute phase) decreased up to 50% at the discharge, reflecting the improved clinical conditions of patients during the hospitalization.

Determination of volatile organic compounds in exhaled breath of heart failure patients by needle trap micro-extraction coupled with gas chromatography-tandem mass spectrometry

D Biagini¹, T Lomonaco^{1*}, S Ghimenti¹, F G Bellagambi¹, M Onor², D Morrone³, M Marzilli³, M G Trivella⁴, R Fuoco¹ and F Di Francesco¹

¹ Department of Chemistry and Industrial Chemistry, University of Pisa, Pisa, Italy

² Institute of Chemistry of Organometallic Compounds, CNR, Pisa, Italy

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Figure 16: Papers submitted in the Journal of breath Research.

The details of the paper which was submitted in the Journal of Breath Research are presented in Table 14.

Table 14: Details of paper submitted in the Journal of breath Research

Journal Title	Journal of Breath Research	Impact Factor	4.177
Targeted audience	Experts in the analysis of exhaled breath in physiology and medicine, and the diagnosis and treatment of breath odours		
Paper title	Determination of volatile organic compounds in exhaled breath of heart failure patients by needle trap micro-extraction coupled with gas chromatography-tandem		

	mass spectrometry		
Volume	Under review	Date	-

2.2 HEARTEN posters/presentations/flyer distribution

EVERIS

Presentation of Poster in the Informatics for Health Congress 2017 (Joint with SAS)

EVERIS collaborated with SAS in the preparation of a poster presenting the integration between the SAS electronic health record (HER) and HEARTEN presented in the Informatics for Health Congress that took place on 24 – 26 April 2017 (Manchester).

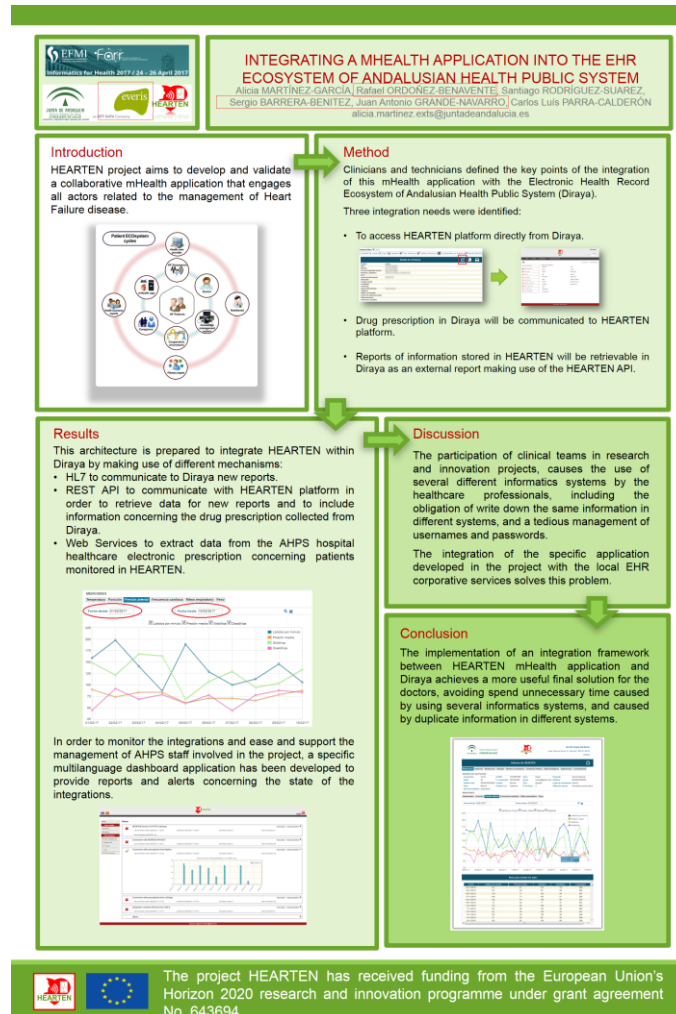


Figure 17: Poster presented in the Informatics for Health Congress.

The details of the congress, where the poster was presented are detailed in Table 15.

Table 15: Details of the Informatics for Health Congress 2017.

Conference Title	Informatics for Health Congress 2017
Location	Manchester United Kingdom
Date	24 – 26 April 2017
Theme of the Conference	The stimulating 3 day programme incorporating Medical Informatics Europe (MEI2017) and The Farr Institute International Conference 2017 offers the opportunity to listen to speakers and thought leaders from across the field of

	health informatics and digital health.
Targeted audience	Academics, health professionals and industry partners.

Publication of HEARTEN Profile in Pan European Networks Health Issue June 2017

EVERIS published an article in the Pan European Networks Health Issue (June 2017) describing the HEARTEN project and the current progress and results [1]. This is an open access publication that reaches 80,000 senior policy makers from European Government departments, the EC, the health research community including funding bodies, institutes and Universities. The objective of this dissemination activity is to create awareness of the project in order to facilitate the exploitation stage.



PROFILE

Take heart, take heed

The Hearten Project develops a co-operative m-health environment targeting the adherence and management of patients suffering from heart failure

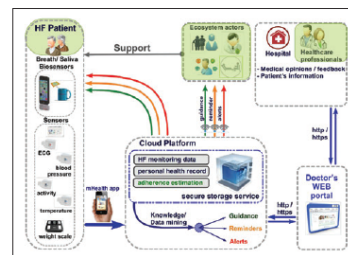
Heart failure (HF) is a chronic, progressive condition in which the heart is no longer efficiently able to pump oxygen-rich blood to the rest of the body. The annual cost to insurers has been estimated at approximately €6,000 per person per year, while the cost-related hospital admissions are estimated to be more than €9,000. Although healthcare professionals provide lifestyle suggestions related to physical activity and nutrition, as well as therapeutic guidance, HF patients are among the most medication non-adherent patients compared to those with other chronic diseases.

In addition, most HF patients do not follow the nutrition suggestions and do not perform regular physical exercise. This is a major barrier with a negative impact on their clinical conditions, autonomy, and consequently, their quality of life.

A patient-centred m-health collaborative environment

HEARTEN's objective is the design, development and validation of an ICT co-operative environment that will enable HF patients to achieve sustainable behaviour changes regarding their adherence, the ecosystem actors to be engaged, and to improve patients' HF management. In order to do this, HEARTEN involves several actors in patient monitoring and management – including healthcare professionals, caregivers (formal and informal), healthcare providers, nutritionists, fitness experts and health insurance experts – in developing a patient-centered m-health collaborative environment.

The HEARTEN system provides ecosystem actors information relating to a patient's status change, medication and adherence levels (in terms of medication, nutrition and physical activity), as well as the risks for adverse events (relapses) and death. Each actor has access to different types of patient information and can provide suggestions and recommendations based on the field of their expertise. Healthcare professionals provide support for changing the treatment plan and for patient medication, exercise programmes and nutrition



recommendations specifically. Physical activity experts, nutritionists and psychologists, meanwhile, can provide support relating to physical activity and nutrition. In this way the HEARTEN system provides different types of alerts to the relevant actors.

Novel biomarkers

Biosensors that detect and quantify novel breath and saliva HF biomarkers have been designed under the scope of the project. These biomarkers reflect the health status of the patient and identify whether the patient adheres to the administered drugs.

In the case of saliva, through validation and confirmation of HF salivary biomarkers of HF patients, sensors detecting changes in

In the case of breath, the validation and confirmation of biomarkers in HF patients and volunteers by cross-validation with relevant clinical parameters have resulted in producing sensors detecting

Figure 18: Article published in Pan European Networks.

This article has been an effort of EVERIS, SAS, FORTH and UCBL towards communicating HEARTEN project and progress to the Senior policy makers from European Government departments, the EC, the health research community including funding bodies, institutes and Universities. More info is provided in Table 16.

Table 16: Details of the Article to be published under Pan European Networks Health Issue

Article	Take Heart, Take Heed: HEARTEN Project develops a co-operative mHEALTH environment targeting adherence and management of patients suffering from Heart Failure
Publisher	Pan European Networks
Date	June 2017
Targeted audience	Senior policy makers from European Government departments, the EC, the health research community including funding bodies, institutes and

Universities.

HEARTEN poster at the XX National Congress of Hospitals and Healthcare management, Seville, Spain

Through an EVERIS' stand, HEARTEN was presented in the XX National Congress of Hospitals and Healthcare management celebrated in Seville from March 29th to 31st. Flyers, a new poster and TV material has been presented in an event oriented to healthcare stakeholders.

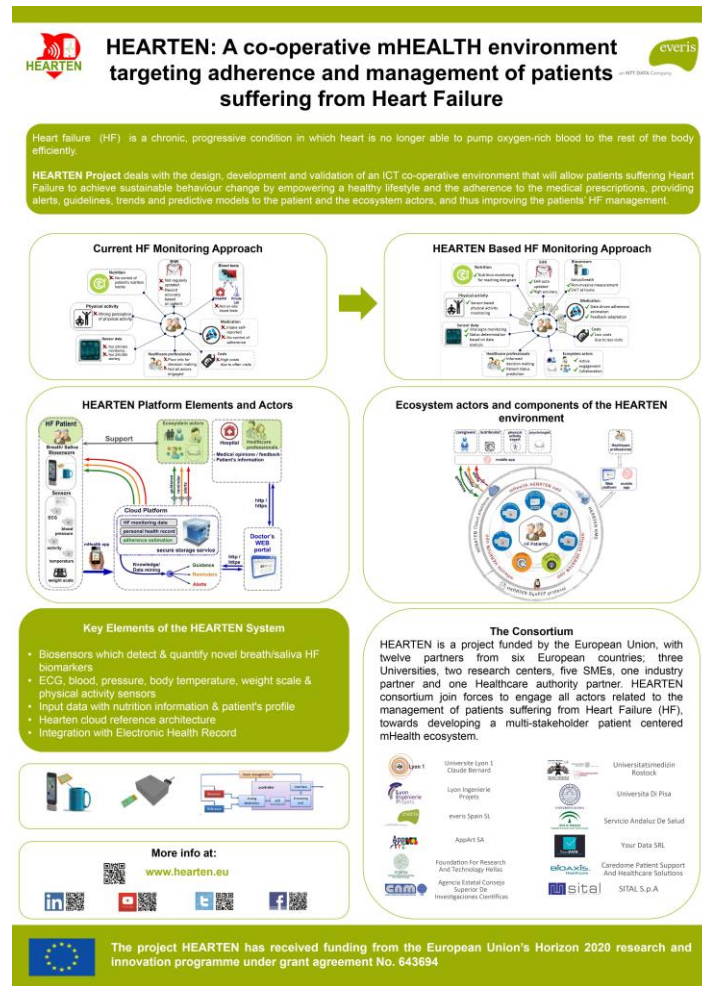


Figure 19: HEARTEN poster in the XX National Congress of Hospitals and Healthcare management.



Figure 20: HEARTEN TV Material presented in the EVERIS' stand.



Figure 21: HEARTEN Flyers distributed during the event.

The details of the XX National Congress of Hospitals and Healthcare management event are presented in Table 17.

Table 17: National Congress of Hospitals and Healthcare management.

Event	XX National Congress of Hospitals and Healthcare management
Location	Seville Spain
Date	March 2017
Organization	Spanish Society of Health Managers (SEDISA) & National Association of Nursing Directors (ANDE)
Targeted audience	Healthcare stakeholders

HEARTEN Presentation at II National Health Hackathon

EVERIS has sponsored the II National Health Hackathon celebrated in Madrid, Spain, from June 9 to 10th, in which designers and programmers promoted in different patients and health professional the developed applications and health games oriented to promote training, education and medical adherence. Taking the advantage of the participation of the health professionals to this event, distribution and communication on the progress and outcomes of the HEARTEN project have been disseminated, including flyer distribution.



Figure 22: Overview of HEARTEN presence in the II National Health Hackathon.

SAS

Poster in the XXXIII Congreso Sociedad Andaluza de Medicina Interna

HEARTEN participated in the XXXIII Congreso Sociedad Andaluza de Medicina Interna, that was held in Córdoba, Spain (June 2017). Through two posters (Figures 23 and 24), SAS disseminated details about the requirements of HEARTEN platform and the prospective data gathering.

IC-003 PROYECTO HEARTEN: ECOSISTEMA MHEALTH PARA PACIENTES CON INSUFICIENCIA CARDÍACA CRÓNICA.

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¹ Medicina Interna, ² Innovación Tecnológica. Complejo Hospitalario Virgen del Rocío, Sevilla (Sevilla).

OBJETIVOS

El proyecto HEARTEN [2] aborda el problema de la falta de adherencia al tratamiento en pacientes con Insuficiencia Cardíaca Crónica (ICC) abarcando:

1. Creación de un ecosistema interactivo, cooperativo y educativo para la gestión integral de la ICC, incluyendo aplicaciones mHealth para los actores de dicho ecosistema.
2. Monitorización continua de biomarcadores específicos en aliento y saliva, así como de variables clínicas.
3. Identificación de tendencias y patrones de falta de adherencia a través de sistemas de gestión del conocimiento. La población objetivo son pacientes con ICC y aguda, ya sea post-isquémica o miocardiopatía dilatada, que requieren ocasionalmente ser readmitidos en el hospital.

PACIENTES Y MÉTODOS

El proyecto involucra activamente al paciente y a facultativos. Los biosensores estarán integrados en la vida cotidiana del paciente. Se dispondrá a cada paciente de un kit de sensores compuesto por los 2 biosensores más otros sensores que realizarán medidas de constantes convencionales. Los datos recibidos por el kit se complementarán con información nutricional que el paciente registrará, así como información que el resto de actores registrarán en el perfil del paciente. Estos datos se transmiten a una BD en la nube, donde un sistema de gestión del conocimiento los analiza haciendo uso de modelos predictivos para identificar patrones de comportamiento.

RESULTADOS

El proyecto se encuentra en su primera anualidad.

- (I) Identificación de un conjunto preliminar de biomarcadores en saliva y aliento.
 - Saliva: proBNP, BNP, NT-proBNP, 8-iso-prostaglandin F2, uric acid, tumor necrosis factor, Interleukin-10, aldosterone, lactate, cortisol.
 - Aliento: acetona, pentano, isopreno y óxido de nitrógeno. Para medir los marcadores definidos e identificar los biomarcadores del proyecto, se van a aplicar metodologías híbridas [3], como p.ej., cromatografía de gases junto con espectrometría de masas (GC-MS).
- (II) Definición de las necesidades de los actores del ecosistema. Se ha utilizado la metodología NDT [4], definiendo un total de 9 objetivos del sistema y 11 requisitos funcionales. Para realizar la recogida de datos, se realizaron un total de 60 entrevistas y 65 cuestionarios a los usuarios tentativos pertenecientes al Servicio Andaluz de Salud, Universidad de Medicina de Rostock y Universidad de Pisa.

CONCLUSIONES

El proyecto HEARTEN mejorará la calidad de vida de los pacientes con ICC proveyendo de alertas, guías, tendencias y modelos predictivos.

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Figure 23: First HEARTEN poster distributed in the XXXIII Congreso Sociedad Andaluza de Medicina Interna.

IC-004 RECOLECCIÓN PROSPECTIVA DE DATOS PARA ESTABLECER UN SISTEMA DE GESTIÓN DEL CONOCIMIENTO PARA MEJORA DE LA ADHERENCIA Y MANEJO DE PACIENTES CON INSUFICIENCIA CARDÍACA (IC).

J. López Morales ¹, A. Martínez García ², V. Sáñez Montagut ¹, M. Pérez Quintana ¹, S. Rodríguez Suárez ¹, J. García Morillo ¹

¹ Medicina Interna, ² Innovación Tecnológica. Complejo Hospitalario Virgen del Rocío. Sevilla (Sevilla).



OBJETIVOS
Recopilar datos prospectivos con el fin de identificar patrones informativos y predictores de adherencia que contribuye al desarrollo de un sistema de gestión del conocimiento (KMS).

PACIENTES Y MÉTODOS
Recolección de información sobre constantes básicas mediante una telemonitorización (temperatura corporal, presión arterial, ritmo cardíaco, actividad física, medidas de ECG y frecuencia respiratoria), así como información relacionada con el paciente (relacionada con nutrición, anamnesis, historia clínica, antecedentes familiares y datos demográficos), de un total de 80 pacientes con Insuficiencia Cardíaca (HF) del Hospital Universitario Virgen del Rocío (Sevilla, España) y de la Universidad de Pisa (Pisa, Italia).

RESULTADOS
El protocolo clínico incluye los siguientes pasos:

1. Identificación del paciente.
2. Criterios de inclusión / exclusión.
3. Explicación sobre el estudio.
4. Consentimiento informado.
5. Resolución de preguntas / dudas.
6. Excel realizan (artículos clínicos y biológicos, puntuaciones, actividad física y sugerencias nutricionales).
7. Monitorización utilizando el dispositivo WinMedical: ECG / actividad / temperatura continuamente durante 20 minutos, presión arterial / peso 2 veces (al principio y al final del período).
8. Consultas de seguimiento: 2ª y 4ª semanas después del alta, protocolo similar (pero duración 30 min; importante una estimación de la adherencia por parte del profesional).
9. Cuestionarios: Conocimiento de HF en el alta, EHFSBS-9 (1er y 2º seguimiento), Minnesota Living With Heart Failure Questionnaire (segundo seguimiento) y Seattle Heart Failure Model.



CONCLUSIONES
Los datos prospectivos, recogidos siguiendo este protocolo, serán analizados por parte del KMS (sistema de gestión del conocimiento; herramienta de inteligencia artificial), que identificará patrones informativos y predictores de adherencia, todo ello participando en un entorno cooperativo de telemedicina que permitirá al paciente HF y los actores del ecosistema mejorar la atención del paciente con IC.

BIBLIOGRAFÍA:
[1] Página web del proyecto HEARTEN: <http://www.hearten.eu/>.

Figure 24: Second HEARTEN poster distributed in the XXXIII Congreso Sociedad Andaluza de Medicina Interna.

Table 18: Details of the XXXIII Congreso Sociedad Andaluza de Medicina Interna

Conference Title	XXXIII Congreso Sociedad Andaluza de Medicina Interna
Location	Córdoba, Spain
Date	June 2017
Theme of the Conference	New advances, knowledge and evolution in Internal Medicine.
Targeted audience	Academics and internal medicine health professionals.

AppART

HEARTEN presentation in Alpha Bank in Athens, Greece

On the 4th of April 2017, AppArt participated in a corporate meeting with Alpha Bank in Athens, (Greece) in order to introduce the company and its activities. The Alpha Bank Group is one of the leading Groups of the financial sector in Greece, with a strong presence in the Greek and international banking market. The presentation took place in Alpha Bank headquarters in Athens, Greece. The participants from Alpha Bank side were senior executives from Vendor Management, as well as CRM departments. The purpose of the meeting was to present AppArt activities, technical know-how and implementation experience. In these frames, AppArt had the opportunity to present also HEARTEN project, its scope as well as AppArt's involvement.

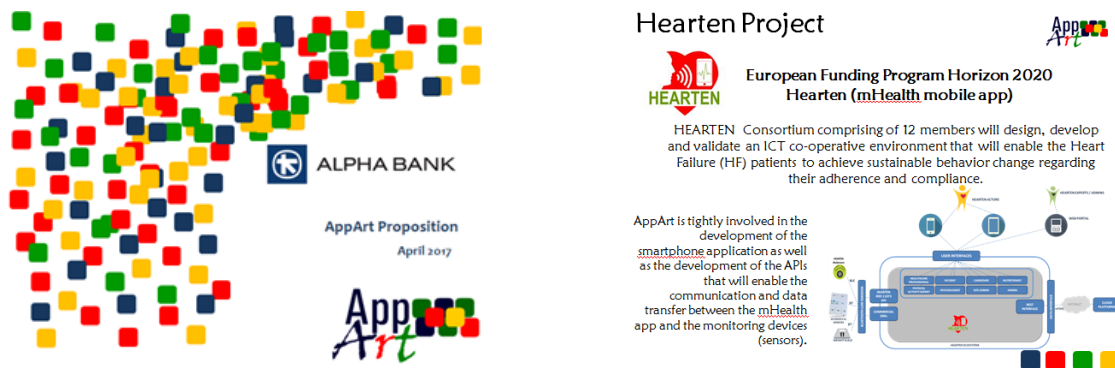


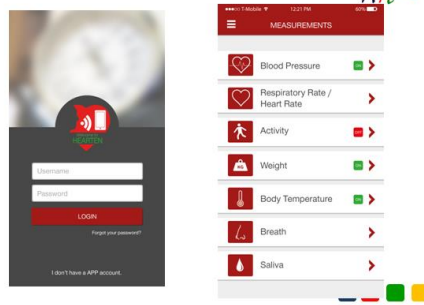
Figure 25: Overview of HEARTEN presentation in Alpha Bank in Athens.

HEARTEN presentation in Eurobank in Athens, Greece

On 24th of April 2017, AppArt participated in a corporate meeting with Eurobank in order to introduce the company and its activities. The Eurobank group is a dynamic banking group active in seven countries, with total assets of €66.4 billion and 15,958 employees. With a total network of 896 branches in Greece and abroad, the Group offers a comprehensive range of financial products and services to its retail and corporate customers. AppArt had the opportunity to present information about company's activities, offering and capabilities through a demonstration of AppArt's solutions and experience in actual project implementations. As part of the demonstration of our expertise related to software development, AppArt presented in detail the HEARTEN project and the developed software communication tools (mobile and web applications). In addition, AppArt presented the aim and scope of the HEARTEN project as well as AppArt's specific involvement in the implementation.



Hearten Project



Hearten Project

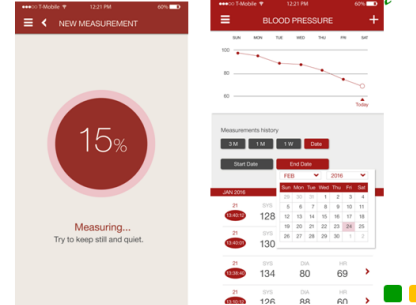


Figure 26: Overview of HEARTEN presentation in Alpha Bank in Athens.

FORTH

Poster presentation in the International Conference on Biomedical and Health Informatics (BHI 2017)

The paper entitled “Estimation of New York Heart Association class in HF Patients Based on Machine Learning Techniques” was presented as a poster in the International Conference on Biomedical and Health Informatics Conference (BHI 2017) (Figure 27).



Figure 27: HEARTEN poster presented in the BHI 2017 Conference.

Presentation in the 16th International Summer School on Biocomplexity, Biodesign Bioinnovation, Biomanufacturing & Bioentrepreneurship

FORTH presented HEARTEN in the 16th International Summer School on Biocomplexity, Biodesign Bioinnovation, Biomanufacturing & Bioentrepreneurship that was held in Chania (Greece) in June. More specifically, the presentation focused on the data mining approaches and the techniques that are used in the different modules of HEARTEN KMS.

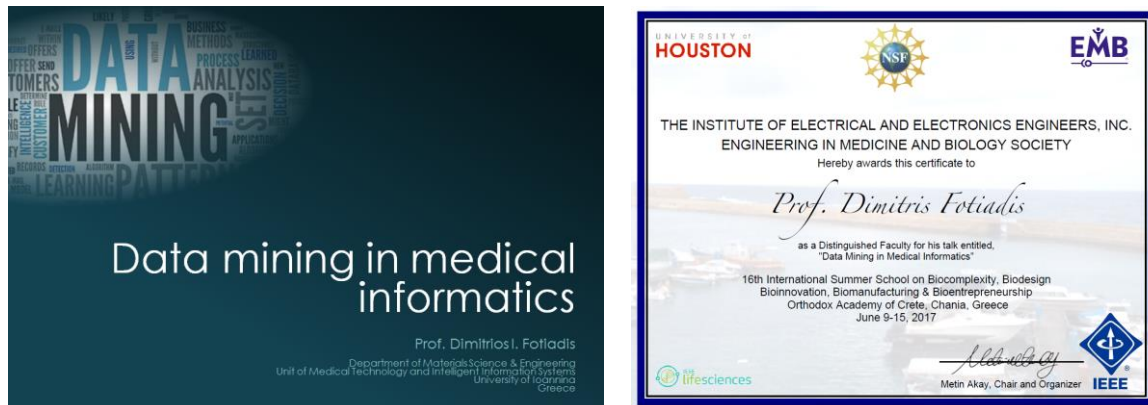


Figure 28: HEARTEN presentation in the 16th International Summer School on Biocomplexity, Biodesign Bioinnovation, Biomanufacturing & Bioentrepreneurship.

Table 19: Details of 16th International Summer School on Biocomplexity, Biodesign Bioinnovation, Biomanufacturing & Bioentrepreneurship

Event	16th International Summer School on Biocomplexity, Biodesign Bioinnovation, Biomanufacturing & Bioentrepreneurship
Talk title	Data mining in medical informatics
Authors	Prof. Fotiadis
Location	Chania, Crete
Date	June 2017
Targeted audience	Undergraduate and graduate Bioinformatics Students

Presentation in the 30th IEEE International Symposium on Computer-Based Medical Systems - IEEE (CBMS 2017)

FORTH participated in the 30th IEEE International Symposium on Computer-Based Medical Systems - IEEE (CBMS 2017) Conference that was held in Thessaloniki in June. Two presentations were presented (Figure 29, Figure 30).

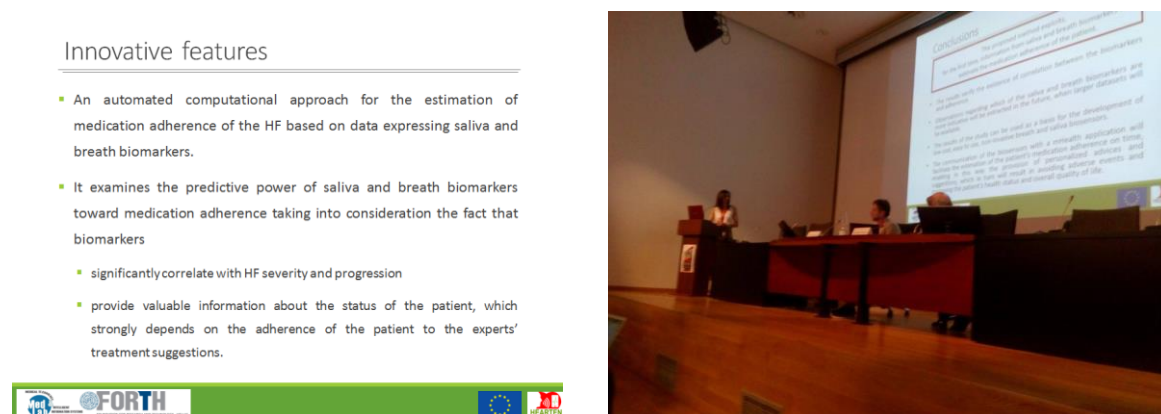


Figure 29: Overview of the first presentation in the CBMS conference.

The first presentation focused on how medication adherence risk and actual medication adherence are achieved through the HEARTEN KMS. The results of the analysis were presented in a wide audience consisted of researchers from different universities in Europe and in USA. The second presentation presented how health related data can provide valuable information and actionable knowledge for patient specific treatment approaches. An extensive presentation of HEARTEN platform was provided focusing on the data collected from the patients and the KMS that retrieves and analyses

those data and extracts personalised messages, alerts and suggestions to the patients and the involved ecosystem actors. In the same event, the project flyer was distributed and demonstrated in the conference participants.

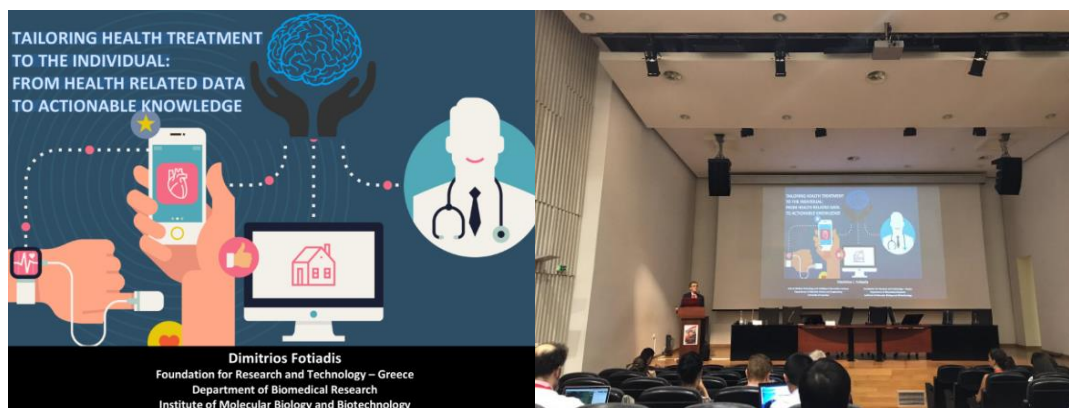


Figure 30: Overview of the first presentation in the CBMS conference.

UMOR

UMOR performed an oral presentation entitled “Online PTR-ToF-MS Applications Reveal the Influence of Oral and Nasal Routes of Breathing on Exhaled VOC Profiles” in the Pittcon 2017 -The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (March 6th 2017).

Table 20: Details of presentation in the Pittcon 2017 Conference.

Conference Title	PittCon 2017
Talk title	Online PTR-ToF-MS Applications Reveal the Influence of Oral and Nasal Routes of Breathing on Exhaled VOC Profiles
Authors	P Sukul, JK Schubert, W Miekisch, S Kamysek
Location	Chicago USA
Date	March 2017
Theme of the Conference	Analytical and Bioanalytical Chemistry
Targeted audience	Bioanalytical and healthcare technology experts

CAREDOME

HEARTEN presentation in Shire, Greece

On 16th of January 2017, CAREDOME participated in a corporate meeting with Shire in Athens, Greece in order to introduce the company and its activities. Shire is an international pharmaceutical company leading in orphan drug production. The participants from Shire were senior executives from General Management Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in BIOIATRIKI, Greece

On 19th of January 2017, CAREDOME participated in a corporate meeting with BIOIATRIKI in Athens, Greece in order to introduce the company and its activities. BIOIATRIKI is one of the leading Diagnostic Centers in Greece, with presence to all major cities. The participants from BIOIATRIKI were senior

executives from General Management Department and Commercial Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement. On 5th of April 2017, a follow up meeting was held in which CAREDOME had the opportunity to present HEARTEN project in the Manager of Healthcare Professionals Network and to the Advisory Board Members.

HEARTEN presentation in EMRI, Greece

On 20th of January 2017, CAREDOME participated in a corporate meeting with EMRI in Athens, Greece in order to introduce the company and its activities. EMRI is Clinical Study and Patient Management company. The participants from EMRI were the CEO and the Product Officer of Clinical Trials and Patient Management. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Novartis, Portugal

On 25th of January 2017, CAREDOME participated in a corporate meeting with Novartis in Lisbon, Portugal in order to introduce the company and its activities. Novartis is a leading international pharmaceutical company. The participants from Novartis were Product Managers and POP executives. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Novartis, USA

On 23rd of January 2017, CAREDOME participated in a remote corporate meeting with Novartis USA in order to introduce the company and its activities. Novartis is a leading international pharmaceutical company. The participants from Novartis were the Global IT Reporting Manager and executives from International Oncology Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Interamerican, Greece

On 24th of January 2017, CAREDOME participated in a corporate meeting with Interamerican in Athens, Greece in order to introduce the company and its activities. Interamerican is a private insurance company leading in the Greek Market. The participants from Interamerican were senior executives from General Management and Networking Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Novartis, Greece

On 26th of January 2017, CAREDOME participated in a corporate meeting with Novartis in Athens, Greece in order to introduce the company and its activities. Novartis is an international pharmaceutical company. The participants from Novartis were senior executives from POP & Digital Department and the Brand Manager of Cardiovascular Products. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Baxalta, Greece

On 30th of January 2017, CAREDOME participated in a corporate meeting with Baxalta in Athens, Greece in order to introduce the company and its activities. Baxalta is an international pharmaceutical company. The participants from Baxalta were senior executives from General Management and Brand Management. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Teva Pharm, Portugal

On 8th of February 2017, CAREDOME participated in a corporate meeting with Teva Pharm in Lisbon, Portugal in order to introduce the company and its activities. Teva Pharm is an international pharmaceutical company specialized mainly in generics. The participants from Teva Pharm were senior executives from Marketing and Patient Access Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in MSD, Portugal

On 8th of February 2017, CAREDOME participated in a corporate meeting with MSD in Lisbon, Portugal in order to introduce the company and its activities. MSD is an international pharmaceutical company. The participants from MSD were senior executives from Marketing. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Pharma Boardroom, UK

On 9th of February 2017, CAREDOME participated in an interview meeting with Pharma Boardroom in Athens, Greece in order to provide insights about the Greek Market. Pharma Boardroom is an international news portal and its target group are Pharmaceutical Executives and Healthcare Decision Makers. The participants from Pharma Boardroom were Journalists and Analysts. The purpose of the meeting was to provide insights about the Greek Market and Patient Management since Pharma Boardroom was preparing a Country Report for Greece. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Vodafone, Greece

On 14th of February 2017, CAREDOME participated in a corporate meeting with Vodafone in Athens, Greece in order to introduce the company and its activities. Vodafone is one of the leading telecommunication providers in Greece. The participants from Vodafone were executives from Key Account Management Department and ICT Solutions Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in MSD, Greece

On 20th of February 2017, CAREDOME participated in a corporate meeting with MSD in Athens, Greece in order to introduce the company and its activities. MSD is an international pharmaceutical company. The participants from MSD were senior executives from Marketing, Medical and Patient Access Department. The purpose of the meeting was to present CAREDOME activities, services and solutions.

Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Pharmathen, Greece

On 1st of March 2017, CAREDOME participated in a corporate meeting with Pharmathen in Athens, Greece in order to introduce the company and its activities. Pharmathen is a pharmaceutical company specialized in generics production and representation of drugs in the local market. The participants from Pharmathen were senior executives from Strategy and Marketing Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Boehringer Ingelheim , Portugal

On 2nd of March 2017, CAREDOME participated in a corporate meeting with Boehringer Ingelheim in Lisbon, Portugal in order to introduce the company and its activities. Boehringer Ingelheim is an international pharmaceutical company. The participants from Boehringer Ingelheim were senior executives from Marketing and Medical Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Merck, Greece

On 3rd of March 2017, CAREDOME participated in a corporate meeting with Merck in Athens, Greece in order to introduce the company and its activities. Merck is an international pharmaceutical company. The participants from Merck were senior executives from Medical and Patient Access Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in PROSYFAPE, Greece

On 17th of March 2017, CAREDOME participated in a corporate meeting with PROSYFAPE in Athens, Greece in order to introduce the company and its activities. PROSYFAPE is a local chain of pharmacies and product distribution chain. The participants from PROSYFAPE were senior executives from General Management and Commercial Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in UCB, Greece

On 27th of March 2017, CAREDOME participated in a corporate meeting with UCB in Athens, Greece in order to introduce the company and its activities. UCB is an international pharmaceutical company. The participants from UCB were senior executives from Marketing Department and Brand Management Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in EUROMEDICA, Greece

On 10th of April 2017, CAREDOME participated in a corporate meeting with EUROMEDICA in Athens, Greece in order to introduce the company and its activities. EUROMEDICA is a leading Diagnostic and

Clinic Network located in major cities in Greece. The participants from EUROMEDICA were senior executives from General Management, Patient Services Management and Clinic Networking Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Lilly, Greece

On 12th of April 2017, CAREDOME participated in a corporate meeting with Lilly in Athens, Greece in order to introduce the company and its activities. Lilly is a pharmaceutical company. The participants from Lilly were senior executives from Marketing Department and Brand Management Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

HEARTEN presentation in Boehringer Ingelheim, Greece

On 28th of April 2017, CAREDOME participated in a corporate meeting with Boehringer Ingelheim in Athens, Greece in order to introduce the company and its activities. Boehringer Ingelheim is an international pharmaceutical company. The participants from Boehringer Ingelheim were senior executives from Procurement and Brand Management Department. The purpose of the meeting was to present CAREDOME activities, services and solutions. Under this framework, CAREDOME had the opportunity to present HEARTEN project, its scope and CAREDOME involvement.

2.3 HEARTEN Website

The project website is updated in a regular basis in order to present all the new communication and dissemination activities of the project. The video that has been prepared and targets the patient population is also available in the website (Figure 31).

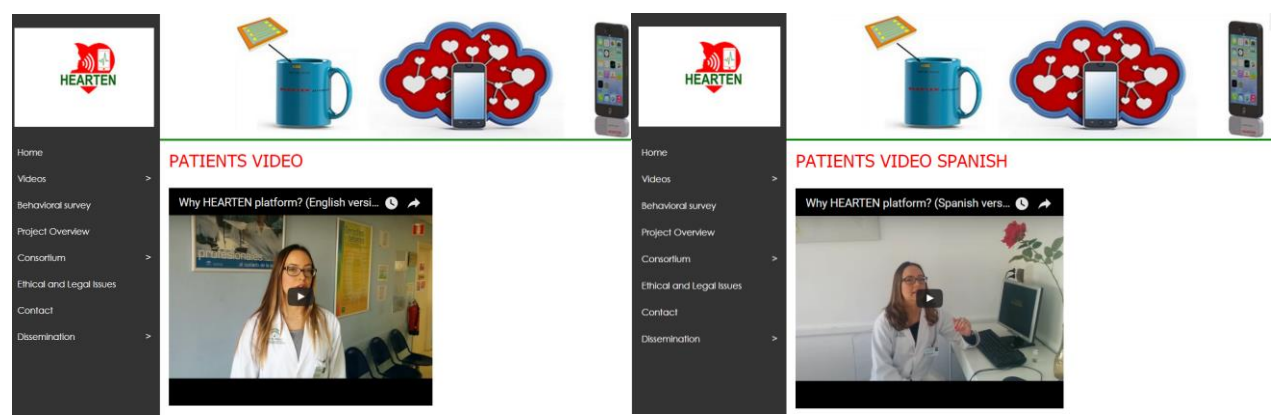


Figure 31: Video targeting the patient population (English and Spanish version).

An overview of the statistics of the project website is provided in Figure 32. More specifically:

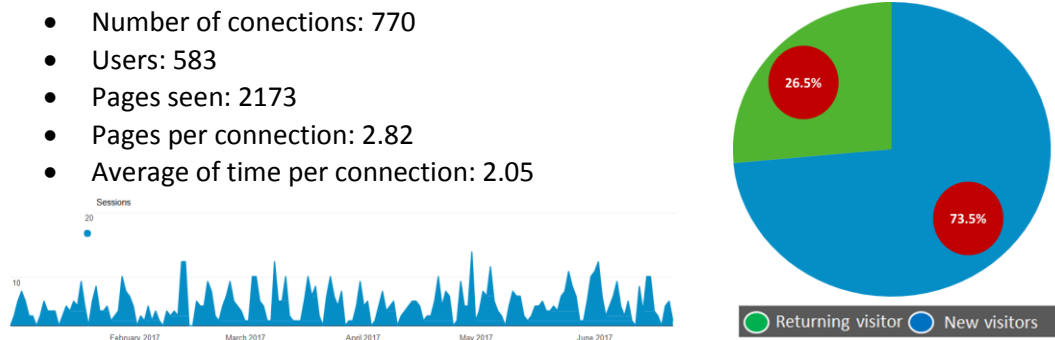


Figure 32: Overview of the website visits.

2.4 Patient specific activities

HEARTEN Consortium emphasized in approaching the patients in order to raise the awareness of the expected outcomes and benefits of HEARTEN platform, and receive valuable feedback on the willingness to use and adopt HEARTEN in their everyday life. Specifically, the activities that have been followed focusing on HF patients are presented below.

Table 21: Overview of the patient specific activities

	Expected number of reached patients	
Direct Meeting	~80 (from Amici del Cuore-Pisa)	~150 (from Amici del Cuore-Livorno)
Contacts with patients' associations and hospitals	~60 (from Hospital "Brotzu")	~50 (from St. Vincents Hospital)
HEALTHIO event	~200	
New flyer/ Social media	~700 (from Heart beat trust) + other HF patients that share our posts/flyer	
Behavioral survey	Ongoing	

HEARTEN presentation in Amici del Cuore-Pisa (Italy) (UNIPi)

UNIPi performed a meeting with the representative of the "Amici del Cuore-Pisa (Italy)", a local association of cardiopathic and HF patients with about 80 members. The meeting was held on February 13th 2017 and the purpose was to communicate and make aware the patient association about the HEARTEN objective and the expected impact on improving the HF patient's management. The HEARTEN survey was also distributed.

HEARTEN presentation in Amici del Cuore-Livorno (Italy) (UNIPi)

UNIPi performed a meeting with the "Amici del Cuore-Livorno (Italy)", a local association of cardiopathic and HF patients with about 150 members. The meeting was held on April 11th 2017. The overall objective of this meeting was to present HEARTEN mHealth platform and further discuss the issues of HF management and how these could be resolved by the adoption of the HEARTEN platform. The HEARTEN survey was also distributed.

Behavioural survey (YOURDATA)

A behavioural survey has been launched with the aim to reach the HF patients and analyse their intention on adopting HEARTEN platform. A full description of the survey can be found in D2.7. Several

contacts have been established with patients' associations and hospitals to inform as much as possible about HEARTEN project and, in this way, engage potential HF patients aiming at filling the survey. A tight cooperation has been established with Hospital "Brotzu", based in Cagliari (IT) and the "St Vincents Hospital" of Dublin (EI).

VIDEO CREATION (SAS)

SAS prepared a video in which the key experts in the management of HF presented the overall approach and vision of HEARTEN project. The video is available in Spanish and English version. It has been uploaded in the social media of HEARTEN and in the project website.



Figure 33: HEARTEN video for patients (English version).

HEARTEN Presentation at HEALTHIO (EVERIS)

EVERIS has participated in the HEALTHIO event, where patients, healthcare professionals and enterprises meet to know the state of the art of innovation in Healthcare. Among the projects presented by EVERIS, the presentation of HEARTEN has been achieved through leaflets and TV material.



Figure 34: HEARTEN Flyer distributed during the event.

The details of the HEARTEN Presentation at HELTHIO are presented in Table 22.

Table 22: Details of HEALTHIO Event.

Event	HEALTHIO
Location	Barcelona, Spain
Date	May 2017
Organization	Fira de Barcelona
Targeted audience	Patients, Healthcare professionals, Pharmaceutical companies, Enterprises

New flyer (FORTH)

FORTH designed a flyer that will be used for approaching and effectively communicating to the HF patients what HEARTEN is about and what are the expected benefits for the patients after the utilization of this mHealth platform for HF management. An overview of the flyer is presented in Figure 35 and Figure 36 respectively.



What is HEARTEN

The HEARTEN system allows you to remotely monitor and manage your health at home and to increase your adherence on your treatment plan.

With HEARTEN, traditional measurements, that require hospital visits, are replaced by measurements at home, by the use of novel sensors for analyzing breath and saliva, and a set of wearable sensors.

The system uses mobile application which enables your mobile phone to an intelligent hub to be able to collect your health data.

The data can be sent to your doctor, physical activity expert, psychologist and nutritionist.

HEARTEN is a system for heart failure patients.

HEARTEN allows you and your doctors to monitor your condition at home.

HEARTEN is a valuable aid to support your everyday effort to follow your treatment plan.

Our mission

At HEARTEN, our goal is to provide our patients and their families with an advanced system for heart failure management.

That is why we offer non-invasive, interactive patient self-care features that let you communicate with your experts, from the convenience of your home.

Benefits

- Home monitoring
- Less hospital visits
- Self-management
- Patient support & empowerment
- Informed medical personnel

Contact Us

Prof. A. Errachid
Tel: +33 437 42 3560
Email: abdelhamid.errachid@univ-lyon1.fr

Figure 35: HEARTEN flyer page 1.


What is HEARTEN

The HEARTEN system allows you to remotely monitor and manage your health at home and to increase your adherence on your treatment plan.

With HEARTEN, traditional measurements, that require hospital visits, are replaced by measurements at home, by the use of novel sensors for analyzing breath and saliva, and a set of wearable sensors.

The system uses mobile application which enables your mobile phone to an intelligent hub to be able to collect your health data.

The data can be sent to your doctor, physical activity expert, psychologist and nutritionist.

HEARTEN is a system for heart failure patients.

HEARTEN allows you and your doctors to monitor your condition at home.

HEARTEN is a valuable aid to support your everyday effort to follow your treatment plan.

Our mission

At HEARTEN, our goal is to provide our patients and their families with an advanced system for heart failure management.

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Benefits

- Home monitoring
- Less hospital visits
- Self-management
- Patient support & empowerment
- Informed medical personnel

Contact Us

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Figure 36: HEARTEN flyer page 2.

HEARTEN in social media (All partners)

HEARTEN is actively engaged in social media. Specifically, the accounts of HEARTEN in Facebook [2], Twitter [3], LinkedIn [4] provide the opportunity for the wide audience to be continuously updated on the progress of HEARTEN progress, as well as the latest news related to HF management. The social media posts aim at: (i) presenting HEARTEN work (ii) engaging HF patients through messages related to HF symptoms, HF management, etc. More specifically, Facebook and Twitter have been used to approach several patient associations, such as the Heartbeat Trust association, an Ireland's national HF charity [5]. Heartbeat Trust was informed about the HEARTEN platform and the gained benefits of its use by the HF patients, and assisted HEARTEN in communicating the project progress and behavioural surveys through their social accounts.

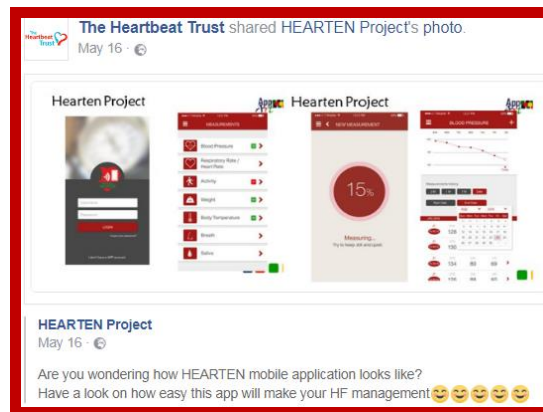


Figure 37: Heartbeat Trust share of HEARTEN project in Facebook.

An overview of the HEARTEN account in the social media and the relevant activity is presented below.



Figure 38: Overview of HEARTEN activity in Facebook.



Figure 39: Overview of HEARTEN activity in Twitter.

2.5 Other dissemination activities

UMOR

UMOR participated in a networking session and presented the “Non-invasive biomedical analysis - VOCs are in the air - from cellular metabolism to crowd monitoring” in the Pittcon 2017 -The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (March 7th 2017).

Table 23: Details of networking session in the Pittcon 2017 Conference.

Conference Title	PittCon 2017
Talk title	Non-invasive biomedical analysis - VOCs are in the air - from cellular metabolism to crowd monitoring
Location	Chicago USA
Date	March 2017
Theme of the Conference	Analytical and Bioanalytical Chemistry
Targeted audience	Bioanalytical and healthcare technology experts

SAS

On 9th March 2017, an online presentation (Figure 40) was published in Virgen del Rocío University Hospital (VRUH) webpage, to communicate the upcoming HEARTEN meeting [6].



Figure 40: HEARTEN online presentation in VRUH webpage.

YOURDATA

YourDATA has presented HEARTEN during the launch of a new co-working space (Taulas) based in Sanluri (Cagliari), in the centre of Sardinia. The event has been attended by policy makers, freelancers and general public.

2.6 Future dissemination activities

UCBL

UCBL will communicate the project results in conferences and through journal publications. More specifically, UCBL will target the dissemination of the progress on the breath and saliva biosensors towards demonstrating the impact of such sensor tools in health application.

EVERIS

EVERIS will perform the following activities:

- Preparation of a video related to the progress of the HEARTEN – SAS EHR integration, which will be published in the social networks of the project.
- Distribution of flyers to Health events in which EVERIS was invited
- Preparation of a flyer concerning the HEARTEN – SAS EHR integration
- Contribution to social networks of the HEARTEN project concerning the integration tasks as well as dissemination events in which EVERIS participate.

AppART

AppArt is in an effort to schedule corporate meetings with other potential customers as well as partners. In this effort and as part of the introduction of our company, our involvement in HEARTEN project is always included in the presentation we perform. Indicatively, we can mention that one of these meeting will take place with SingularLogic. SingularLogic is the No 1 Greek Software Vendor and

one of the largest, Integrated IT Solutions Group in Greece. Its activities comprise of the development and distribution of business software applications, design and implementation of Integrated IT Solutions for large enterprises of the private and public sector, including distribution and support of well-established international IT products. In addition, AppArt is in an effort of trying to achieve a publication related to HEARTEN project, its scope as well as AppArt's involvement in HEARTEN implementation which is the design and development of the mobile and web application. Our target is to perform the publication in two well-known means of communication. The first one is the Greek newspaper "To Vima". It is a very popular and creditable newspaper, well established in Greece and therefore we believe that achieving such a publication will have significant effect and impact. The second publication is the "Daily Infocom", which is a newsletter related to Telecommunications and Information Technology. This newsletter has a significant number of recipients daily and communicates the most important facts, information and news mainly from the Greek Telecommunication market but major events from abroad as well.

FORTH

FORTH is focusing on the development of the HEARTEN KMS through the employment of data mining techniques and machine learning methods. The results of this analysis that go beyond the state-of-the-art will be presented in several Conferences and will be published in Journals. . Exploiting the latest pre-pilot data and pilot, FORTH will present and publish research outcomes.

CSIC

The results from the project will be disseminated at conferences. Specifically, at the World Congress on Biosensors (June 2018) and the Micro and Nano Engineering Conference (September 2017). New results from the project will be published in the journals Biosensors and Bioelectronics, Sensors and Actuators B and Electroanalysis.

UNIFI

The results from the project will be disseminated at national and international conferences. At present, contributions are in the preparation for the coming National Congress of the Italian Chemical Society (September 2017). New results from the project will be published in peer-reviewed scientific journals, such as Biosensors and Bioelectronics, Sensors and Actuators B, Microchemical Journal, Journal of Breath Research, etc.

SAS

SAS team will perform a publication related to the clinical protocol and the pilot study in the International Journal of Technology Assessment in Health Care.

YOURDATA

HEARTEN project will be presented during next SINNOVA, Sardinian fair of innovation, for the year 2017, planned in October. During this event, HEARTEN will be presented to potential customers and investors, as well as to general public (each year SINNOVA event is visited by around 3,000 people).

CAREDOME

CAREDOME will present HEARTEN solution to pharmaceutical companies, insurance companies, doctors' associations and patient associations. Furthermore, CAREDOME is planning to present HEARTEN solution to IDIKA, which is the Public Company of Electronic Governance of Social Insurance

in Greece. In addition, CAREDOME will send an updated email campaign to cooperating nurses and healthcare professionals. Finally, CAREDOME is planning to publish on December 2017 an article about HEARTEN solution in Virus.com.gr, which is a news portal for Healthcare and Pharmaceutical industry.

APPENDIX

A1 Dissemination activities per partner

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Journal (details)/ Media / Comments
UCBL	January 2017	Tailoring of carboxyl-decorated magnetic latex particles using seeded emulsion polymerization	Journal paper	Polymers advanced technologies Journal
UCBL	June 2017	Electrochemical biosensors platform for TNF- α cytokines detection in both artificial and human saliva: Heart failure,	Journal paper	Sensors and Actuators B: chemical Journal
FORTH	Accepted/to be presented in July 2017	A Computational Approach for the Estimation of Heart Failure Patients Status Using Saliva Biomarkers	Conference paper	IEEE Engineering in Medicine and Biology Society (EMBC'17)
FORTH	June 2017	Estimation of heart failure patients medication adherence through the utilization of saliva and breath biomarkers and data mining techniques	Conference paper	30th IEEE International Symposium on Computer-Based Medical Systems - IEEE (CBMS 2017)
FORTH	February 2017	Estimation of New York Heart Association class in Heart Failure Patients Based on Machine	Conference paper	Biomedical and Health Informatics (BHI 2017)

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Journal (details)/ Media / Comments
		Learning Techniques		
FORTH	June 2017	Estimation of heart failure patients medication adherence through the utilization of saliva and breath biomarkers and data mining techniques	Presentation	30th IEEE International Symposium on Computer-Based Medical Systems - IEEE (CBMS 2017)
FORTH	June 2017	Tailoring health treatment to the individual: from health related data to actionable knowledge	Presentation/flyer distribution	30th IEEE International Symposium on Computer-Based Medical Systems - IEEE (CBMS 2017)
FORTH	February 2017	Estimation of New York Heart Association class in Heart Failure Patients Based on Machine Learning Techniques	Presentation	Biomedical and Health Informatics (BHI 2017)
FORTH	June 2017	Data mining in medical informatics	Presentation	16th International Summer School on Biocomplexity, Bidesign Bioinnovation, Biomanufacturing & Bioentrepreneurship
CSIC	March 2017	Silicon nitride capacitive chemical sensor for phosphate ion detection based on copper phthalocyanine-acrylate-polymer	Journal paper	Electroanalysis Journal

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Journal (details)/ Media / Comments
CSIC	July 2017	A fully integrated electrochemical biosensor platform fabrication process for cytokines detection	Journal paper	Biosensors and Bioelectronics Journal
CSIC	July 2017	Novel strategy for sulfapyridine detection using a fully integrated electrochemical Bio-MEMS: Application to honey analysis	Journal paper	Biosensors and Bioelectronics Journal
CSIC	May 2017	Development of biosensors for non-invasive measurements of heart failure biomarkers in saliva	Conference paper	SPIE Microtechnologies – Smart Sensors, Actuators, and MEMS VIII
CSIC	February 2017	Oral or nasal breathing? Real-time effects of switching sampling route onto exhaled VOC concentrations	Journal paper	Journal of Breath Research
SAS	April 2017	Project presentation	Poster presentation	27th Medical Informatics Europe Conference, that was held in Manchester, England
YOURDATA	June 2017	Project presentation	Project presentation	Co-working space (Taulas) based in Sanluri (Cagliari), Italy
AppArt	April 2017	Corporate Meeting with Alpha Bank in Athens,	Corporate Presentation	Presentation of HEARTEN purposes and AppArt' s involvement in the project.

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Journal (details)/ Media / Comments
		Greece		
AppArt	April 2017	Corporate Meeting with Eurobank in Athens, Greece	Corporate Presentation	Presentation of HEARTEN purposes and AppArt's involvement in the project.
CAREDOME	January 2017	Presentation of H2020 project HEARTEN	Informative meeting	Shire, Greece
CAREDOME	January 2017	Presentation of H2020 project HEARTEN	Informative meeting	BIOIATRIKI, Greece
CAREDOME	January 2017	Presentation of H2020 project HEARTEN	Informative meeting	EMRI, Greece
CAREDOME	January 2017	Presentation of H2020 project HEARTEN	Informative meeting	Novartis, Portugal
CAREDOME	January 2017	Presentation of H2020 project HEARTEN	Informative meeting	Novartis USA, Remote Meeting
CAREDOME	January 2017	Presentation of H2020 project HEARTEN	Informative meeting	Interamerican, Greece
CAREDOME	January 2017	Presentation of H2020 project HEARTEN	Informative meeting	Novartis, Greece
CAREDOME	January 2017	Presentation of H2020 project HEARTEN	Informative meeting	Baxalta, Greece

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Journal (details)/ Media / Comments
CAREDOME	February 2017	Presentation of H2020 project HEARTEN	Informative meeting	Teva Pharm, Portugal
CAREDOME	February 2017	Presentation of H2020 project HEARTEN	Informative meeting	MSD, Portugal
CAREDOME	February 2017	Presentation of H2020 project HEARTEN	Informative meeting	Pharmaboardroom, UK, Meeting in Greece
CAREDOME	February 2017	Presentation of H2020 project HEARTEN	Informative meeting	Vodafone, Greece
CAREDOME	February 2017	Presentation of H2020 project HEARTEN	Informative meeting	MSD, Greece
CAREDOME	March 2017	Presentation of H2020 project HEARTEN	Informative meeting	Pharmathen, Greece
CAREDOME	March 2017	Presentation of H2020 project HEARTEN	Informative meeting	Boehringer Intelheim, Portugal
CAREDOME	March 2017	Presentation of H2020 project HEARTEN	Informative meeting	Merch, Greece
CAREDOME	March 2017	Presentation of H2020 project HEARTEN	Informative meeting	PROSYFAPE, Greece
CAREDOME	March 2017	Presentation of H2020 project HEARTEN	Informative meeting	UCB, Greece

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Journal (details)/ Media / Comments
CAREDOME	April 2017	Presentation of H2020 project HEARTEN	Informative meeting	BIOIATRIKI, Greece
CAREDOME	April 2017	Presentation of H2020 project HEARTEN	Informative meeting	EUROMEDICA, Greece
CAREDOME	April 2017	Presentation of H2020 project HEARTEN	Informative meeting	Lilly, Greece
CAREDOME	April 2017	Presentation of H2020 project HEARTEN	Informative meeting	Boehringer Intelheim, Greece
UNIFI	March 2017	The effect of sampling procedures on the urate and lactate concentration in oral fluid	Journal paper	Microchemical Journal
UNIFI	March 2017	Chemical biomarkers in human breath and oral fluid: Method development and application in non-invasive clinical analyses.	PhD thesis	Available at the following link: https://etd.adm.unifi.it/theses/browse/by_type/D1.html
UNIFI	June 2017	Determination of volatile organic compounds in human breath for monitoring heart failure patients.	International congress oral presentation	Colloquium Spectroscopicum Internationale XL, Pisa (Italy)
UNIFI	June 2017	Determination of biomarkers in oral fluid for monitoring heart	International congress oral presentation	Colloquium Spectroscopicum Internationale XL, Pisa (Italy)

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Journal (details)/ Media / Comments
		failure patients.		
UNIFI	June 2017	On-sorbent derivatization of carbonyl compounds in exhaled breath.	International congress poster presentation	Colloquium Spectroscopicum Internationale XL, Pisa (Italy)
UNIFI	February 2017	Meeting on "The H2020 project HEARTEN: presentation of the HEARTEN survey."	Informative meeting	Meeting with the representative of the "Amici del Cuore-Pisa (Italy)", a local association of cardiopathic and heart failure patients with about 80 members.
UNIFI	April 2017	Meeting on "The H2020 project HEARTEN: presentation of the HEARTEN survey."	Informative meeting	Meeting with the representative of the "Amici del Cuore-Livorno (Italy)", a local association of cardiopathic and heart failure patients with about 150 members.
UMOR	March 2017	Online PTR-ToF-MS Applications Reveal the Influence of Oral and Nasal Routes of Breathing on Exhaled VOC Profiles	International congress - oral presentation	Pittcon 2017 -The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy;
UMOR	March 2017	Non-invasive biomedical analysis - VOCs are in the air - from cellular metabolism to crowd monitoring	International congress - networking session	Pittcon 2017 -The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy
UMOR	February 2017	Oral or nasal breathing? Real-time effects of switching sampling route onto exhaled VOC concentrations.	Journal paper	Journal of Breath Research

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Journal (details)/ Media / Comments
SAS with EVERIS collaboration	April 2017	Integrating a mHealth Application into EHR Ecosystem of Andalusian Health Public System	International congress poster presentation	Informatics for Health Congress, Manchester, UK
EVERIS	March 2017	Presentation of H2020 project HEARTEN	National congress presentation	XX National Congress of Hospitals and Healthcare management, Seville, Spain
EVERIS	May 2017	Presentation of H2020 project HEARTEN	National congress presentation	HEALTHIO, Barcelona, Spain
EVERIS	June 2017	Take heart, Take heed	Open Access Publication	Pan European Networks Health Magazine. The publication will be sent to circa 80,000 senior policy makers from European Government departments, the EC, the health research community including funding bodies, institutes and Universities
EVERIS	June 2017	Presentation of H2020 project HEARTEN	National Health Event	II National Health Hackathon

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- [4] E. projects in H. 2020, "HEARTEN Project | Professional Profile | LinkedIn." Available: https://gr.linkedin.com/in/heartenproject?trk=public_profile_card_url.
- [5] "Heartbeat Trust." [Online]. Available: <http://heartbeat-trust.ie/>.
- [6] "HEARTEN project prospective meeting announcement." Available: <http://mac-ro.es/home-rocio/49-i-d-i-n/340-reuni%C3%B3n-de-consorcio-del-proyecto-europeo-hearten-de-la-convocatoria-h2020.html>.