



DELIVERABLE D3.4

JOINT STATEMENT OF UNMET NEEDS

Project Acronym	EPP-eHEALTH
Issue Date:	December 2016
WP Number:	WP3
Author	BravoSolution
Contributor	All the partners
Status :	Released

DISEMINATION LEVEL	
X	PU = Public
	PP = Restricted to other programme participants (including the EC)
	RE = Restricted to a group specified by the consortium (including the EC)
	CO = Confidential, only for members of the consortium (including the EC)

CONTENTS

CONTENTS	2
1 INTRODUCTION.....	3
2 THE POWER OF COLLECTIVE ACTION	6
3 PRIORITY AREA #1 - PATIENT EMPOWERMENT THROUGH TELEMEDICINE AND INDIVIDUAL TAILORED APPS. (COORDINATOR: ZEALCO)	7
4 PRIORITY AREA #2 – MANAGEMENT OF DISEASES (COORDINATOR: SAS).....	11
5 PRIORITY AREA #3- ELECTRONIC HEALTH RECORD: EXTRACTION OF DATA AND EXPLOITATION. (COORDINATOR: SAS).....	13
6 PRIORITY AREA #4 – REAL TIME TRACKING SOLUTIONS (COORDINATOR: SU).....	19
7 PRIORITY AREA #5 - ADVANCED CLINICAL IMAGING SOLUTIONS (COORDINATOR: SERMAS).....	22
8 PRIORITY AREA #6- IMPROVING HEALTH SOCIAL INNOVATION (COORDINATOR: ZEALCO)	25

1 INTRODUCTION

This document has been prepared as part of the EU Horizon2020 funded EPP-eHealth project. Its objective is to invite ambitious European Healthcare institutions that are seeking for unmet needs to join us in communicating collective messages to the market. Several 'Joint Statement of Unmet needs' have been identified by the EPP-eHealth consortium and the final versions will include the names of those healthcare institutions that express interest. The remainder of the document provides the context and logic for the proposed joint communication.

The main aim of the EPP-eHealth project is to mobilise the procurement power of healthcare institutions and major companies to help accelerate progress towards deployment and market uptake of eHealth solutions. One approach to mobilise such procurement power is to develop Joint Statements of Unmet Needs that demonstrate a common need for new solutions. These can then be communicated to potential solution providers (through a process known as 'market sounding') with the aim of creating a dialogue that will result in new solutions becoming available to city authorities and their suppliers. This is known as innovation procurement.

Each of the four healthcare institutions involved in the EPP-eHealth project has identified several specific unmet needs related to eHealth unmet challenges.

This document is aimed at encouraging other healthcare institutions that are interested in the same eHealth unmet needs to lend their support to the broad communication of Joint Statements of unmet need.

Joint Statements of Unmet needs offer an aggregated means of communicating common unmet needs to the market in a way that demonstrates scale and replicability. They are not about joint procurement but are aimed at convincing innovative businesses that there is substantial customer demand for new solutions to address these unmet needs.

This document includes six priority areas unmet needs for solutions that have been highlighted by healthcare institutions that are participating in the EPP-eHealth project, namely:

- **Priority Area # 1- Patient empowerment through telemedicine and individual tailored apps.** The specific identified unmet needs under this priority area are:
 1. Empowering patients through telemedicine, Teleconsultation, and Tlediagnosis
 2. Increased patient use of individual tailored health care apps
 3. Telemedicine platform
- **Priority Area # 2 – Management of Diseases**

The specific identified unmet needs under this priority area are:

 1. Platform for the management of chronic diseases
 2. Integral system to support patient safety: prescription, dispensing and consumption of medical drugs
 3. Mirror therapy programme for face neurological rehabilitation
- **Priority Area # 3- Electronic health record: extraction of data and exploitation.** The specific identified unmet needs under this priority area are:
 1. Process management applied to the Electronic Health Record
 2. Decision support systems based on Electronic Health Record
 3. Big data: bioinformatics, integration of omics data, biomarkers, use and interpretation of data from EHR and other information systems
 4. Personalised medicine/ precision medicine. Integrate biological/clinical data with other data
 5. Reduction of risk for patients' security in the Electronic Health Record design, implementation and use
 6. Implantable pacemakers and defibrillators remote monitoring integrated system
 7. Maternal-fetal integrated monitoring system used during labour
 8. A solution to improve the timeframe for diagnosis
- **Priority Area # 4 – Real Time Tracking Solutions**

The specific identified unmet needs under this priority area are:

 1. Mobile assets and medical devices
 2. Surgical tools (sponges, towels, scalpels, needles, etc)
 3. Tracking patients
- **Priority Area # 5- Advanced clinical imaging solutions**

The specific identified unmet needs under this priority area are:

 1. Cardiac imaging
 2. Retina imaging
- **Priority area # 6- Improving health social innovation**

The specific identified unmet needs under this priority area are:

1. **Equal healthcare for everybody**
2. **From treatment-provider to mediator of knowledge – facilitating the transformation**

In each case, healthcare institutions (by operating in a cooperative manner) have the collective power to create a lead market for new solutions through their procurement functions and these can subsequently be adopted by others in the wider healthcare arena. Of course, in order to be sustainable and replicable, solutions also need to be economically viable and aimed at improving the quality and/or efficiency of the healthcare services.

We believe these unmet needs are common to many other healthcare institutions across Europe and we therefore invite other healthcare institutions to join this EPP-eHealth initiative by confirming your interest in supporting the joint communication of unmet needs for eHealth solutions. A list of healthcare institutions that express interest will be included in the final version of the document that is communicated to the market and may lead to a future collaborative action under Horizon 2020.

“We invite other healthcare institutions to join this EPP-eHealth initiative by confirming your interest in supporting the joint communication of unmet needs”

To express interest in this Joint Statement of Unmet need please send an email to: **I.sanchez@bravosolution.es** indicating which of the Priority Unmet Need you wish to support. Each also has a coordinator who can provide more information on their specific interest.

2 THE POWER OF COLLECTIVE ACTION

Healthcare systems across Europe face considerable challenges including rising costs of providing care, increased budget pressures and disparity between the service on offer and healthcare needs. However, the rate of adoption of eHealth solutions appears to be slow and the benefits remain unrealised in the sector. Yet, eHealth has the potential to make a valuable contribution.

To realise this value a shift in approach is necessary. At present there is no shortage of eHealth ideas and solutions, but there is disparity between what is available and what is needed; technology push versus market demand. Currently, suppliers are developing technology solutions that they believe will be useful and beneficial to the sector, but there is no dialogue to confirm the need with healthcare stakeholders.

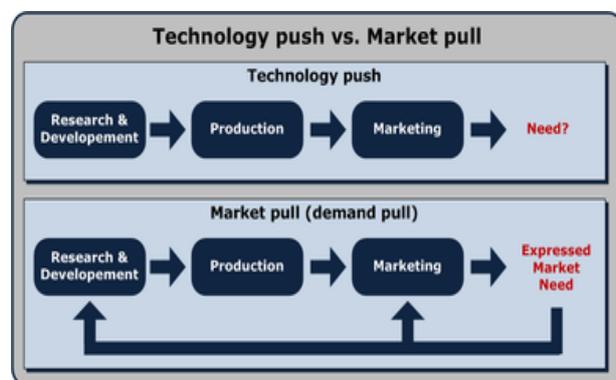


Figure 1: Technology Push vs Market Pull

Rather, this situation should be reversed; procurers should express their need to the market and the supply chain should conduct the necessary research and development to develop a solution to meet the communicated need.

Across Europe efforts are being made to recognise unmet needs and this report aims to presents these needs and translate them into messages that can be taken to the market; thus market pull (demand) rather than technology push.

3 PRIORITY AREA #1 - PATIENT EMPOWERMENT THROUGH TELEMEDICINE AND INDIVIDUAL TAILORED APPS. (COORDINATOR: ZEALCO)

CONTEXT - Healthcare is under pressure in the EU and patient empowerment through e.g. Telemedicine and healthcare apps have the potential to shift the current paradigm of health care and will be one of the biggest cost savings potential in the future. The rising number of patients with multiple long-term illnesses further increases the need for innovative solutions in this area.

The procurement requirement is for solutions, which enables patients to access electronic medical records, information about next appointment, video, animations, and communication with health care providers. The solutions should be tailored around the patient's needs and make it possible for the patient to engage in decision making in the patient journey whilst integrating with legacy systems and also the health regulatory framework.

Also, responsibilities and roles in the system and during treatment must be clear to the patient. The procurement requirement is also for solutions, which strengthen the clinical personnel education tools to support patient empowerment, for example 'joint decision making' and 'good communication'. Innovative solutions to support further patient empowerment underpins the development of a health care system, with focus on quality and patient safety through targeted and individualised involvement of the patient and relatives.

There is a need to establish an integrated common platform of telemedicine that could resolve technological challenges of telemedicine projects on one hand, and that ensures interoperability, scalability, safety and long-term viability of the telemedicine solutions on the other hand. It should be aligned with the ICT strategy of the healthcare system, ensuring integration with corporate systems.

STATE OF THE ART - Sophisticated healthcare apps are already being tested, e.g. by Zealand Region in Denmark and tele solutions exist in different versions. There is however, still a need to make the widespread of such technologies happen and to explore further how to motivate different groups of patients to use and embrace eHealth solutions. This calls for

further research, technology development, knowledge sharing, and educational development studies.

BENEFITS / IMPACTS - Solutions within telemedicine and healthcare apps provide clinicians and patients with tools that move parts of the treatment from the hospital to the patients' own home, thus creating both a huge cost savings potential, empowerment and increased patient satisfaction.

One of the great advantages with e.g. healthcare apps are the inexpensive cost level of development. Moreover, functionalities and possibilities for smart devices and healthcare have no limit, only a pathway of unique possibilities.

SPECIFIC NEED #1 - EMPOWERING PATIENTS THROUGH TELEMEDICINE, TELECONSULTATIONS, AND TELEDIAGNOSIS

CONTEXT - Telemedicine, Teleconsultation, and Telediagnosis have the potential to create a shift in the current paradigm of health care. At the moment physicians spend too much time writing regular prescriptions for patients in continuous treatment. In addition, patients lose a lot of time for appointments that result only in receiving a prescription. Given the fact that a patient's examination by the doctor is mandatory by law in some countries, the Teleconsultation / Telediagnosis would be a compromise solution.

Also, there is a need to have more efficient control and time management over the terms of patient's visits to medical specialists. In connection with the above solutions, there is a need to secure and support patient safety and to check compliance with law and regulations of the specific national health care systems.

STATE OF THE ART - There are currently solutions on the market, which partially could meet the identified needs of the participants in this project. But dynamics of knowledge and available technology could lead to more effective solutions. There is a need to establish an integrated common platform of tele-medicine that could resolve technological challenges of tele-medicine projects on one hand, and that ensures interoperability, scalability, patient safety and long-term viability of the tele-medicine solutions on the other hand. It should be aligned with the ICT strategy of the healthcare system, ensuring integration with corporate systems. It is necessary that telemedicine makes a leap from fragmentation to integration.

BENEFITS /IMPACTS - The impact of innovative solutions for the management of diseases and patient empowerment via tele solutions will include a reduction in the pressure on the health care system, and an improvement in health care delivery and patient outcomes and well-being.

Tele solutions will allow including telemedicine services widely within the existent healthcare management processes, thus helping save time for both patients and healthcare professionals, and would significantly improve the use of resources in the health care system. There is an enormous cost reduction potential within tele solutions and since the technology is quite mature it should be possible in the short-term perspective to develop good business cases for further use of tele solutions.

SPECIFIC NEED #2 - INCREASED PATIENT USE OF INDIVIDUAL TAILORED HEALTH CARE APPS

CONTEXT - Sophisticated healthcare apps are currently able to provide solutions that encourage and increase patient use of ICT. These apps provide information about next appointment, knowledge about the patient journey, and enables communication between hospital, municipality, and the patient. Patients can include family and relatives in the loop of information. The patient can send video, pictures, and tests, and can answer questionnaires. The app is tailored around the individually patient's needs. Clinical personnel in cooperation with the patient can choose from 25 different modules (blood pressure, temperature, weight etc.) to provide quality in the patient journey.

Still the widespread use of such apps is very limited. One reason is limited knowledge of the existence of such apps among clinical personal. Another reason could be inexperience amongst patients and patients unmotivated for using apps. These groups of patients are unlikely to utilize eHealth solutions although they might have access to it. Therefore, there is a need for solutions that traces this group of people and increases their use of ICT.

STATE OF THE ART - A sophisticated healthcare app like the above mentioned is currently being tested in Zealand Region. There is however, still a need to make the widespread use of such apps happen. This should be done by further exploring the possibilities and benefits of eHealth apps and through extended knowledge sharing within clinical personal. Also, there is a need to explore further how to motivate different groups of patients to use and embrace eHealth solution. This calls for further research and educational development studies.

IMPACT / BENEFITS - One of the great advantages with healthcare apps are the inexpensive cost level of development. Devices like iPhone and software like Android are continuously updated with new features. Features the healthcare sector and the industry can use to create be better treatment, higher quality, and real time data set. The platform is given, and new possibilities arise every time Apple, Samsung or Google update software or smart

devices. There is an enormous cost reduction potential within eHealth apps and the user possibilities are next to endless. The technology is quite mature and it should be possible in the short-term perspective to develop good business cases for further use of eHealth apps.

SPECIFIC NEED #3 – TELEMEDICINE PLATFORM

CONTEXT - There is a need to establish an integrated common platform of tele-medicine that could resolve technological challenges of tele-medicine projects on one hand, and that ensures interoperability, scalability, safety and long-term viability of the tele-medicine solutions on the other hand.

It should be aligned with the ICT strategy of the healthcare system, ensuring integration with corporate systems.

STATE OF THE ART - It is necessary that tele-medicine makes a leap from fragmentation to integration. This qualitative change is only possible through a sustainable approach for tele-medicine, in contrast with the launching of short-life projects or projects that are extended arbitrarily.

4 PRIORITY AREA #2 – MANAGEMENT OF DISEASES (COORDINATOR: SAS)

CONTEXT - Building on the development of a fully digitalised information and management integrated system, health services in Europe will need to open their current service portfolio to innovative solutions that allow better management of diseases, and that ensure patient empowerment when possible. This is of special interest to the EU for the management of chronic diseases and multimorbidity, as described in the CE eHealth Action Plan 2012-2020 (http://ec.europa.eu/health/sites/health/files/ehealth/docs/com_2012_736_en.pdf).

BENEFITS / IMPACT-

- Reduction in the pressure on the health care system, and an improvement in health care delivery and patient outcomes and well-being.
- Increase the self-management of diseases that could bring a significant reduction in the number of patient visits as well as a reduction in the number of healthcare professionals and an increase on the implementation of the e-prescription across Europe.
- Increasing the efficiency of treatments and rehabilitation times as well as the cost of each treatment.
- Reduction of errors in the administration of drugs while improving the real stock management and monitoring the adherence of treatments.
- Improvement in knowledge management and data exploitation allowing citizens to take active part in healthcare, and provide resources to healthcare professionals for personalised treatments that prevent unjustified variability in clinical practice.

Three specific needs have been detected in the area of disease management:

SPECIFIC NEED #1 - PLATFORM FOR THE MANAGEMENT OF CHRONIC DISEASES

CONTEXT - Primary healthcare is the key pillar that consolidates the sustainability of healthcare systems. It is the main doorway for patients and for data that feeds clinical data bases. It is necessary to provide new tools that allow primary healthcare to better play its role. Among these tools is the “healthcare biography”, or life story of health information, as a tool that links the EHR with the preventive actions of proven efficacy to improve health. Likewise, tools to support decision, communication tools for different levels within the healthcare system and users, tools for managing the knowledge generated within the healthcare biography and specific tools for the management of chronic patients are needed to ensure healthcare continuity and remote management of patients. All these tools should be part of a unique platform allowing the management of multiple chronic diseases.

STATE OF THE ART - The development of health care Apps and medical devices at EU level is profuse, although it seems that the market uptake is mainly local or regional. A preliminary contact with suppliers has brought forward a variety of developments already in the market. The main barrier for the uptake of an App is that the strategy of the purchasing organisation is not taken into account. It is also necessary to engage key staff at decision-making level in order to ensure a commitment from the health service. It is necessary a bigger effort from health systems to communicate their needs to suppliers. There are no solutions in the market that cover this need.

SPECIFIC NEED #2 - INTEGRAL SYSTEM TO SUPPORT PATIENT SAFETY: PRESCRIPTION, DISPENSING AND CONSUMPTION OF MEDICAL DRUGS (

CONTEXT - There is a need of an integral system for medicine traceability that allows eliminating completely human error in the process of dispensing drugs. The system should be able to communicate wirelessly with any ICT device, sensing events and trigger visual and sound alarms to interact with the pharmacy and clinical staff involved.

STATE OF THE ART - There are no solutions in the market that cover this need.

SPECIFIC NEED #3 - MIRROR THERAPY PROGRAMME FOR FACE NEUROLOGICAL REHABILITATION

CONTEXT – Mirror therapy is a relatively new therapeutic intervention which is simple, personalised and quite inexpensive that focuses on moving the unimpaired part of the body. Even if the mirror therapy is promising, an individualised therapy approach is necessary for an effective rehabilitation regime focused on the face. The solution should:

- Provide a rehabilitation programme which can be personalised for each patient and disease.
- Provide different training modules, including a specific training module to prepare the patient at home for the whole rehabilitation process.
- Allow the treatment to be administered as a home-based training programme.
- Support the interconnection and interoperability of different devices that can be used during the rehabilitation process at both, hospital and home.
- Allow hospital staff to monitor the rehabilitation process, even when the patients are at home.

STATE OF THE ART - A preliminary market research has shown that there are some available solutions that are focused in other body's parts but not in the face.

**5 PRIORITY AREA #3- ELECTRONIC HEALTH RECORD: EXTRACTION OF DATA AND EXPLOITATION. (COORDINATOR: SAS)**

CONTEXT - Most European countries are currently in the process of implementing personal Electronic Health Records. Some regions have already developed, implemented and deployed a Health Care Information and Management Integrated System, based on EHR (like Andalusia). This is a step of great importance in order to achieve *access to safe and high-quality cross-border healthcare in the Union and to ensure patient mobility* (Directive 2011/24/EU).

Once the information and management system is in place, there is a need to use and integrate the wealth of data available, in order to transform the information available into knowledge. This knowledge is basic for clinical and research applications. The access and ability to use this knowledge will enable a number of other applications that need to feed from these data and information, including the management of diseases, patient empowerment and improved diagnostic solutions, among other.

BENEFITS / IMPACTS –

- Improvement of eHealth solutions and of professionals' skills which lead to accurate diagnostics and treatment and to the identification of new hazards, and therefore in the reduction of response times and of related adverse events
- Obtaining better eHealth solutions regarding patient safety while stimulating research on patient safety in relation to Health Information Technologies (HIT)
- Increase of the availability of data for biomedical research, which would lead to improvements in current clinical practice and better patient outcomes.
- Improvement in patient safety thanks to the use of a quality assurance system for health care systems and medical software.
- Improvement of the use of resources that would shorten the healing process and decrease the costs of provided healthcare due to better precision of the clinical practice and the collaboration at different levels.
- Advancement in the availability of electronic administration services for citizens which will lead to an increase of patient empowerment, potentially improving health care delivery and reducing pressure on health care systems.
- Improvement of interoperability of health care data at European level while improving health care delivery for EU citizens. The connection of data, even big data set will change the way we look at treatment today.
- Reducing the variability of the healthcare systems while optimising the use of resources by the system.

A total of eight specific needs related to the use of information from the EHR and extraction and interpretation of data have been detected:

SPECIFIC NEED #1- PROCESS MANAGEMENT APPLIED TO THE ELECTRONIC HEALTH RECORD

CONTEXT - Process management includes a series of interrelated and chronologically ordered healthcare actions and tasks, which are performed to users with known health conditions in order to obtain foreseeable and acceptable results. From an organisational point of view, it entails a shift of the classic healthcare paradigm structured in levels and services, to a horizontal and integrative model of health and care services.

The innovative solution expected seeks to adequate this well-defined processes in order to be understood by IT systems: inclusion criteria, work flow, tasks, competences and involvement of relevant actors, and foreseeable results. The resulting module will be the EHR process manager, integrating the existing information to offer healthcare professionals an effective guide of the tasks and processes necessary for healthcare. It will allow monitoring of the activities by both the healthcare professionals and the health service.

STATE OF THE ART - There are no solutions in the market that cover this need.

SPECIFIC NEED #2 - DECISION SUPPORT SYSTEMS BASED ON ELECTRONIC HEALTH RECORD

CONTEXT – The medical decision-making processes are in transition from decisions based on evidence to decisions based on real time data. At the same time, there is a need for better prediction of patient diseases.

An intelligent system based on the integration of healthcare processes in the EHR is needed. It should contain a layer of information in the EHR that includes processes and healthcare protocols into the clinical information system, as a tool that supports decision and that shows the optimal path for the patient within the healthcare system, depending on the clinical data introduced. It should automatize clinical knowledge and best practices through the design of intelligent algorithms integrated in the information system. This should allow the system to suggest specific tests or referral to specialists according to patient record and the data included in the current process. It should be able to signal autonomously specific risks for health. The system should also be able to learn from alternatives presented by healthcare professionals in order to include them as current evidence.

STATE OF THE ART - There are some examples already in use of decision support systems at for specific uses, like in the field of liver transplantation. However, there are no generic systems with these capabilities based on EHR, due to the variability in clinical practice.

SPECIFIC NEED #3 - BIG DATA: BIOINFORMATICS, INTEGRATION OF OMICS DATA, BIOMARKERS, USE AND INTERPRETATION OF DATA FROM EHR AND OTHER INFORMATION SYSTEMS

CONTEXT - The solution needed in the field of Big Data would cover both clinical practice and management of the health systems. Once EHR is implemented homogeneously in the Health Service, it generates a vast amount of data that are not being exploited. It would be possible to obtain a wealth of information that is suitable to be transformed into knowledge. The applications of Big Data in health are varied, including:

- Personalised/precision medicine, in order to improve diagnostic and treatment for patients, improving healthcare outcomes and decreasing costs.
- Effectiveness of drug therapy: combining an e-prescription system with the information in the EHR would make possible to analyse effectiveness of treatment for patients. This would allow to adapt prescriptions for specific pathologies to more effective treatments and discard other that are not being effective. This will allow a shift to a model of payment to pharmaceutical companies based on treatment effectiveness, in opposition to the current payment per dosage.
- The implementation of healthcare processes is becoming common in the clinical practice. The information contained in the EHR could help to improve these processes, allowing their modification in order to obtain better results in health outcomes or in the effectiveness of the processes.
- Patient safety: combining data from different sources would allow to know how the quality of a diagnostic or a treatment affects patient safety. This will help to offer all possible safety guarantees in healthcare delivery, avoiding as much adverse events as possible.

There is a need of innovative tools that allow data exploitation and analysis, integrating data from different sources, and from different healthcare levels (primary care, hospitals, pharmacy, finance, etc.).

STATE OF THE ART - There are no solutions in the market that cover this need.

SPECIFIC NEED #4 - PERSONALISED MEDICINE/ PRECISION MEDICINE. INTEGRATE BIOLOGICAL/CLINICAL DATA WITH OTHER DATA

CONTEXT - Personalised medicine addresses some challenges faced by health care systems, like low effectiveness of many common medicines, the presence of adverse reactions to drugs, and the increasing costs of chronic diseases management as the population ages (<http://ec.europa.eu/research/health/index.cfm?pg=policy&policyname=personalised>). The advancement of personalised /precision medicine involves providing health care systems with bioinformatics tools that allow the adaptation of current clinical protocols to the specific needs of each patient. In order to optimise healthcare management of some

diseases, it will be necessary to take into account not only clinical, pathology, medical image, prognostic and predictive variables, but also other type of data that are alien to the healthcare system, like lifestyle, adherence to treatment, and other public information about users.

The innovative solution needed will improve diagnosis and treatment of patients with chronic, onco-haematology, rare, and degenerative diseases through the application of personalised medicine and the use and application of Big Data tools in the health care system. It should integrate data from diverse sources and facilitate its analysis and exploitation, allowing the identification of common patterns of disease progression, therapeutic response, etc.

STATE OF THE ART - Although some technologies are already in the market, there are no integrated solutions that could solve this specific need.

SPECIFIC NEED #5- REDUCTION OF RISK FOR PATIENTS' SECURITY IN THE ELECTRONIC HEALTH RECORD DESIGN, IMPLEMENTATION AND USE

CONTEXT - All technological advances carry with them new challenges that need to be tackled, especially in relation to patient safety. The management of adverse events related directly to the use of eHealth solutions at all levels, including the empowered patient, must be taken into consideration at all times when designing and implementing technology solutions.

STATE OF THE ART - There is a need of a quality assurance system for IT solutions-software-for healthcare (non-existent at the moment). It is necessary to develop policies, guidelines, standards, frameworks and organizational structures aimed at ensuring patient safety in the use and implementation of eHealth solutions.

SPECIFIC NEED #6 - IMPLANTABLE PACEMAKERS AND DEFIBRILLATORS REMOTE MONITORING INTEGRATED SYSTEM

CONTEXT - The need for human oversight in the interpretation of cardiac monitoring data is still very important and cannot be avoided or reduced with the current market solutions. Furthermore each company has developed its own platform and software that are not compatible with other company's products.

The solutions should:

- Monitor patients with a pacemaker or defibrillator remotely, safely and effectively irrespectively of device brand

- Provide an active computerized analysis for cardiac monitoring of patients with a pacemaker or defibrillator implanted that allows professionals immediate data review and determine when it is appropriate to react.
- Allow to personalize the parameters and to reduce, as much as possible, the number of false alarms that need to be evaluated by healthcare professionals while reducing the overtreatment of patients.
- Allow to react in time and to prevent potential cardiovascular events at an early stage.
- Be compatible with different available products in the market in order to avoid several trainings and tasks overlapping as well as to reduce time analysis.
- Provide a friendly user interface that does not demand specific training and that can be available to patients.
- Integrate the data from the remote monitoring to the electronic patient record as well as take into account data security and storage requirements.

STATE OF THE ART - A preliminary market research has shown only one potential solution under development: IHE IDCO, hospital development.

SPECIFIC NEED #7 – MATERNAL-FETAL INTEGRATED MONITORING SYSTEM USED DURING LABOUR

CONTEXT - One of the biggest problems with the labour process is that even with all the available devices, most of them sensors, doctors still need some time to differentiate the mom's medical data from the baby's, which also implies moving the sensors around and listening. Moreover, to have a single monitoring system that integrates all data is a real challenge. The solution should:

- Acquire, storage and process the maternal-fetal related medical data in an integrated way.
- Support the interconnection and interoperability of the different devices used during the delivery process.
- Be able to use wireless devices and reduce the number and size of them.
- Display continuously all values on the monitor's front panel paying special attention to warnings.
- Allow hospital staff to monitor the labour process in a more effective way and receive warnings in other devices, such as mobile phones.
- Allow the woman in labour and her family to get some basic information about the delivery process on their mobile phones.

STATE OF THE ART - A preliminary analysis of the market has allowed us to identify some solutions which only cover some of the aforementioned features but we could have not identified an integrated solution.

SPECIFIC NEED #8- SOLUTIONS TO IMPROVE THE TIMEFRAME FOR DIAGNOSIS

CONTEXT - Long lasting diagnosis of difficult medical cases, where patients are often directed by one medical specialist to another specialist. There is a need of easy exchange of experiences in the field of atypical symptoms in order to speed up diagnosis of the patient. The best solution would be a platform that would suggest next steps for doctors who have detected certain symptoms. This solution could have following functions: as a source of information on the patient's history of diseases (searching for patient's data in different IT-systems of the hospital or outside of the hospital); a tool for on-line consultation between the doctor and the doctors of other specialisations; a platform of knowledge serving an educational function on a postgraduate level - vocational training for doctors, who work in clinical teaching hospitals. This tool could not only suggest a possible diagnosis, but also suggest the additional diagnostic tests for the patient, maybe even with a suggestion, where such additional diagnostics could take place. This could be a list of diagnostic institutions, where such diagnostics are being performed with the number of diagnostic services provided. This would give the information for the patient on the experience of such institution in performing such diagnostics.

STATE OF THE ART - After extended market research, we are aware, that there are solutions on the market, which could partially meet this need. But dynamics of knowledge (especially in the field of artificial intelligence) and available technology could lead to most effective one. An optimal solution could be designed in a R&D process in cooperation between business and a hospital. Clinical Hospital would cooperate in a R&D process with business to identify the optimal solution.

6 PRIORITY AREA #4 – REAL TIME TRACKING SOLUTIONS (COORDINATOR: SU)

CONTEXT - At hospital level there is a common need of improving tracking management and of optimizing the use of equipments, tools and resources as well as developing new technologies for tracking different medical elements and improving patient safety and the quality of care. The main elements that can be tracked in a hospital are mobile assets, mobile medical devices, surgical tools and patients. These elements are gathered in three specific needs which are explained in separate sections.

Mobility of people and assets is a requirement for delivery of high-quality patient care. However, tracking mobile assets, surgical tools and patients and therefore improving the quality of the service poses challenges for healthcare organizations. The current practice related to tracking requires manual checking, searching and supervision which imply a waste of precious time, cost and it is liable to human errors. Helping locate people and assets in an automated way can save health care professionals a great deal of time and improve the efficiency of such tasks.

BENEFITS / IMPACT - The solutions should:

- Be affordable, reliable, safe and replicable in a wide range of environments.
- Allow to develop tracking management technologies with the specific needs of each element and hospital service.
- Allow to obtain real-time information about the availability, location and status of all the mobile assets, medical devices, surgical tools and patients.
- Allow to book the mobile assets and medical devices in advance while assuring full utilization.
- Detect usage trends to reduce over procurement and improve future procurement
- Be user friendly and integrated with current hospital systems allowing the use of current workstations.
- Include all the necessary software for server and storage administration and maintenance.

Some of the **impacts** of the potential solutions are listed below:

- Reducing cost and time consumption of the checking and searching of mobile assets, medical devices and surgical tools
- Reducing the number of medical errors and therefore ensuring patients safety and improving surgery performance
- Reducing patient time in the hospital while reducing treatment cost
- Reducing costs from lost, damaged or stolen inventory
- New developments regarding server and storage capacity, administration and maintenance

- Opening of a new market sector for tracking equipment, supplies and services while reinforcing the European healthcare value chain and improving the competitiveness of the European companies.

Below the three specific needs identified within this priority area:

SPECIFIC NEED #1- MOBILE ASSET AND MEDICAL DEVICES

CONTEXT - This unmet need is related to tracking and managing different mobile assets and medical devices at the hospital environment such as wheelchairs, mobile X-ray units, respiratory machines, patient monitors, mammography units, defibrillators, scales, pyjamas, etc.

Healthcare professionals spend valuable time searching for mobile equipment each day at hospitals and clinics. Optimizing workflow, by being able to locate resources and coordinate this information with staff members will enable healthcare professionals to optimize their workflow.

An e-health solution should gather the information from the own-reports of the equipment or from the internal information systems of the hospital and analyse the real time of the use of a piece of equipment. This kind of analytical tool should provide information for the administration of the Hospital, whether the equipment is being used efficiently and to what extent. An e-Health solution to monitor and analyse the real usage of the equipment would help the administration of the hospital to optimise its effectiveness, to properly allocate the equipment and the personnel, who is operating the equipment, which in the scale of the hospital would give significant savings or additional sources of income (commercial activity) and reduce the waiting time for the treatment. It would be also useful for purchase planning.

STATE OF THE ART - A preliminary analysis of the market reveals that there are some expensive solutions available in the market which covers some of these features. These solutions do not provide such comprehensive and multifunctional information as it is needed. Moreover, there would be a need for compatibility of data exchange between new ITC solutions, ICT systems already functioning in the hospitals and data generated by the equipment itself.

SPECIFIC NEED #2- SURGICAL TOOLS (sponges, towels, scalpels, needles, etc)

CONTEXT - Hospitals need to improve the tracking of surgical tools such as sponges, towels, scalpels, needles, etc before, during and after surgery, as well as identify when some of them require maintenance or replacement. Some of these surgical processes also imply patient safety due to the human error that can happen while accounting for all of the



required surgical tools before, during and after a surgical procedure. To prevent these types of errors, all surgical items are recounted and inventoried after a procedure and those missing must be located before procedure can be completed. This manual tracking process is also very high time-consuming.

STATE OF THE ART - A preliminary contact with suppliers reveals that there are some expensive solutions available in the market which are also very time and staff demanding

SPECIFIC NEED #3- TRACKING PATIENTS

CONTEXT -Providing efficient, high-quality patient care requires that health care professional have real time information about patients' locations and conditions. When procedures must be done in a sequential and time-sensitive order, it is critical to be able to immediately locate the patient and to have access to patient's vital signs.

Furthermore, being able to track people that want to go out of bed or out of the room or those with dementia is another challenge that will become increasingly more prevalent as the population ages. Newborns could also be tracked to avoid tragic incidents.

STATE OF THE ART - Having health care professionals assigned to each patient or to a group of patients consumes a lot of valuable resources but the solutions that are available in the market are also quite time and staff demanding.

7 PRIORITY AREA #5 - ADVANCED CLINICAL IMAGING SOLUTIONS (COORDINATOR: SERMAS)

CONTEXT - At hospital level there is a common need to:

- Improve clinical imaging strategies
- Optimize the use of imaging resources and data.
- Develop new approaches for obtaining and processing images and data.

These needs are common to several pathologies but two of them are more relevant because they represent real challenges related to clinical imaging: cardiac imaging and retina imaging. More information about these two specific needs can be found in the following sections.

The current practice of clinical image analysis, screening and processing is based on examination by human experts. It requires trained clinicians to examine images, searching for lesions, in order to provide an accurate diagnosis.

Screening and automatization programs are costly and time consuming due to the prevalence of some diseases and the shortage of specialists. This burdens clinicians and increases time to diagnosis and waiting lists, and may compromise health care quality.

Taking all this into account, there are four common topics in the clinical imaging field that still represent a real challenge:

- **Image acquisition:** the acquisition of some types of clinical images, such as kinetic cardiac images and retinal vessels, is still very challenging. Improvements in this field can allow a more efficient and cost-sensitive workflow.
- **Image processing and automation:** The processing and screening of clinical images is performed by clinicians and therefore it's time and resource consuming. The automation, integration and interoperation of these processes is still very low and unreliable.
- **Image analysis and diagnosis:** this implies the extraction of meaningful information from images in order to provide an accurate diagnosis. This information is transferred into knowledge, leading to vast quantities of data. Image analysis can be performed both by humans and by computational techniques in an automated way. As mentioned before this last process is still poorly developed and unreliable.
- **Image data storage:** as more images are obtained, more storage capacity is needed. Storage capacity and file management, including data safety, is a big and real challenge that requires new and cheaper solutions. Solutions that improve current

practices (hardware-miniaturization, etc) will have a positive impact and reduce costs on ICT systems.

BENEFITS / IMPACT - The solutions should:

- Be affordable, reliable, safe and replicable in a wide range of pathologies and environments.
- Enable obtaining static and kinetic clinical images that can be processed and interpreted without human intervention, leading to an accurate diagnosis.
- Allow 3D replication of organs and body parts in order to use them in surgical procedure simulations and in the creation of prostheses.
- Allow access to the latest developments of each patient from any workstation.
- Share and have access to this information from different locations, ensuring data protection.
- Be integrated with current hospital advanced processing solutions allowing the use of current workstations.
- Include all the necessary software for server and storage administration and maintenance.
- Use an identical work environment for research and clinical tasks.

Some of the potential impacts of the potential solutions are listed below:

- The development of a novel imaging approach, which allows to obtain kinetic images and to process this images without human intervention..
- Imaging technologies facilitating the provision of more accurate diagnosis and new therapies for patients;
- Reducing cost and time on the screening and processing of clinical images, while improving accuracy of diagnosis and treatment, and reducing pressure on health care systems.
- New developments regarding server and storage capacity, administration and maintenance.

Opening of new markets for clinical imaging equipment, supplies and services, while reinforcing the European healthcare value chain and improving the competitiveness of the European healthcare sector

SPECIFIC NEED #1: CARDIAC IMAGING

CONTEXT - This unmet need is related to the acquisition of kinetic images as well as to the rest of crossed challenges that are present in the clinical imaging field such as: processing, automation and storage.

Congenital heart malformations are very complex, with many combinations of defects. Some of these defects are related to cardiac movements. and their treatment is invasive and needs

to be tailored to each individual patient. Therefore, the main goal is the acquisition and segmentation of kinetic cardiac images that allow 3D printing and an accurate diagnosis and a tailored treatment, which will improve patients' safety.

STATE OF THE ART - A preliminary analysis of the market reveals that there is not a product like this in the market. Some solutions that are being developed have been identified but they are not in a market phase.

SPECIFIC NEED #2: RETINA IMAGING

CONTEXT - The acquisition of high-resolution retinal images is technologically challenging and expensive. Smartphone cameras may enable imaging the retina in a simple, low-cost and non-invasive way. Thus the main goal is the efficient, semi-automatic segmentation of retinal vessels, the quantification of their properties and the availability of these technologies at an affordable price.

STATE OF THE ART - The preliminary contact with suppliers has identified at least one solution under development for specific use on images of the retina.

8 PRIORITY AREA #6- IMPROVING HEALTH SOCIAL INNOVATION (COORDINATOR: ZEALCO)

CONTEXT - Many recent studies show a significant inequality in health and healthcare delivery depending on factors like geographic location, education and income and is often closely related to other areas in life like low work ability and low social competences. Inequality is often enhanced in peripheral areas, where the presence of the right number of health care personal combined with the right clinical skills is often problematic.

The procurement requirement is for innovative solutions, which secure easy and equal access to the health care system. The development of eHealth solutions is to some extent capable of meeting this need by expanding the opportunities to offer medical advice and treatment via e-mail and tele solutions.

Another aspect of improving health social innovation is to include the patient's own involvement and resources as much as possible. It should be ensured that patients receive the necessary knowledge and the necessary skills to act in health care. The medical staff should advise patients and relatives on how to strengthen the patient and where to find information. Several new healthcare apps pave the way for unique possibilities for the clinical personnel to connect traditional healthcare data with data sounding the patient in their life outside the hospital.

The connection between data from the apps and the doctor's medical knowledge will be the future of healthcare, and will transform the role of the doctor from being a treatment-provider to a mediator of knowledge.

STATE OF THE ART - There is a need to explore further how to motivate different groups of patients to use and embrace eHealth solution. Often patients with low personal resources are more unlikely to embrace eHealth solutions. This calls for further research and educational development studies.

BENEFITS / IMPACTS - Benefits from improving health social innovation are most likely to be identified on a broad societal level. The health care system would be likely to receive fewer patients with multiple diagnoses and eHealth solutions would contribute to increased health and well-being for many patients. One of the great advances with eHealth care is that, compared to other infrastructure solutions, it is a relatively cheap method to provide equal health care to a larger population. The precondition for this though, is that the electronic infrastructure is in place.

SPECIFIC NEED #1 - EQUAL HEALTHCARE FOR EVERYBODY

CONTEXT - Many studies show a significant inequality in health and healthcare delivery depending on factors like geographic location, education and income. The emergence of eHealth solutions at some point transcend these inequalities and at some point, enhance them.

Patients with fewer personal resources e.g. on the psychiatric area, might have high competences using Smartphone and other eHealth solutions. Apps can help these patients in treatment and dialog with physicians. Similar for patients with low mobility resources. Here eHealth solutions can compensate for long distances to relevant healthcare providers.

On the other hand, some patient's e.g. elderly, poorly educated or low income patients might not have skills or motivation to use ICT-tools in their own treatment. These patients do not benefit from eHealth solutions to the same level as other patients and this increases health inequality.

Also, eHealth solutions presuppose that all citizens have equal access to the Internet and telecommunications connections. This is especially not the case in peripheral areas and hence increases an already existing health care inequality for these areas.

STATE OF THE ART - Providers are continuously working to develop more and more user-friendly eHealth solutions. Still there is a need to explore further how to motivate different groups of patients to use and embrace eHealth solution. This calls for further research and educational development studies. The lack of access to Internet and telecommunications are still a reality many places in Europe, even though it has very high and increasing political priority in many communities across Europe. This also needs to be addressed.

BENEFITS / IMPACTS - Benefits from reducing inequality in the health care system are most likely to be identified on a broad societal level. The health care system would be likely to receive fewer patients with multiple diagnoses and eHealth solutions would contribute to increased health and well-being for many patients. One of the great advances with eHealth care is that, compared to other infrastructure solutions, it is a relatively cheap method to provide equal health care to a larger population. The precondition for this though, is that the electronic infrastructure is in place.

Inequality is already an existing and accelerating challenge for the healthcare system in Europe. Using eHealth solutions to reduce further inequality should be a top priority in a short-term perspective.

SPECIFIC NEED #2 - FROM TREATMENT-PROVIDER TO MEDIATOR OF KNOWLEDGE – FACILITATING THE TRANSFORMATION

CONTEXT - Over the last couple of years eHealth have matured and a new industry has emerged. The development of several new healthcare apps paves the way for unique possibilities of connecting traditional healthcare data with data sounding the patient in their life outside the hospital.

The connection of data, even big data set, will change the way we look at treatment today. The connection between the data from the Smartphone and the doctor's knowledge will be the future of healthcare. As a result, a transformation of roles in the healthcare sector is occurring. For example, the role of the doctor is transforming from being a treatment-provider to a mediator of knowledge. Hence, the need for solutions that support this development, and knowledge and research about eHealth as a facilitator for the transformation of the roles.

STATE OF THE ART - The transformation process is still in the making, and to our knowledge, the market provide no current solution to the specific need. The development of a solution would require further knowledge and research regarding eHealth as a facilitator for the transformation of the roles.

BENEFITS / IMPACT - An innovative solution to facilitate the transformation of roles would make it possible for doctors to see the patient in a more holistic manner, considering health *and* societal data, making it more likely to provide the right diagnosis and or treatment, thus saving time and money in the healthcare system and at the same time radically improve patient experience.

Efficiency will continuously be one the core issues in the future healthcare sector. With expectedly more and more available data and healthcare apps on the market, the need for facilitating the transformation and being able to integrate different data in the treatment will increase and the need for an innovative solution will become relevant in a medium-term perspective.