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1. Executive Summary

The objective of HEARTEN dissemination strategy is to present the dissemination and communication activities and results of the project to the public, the relevant stakeholders and the involved actors. This strategy has been continuously evolved to increase the visibility of the project and achieve a wide penetration. “D2.5 – HEARTEN Presentations and Promotional Material 4” provides an overview of the performed actions in the period M31-M36 and explains in detail the dissemination activities that the consortium has participated in to disseminate the objectives and results of HEARTEN project and final integrated platform solution. Among the communication tools that have been utilized to effectively and efficiently diffuse HEARTEN are:

- **Journal publications** in the Journal of Breath Research, in the Microchemical Journal, in the Biosensors and Bioelectronics Journal, in the Electroanalysis Journal, in the Sensors and Actuators B: Chemical Journal, in the Macromolecular Science -Part A Journal and in the Analytical Letters Journal.
- **Conference publications;** at the IEEE International Conference on BioInformatics and BioEngineering - BIBE 2017, at the IEEE Conference on Biomedical and Health Informatics - BHI 2018, at the SPIE Microtechnologies 2017 Conference and at the Eurosensors 2017 Conference.
- **Project presentations:** (i) to SingularLogic, which is a leading Greek Software Vendor, (ii) to pharmaceutical industry, banking industry, (iii) to private insurance industry, to telemedicine vendors and to healthcare professionals, (iv) in the IEEE Engineering in Medicine and Biology Society - EMBC'17, (v) in the National University Health System (NUHS), (vi) in the Taishan International Forum on Healthcare Technologies, Robots and Artificial Intelligence, (vii) in the European Respiratory Society Congress, (viii) in the kick off meeting of Inno-INDIGO-NCD-CAPomics project and, (ix) in the annual national cardiology meeting (Milan, Italy).
- **Poster presentations** at the International Conference on Micro and Nano Engineering 2017, at the XXVI National Congress of the Italian Chemical Society event, at the EuroEcho-Imaging 2017 Congress and in the Sinnova 2017 - Sardinian innovation fair.
- **Flyer distribution to several events,** such as in the Big/Open/Small Data in the Health Event (Valencia, Spain), in the Cardiovascular Symposium for Chronic Heart Failure Management (Greece), in the BRIGHT: Researchers' Night" (Italy), in the National Cardiology meeting (Italy), in Sinnova 2017 - Sardinian innovation fair (Italy) and in the Virgen del Rocío University Hospital (Spain).
- **Other dissemination activities,** such as the creation of a video showing the integration tool for HEARTEN platform and SAS clinical center, the creation of newsletters consolidating the highlights of news published under the social network accounts and under the HEARTEN website, the creation of a HEARTEN product informative sheet to be used in commercial actions, and the creation of a newsletter targeting the caregivers network.
- **Update of HEARTEN website** and active participation in social media (Facebook, Twitter, LinkedIn).

An overview of the dissemination activities performed from M31-M36 per category is presented in Table 1.

Table 1: Dissemination and promotional activities from M31-M36.

Type of activity	Number
Journal publications	12
Conference publications	5
Poster presentations	7
Project presentations	120
Flyer distribution to events	6
Newsletters creation	8
Video creation	1

2. Dissemination Tools and Activities

2.1 Summary of dissemination activities conducted by each partner

UCBL

The main activities of UCBL have focused in the dissemination of the results achieved on the HEARTEN biosensors in scientific journals and presentations in several European and international conferences. This has been done in collaboration with other partners (UNIP, CSIC, FORTH etc.). The Scientific results of the project were focused on development of new biosensors for the analysis of breath and saliva, and most of results were published in high ranking journals.

EVERIS

EVERIS has taken the opportunity to attend different events, present HEARTEN project by creating and promoting new promotional material including a new video and a product sheet. EVERIS led the translation into Spanish of a new leaflet prepared by FORTH. Some of the dissemination actions performed by EVERIS include:

- Distribution of HEARTEN leaflets at the Big/Open/Small Data in Health Event in Valencia, Spain.
- Led of Spanish translation of the latest project leaflet.
- Creation of product sheet adapted to EVERIS guidelines to be distributed among other product sheets of services and products by EVERIS in different commercial events.
- Preparation of a video demonstrating the tool created for integrating HEARTEN with SAS Electronic Health Record
- Preparation of newsletters consolidating highlights of news published under the social network accounts and published under the HEARTEN Website.
- Contribution to the social networks of the HEARTEN Project

AppArt

AppArt is a software development company with a big portfolio of IT customers. AppArt disseminates the project results utilizing the existing customer base and partnerships. Furthermore, AppArt utilizes the wide network of cooperation with other vendors and IT Integrators in order to promote HEARTEN project and leverage the targeting of their customers in Greece or other countries, in which they operate in Europe and Middle East. In this context, AppArt organized and performed a presentation to SingularLogic, a leading Greek Software Vendor, which was actually a corporate presentation aiming to inform our partner about AppArt's activities, projects, technical know-how and experience. A special section was dedicated to the presentation of our work and the results of HEARTEN project.

FORTH

The dissemination and communication activities of FORTH are targeting on wide-spreading the outcomes of the HEARTEN Knowledge Management System (KMS) and the overall project findings. Towards this direction, the period from M31-M36, the following activities have been performed; (i) presentation in the 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society - EMBC'17 in Korea (July 2017), (ii) paper publication and presentation in the 7th annual IEEE International Conference on BioInformatics and BioEngineering - BIBE 2017 in Washington (October 2017), (ii) paper submission in the IEEE Conference on Biomedical and Health Informatics (BHI 2018) that will be held in Las Vegas (March 2018), (ii) participation and flyer distribution in the Cardiovascular Symposium for Chronic Heart Failure Management (Ioannina, Greece), (iii) project presentations in the National University Health System (NUHS) in Singapore (September 2017) and in the Taishan International Forum on Healthcare Technologies, Robots and Artificial Intelligence in China (August 2017).

CSIC

The activities of CSIC have focused in the dissemination of the results achieved on the HEARTEN biosensors in scientific journals and conferences. This has been done in collaboration with UCBL, since the biosensors are a joint development of both beneficiaries. In cooperation with the Spanish partners (EVERIS, SAS), CSIC has contributed to the translation to Spanish of the second HEARTEN leaflet, dedicated to HF patients.

UMOR

UMOR dissemination activities focused on the publication in scientific journals and presentations in several European and International conferences aiming to share the achievements and develop national and international links. Research results of the project were related to healthcare, analytical chemistry and the biomedical field and communicated to the scientific and medical community. The results were published in high ranking journals and distributed at several relevant events. In addition, we used the new knowledge in the University Hospital for educating and training of the students.

UNIFI

The main goal of the dissemination activities carried out by UNIFI is to spread the knowledge obtained during the whole period among cardiology specialists, analytical chemists and family doctors. Furthermore, dissemination is also performed in HF patient local association. Finally, dissemination was performed by conventional channels: conferences (national and international conference) and papers in scientific journals.

SAS

From August 2017, SAS performed a patient-oriented leaflet distribution in Virgen del Rocío University Hospital installations (50 leaflets).

YOURDATA

The main objective of YOURDATA communication activities has been the dissemination of the general content of the project to potential customers and investors, as well as to general public and policy makers. The channels used have been: Innovation fairs, public presentations and local press.

BIOAXIS-CAREDOME

BIOAXIS-CAREDOME has focused on disseminating the progress of HEARTEN to its core partners and customers across Portugal, Greece, United Kingdom and Bulgaria. Therefore, the dissemination target group is consisted of pharmaceutical industry executives, healthcare professionals, cooperating caregivers (nurse agents), Bank Institutes, Private Insurance Companies and medical devices and telemedicine vendors. BIOAXIS-CAREDOME has developed the necessary presentations and newsletter

which were used to achieve the dissemination targets during this period. In addition, the HEARTEN project video has been used in face to face presentations. In summary, the following dissemination activities were conducted:

- Face to face meetings and presentations to 69 international pharmaceutical companies in Portugal, Greece and Bulgaria.
- Face to face meetings and presentations to two Private Banks in Greece.
- Face to face meetings and presentations to two Private Insurance companies in Greece.
- Face to face presentation to 37 cardiologists located in Portugal and Greece.
- Face to face meetings and presentations to two medical device vendors in Greece and United Kingdom.
- Newsletter to 72 nurse agents cooperating with BIOAXIS-CAREDOME, 279 pharmaceutical industry experts and 1.114 healthcare professionals.

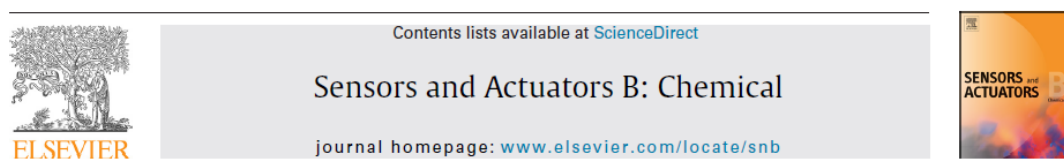
2.2 Summary of overall dissemination activities

2.2.1 HEARTEN publications (Journal, Conferences)

UCBL

A paper entitled “Miniaturized multiparametric flexible platform for the simultaneous monitoring of ionic: Application in real urine” has been published in the Sensors and Actuators B Journal (Figure 1). This paper reports on the fabrication of platform fabricated by means of rapid prototyping techniques using polymeric substrates, and incorporates all the necessary elements to measure the four analytes. It was designed with four gold sensing electrodes, and integrates a gold counter electrode and an Ag/AgCl pseudo-reference electrode for the electrochemical measurements in small volumes (0.83 L) of samples. The sensors featured good sensitivities of 3.60 ± 0.2 nA (mg L⁻¹) for DO and 69 ± 1 mV decade⁻¹ for pH. Na⁺ and K⁺ ISE exhibited sensitivities of 57 ± 1 mV decade⁻¹ and 52 ± 2 mV decade⁻¹, and low limits of detection 5×10^{-6} M and 0.5×10^{-5} M respectively. This platform allows the dynamic measurement of the biological fluids parameters simultaneously, in real time and with a rapid response. The versatility of the platform allows its adaptation in any microfluidic cells culture systems. The novel multi-sensor platform has been validated in controlled buffers and with artificial urine (AU). A proof-of-concept using real mice urine (RU) has been carried out, demonstrating the good behaviour of the multi-sensing platform.

Sensors and Actuators B 255 (2018) 2861–2870



Miniaturized multiparametric flexible platform for the simultaneous monitoring of ionic: Application in real urine



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Figure 1: Paper entitled “Miniaturized multiparametric flexible platform for the simultaneous monitoring of ionic: Application in real urine”.

The details of the journal, where the paper was submitted are depicted in Table 2.

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

Journal Title	Sensors and Actuators B	Impact Factor	5.401
Targeted audience	Biosensor experts and Electrochemical sensor experts		
Paper title	Miniaturized multiparametric flexible platform for the simultaneous monitoring of ionic: Application in real urine		
Volume	255	Date	2018

Paper published in the Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy

Journal

A paper entitled “Highly selective apo-arginase based method for sensitive enzymatic assay of manganese (II) and cobalt (II) ions” has been published in *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy Journal* (Figure 2). This paper reports on a novel enzymatic method of manganese (II) and cobalt (II) ions assay, based on using apo-enzyme of Mn^{2+} -dependent recombinant arginase I (arginase) and 2,3-butanedione monoxime (DMO) as a chemical reagent is proposed. The principle of the method is the evaluation of the activity of L-arginine-hydrolyzing of arginase holoenzyme after the specific binding of Mn^{2+} or Co^{2+} with apo-arginase. Urea, which is the product of enzymatic hydrolysis of L-arginine (Arg), reacts with DMO and the resulted compound is detected by both fluorometry and visual spectrophotometry. Thus, the content of metal ions in the tested samples can be determined by measuring the level of urea generated after enzymatic hydrolysis of Arg by reconstructed arginase holoenzyme in the presence of tested metal ions. The linearity range of the fluorometric apo-arginase-DMO method in the case of Mn^{2+} assay is from 4 pM to 1.10 nM with a limit of detection of 1 pM Mn^{2+} , whereas the linearity range of the present method in the case of Co^{2+} assay is from 8 pM to 45 nM with a limit of detection of 2.5 pM Co^{2+} . The proposed method being highly sensitive, selective, valid and low-cost, may be useful to monitor Mn^{2+} and Co^{2+} content in clinical laboratories, food industry and environmental control service.

Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 193 (2018) 349–356



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Highly selective apo-arginase based method for sensitive enzymatic assay of manganese (II) and cobalt (II) ions



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ABSTRACT

A novel enzymatic method of manganese (II) and cobalt (II) ions assay, based on using apo-enzyme of Mn^{2+} -dependent recombinant arginase I (arginase) and 2,3-butanedione monoxime (DMO) as a chemical reagent is proposed. The principle of the method is the evaluation of the activity of L-arginine-hydrolyzing of arginase holoenzyme after the specific binding of Mn^{2+} or Co^{2+} with apo-arginase. Urea, which is the product of enzymatic hydrolysis of L-arginine (Arg), reacts with DMO and the resulted compound is detected by both fluorometry and visual spectrophotometry. Thus, the content of metal ions in the tested samples can be determined by measuring the level of urea generated after enzymatic hydrolysis of Arg by reconstructed arginase holoenzyme in the presence of tested metal ions. The linearity range of the fluorometric apo-arginase-DMO method in the case of Mn^{2+} assay is from 4 pM to 1.10 nM with a limit of detection of 1 pM Mn^{2+} , whereas the linearity range of the present method in the case of Co^{2+} assay is from 8 pM to 45 nM with a limit of detection of 2.5 pM Co^{2+} . The proposed method being highly sensitive, selective, valid and low-cost, may be useful to monitor Mn^{2+} and Co^{2+} content in clinical laboratories, food industry and environmental control service.

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Figure 2: Paper entitled “Highly selective apo-arginase based method for sensitive enzymatic assay of manganese (II) and cobalt (II) ions”.

The details of the journal, where the paper was submitted are depicted in Table 3.

Table 3: Details of the paper presented in the “Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy Journal”.

Journal Title	Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy Journal	Impact Factor	2.536
Targeted audience	Biosensor experts and Electrochemical sensor experts		
Paper title	Highly selective apo-arginase based method for sensitive enzymatic assay of manganese (II) and cobalt (II) ions		
Volume	193	Date	2018

FORTH

Paper published in the Proceedings of the 7th annual IEEE International Conference on BioInformatics and BioEngineering - BIBE 2017

A paper entitled “Predicting Heart Failure patient events by exploiting saliva and breath biomarkers information” has been accepted in the 7th annual IEEE International Conference on BioInformatics and BioEngineering - BIBE 2017 (Figure 3) [1]. The paper presents a machine learning based approach for predicting the adverse events in terms of mortality and relapses in patients with heart failure (HF). To accomplish this, measurements of breath and saliva biomarkers are exploited. More specifically, data collection and analysis from 27 patients enabled the prediction of adverse events with an accuracy of 77%.

Predicting Heart Failure patient events by exploiting saliva and breath biomarkers information

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Abstract—The aim of this work is to present a machine learning based method for the prediction of adverse events (mortality and relapses) in patients with heart failure (HF) by exploiting, for the first time, measurements of breath and saliva biomarkers. Data from 27 patients are used in the study and the prediction of adverse events is achieved with high accuracy (77%). As in the near future, biomarkers can be measured at home, together with other physiological data, the accurate prediction of adverse events on the basis of home based measurements can revolutionize HF management.

with HF die while in hospital and the 17-25% die within one year of admission [2]. The cost of HF management is driven by hospitalizations, corresponding to 1-2% of total healthcare expenditure.

The ability to accurately predict the aforementioned undesirable events enables the effective risk stratification of patients and allows the clinical decision making. This valuable prognostic information can guide the clinical experts in the adaptation of patient management and in the selection of the best treatment plan that should be followed. In turn, this is expected to improve the quality of care provided to the patients, while in parallel result in better health outcomes. Towards this direction, different factors

Figure 3: Paper entitled “Predicting Heart Failure patient events by exploiting saliva and breath biomarkers information”.

The details of the Conference, where the paper was accepted are depicted in Table 4.

Table 4: Details of BIBE 2017 Conference.

Conference Title	7th annual IEEE International Conference on Bioinformatics and BioEngineering - BIBE 2017
Location	Washington
Date	23 -25 October 2017
Theme of the Conference	Conference on Bioinformatics and Bioengineering
Targeted audience	Bioinformatics and Bioengineering/Biomedical experts

Paper submitted in the IEEE Conference on Biomedical and Health Informatics - BHI 2018

A paper entitled “HEARTEN: An integrated mHealth platform for holistic HF management” has been submitted in the IEEE Conference on Biomedical and Health Informatics - BHI 2018 (Figure 4) ([2]. The paper presents an overview of HEARTEN integrated mHealth platform including a description on the current progress on the novel breath and saliva biosensors, the mobile and web application, the Knowledge Management System and the Dynamic Patient Communication Protocol (DynPCPC).

HEARTEN: An integrated mHealth platform for holistic HF management

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Abstract— Heart Failure (HF) is a chronic disease with a continuously increasing incidence and prevalence. HF patients need to cope with often re-admissions and adverse events. Patient adherence in medication, nutrition and physical activity guidelines becomes a critical factor that can significantly reduce or even prevent re-hospitalizations and improve quality of life. HEARTEN, an integrated mHealth platform for holistic HF management can significantly contribute to effective and efficient (self) management of the HF patients, through the integration of novel breath and saliva biosensors, sensors and machine learning and knowledge management techniques.

I. INTRODUCTION

Heart Failure (HF) is a chronic disease with a continuously increasing incidence and prevalence. This cardiovascular syndrome is expected to increase the next 25 years, double the incidence rates and increase its prevalence 10 fold from age 60 to age 80 [1]. Currently, 15 million people are living with HF in Europe [2].

In the current clinical practice, the management of HF patients involves different experts. The latter examine the patients in a frequent basis and provide a variety of treatment suggestions and recommendations. Current guidelines of the European Society of Cardiology for HF management call for

optimal management in medication, hypertension control, nutrition, weight, physical activity, and adoption of individualized education and counseling that emphasizes self-care [3]. In this framework, patient adherence becomes a critical factor that can significantly reduce or even prevent re-hospitalizations and improve quality of life.

The identification of patients who could be decompensate is valuable in terms of expected hospitalization reduction. Several attempts have been made to recognize the HF patients being at risk by using telemonitoring programs or patient home visits. Some of these programs have been partially effective, however the latter were of excessive cost and were difficult to be implemented in high number of patients [5], [6]. An efficient self-management system, that avoids hospital visits, allows home monitoring and can therefore significantly increase patient adherence and reduce adverse events and re-hospitalities, is essential. Such a system should efficiently integrate and orchestrate all disease management actors, including the patient himself/herself, the doctors, the caregivers, the experts on nutrition, on physical activity, etc.

This is the goal of the HEARTEN platform, an integrated mHealth platform for holistic HF management. In contrast to the previously proposed systems, HEARTEN targets the management of the patients suffering from HF, the

Figure 4: Paper entitled “HEARTEN: An integrated mHealth platform for holistic HF management”.

The details of the Conference, where the paper was submitted are depicted in Table 5.

Table 5: Details of BHI 2018 Conference.

Conference Title	IEEE Conference on Biomedical and Health Informatics - BHI 2018
Location	Las Vegas, Nevada, USA
Date	March 2018
Theme of the Conference	Novel sensors, systems, signal processing, analytics and data management services
Targeted audience	mHealth and health analytics experts

Paper published in the Biosensors and Bioelectronics Journal

A paper on a biosensor for the detection of cytokines has been published in Biosensors and Bioelectronics (Figure 5) [3]. Interleukin-1b (IL-1b) and interleukin-10 (IL-10) biomarkers are one of many antigens that are secreted in acute stages of inflammation after left ventricle assisted device (LVAD) implantation for patients suffering from heart failure (HF). In this paper we developed a fully integrated electrochemical biosensor platform for cytokine detection at minute concentrations. 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.

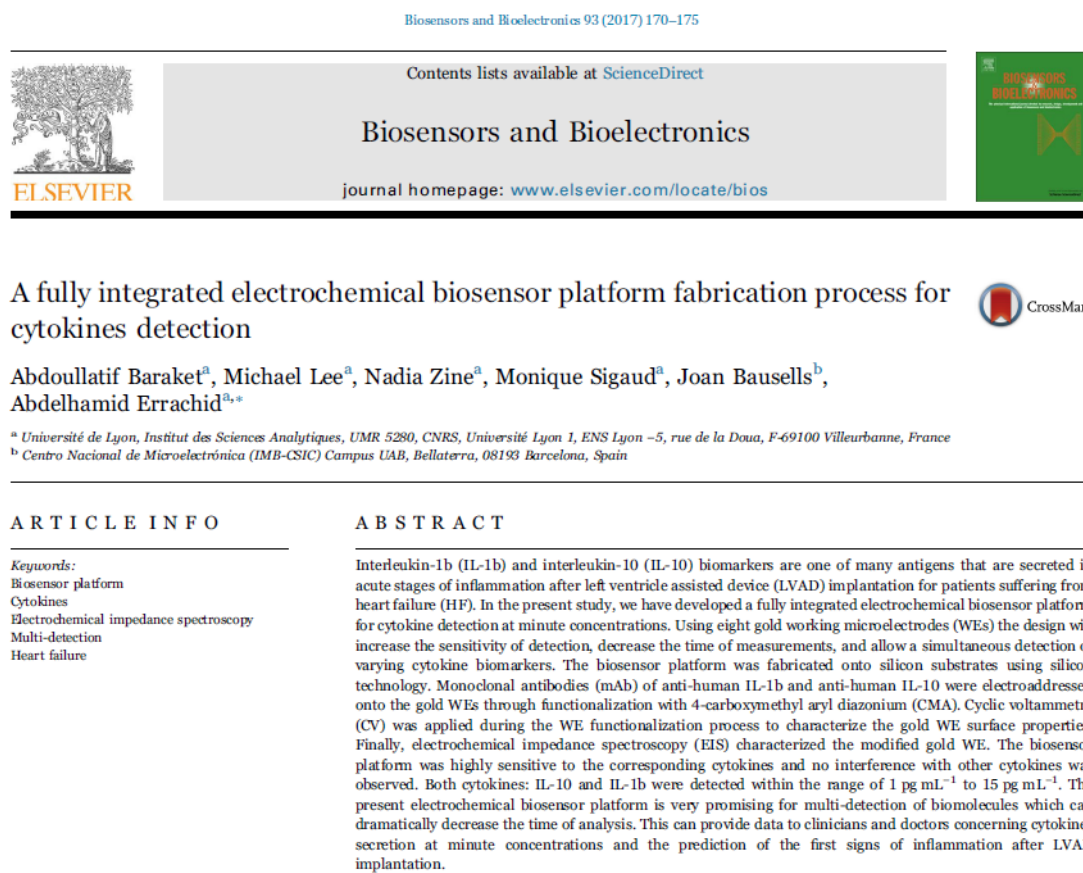


Figure 5: Paper published in “Biosensors and Bioelectronics” Journal.

The details of the journal, where the paper was submitted are depicted in Table 6.

Table 6: Details of the paper presented in the Journal “Biosensors and Bioelectronics”.

Journal Title	Biosensors and Bioelectronics	Impact Factor	7.476
Targeted audience	Biosensor experts; 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

A paper on a biosensor for the detection of sulfapyridine has been published in Biosensors and Bioelectronics (Figure 6) [3]. Sulfapyridine (SPy) is an antibiotic largely employed as veterinary drugs for prophylactic and therapeutic purposes. Therefore, its spread in the food products has to be restricted. 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-carboxylic acid) (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.

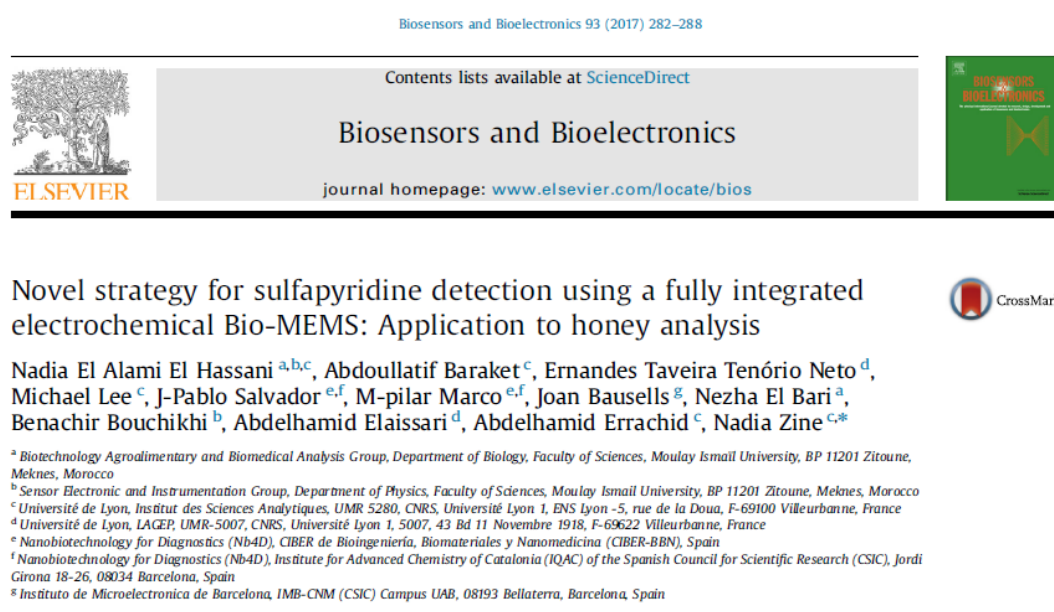


Figure 6: Paper published in “Biosensors and Bioelectronics” Journal.

The details of the journal, where the paper was submitted are depicted in Table 7.

Table 7: Details of the paper presented in the Journal “Biosensors and Bioelectronics”.

Journal Title	Biosensors and Bioelectronics	Impact Factor	7.780
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

Paper published in the Electroanalysis Journal

A paper on a chemical sensor for phosphate ion detection has been published in Electroanalysis (Figure 7) [4]. The paper reports a highly sensitive capacitive sensor based on an acrylate polymer that contains Cu ions. The polymer was deposited on a structure with silicon dioxide and silicon nitride over a silicon substrate, and the capacitance as a function of the applied voltage was used for the measurements. The 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 and a limit of detection of 1 nM.

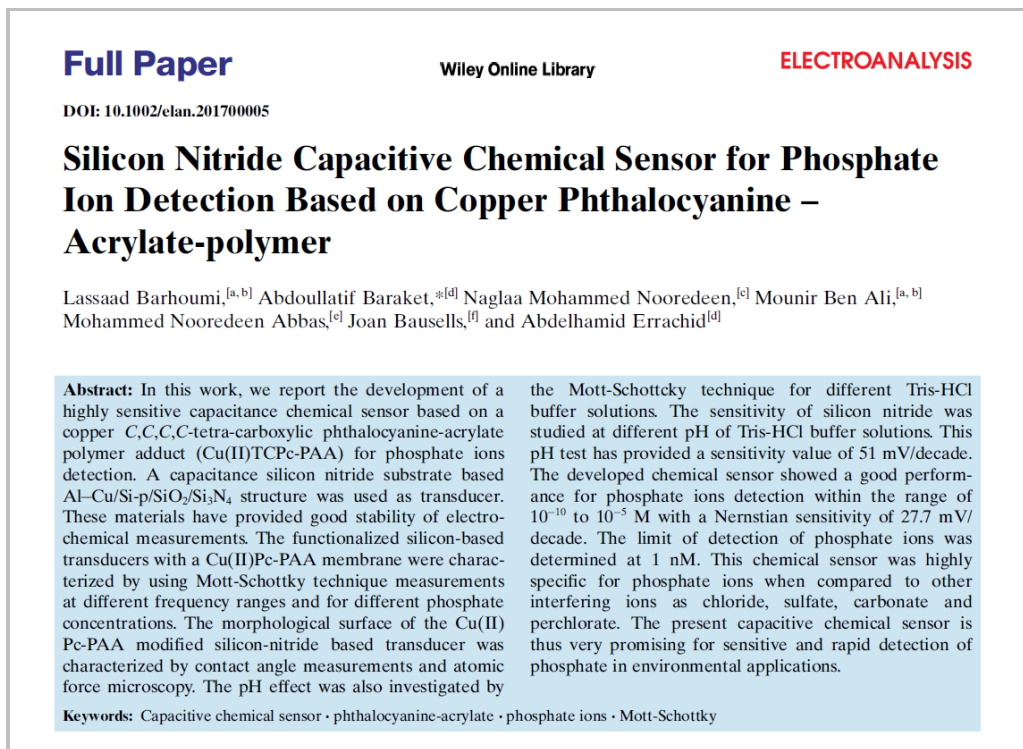


Figure 7: Paper published in “Electroanalysis” Journal.

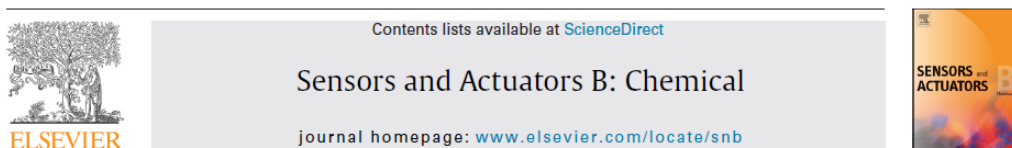
The details of the journal, where the paper was submitted are depicted in Table 8.

Table 8: Details of the paper presented in the Journal “Electroanalysis”.

Journal Title	Electroanalysis	Impact Factor	2.851
Targeted audience	Electrochemical sensor 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 Sensors and Actuators B: Chemical Journal

A paper describing a biosensor platform for TNF- α detection in saliva has been published in Sensors and Actuators B: Chemical Journal (Figure 8) [5]. The paper reports a highly sensitive biosensor for TNF- α detection in human saliva. The monoclonal antibodies anti-TNF- α were immobilized onto gold electrodes through functionalization with carboxyl diazonium. Electro-chemical impedance spectroscopy combined with the standard addition method were used for the detection. TNF- α was analysed in PBS buffer, artificial saliva and real human saliva within the range 1–100 pg/mL, which is relevant for patients suffering from heart failure. The results allowed detecting a concentration of 3.1 pg/mL in human saliva, which is very promising for rapid analysis for cytokines detection.



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



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Figure 8: Paper published in “Sensors and Actuators B: Chemical” Journal.

The details of the journal, where the paper was submitted are depicted in Table 9.

Table 9: Details of the paper presented in the Journal “Sensors and Actuators B”.

Journal Title	Sensors and Actuators B: Chemical Journal	Impact Factor	5.401
Targeted audience	Biosensor experts and Electrochemical sensor experts		
Paper title	Electrochemical biosensor platform for TNF- α cytokines detection in both artificial and human saliva: Heart failure		
Volume	251	Date	2017

Paper published in the Journal of Macromolecular Science, Part A: Pure and Applied Chemistry

A paper describing polypyrrole/silicon nitride materials for electrochemical sensors has been published in Journal of Macromolecular Science, Part A: Pure and Applied Chemistry (Figure 9) [6]. In this research, an efficient fabrication process of conducting polypyrrole (PPy)/silicon nitride hybrid materials was developed in order to be employed as transducers in electrochemical sensors used in environmental and biomedical applications. The electrical properties of the prepared substrates were characterized by cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS), with good results.

Fabrication of new polypyrrole/silicon nitride hybrid materials for potential applications in electrochemical sensors: Synthesis and characterization

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ABSTRACT

In this research, an efficient fabrication process of conducting polypyrrole (PPy)/silicon nitride (Si₃N₄) hybrid materials were developed in order to be employed as transducers in electrochemical sensors used in various environmental and biomedical applications. The fabrication process was assisted by oxidative polymerization of pyrrole (Py) monomer on the surface of Si/SiO₂/Si₃N₄ substrate in presence of FeCl₃ as oxidant. To improve the adhesion of PPy layer to Si₃N₄ surface, a pyrrole-silane (SPy) was chemically bonded through silanization process onto the Si₃N₄ surface before deposition of PPy layer. After Py polymerization, Si/SiO₂/Si₃N₄-(SPy-PPy) substrate was formed. The influence of SPy concentration and temperature of silanization process on chemical composition and surface morphology of the prepared Si/SiO₂/Si₃N₄-(SPy-PPy) substrates was studied by FTIR and SEM. In addition, the electrical properties of the prepared substrates were characterized by cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS). It was found that the best silanization reaction conditions to get Si/SiO₂/Si₃N₄-(SPy-PPy) substrate with high PPy adhesion and good electrical conductivity were obtained by using SPy at low concentration (4.3 mM) at 90°C. These promising findings open the way for fabrication of new hybrid materials which can be used as transducers in miniaturized sensing devices for various environmental and biomedical applications.

ARTICLE HISTORY

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KEYWORDS

Silicon nitride; Polypyrrole;
Oxidative polymerization;
Surface characterization;
Cyclic voltammetry;
Electrochemical impedance
spectroscopy

Figure 9: Paper published in “Journal of Macromolecular Science, Part A” Journal.

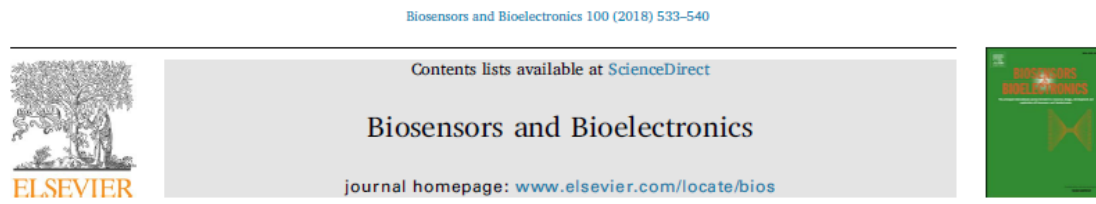
The details of the journal, where the paper was submitted are depicted in Table 10.

Table 10: Details of the paper presented in the Journal “Journal of Macromolecular Science, Part A”.

Journal Title	Journal of Macromolecular Science, Part A: Pure and Applied Chemistry	Impact Factor	0.963
Targeted audience	Electrochemical sensor experts		
Paper title	Fabrication of new polypyrrole/silicon nitride hybrid materials for potential applications in electrochemical sensors: Synthesis and characterization		
Volume	54	Date	2017

Paper published in the Biosensors and Bioelectronics Journal

A paper on a miniaturized potentiostat for biosensors has been published in Biosensors and Bioelectronics (Figure 10) [3]. It reports the development of a miniaturized potentiostat for electrochemical impedance spectroscopy measurements. The performance of the proposed device was benchmarked against a commercial impedance analyser by using a biosensor for TNF- α in the 0.2 to 660 ng/mL range, obtaining a strong correlation between the measurements with both instruments.



A low-cost and miniaturized potentiostat for sensing of biomolecular species such as TNF- α by electrochemical impedance spectroscopy



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ARTICLE INFO

Keywords:
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Cytokines
Point-of-care
Biosensors platform
Electrochemical impedance spectroscopy
Immuno-biosensor

ABSTRACT

Miniaturizing potentiostats, keeping their cost low and yet preserving full measurement characteristics (e.g. bandwidth, determination of capacitive/inductive contribution to sensor's impedance and parallel screening) is still an unresolved challenge in bioelectronics. In this work, the combination of simple analogue circuitry together with powerful microcontrollers and a digital filter implementation is presented as an alternative to complex and incomplete architectures reported in the literature. A low-cost acquisition electronic system fully integrated with a biosensors platform containing eight gold working microelectrodes and integrated reference and counter electrodes was developed and validated. The manufacturing cost of the prototype was kept below 300 USD. The performance of the proposed device was benchmarked against a commercial impedance analyzer through the electrochemical analysis of a highly sensitive biosensor for the detection of tumor necrosis factor α (TNF- α) within the randomly chosen range of 266 pg/mL to 666 ng/mL in physiological medium (PBS). A strong correlation between the outputs of both devices was found in a critical range of frequencies (1–10 Hz), and several TNF- α cytokine concentrations were properly discriminated. These results are very promising for the development of low-cost, portable and miniaturized electrochemical systems for point-of-care and environmental diagnosis.

Figure 10: Paper published in “Biosensors and Bioelectronics” Journal.

The details of the journal, where the paper was submitted are depicted in Table 11.

Table 11: Details of the paper presented in the Journal “Biosensors and Bioelectronics”.

Journal Title	Biosensors and Bioelectronics	Impact Factor	7.780
Targeted audience	Biosensors experts and Electrochemical sensor experts		
Paper title	A low-cost and miniaturized potentiostat for sensing of biomolecular species such as TNF- α by electrochemical impedance spectroscopy		
Volume	100	Date	2018

Paper accepted for publication in the Analytical Letters Journal

A paper on a biosensor for the detection of amphetamine has been accepted for publication in Analytical Letters (Figure 11) [7]. The paper reports ion-selective microelectrodes fabricated by using a polypyrrole film doped with the cosine anion as the internal solid contact layer between the polymeric (PVC-based) sensitive membrane and a platinum working microelectrode. The sensor was highly sensitive to amphetamine, with a linear response within the concentration range from 10^{-5} to 10^{-3} M, with a slope of 53 mV/decade and a limit of detection of $4 \cdot 10^{-5}$ M.

Sensitive Potentiometric Determination of Amphetamine with an All-Solid-State Micro Ion-Selective Electrode

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ABSTRACT

The development of amphetamine-ion-selective microelectrodes using electrochemical polymerization and microfabrication technologies is reported in this study. The microelectrodes include polypyrrole films electrochemically polymerized and doped with cosane anion $[(3,3'\text{-Co}(1,2\text{-C}_2\text{B}_9\text{H}_{11})_2)^-]$ as the internal solid contact layer between the polymeric sensitive membrane and platinum working microelectrode. Several poly(vinyl chloride)-type membranes with different compositions of plasticizers/ionophore were drop casted on the conducting polymer layer, polypyrrole $[3,3'\text{-Co}(1,2\text{-C}_2\text{B}_9\text{H}_{11})_2]$. Potentiometric measurements were performed to calibrate the response of the developed chemical sensors. The sensor was highly sensitive to amphetamine using a membrane composition of 26 wt% poly (vinyl chloride), 63 wt% di-butyl phthalate, 6 wt% sodium tetraphenylborate, and 5 wt% dibenzo-18-crown 6-ether. A high and linear response was demonstrated within the concentration range from 10^{-5} to 10^{-3} M with a slope of 53 mV/decade and a limit of detection of 4×10^{-5} M. A Reilly diagram shows that the sensor signal is stable for a working pH between 1.50 and 8.50. The chemical sensor was highly selective to amphetamine when compared to other interfering ions and compounds including K^+ , Na^+ , NH_4^+ , D,L-phenylalanine, caffeine, (\pm)-epinephrine bitartrate salt, and *N*-formylamphetamine using the fixed interference method with coefficients of selectivity ($\text{Log } K_{ij}^{\text{Pot}}$) from -1.40 to -1.15 .

ARTICLE HISTORY

Received 31 December 2016
Accepted 29 April 2017

KEYWORDS

Amphetamine; cyclic voltammetry (CV); electrochemical impedance spectroscopy (EIS); micro ion-selective electrode (μ ISE)

Figure 11: Paper accepted for publication in “Analytical Letters” Journal.

The details of the journal, where the paper was submitted are depicted in Table 12.

Table 12: Details of the paper presented in the Journal “Analytical Letters”.

Journal Title	Analytical Letters	Impact Factor	1.150
Targeted audience	Biosensors experts and Electrochemical sensor experts		
Paper title	Sensitive potentiometric determination of amphetamine with an all-solid-state micro ion-selective electrode		
Volume	In press	Date	2018

Conference paper presented in the SPIE Microtechnologies 2017 Conference

A paper was presented at the SPIE Microtechnologies Conference (Figure 12) [8]. It presents sensors to detect specific biomarkers in human saliva related with heart failure 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.

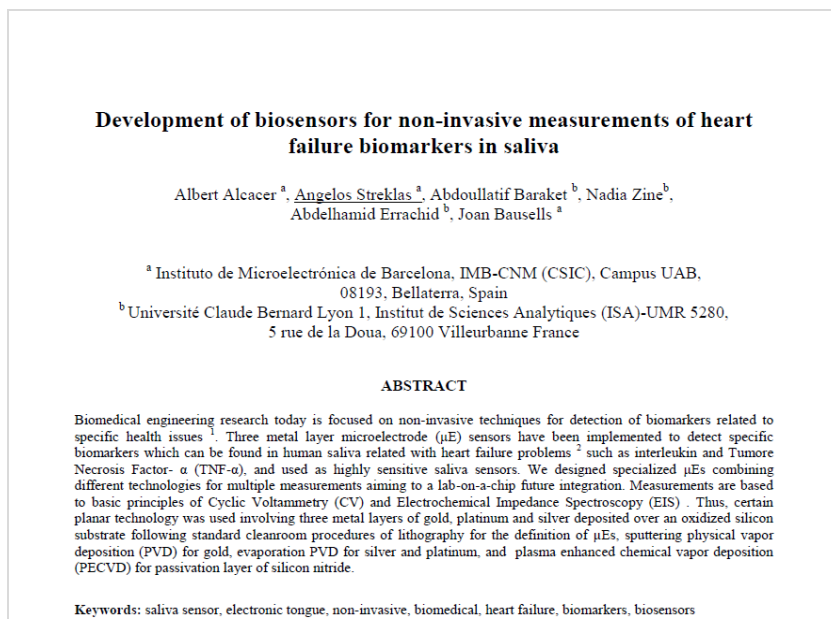


Figure 12: Paper presented in SPIE Microtechnologies 2017.

1. INTRODUCTION



The details of the conference, where the paper was submitted are depicted in Table 13.

Table 13: Details of the paper presented in SPIE Microtechnologies 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

Conference paper presented in the Eurosensors 2017 Conference

A paper was presented at the Eurosensors Conference (Figure 13) [9]. It presents a highly sensitive ion-selective microelectrode for the detection of amphetamine. A novel ion-par complex based on the metallocarborane, cobalt bis(dicarbollide) anion coupled to amphetamonium cation was prepared as the active site for amphetamine recognition, and it was incorporated to a PVC-type sensitive membrane. It provided a quick response within the range 10^{-5} M to 10^{-3} M of amphetamine concentration, with a limit of detection of 12 μ M and a slope of 60.1 mV/decade. It has been published as Proceedings 2017, 1, 481.

Proceedings

A Highly Sensitive Potentiometric Amphetamine Microsensor Based on All-Solid-State Membrane Using a New Ion-Par Complex, $[3,3'\text{-Co}(1,2\text{-closo-C}_2\text{B}_9\text{H}_{11})_2]^- \text{C}_9\text{H}_{13}\text{NH}^{+}$

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† Presented at the Eurosensors 2017 Conference, Paris, France, 3–6 September 2017.

Published: 7 August 2017

Figure 13: Paper presented in Eurosensors 2017.

Abstract: In the present work a highly sensitive ion-selective microelectrode for the detection of amphetamine is presented. For this purpose, a novel ion-par complex based on the amphetamine cation has been prepared as the active site for amphetamine recognition. The prepared ion-par complex was incorporated to a PVC-type sensitive membrane. It was then on the top of a gold microelectrode previously modified with a solid contact layer of $\text{Pt}(\text{NH}_3)_4^{2+}$. This novel amphetamine microsensor has provided excellent and quick response to amphetamine. For a 10^{-5} M of amphetamine concentration, a limit of detection of $12 \mu\text{M}$ and a selectivity coefficient of 10^{-3} was also found to be highly selective toward some potential compounds when compared to amphetamine.

Table 14: Details of the paper presented in Eurosensors 2017.

Conference title	31 st Eurosensors, 2017
Location	Paris, France
Date	3–6 September 2017
Theme of the Conference	Technology and applications of sensors, including biosensors
Targeted audience	Amphetamine; ion-par complex; metalloboranes

Conference paper presented in the Eurosensors 2017 Conference

A paper was presented at the Eurosensors Conference (Figure 14) [9]. It presents the development of a miniaturized potentiostat for Lab-on-Chip measurements. The system was coupled to an array of miniaturized gold working electrodes to perform complex impedance analyses for TNF- α cytokine detection. It has been published as Proceedings 2017, 1, 604.



Figure 14: Paper presented in EuroSensors 2017.

The details of the conference, where the paper was submitted are depicted in Table 15.

Table 15: Details of the paper presented in EuroSensors 2017.

Conference title	31 st EuroSensors, 2017
Location	Paris, France
Date	September 2017
Theme of the Conference	Technology and applications of sensors, including biosensors
Targeted audience	Sensor experts

UMOR

Journal paper presented in the Journal of Breath Research

A paper entitled “Applied upper-airway resistance instantly affects breath components: a unique insight into pulmonary medicine” has been accepted in the Journal of Breath Research (Figure 15) [10]. In this paper, it is demonstrated that modifications of the upper airway resistance affected the breath biomarker profiles. VOC Profiles mirror conditions in the airways/ lungs. These findings are very important for implication of sensor technology in HF patients.

Journal of Breath Research



CrossMark

PAPER


Applied upper-airway resistance instantly affects breath components: a unique insight into pulmonary medicine

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Keywords: respiratory physiology, airway resistance, breath biomarker, VOCs, ventilation and hemodynamics, sampling mouthpiece diameter, standardisation

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

Figure 15: Paper presented in the Journal of Breath Research.

The details of the conference, where the paper was submitted are depicted in Table 16.

Table 16: Details of the paper presented in the Journal of Breath Research.

Journal Title	Journal of Breath Research	Impact Factor	4.31
Targeted audience	Breath researchers, medical professionals, analytical chemists and applied biotechnologists		
Paper title	Applied upper-airway resistance instantly affects breath components: a unique insight into pulmonary medicine		
Volume	11	Date	1 November 2017

UNIFI

Journal paper accepted in Microchemical Journal

A paper entitled “The effect of sampling procedures on the urate and lactate concentration in oral fluid” has been accepted to be published in the Microchemical Journal (Figure 16) [11]. This paper was aimed at assessing a reliable sampling protocol for the non-invasive determination of urate and lactate in oral fluid samples by comparing the composition of non-stimulated and stimulated oral fluid samples collected at different frequencies of stimulation (50, 100 and 150 min⁻¹).



Contents lists available at ScienceDirect

Microchemical Journal

journal homepage: www.elsevier.com/locate/microc


The effect of sampling procedures on the urate and lactate concentration in oral fluid



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pH

ABSTRACT

This study was aimed at evaluating the influence of sampling procedure on the determination of uric acid and lactate in oral fluid. Samples of non-stimulated and stimulated oral fluid were collected 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.

The urate concentration in oral fluid decreased with the increase of the stimulation and oral fluid flow rate ($r = -0.98$, $p = 0.01$). Also, the lactate concentration was much ($p = 0.03$, two tailed) lower in samples collected under a mild stimulation (50 min⁻¹) than in samples collected without stimulation. Nevertheless, it progressively increased at higher stimulations (100 and 150 min⁻¹). A transfer process mediated by membrane carriers (i.e. urate transporter and organic anion transporters) was hypothesized to explain these results. Finally, a reduced variability (relative standard deviation below 10%) of the urate concentration was obtained when oral fluid was sampled at constant stimulation (70 min⁻¹), but it increased remarkably (20–50%) in case of sampling at self-selected pace. Nevertheless, expressing the salivary excretion of urate as a function of time (μg min⁻¹), the variability of sampling procedure at self-selected pace was lower than 15%.

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Figure 16: Paper entitled “The effect of sampling procedures on the urate and lactate concentration in oral fluid”.

The details of the conference, where the paper was submitted are depicted in Table 17.

Table 17: Details of the paper entitled “The effect of sampling procedures on the urate and lactate concentration in oral fluid”.

Journal Title	Microchemical Journal	Impact Factor	3.034
Targeted audience	Chemistry specialized scientific community, analytical chemistry researchers		
Paper title	The effect of sampling procedures on the urate and lactate concentration in oral fluid		
Volume	136	Date	2018

Journal paper accepted in 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 published in the Journal of Breath Research (Figure 17) [10]. This paper reports a validated analytical procedure for the determination of volatile organic compounds (e.g. ketones, aldehydes, alcohols, hydrocarbons, sulfur and aromatic compounds) in exhaled breath samples by needle trap micro-extraction followed by gas chromatography-tandem mass spectrometry

analysis. The procedure was successfully applied to the analysis of exhaled breath samples collected from forty patients suffering from heart failure during their hospitalization. Results highlighted the potential role of breath acetone for monitoring the health conditions of these patients.

IOP Publishing

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Journal of Breath Research



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

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Keywords: needle trap micro-extraction, GC-MS/MS, breath analysis, heart failure, VOCs

Supplementary material for this article is available online

Figure 17: 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”.

The details of the conference, where the paper was submitted are depicted in Table 18.

Table 18: Details of the paper presented in the Journal of Breath Research.

Journal Title	Journal of Breath Research	Impact Factor	4.318
Targeted audience	Experts in breath analysis, analytical chemistry specialized scientific community		
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	doi: 10.1088/1752-7163/aa94e7	Date	2017

2.2.2 HEARTEN Poster presentations

UCBL

Poster presented in the International Conference on Micro and Nano Engineering 2017 (1)

HEARTEN presented a Plenary Talk entitled “BioLab-on-chip based on Impedance Spectroscopy for Heart failure application “ at the 10th International Workshop on Impedance Spectroscopy, September 26-29 2017 (Figure 18). This is a joint activity with CSIC.



TECHNISCHE UNIVERSITÄT
CHEMNITZ

10th International Workshop on Impedance Spectroscopy, September 26-29 2017

TU Chemnitz → Mess- und Sensortechnik → IWIS → Program Overview → Program IWIS

IWIS 2017

Program Overview

Program IWIS

Program ASIS

Advanced School on IS

Submission and Registration

Circle of Experts

Travel and Venue

Books

History

Contact







IWIS Program

Thursday, September 28th, 2017	
08:00 – 08:30	Registration (Registration Desk)
08:30 – 08:45	Opening Chair: Olfa Kanoun
08:45 – 09:30	Plenary Talk 1: BioLab-on-chip based on Impedance Spectroscopy for Heart failure application. Prof. Errachid Abdelhamid

Figure 18: Poster in the Micro and Nano Engineering Conference.

The details of the conference, where the poster was presented are depicted in Table 19.

Table 19: Details of the plenary talk presented in the Micro and NanoEngineering 2017.

Event	10 th International workshop on impedance spectroscopy
Location	Chemnitz, Germany
Date	26-29 September, 2017
Poster title	BioLab-on-chip based on Impedance Spectroscopy for Heart failure application
Targeted audience	Engineers and scientists in the fabrication and application of micro- and nano devices using impedance spectroscopy as a tool for electrochemical characterization.

Poster presented at the Eurosensors Conference

HEARTEN presented a poster entitled “A highly selective potentiometric amphetamine microsensor based on all-solid-state membrane using a new ion-pair complex $[C_9H_{13}NH]^+[3,3-Co(1,2-closo-C_2B_9H_{11})_2]^-$ ” at the Eurosensors Conference (Figure 19). It is the premium European conference on sensors and biosensors and its applications. This is a joint activity with CSIC.

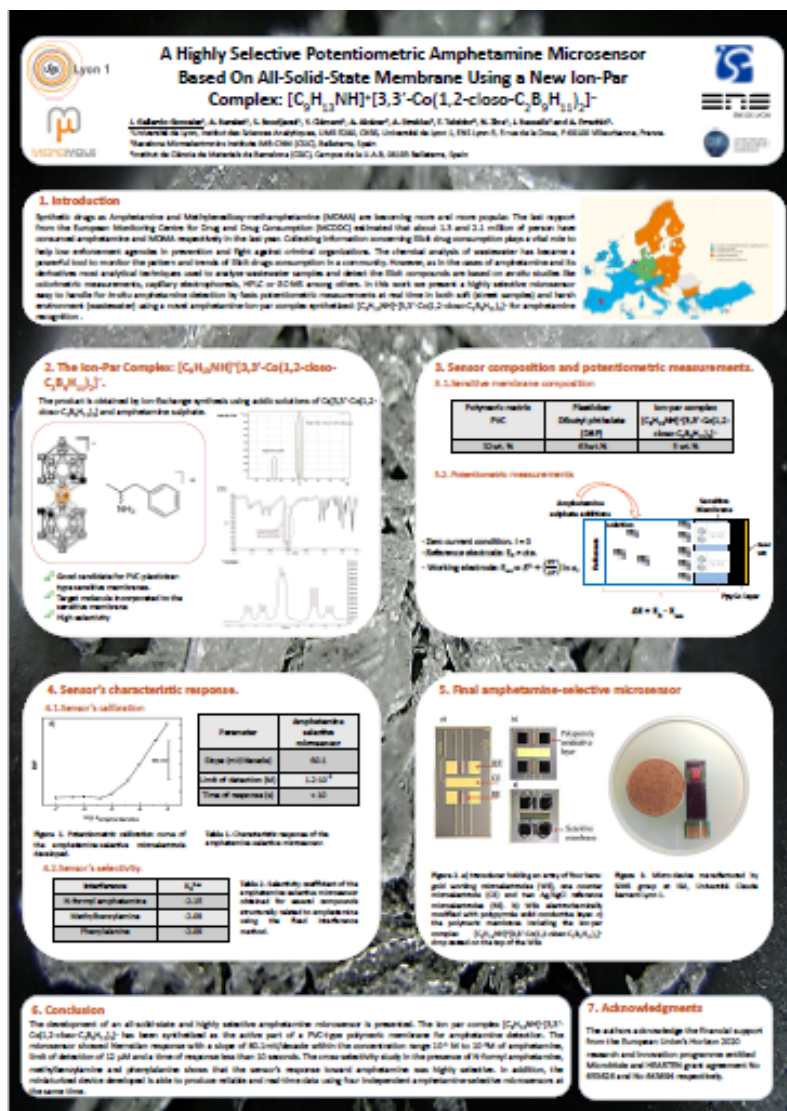


Figure 19: Poster presented in Eurosensors 2017.

The details of the conference, where the paper was submitted are depicted in Table 20.

Table 20: Details of the poster presented in Eurosensors 2017.

Conference title	31 st Eurosensors, 2017
Location	Paris, France
Date	September 2017
Theme of the Conference	Technology and applications of sensors, including biosensors
Targeted audience	Sensor experts

Poster presented in the International Conference on Micro and Nano Engineering 2017

HEARTEN presented two posters. The first one entitled “Acetone sensor based on electro-addressing chitosan/zeolites Ag-ZSM5 onto gold μ IDEs : Application to diagnostic of heart failure “ and the second one entitled “PDMS-based microfluidic Lab-on-a-chip for real-time electrochemical measurements in sewage applications“ at the Conference Micro and NanoEngineering 2017 (Figure 20, Figure 21). It is the premium European conference on micro and nanofabrication and its applications.

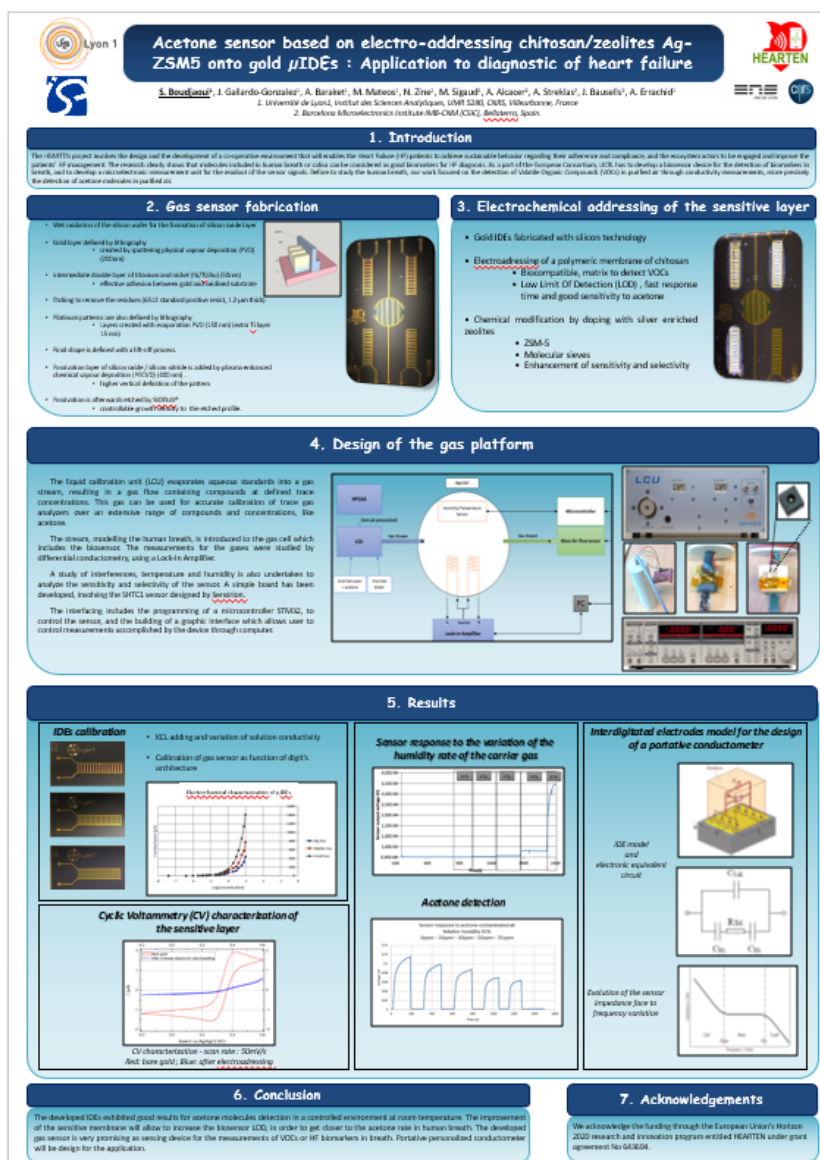


Figure 20: Poster in the Micro and Nano Engineering Conference.

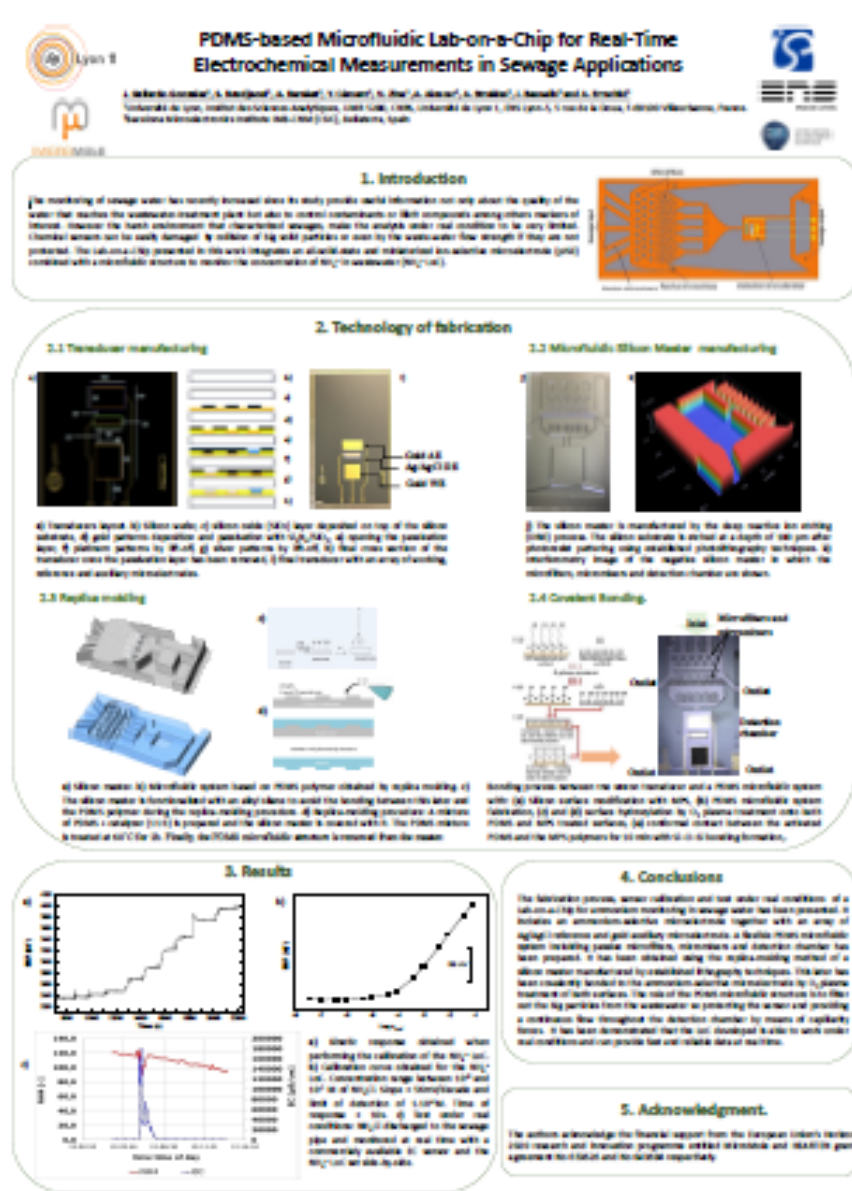


Figure 21: Poster in the Micro and Nano Engineering Conference.

The details of the conference, where the posters were presented are depicted in Table 21.

Table 21: Details of the poster presented in the Micro and NanoEngineering 2017.

Event	Micro and NanoEngineering 2017
Location	Braga, Portugal
Date	18-22 September, 2016
Poster title	Acetone sensor based on electro-addressing chitosan/zeolites Ag-ZSM5 onto gold μIDEs : Application to diagnostic of heart failure
Targeted audience	Engineers and scientists expert in the fabrication and application of micro- and nanostructures and devices. This includes applications in life sciences and medicine.

UNIFI presented a poster entitled “Determination of volatile organic compounds in exhaled breath of heart failure patients by Needle Trap Micro-Extraction coupled to GC-MS/MS” at the XXVI National Congress of the Italian Chemical Society (Figure 22) [13].

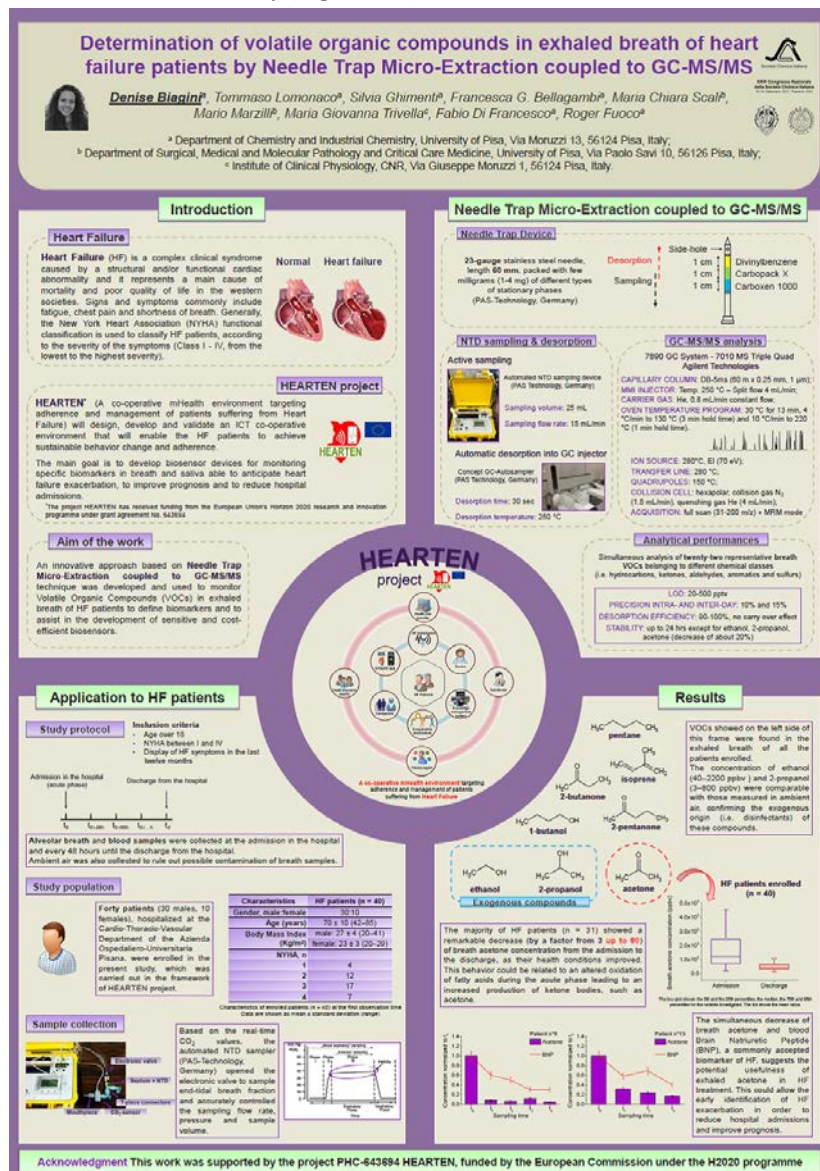


Figure 22: Poster in the XXVI National Congress of the Italian Chemical Society.

The details of the conference, where the poster was presented are depicted in Table 22.

Table 22: Details of the poster presented in the XXVI National Congress of the Italian Chemical Society.

Conference Title	XXVI National Congress of the Italian Chemical Society
Location	Paestum (SA), Italy
Date	September, 2017
Theme of the Conference	Chemistry
Targeted audience	Chemistry specialized scientific community, analytical chemistry researchers

UNIFI presented a poster entitled “Monitoring patients with acute heart failure: alternative non-invasive methods” at the EuroEcho-Imaging 2017 Congress (Figure 23) [14].

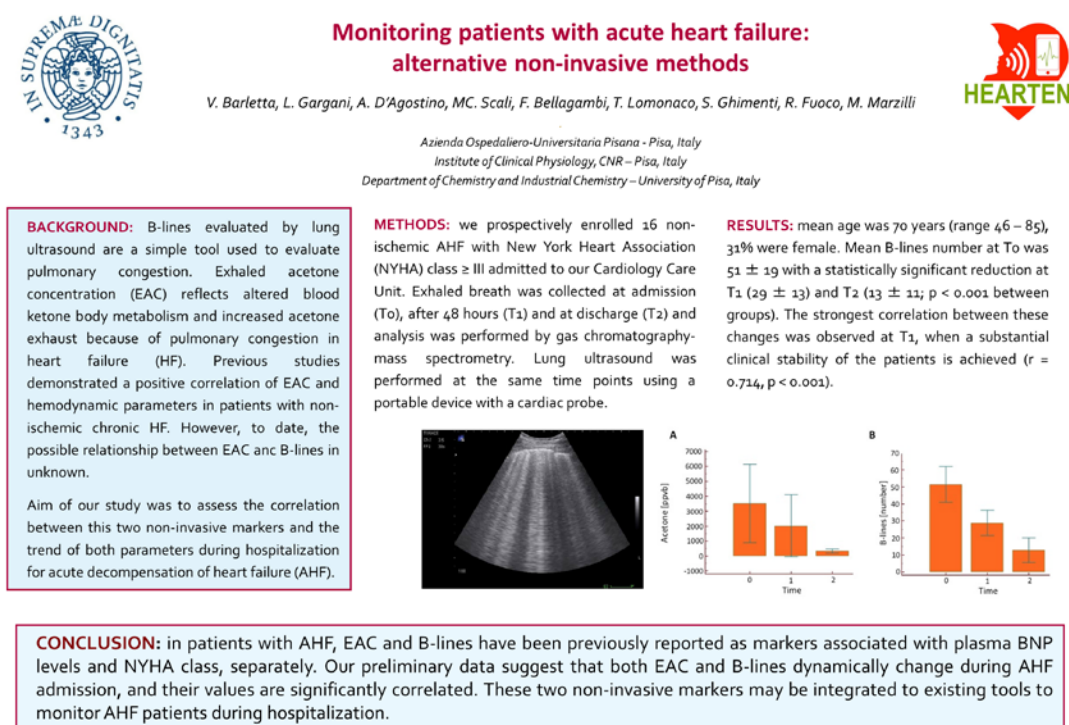


Figure 23: Poster presented in the EuroEcho-Imaging 2017 congress.

The details of the conference, where the poster was presented are depicted in Table 23.

Table 23: Details of the poster presented in the EuroEcho-Imaging 2017 event.

Conference Title	EuroEcho-Imaging 2017
Location	Lisbon, Portugal
Date	December, 2017
Theme of the Conference	Monitoring patients with acute heart failure: alternative non-invasive methods
Targeted audience	Health specialized scientific community, cardiovascular imaging experts

YOURDATA

The activities and results related to HEARTEN project were presented into an innovation fair as oral presentation and posters [15]. In this event, HEARTEN has been explained to a very relevant audience (ICT experts, ehealth stakeholders) as well as general public and policy makers.



Figure 24: Poster in SINNOVA 2017, Sardinian innovation fair

Table 24: Details of the SINNOVA 2017, Sardinian innovation fair.

Conference Title	Sinnova 2017, Sardinian innovation fair
Location	Cagliari, Italy
Date	October, 2017
Theme of the Conference	Innovative solutions
Targeted audience	Researchers, developers, general public, policy makers

2.2.3 HEARTEN Project presentations

AppArt

AppArt performed a company presentation (Figure 25) to SingularLogic, which included presentation of the work performed within the frames of HEARTEN project as well as the potential of exploiting the results of the project. SingularLogic is a leading 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. SingularLogic provides solutions specialized for Healthcare industry such as hospitals, clinics, medical diagnostic centers etc.

Moreover, SingularLogic is part of a Group of Companies to which a large private Healthcare organization belong: The Hygeia Group. Hygeia is a private hospital with geographical presence in Greece and Albania and various specializations. In this context, AppArt presented HEARTEN project to SingularLogic aiming at finding the right stakeholders that could be interested in utilizing HEARTEN

results for Healthcare purposes under a business model which would provide value for their operations. The said presentation took place on October 12th 2017.



Figure 25: Presentation in SingularLogic company.

FORTH

HEARTEN Presentation in the IEEE Engineering in Medicine and Biology Society - EMBC'17

HEARTEN participated in the IEEE Engineering in Medicine and Biology Society - EMBC'17 in Korea (July 2017) [16], where the paper entitled "A Computational Approach for the Estimation of Heart Failure Patients Status Using Saliva Biomarkers" was presented (Figure 26). The presentation focused on 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 in acute, progressive or stable condition through the employment of feature selection and classification techniques on a dataset of 29 patients.



Figure 26: Presentation in the IEEE Engineering in Medicine and Biology Society (EMBC 2017).

HEARTEN Presentation in the National University Health System (NUHS)

HEARTEN presented the objective and current progress of HEARTEN project in the National University Health System (NUHS) in Singapore (September 2017) (Figure 27) [17]. FORTH had the opportunity to meet and discuss with University officials and Bioengineering scientists and spread the concept of mHealth monitoring and management for HF achieved by the adoption of HEARTEN platform.

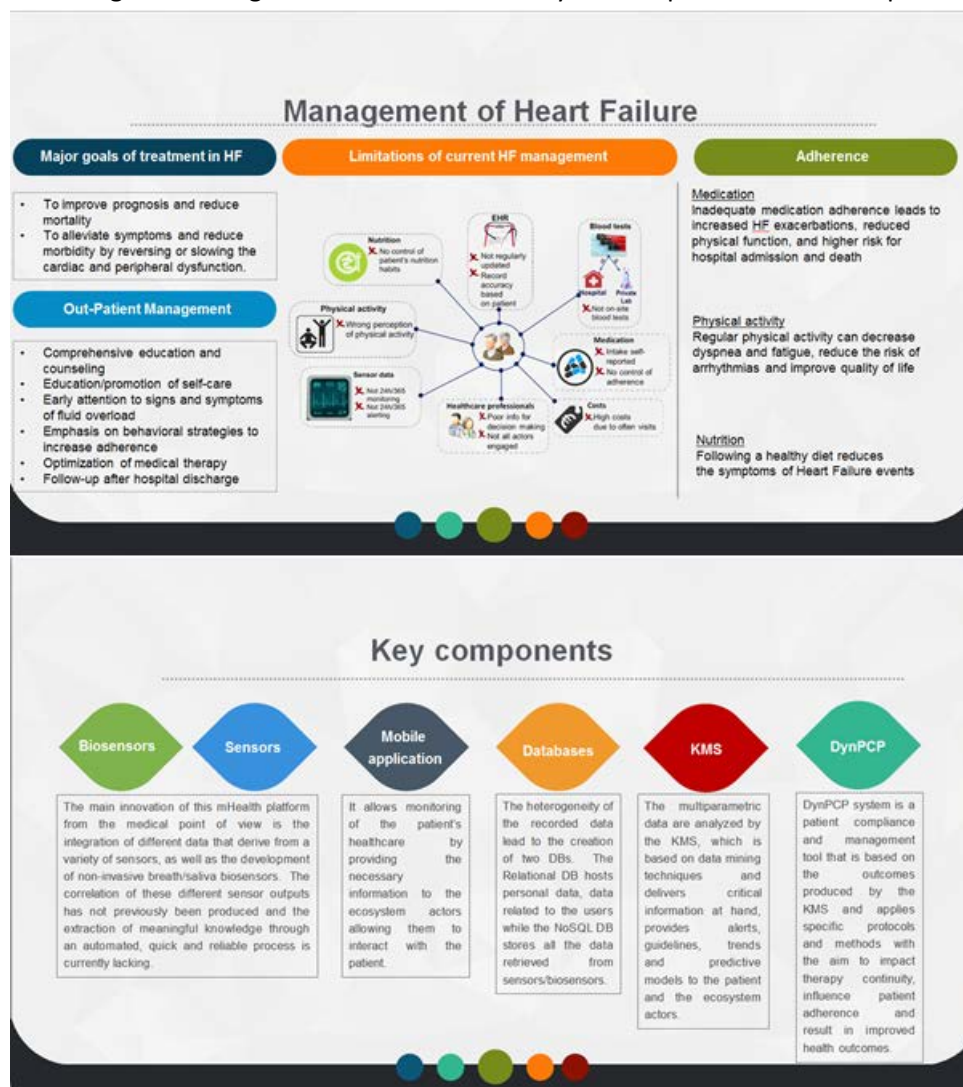


Figure 27: Presentation in the National University Health System (NUHS).

HEARTEN Presentation in the Taishan International Forum on Healthcare Technologies, Robots and Artificial Intelligence

FORTH had an invited talk on smart healthcare technologies in the Taishan International Forum on Healthcare Technologies, Robots and Artificial Intelligence that was held in China (August 2017) (Figure 28). In this presentation entitled “Healthcare Tailored to the Patient’s Needs: Use of Personalized data and Knowledge Extraction for Action” FORTH demonstrated the importance of the utilisation of personalised data for mHealth monitoring systems and ecosystem creation, focusing on HF disease.



Figure 28: Presentation in the Taishan International Forum on Healthcare Technologies, Robots and Artificial Intelligence.

UMOR

Basic result of the HEARTEN related pilot studies on the effect of physiology and confounding variables onto breath VOC profiles were presented in international conferences (e.g. respiration physicians/scientists) and EU meetings as oral presentation [18].

Table 25: Details of the Conference where UMOR oral presentations took place.

Conference Title	European Respiratory Society Congress.
Location	Milan, Italy.
Date	September, 2017
Theme of the Conference	Role of respiratory physiology on real-time breath-gas analysis
Targeted audience	Medics and scientist from respiratory medicine and research
Conference Title	Inno-INDIGO-NCD-CAPomics project Kick-off meeting.
Location	Madeira, Portugal
Date	September, 2017
Theme of the Conference	Potential confounders in clinical breath-gas analysis!!
Targeted audience	Analytical and bio-analytical scientist from EU and India

UNIPi

HEARTEN Presentation in the National cardiology meeting

UNIFI had a talk on sensors and ICT technologies in the annual national cardiology meeting that was held in Milan, Italy (25-28 September 2017) (Figure 29). In this presentation entitled “Sensoristica e ICT al servizio della medicina” UNIFI illustrated the advantages represented by the application of new sensor-based technologies for m-Health monitoring systems, focusing on HF patients.

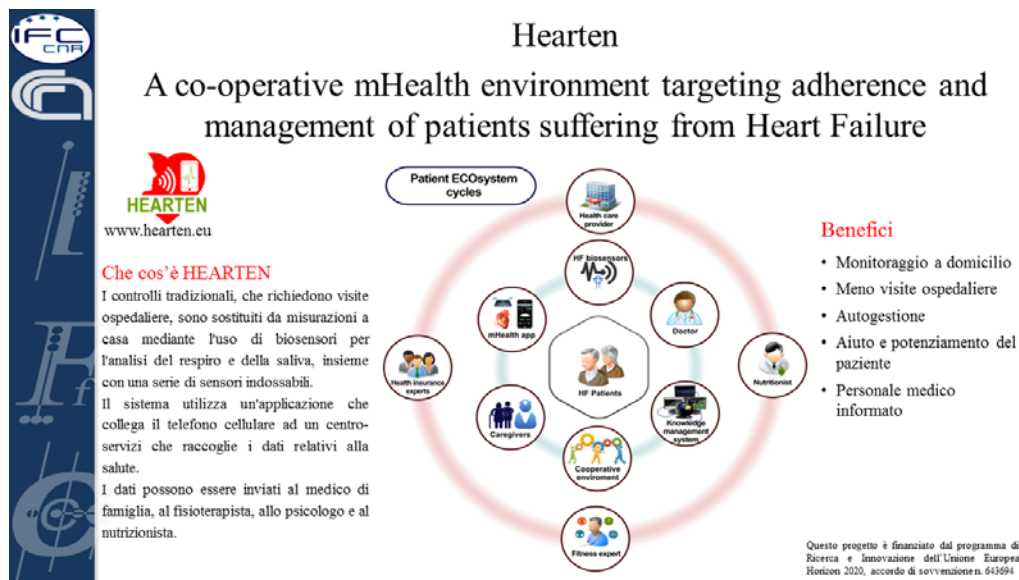


Figure 29: Presentation in the National Cardiology meeting.

Details on the presentation in the National Cardiology meeting event are presented in Table 26.

Table 26: Details of the National Cardiology meeting event.

Conference Title	National Cardiology meeting
Location	Milan (Italy)
Date	25-28 September 2017
Theme of the Conference	Annual national cardiology meeting
Targeted audience	Cardiology specialists (about 200 attendees)

BIOAXIS-CAREDOME

BIOAXIS-CAREDOME has focused on disseminating the progress of HEARTEN to the pharmaceutical industry, banking industry, private insurance industry, telemedicine vendors and healthcare professionals. BIOAXIS-CAREDOME has developed the necessary presentations which were used to achieve the dissemination targets during this period. In addition, the HEARTEN project video has been used in face to face presentations. In summary, the following dissemination activities were conducted (Appendix A1) (Figure 30):

- Face to face meetings and presentations to 69 international pharmaceutical companies in Portugal, Greece and Bulgaria.
- Face to face meetings and presentations to two Private Banks in Greece.
- Face to face meetings and presentations to two Private Insurance companies in Greece.
- Face to face meetings and presentations to three telemedicine and medical device vendors in UK and Greece.

- Face to face presentation to 37 cardiologists located in Portugal and Greece (Appendix A1).



Figure 30: HEARTEN Presentation slide.

2.2.4 HEARTEN Leaflets

EVERIS

HEARTEN Leaflet distribution at Big/Open/Small Data in Health Event

EVERIS has sponsored the Big/Open/Small Data in Health Event celebrated at the University of Valencia, Spain, on September 21st which deals with the concern of the use of data in Health in order to find benefits from the economical and quality of life perspective (Figure 31). Taking the advantage of the attendance of health professionals, public organizations and academic members to this event, distribution and communication on the works done under the HEARTEN project have been disseminated, including leaflet distribution.



Figure 31: HEARTEN Flyer distributed during the event sponsored by EVERIS.

The details of the HEARTEN Presentation at Big/Open/Small Data in Health Event are presented in Table 27.

Table 27: Details of Big/Open/Small Data in Health Event.

Event	Big/Open/Small Data in Health Event
Location	University of Valencia, Valencia, Spain
Date	21 September 2017
Organization	IDAL. Universitat de València.
Targeted audience	Healthcare stakeholders, health IT developers

HEARTEN Flyer #2 Translation into Spanish

EVERIS led the Spanish translation of the new Flyer prepared by FORTH in July 2017 (in collaboration with SAS and CSIC) (Figure 32, Figure 33).

Mantén tu corazón saludable... con HEARTEN

Imagina...

Un sistema que puede ayudarte...

Que está centrado en ti y en tus necesidades...

Que te motiva a seguir el tratamiento...

Que puede ser utilizado por tu propio médico de familia y por una red de profesionales....

Que puede proporcionar apoyo y asesoramiento de manera continua...

Imagina la plataforma HEARTEN

Proporcionado por:



Síguenos



<http://www.hearten.eu/>

 Este proyecto ha recibido financiación del programa de investigación e innovación de la Unión Europea "Horizonte 2020", según el acuerdo número 643694



Una plataforma colaborativa para ayudarte a gestionar la insuficiencia cardíaca



Figure 32: HEARTEN flyer (Spanish version) (1/2).



Figure 33: HEARTEN flyer (Spanish version) (2/2).

FORTH

Participation and flyer distribution in the Cardiovascular Symposium for Chronic Heart Failure Management

FORTH participated in the Cardiovascular Symposium for Chronic Heart Failure Management that was held in Ioannina in October (Figure 34). The symposium focused on the clinical perspectives for managing the HF patients depending on the NYHA class they belong to and the symptoms associated with their disease. FORTH had the opportunity to approach several HF clinical experts, presented the capabilities of HEARTEN platform, the opportunities arising for optimizing the disease management and received important comments and suggestions regarding the experts needs and expectations by such an mHealth platform. In parallel, the project flyer was distributed in the Symposium participants.



Figure 34: HEARTEN participation in the Cardiovascular Symposium for Chronic Heart Failure Management.

UNUPI

Event: “BRIGHT: Researchers’ Night”

UNUPI team presented the HEARTEN research activities and provided the latest version of the flyer in “BRIGHT: Researchers’ Night” (Figure 35) [19]. This event included open labs, events, and conferences on Brilliant Researchers Impact on Growth Health and Trust in research.



Figure 35: HEARTEN flyer distribution during “BRIGHT: Researchers’ Night” event.

Details of the “BRIGHT: Researchers’ Night” event are presented in Table 28.

Table 28: Details on the “BRIGHT: Researchers’ Night” event

Event	BRIGHT: Researchers’ Night
Location	Pisa (PI), Italy
Date	29 September 2017
Targeted audience	Researchers

Event: National Cardiology meeting

UNUPI team presented the HEARTEN research activities and provided the latest version of the flyer at the national Cardiology meeting held in Milan (Italy) on 25-28 September 2017 (Figure 36).



Figure 36: Flyer distribution in the National Cardiology meeting held in Milan.

Details of the National Cardiology meeting held in Milan are presented in Table 29.

Table 29: Details in the National Cardiology meeting held in Milan.

Event	Cardiology meeting
Location	Milan (Italy)
Date	25-28 September 2017
Targeted audience	Cardiology specialists from Italy (registered more than 1000 attendees)

Event: National Cardiology meeting

UNIFI team presented the HEARTEN research activities and provided the latest version of the flyer at the Cardiology meeting held in Milan (Italy) on 24-25 November 2017 (Figure 37).

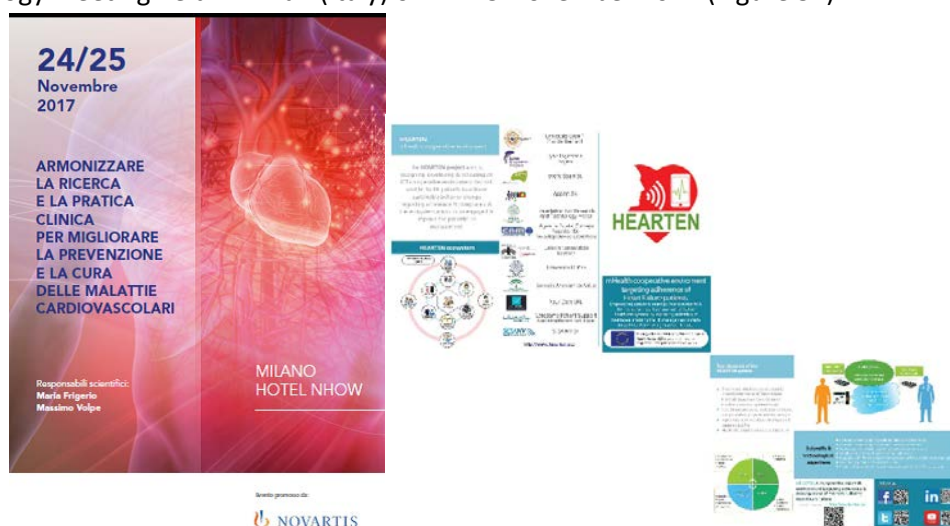


Figure 37: HEARTEN flyer distribution during the meeting “Harmonize clinical research and practice to improve prevention and care of cardiovascular disease”.

Details of HEARTEN dissemination in the Cardiology meeting that was held in Milan are presented in Table 30.

Table 30: Details on HEARTEN dissemination in the Cardiology meeting./

Event	Meeting on cardiovascular disease
Location	Milan (Italy)
Date	24-25 November 2017
Targeted audience	Cardiovascular disease specialists from Italy (expected more than 200 attendees)

SAS

From August 2017, SAS performed a patient-oriented leaflet distribution in Virgen del Rocío University Hospital installations (50 leaflets).

YOURDATA

YOURDATA participated in the Sinnova 2017, Sardinian innovation fair, that took place in Cagliari in October 2017 (Figure 38).


Figure 38: HEARTEN flyer distribution in SINNOVA 2017.

Table 31: SINNOVA 2017.

Event	SINNOVA 2017, Sardinian innovation fair
Location	Cagliari, Italy
Date	October, 2017
Targeted audience	General public, healthcare stakeholders and policy makers

2.2.5 HEARTEN Website

The project website [20] is updated in a regular basis to include the dissemination activities performed by the HEARTEN consortium. On overview of the statistics tool showing the visits in the website from M1-M36 is provided in Figure 39.

- Number of connections: 697
- Users: 521
- Pages seen: 1639
- Pages per connection: 2.35
- Average of time per connection: 1:48

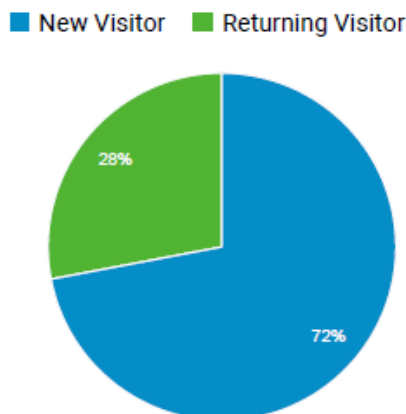



Figure 39: Overview of the website visits.

2.2.6 Dissemination via the social media

The utilization of project social media (Facebook, twitter, LinkedIn) is vital for enabling the dissemination and wide communication of project findings and events. Special emphasis has been given in targeting the HF patients through providing clinical information and guidance in an easy and understandable way towards educating them on the significance of following the doctor's suggestions and assisting them in being adherent in the treatment plan (Figure 40, Figure 41). An overview of the performed posts from M31-M36 in Facebook and Twitter is presented in the following table.

Table 32: Facebook and Twitter posts (M31-M36).

Number of posts		M31-M36
	Facebook	42
	Twitter	43

Facebook, Twitter and LinkedIn

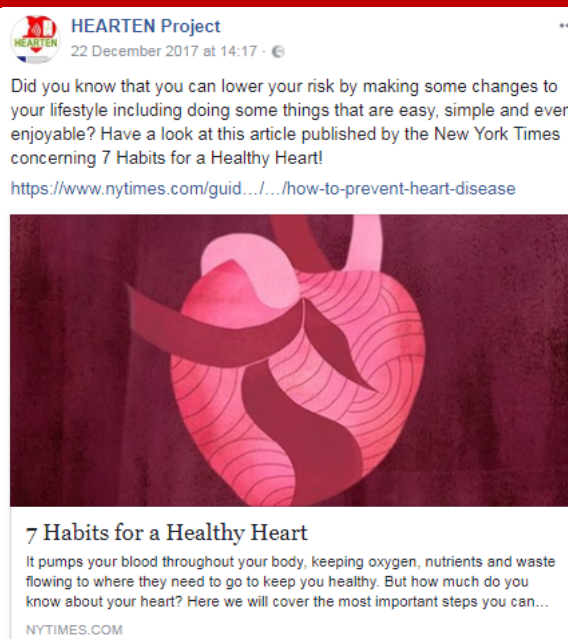


Figure 40: Overview of HEARTEN posts in Facebook.



Figure 41: Overview of HEARTEN posts in Twitter.

LinkedIn

LinkedIn account has been created to reach people from different fields of expertise including clinical experts in Cardiology, Bioinformaticians, Researchers of Medical Science, Psychologists, Physicians, nutritionists, Business Developers, Health Unit experts and Health economy Consultants, etc. Currently, HEARTEN linkedIn account has 657 connections (Figure 42).

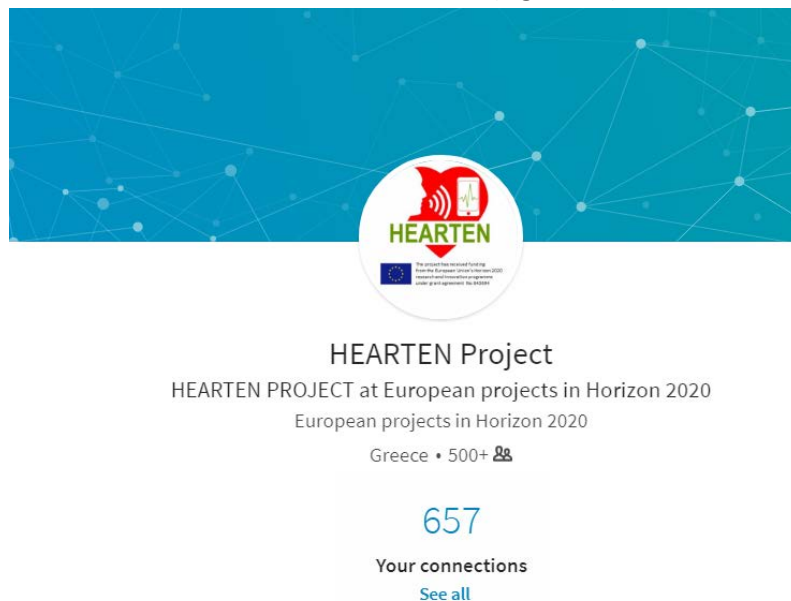


Figure 42: Overview of HEARTEN posts in LinkedIn.

2.2.7 Other dissemination activities

EVERIS

HEARTEN Video concerning Integration Tool developed for SAS Pilot

EVERIS prepared a video concerning the works developed to integrate HEARTEN with the Electronic Health Record used by the Andalusian Health Service (SAS) at the Hospital Virgen del Rocío site. The

video puts into context the HEARTEN project, its consortium, the location of the Virgen del Rocío Hospital, which is the the largest medical complex in the Andalusian Public Health System in Spain and referral hospital for southern Spain serving more the 800.000 patients annually, and the characteristics of the tool created for the integration of the Patient Health Record with HEARTEN. The video has a duration of 2 minutes and 36 seconds, with a narration in English and with subtitles both in English and Spanish.

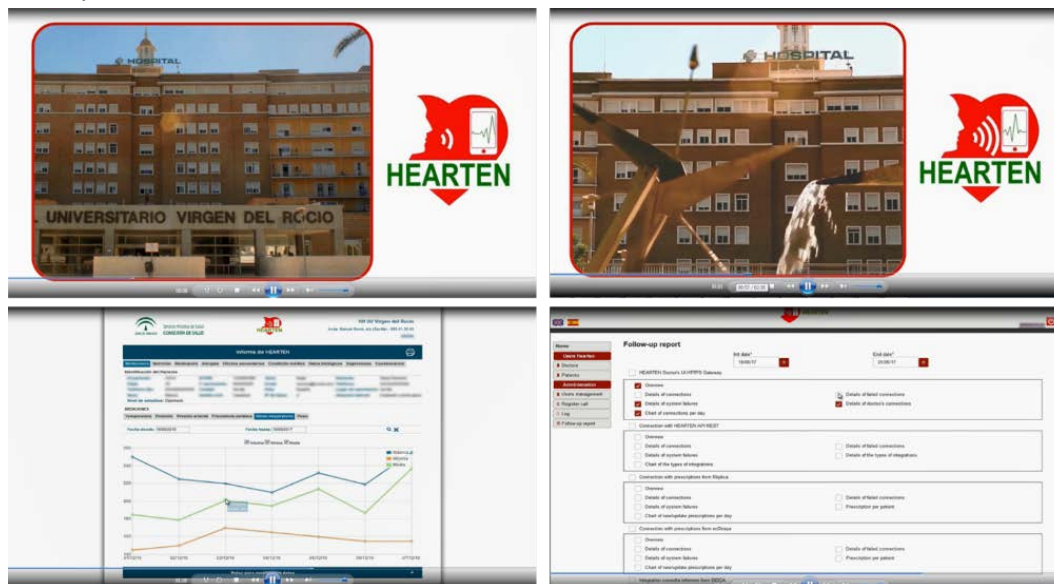


Figure 43: HEARTEN Video showing the Integration Tool deployed under Hospital Virgen del Rocío (SAS)

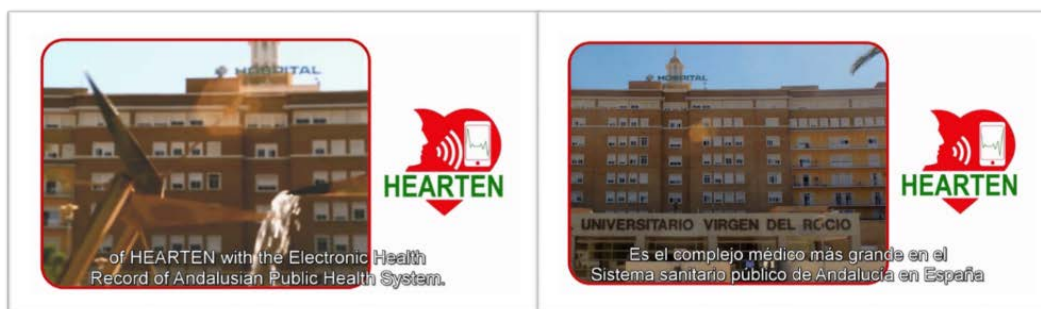


Figure 44 English and Spanish versions of the HEARTEN video showing the integration.

This video was uploaded to the Youtube channel of HEARTEN Project and it is part of the different TV presentations performed by EVERIS in commercial actions as part of its dissemination and exploitation strategy.

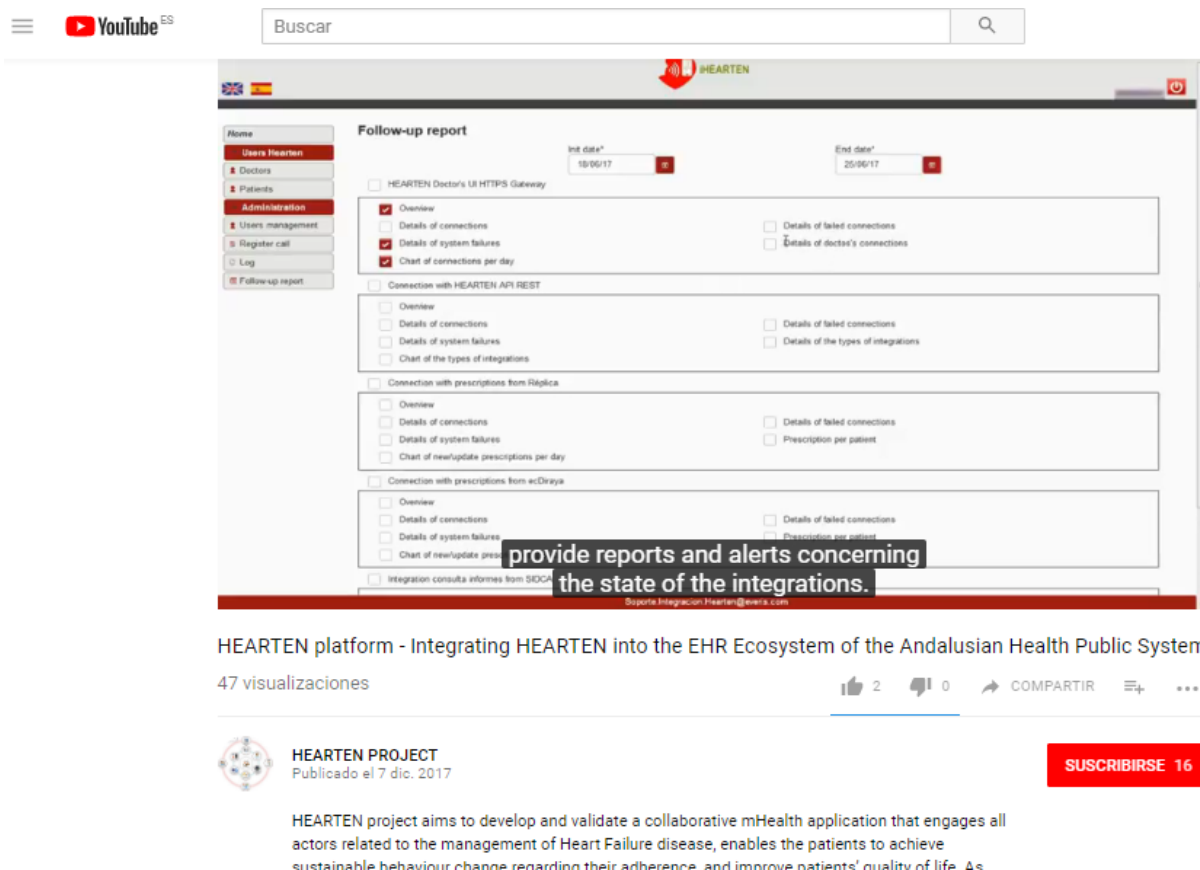


Figure 45: The video has been uploaded to HEARTEN YouTube channel and is available at <https://youtu.be/Cx6592zLgGA>

Newsletters

EVERIS has prepared a set of newsletters consolidating the highlights of news published under the social network accounts and published under the HEARTEN Website. The newsletters serve a double purpose: (i). to provide to new followers a summary of publications published from the beginning of the project. (ii) to increase the number of visitors of the HEARTEN project site (each click to open the newsletter from Facebook will imply a visit to the Hearten.eu site), which will help to position the site among top results in Google when users and professionals look for the term “heart failure”.

The following newsletters have been created:

- Newsletter containing relevant publications done in 2015
- Newsletter containing relevant publications done January-June 2016
- Newsletter containing relevant publications done July-Dec 2016
- Newsletter containing relevant publications done Jan-March 2017
- Newsletter containing relevant publications between April-June 2017
- Newsletter containing relevant publications between July-September 2017
- Newsletter containing relevant publications between October-December 2017



Figure 46: Newsletter including publications performed between July and September 2017.

All newsletters contain the following sections:

- Cover containing the period that comprises the newsletter
- Index of contents
- For each relevant publication done in HEARTEN social accounts:
 - Title of publication
 - Short summary
 - Link to the full publication



Figure 47: The links published in the newsletter redirect to the original publication in the social networks.

Newsletters are uploaded at the main HEARTEN website and a new indicating this is published under the project social networks.

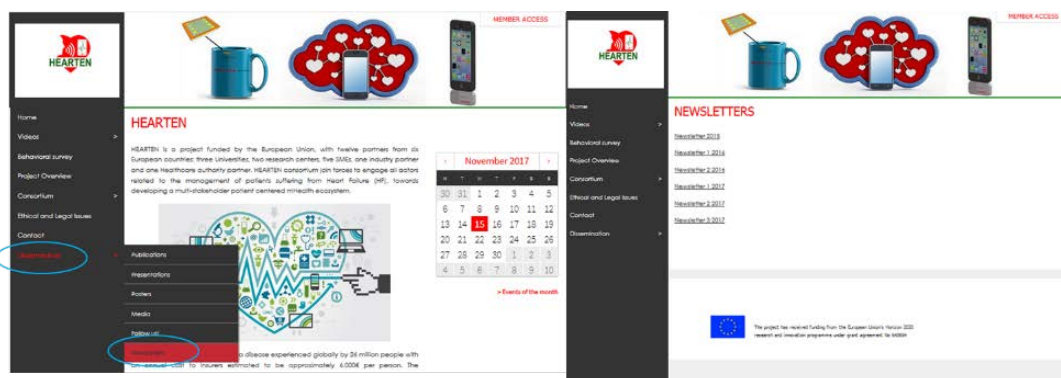
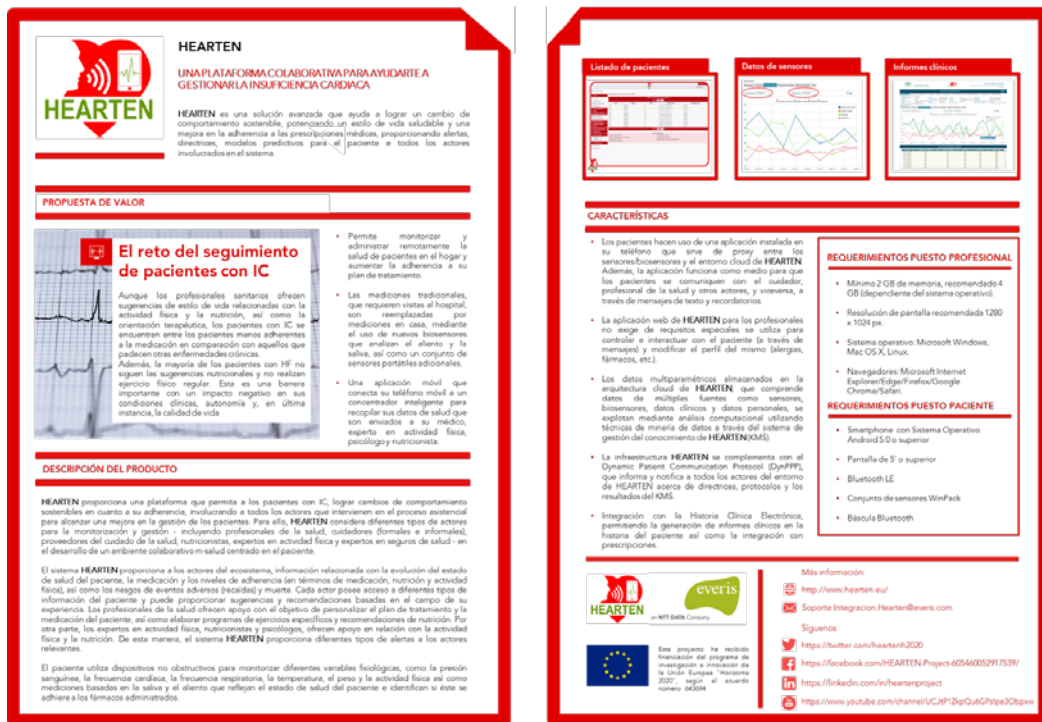


Figure 48: Overview of newsletters uploaded in the HEARTEN Website

HEARTEN Product Sheet

EVERIS has created a product informative sheet (to be used in commercial actions by the company following the guidelines of other products and services commercialized by EVERIS. This product sheet will be part of the EVERIS' portfolio solutions offered to their clients during commercial events, mostly oriented to Health Public and Private Sector and Pharmaceutical companies. The sheet has been prepared in Spanish and these commercial actions (Figure 49, Figure 50) are communicated in Spain and Latin America.



HEARTEN
UNA PLATAFORMA COLABORATIVA PARA AYUDARTE A GESTIONAR LA INSUFICIENCIA CARDIACA

HEARTEN es una solución avanzada que ayuda a lograr un cambio de comportamiento sostenible, potenciando un estilo de vida saludable y una mejora en la adherencia a las prescripciones médicas, proporcionando alertas, directrices, modelos predictivos para el paciente y todos los actores involucrados en el sistema.

PROPUESTA DE VALOR

El reto del seguimiento de pacientes con IC

Aunque los profesionales sanitarios ofrecen sugerencias de estilo de vida relacionadas con la actividad física y la nutrición, así como la orientación terapéutica, los pacientes con IC se encuentran entre los pacientes menos adherentes a la medicación en comparación con aquellos que padecen otras enfermedades crónicas. Además, la mayoría de los pacientes con HF no siguen las sugerencias nutricionales y no realizan ejercicio físico regular. Esta es una barrera importante con un impacto negativo en sus condiciones clínicas, autonomía y, en última instancia, la calidad de vida.

- Permite monitorizar y administrar remotamente la salud de pacientes en el hogar y aumentar la adherencia a su plan de tratamiento.
- Las mediciones tradicionales, que requieren visitas al hospital, son reemplazadas por mediciones en casa, mediante el uso de nuevos biosensores que analizan el ritmo y la salina, así como un conjunto de sensores portátiles adicionales.
- Una aplicación móvil que conecta su teléfono móvil a un controlador inteligente para recopilar sus datos de salud que son enviados a su médico, experto en actividad física, psicólogo o nutricionista.

DESCRIPCIÓN DEL PRODUCTO

HEARTEN proporciona una plataforma que permite a los pacientes con IC, lograr cambios de comportamiento sostenibles en cuanto a su adherencia, involucrando a todos los actores que intervienen en el proceso asistencial para alcanzar una mejora en la gestión de los pacientes. Para ello, HEARTEN considera diferentes tipos de actores para la monitorización y gestión - incluyendo profesionales de la salud, cuidadores (formales e informales), proveedores del cuidado de la salud, nutricionistas, expertos en actividad física y expertos en seguros de salud - en el desarrollo de un ambiente colaborativo en salud centrado en el paciente.

El sistema HEARTEN proporciona a los actores del ecosistema, información relacionada con la evolución del estado de salud del paciente, la medicación y los niveles de adherencia (en términos de medicación, nutrición y actividad física), así como los riesgos de eventos adversos (caídas) y muerte. Cada actor posee acceso a diferentes tipos de información del paciente y puede proporcionar sugerencias y recomendaciones basadas en el campo de su experiencia. Los profesionales de la salud ofrecen apoyo con el objetivo de personalizar el plan de tratamiento y la medicación del paciente, así como elaborar programas de ejercicios específicos y recomendaciones de nutrición. Por otra parte, los expertos en actividad física, nutricionistas y psicólogos, ofrecen apoyo en relación con la actividad física y la nutrición. De esta manera, el sistema HEARTEN proporciona diferentes tipos de alertas a los actores relevantes.

El paciente utiliza dispositivos no invasivos para monitorizar diferentes variables fisiológicas, como la presión sanguínea, la frecuencia cardíaca, la frecuencia respiratoria, la temperatura, el peso y la actividad física así como mediciones basadas en la saliva y el ritmo que reflejan el estado de salud del paciente e identifican si este se adhiere a los fármacos administrados.

Características:

- Los pacientes hacen uso de una aplicación instalada en su teléfono que sirve de proxy entre los sensores/biosensores y el entorno cloud de HEARTEN. Además, la aplicación funciona como medio para que los pacientes se comuniquen con el cuidador, profesional de la salud y otros actores, y viceversa, a través de mensajes de texto y recordatorios.
- La aplicación web de HEARTEN para los profesionales no exige de requisitos especiales se utiliza para controlar e interactuar con el paciente (a través de mensajes) y modificar el perfil del mismo (alergias, fármacos, etc.).
- Los datos multiparamétricos almacenados en la arquitectura cloud de HEARTEN, que comprende datos de múltiples fuentes como sensores, biosensores, datos clínicos y datos personales, se exploran mediante análisis computacional utilizando técnicas de minería de datos a través del sistema de gestión del conocimiento de HEARTEN(XMS).
- La infraestructura HEARTEN se complementa con el Dynamic Patient Communication Protocol (DyPP), que informa y notifica a todos los actores del entorno de HEARTEN acerca de directrices, protocolos y los resultados del XMS.
- Integración con la Historia Clínica Electrónica, permitiendo la generación de informes clínicos en la historia del paciente así como la integración con prescripciones.

REQUERIMIENTOS PUESTO PROFESIONAL

- Mínimo 2 GB de memoria, recomendado 4 GB (dependiente del sistema operativo).
- Resolución de pantalla recomendada 1280 x 1024 px.
- Sistema operativo Microsoft Windows, Mac OS X, Linux.
- Navegadores: Microsoft Internet Explorer/Edge/Firefox/Google Chrome/Safari.

REQUERIMIENTOS PUESTO PACIENTE

- Smartphone con Sistema Operativo Android 5.0 o superior.
- Pantalla de 5" o superior.
- Bluetooth LE.
- Conjunto de sensores WinPack.
- Batalla Bluetooth.

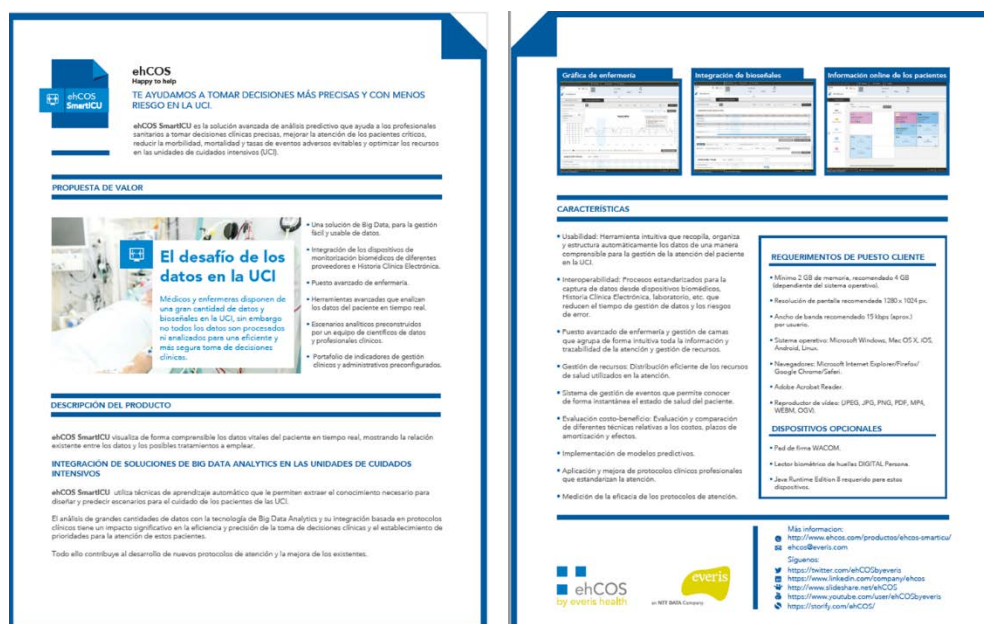
Más información:

- <http://www.hearten.eu/>
- Soporte Integración: hearten@everis.com

Síguenos:

- <https://twitter.com/hearten2020>
- <https://facebook.com/HEARTEN-Project-656405291733/>
- <https://linkedin.com/in/heartenproject>
- <https://www.youtube.com/channel/UCRP1DgQuGPhpe3Ckps>

Figure 49: HEARTEN Product Sheet to be used in EVERIS commercial actions.



ehCOS
Happy to help
TE AYUDAMOS A TOMAR DECISIONES MÁS PRECISAS Y CON MENOS RIESGO EN LA UCI.

ehCOS SmartICU es la solución avanzada de análisis predictivo que ayuda a los profesionales sanitarios a tomar decisiones clínicas precisas, mejorar la atención de los pacientes críticos, reducir la morbilidad, mortalidad y tasas de eventos adversos evitables y optimizar los recursos en las unidades de cuidados intensivos (UCI).

PROPUESTA DE VALOR

El desafío de los datos en la UCI

Médicos y enfermeras disponen de una gran cantidad de datos y biosensores en la UCI, un embalse no todos los datos son procesados ni analizados para una eficiente y más segura toma de decisiones clínicas.

- Una solución de Big Data, para la gestión fácil y usable de datos.
- Integración de los dispositivos de monitorización biométrica de diferentes proveedores e Historia Clínica Electrónica.
- Punto avanzado de enfermería.
- Historiales avanzados que analizan los datos del paciente en tiempo real.
- Exámenes analíticos presintéticos por un equipo de científicos de datos y profesionales clínicos.
- Perfilado de indicadores de gestión clínicos y administrativos geolocalizados.

DESCRIPCIÓN DEL PRODUCTO

ehCOS SmartICU visualiza de forma comprensible los datos vitales del paciente en tiempo real, mostrando la relación existente entre los datos y los posibles tratamientos a emplear.

INTEGRACIÓN DE SOLUCIONES DE BIG DATA ANALYTICS EN LAS UNIDADES DE CUIDADOS INTENSIVOS

ehCOS SmartICU utiliza técnicas de aprendizaje automático que le permiten extraer el conocimiento necesario para diagnosticar y predecir escenarios para el cuidado de los pacientes de la UCI.

El análisis de grandes cantidades de datos con la tecnología de Big Data Analytics y su integración basada en protocolos clínicos tiene un impacto significativo en la eficiencia y precisión de la toma de decisiones clínicas y el establecimiento de prioridades para la atención de estos pacientes.

Todo ello contribuye al desarrollo de nuevos protocolos de atención y la mejora de los existentes.

Características:

- Usabilidad: Herramienta intuitiva que recopila, organiza y estructura automáticamente los datos de una manera comprensible para la gestión de la atención del paciente en la UCI.
- Interoperabilidad: Proceso estandarizado para la captura de datos desde dispositivos biométricos, Historia Clínica Electrónica, laboratorio, etc., que reducen el tiempo de gestión de datos y los riesgos de error.
- Punto avanzado de enfermería y gestión de camas que agrega de forma intuitiva toda la información y trazabilidad de la atención y gestión de recursos.
- Gestión de recursos: Distribución eficiente de los recursos de salud utilizados en la atención.
- Sistema de gestión de eventos que permite conocer de forma instantánea el estado de salud del paciente.
- Evaluación costo-beneficio: Evaluación y comparación de diferentes técnicas relativas a los costos, plazos de amortización y efectos.
- Implementación de modelos predictivos.
- Aplicación y mejora de protocolos clínicos profesionales que estandarizan la atención.
- Medición de la eficacia de los protocolos de atención.

REQUERIMIENTOS DE PUESTO CLIENTE

- Mínimo 2 GB de memoria, recomendado 4 GB (dependiente del sistema operativo).
- Resolución de pantalla recomendada 1280 x 1024 px.
- Ancho de banda recomendado 15 Mbps (aprox.) por usuario.
- Sistema operativo: Microsoft Internet Explorer/Firefox/Google Chrome/Safari.
- Editor: Adobe Flash.
- Regulador de vídeo: MPEG, JPE, PNG, PDF, MP4, WEBM, OGV.

DISPOSITIVOS OPCIONALES

- Pad de 6 mm Wacom.
- Lector biométrico de huellas DIGITAL Person.
- Java Runtime Edition 8 requerido para estos dispositivos.

Más información:

- <http://www.ehcos.com/productos/ehcos-smarticu/>
- ehcos@everis.com

Síguenos:

- <https://twitter.com/ehCOSbyeveris>
- <https://www.linkedin.com/company/ehcos>
- <http://www.slideshare.net/ehCOS>
- <https://www.youtube.com/user/ehCOSbyeveris>
- <https://www.ehcos.com/>

Figure 50: An example of a product sheet of a commercial software distributed by Everis.

BIOAXIS-CAREDOME

BIOAXIS-CAREDOME communicated to its newsletter subscribers the final HEARTEN ICT components integration on the cloud. The newsletter list included the cooperating Nurse Network of BIOAXIS-CAREDOME (72 contacts), Executives from pharmaceutical companies (279 contacts) and cooperating Healthcare Professionals of different medical fields (1.114 contacts) (Figure 51).

Dear [title] [First Name] [Last Name],

As the end of a productive year is coming to an end, we would like to inform you about the current progress status of the HEARTEN project in which we are actively engaged for the last 36 months.

HEARTEN has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 643694 and its scope is to design, develop and validate an ICT co-operative environment that will enable Heart Failure patients to achieve sustainable behavior change regarding their adherence, and the ecosystem actors to be engaged and to improve the patients' management. HEARTEN targets all stakeholders related to the management of patients suffering from Heart Failure, including healthcare professionals, caregivers, healthcare providers, nutritionists, fitness experts and health insurance experts, towards developing a multi-stakeholder patient centered mHealth ecosystem.

After 36 months of research and development and in cooperation with all involved partners across Europe, we achieved to develop a patient centric mHealth environment which connects patients and caregivers with all the involved actors in the process of personalized monitoring and management of Heart Failure. The mHealth environment is consisted by multi components (medical devices, sensors, mobile application, web portal, Knowledge Management System and Dynamic Patient Communication Protocol system) which serve the different needs of each involved actor and at the same time connects them to achieve the maximum patient compliance and adherence.

In the next months, the HEARTEN project will evaluate that mHealth environment by conducting a pilot study in two different sites. We are looking forward for sharing the evaluation results with you as soon as possible.

For more information about HEARTEN, please visit www.hearten.eu

Figure 51:Overview of the newsletter created by BIOAXIS-CAREDOME.

APPENDIX

A1. Project presentations (BIOAXIS-CAREDOME)

Month	Company	Insutry	Country	Audience
M31	Sanofi	Pharmaceutical Company	Bulgaria	2
M31	Phillips	Medical Devices	Greece	1
M31	MSD	Pharmaceutical Company	Greece	3
M31	Novartis	Pharmaceutical Company	Greece	1
M31	Baxalta	Pharmaceutical Company	Greece	2
M31	UCB	Pharmaceutical Company	Greece	1
M31	Novartis	Pharmaceutical Company	Greece	2
M31	Novartis	Pharmaceutical Company	Greece	2
M31	Pharmathen	Pharmaceutical Company	Greece	2
M31	Novo Nordisk	Pharmaceutical Company	Greece	3
M31	Abbvie	Pharmaceutical Company	Greece	2
M31	Pfizer	Pharmaceutical Company	Greece	2
M31	Janssen	Pharmaceutical Company	Greece	2
M31	ELPEN	Pharmaceutical Company	Greece	1
M31	Bayer	Pharmaceutical Company	Greece	2
M31	Astellas	Pharmaceutical Company	Greece	2
M31	Novartis	Pharmaceutical Company	Portugal	1
M31	Sanofi	Pharmaceutical Company	Portugal	2
M31	Bayer	Pharmaceutical Company	Portugal	1
M32	Pharmathen	Pharmaceutical Company	Greece	2
M33	Novartis	Pharmaceutical Company	Greece	1
M33	GSK	Pharmaceutical Company	Greece	2
M33	Shire	Pharmaceutical Company	Greece	2
M33	Novartis	Pharmaceutical Company	Greece	3
M33	Angelini	Pharmaceutical Company	Greece	2
M33	Pharmathen	Pharmaceutical Company	Greece	2
M33	Abbvie	Pharmaceutical Company	Greece	2
M33	Pfizer	Pharmaceutical Company	Greece	2
M33	L'Oreal	Pharmaceutical Company	Greece	1
M33	ITF Pharmaceuticals	Pharmaceutical Company	Greece	1
M33	Novartis	Pharmaceutical Company	Portugal	2
M33	Novartis	Pharmaceutical Company	Portugal	2
M34	UCB	Pharmaceutical Company	Bulgaria	5
M34	Abbott	Pharmaceutical Company	Greece	4
M34	UCB	Pharmaceutical Company	Greece	2
M34	Novartis	Pharmaceutical Company	Greece	4
M34	GSK	Pharmaceutical Company	Greece	1
M34	Novartis	Pharmaceutical Company	Greece	1
M34	Sanofi	Pharmaceutical Company	Greece	3
M34	Merk	Pharmaceutical Company	Greece	2

M34	Abbvie	Pharmaceutical Company	Greece	2
M34	Rafarm	Pharmaceutical Company	Greece	2
M34	Ferring	Pharmaceutical Company	Greece	2
M34	Attika	Private Bank	Greece	3
M34	Eurobank	Private Bank	Greece	3
M34	Interamerican	Private Insurance	Greece	2
M34	Eyropaiki Pisti	Private Insurance	Greece	2
M34	Novartis	Pharmaceutical Company	Portugal	2
M34	Novo Nordisk	Pharmaceutical Company	Portugal	2
M35	Novartis	Pharmaceutical Company	Greece	2
M35	Novartis	Pharmaceutical Company	Greece	2
M35	Novartis	Pharmaceutical Company	Greece	5
M35	Novartis	Pharmaceutical Company	Greece	2
M35	UCB	Pharmaceutical Company	Greece	3
M35	Merk	Pharmaceutical Company	Greece	2
M35	Genesis	Pharmaceutical Company	Greece	2
M35	Novartis	Pharmaceutical Company	Greece	1
M35	Vianex	Pharmaceutical Company	Greece	3
M35	Superfoods	Pharmaceutical Company	Greece	1
M35	Shire	Pharmaceutical Company	Greece	2
M35	Pfizer	Pharmaceutical Company	Greece	2
M35	ELPEN	Pharmaceutical Company	Greece	1
M35	Novartis	Pharmaceutical Company	Portugal	3
M35	MSD	Pharmaceutical Company	Portugal	2
M35	HealthBeacon	Medical Devices	UK	1
M36	Sanofi	Pharmaceutical Company	Portugal	2
M36	GSK	Pharmaceutical Company	Greece	4
M36	Vianex	Pharmaceutical Company	Greece	2
M36	Merk	Pharmaceutical Company	Greece	2
M36	Novartis	Pharmaceutical Company	Greece	3
M36	Novo Nordisk	Pharmaceutical Company	Greece	2
M36	Sandoz	Pharmaceutical Company	Greece	4
M36	Roche	Pharmaceutical Company	Greece	3
M36	Lundbeck	Pharmaceutical Company	Greece	1
M36	MSD	Pharmaceutical Company	Portugal	2

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