



**HORIZON 2020**

**PHC-26-2014**

**Self management of health and disease: citizen engagement and mHealth**

**Grant agreement number: 643694**

**Project Title:**

**A co-operative mHEALTH environment targeting adherence and management of patients suffering from Heart Failure**



**Deliverable Number:** D2.9

**Title of Deliverable:** Dissemination plan and activities 1

**WP related to the Deliverable:** WP2

**Dissemination Level: (PU/PP/RE/CO)\*:** PU

**Nature of the Deliverable: (R/P/D/O)\*\*:** R

**Contractual Date of Delivery to the CEC:** 31/12/2015

**Actual Date of Delivery to the CEC:** 31/12/2015

**WP responsible for the Deliverable:** FORTH

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## VERSION HISTORY

Version	Primary Author	Version Description	Date Completed
1.0	FORTH	TOC circulation	29 July 2015
1.1	FORTH	Section 1	13 October 2015
1.2	FORTH	Section 2, 2.1	14 October 2015
1.3	BIOAXIS- CAREDOME	Section 3.1, 3.2, 4.2	29 October 2015
1.4	EVERIS	Section 4.2	2 November 2015
1.5	APPART	Section 4.2	10 November 2015
1.6	SAS	Section 3.5, 4.2	11 November 2015
1.7	LIP	Section 4.1.2, 4.2, APPENDIX A2	11 November 2015
1.8	FORTH	Section 3.3, 3.4	17 November 2015
1.9	SESA	Section 4.2	4 December 2015
1.10	FORTH	Section 4.3	9 December 2015
2.0	YOURDATA	Section 4.2, 4.1.10	11 December 2015
2.1	FORTH	Section 5, APPENDIX A1	11 December 2015
2.2	FORTH	APPENDIX A3 - A7	11 December 2015
2.3	UMOR	Section 4.1.8	14 December 2015
2.4	CSIC	Section 4.2	16 December 2015
2.5	UCBL	Section 4.2	16 December 2015
2.6	UMOR	Section 4.2	18 December 2015
2.7	FORTH	Section 4.2	21 December 2015
2.8	BIOAXIS - CAREDOME	Review	21 December 2015
2.9	FORTH	Section 4.4, 4.1.1, 4.1.3, 4.1.4, 4.1.5, 4.1.6, 4.1.7, 4.1.9	22 December 2015
3.0	UNIPi	Section 4.2	23 December 2015
3.1	FORTH	All Sections revision	30 December 2015
Final version	FORTH	Final version submitted to EC	31 December 2015

## TABLE OF CONTENTS

1. EXECUTIVE SUMMARY.....	6
2. INTRODUCTION .....	7
2.1 Project description .....	7
3. DISSEMINATION STRATEGY .....	9
3.1 Objectives.....	9
3.2 Target audiences .....	10
3.3 Quality indicators .....	12
3.4 Key messages .....	13
3.5 HEARTEN Added Value.....	13
4. DISSEMINATION TOOLS AND ACTIVITIES .....	15
4.1 Dissemination tools.....	15
4.1.1 HEARTEN logo .....	15
4.1.2 HEARTEN website .....	15
4.1.3 Project reports .....	16
4.1.4 Project presentations.....	16
4.1.5 Flyers and Brochures.....	16
4.1.6 Posters .....	17
4.1.7 Events.....	17
4.1.8 Conferences and journal publications .....	17
4.1.9 Social media .....	18
4.1.10 Focus group in HEARTEN project .....	18
4.2. Dissemination activities .....	19
4.2.1 Performed dissemination activities .....	19
4.2.2 Planned dissemination activities .....	25
4.3. Clustering with other projects .....	27
4.4 Expected Dissemination Impact.....	28
5. CONCLUSIONS .....	31
REFERENCES.....	32
APPENDIX A DISSEMINATION ACTIVITIES .....	34
A.1 Dissemination activities per partner.....	35
A2. HEARTEN website .....	40
A3. HEARTEN brochure .....	43
A4. HEARTEN posters .....	45
A5. HEARTEN Newsletter in Everis.....	48
A6. Social media .....	50
A7. Conferences and journal publications .....	55

## LIST OF FIGURES

Figure 1: HEARTEN dissemination strategy. ....	9
Figure 2: Key messages for HEARTEN dissemination.....	13
Figure 3: HEARTEN logo. ....	15
Figure 4: Aspects of HEARTEN dissemination impact. ....	28
Figure 5: HEARTEN website “private area”.....	40
Figure 6: HEARTEN website “Dissemination section”.....	40
Figure 7: HEARTEN website “Publication section”.....	41
Figure 8: HEARTEN website “in media”. ....	41
Figure 9: Ethical and Legal issues in HEARTEN website.....	42
Figure 10: HEARTEN flyer (page 1/2). ....	43
Figure 11: HEARTEN flyer (page 2/2). ....	44
Figure 12: 1 <sup>st</sup> Poster in International Association of Breath Research - IABR 2015.....	45
Figure 13: 2 <sup>nd</sup> Poster in International Association of Breath Research - IABR 2015.....	46
Figure 14: Poster in XXXVI Congreso Nacional de la Sociedad Española de Medicina Interna - SEMI conference. ....	47
Figure 15: EVERIS newsletter. ....	48
Figure 16: Preview of EVERIS Newsletter extended information. ....	49
Figure 17: HEARTEN in Facebook (main page).....	50
Figure 18: HEARTEN in Facebook (posts). ....	51
Figure 19: HEARTEN in Twitter (main page). ....	52
Figure 20: HEARTEN in LinkedIn (main page). ....	53
Figure 21: HEARTEN in YouTube. ....	54
Figure 22: Paper in 15th IEEE International Conference on Bioinformatics & Bioengineering. ....	55
Figure 23: Paper in 37th Annual International Conference of the IEEE Engineering in Medicine and Biology.....	55
Figure 24: Paper in the XIV Mediterranean Conference on Medical and Biological Engineering and Computing.....	56
Figure 25: Paper in Journal of Breath Research (November 2015). ....	57
Figure 26: Paper in Journal of Breath Research (December 2015).....	58

## LIST OF TABLES

Table 1: HEARTEN dissemination quality indicators.....	12
Table 2: HEARTEN expected results.....	14
Table 3: Performed dissemination activities by UCBL/CSIC.....	20
Table 4: Performed dissemination activities by EVERIS.....	21
Table 5: Performed dissemination activities by AppArt. ....	22
Table 6: Performed dissemination activities by FORTH.....	22
Table 7: Performed dissemination activities by UMOR.....	23
Table 8: Performed dissemination activities by UNIPL.....	23
Table 9: Performed dissemination activities by SAS.....	24
Table 10: Performed dissemination activities by YOURDATA. ....	25
Table 11: Performed dissemination activities by BIOAXIS-CAREDOME.....	25
Table 12: Performed dissemination activities by SESA.....	25
Table 13: Planned dissemination activities (all partners).....	25

## 1. EXECUTIVE SUMMARY

The HEARTEN project addresses the management of Heart Failure (HF) patients aiming to improve their adherence in the provided suggestions and recommendations, to adopt a healthy living, to be empowered, to enable the disease management outside institutions and to improve health outcomes. The dissemination of the gained clinical and technical knowledge throughout the project's lifecycle is essential. HEARTEN identifies dissemination as the cornerstone for communicating the HEARTEN final solution, as well as, its sub-components.

Therefore, the selected strategy and the way this knowledge is diffused are the main dissemination and communication tools to properly and effectively approach the professional and the general public. The main aspects of the HEARTEN's dissemination activities are related to: (i) the development of a patient-centered collaborative HF environment, (ii) the innovations in the field of biomarkers identification and breath/saliva biosensors development and, (iii) the overall technological solution adopted within the framework of the project. To achieve the targeted dissemination level, several communication channels are utilized focusing on the wide audience and on specific groups of stakeholders. Key target groups for disseminating the project's activities are the HF patients, healthcare professionals and other ecosystem actors, the healthcare institutions, the pharmaceutical industry, the scientific community, the biosensor market and the patient support service companies, as well as, the general public interested in disease management systems. According to the expertise of each partner the dissemination plan includes the interdisciplinary partners' cooperation and the accommodation of the multidisciplinary effort required to achieve the objectives of disseminating HEARTEN progress and findings.

## 2. INTRODUCTION

This deliverable presents and outlines the major dissemination activities of the HEARTEN project, from the beginning of the project to December 31<sup>th</sup> 2015. The information and the way the extracted results are presented may change during the lifecycle of the project, however, the key element of the approach that we have adopted is that we define, identify and enhance the dissemination of the project's achievements in order to ensure a high impact and a penetration to all relevant stakeholders and to the HF community.

Among the dissemination activities that we have performed during the first year of the project are:

- Project's website development, which acts as a direct informative tool and supports the dissemination of the results of the HEARTEN project.
- Creation of social network accounts and increase of the contacts through forums, blogs, etc.
- Newsletters and articles publication in newspaper and health related websites.
- Participation in relevant national and international Conferences and events that are related to the project objectives.
- Identification of other relevant projects in order to facilitate the exchange of longstanding experience and analysis of the HEARTEN outcomes.

Through the HEARTEN dissemination strategy, the target audience is provided in a clear and understandable way, with critical and useful information related to the project's progress and results. In addition, the main objective of the strategy that we follow is to inform the different groups and actors on the benefits that they will gain using the HEARTEN platform.

### 2.1 Project description

HEARTEN project deals with the design and the development of an ICT environment that will empower the management of patients suffering from HF. It focuses on a management concept that derives from the mixing of related clinical expertise and basic research, combined with technical development. The project presents an efficient and innovative tool for approaching the problem of medication non-adherence and treatment non-compliance of HF patients.

The limitations of current HF disease management make HEARTEN a user-friendly cooperative environment for the HF patients, the formal /informal caregivers and the healthcare professionals. The project involves the design and the development of breath/saliva biosensors that will be integrated into the patient's smartphone and cup respectively. Additional sensors (commercial) will be utilized for the monitoring of heart rate, respiration, blood pressure, body temperature, weight and physical activity. The mobile application will also handle the HF patient's nutrition data which will be

transmitted to the cloud platform. The Knowledge Management System and a protocol-based application for patient management will deliver information, reminders and alerts to the patients and the ecosystem actors. All modules will be designed and developed in a way that will meet and ensure the patient safety and all the legal and ethical considerations.



### 3. DISSEMINATION STRATEGY

The dissemination strategy presents clear guidelines, tools and activities that are used for promoting the project and its findings that derived during the first year. These results are disseminated to relevant target audience on the appropriate way and frequency.

The dissemination strategy of HEARTEN consists of the following components:

- **Dissemination objectives:** Identification of the dissemination objectives.
- **Target groups:** Identification of the groups which are more interested in the project's outcomes.
- **Key messages:** Identification of the promotional messages that are communicated.
- **Dissemination methods:** Identification of the way that the messages are communicated.
- **Dissemination timing:** Design of appropriate time plan for dissemination activities.



Figure 1: HEARTEN dissemination strategy.

#### 3.1 Objectives

The objectives of the dissemination strategy of the HEARTEN project are the following:

- Assess potential drawbacks and limitations through a continuous look on the advances in research during the project, and on the market trends.
- Adapt the dissemination activities according to the differences between the EU countries.
- Establish a dissemination plan at various levels including the appropriate targeted events for the healthcare professionals, healthcare organizations and the general public, taking into account the project's development phases and the dissemination goals at each stage (reviewed and upgraded on a 6-months basis).
- Prepare scientific journal articles, workshops and conference presentations of the HEARTEN results.

- Guarantee that the research findings will be communicated to relevant target groups, both in the academic, as in the market field.
- Develop, maintain and update regularly the HEARTEN website and the electronic newsletters.
- Produce brochures, flyers and promotional/information materials.
- Develop a visual identity, which includes: (i) the HEARTEN logo, (ii) the format of the HEARTEN presentations and posters.
- Create a scientific professional network for all researchers and individual experts.
- Stimulate an increased public awareness among the general public in the issues of (and the consequences of) HF.
- Capture, manage and re-use the knowledge created in the project.
- To make known, as widely as possible, the findings and recommendations of the HEARTEN project, especially to policy-makers, stakeholders and healthcare institutions, pharmaceutical industry, scientific community and other end-users at the EU and international levels.
- Maximize the impact of the research findings.

### 3.2 Target audiences

HEARTEN's target groups are composed by the patients with chronic and acute HF. Other actors related to the management of patients suffering from HF, including healthcare professionals, caregivers (formal/informal), healthcare provider's, nutritionists, physical activity experts and health insurance experts are also included in the target groups.

#### **HF Patients**

HF patients receive medical, psychological and educational support through a co-operative mHealth platform, which is a more instant and easily way to communicate among other means, such as discussion groups, file sharing, messages. The patients are empowered in self-care management, by using their smartphones and tracking their medical vital signs.

This mHealth environment allows the HF patient to: (i) better adhere to their treatment with a regular medication; (ii) prevent critical incidents; (iii) improve the quality of life, under different perspectives (personal, relational, social and financial); (iv) reduce the frequency of unplanned visits and re/hospitalization; (v) adopt healthy nutrition and physical activity; (vi) decrease obesity and unhealthy eating; (vii) increase potential year's expectancy and, (viii) decrease mortality rate, etc.

Thus, the HF patient is more active, continues working, improves productivity and also the patient satisfaction, with the perceived level of patient-health professional interaction, is increased.

#### **Healthcare Professionals**

HEARTEN solution is a valuable tool that will empower healthcare professionals to a better monitoring of HF patients with real time information access and sharing. They can evaluate patient's health-

behavioral change and define the level of interaction through the access to daily monitored HF patient parameters, such as HF biomarker/medication, blood pressure, heart rate, weight, physical activity and nutrition.

HEARTEN platform is a patient-centered care system, which allows early detection of complications or side effects from medication or lifestyle, and assists the healthcare professionals to educate, issue warnings, coordinate therapies, promote and improve medical adherence and intervene before frailty incidences occur.

- **Cardiologists:** The adoption of mHealth solution allows; (i) gain of medical knowledge; (ii) reduced healthcare professional manpower requirements; (iii) increase of the doctor's availability, due to less HF patients visits; (iv) elimination of paperwork and data entry to patient record systems; (v) increase of doctor's productivity; (vi) early evaluation of the clinical condition of the patient's status; (vii) determination if any action needs to be taken; (viii) enhancement of the effective patient-cardiologist communication and, (ix) empowerment of patients adherence, etc.
- **General Practitioner (GP):** HEARTEN will support GP's in providing guidance to the patients in order to influence their attitudes and behavior required to maintain or improve their health.
- **Nutritionists/ Physical activity experts:** The nutritionists and the physical activity experts can assist to the stabilization of the HF patient's health condition, empowering the patient to be active in his/her health condition. These professionals encourage better health behaviors related to wellbeing, promote healthy nutrition, assist the patient in keeping a healthy weight and prevent pre-frailty states. In addition, they encourage the patients to exercise regularly, reduce/quit smoking and/or prevent the abstinence/modest intake of alcohol, etc.

#### Caregivers (formal/informal)

HEARTEN will inform the caregivers about the patient's health status, improving patient/caregiver interaction towards efficient HF management.

- **Nurses:** Nurses can monitor fast and efficiently specific aspects of HF patient health and make the patients more responsible about their health management. HEARTEN provides nurse support through continuously monitoring of the patient's parameters, and that results in a more effective patient-nurse communication, more educated patients, patient's wellness and better HF management. If the level of alert is high, the nurse can contact the healthcare professional, who is responsible for the patient.
- **Informal Caregivers:** Receiving information about the patient's health status and information for critical situations, such as drug non-adherence, is a valuable and helpful tool to engage caregivers in HF patients support.

**Health insurance experts**

HEARTEN has the potential to: (i) decrease the overall costs of healthcare institutions (treatment, hospitalization cost and secondary prevention), (ii) promote the cost reduction per patient and, (iii) reduce the costs related to the patient's visits to the healthcare professional.

**Hospitals**

The adoption of mHealth has major impact to the quality of the healthcare delivery and the patient outcomes. In consequence, the patient needs fewer visits to the hospital (reduction of hospitalization and/or readmission), saves treatment cost and decreases the overall cost of drug adherence management.

**Pharmaceutical Companies**

Pharmaceutical industry could benefit through developing new generation drugs and through the gained knowledge related to the breath and saliva biomarkers.

**Public Health authorities**

Public Health authorities will infer new informed decisions and guidelines for HF treatment, which could lead to cost reduction and improved quality of HF treatment.

**Mobile operators/Smartphone health Market**

The development of HEARTEN mHealth application will enable the mobile operators/smartphone health market to successfully monetize their services by embracing smartphones, as a means to improve healthcare delivery.

**3.3 Quality indicators**

All HEARTEN publications account for the policy and the rules that the partners have agreed on the Consortium Agreement. The HEARTEN Consortium follows a specific policy for publishing deliverables that are related to dissemination activities; the deliverables can potentially exhibit economic and social impact. HEARTEN dissemination "results" are evaluated by checking specific quality indicators (QI), as listed in the following table.

**Table 1: HEARTEN dissemination quality indicators.**

HEARTEN quality indicators	
QI1.	All target groups are clearly approached through the dissemination plan
QI2.	Dissemination strategy and activities are well defined
QI3.	Proper communication tools and channels are used
QI4.	No. of dissemination activities towards healthcare professionals/Caregivers
QI5.	No. of dissemination activities towards technology experts
QI6.	No. of dissemination activities towards general public
QI7.	Presence of project in web and social media
QI8.	No. of press releases
QI9.	Time plan of the dissemination activities

### 3.4 Key messages

Once the objectives and the target groups of the dissemination are defined, the key messages can be created. The main principles of the key messages are to be simple, clear and easily understandable with an appropriate language for the target group and if possible not to be very clinical or technical. It is also of great importance to take into consideration what exactly is the information that the target groups receive. In addition, messages of other projects related to HEARTEN subject can be presented in parallel, in order to enhance the impact of HEARTEN key messages. Special attention is given in the content of the information; to be correct, clear and direct.

The following keywords are among these that are selected to be used in the dissemination materials (Figure 2):

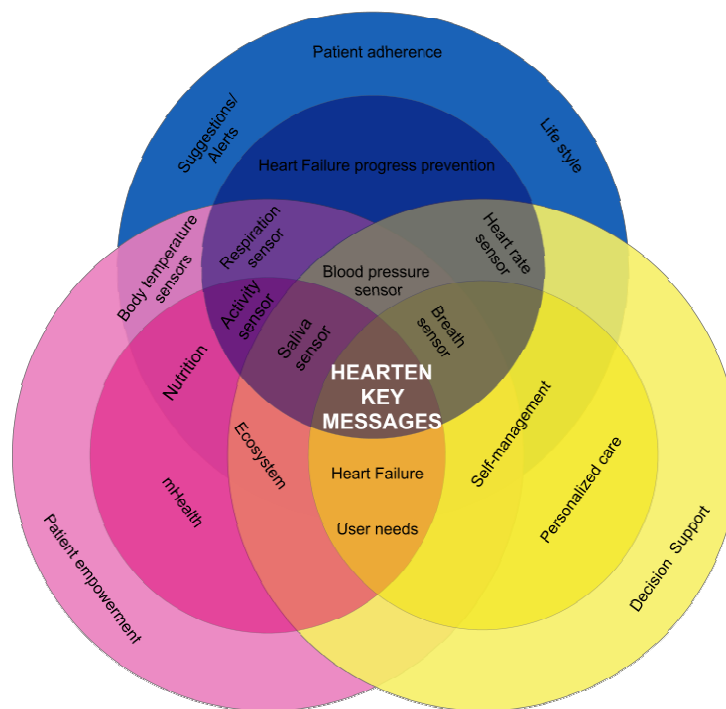


Figure 2: Key messages for HEARTEN dissemination.

### 3.5 HEARTEN Added Value

The partners involved in the project present a set of complementary expertise enabling the exploitation of scientific and technical know-how, developed in six countries: France, Spain, Greek, Germany, Italy and Portugal.

The added value of the project contributes in the advancement of the current state-of-the-art on EU research, in the area of: (i) biosensors, (ii) adherence, and (iii) HF patient management.

The following table summarizes the main results and the potential use of these results we expect to cover:

**Table 2:** HEARTEN expected results.

Main Expected Results	Potential Use	Target Users
HEARTEN use cases	HEARTEN results and learned lessons could be reused in other healthcare environments	
HEARTEN biomarkers in breath/saliva	Enable new biomarkers to monitor HF patients	1. Actors related to the management of HF patients
HEARTEN biosensors for sensing the biomarkers in breath/saliva	Collect and analyze relevant breath/saliva samples	2. Scientific community.
HEARTEN data mining and knowledge management system	Identify new predictive models for alert issuing and decision support for actors related to the HF patients management	3. Citizens.
HEARTEN integrated platform	Allow actors to participate efficiently in HF patients management	4. Public and private healthcare administrations and institutions (public and private centers)
		5. Health ministry
		6. Pharmaceutical industry

## 4. DISSEMINATION TOOLS AND ACTIVITIES

### 4.1 Dissemination tools

#### 4.1.1 HEARTEN logo

The HEARTEN consortium created a logo (Figure 3) with the aim to raise the visibility of the project and enhance its efficient identification among other relevant projects. The design concept was based on the project's identity and the overall approach. The human heart denotes the HF patients, whereas the smartphone and the human breathing infographics symbolizes the HEARTEN sensors/biosensors and the interconnection with the mHealth application. The logo is utilized in all HEARTEN deliverables, reports, documents and communication (electronic or traditional).



Figure 3: HEARTEN logo.

#### 4.1.2 HEARTEN website

To provide continuous information on the HEARTEN project and ensure its wide dissemination, the HEARTEN website was developed. Through the HEARTEN website, all the necessary information regarding the HEARTEN scientific and technological objectives are provided to all the interested parties.

All dissemination activities such as posters, presentations during international conferences, papers, etc. are uploaded to the website in a regular basis.

The structure of the HEARTEN website targets the following goals:

- Communication and collaboration between project's partners via the private area, which ensures a smooth communication and the exchange of documents in a safe and secure manner.
- HEARTEN Dissemination containing: (i) the public deliverables, (ii) the flyer to be distributed by partners when attending events, (iii) the HEARTEN presentation and, (iv) other dissemination materials.

- Presentation of all dissemination and communication activities performed by partners in media.
- Presentation of the Ethical and Legal Aspects in the HEARTEN Project. In this section special emphasis is given on respecting the national and European legal and ethical requirements related to patient's rights, anonymity and confidentiality. The Ethical and Legal Board and its members are also included.

The HEARTEN website was created after the kick off meeting and is continuously updated with the HEARTEN latest results and activities.

- Legal and Ethical Issues has been updated with the Curriculum Vitae of the Ethical Advisory board members.
- The publications section is frequently updated with the very last inputs received from HEARTEN partners, concerning their dissemination activities (Conferences, publications, etc).
- The dissemination section includes all the materials used for communicating HEARTEN outcomes.

For more details see Appendix A2.

#### **4.1.3 Project reports**

The dissemination of the HEARTEN results is achieved through making publicly available the project's deliverables. The HEARTEN consortium uses the deliverables as one of the most significant means for disseminating the developed knowledge and making aware to the wide audience the progress of the project. These deliverables are published, and can be reached by everyone who is interested in, to the HEARTEN website. In addition, all deliverables that are confidential can be reached from the HEARTEN partners through the internal area of HEARTEN website.

For more details see Appendix A2.

#### **4.1.4 Project presentations**

To keep the project's identity, a template of the HEARTEN presentation was created and distributed among all HEARTEN partners. This template can be utilized in all the events where the clinical, scientific and technological aspects of HEARTEN project are presented.

This presentation has already been created the previous months (please see D2.2) and has been presented in the Medical School, University of Ioannina (November 2015).

#### **4.1.5 Flyers and Brochures**

For effectively and efficiently disseminating the HEARTEN project, a three-folded flyer was created. This flyer presents (i) the HEARTEN partners, (ii) the main scientific and technological objectives of the project. The flyer is simple and consistent, characteristics that makes it user-friendly and attractive as



well. This flyer has been created the previous months (please see D2.2) and has been circulated in the 15<sup>th</sup> IEEE International Conference on Bioinformatics & Bioengineering – BIBE2015 (November 2015) [1].

For more details see Appendix A3.

#### **4.1.6 Posters**

The project's posters are developed with the aim to provide basic information about: (i) the project's main objectives, (ii) the technical and scientific goals, (iii) the expected results and, (iv) the HEARTEN consortium. This can potentially serve as a reference point and can be distributed in appropriate occasions.

For more details see Appendix A4.

#### **4.1.7 Events**

During the first twelve months of the project, HEARTEN partners have participated with success in several events that are related to clinical, scientific and technological elements. Through the participation in such events, the progress of the project was presented in depth and the outcomes of the project were made visible in wide audience. Special emphasis was given on the type of audience that was participating in each of these events, with the aim to approach each of them focusing on the expertise obtained in different fields.

The HEARTEN consortium meetings were also an efficient way of ensuring all the aspects of communication and results dissemination. More specific, the first consortium meeting was held in Lyon in February 2015 (kick-off meeting), where the partners and their expertise were presented. Following this, the next meeting took place in Pisa, in June 2015 (WP leaders meeting), where the involved partners (WP leaders) had the opportunity to follow the project progress and exchange significant information related to the inter-communication of the different Work packages. The third meeting was held on Barcelona, in November 2015, where the partners reviewed in depth the progress and the intermediate results of the remaining Work packages.

#### **4.1.8 Conferences and journal publications**

The dissemination of the scientific, technological and clinical ideas and the findings of the project is important, in order to transfer HEARTEN results to a broader scientific/technological community, to collect impact from leaders from the representative fields and to foster similar mHealth approaches. HEARTEN partners are actively participating in national and international conferences, in the relevant areas and meetings, presenting posters and papers, and giving oral presentations to a wide range of audience, including experts in medicine, pharmacology, analytical chemistry, breath analysis,

bioengineering, and public or private companies potentially interested to use the results of HEARTEN on a commercial level.

During the first year of the project, publications have focused on the innovative concept of HEARTEN, the potential of high level HF monitoring, our innovative technical and scientific approaches and the first results of these efforts. Several conference contributions have been linked to the biosensor devices and the underlying nano-architecture. In addition HEARTEN architecture and main modules have been presented and intensively discussed with the leading experts. First peer reviewed publications, published in the Journal of Breath Research, examined the methodological HEARTEN setup, as well as, the effects of hemodynamics on compositions of exhaled breath. We were able to show that exhaled volatile organic compounds may mirror hemodynamics, ventilation, ventilation/perfusion effects and compartmental distribution.

These type of dissemination is a way for the effective interaction between the HEARTEN partners from different disciplines, but also well suited to receive feedback and fruitful suggestions and recommendations from different fields, as well as, for following up and comparing HEARTEN progress with other similar projects. These dissemination activities (conferences attendance, journal publications and workshops of different fields) will be continued and boosted during the project. HEARTEN consortium will participate in selected events from relevant areas, as well as, trans-disciplinary conferences with the aim to disseminate the new HEARTEN knowledge into different areas of science, medicine and technology and to foster further interactive, multi-disciplinary and innovative mHealth actions.

For more details see Appendix A7.

#### **4.1.9 Social media**

Social media networks can attract the attention and encourage the social network users to share their social networks. The information can be easily spread among several users and this was the main reason that HEARTEN decided to be present on Facebook [2], LinkedIn [3] and Twitter [4]. Through these networks the interaction becomes more personal and allows the “friends” (For Facebook) and the “followers” (for twitter) to follow the HEARTEN activities, post, “tweet” or comment on specific subjects.

For more details see Appendix A6.

#### **4.1.10 Focus group in HEARTEN project**

Focus groups is a well-known qualitative approach for stakeholders involvement in project’s decisions and they can be a very helpful and flexible tool also in the case of HEARTEN project, if they are appropriately used.

The focus-groups methodology will be applied regarding to the on-going status of the project:

- at the early stage of the HEARTEN technological development: a focus group with experts in the field to understand the current trends in HF treatments, and to confirm our hypothesis in the establishment of the HEARTEN solution and services. Results of this focus group will be used to revise, if necessary, our technological plan of development;
- at the intermediate stage of the project, when the technological development prototype will be ready: a focus groups with target users and potential stakeholders that could support the deployment of the initiative (e.g. regional health authorities; telecom operators, health insurance companies, etc.). Scope of these focus groups is to understand the acceptability of the proposed solution and the willingness to adopt it in the daily practice. Results of these focus groups will be used to fine tuning the HEARTEN solution before the final technological development and the exploitation;
- at the end of the project life cycle, when the HEARTEN solution is ready: the last set of focus groups aims at understanding from relevant stakeholders and policy makers the best exploitation strategy for HEARTEN solution, according to the different welfare systems and the HF management practices.

## **4.2. Dissemination activities**

### **4.2.1 Performed dissemination activities**

#### **UCBL**

UCBL is an academic and research institution and is highly involved in innovative scientific contributions throughout the development phase of the HEARTEN project. Thanks to the researchers, PhD students and Post-docs that are involved in different tasks, related to the production of nano-materials, bio-functionalization, development of gas&biosensor, the corresponding results are disseminated on a large scale. The objective is to ensure wide diffusion of the results within the scientific community, socio-economic sectors, and regulatory bodies involved in biomedical applications and especially in mHealth field. Rules on due diligence regarding suitable protection of results, including rules not to publish significant results until they have been patented, are respected to ensure full valorization of the project.

The dissemination and communication activities are considered at different levels:

- To the European Commission through Annual Reports and Mid-Term Reports, as well as through requested meetings.

- To the Scientific Community. Some preliminary results have been presented in different conferences, journals and writing patent about novel strategy for the detection of gases in breath.

### **CSIC**

The contribution of CSIC to HEARTEN is mainly centered on the development of the saliva and breath biosensors. CSIC is developing the transducer element of the biosensors and the electronic module that is required to communicate the sensors to the mobile devices running the HEARTEN applications. Functional biosensors are obtained by combining the transducer chips from CSIC with the biomarker-sensitive layers developed by UCBL. It is therefore expected that most of the results concerning biosensors are joint developed and disseminated by CSIC and UCBL.

The dissemination strategy of CSIC is mainly based in the publication of the project results in scientific journals and in the presentation of the results in international conferences related to the development of saliva and breath biosensors. The target audience of this scientific dissemination is the group of biosensor researchers and developers.

**Table 3:** Performed dissemination activities by UCBL/CSIC.

Partner(s) responsible	Actual dates	Communication type	Event /Media
UCBL/CSIC	August 2015	Poster	Advanced materials world congress [5]
UCBL/CSIC	November 2015	Keynote Lecture	Biosensors for food seventh international workshop on biosensors for food safety and environmental monitoring [6]
UCBL/CSIC	November 2015	Poster	Biosensors for food seventh international workshop on biosensors for food safety and environmental monitoring [6]
UCBL/CSIC	November 2015	INVITED SPEAKER	XIIème Journées maghrébines des sciences des matériaux [7]
UCBL/CSIC	September 2015	Invited Oral	SEA-on-a-CHIP Summer school [8]

### **LIP**

The individual plan of LIP regarding HEARTEN project is clearly linked to the project website. The website will be maintained for at least one year after the end of the project to allow a large dissemination of HEARTEN project achievements. As described in HEARTEN grant, a continuous and dynamic updated version of the website will ensure the wide communication for diverse types of stakeholders.

## EVERIS

Information regarding the HEARTEN project are communicated through EVERIS Corporate Communications Department, which has a national, (Madrid, Barcelona, Valencia and Sevilla), and international presence, in Europe and in Latin-America. The networks and channels that are used include news agencies and media on and offline, as well as the company's public website and social media channels (Facebook, Twitter and LinkedIn). Actions include interviews in specialized magazines, such as the article appeared in the Spanish magazine "El Economista" (June 2015), where EVERIS introduced to the public the joint efforts regarding the HEARTEN project. Also, being one of the Spanish partners that work in the consortium, some national actions, as the press release that was launched during Q1 of 2015 (a joint effort with Spanish partners SAS and CSIC) have been performed.

**Table 4:** Performed dissemination activities by EVERIS.

Partner(s) responsible	Actual dates	Communication type	Event /Media
EVERIS	May 2015	HEARTEN: controlling IC with an "app" Published in special number "Sanidad" (Health) in "el Economista"	Written Press
EVERIS	May 2015	Everis, CSIC y el SAS participant en un proyecto europeo para tratar la Insuficiencia Cardíaca a través de aplicaciones	web

## AppART

AppArt is a Software Development company with activities focusing on the provisioning of solutions and services. AppArt holds deep market knowledge, which, in combination with the technical and marketing expertise and the long implementation experience of its people, allows for great creativity and easy adaptability to customer requirements.

Due to the nature of our industry, there is a limited number of media with significant impact factor and as a result the alternatives are restricted. AppArt has selected very carefully the media that will host a report/review for this European project. The parameters taken into consideration for the selection are:

- Significant impact factor
- High visibility among peers
- Subject relevancy

AppArt participated as a Sponsor on the 24<sup>th</sup> of November 2015 in the 17<sup>th</sup> Infocom World Conference, which was held in Athens [9]. Infocom World Conference is an annual conference which manages to gather all Telco industry companies revealing new trends and upcoming technologies. AppArt is

participating the last three years in this event, since it manages to attract all major professionals of Telco Industry. This year we managed to promote HEARTEN project and also distribute the HEARTEN brochures. The flyers were placed in stands where Congress participants gathered during the breaks, so they had the chance to read them and get informed about our project. AppArt team managed also to introduce HEARTEN project to other colleagues offering them also the flyer for reference and further information.

**Table 5:** Performed dissemination activities by AppArt.

Partner(s) responsible	Actual dates	Communication type	Event /Media
AppArt	November 2015	HEARTEN flyer	17th Infocom World Conference [10]

## **FORTH**

FORTH is a highly innovative research institute with strong expertise in the fields of biomedical engineering and in the development of intelligent information systems. The main objective of FORTH, regarding the dissemination of HEARTEN project, is related to the participation in events and conferences since this is a great opportunity to build the HEARTEN network, increase the awareness and meet experts that could be interested in the same topics and in HEARTEN. In addition, FORTH took advantage of the social media and facilitates communication, knowledge and findings discovery and delivery to a wide audience in a useful and effective way.

The first year of the project, FORTH has presented a paper in the 15th IEEE International Conference on Bioinformatics & Bioengineering (BIBE2015) [11] and circulated the HEARTEN flyer in potential stakeholders. In addition, a paper was accepted in the XIV Mediterranean Conference on Medical and Biological Engineering and Computing (MEDICON 2016) [12].

**Table 6:** Performed dissemination activities by FORTH.

Partner(s) responsible	Actual dates	Communication type	Event /Media
FORTH	November 2015	Conference Paper	IEEE International Conference on Bioinformatics & Bioengineering (BIBE) [11]
FORTH	November 2015	HEARTEN flyer	IEEE International Conference on Bioinformatics & Bioengineering (BIBE2015) [11]
FORTH	December 2015	Conference Paper	XIV Mediterranean Conference on Medical and Biological Engineering and Computing (MEDICON 2016) [12]

## UMOR

As a medical school and university, UMOR is focused on research and application of new technologies in a clinical environment. Therefore, UMOR is much interested in gaining basic knowledge on new biomarkers in HF patients (publications, thesis, presentations, lectures) as well as in gaining information's on the application of a new, non-invasive Point of Care technology in broader patient cohorts. HEARTEN findings, throughout the whole duration of the project, will help to increase UMOR expertise and consolidate the leading position in breath research. The mHealth platform can be used for education and training of students. The multi-parameter HF recognition by means of the HEARTEN approach could assist to increase basic understanding of the HF disease in depth. As active members of the international association for breath research (IABR) and leaders of the task force for standardization, J. Schubert and W. Miekisch use scientific results of the project to foster other new and innovative applications in the field and are able to transport and disseminate new knowledge into a broad international research community.

**Table 7:** Performed dissemination activities by UMOR.

Partner(s) responsible	Actual dates	Communication type	Event /Media
UMOR	November 2015	Paper	Publication: "Journal of Breath Research" [13]

## UNIPi

UNIPi published several papers in scientific journals and participated in international conferences presenting the outcomes of its research related to the analysis and identification of breath and saliva biomarkers. The target audience was experts in medicine, pharmacology, analytical chemistry, breath and saliva analysis, and experts in engineering.

**Table 8:** Performed dissemination activities by UNIPi.

Partner(s) responsible	Actual dates	Communication type	Event /Media
UNIPi	August 2015	Conference Paper	37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) [14]
UNIPi	September 2015	Poster Presentation	EUROANALYSIS XVIII 18th edition of EuroAnalysis The European Conference on Analytical Chemistry [15]
UNIPi	September 2015	Poster Presentation	EUROANALYSIS XVIII 18th edition of EuroAnalysis The European Conference on Analytical Chemistry [15]

UNIPi	September 2015	HEARTEN poster	IABR Summit 2015 [16]
UNIPi	September 2015	Poster Presentation	IABR Summit 2015 [16]
UNIPi	September 2015	Poster Presentation	IABR Summit 2015 [16]
UNIPi	September 2015	Oral Presentation	XXV Congresso della Divisione di Chimica Analitica della Società Chimica Italiana [17]
UNIPi	September 2015	Paper	Journal of Breath Research [13]

## SAS

SAS is taking part in the project dissemination, participating in the general dissemination plan of the project (HEARTEN website, social media, etc), and performing its own individual plan. SAS individual dissemination plan aims to communicate HEARTEN progress and results, primarily from a clinical point of view.

**Table 9:** Performed dissemination activities by SAS.

Partner(s) responsible	Actual dates	Communication type	Event /Media
SAS	November 2015	Poster communication	XXXVI Congreso Nacional de la Sociedad Española de Medicina Interna (SEMI) [18]
SAS	November 2015	HEARTEN flyer	XXXVI Congreso Nacional de la Sociedad Española de Medicina Interna (SEMI) [18]
SAS	November 2015	Oral communication	SALUD CONECTADA: II Congreso Iberoamericano de Telesalud y Telemedicina, XIII Reunión del Foro de Telemedicina de la SEIS, XII Reunión del Fórum Ibérico de Telemedicina. [19]
SAS	November 2015	HEARTEN flyer	SALUD CONECTADA: II Congreso Iberoamericano de Telesalud y Telemedicina, XIII Reunión del Foro de Telemedicina de la SEIS, XII Reunión del Fórum Ibérico de Telemedicina.
SAS	November 2015	HEARTEN flyer	IV Reunión de la Plataforma Tecnológica para la Innovación en Salud [20]

## YOURDATA

Dissemination and communication activities of YourDATA are tailored to individual needs. Each research and development project needs a great support in order to guarantee its results in terms of dissemination. YourDATA uses common channels to disseminate its activities and specific communications to reach particular groups or partners where YourDATA is involved. Main tools used by YourDATA are: its website, Facebook and LinkedIn accounts, conferences, local and national press and television. In particular, YourDATA focuses on spreading information and results among Sardinian local health care system actors.



**Table 10:** Performed dissemination activities by YOURDATA.

Partner(s) responsible	Actual dates	Communication type	Event /Media
YOURDATA	July 2015	Workshop	SINNOVA 2015 [21]

### **BIOAXIS-CAREDOME**

BIOXIS-CAREDOME dissemination plan targets pharmaceutical companies, which have HF and cardiovascular products in their portfolio. Healthcare Professionals and clinics related to HF are a secondary target of the dissemination plan. By targeting those two stakeholders, in Portugal and Greece, BIOAXIS-CAREDOME maximizes the potential future dissemination of HEARTEN project in Europe, since pharmaceutical companies and Healthcare Professionals are two stakeholders which are trusted by the patients.

**Table 11:** Performed dissemination activities by BIOAXIS-CAREDOME.

Partner(s) responsible	Actual dates	Communication type	Event /Media
BIOAXIS-CAREDOME	July 2015	Meeting	Company Visit (Teva Pharmaceuticals)

### **SESA**

SESA's Company is in the middle of a transformation period and this process will end with the birth of a group of companies under the same holding company with a vertical focus; one of the most important focus is related to the Funded Projects and the Healthcare sector, especially for Italian PA (Public Administration).

**Table 12:** Performed dissemination activities by SESA.

Partner(s) responsible	Actual dates	Communication type
SESA	From Aug 2015	SESA Website [22]

### **4.2.2 Planned dissemination activities**

All HEARTEN partners will take part in and carry out dissemination activities and will boost the penetration to the target audiences. The following table presents potential dissemination activities for the coming year.

**Table 13:** Planned dissemination activities (all partners).

Partner	Means of dissemination	Event/Media
BIOAXIS-CAREDOME	Pharmaceutical Event/ (Presentation, Leaflet)	10 <sup>th</sup> Pharmaceutical Marketing Conference (Greece) [23]
	Healthcare Professionals Event/	42 <sup>nd</sup> Panhellenic Medical Conference (Greece)

Partner	Means of dissemination	Event/Media
	(Presentation, Leaflet)	[24]
	HEARTEN state of the art from clinical perspective (Newsletter)	42 nurses cooperating with BIOAXIS-CAREDOME
	Cardiologists presentations (Meetings in Portugal and Greece)	Medical Office / Clinic visits
	Abbvie Pharmaceuticals (Meeting - Greece)	Company Visit [25]
	Roche (Meetings in Portugal and Greece)	Company Visit [26]
	Novartis (Meetings in Portugal and Greece)	Company Visit [27]
	Bayer (Meetings in Portugal and Greece)	Company Visit [28]
	Amgen (Meeting in Greece)	Company Visit [29]
	Takeda (Meetings in Greece and Rest of Balkans)	Company Visit [30]
	MSD (Meetings in Portugal and Greece)	Company Visit [31]
	Boehringer Ingelheim (Meetings in Portugal and Greece)	Company Visit [32]
	UCB (Meetings in Portugal and Greece)	Company Visit [33]
	Pfizer (Meetings in Portugal and Greece)	Company Visit [34]
SESA	Presentation of Funded Project, Research and HEARTEN Project	Corporate Site
	IEO – European Institute of Oncology [30]	Meetings with our Italian customers
	Centro Cardiologico Monzino [31]	
	Lombardia Informatica [32]	
YOURDATA	Presentations, newsletters, brochures, announcements, papers etc.	Website
		Facebook and LinkedIn accounts
		Conferences
		Local and national press and television
		Sardinian local health care system
SAS	Clinical sessions in Virgen del Rocío University Hospital	Internal diffusion
	Conferences about HF or Medical Informatics	Flyers /brochures
		Newsletters
	Poster and/or oral communications in national (Spanish) and international conferences	Conferences
	Scientific papers in relevant journals like: <ul style="list-style-type: none"> <li>Journal of the American Medical Informatics Association.</li> <li>Journal of Medical Systems.</li> <li>Journal of Biomedical Informatics.</li> <li>IEEE Journal of Biomedical and</li> </ul>	Scientific publications

Partner	Means of dissemination	Event/Media
	Health Informatics.	
UNIP	Presentation of the outcomes of its research related to the analysis and identification of breath and saliva biomarkers.	Conferences
		Scientific publications
UMOR	Transport and disseminate new knowledge into a broad international research community	International association for breath research (IABR)
		Task force for standardisation
CSIC	Poster and/or oral communications in national and international conferences, as well as, journals related to the development of saliva and breath biosensors	Conferences
		Scientific journals
	Dissemination of both CSIC-specific results and general overviews of the project development to Spanish media (press releases, press conferences, interviews, web pages and social networks)	Press and outreach offices/CSIC communication department
FORTH	Scientific papers in relevant journals like: <ul style="list-style-type: none"> <li>38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'16)</li> <li>Federated conference on computer science and information systems (FedCSIS)</li> </ul>	Scientific publications
AppART	Dissemination in several online and on-paper magazines, webspots and congresses	Greek Media Agency
EVERIS	Presentations, newsletters, brochures, announcements, papers etc.	Company website, Social media, Company presentations, Media
UCBL	Scientific papers in relevant journals like: <ul style="list-style-type: none"> <li>Journal "Materials Science and Engineering: C" [35]</li> <li>Journal "Trends in Analytical Chemistry" [36]</li> </ul>	Scientific publications

### 4.3. Clustering with other projects

The dissemination activities of the HEARTEN project can be enhanced by organizing clustering activities with other EU-funded related projects. These activities include communication with research institutes, universities, health-care providers and companies.

HEARTEN Consortium has identified potential projects for clustering activities with HEARTEN:

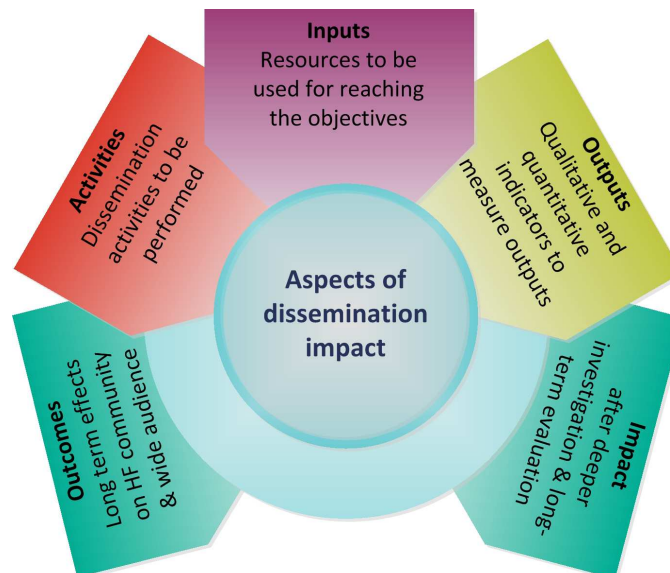
- **MEDIA project: MEtabolic route to DIAstolic heart failure** [37]
- **HOMAGE project: Heart OMics in AGEing** [38]
- **PALANTE project** [39]

- **United4Health project** [40]
- **Regions of Europe Working together for Health** [41]
- **HeartCycle** [42]
- **SensorArt** [43]
- **Sniffphone** [44]
- **BIOSTAT-CHF Result In Brief** [45]
- **VPH2** [46]

FORTH and UCBL participated in SensorArt and will enhance the liason by matching the research activities developed in SensorArt project and the research activities of HEARTEN project. In addition, HEARTEN Consortium has already contacted with VPH2 project and presented the mHealth platform for HF management, aiming to further investigate and consider options of liason with VPH2 project. In the following months HEARTEN will focus on finding the most appropriate and suitable way for clustering activities with other projects.

#### 4.4 Expected Dissemination Impact

The findings of HEARTEN dissemination actions should be effective in order to ensure that the impact in the domain of healthcare management is high. Furthermore, HEARTEN is expected to benefit, not only the identified stakeholders, but also it would be of much interest for those involved in the clinical, scientific and technological field.



**Figure 4:** Aspects of HEARTEN dissemination impact.

The impact of the dissemination of HEARTEN project could be approached through the following elements:

### **1. HEARTEN engagement**

The overall concept of HEARTEN is designed by taking into account: (i) the creation of an international roadmap on the future management needs of the HF patients in the domain of patient-centered healthcare delivery and, (ii) the collaboration and enhancement of the different communities of clinical experts, technology experts and researchers with the vision to join and expand the collaborative aspects of interaction.

During the next months, HEARTEN aims to approach several stakeholders, clinical and research communities that could be interested in the specific clinical, technological or research fields.

### **2. Research impact**

HEARTEN is putting much emphasis on bridging together research and clinical views, as reflected by the different categories of stakeholders.

- Preparation and submission of a number of scientific papers.
- Preparation of HEARTEN presentations targeted to different stakeholders.
- Creation and sharing of developed knowledge.
- Enhancement of the involvement across different scientific approaches.
- Communication of the importance of mHealth platform.

### **3. Crossover Recognition & Networking Effects**

Except from the dissemination of the HEARTEN platform, the dissemination activities can benefit the HEARTEN partners through creating multiple networking effects and building individual networks.

- The dissemination materials that will be created during HEARTEN lifetime, such as leaflets, posters, newsletters, press releases, etc. will be communicated to a variety of experts with the aim to inform them about the findings through several channels.
- The events which will be organized by HEARTEN should receive significant attention from the stakeholders.

### **4. Sustainability approach**

All the planned dissemination activities aim to enhance the ability of HEARTEN to maintain its services and provided benefits, during and after the project's lifetime. To accomplish this, apart from initially informing the wide audience about the existence of HEARTEN and providing them with the updated outcomes, the issue of acceptability is critical as well. To improve the sustainability, HEARTEN focuses on the following:

- HEARTEN website will be maintained for at least one year after the end of the project to allow a large dissemination of project achievements and to serve as a resource for providing the scientific and business material.

- The establishment of social media during the project can assist in sustaining the collaboration between research team in the Europe and worldwide.

## 5. CONCLUSIONS

In this deliverable, the dissemination activities that were performed during the first year of HEARTEN project were presented. The planning and the strategies were selected by respecting: (i) the expected benefits to the overall project's objectives, (ii) the information and impact to the wide audience and the stakeholders and, (iii) the specific methods and the timing. Mainly all the dissemination activities were allocated focusing on raising awareness and informing on the project's findings. The intensity of the dissemination activities were conducted in accordance to the specifications and the expectations of the dissemination objectives.

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## APPENDIX A DISSEMINATION ACTIVITIES

### A.1 Dissemination activities per partner

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Media
UCBL/CSIC	2015 (in progress)	A novel EIS field effect structures coated with polypyrrole as organic polymer matrix and functionalized by dibromoaza helicene as ionophore for the detection of potassium ions	Journal paper	Journal "Materials Science and Engineering: C" [35]
UCBL/CSIC	2015 (in progress)	Magnetic particles: from preparation to lab-on-a-chip, biosensors, microsystems and microfluidics applications	Journal paper	Journal "Trends in Analytical Chemistry" [36]
UCBL/CSIC	August 2015	The development of a novel competitive BioMEMS for the detection of Irgarol 1051 for seawater monitoring	Poster	Advanced materials world congress [5]
UCBL/CSIC	November 2015	BioLab-on-a-chip for cytokine detection: Application to patients suffering from heart failure »	Keynote Lecture	Biosensors for food seventh international workshop on biosensors for food safety and environmental monitoring [6]
UCBL/CSIC	November 2015	Development and testing of immuno-fet devices for interleukin-10 detection	Poster	Biosensors for food seventh international workshop on biosensors for food safety and environmental monitoring [6]
UCBL/CSIC	November 2015	Micro & nano-structuration of materials using non-photolithographic techniques	INVITED SPEAKER	XIIème JOURNÉES MAGHRÉBINES DES SCIENCES DES MATÉRIAUX [7]
UCBL/CSIC	September 2015	Lab-on-a-chip and applications	Invited Oral	SEA-on-a-CHIP Summer school [8]
CSIC	June 2015	Hearten, an app to help in the treatment of heart failure	web	<a href="http://www.dicat.csic.es/rdcsic/index.php/en/biologia-y-biomedicina-2/106-projects/340-hearten-an-app-to-help-in-the-treatment-of-heart-failure">http://www.dicat.csic.es/rdcsic/index.php/en/biologia-y-biomedicina-2/106-projects/340-hearten-an-app-to-help-in-the-treatment-of-heart-failure</a>

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Media
CSIC	May 2015	Hearten, un proyecto europeo para tratar la insuficiencia cardiaca a través de aplicaciones para móviles	web	<a href="http://www.csic.es/canales?p_p_id=contentviewerservice_WAR_alfresco_packportlet&amp;p_p_lifecycle=0&amp;p_p_state=maximized&amp;p_p_mode=view&amp;contentviewerservice_WAR_alfresco_packportlet_struts_action=/contentviewer/view&amp;contentviewerservice_WAR_alfresco_packportlet_nodeRef=workspace://SpacesStore/19a91eac-b9a3-437b-96bd-57783f80a034&amp;contentviewerservice_WAR_alfresco_packportlet_contentType=news">http://www.csic.es/canales?p_p_id=contentviewerservice_WAR_alfresco_packportlet&amp;p_p_lifecycle=0&amp;p_p_state=maximized&amp;p_p_mode=view&amp;contentviewerservice_WAR_alfresco_packportlet_struts_action=/contentviewer/view&amp;contentviewerservice_WAR_alfresco_packportlet_nodeRef=workspace://SpacesStore/19a91eac-b9a3-437b-96bd-57783f80a034&amp;contentviewerservice_WAR_alfresco_packportlet_contentType=news</a>
APPART	November 2015	Dissemination of HEARTEN brochures and discussion with industry colleagues on the project	HEARTEN flyer	17th Infocom World Conference [10]
FORTH	November 2015	A preliminary presentation of a mobile co-operative platform for Heart Failure self-management	Conference Paper	IEEE International Conference on Bioinformatics & Bioengineering (BIBE) [11]
FORTH	November 2015	HEARTEN project	HEARTEN flyer	IEEE International Conference on Bioinformatics & Bioengineering (BIBE2015) [11]
FORTH	December 2015	The evolution of mHealth interventions in Heart Failure	Conference Paper	XIV Mediterranean Conference on Medical and Biological Engineering and Computing (MEDICON 2016) [12]
UMOR	November 2015	Instant effects of changing body positions on compositions of exhaled breath	Sci. Paper	Publication: "Journal of Breath Research" [13]
UNIFI	January 2015	Quasi 4,5 milioni di euro per dodici progetti di ricerca dell'Università di Pisa	web	<a href="http://iltirreno.gelocal.it/pisa/cronaca/2015/01/30/news/quasi-4-5-milioni-di-euro-per-dodici-progetti-di-ricerca-dell-universita-di-pisa-1.10766052">http://iltirreno.gelocal.it/pisa/cronaca/2015/01/30/news/quasi-4-5-milioni-di-euro-per-dodici-progetti-di-ricerca-dell-universita-di-pisa-1.10766052</a>

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Media
				<a href="http://www.pisainformaflash.it/notizie/dettaglio.html?nid=20871">http://www.pisainformaflash.it/notizie/dettaglio.html?nid=20871</a> <a href="http://www.unipi.it/index.php/tutte-le-news/item/5524-dall%E2%80%99europa-le-prime-valutazioni-per-i-progetti-di-ricerca-dellateneo">http://www.unipi.it/index.php/tutte-le-news/item/5524-dall%E2%80%99europa-le-prime-valutazioni-per-i-progetti-di-ricerca-dellateneo</a>
UNIFI	August 2015	A breath sampling system assessing the influence of respiratory rate on exhaled breath composition	Conference Paper	37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) [14]
UNIFI	September 2015	Alveolar breath analysis by needle trap sampling device coupled with gas chromatography/tandem mass spectrometry	Poster Presentation	EUROANALYSIS XVIII 18th edition of EuroAnalysis The European Conference on Analytical Chemistry [15]
UNIFI	September 2015	Influence of the sampling procedure on the measured concentration of uric acid in oral fluid	Poster Presentation	EUROANALYSIS XVIII 18th edition of EuroAnalysis The European Conference on Analytical Chemistry [15]
UNIFI	September 2015	A CO-OPERATIVE mHEALTH ENVIRONMENT TARGETING ADHERENCE AND MANAGEMENT OF PATIENTS SUFFERING FROM HEART FAILURE	HEARTEN poster	IABR Summit 2015 [16]
UNIFI	September 2015	Impact of the breathing pattern on the measured concentration of volatiles in breath	Poster Presentation	IABR Summit 2015 [16]
UNIFI	September 2015	Alveolar breath analysis by needle trap micro extraction technique coupled with gas chromatography/tandem mass spectrometry	Poster Presentation	IABR Summit 2015 [16]
UNIFI	September 2015	Needle trap micro-extraction: a new strategy for the collection and pre-concentration of breath samples	Oral Presentation	XXV Congresso della Divisione di Chimica Analitica della Società Chimica Italiana [17]
UNIFI	September 2015	Comparison of sampling bags for the analysis of volatile organic compounds in breath	Paper	Journal of Breath Research [13]

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Media
SAS	May 2015	<p>Profesionales del Hospital Universitario Virgen del Rocío participan con Everis y el CSIC en un proyecto europeo para tratar la insuficiencia cardiaca a través de aplicaciones móviles</p> <p>El proyecto Hearten permitirá a los pacientes controlar su estado de salud y comprobar si siguen su tratamiento a los profesionales médicos gracias a un kit de biosensores conectados a su smartphone</p>	Web	<p><a href="http://www.juntadeandalucia.es/servicioandaluzdesalud/principal/noticia.asp?codcontenido=24021">http://www.juntadeandalucia.es/servicioandaluzdesalud/principal/noticia.asp?codcontenido=24021</a></p> <p>-</p> <p><a href="http://www.comsevilla.es/contenido/noticias_salud/5061_PROFESIONALES_DEL_HOSPITAL_UNIVERSITARIO_VIRGEN_DEL_ROC_O_PARTICIPAN_CON_EVERIS_Y_EL_CSIC_EN_UN_PROYECTO_EUROPEO_PARA_TRATAR_LA_INSUFICIENCIA_CARDIACA_A_TRAVES_DE_APLICACIONES_MOVILES.html">http://www.comsevilla.es/contenido/noticias_salud/5061_PROFESIONALES_DEL_HOSPITAL_UNIVERSITARIO_VIRGEN_DEL_ROC_O_PARTICIPAN_CON_EVERIS_Y_EL_CSIC_EN_UN_PROYECTO_EUROPEO_PARA_TRATAR_LA_INSUFICIENCIA_CARDIACA_A_TRAVES_DE_APLICACIONES_MOVILES.html</a></p> <p>-</p> <p><a href="http://www.juntadeandalucia.es/salud/sites/csalud/contenidos/Noticias/2015/05/dia05/Noticia28418">http://www.juntadeandalucia.es/salud/sites/csalud/contenidos/Noticias/2015/05/dia05/Noticia28418</a></p> <p>- <a href="http://www.presspeople.com/nota/profesionales-hospital-universitario-virgen-rocio-participan">http://www.presspeople.com/nota/profesionales-hospital-universitario-virgen-rocio-participan</a></p>
SAS	November 2015	ANÁLISIS DE LOS REQUISITOS FUNCIONALES PARA EL DESARROLLO DE UN ENTORNO M-HEALTH EN LA ATENCIÓN DE PACIENTES CON INSUFICIENCIA CARDIACA. PROYECTO HEARTEN	Poster communication	XXXVI Congreso Nacional de la Sociedad Española de Medicina Interna (SEMI) [18]
SAS	November 2015	-	HEARTEN flyer	XXXVI Congreso Nacional de la Sociedad Española de Medicina Interna (SEMI) [18]
SAS	November 2015	PROYECTO HEARTEN: ECOSISTEMA MHEALTH PARA PACIENTES CON INSUFICIENCIA CARDÍACA CRÓNICA	Oral communication	SALUD CONECTADA: II Congreso Iberoamericano de Telesalud y Telemedicina, XIII Reunión del Foro de Telemedicina de la SEIS, XII Reunión del Fórum Ibérico de Telemedicina. [19]

DISSEMINATION ACTIVITIES				
Partner(s) responsible	Actual dates	Title	Communication type	Event /Media
SAS	November 2015	-	HEARTEN flyer	SALUD CONECTADA: II Congreso Iberoamericano de Telesalud y Telemedicina, XIII Reunión del Foro de Telemedicina de la SEIS, XII Reunión del Fórum Ibérico de Telemedicina.
SAS	November 2015	-	HEARTEN flyer	IV Reunión de la Plataforma Tecnológica para la Innovación en Salud [20]
YOURDATA	July 2015	3rd Sardinian workshop on innovation	Workshop	SINNOVA 2015 [21]
BIOAXIS-CAREDOME	October 2015	Technology helps patients' battle heart failure: BIOAXIS Healthcare Portugal's role in a novel cooperative targeting patients suffering from heart failure.	Company website	<a href="http://www.bioaxis.com/news/entry/92-technology-helps-patients-battle-heart-failure-bioaxis-healthcare-portugal-s-role-in-a-novel-cooperative-targeting-patients-suffering-from-heart-failure">http://www.bioaxis.com/news/entry/92-technology-helps-patients-battle-heart-failure-bioaxis-healthcare-portugal-s-role-in-a-novel-cooperative-targeting-patients-suffering-from-heart-failure</a>
BIOAXIS-CAREDOME	July 2015	HEARTEN presentation	Meeting	Company Visit at Teva Pharmaceuticals
SESA	From August 2015	HEARTEN Cloud Platform	Company website	<a href="http://www.sesanv.com/index.php/en/news">http://www.sesanv.com/index.php/en/news</a>
everis	May 2015	HEARTEN: controlling IC with an "app" Published in special number "Sanidad" (Health) in "el Economista" <a href="http://www.eleconomista.es/premium/pdf.php?idPDF=5615">http://www.eleconomista.es/premium/pdf.php?idPDF=5615</a> Page 44	Press Magazine	Written Press
everis	May 2015	Everis, CSIC y el SAS participant en un proyecto europeo para tratar la Insuficiencia Cardíaca a través de aplicaciones	Web	<a href="http://www.everis.com/spain/es-ES/sala-de-prensa/noticias/Paginas/hearten-aplicaciones-moviles.aspx">http://www.everis.com/spain/es-ES/sala-de-prensa/noticias/Paginas/hearten-aplicaciones-moviles.aspx</a>

## A2. HEARTEN website

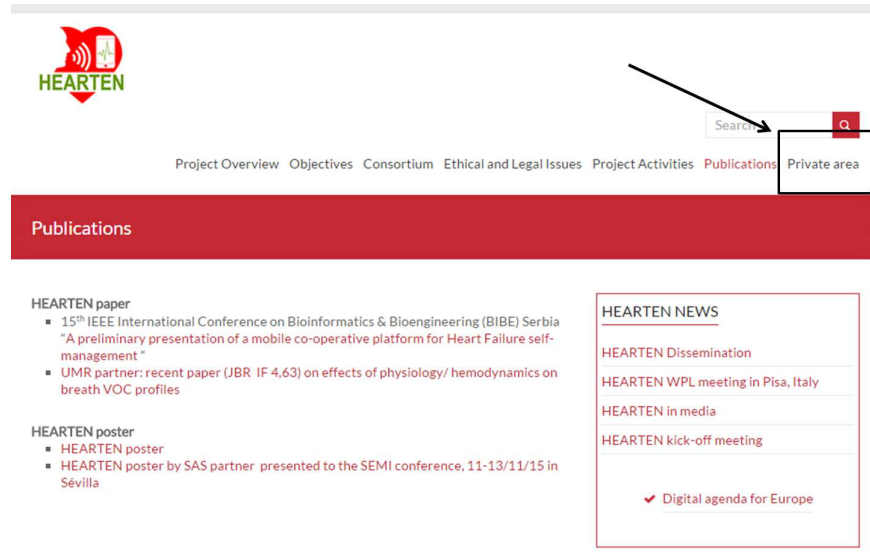


Figure 5: HEARTEN website “private area”.

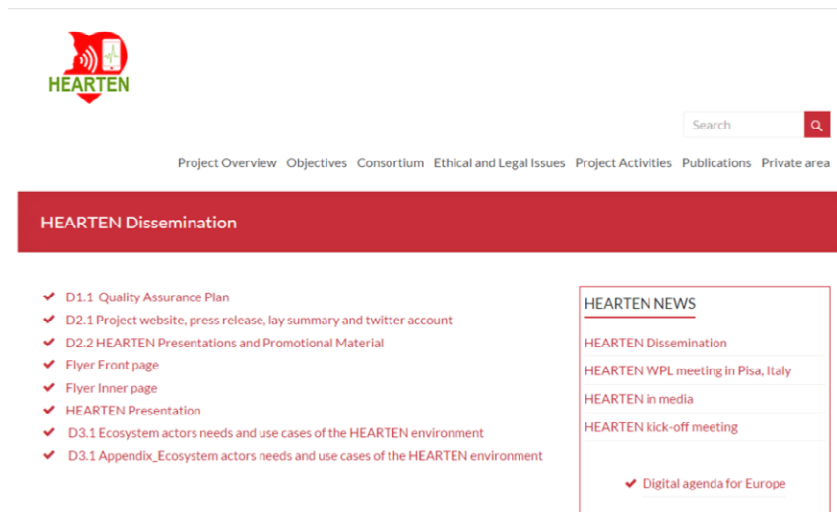
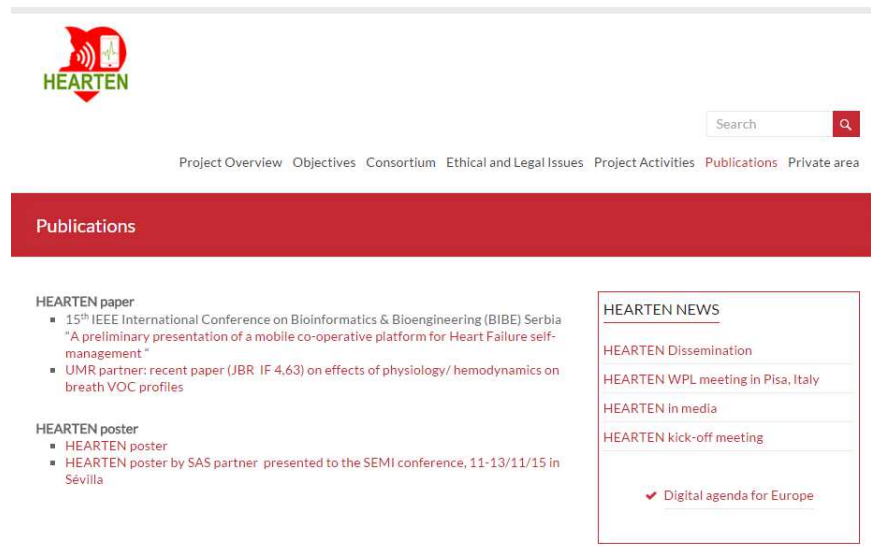
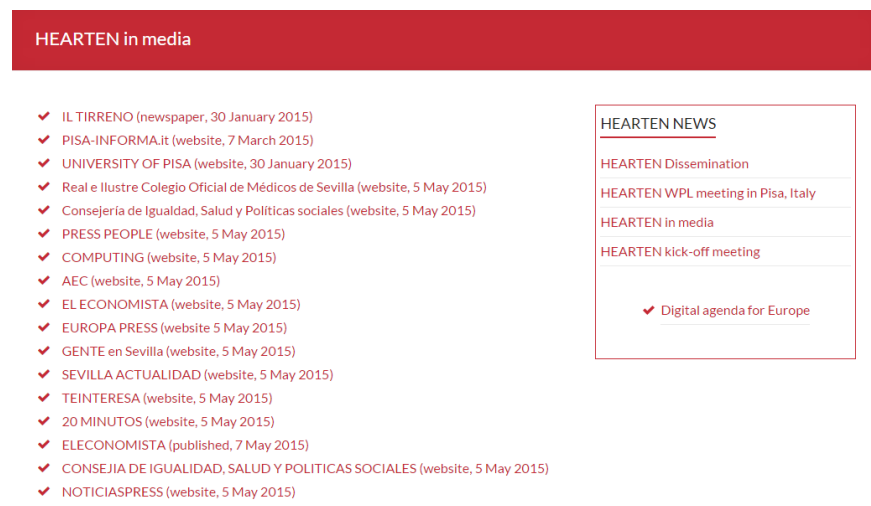


Figure 6: HEARTEN website “Dissemination section”.





**Figure 7:** HEARTEN website “Publication section”.



**Figure 8:** HEARTEN website “in media”.



[Project Overview](#) [Objectives](#) [Consortium](#) [Ethical and Legal Issues](#) [Project Activities](#) [Publications](#) [Private area](#)

## Ethical and Legal Issues

### The Management of Ethical and Legal Aspects in the Hearten Project

The HEARTEN project has the potential to improve the quality of life of heart failure (HF) patients; however, the development of a mHEALTH platform for monitoring adherence and managing HF patients can carry and reveal some risks. Therefore, it is crucial that the desire for improving the HF management should never compromise the patient safety and/or quality of life, be careful in patient's information as well as respectful of her/his consent and/or dropout willingness, guarantee their confidentiality and anonymity. For these reasons, specific guidance for undertaking the national and European legal and ethical requirements will be taken into consideration throughout the entire HEARTEN project.

The main responsible for guiding and monitoring the ethical and legal implications arising from the project research activities is the Ethical and Privacy Issues Manager, Dr. M. Giovanna Trivella. Her main duties are to ensure that all measures have been taken in order for the project to timely identify, analyse and address potential ethical and privacy issues, arising from accessing patient health information. She will closely co-operate with the Project Coordinator, Prof. Abdelhamid Errachid, and the Technical Manager, Prof. Dimitrios Fotiadis, inform all partners about the necessary measures that have to be taken at all project phases, including analysis of project requirements and architecture design, components implementation, platform integration and system evaluation.

Moreover, in order to provide the HEARTEN consortium with an ethical and legal framework of reference and ensure compliance with EU directives and regulations, an Advisory Board is established. The Board consists of selected members of the consortium with expertise in the field of medical environment, ICT, ethics and law and it is managed by Dr M.Giovanna Trivella. The appointed members of the Advisory Board are:

- ✓ Dr. M.Giovanna Trivella, Ethical and Privacy Issues Manager, UNIFI [cv](#)
- ✓ Prof. Dimitrios Fotiadis, Technical Manager, FORTH [cv](#)
- ✓ Mr. Rafael Ordóñez Benavente, ICT consultant, EVERIS [cv](#)
- ✓ Mr. Carlos Luis Parra Calderón, Member of the Spanish Society of Health Informatics, SAS [cv](#)
- ✓ Mrs. Chrysa Alexea, Legal advisor and litigation attorney in Information Technology & Personal Data Protection, CARE [cv](#)
- ✓ Mr. Jochen Klaus Schubert, D.E.A.A. Physician and chemist, Professor in Anaesthesiology, UMR [cv](#)
- ✓ Mr. Angelo Gemignani MD, PhD, MS, Associate Professor of Psychophysiology, UNIFI [cv](#)
- ✓ Mrs. Tiziana Marino, Consultant at Telecom Italia S.p.A. "Prepaid" Business Unit/"IT Governance" department, SESA [cv](#)

### HEARTEN NEWS

[HEARTEN Dissemination](#)

[HEARTEN WPL meeting in Pisa, Italy](#)

[HEARTEN in media](#)

[HEARTEN kick-off meeting](#)

✓ [Digital agenda for Europe](#)

Figure 9: Ethical and Legal issues in HEARTEN website.

### A3. HEARTEN brochure

Circulated in 15th IEEE International Conference on Bioinformatics & Bioengineering –BIBE2015 (November 2015)

#### HEARTEN mHealth cooperative enviroment

The **HEARTEN project** aims at designing, developing & validating an ICT co-operative environment that will enable the HF patients to achieve sustainable behavior change regarding adherence & compliance & the ecosystem actors to be engaged & improve the patients' HF management.





#### HEARTEN ecosystem

	Universite Lyon 1 Claude Bernard
	Lyon Ingenierie Projets
	everis Spain SL
	AppArt SA
	Foundation For Research And Technology Hellas
	Agencia Estatal Consejo Superior De Investigaciones Cientificas
	Universitätsmedizin Rostock
	Universita Di Pisa
	Servicio Andaluz De Salud
	Your Data SRL
	Caredome Patient Support And Healthcare Solutions
	SESA NV Srl

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

#### mHealth cooperative enviroment targeting adherence of Heart Failure patients

Empowering patient to manage their own health & HF disease will result in more cost-effective healthcare systems by improving utilization of healthcare, enabling the HF management outside institutions & improving health outcomes.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 643694.

Figure 10: HEARTEN flyer (page 1/2).

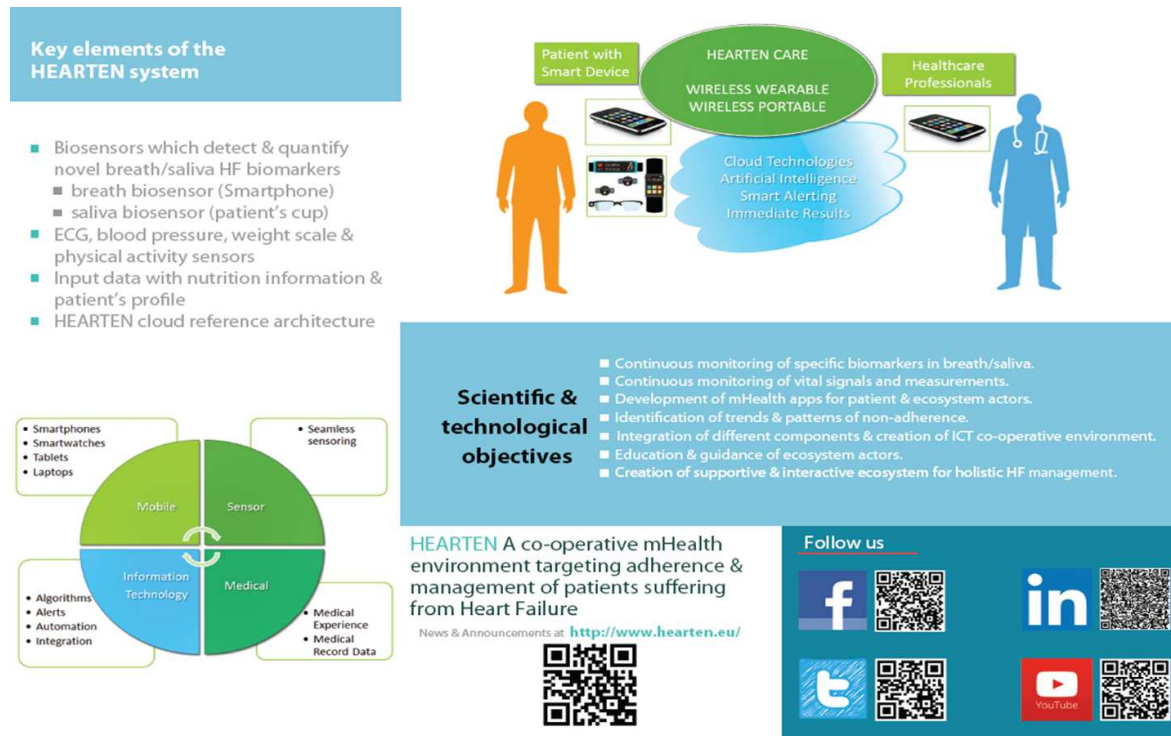




Figure 11: HEARTEN flyer (page 2/2).

## A4. HEARTEN posters

Posters presented in International Association of Breath Research -IABR 2015 (September 2015).  
(<http://www.breathinternational.com>)





# HEARTEN

## A co-operative mHealth environment targeting adherence and management of patients suffering from Heart Failure

HEARTEN will design, develop, and validate an ICT co-operative environment that will enable the patients suffering from heart failure (HF) to achieve a sustainable behavior change regarding their adherence and compliance, the ecosystem actors to be engaged, and to improve the HF patients' management to be improved.

**What is Heart Failure?**

Heart failure is a chronic, progressive condition in which the heart muscle is unable to pump enough blood to meet body needs for blood and oxygen. Basically, the heart can't keep up with its workload.\*

**What is HEARTEN?**

HEARTEN is a massive opportunity for supporting the building and running of a complete end-to-end mHealth environment for HF patients. HEARTEN creates solutions for efficient medical data management and patient profiling through the engagement of breath/saliva biosensors and multiple monitoring devices in a patient centered way.

**The HEARTEN Consortium**

- Université Lyon 1 Claude Bernard (France)
- Lyon Ingénierie Projets (France)
- Everis Spain SI (Spain)
- Appart Sa (Greece)
- Foundation For Research And Technology Hellas (Greece)
- Agencia Estatal Consejo Superior De Investigaciones Cientificas (Spain)
- Universitätsmedizin Rostock (Germany)
- Università Di Pisa (Italy)
- Servicio Andaluz De Salud (Spain)
- Your Data S.r.l. (Italy)
- Caredome Patient Support And Healthcare Solutions
- Portugal Unip Lda (Portugal)
- Software E Sistemi Avanzati S.P.A. (Italy)


**Key Activities**

- Detection of HF biomarkers
- Development of an mHealth application
- Identification of non-adherence pattern
- Creation of a co-operative ICT environment
- Patients and ecosystem actors education

**The Pilot Study**

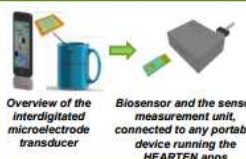
Mass spectrometry-based methods will be employed in **BREATH** and **SALIVA** samples of HF patients to define biomarkers and to assist in the development of sensitive and cost-efficient breath/saliva **BIOSENSORS**.

**Ecosystem actors and components of the HEARTEN environment**




The target population of **HEARTEN** are patients with chronic and acute HF, either post-ischemic or with dilated cardiomyopathy, requiring occasional re-admittance into hospitals. The idea is to develop biosensors able to anticipate critical episodes by means of breath and saliva biomarkers. These biomarkers shall reflect the health status of the HF patients and help to assess compliance to therapy.

**Overview of the interdigitated microelectrode transducer**

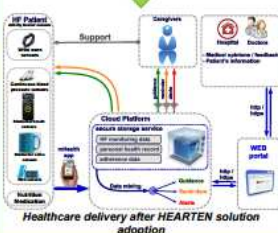


**Biosensor and the sensor measurement unit, connected to any portable device running the HEARTEN apps**



**Current Healthcare delivery for HF management**



**Healthcare delivery after HEARTEN solution adoption**



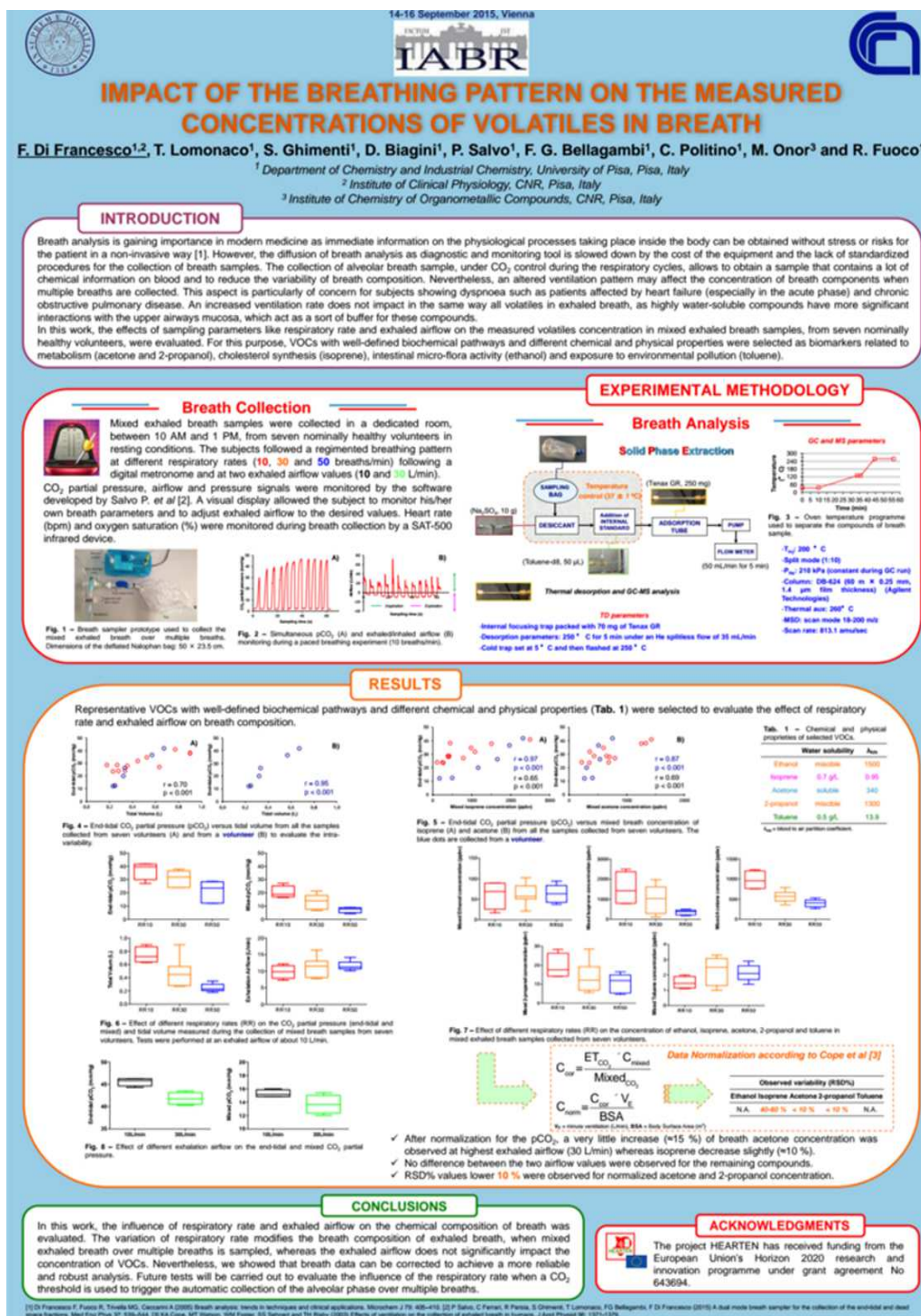
\* American Heart Association, [www.heart.org](http://www.heart.org)

The project HEARTEN has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 643694

Figure 12: 1<sup>st</sup> Poster in International Association of Breath Research - IABR 2015.





**Figure 13:** 2<sup>nd</sup> Poster in International Association of Breath Research - IABR 2015.

Poster presented in XXXVI Congreso Nacional de la Sociedad Española de Medicina Interna - SEMI conference (November 2015).  
(<http://www.congresosemi.org>)

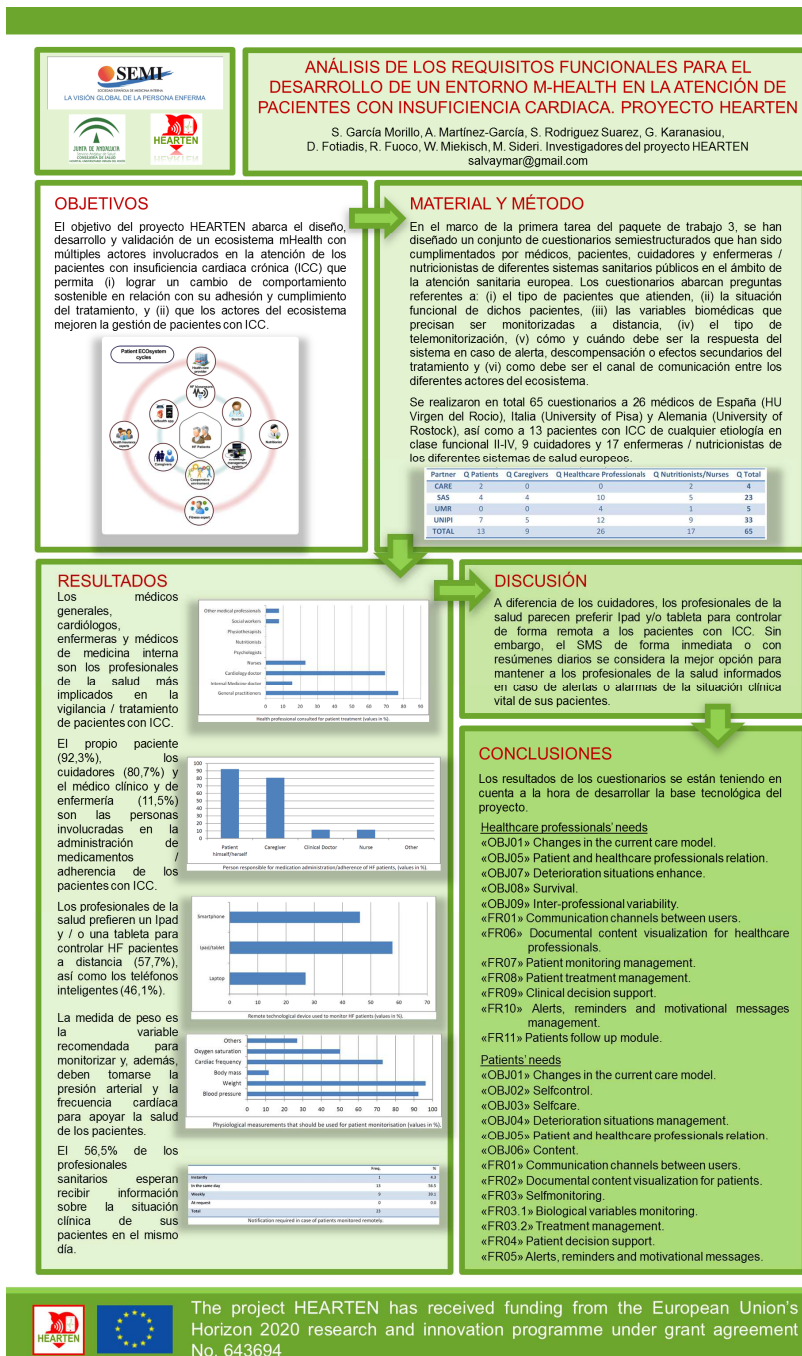


Figure 14: Poster in XXXVI Congreso Nacional de la Sociedad Española de Medicina Interna - SEMI conference.

## A5. HEARTEN Newsletter in Everis

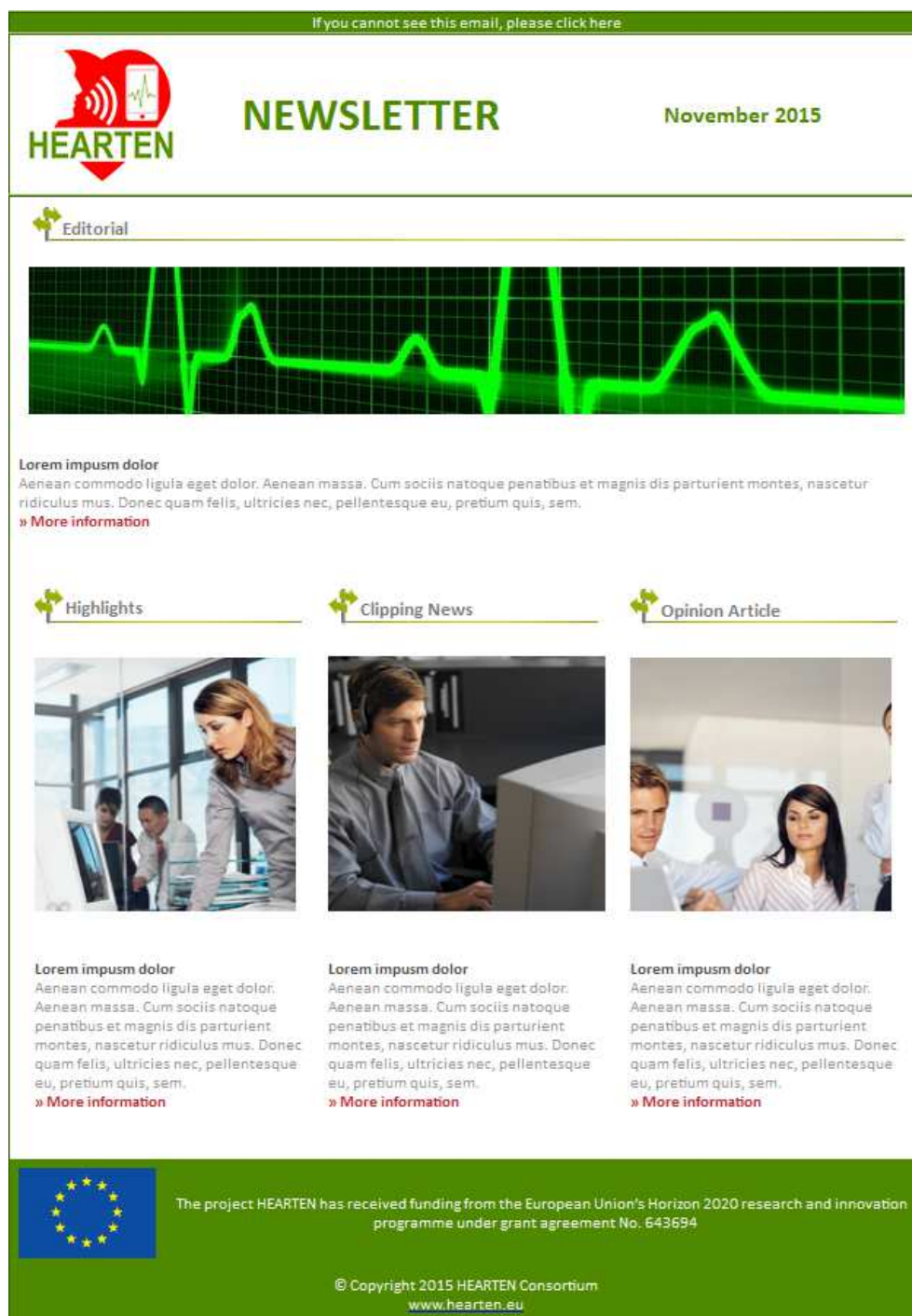


Figure 15: EVERIS newsletter.





Figure 16: Preview of EVERIS Newsletter extended information.

## A6. Social media

HEARTEN in Facebook

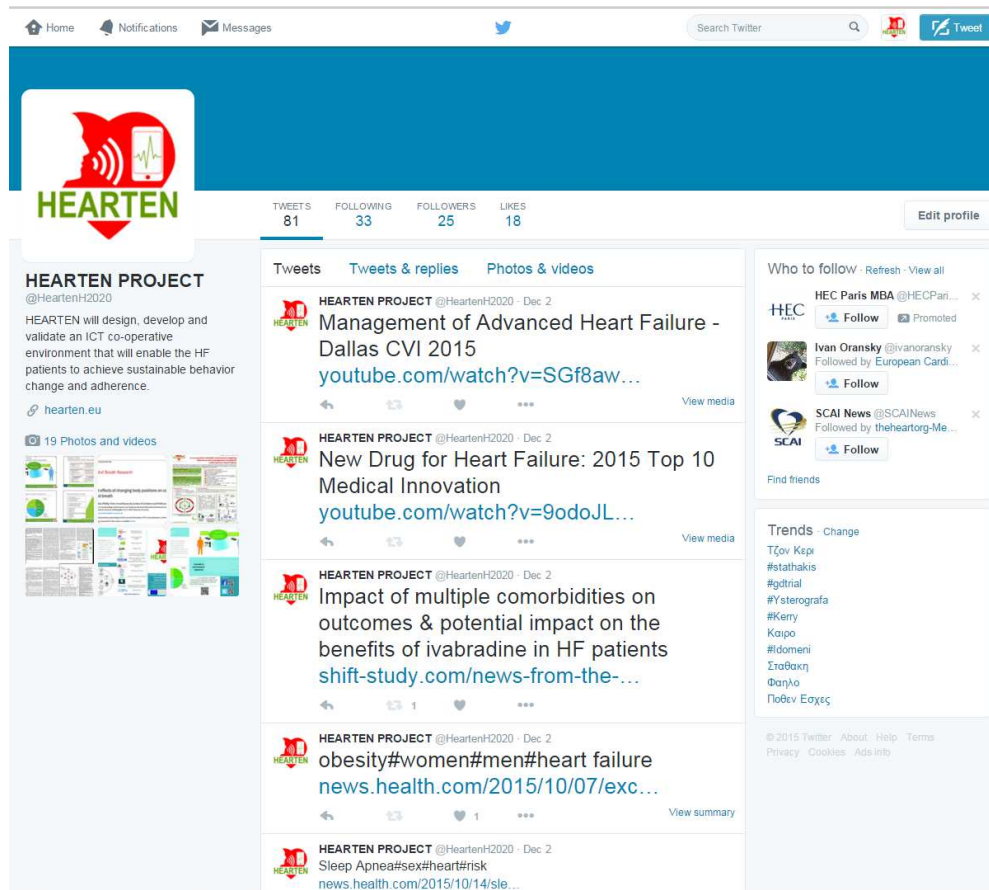


Figure 17: HEARTEN in Facebook (main page).



**Figure 18:** HEARTEN in Facebook (posts).

## HEARTEN in Twitter

**HEARTEN PROJECT**  
@HeartenH2020  
HEARTEN will design, develop and validate an ICT co-operative environment that will enable the HF patients to achieve sustainable behavior change and adherence.  
hearten.eu

19 Photos and videos

**Tweets** | Tweets & replies | Photos & videos

**HEARTEN PROJECT** @HeartenH2020 · Dec 2  
Management of Advanced Heart Failure - Dallas CVI 2015  
[youtube.com/watch?v=SGf8aw...](https://youtube.com/watch?v=SGf8aw...)

**HEARTEN PROJECT** @HeartenH2020 · Dec 2  
New Drug for Heart Failure: 2015 Top 10 Medical Innovation  
[youtube.com/watch?v=9odoJL...](https://youtube.com/watch?v=9odoJL...)

**HEARTEN PROJECT** @HeartenH2020 · Dec 2  
Impact of multiple comorbidities on outcomes & potential impact on the benefits of ivabradine in HF patients  
[shift-study.com/news-from-the-...](https://shift-study.com/news-from-the-...)

**HEARTEN PROJECT** @HeartenH2020 · Dec 2  
obesity#women#men#heart failure  
[news.health.com/2015/10/07/exc...](https://news.health.com/2015/10/07/exc...)

**HEARTEN PROJECT** @HeartenH2020 · Dec 2  
Sleep Apnea#sex#heart#risk  
[news.health.com/2015/10/14/sle...](https://news.health.com/2015/10/14/sle...)

**Who to follow** · Refresh · View all

- HEC Paris MBA @HECPari... [Follow](#) [Promoted](#)
- Ivan Oransky @ivanoransky [Follow](#) [Followed by European Cardi...](#)
- SCAI News @SCAINews [Follow](#) [Followed by theheartorg-Me...](#)

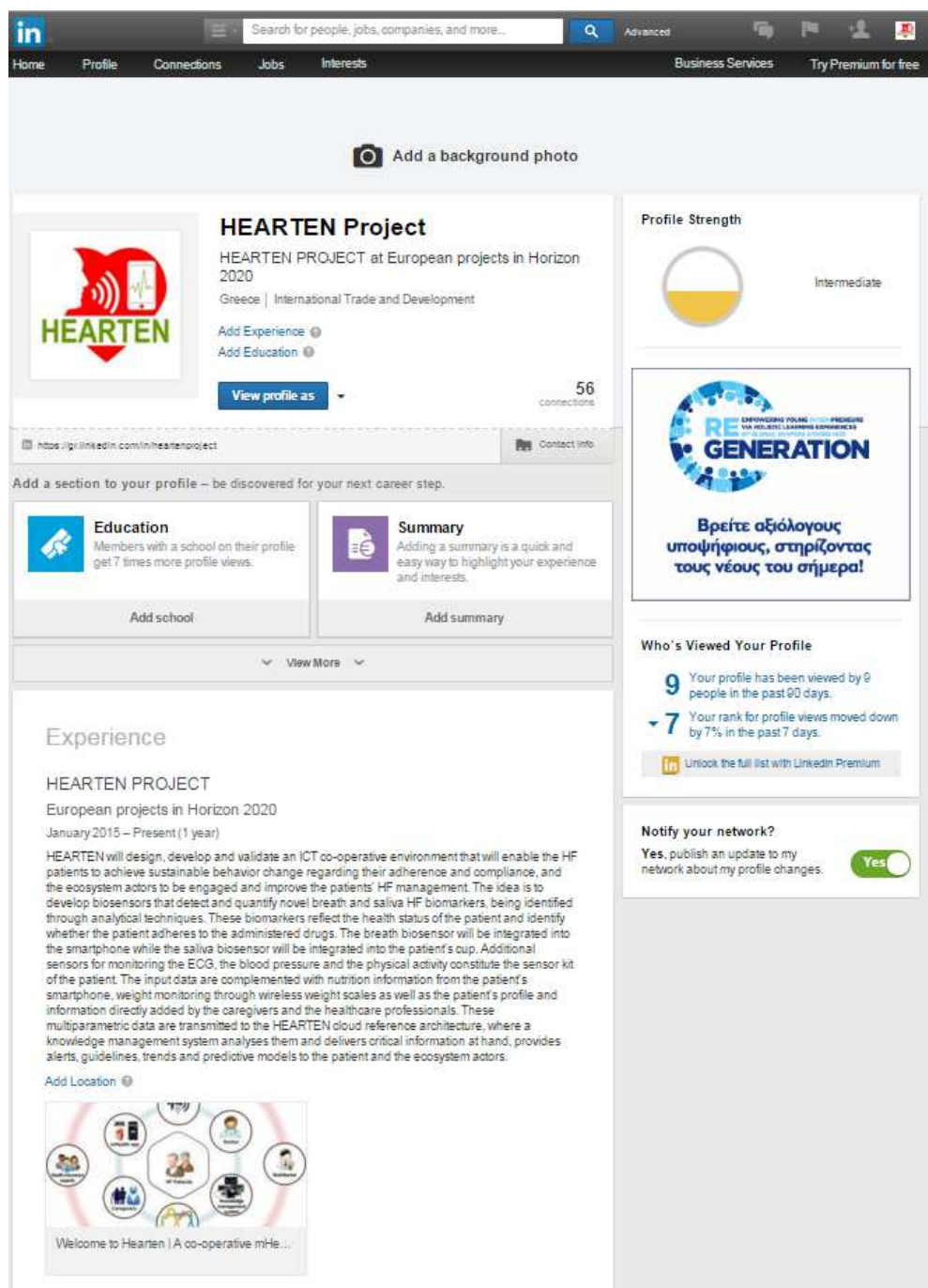
**Trends** · Change

- Τζόνι Κερί
- #stathakis
- #gdtrial
- #Ysterografa
- #Kerry
- Καίρο
- #Idomeni
- Σταθάρη
- Φαήλο
- Ποτέν Εσχαές

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Figure 19: HEARTEN in Twitter (main page).

## HEARTEN in LinkedIn

The screenshot shows the LinkedIn profile of the HEARTEN Project. The profile header includes the HEARTEN logo, the project name, and a description: "HEARTEN PROJECT at European projects in Horizon 2020". It also shows the location "Greece" and the industry "International Trade and Development". The profile has 56 connections and a "Profile Strength" of "Intermediate".

The main content area is divided into sections:

- Education:** Members with a school on their profile get 7 times more profile views. (Add school)
- Summary:** Adding a summary is a quick and easy way to highlight your experience and interests. (Add summary)
- Experience:** HEARTEN PROJECT, European projects in Horizon 2020, January 2015 – Present (1 year). The description details the project's goals and the roles of various stakeholders.

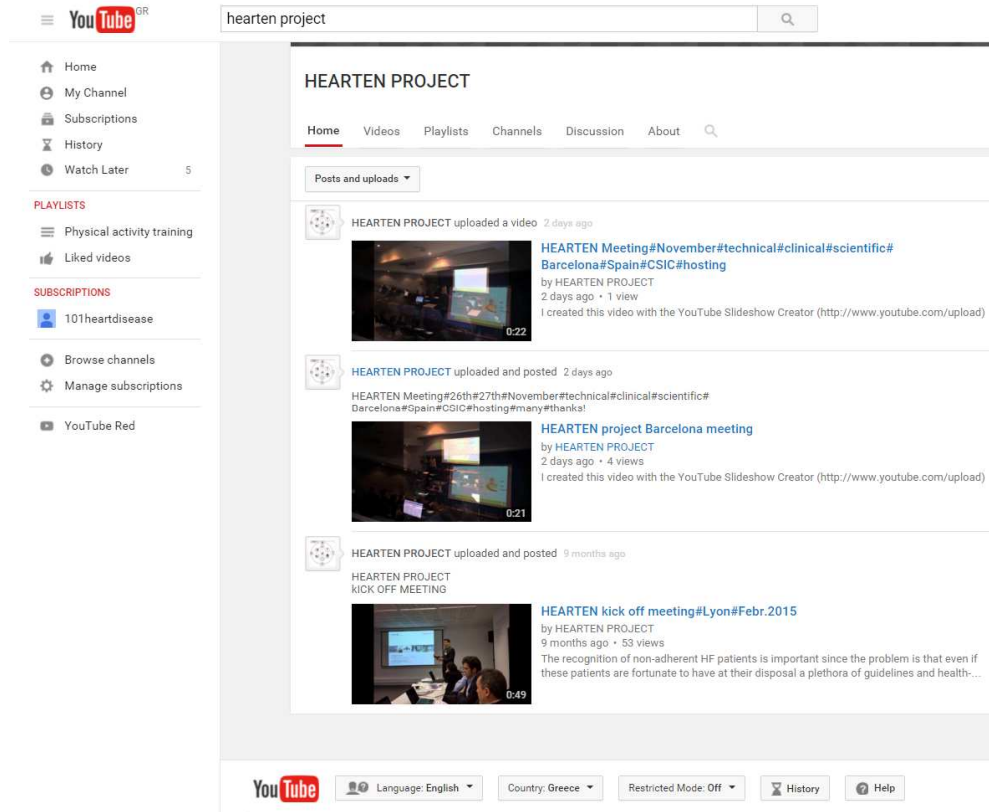
On the right side, there are additional features:

- Profile Strength:** A circular progress indicator showing "Intermediate" strength.
- Who's Viewed Your Profile:** A list of people who have viewed the profile, including a "9" indicating the number of views in the past 90 days.
- Notify your network?:** A toggle switch to "Yes" to publish an update to the network about profile changes.

At the bottom, there is a "Welcome to Herten | A co-operative mHe..." section with a circular diagram showing the project's structure.

Figure 20: HEARTEN in LinkedIn (main page).

## HEARTEN in YouTube



The screenshot shows the YouTube channel page for 'HEARTEN PROJECT'. The search bar at the top contains 'hearten project'. The channel name 'HEARTEN PROJECT' is displayed at the top of the content area. Below the name are tabs for 'Home', 'Videos', 'Playlists', 'Channels', 'Discussion', and 'About'. The 'Home' tab is selected. The main content area shows a list of videos under the heading 'Posts and uploads'. The first video is titled 'HEARTEN Meeting#November#technical#clinical#scientific#Barcelona#Spain#CSIC#hosting' and was uploaded 2 days ago. The second video is titled 'HEARTEN project Barcelona meeting' and was also uploaded 2 days ago. The third video is titled 'HEARTEN kick off meeting#Lyon#Febr.2015' and was uploaded 9 months ago. The left sidebar shows the YouTube navigation menu with options like Home, My Channel, Subscriptions, History, Watch Later, Playlists, Physical activity training, Liked videos, Subscriptions, 101heartdisease, Browse channels, Manage subscriptions, and YouTube Red. The bottom of the page shows the YouTube logo, language settings (English), country settings (Greece), restricted mode (Off), history, and help links.

Figure 21: HEARTEN in YouTube.



## A7. Conferences and journal publications

Paper in 15th IEEE International Conference on Bioinformatics & Bioengineering –BIBE2015 (November 2015) entitled “A preliminary presentation of a mobile co-operative platform for Heart Failure self-management”.

### **A preliminary presentation of a mobile co-operative platform for Heart Failure self-management**

Georgia S. Karanasiou, Fanis G. Kalatzis, Evanthia E. Tripoliti, Abdelhamid Errachid, Maria Giovanna Trivella, Roger Fuoco, Fabio Di Francesco, Mario Marzilli, Alicia Martinez-Garcia, Carlos Luis Parra-Calderón, Jochen K. Schubert, Wolfram Miekisch, Joan R. Bausells, *Senior Member, IEEE*, Themis P. Exarchos, Dimitrios I. Fotiadis, *Senior Member, IEEE*

**Abstract**—Heart Failure (HF) is a rapidly increasing cardiovascular chronic disease that affects millions of people globally. Lack of proper management of HF patients increases the risk of frailty and other undesirable effects and contributes to loss of independence. The engagement of the HF patient and all actors related to his/her disease management is critical for empowering the patients in achieving sustainable behaviour change, regarding their adherence and compliance. To address this, the concept and the architecture of a mobile co-operative platform are described. The design and development is based on a multi-stakeholder patient centered mHealth ecosystem for HF patients that will facilitate the collaboration of multidisciplinary actors.

while 3.6 million people are diagnosed with HF, every year [1]. Over the next 50 years, the number of people aged 65+, in the European Union (EU) is expected to almost double, from 85 million (2008) to 151 million (2060) [2]. Due to the fact that HF occurs mostly among elderly individuals, the increase of the life expectancy is expected to be followed by a progressive increase of HF incidence that will augment the challenge of appropriately and effectively managing the HF patients. In addition, the increasing incidence of HF poses a considerable economic burden; the annual cost of HF to insurers has been recently estimated to be approximately 6,000€ per person per year, and the cost related to

**Figure 22:** Paper in 15th IEEE International Conference on Bioinformatics & Bioengineering.

Paper in 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS) entitled “A breath sampling system assessing the influence of respiratory rate on exhaled breath composition”.

### **A breath sampling system assessing the influence of respiratory rate on exhaled breath composition\***

T. Lomonaco, P. Salvo, S. Ghimenti, D. Biagini, F. Bellagambi, R. Fuoco and F. Di Francesco

**Abstract**— This work presents a computerized system to monitor mouth pressure, tidal volume, exhaled airflow, respiration rate and end-tidal partial pressure of CO<sub>2</sub> during breath collection. The system was used to investigate the effect of different respiratory rates on the volatile organic compounds (VOCs) concentrations in exhaled breath. For this purpose, VOCs with well-defined biochemical pathways and different chemical and physical properties were selected as biomarkers related to metabolism (acetone and isopropyl alcohol), cholesterol synthesis (isoprene) and intestinal microflora activity (ethanol). Mixed breath was collected from a nominally healthy volunteer in resting conditions by filling a Nalophan bag. The subject followed a regimented breathing pattern at different respiratory rates (10, 30 and 50 breaths per minute). Results highlight that ventilation pattern strongly influences the concentration of the selected compounds. The proposed system allows exhaled breath to be collected also in patients showing dyspnea such as in case of chronic heart failure, asthma and pulmonary diseases.

developing lightweight devices that can be promptly used to collect breath samples.

Mixed breath samples or end-tidal samples are generally collected. Mixed breath sampling entails the collection of the undifferentiated breath, i.e. including the dead space volume contained in the upper airways which experiences no gas exchange with blood, whereas end-tidal sampling selectively collects the breath fraction coming from the alveoli [3]. Since the concentration of VOCs in exhaled breath may exhibit flow rate dependence, we hypothesized that changes in ventilation may affect the concentration of breath components when multiple breaths are collected. This aspect is important especially for patients showing dyspnea [7], a symptom associated with asthma, cardiac ischemia, interstitial lung disease, congestive heart failure or chronic obstructive pulmonary disease [8]. This study proposes a portable breath sampler capable of being used as point-of-care tool to collect exhaled air in Nalophan® or Tedlar bags for further analysis. The sampler was tested to evaluate the

**Figure 23:** Paper in 37th Annual International Conference of the IEEE Engineering in Medicine and Biology.

Paper in the XIV Mediterranean Conference on Medical and Biological Engineering and Computing (MEDICON 2016) entitled “The evolution of mHealth interventions in Heart Failure”.

### The evolution of mHealth interventions in Heart Failure

G.S. Karanasiou<sup>1</sup>, E.E. Tripoliti<sup>1</sup>, F.G. Kalatzis<sup>1</sup>, A. Errachid<sup>2</sup>, D.I. Fotiadis<sup>1</sup>

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**Abstract**—Heart Failure (HF) is among the most deadly diseases globally with reduced quality of life (QoL), repeatable hospitalizations, and early mortality. For effectively managing HF patients should systematically monitor their symptoms and follow the experts' guidelines. While the precise mechanism behind HF disease has not been fully delineated, risk factors for HF have been identified. Though the risk factors are known, there is a compelling need for efficient and effective management and monitoring the progress of HF. Mobile health (mHealth) intervention has the potential to offer personalized services for predictive, participatory and preventative care and contribute to more accessible, faster and reliable disease monitoring. In this work we present an extended review of the evolution of mHealth interventions in cardiology and HF and the emerging potential these resources provide.

**Keywords**— Heart Failure, mHealth, personalized management, ecosystem, patient empowerment.

#### B. Description of the condition

Current guidelines of the European Society of Cardiology (ESC) for HF management call for optimal management in hypertension, medication, nutrition, weight, physical activity. In parallel individualized education and counseling of HF self-care is a critical element [12]. The evolution in the field of medicine contributed to a widely available amount of medication for HF (Angiotensin-converting-enzyme inhibitor, Aldosterone Inhibitor, Angiotensin II Receptor Blocker, Beta-Blockers, Calcium Channel Blockers, Cholesterol -Lowering drugs, etc.). In specific HF stages, patients are more likely to be prescribed more than one kind of medication [13]. HF patients should also pay attention to the diet they follow and also include physical activity in their daily practice. Among other factors, weight moni-

**Figure 24:** Paper in the XIV Mediterranean Conference on Medical and Biological Engineering and Computing.



# Paper in Journal of Breath Research (November 2015)



**Figure 25:** Paper in Journal of Breath Research (November 2015).

## Paper in Journal of Breath Research (December 2015)

IOP Publishing *J. Breath Res.* 9 (2015) 047110 doi:10.1088/1752-7155/9/4/047110

**Journal of Breath Research**

 **CrossMark**

**PAPER**

**Comparison of sampling bags for the analysis of volatile organic compounds in breath**

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**RECEIVED**  
6 June 2015

**REVISED**  
24 August 2015

**ACCEPTED FOR PUBLICATION**  
18 September 2015

**PUBLISHED**  
15 December 2015

**Keywords:** breath analysis, VOCs, Sampling bag, Nalophan, Tedlar, cali-5-bond

**Abstract**

Nalophan, Tedlar and Cali-5-Bond polymeric bags were compared to determine the most suitable type for breath sampling and storage when volatile organic compounds are to be determined. Analyses were performed by thermal desorption gas chromatography mass spectrometry. For each bag, the release of contaminants and the chemical stability of a gaseous standard mixture containing eighteen organic compounds, as well as the CO<sub>2</sub> partial pressure were assessed. The selected compounds were representative of breath constituents and belonged to different chemical classes (i.e. hydrocarbons, ketones, aldehydes, aromatics, sulfurs and esters). In the case of Nalophan, the influence of the surface-to-volume ratio, related to the bag's filling degree, on the chemical stability was also evaluated. Nalophan bags were found to be the most suitable in terms of contaminants released during storage (only 2-methyl-1,3-dioxalane), good sample stability (up to 24 h for both dry and humid samples), and very limited costs (about 1 € for a 20 liter bag). The (film) surface-to-(sample) volume ratio was found to be an important factor affecting the stability of selected compounds, and therefore we recommended to fill the bag completely.

**Figure 26:** Paper in Journal of Breath Research (December 2015).