RESEARCH AND INNOVATION IN THE FIELD OF ICT FOR HEALTH, WELLBEING AND AGEING:

AN OVERVIEW

EUROPEAN COMMISSION
Directorate-General for Communications Networks, Content and Technology

Digital Society, Trust and Cybersecurity

Research and Innovation in the field of ICT for Health, Wellbeing & Ageing Well: an overview

INTRODUCTION

Introduction

Better health, wellbeing and ageing through ICT:
Our research and innovation turns the future of health and care into the present.

What have the best brains of Europe come up with to improve health, wellbeing and ageing with the help of Information and Communication Technology (ICT)? This report offers an overview of the most current (on-going or recently finished) European funded projects in this field.

The research and innovation projects listed here have been divided in the following types:

- Managing your health and care projects: These projects help patients and healthcare professionals to manage a certain condition. Or they preventively help people to stay healthy. A special chapter is dedicated to projects working in and with development countries;

- Projects that innovate the health and care system and the way it works. This includes projects which are related to interoperability - meaning the ability of systems and organizations to work together ('inter-operate'). It also includes projects implemented through innovation procurement;

- ICT solutions supporting active and healthy ageing; this includes projects funded through the Active and Assisted Living Programme;

- Projects funded by the SME Instrument, accelerating market introduction of ICT solutions for Health, Well-being and Ageing Well.

At the end of this report you will find an overview of the programs used to fund these projects in order to enable them.

For more detailed information on each project, please visit the project website mentioned herein or visit the Cordis website. And for a selection of finished projects with successful results, please visit bit.ly/fromLab2Market.

To be further informed on exciting results of these projects, new projects and other eHealth news, you can subscribe to the newsletter *eHealth, Wellbeing & Ageing*.

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1. MANAGING YOUR HEALTH & CARE

1.1 Mental health projects

NEVERMIND

NEVERMIND sets out to empower people who suffer from symptoms of **depression** related to a serious somatic disease.

The envisaged system works via a smartphone and a lightweight sensitised shirt. It predicts the severity and onset of depressive symptoms by collecting and processing physiological data, body movement, speech, and the recurrence of social interactions.

The data will trigger a response encouraging the patient to conduct or alter activities or lifestyle to reduce the occurrence and severity of depressive symptoms.

The final aim is to bring this system to the market, giving people the tools to control their depression and unburden their minds.

www.nevermindproject.eu

Duration: 2016-2019

NYMPHA-MD

NYMPHA-MD (Next Generation Mobile Platform for Health in Mental Disorders) is implementing a Pre-Commercial Procurement (PCP) of mHealth services for supporting physicians and patients in the treatment of **bipolar disorder**. Continuous patient monitoring will dynamically support illness management and potentially identify early deviations in mood and attitudes suggesting the onset of a crisis.

www.nympha-md-project.eu

Duration: 2014-2017

MASTERMIND

MASTERMIND offers e-services for better management of **depression**:

1. Guided, computerised Cognitive Behavioural Therapy (cCBT) for depression treatment;
2. Collaborative care for depression facilitated by video conference.

www.mastermind-project.eu

Duration: 2014-2017

m-RESIST

With a €4 Million budget, the m-RESIST Project (Mobile Therapeutic Attention for Patients with **Treatment Resistant Schizophrenia**) aims to develop a therapeutic program that draws on the support of mobile devices and actively involves patients with treatment-resistant schizophrenia. This will make them capable of self-managing their illness, as well as support their carers.

www.mresist.eu

Duration: 2015-2018

STARS

This consortium of European healthcare **procurers** challenges the industry to develop smart solutions for tailored avoidance and/or reduction of healthcare related **stress** in patients, beginning as early as in the preclinical phase, proceeding during the patient's hospitalisation until the end of the aftercare period.

As a result it can be expected that recovery time will be shortened, harmful side-effects of sedating drugs will be prevented and costs will be reduced.

Technical challenges to overcome for suppliers relate to vital signs measuring, wireless real-time transfer of large data amounts and big data analysis and decision making.

www.stars-pcp.eu

Duration: 2017-2020

DynaMORE

Resilience is that ineffable quality that allows you to be knocked down by life and still find a way to rise from the ashes. The DynaMORE project (Dynamic MOdelling of Resilience) will generate the first personalised in-silico model to determine and enhance **psychological resilience** in individuals. The development and testing of these computer models will also substantially deepen our scientific understanding of the mechanisms of resilience.

A smartphone app will be developed which will provide personalised recommendations and training sessions to help improve your resilience. This mHealth product will include model-based prognostic tools for monitoring of at-risk subjects and for automatised decision-making about timed, personalised interventions.

www.dynamore-project.eu

Duration: 2018-2023

1.2 Pain-related projects

RELIEF

With a budget of nearly € 2 million, the Horizon 2020 RELIEF project is using pre-commercial procurement to help improve **chronic pain** relief through innovative ICT self-management solutions.

In its first phase, the RELIEF experts will conduct a pre-study or 'solution exploration' where several different solutions are explored.

A second phase will include prototype development of the solutions that are judged most promising. This will be followed by the development of a small test-batch of some of the remaining solutions. Eventually one or few of the remaining solutions will be selected for commercial roll-out.

www.relief-chronicpain.eu

Duration: 2016-2019

SELFBACK

A decision support system for self-management of **low back pain**.

The core component in the self-management of non-specific low back pain is physical activity and strength/stretching exercises. However, adherence to this is challenging due to lack of feedback and reinforcement. The SELFBACK project will develop a decision support system that, through a smartphone app, will assist the patient in deciding and reinforcing the appropriate actions to manage own LBP after consulting a health care professional in primary care.

The advice will be tailored to each patient based on the symptom state, symptom progression, the patients goal-setting, and a range of patient characteristics including information from a physical activity-detecting wristband worn by the patient.

www.selfback.eu

Duration: 2016-2020

Back-UP

Neck and low back pain (NLBP) is one of the leading causes for years lived with disability in Europe and worldwide. Management of NLBP is a real challenge for healthcare professionals, since their decisions impact the patient's future health and welfare, as well as the economic burden on the public and private healthcare systems.

On top of this, health professionals often lack information to tailor the management and follow-up of individual patients and to predict the outcome of a certain treatment.

To solve this issue, Back-UP will create a prognostic model to support more effective and efficient management of NLBP. Patient-specific models will provide a personalised evaluation of the patient case, using multidimensional health data.

www.backup-project.eu

Duration: 2018-2020

OActive

Transforming and accelerating the diagnosis and prediction of **osteoarthritis**: The OActive experts will achieve a more comprehensive and holistic understanding of disease pathophysiology, dynamics, and patient outcomes.

They will integrate patient-specific information from various levels (cell, tissue, organ and whole body) and combine this with information from other sources, such as biochemical/inflammatory biomarkers, behaviour modelling and social/environmental risk factors.

This will generate robust predictors for new personalised interventions for delaying the onset and slowing down the progression of osteoarthritis. Augmented Reality empowered interventions will be developed in a personalised framework, allowing patients experience the treatment as more enjoyable, resulting in greater motivation, engagement, and training adherence.

www.oactive.eu

Duration: 2017-2020

1.3 Projects related to neurological disorders, such as dementia, Parkinson's and Alzheimer's disease

VirtualBrainCloud

The VirtualBrainCloud addresses this by bridging the gap between computational neuroscience and subcellular systems biology, integrating both research streams into a unifying computational model that supports personalized diagnostics and treatments in **dementia** patients. TheVirtualBrainCloud not only integrates existing software tools, it also merges the efforts of two big EU initiatives, namely The Virtual Brain large scale simulation platform of the EU Flagship Human Brain Project and IMI-EPAD initiative (European prevention of Alzheimer's dementia consortium). VirtualBrainCloud will develop and validate a decision support system that provides access to high quality multi-disciplinary data for clinical practice. The result will be a cloud-based brain simulation platform to support personalized diagnostics and treatments in dementia patients.

VirtualBrainCloud Cordis website

Duration: 2015-2019

SMART4MD (MIAMI-MD)

The tool will help **dementia** patients to adhere to their treatment and share data with their carers and doctors; carers will use the same application to monitor patients more easily and share their own well-being with doctors. Our project will comprise two phases: first we will use digital accessibility tools to re-design the existing application for dementia patients. In the second phase we will pilot the optimised application with 1,100 users and 1,100 controls.

www.smart4md.eu

Duration: 2015-2019

CAREGIVERSPRO-MMD

The project is building an **mHealth app** that is specifically targeted to caregivers and patients with mild to moderate **dementia**. The result will be a tool integrating a broader diagnostic approach, incorporating the live-in family caregiver-patient dyad and considering this dyad as the unit of care.

CAREGIVERSPRO-MMD will provide value-added services based on social networks, tailored interventions, clinical strategies and gamification for improving quality of life for dementia's patients and caregivers that allow them to live in the community for as long as possible.

https://caregiversprommd-project.eu/

Duration: 2016-2019

Dem@Care

Development of a complete system providing personal health services to people with **dementia**, as well as medical professionals and caregivers by using a multitude of sensors (context-awareness, lifestyle monitoring, health parameter).

www.demcare.eu

Duration: 2011-2015

I-Prognosis

This project is developing new detection methods and interventions for **Parkinson's disease**. From smartphones and fitness bands to smart connected everyday devices (Internet of Things) and serious games, i-PROGNOSIS will employ the latest technology.

For an early detection of the disease, the researchers have developed an app for data collecting. Using the app contributes to a large-scale study that permits to develop algorithms able to detect Parkinson's related behavioural changes. Eventually, the i-Prognosis project will develop a tool for your mobile phone that screens for Parkinson's in daily life and leads to an early diagnosis with the help of your doctor.

www.i-prognosis.eu

Duration: 2016-2020

NeuroTREMOR

NeuroTREMOR developed a novel system for understanding **tremors**. The solution provides support for diagnosis, research and for managing tremors.

www.g-nec.com/project_Neurotremor.html

Duration: 2012-2015

NoTremor

NoTremor worked to create new tools to predict how **Parkinson's disease** (PD) develops. The project developed patient specific virtual, physiological and computational neuromuscular models of the coupled brain and neuromuscular systems.

www.notremor.eu

Duration: 2014-2016

PD_manager

This project will allow people with **Parkinson's Disease** to be followed by a multidisciplinary team, with the use of easy and accessible technologies: A smart watch, an insole to measure gait and balance, an electronic pillbox and a set of applications for smartphone and/or tablet.

With these tools and the support of a powerful server and online data collection system, it will be possible to provide each patient the specific therapeutic changes necessary to ensure the best treatment and develop a rehabilitation focused home-care system that will improve the quality of life and reduce the risk of complications including falls.

www.parkinson-manager.eu

Duration: 2015-2018

PredictND

The research project PredictND is taking an important step towards better prediction, diagnostics and management of **memory disorders** such as Alzheimer's. This project aims to predict these disorders even before the symptoms start. The PredictND project is a VPH-project, so it will use biomedical computer models to simulate the human brain.

On top of that, clinicians experience an overload of information: They need to combine information from multiple tests and biomarkers for finding the correct reason and name for the disease. PredictND will provide tools that help clinicians to form a holistic view of the patient by combining information from several sources, such as clinical tests, imaging and blood samples, and by comparing these measurements to previously diagnosed cases available in hospital databases.

www.predictnd.eu

Duration: 2014-2018

REMPARK

Goal was to develop a Personal Health System for the management of **Parkinson's disease** (PFD) patients at two levels: wearable monitoring system able to identify in real time the motor status of the PFD patients; intelligent analysis of data provided by the first level, supported with the disease management system. The tool was tested on 60 patients in real life.

www.rempark.eu

Duration: 2011-2015

VPH-DARE@IT

A clinical decision support platform for early differential diagnosis of **dementias** and their evolution. This is being based on models of the ageing brain and taking into account biochemical, metabolic and biomechanical brain substrate, as well as for genetic, clinical, demographic and lifestyle determinants.

The VPH-DARE@IT project covers part of the "Virtual Physiological Human" (VPH), which deals with biomedical modelling and simulation of the human body.

www.vph-dare.eu

Duration: 2013-2017

1.4 Stroke-related projects

PRECISE4Q

PRECISE4Q sets out to **minimise the burden of stroke** for the individual and for society. It will create multi-dimensional data-driven predictive simulation computer models enabling – for the first time – personalised stroke treatment, addressing patient's needs in four stages: prevention, acute treatment, rehabilitation and reintegration. Heterogeneous data from multidisciplinary sources will be integrated. Novel hybrid model architectures, structured prediction models, complex deep-learning and gradient boosting models will form the Digital Stroke Patient.

The decision support will be tailored to the patient's current life stage thus enabling clinicians to optimise prevention and treatment strategies over time, and will include personalised coping strategies, support of well-being and reintegration into social life and work. The predictive capability and clinical precision will be validated with real clinical data.

www.precise4q.eu

Duration: 2018-2022

MAGIC

This project, entitled 'Mobile Assistance for Groups and Individuals in the Community' (MAGIC), aims to discover innovative approaches to **post-stroke care** with a view to improving the independence of stroke survivors. It will use Pre-Commercial Procurement to engage industry providers who will be required to compete through several phases of solution development and testing.

http://magic-pcp.eu/

Duration: 2016-2020

STARR

You suffered a **stroke** and you want to avoid getting a second one? The 'Decision SupporT and self-mAnagement system for stRoke survivoRs' (STARR) project aims to enable the self-management of stroke risk factors.

Based on existing computational predictive models of stroke risk, the project will develop a modular, affordable, and easy-to-use system, which will inform stroke survivors about the relation between their daily activities (e.g. medication intake, physical and cognitive exercises, diet, social contacts) and the risk of having a secondary stroke.

This will better prevent and reduce the number of secondary stroke events, and will also increase patients' participation in medical decision-making.

www.rt-rk.uns.ac.rs/www.starrproject.eu/index.html

Duration: 2016-2019

INSIST

Stroke is the number one cause of disability in the Western world and the 3rd most common cause of death. Despite new treatment options with intra-arterial thrombectomy, two out of three patients still have a poor outcome.

The goal of INSIST is to advance treatments of ischemic stroke and to realise in silico clinical trials in which stroke and treatment are modelled. The project will generate virtual populations of stroke patients, generate and validate in silico models for intra-arterial thrombectomy, thrombosis and thrombolysis, and microvascular perfusion and neurological deterioration after stroke, and integrate the in silico models to realise an in silico clinical stroke trial.

The in silico models and virtual populations will be combined to simulate clinical trials and validated by simulating and comparing finalised and currently running trials. The in silico models will also be used to evaluate effectiveness and safety of novel devices and medication.

www.insist-h2020.eu

Duration: 2017-2021

1.5 Pulmonary-related projects

AirPROM

This project developed and validated tools to create patient specific **airway models** to predict both disease progression and response to treatment. Using these eHealth tools, the project helped developing a breakthrough **pill against asthma**. The research and the development of the pill went much faster and more efficient than normal, they estimated that they saved about 20 years.

The AirPROM project covers part of the "Virtual Physiological Human" (VPH), which deals with biomedical modelling and simulation of the human body.

www.europeanlung.org/projects-and-research/projects/airprom

Duration: 2011-2016

myAirCoach

myAirCoach is creating a user-friendly tool for **asthmatic patients** to monitor and self-control their disease. This tool, a holistic mHealth personalised asthma monitoring system, will increase the patients' awareness of their clinical state and effectiveness of medical treatment.

This will be achieved through a multi-disciplinary approach aiming at the development of an ergonomic, compact and efficient sensor-based inhaler that will be in continuous communication with a mobile device. This sensing infrastructure will have the capability of automated monitoring of several clinical, behavioural and environmental factors in realistic conditions.

www.myaircoach.eu/

Duration: 2015-2018

MyCyFAPP

The MyCyFAPP project helps **Cystic Fibrosis** patients and caregivers to manage the disease with an innovative app. Cystic fibrosis (CF) is a genetic disease, causing severe damage to the lungs and the digestive system. The affected people suffer from insufficient activity of their pancreas, thus leading to malnutrition and growth disturbances. In Europe, about 4% of the population carry the genetic mutation, and ca. 0.3% of the European population suffer from this severe illness, which cannot be cured.

An individualised therapy with enzyme replacement could relieve many of the life-shortening side effects of CF. Within the MyCyFAPP project, such a therapy is being realised in terms of an innovative ICT tool, i.e. an app and a software program. This will encourage the patient's adherence to the treatment and the best outcome of nutritional intervention, especially important for young patients.

www.mycyfapp.eu

Duration: 2015-2018

WELCOME

To help **COPD** patients with comorbidities and to reduce the burden on our health systems, the FP7 WELCOME project created innovative solutions such as an integrated care management tool and a monitoring vest. Great attention has been paid to the validation of the project and its impact on healthcare in five countries (Greece, UK, Ireland, Germany and the Netherlands).

www.welcome-project.eu

Duration: 2013-2017

1.6 Cardiovascular disorder-related projects

HSMonitor

HSmonitor will apply the internationally acclaimed Chronic Care Model to specify support needs for hypertensive patients at all stages. Self-management and treatment will be supported by personalised guidelines and making the best use of clinical data. In this way a quality culture in healthcare will be fostered and learning healthcare systems made reality

Duration: 2019-2023

SMARTool

SMARTool aims at developing a platform based on cloud technology, for the management of patients with **coronary artery disease** by standardizing and integrating heterogeneous health data, including those from key enabling technologies. The platform includes existing multiscale and multilevel models of coronary plaque progression based on non-invasive coronary CT angiography and fractional flow reserve computation, refined by heterogeneous patient-specific non-imaging data) and cellular/molecular markers derivable from a microfluidic device for on-chip blood analysis.

www.smartool.eu

Duration: 2016-2019

RITMOCORE

RITMOCORE is addressing the evolution in the treatment of elderly patients with **arrhythmias** using or in need of a pacemaker. The proposed approach promotes a comprehensive model of care including: empowerment of general practitioners and integration of care pathways through the adequate information sharing; remote monitoring of pacemakers; home monitoring of vital signs using wearables, apps and available innovative devices; patient activation, and increases the alignment of objectives among all involved stakeholders. To achieve these goals RITMOCORE proposes to move from a conventional purchasing of devices to an innovative service provision able to complement the resources of the public service providers including: support center for remote monitoring of pacemakers, delivering of pre-defined information sets to all stakeholders and professionals involved in the care path, integration and quality labeling of vital signs home monitoring devices and wearables and support for patient activation.

www.ritmocore-ppi.eu

Duration: 2016-2021

CARDIOPROOF

Previous 'Virtual Physiological Human' (VPH) efforts, such as Health-e-Child, Sim-e-Child and EUHeart, developed some very powerful tools for **computer-based modelling of various cardiovascular diseases,** improving early diagnosis and for predicting disease behaviour and evolution as well as treatment outcomes.

Cardioproof worked on further developing, testing and thereby proving the effectiveness of these tools.

One of the new tools for example has enabled **virtual stenting**: By examining a computer model of an aortic artery and of the stents, the interventional cardiologist, before actually placing the stents, can see what the consequences of his actions would be. This makes the treatment much safer and more accurate.

Another computational **pressure mapping tool** makes it possible to avoid invasive (and risky) catheterisation for pressure detection. Both these modelling tools have shown excellent outcomes in terms of reliability and clinical relevance as well as in terms of applicability to routine clinical practice.

Furthermore, Cardioproof provided clear evidence of how VPH technologies have the potential to **reduce costs of care**. The London School of Economics, one of the project partners, has quantified that thanks to

this new technology we could reduce up to 15% per-patient in hospital expenditure. And a significant reduction in time can be achieved by deploying a web-based solution for the multi-disciplinary workflow of treatment planning for coarctation of the aorta.

www.cardioproof.eu

Duration: 2013-2016

CARRE

To help patients manage their **chronic heart and kidney disease**, CARRE developed personalised alerting, planning and educational services. This empowers patients and enables both professionals and patients to make shared informed decisions on the disease.

The CARRE consortium consisted of 6 partners from 4 countries (Greece, United Kingdom, Lithuania and Poland) and was coordinated by the Democritus University of Thrace in Alexandroupoli, Greece.

www.carre-project.eu/

D*uration: 2013 -2016*

Do CHANGE

According to research, 90% of people who are advised to **change their lifestyle** after a serious medical event such as a heart attack, fail to do so. To help them, experts from the UK, Belgium, the Netherlands, Spain and a hospital in Taiwan will link inputs from medical devices, nutritional sensors, doctors and consultants, thus creating a new health ecosystem that puts the user at the centre.

Participating patients will monitor their condition and what they eat at home with the new devices that feed into the 'Do Change' system. This will inform the kind of lifestyle changes required, which in turn will help to shape a personalised programme in near real-time.

The patient will receive 'Do's' designed by the project's psychologists to encourage him or her to make the changes the cardiology team suggests they need to make for their long-term health.

www.do-change.eu

Duration: 2015-2018

EurValve

EurValve looks at **Valvular Heart Disease**. By combining multiple complex modelling components developed in recent EU-funded research projects, the project is developing a comprehensive, clinically-compliant decision-support system to meet this challenge, by quantifying individualised disease severity and patient impairment, predicting disease progression, ranking the effectiveness of alternative candidate procedures, and optimising the patient-specific intervention plan.

This algorithmically-driven process will dramatically improve outcomes and consistency across Europe in this fast-growing patient group, maximising individual, societal and economic outcomes.

www.eurvalve.eu

Duration: 2016-2019

HEARTEN

The HEARTEN project wants to prevent **Heart Failure** (HF). The project researchers are developing biosensors that detect and quantify novel breath and saliva HF biomarkers that can reflect the health status of the patient and also identify whether the patient adheres to the administered drugs. A new platform will send smartphone alerts to HF patients every time they find themselves in a critical situation.

www.hearten.eu/

Duration: 2015-2018

HeartMan

HeartMan is designing a personal health system to help patients with **Congestive Heart Failure** to manage their condition. The system will involve medication management, monitoring of fluid intake and weight, exercise and lifestyle changes. The system will also feature mindfulness exercises, methods to understand the patients' physical and psychological state, and standard-based data management for wide interoperability.

www.heartman-project.eu

Duration: 2016-2019

PATHway

PATHway is working on a novel approach to **cardiac rehabilitation**. The PATHway experts are developing an individualised programme including an internet- enabled, sensor-based home exercise platform that manages exercise or other physical activity, smoking, diet, stress management, alcohol use etc. This enables patients to both better understand and deal with their own condition and to lead a healthier lifestyle.

The system will allow remote participation in specially designed exercise programs at any time, either individual or together with a small number of patients, from the comfort of their own living room.

www.pathway2health.eu

Duration: 2015-2018

SMARTool

This project aims at **predicting coronary artery disease** through simulation modelling. It will support clinicians in early diagnosis, prevention and treatment of heart disease.

The new computer models, based on non-invasive diagnostic imaging techniques, simulate the formation and growth over time of coronary plaques (fatty deposits responsible for the narrowing of the coronary arteries at the base of atherosclerosis). A software platform based on cloud computing technology will integrate all clinical data of the individual patient including genetic factors, medical history, risk factors and environmental factors.

Using these solutions, clinicians will be able to predict the individual evolution of heart disease, diagnose it early and assess any future risks.

www.smartool.eu

Duration: 2016-2019

UNWIRED Health

UNWIRED Health dealt with mHealth procurement for the transformation of healthcare services. In this case, the Pre-Commercial Procurement (PCP) focused on an **app** offering services to coach patients with **heart failures** enabling education, motivation, remote monitoring and other functionalities, integrating and coordinating care provided by a hospital and the primary care physician.

The app was to be innovative, integrated in the regional public health systems and to be prescribed by GPs. The consortium consisted of three procurers introducing the innovation in Catalonia, Scotland and Southern Denmark and three vendor independent non-profit associations that acted as catalyst to foster the development of open platforms and interoperable solutions.

UNWIREDHealth Cordis website

Duration: 2014-2016

VP2HF

Heart failure (HF) is one of the major health issues in Europe affecting 6 million patients and growing substantially. Existing therapies are ineffective in up to 50% of the treated patients and involve significant morbidity and substantial cost. The primary aim of VP2HF was to bring together image and data processing tools with statistical and integrated biophysical models mainly developed in previous VPH projects, into a single clinical workflow to improve therapy selection and treatment optimisation in HF. The tools were tested and validated in 200 patients (including 50 historical datasets) across 3 clinical sites in Europe.

VP2HF Cordis website

Duration: 2013-2016

InSilc

The InSilc project is working on a digital **clinical trial platform** for assessing **coronary artery treatment** in a virtual environment.

Coronary artery disease remains the leading cause of mortality worldwide and accounts for over 4 million deaths per year, close to half of all deaths in Europe.

Coronary stents are currently the most widely used for treating this disease. But the permanent presence of a metallic platform and the durable polymer can impair the natural healing process of the coronary vessel wall, leading to a prolonged inflammatory response. In recent years, bioresorbable vascular scaffolds (BVS) have emerged as an alternative: this prosthesis in the coronary artery is bioresorbable and therefore impermanent.

By using an in silico (computer modelling) clinical trial platform, clinicians can observe the performance of the scaffold, assess and quantify the intended effect, with a deeper understanding than normal trials can provide. This will not only increase the safety and efficacy of drug-eluting BVS, it also lowers development costs and shorten time-to-market, reduce, refine, and partially replace human clinical trials through a more effective human clinical trials design, and reduce the need for animal testing.

www.insilc.eu

Duration: 2017-2020

1.7 Diabetes-related projects

MISSION-T2D

This project developed a patient-specific model for the simulation and prediction of metabolic and inflammatory processes in the onset and progress of **type 2 diabetes** (T2DM); A diagnostic tool estimates the risk of developing T2DM and predicts its progression in response to possible therapies.

This tool became part of an anti-diabetes app called Vitadock+ and is available for downloading in your app store.

MISSION-T2D Cords website

Duration: 2013-2016

MOSAIC

You can now calculate your risk of developing **type 2 diabetes** online thanks to this project. Its experts developed mathematical models and algorithms that enhance the current tools and standards for the diagnosis of metabolic disorders T2DM, IGT, IFG and GDM. This improves the characterisation of patients suffering from those disorders and helps evaluating the risk of developing T2DM and GDM and their related complications.

www.mosaicproject.eu

Duration: 2013-2016

PAL

PAL is devoted to developing a Personal Assistant for healthy Lifestyle (PAL) for **type 1 diabetes** patients aged 7-14.

The assistant helps children, health professionals and parents to advance the self-management of the **diabetic child**, so that an adequate level is established before adolescence.

Why? Severe episodes and complications can be prevented by performing self-management. For example, the monitoring carbohydrate intake, physical activity, and blood glucose, recognizing symptoms of hypoglycemia and hyperglycemia, and injecting insulin, can help regulate glucose levels and help minimizing the impact of the illness on the patient's health.

The PAL system is composed of a social robot (NAO), its (mobile) avatar, and an extendable set of (mobile) health applications (diabetes diary, educational quizzes, sorting games, etc.), which all connect to a common knowledge-base and reasoning mechanism.

www.pal4u.eu

Duration: 2015-2019

PEPPER

A predictive **diabetes self-management system** - that's the aim of PEPPER. This project is developing a personalised decision support system for **type 1 diabetes** management that will make predictions based on real-time data in order to empower individuals.

www.pepper.eu.com

Duration: 2016-2019

POWER2DM

The main objective of POWER2DM is to develop and validate a personalised **self-management** support system for **type 1 and**

type 2 diabetes patients. It combines and integrates:

- A decision support system based on leading European predictive personalised models for diabetes interlinked with predictive computer models;
- Automated e-coaching functionalities based on Behavioural Change Theories, and;
- Real-time Personal Data processing and interpretation.

By using this system the participation of the patient in the care process will increase, resulting in better self-control and management of the disease. This will lead to better glucose management, thereby preventing severe episodes and long-term complications.

www.power2dm.eu

Duration: 2016-2020

ProEmpower

With a budget of €3 Million, ProEmpower will procure a management solution to support patients with **Diabetes Mellitus type 2**. The procurement will jointly take place in four countries: Turkey, Italy, Portugal and Spain.

Proposed solutions should provide continuous diabetes management to 12 million patients, consider all aspects of care and go beyond the state of the art.

The instrument to jointly purchase the technology is Pre-commercial Procurement (PCP). This type of public procurement is used when there are no near-to-the-market solutions yet and new R&D is needed. PCP can then compare the pros and cons of alternative competing solution approaches.

www.proempower-pcp.eu

Duration: 2016-2020

1.8 Oncology-related projects

PRIMAGE

PRIMAGE proposes a cloud-based platform to support decision making in the clinical management of malignant solid tumours, offering predictive tools to assist diagnosis, prognosis, therapies choice and treatment follow up, based on the use of novel imaging biomarkers, in-silico tumour growth simulation, advanced visualisation of predictions with weighted confidence scores and machine-learning based translation of this knowledge into predictors for the most relevant, disease-specific, Clinical End Points. The proposed data infrastructures, imaging biomarkers and models for in-silico medicine research will be validated in the application context of two **paediatric cancers**, neuroblastoma (NB, the most frequent solid cancer of early childhood) and the Diffuse Intrinsic Pontine Glioma (DIPG, the leading cause of brain tumour-related death in children). These two paediatric cancers are relevant validation cases given their representativeness of cancer disease, and their high societal impact.

www.primageproject.eu

Duration: 2018-2022

iPC

Effective personalized medicine for **paediatric cancers** must address a multitude of challenges, including domain-specific challenges. To overcome these challenges, we propose a comprehensive computational effort to combine knowledge-base, machine-learning, and mechanistic models to predict optimal standard and experimental therapies for each child. Our approach is based on virtual patient models whose analysis can inform personalized diagnostics and recommend treatments and allow care givers to query models and infer benefits and drawbacks for specific treatment combinations for each child.

We will produce, assemble, standardize, and harmonize accessible high-quality multi-disciplinary data and leverage the potential of Big Data and HPC for the personalized treatments of European citizens. In summary, iPC will address the critical need for personalized medicine for children with cancer, contribute to the digitalization of clinical workflows, and enable the Digital Single Market of the EU data infrastructure.

www.ipc-project.eu

Duration: 2019-2022

BD2Decide

Big Data and models for personalised **Head and Neck Cancer** Decision support.

The BD2Decide Integrated Decision Support System links population-specific epidemiology and behavioural data, patient-specific genomic, pathology, clinical and imaging data with big data techniques, multi-scale prognostic models. Advanced graphical visualization tools are developed for prognostic data disclosure and patient co-participation to the selected treatment.

BD2Decide will improve the clinical decision process, uncover new patient-specific patterns that can improve care, and create a virtuous circle of learning. A multi-centric clinical study with over 1,000 patients will be used to validate the system.

www.bd2decide.eu

Duration: 2016-2019

CHIC

Computational Horizons In Cancer (CHIC): Developing Meta- and Hyper-Multiscale Models and Repositories for **In Silico Oncology**.

The CHIC project covers part of the "Virtual Physiological Human" (VPH), which deals with biomedical modelling and simulation of the human body.

www.chic-vph.eu

Duration: 2013-2017

ClinicIMPPACT

This project aims to bring the existing radio frequency ablation (RFA) model for **liver cancer** treatment (developed by its predecessor, the IMPPACT project) into clinical practice.

The project experts are working on an integrated, accurate tool for predicting RFA-induced lesions in liver tissue.

www.clinicimppact.eu

Duration: 2014-2017

DESIREE

eHealth system for support in diagnosis and treatment of **breast cancer**. The DESIREE project is working on a decision support system that predicts the evolution of breast cancer case by case. A web-based collaborative system will bring together all available information of breast cancer cases, will provide a more customised and holistic view of the patient, will obtain new evidence (based on accumulated and collaborative experiences), and will provide agile, intuitive and visual tools for clinical decision support.

If successful, it will be used in Breast Units to apply specific therapies for each patient depending on the diagnosis.

www.desiree-project.eu

Duration: 2016-2019

DR THERAPAT

This project created a Digital Radiation Therapy Patient platform. This **platform** integrates available knowledge on tumour imaging, image analysis and interpretation, radiobiological models and radiation therapy planning into a coherent, reusable, multi-scale digital representation.

www.drtherapat.eu

Duration: 2013-2016

GoSmart

GoSmart has built a generic, open-source software, simulation environment for the planning of image guided percutaneous minimally invasive **cancer treatment** (MICT).

The environment allows the interventional radiologist to select the optimal type of MICT by simulating the personalised result of the different treatments and medical protocols in patient specific conditions.

www.gosmart-project.eu

Duration: 2013-2016

iManageCancer

How can you manage your own care in an intelligent, informative and fun way? The iManageCancer project is finding out how mobile healthcare (**mHealth**) and **serious games** help people with chronic illnesses and in particular **cancer**.

The iManageCancer project will provide a cancer disease self-management platform designed according to the specific needs of patients and focusing on their wellbeing. Eight partners from five European countries are helping those with chronic illnesses manage their health in a new way, all from their smartphone.

www.imanagecancer.eu

Duration: 2015-2018

OraMod

This project dealt with **oral cavity cancer**. To improve early prediction of reoccurrence of this disease, OraMod intended to develop and translate innovative methods, tools, virtual models and predictive markers for risk of reoccurrence from the lab into the clinic and into the usual care delivery practice. OraMod covered part of the "Virtual Physiological Human" (VPH) aimed at personalised healthcare and disease prevention.

www.oramod.eu

Duration: 2013-2016

PICTURE

PICTURE, also part of the VPH, has created an ICT tool for modelling and predicting the outcome of **breast surgery** after breast cancer diagnosis.

www.vph-picture.eu

Duration: 2013-2016

TRANS-FUSIMO

Removing a **tumour** without a scalpel or x-rays? This is possible thanks to a certain type of ultrasound: Strong, concentrated ultrasonic waves are directed at the patient's body in such a way that they heat and kill individual cancer cells. The follow-up of FUSIMO: The new Trans-Fusimo project will use the ultrasound technique for treating cancer in moving organs, especially the **liver**.

The first step is to obtain 3D images from magnetic resonance tomography (MRT) that show the inside of the patient's abdomen and simultaneously register the respiratory movements. Based on this data, experts can perform computer simulations of ultrasound treatment on the liver.

www.trans-fusimo.eu

Duration: 2014-2018

VPH-PRISM

This project has developed a multidisciplinary model of the breast to improve the treatment of **breast cancer**. This model gives insight in environment-tissue interactions and can serve as a basis for quantitative drug efficacy assessment, surgery planning and treatment outcome prediction at both early and advanced stages of breast cancer. The VPH-PRISM project covered part of the "Virtual Physiological Human" (VPH), which deals with biomedical modelling and simulation of the human body.

www.vph-prism.eu

Duration: 2013-2016

BOUNCE

BOUNCE (Predicting Effective Adaptation to Breast Cancer to Help Women to BOUNCE Back) brings together modelling, medical, and social sciences experts to advance current knowledge on the nature of resilience as it relates to recovery from **breast cancer**. The project will predict and increase individual resilience in breast cancer survivors and help them remain in the workforce and enjoy a better quality of life.

A decision-support system for routine clinical practice will provide physicians and other health professionals with concrete, personalised recommendations regarding optimal psychosocial support strategies.

www.bounce-project.eu

Duration: 2017-2021

1.9 Paediatrics-related projects

BigO

By using **big data**, the BigO project aims to redefine the way policy strategies targeting **childhood obesity** prevalence are designed and deployed in European societies.

More than 25.000 obese children and adolescents will be reached out to as sources for community data, provided by mobile and wearable electronics. Comprehensive models of the obesity prevalence dependence matrix will be created, allowing, for the first time the data-driven effectiveness predictions about specific policies on a community and the real-time monitoring of the population response, supported by powerful real-time data visualisations. In short, BigO will provide an innovative new suite, allowing the Public Health Authorities to evaluate their communities based on their obesity prevalence risk and to take local action, based on objective evidence.

www.bigoprogram.eu

Duration: 2016-2020

Digi-NewB

This project wants to reduce **mortality and morbidity of hospitalised new-borns** through a new class of monitoring and a new decision support system (DSS).

The DSS will assist the clinician in his decision-making through non-invasive monitoring of sepsis risk and of cardio-respiratory and neurobehavioral maturations. The monitoring will result in i) a decrease in sepsis related death and morbidity through early and personalised prescription of antibiotics, ii) a decrease in the risks of severe cardio-respiratory events and inadequate prolongation of hospitalization iii) a decrease in health costs.

www.digi-newb.eu

Duration: 2016-2020

MD Paedigree

Worldwide advanced **paediatric digital repository**. In the fight against childhood obesity and other child diseases, this medical research project uses mathematical models, the cloud and big data to improve the treatment of children.

Article: "EU awards 12 million euros to supercompute a healthier future for Europe's children"

www.md-paedigree.eu

Duration: 2013-2017

1.10 Anaesthesia-related projects

RASimAs

A better outlook for those about to undergo surgery or have a child: The RASimAs project worked on a virtual reality simulator for doctors performing regional **anesthesia**. This tool supports prediction and avoidance of possible complications during regional anesthesia providing a precise anatomy of every single patient.

www.rasimas.eu

Duration: 2013-2016

1.11 Sight and hearing-related projects

EMBalance

Balance disorders (e.g. vertigo, Ménière's Disease, migraine-related dizziness etc.) affect more than a third of the EU population at some point in their lives and falls are the most common cause of accidental death in those aged 75+. However, diagnosis of balance disorders is rarely straightforward and can often take months, or even years.

EMBalance has been developing a new, online Decision Support System that will aid clinical decision-making in the evaluation and management of balance disorders. General Practitioners and other doctors will be equipped with this system to help diagnose and treat dizzy patients.

www.embalance.eu

Duration: 2013-2016

EVOTION

Hearing loss prevention, protection from noise, early diagnosis, long-term treatment and rehabilitation, detection and prevention of cognitive decline, and socioeconomic inclusion of patients with hearing loss. All of this calls for appropriate management and public health policies.

Through the use of **big data**, the EVOTION platform will help health care professionals and health policy makers to identify, simulate, select and monitor the effectiveness of current and new hearing loss interventions.

www.h2020evotion.eu

Duration: 2016-2019

PRO4VIP

PRO4VIP was a European Pre-Commercial Public Procurement (PCP) and Innovative Public Procurement (IPP) project that is part of the European Vision 2020 strategy to combat **preventable blindness**, especially due to old age.

This project:

- Created and consolidated a pan-European network of procurers;
- Defined a common innovation procurement roadmap both in the short term and in the long term;
- Defined cross-border and joint public procurement of innovation procedure(s) that best meet(s) PRO4VIP procuring authorities' needs (that could be either a PCP or a PPI or both) and that in line with Vision 2020 would either support the early detection and treatment of functional low vision conditions or would support the provision for low vision services.

www.pro4vip.eu

Duration: 2015-2016

SIFEM

This project helped research on **hearing** impairment and loss as well as **ear surgery** by improving personalised 3D ear visualisation. The SIFEM project also covered part of the "Virtual Physiological Human" (VPH), which deals with biomedical modelling and simulation of the human body.

www.sifem-project.eu

Duration: 2013-2016

Sound of Vision

The Sound of Vision project aims to create and convey an auditory representation of the surrounding environment to assist **blind or visually impaired** people. This representation will be created, updated and delivered in real time without any a-priori knowledge of the environment – indoor/outdoor – and without the need for predefined sensors located in the surroundings.

A high quality user experience is essential; the system uses brain computer interfaces for behaviour understanding, in order to avoid overwhelming the user with information.

www.soundofvision.net

Duration: 2015-2017

HOLOBALANCE

HOLOBALANCE is developing and validating a new personalised platform for virtual coaching, motivation and empowerment of people with **balance disorders**.

The coaching part will be realised by holograms and augmented reality games, along with easy to use sensors (smart bracelet, smart glasses, sensorised soles) that can be customised to implement and coach the user with specific, individualised exercises, offering new forms of accessible user interaction.

To develop this multi-stakeholder user centred coaching ecosystem, the project will engage experts such as physiotherapists, Ear Nose Throat experts (ENTs), neurologists, psychologists and gerontologists. The experts will suggest specific exercises and tasks and an activity plan on a daily basis, which will then be refined and updated through autonomous learning algorithms.

Three different types of coaching will be provided by the HOLOBALANCE platform: balance physiotherapy, cognitive training combined with auditory tasks, and lastly multilevel motivation and physical activity promotion.

www.holobalance.eu

Duration: 2017-2020

1.12 Urogenital system-related projects

EmERGE

EmERGE is developing an **mHealth** platform to enable self-management of **HIV** in patients with stable disease.

The platform will provide users with web based and mobile device applications which interface securely with relevant medical data and facilitate remote access to key healthcare providers. EATG, the European HIV patient organisation, is involved and will interact with representative patients and clinicians from 5 EU countries. The platform and interfaces will be validated in a large study of 3900 patients. Guidelines and policy briefs will be produced to prove the benefits and disseminate the lessons learned to support the uptake of mHealth for self-management of chronic diseases.

www.emergeproject.eu

Duration: 2015-2020

PAEON
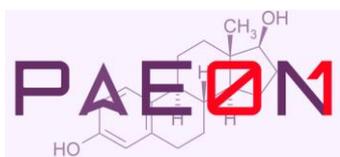
PAEON dealt with **infertility**. It developed patient-specific models of the menstrual cycle and external influences. This helps to predict the outcome of a treatment on patients with infertility related disorders such as Polycystic Ovarian Syndrome, hyperprolactinemia or endometriosis.

The PAEON project covered part of the "Virtual Physiological Human" (VPH), which deals with biomedical modelling and simulation of the human body.

www.paeon.di.uniroma1.it

Duration: 2013-2016

WOMEN-UP

WOMEN-UP is working on delivering a holistic and cost effective solution for the self-management of **urinary incontinence**. A home treatment including pelvic floor muscle training is being tested, allowing for self-management of urinary incontinence via a decision support system combined with remote medical supervision.

Recent studies show that about 56 million European citizens are affected by urinary incontinence. The WOMEN-UP project has the main objective of improving the quality of life of patients affected by this disease, which represents a serious impairment to their professional and personal lives.

www.women-up.eu

Duration: 2015-2019

1.13 Projects related to personal health in general, preventive healthcare, mobile health

BeatHealth

Better at sports while listening to music? BeatHealth wanted to exploit this link between music and movement for boosting individual performance and **enhancing health and wellness**. It aimed to create an intelligent portable tool and IT network for rhythmical stimulation adapted to the individual's skills.
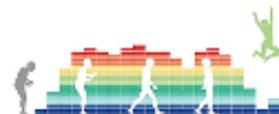
The beneficial effects of BeatHealth were evaluated both in patients with **movement disorders** (i.e., Parkinson's disease), and in healthy citizens of various ages with moderate physical activity.

www.euromov.eu/beathealth

Duration: 2013-2016

DAPHNE

With DAPHNE, researchers and businesses joined forces to help people **manage their weight** and increase physical exercise using emerging technologies and information systems.

The project used a new generation of sensors to detect how much energy a person expends - including how much time they have been sitting still, walking, standing, doing housework, etc - and can monitor their overall fitness.

www.daphne-fp7.eu

Duration: 2013-2016

LIVE INCITE

This consortium of healthcare procurers challenges the industry to develop smart ICT solutions that enable **lifestyle** interventions in the **perioperative process**. The target is new innovative eHealth solutions that can influence patients in a personalised way to take the necessary actions both prior and after **surgery** in their lifestyle to optimise the healthcare outcome.

www.karolinska.se/en/live-incite

Duration: 2016-2020

MyHealth Avatar

Digital representation of a patient's **health status**. The research project launched an app and an online platform that collects, and gives access to, your digital long-term health-status information.

This takes on the form of a life-long health companion ('avatar'). MyHealthAvatar also predicts your risk for stroke, diabetes, cardiovascular disease and hypertension.

www.myhealthavatar.eu

Duration: 2013-2016

NoHoW

Helping people to lose weight has been very much examined. The NoHoW project however focusses on keeping the weight off in the long term. By collecting evidence about what works and what doesn't, the NoHoW researchers are developing a **weight loss maintenance** programme including toolkit.

The toolkit includes mobile apps, web-based tools and innovations such as smart scales and activity trackers that give feedback to participants based on personalised prediction models of what is most effective for them. Participants in Denmark, Portugal and the UK will test the programme.

www.nohow.eu

Duration: 2015-2020

PEGASO Fit for Future

Promoting **healthy lifestyles and food awareness** among teenagers through games and technology.

Knowing how to stay healthy is not enough to motivate individuals to adopt healthy lifestyles. PEGASO targets teenagers through approaches they are familiar with. Gaming strategies, leveraging social networks and communities of interest, integrated in a participatory design methodology can make the difference.

www.pegasof4f.eu

Duration: 2013-2017

PRECIOUS

To maintain a **healthy lifestyle**, PRECIOUS aimed to improve motivation using a combination of motivational interview and gamification principles, as well as creating a personalised system that adapts to the users' goals and preferences. The system measures food intake, physical activity, stress levels and sleep patterns.

www.thepreciousproject.eu

Duration: 2013-2016

SEMEOTICONS

The central idea of SEMEOTICONS was to exploit the **face** as a major indicator of individual's **well-being** by tracing traits of physical and expressive status.

To map and assess these face signs, SEMEOTICONS has designed and constructed a multi-sensory system integrated into a hardware platform having the exterior aspect of a mirror: the so-called 'Wize Mirror'. This should easily fit into users' home or other sites of their daily life.

www.semeoticons.eu

Duration: 2013-2016

SPLENDID

This project developed hi-tech sensors aiming to **prevent obesity**; By measuring food intake and activity the system can assess obesity risks. In the fight against obesity, SPLENDID also developed special programs for guiding both school children and adults.

https://splendid-program.eu/

Duration: 2013-2016

Council of Coaches (COUCH)

How to achieve your **health goals**? The Council of Coaches project is developing an autonomous virtual council that can assist people in the areas of physical, cognitive, mental and social wellbeing, with a particular focus on diabetes and chronic pain.

Each of the virtual coaches has its own area of expertise, personality, and style of coaching. Through sensing and profiling the system builds up a knowledge base to drive the coaching actions.

The project also takes dialogue management to the next level. It introduces a multi-party automatic dialogue system in which virtual characters can interact with a human user. Finally, users can step into the virtual council meeting room and join a special session with the expert coaches, adding a radically new concept of human-computer interaction.

www.council-of-coaches.eu

Duration: 2017-2020

WellCo

WellCo (Wellbeing and Health Virtual Coach) intends to deliver a radical new ICT-based solution for providing personalised advice, guidance and follow-up of users for the adoption of **healthier behaviour choices**.

The advice is specifically tailored to each user. Interventions range from goals to achieve on a Social Network to recommended activities around seven areas:

- cognitive stimulation
- leisure and entertainment
- supporting groups,
- physical activity
- health status
- nutrition and tips

The system will assess the probability of a given disease expression. Guidance and follow-up is provided by a Virtual Coach: an affective-aware coach that is always active and interacts through speech with the user. It acts as a virtual interface and empowers users in their behaviour change process through simulation activities tailored to their current mood.

The whole service is also followed-up and continuously supported by a multidisciplinary team of experts as well as users' close caregivers that provide clinical evidence and knowledge about the user to ensure effectiveness and accuracy of the change interventions.

www.wellco-project.eu

Duration:2017-2020

2. INTERNATIONAL PROJECTS IMPROVING HEALTH AND CARE IN EMERGING ECONOMIES

DMC-MALVEC

This project wants to improve the control of **malaria**, a disease that yearly causes more than 500,000 deaths in sub-Saharan Africa. They will do this by automating the monitoring of mosquito vector populations – this monitoring is a prerequisite for effective insecticide interventions, currently the best way to prevent malaria.

The system, a platform called LabDisk, will monitor the mosquito species ID, the infection status of the mosquitoes and their insecticide resistance. A smart database called Disease Data Management System (DDMS) will collate and analyse malaria data. Third, serious gaming technology called GAME will communicate and teach operational end users the importance and use of data output.

www.dmc-malvec.eu

Duration: 2016-2020

mHealth4Afrika

mHealth4Afrika addresses the quality of **maternal and newborn healthcare delivery** in Southern Africa (Malawi, South Africa), East Africa (Kenya) and Horn of Africa (Ethiopia). The project will research and evaluate the impact of co-designing an open source, multilingual mHealth platform on this topic.

Research and innovation actors from three European and four African countries aim to engage with local end-user communities (i.e. representatives of parents and local community leaders, Ministry of Health, healthcare professionals and volunteers, health oriented NGOs).

The consortium will integrate and adapt:

- Multilingual electronic health records to store patient history, associated tests and test results;
- Sensors to capture the results of a range of standardised tests for expectant and lactating mothers, unborn babies and infants;
- Analytical and visualisation tools to facilitate the interpretation and monitoring of the patient results; and
- Multi-lingual and multimodal mobile interfaces leveraging visualisation and speech synthesis to address literacy deficits and digitise data gathering through electronic forms.

By focusing on accessibility, usability and integrated training, this will facilitate urban, rural and deep rural healthcare workers to adopt and use a comprehensive system that integrates quality community based healthcare delivery with telemedicine. The expected outcome is a multi-region proof of concept that can make a significant contribution in accelerating exploitation of mHealth across Africa.

www.mhealth4afrika.eu

Duration: 2015-2018

3. INNOVATING HEALTHCARE AND THE WAY IT WORKS

3.1. Knowledge sharing for professionals, big data

Some of the projects below focus on helping SMEs, others focus on health professionals, health procurers or policy makers. The policy related projects are analysing Big Data generated from a plurality of sources. This offers possibilities for new insights, for understanding human systems at a systemic level to develop personalised medicine, prevent diseases and support healthy life.

SPHINX

SPHINX aims to introduce a Universal **Cyber Security Toolkit**, thus enhancing the cyber protection of Health IT Ecosystem and ensuring the patient data privacy and integrity. SPHINX toolkit will provide an automated zero-touch device and service verification toolkit that will be easily adapted or embedded on existing, medical, clinical or health available infrastructures, whereas a user/admin will be able to choose from a number of available security services through SPHINX cyber security toolkit. The SPHINX toolkit will enable service providers to specify complete services and sell or advertise these through a secure and easy to use interface.

www.sphinx-project.eu

Duration: 2019-2021

SERUMS

In order to achieve high quality healthcare provision, it is increasingly important to collect **highly confidential and personal medical data** that has been obtained from a variety of sources. Patients expect full privacy, except where permission has been explicitly given, but they equally expect to be provided with the best possible medical treatment. There is a strong and urgent demand to deliver better, more efficient and more effective healthcare solutions that can achieve excellent patient-centric healthcare provision, while also complying with increasingly **strict regulations on the use and sharing of patient data**. The goal of the SERUMS project is to put patients at the center of future health-care provision, enhancing their personal care, and maximizing the quality of treatment that they can receive, while ensuring trust in the security and privacy of their confidential medical data.

www.serums-smartpatient.eu

Duration: 2018-2021

SecureHospitals.eu

The SecureHospitals.eu project seeks to raise awareness on risks and protection opportunities, setup training schemes and the initiate training sessions for IT staff working in hospitals. Through several training approaches, the project will boost the level of training in cybersecurity in Europe, improve the knowledge of staff and in turn contribute to decreased vulnerabilities against cyber-threats and increased patient trust and safety.

https://project.securehospitals.eu/

Duration: 2018-2021

ProTego / Panacea

ProTego project will develop a toolkit and guidelines to help health care systems users address **cybersecurity risks** in this new environment by introducing 3 main advances over current approaches: Extensive use of machine intelligence: a combination of machine inference exploiting a priory knowledge for security by-design, and machine learning from data for run-time threat detection and diagnosis; Advanced data protection measures: advanced encryption techniques and hardware based full memory encryption, and multi-stakeholder IAM to control access to and by user devices, to protect data at rest and provide ultra-secure data exchange portals; Innovative protocols for stakeholder education: using security-by-design analysis to target training and support stakeholders to contribute to network overall security. The toolkit will be integrated and validated in IoT and BYOD-based case studies at two hospitals.

www.panacearesearch.eu

Duration: 2019-2021

DigitalHealthEurope

The project will support **large-scale deployment of digital solutions** for person-centred integrated care by identifying, analysing, and facilitating the replication of highly impactful best practices, utilising the consortium's exceptional expertise on knowledge management and impact, twinning schemes, and mobilisation of stakeholders. A marketplace will enable organisations to find suitable partnerships. A funding advice service and capacity building framework will be provided to further stimulate deployment and scale up.

Building on the unique composition of the consortium, the project will establish and manage 3 collaboration platforms where partners will utilise the vast network of more than 1,100 members representing national, regional, and EU-wide stakeholders. The collaborative work will lead to common strategic agendas and commitments for action that will boost innovation and progress in the respective topics.

www.digitalhealtheurope.eu

Duration: 2019-2020

CUREX

The Health sector's increasing dependence on digital information and communication infrastructures renders it vulnerable to threats to privacy and **cybersecurity**, especially as the theft of health data has become particularly lucrative for cyber criminals. CUREX addresses comprehensively the protection of the confidentiality and integrity of health data by producing a novel, flexible and scalable situational awareness-oriented platform. It allows a healthcare provider to assess the realistic cybersecurity and privacy risks they are exposed to and suggest mathematically optimal strategies for addressing these risks with safeguards tailored.

CUREX is fully GDPR compliant by design. At its core, a decentralised architecture enhanced with a private blockchain infrastructure ensures the integrity of the risk assessment process and of all data transactions that occur between the diverse range of stakeholders involved. CUREX also improves cyber hygiene through training and raising awareness activities for a healthcare institution's personnel. Its validation focuses on the highly challenging condition of (cross-border) health data exchange.

www.curex-project.eu

Duration: 2018-2021

BD2Decide

Cancers of the Head and Neck Region (HNC) are the 6th more deadly cancers worldwide. The main reasons for high mortality are the fact that the majority of cases are diagnosed in advanced stag. At present the only adopted treatment decision method is based on TNM (Tumour-lymphnodes-metastasis) prognostic system, that considers only a few risk factors. The TNM system is therefore inadequate to capture the patient-specific biomolecular characteristics of the tumour. BD2Decide DSS provides clinicians with the "means" and all the necessary information to tailor treatment and care delivery pathway to each and any HNC patient during their usual practice. BD2Decide realizes and validates an Integrated Decision Support System using big data techniques. Graphical visualization tools are developed for prognostic data disclosure and patient co-participation to the selected treatment. BD2Decide will improve the clinical decision process, uncover new patient-specific patterns that can improve care, and create a virtuous circle of learning.

www.bd2decide.eu

Duration: 2016-2019

CrowdHEALTH

Today's rich digital information environment is characterised by a multitude of data sources providing health related information. CrowdHEALTH will introduce a new paradigm of Holistic Health Records (HHRs) that include all health determinants.

CrowdHEALTH will deliver a secure integrated ICT platform that seamlessly integrates **big data** technologies across the complete data path, providing of Data as a Service (DaaS) to **health ecosystem stakeholders**. The project will also develop policy modelling techniques to facilitate the inclusion of Key Performance Indicators (KPIs) in policies and the correlation of these KPIs both with all health determinants captured in HHRs and with information from other domains towards a 'health in all policies' approach. The data will be collected and validated through 5 pilots addressing different environments (care centers, social networks, public environments, living labs, diseases monitoring).

www.crowdhealth.eu

Duration: 2017-2020

eHealth HUB

During its three years, this project will involve over 700 **SMEs and start-ups** in its activities, organising trainings, pitching sessions etc. They will bring together European and international healthcare organisations, investors and other stakeholders. Through its support to eHealth SMEs, the ambition of the eHealth HUB project is not only to increase the number of useful eHealth solutions available on the market, they also aim to optimise efficiency and effectiveness of healthcare provision, personalised medicine and consumer health across Europe. The eHealth HUB team includes European innovation specialists, legal and regulatory experts and eHealth support organisations.

www.ehealth-hub.eu

Duration: 2016-2019

ENS4Care

ENS4Care has developed five guidelines for European **nurses and social workers** on how to use eHealth for promoting a healthy lifestyle and prevention, clinical practice, skills development for advanced roles, integrated care and nurse ePrescribing.

www.ens4care.eu

Duration: 2013-2015

EPP-eHealth

EPP-eHealth project aims to transform the market for eHealth solutions through dialogue and innovation procurement. The project will create a network of **procuring organisations** that understand the opportunities that eHealth can offer and have competence in innovation procurement and the capacity to pioneer new approaches to collaborative procurement.

As well as stimulating demand for eHealth goods and services and creating a robust framework for practical procurement (public procurement of innovation and pre-commercial procurement), it also serves as a leading procurers group for the wider population of some 15,000 hospitals in Europe.

www.innovationithospitals.com

Duration: 2015-2017

EU*US eHealth Work

This project is mapping the need, supply and demand for workforce skills and competences, utilising these results to further develop IT skills and training programmes for the **healthcare workforce**.

The project will provide an interactive web platform in which end-users, educators, governments and industry can exchange information, provide and locate opportunities for training, skills development and employment opportunities. This will increase knowledge related to eHealth, health information technology, and health informatics disciplines.

www.ehealthwork.eu

Duration: 2016-2018

IASIS

Integration and analysis of heterogeneous **big data** for precision medicine and suggested treatments for different types of patients.

IASIS is turning the wave of data heading our way into actionable knowledge for decision makers. This is achieved by integrating data from disparate sources, including genomics, EHRs and bibliography, and applying advanced analytics methods to discover useful patterns.

This information can be used to provide better care, reduce errors and create more confidence in sharing data, thus providing more insights and opportunities. Data resources for two different disease categories will be explored, dementia and lung cancer.

www.project-iasis.eu

Duration: 2017-2020

INSPIRE

 An EU-network that brought together experts and procurers interested in developing and implementing innovative procurements in the eHealth, Active Aging and Independent Living areas.

www.nhg.fi

Duration: 2013 – 2015

mHealth Hub

The EU mHealth Hub will collect and share national experiences of working with mobile health (mHealth) and help Member States introduce mHealth programmes. The project, managed by the World Health Organisation (WHO) and the International Telecommunication Union (ITU), aims to collect best practices on the use of mHealth in Europe in order to gather evidence for the integration of mHealth in European healthcare systems.

www.itu.int/en/ITU-D/ICT-Applications/eHEALTH/Be_healthy/Pages/The-EU-mHealth-Hub-Project.aspx

Duration: 2017-2021

p-Medicine

p-Medicine worked on an **infrastructure** that facilitates the translation from current practice to **personalised medicine**. The project developed a 'data warehouse' and a workbench with a tools repository. Heterogeneous pseudonymised/anonymised data from different origins are stored in this data warehouse for further use by the scientific community.

www.p-medicine.eu

Duration: 2011-2015

PULSE

Working within five global **cities**, PULSE (Participatory Urban Living for Sustainable Environments) will harvest data to enable evidence-driven and timely management of **public health**. The clinical focus of the project will be respiratory diseases (asthma) and metabolic diseases (Type 2 Diabetes) in adult populations. The project will culminate in establishing Public Health Observatories in the five cities. These observatories will serve as linked hubs that utilise knowledge-driven processes and **big data** to shape intersectoral public policy and service provision, support citizen health, and encourage entrepreneurship in the fields of data science and mobile health.

www.pulseproject.info

Duration: 2016-2019

IDIH

The aim of the project is to promote and **increase international cooperation** to advance digital health in the EU and key strategic countries to support active and healthy ageing through innovation. IDIH will identify shared priorities and foster collaboration between the EU and five strategic third countries. Project sets 4 targeted objectives: to support the definition of common priorities to enhance strategic international cooperation in digital health; to provide specific contributions to the international dialogue; to facilitate the exchanges between RTI stakeholders from the EU and strategic third countries in digital health through international workshops, promotion of cooperation opportunities; and to foster international collaboration for digital solutions for health care benefitting the society and industry through networking and co-creation sessions in RTI workshops.

https://idih-global.eu/

Duration: 2019-2022

3.2. Contact with the hospital through ICT - telemedicine

Telemedicine – the interaction between doctors and patients or among health professionals through electronic media – can help citizens receive personalised care, regardless of their location. This is especially helpful for patients suffering from chronic illnesses who have to see a doctor regularly.

ELECTOR

'Changing the future care of **arthritis** patients' – This project is developing a small, mobile blood testing device for home use, so arthritis patients won't lose time and energy travelling to and from the clinic.

The ELECTOR platform encompasses web-based software for communication and data transfer in combination with miniaturised biochemistry devices using blood retrieved by finger pricking for measuring C-reactive protein (CRP), the liver biomarker alanine aminotransferase (ALT), granulocytes and haemoglobin at home.

Results are then transmitted to the rheumatology clinic ready for the appointment with your doctor or healthcare professional via a secure video or audio link. The adaptive and flexible nature of this solution will change the provision of healthcare and may be disseminated to monitor a variety of chronic diseases.

www.elector.eu

Duration: 2015-2018

MOMENTUM

Toolkit and guidelines on **how to deploy telemedicine** in your region or organisation as a daily practice and how to make it sustainable.

www.telemedicine-momentum.eu

Duration: 2012-2015

NIGHTINGALE

The Nightingale healthcare procurers will launch a call for tender for the development of a robust **monitoring and communication system** which connects patients and carers.

The system should provide an early warning of acute deterioration of patients' health condition in and out of hospital, and learn and adapt to different individuals in different situations. An approach based on wearable sensors, self-learning adaptive algorithms and big data analysis will be used.

www.nightingale-h2020.eu

Duration: 2016-2020

REWIRE

REWIRE developed, integrated and field tested an innovative **virtual reality** based **rehabilitation platform**, which allows patients, discharged from the hospital, to continue intensive rehabilitation at home under remote monitoring by the hospital itself.

www.rewire-project.eu

Duration: 2011-2014

THALEA & THALEA II

Through the THALEA project, five hospitals from Germany, Netherlands, Spain, Belgium and Finland will initiate a joint Pre-Commercial Procurement (PCP) focusing on getting a highly interoperable **telemedicine** and **telemonitoring platform** (a central 'monitoring cockpit') for improving the care of acutely live-threatened patients at **intensive care** units.

www.thalea-pcp.eu

Duration: 2013 -2019

United4Health

Through 14 large scale telemedicine pilots in Europe, this project has seeked to deliver **telemedicine** and personal health services to the many people suffering from **Chronic Obstructive Pulmonary Diseases (COPD), diabetes** and **cardiovascular diseases**. The large scale real-life pilots validated and evaluated these services. A report about how the deployment sites embedded telehealth technology into their care pathways and what the results were, has been published. The project experts also give policy recommendations.

www.united4health.eu

Duration: 2013-2016

3.3. Digital health literacy & patient empowerment

REgioNs of Europe WorkINg toGether for HEALTH

Renewing Health aims at implementing, validating and evaluating innovative **telemedicine** solutions within the management of chronic diseases. The project brings together a consortium of nine European regions, where service solutions are operational for tele-monitoring and treatment of patients suffering from diabetes, chronic obstructive pulmonary and/or cardiovascular diseases. The services give patients a central role in the management of their own diseases: in fine-tuning the choice and dosage of medications, in following and adhering to their treatment, and in helping healthcare professionals to detect early signs of worsening.

www.renewinghealth.eu

Duration: 2010-2013

ASCLEPIOS

The vision of ASCLEPIOS is to maximize and **fortify the trust** of users on cloud-based healthcare services by developing mechanisms for protecting both corporate and personal sensitive data. ASCLEPIOS is addressing these limitations by utilizing several modern cryptographic approaches to build a cloud-based eHealth framework that protects users' privacy and prevents both internal and external attacks. ASCLEPIOS offers a novel solution through which healthcare practitioners and medical researchers are able to calculate statistics on medical data in a privacy-preserving way. Finally, a list of activities with the aim to raise security awareness within the healthcare industry will be organized by project.

www.asclepios-project.eu

Duration: 2018-2021

EMPATTICS

This Pre Commercial Procurement project will research and define how health and care professionals and patients **use ICT technologies** to plan interventions with patients and to monitor the progression of their physical and mental state. It will investigate and document the requirements for Decision Support Tools that can be created, deployed and embedded into the daily routines of patients and health and care professionals to deliver quality standardised care across a large population of chronic and elderly patients.

www.empattics.eu

Duration: 2016-2019

IC-HEALTH

This project is working on a series of Massive Open Online Courses (MOOCS) to help improve the **digital health literacy** of European citizens. The project experts will also test the MOOCs and assess their impact on health literacy, digital health literacy and on health self-management. Goal is to advance the understanding of digital health literacy and of how it can be used to improve health outcomes. Countries involved in the pilot are Spain, Italy, Belgium, United Kingdom, Netherlands, Sweden, Germany and Denmark.

www.ichealth.eu

Duration: 2016-2018

3.4. eHealth interoperability and cross-border healthcare

PHArA-ON

Pharaon's overall objective is to make a reality smart and active living for Europe's ageing population by creating a set of integrated and highly customizable interoperable open platforms with advanced services, devices, and tools including IoT, artificial intelligence, robotics, cloud computing, smart wearables, big data, and intelligent analytics. Platform interoperability will be implemented within Pharaon ecosystems and platforms, as well as other standardised platforms within health and other domains (energy, transport and smart cities). Data privacy, cybersecurity and openness will be key design principles.

Duration: 2019-2023

Smart4Health

Smart4Health will enable the citizen-centred EU EHR exchange for personalised health. This will pave the way for the full deployment of citizen-centred solutions and services in a digital single market for wellbeing and healthcare.

It will provide for **interoperability, complementarity and cooperativity** with profiles that are currently used e.g. by Member States and regions. Smart4Health will enable the bridging between the diverse EU EHR data and citizen-generated health data. It will connect citizens to science and personalised health services. Smart4Health provides an easy, secure, constantly accessible and portable health data and services prototype, thus advancing citizen health and wellbeing, and digital health innovation.

www.smart4health.eu

Duration: 2019-2023

InteropEHRate

InteropEHRate aims to empower the citizen and **unlock health data from local silos**, using a bottom-up approach for EHR interoperability that is mediated by the citizen through the adoption of a D2D (device to device) standard, authorized by the citizen through peer-to-peer protocols for cross-border interoperability among EHRs and research apps, is based on open specifications, connecting for-profit and non-profit data providers with different levels of interoperability, as well as has a co-design approach and a specific governance model that will manage human aspects related to ethics, laws, technology evolution.

www.interopehrate.eu

Duration: 2019-2022

FeatureCloud

FeatureCloud's transformative security-by-design concept will minimize the cyber-crime potential and enable first secure **cross-border collaborative data mining** endeavours. FeatureCloud will be implemented into a software toolkit for substantially reducing cyber risks to healthcare infrastructure by employing the world-wide first privacy-by-architecture approach, which has two key characteristics: (1) no sensitive data is communicated through any communication channels, and (2) data is not stored in one central point of attack. Federated machine learning (for privacy-preserving data mining) integrated with blockchain technology (for immutability and management of patient rights) will safely apply next-generation AI technology for medical purposes. Importantly, patients will be given effective means of revoking previously given consent at any time.

www.featurecloud.eu

Duration: 2019-2023

ASSESS CT

To contribute to better semantic interoperability of eHealth services in Europe, ASSES CT investigated the fitness of the international clinical terminology 'SNOMED CT' as a potential standard for EU-wide eHealth deployment.

The project experts analysed concrete reasons for adoption/non adoption of SNOMED CT, lessons learned, success factors, type and purpose of use, multilingualism, cultural differences, strengths and weaknesses. They investigated the impact of SNOMED CT adoption from a socio-economic viewpoint, encompassing management, business, organisational, and governance aspects.

http://www.assess-ct.eu/

Duration: 2015-2016

DECIPHER PCP

DECIPHER PCP dealt with mHealth procurement. This process resulted in a mobile solution which enables secure **cross-border access to existing patient healthcare portals**.

www.decipherpcp.eu

Duration: 2012-2016

eStandards

eStandards is advancing **eHealth interoperability and global alignment of standards**. The project experts are joining up with stakeholders all over Europe and globally to build consensus on eHealth standards, accelerate knowledge-sharing, and promote wide adoption of standards.

The proposal's ambition is to strengthen Europe's voice and impact, while reinforcing the bridges across the Atlantic and among Member States.

An eStandards Roadmap and associated evidence base, a white paper on the need for formal standards, and two guidelines addressing how to work with: (a) clinical content in profiles and (b) competing standards in large-scale eHealth deployment, will be pragmatic steps toward alignment and convergence.

www.estandards-project.eu

Duration: 2015-2017

EURO-CAS

Between 2016 and 2018, the EURO-CAS project develops a sustainable 'Conformity Assessment Scheme' (CAS) for Europe, which will promote the adoption and take-up of **interoperability testing of eHealth solutions** against identified eHealth standards and profiles defined in the [refined eHealth European Interoperability Framework](#).

The project is led by IHE-Europe (BE) and coordinated by EIBIR (AT), and joined by fourteen national and regional government bodies, competence centres, and associations.

www.euro-cas.eu

Duration: 2016-2018

MIDAS

Information is everywhere. But when it comes to healthcare, unless we can bring the information together and analyse it, we won't get the most from it. That's where MIDAS (Meaningful Integration of Data, Analytics and Services) hopes to make its mark.

This project will investigate connecting patient data from European health authorities with individual data collected from apps, sensors and social media. Complying with the highest standards of data protection and ethics, the data will be analysed on the pioneering MIDAS platform, which provides a tool for **policy makers** to benchmark, simulate and forecast outcomes of healthcare policy decisions.

Challenges which will be addressed include ageing population, obesity and mental health. This research should dramatically enhance the effectiveness of healthcare policies in these fields.

www.midasproject.eu

Duration: 2016-2020

openMedicine

Goal of the project: Safer and better cross-border (and also national level) healthcare through interoperable **ePrescriptions**.

The project experts are developing concrete solutions to communicate medicines in cross-border settings. Whereas the epSOS project basically solved the electronic 'communication' or message transfer problem, it encountered a serious 'delivery' problem: No common data models, standards and a lack of common vocabulary – issues to be solved by openMedicine.

www.open-medicine.eu

Duration: 2015-2017

Trillium Bridge II

What if you, while visiting another country, need urgent medical help and the doctor doesn't know your medical history? After its predecessor Trillium Bridge I, this project further advances global Electronic Health Record (EHR) interoperability. Activities surrounding the **International Patient Summary** (IPS) standards can nurture digital health innovation, lower trade barriers and advance patient safety, bridging the gap between strategic intent and capability for action.

www.trilliumbridge.eu

Duration: 2017-2019

VALUeHEALTH

VALUeHEALTH establishes how **eHealth interoperability** can create and deliver value for all citizens, for a sustainable market in scaling up cross-border services.

This project is a Coordination and Support Action. It develops an evidence-based business plan for eHealth interoperability, beginning with financial support by the Connected Europe Facility (CEF) programme to member states, and then sustainable revenue streams for developing and operating self-funding priority pan-European eHealth Services beyond 2020.

www.valuehealth.eu

Duration: 2015-2017

3.5. Projects related to clinical research

SILICOFCM

SILICOFCM project will develop **in silico computational cloud** platform which will integrate from stopped-flow molecular kinetic assays to magnetic resonance imaging of the whole heart, bioinformatics and image processing tools with state of the art computer models with the aim to reduce animal and clinical studies for a new drug development and optimized clinical therapy of familial cardiomyopathies.

The developed system will be distributed on the cloud platforms in order to achieve efficient data storage and high performance computing, that can offer end users results in reasonably short time. Academic technical partners will be responsible for developing and integration of in silico cloud computational platform with multi-scale cardiac muscle modelling which include experiments on protein mutation in vitro.

www.silicofcm.eu

Duration: 2018-2021

Avicenna

Clinical trials to test new drugs, devices or treatments are not only expensive, they are also risky for the test subjects; animals or humans. Solution: Perform the tests using high-quality and reliable computer simulations. Avicenna, part of the VPH community, created a roadmap to make this possible and to transform the entire biomedical industry.

Now the project has ended, the Avicenna Alliance is continuing the work: They are bringing all relevant stakeholders such as the biomedical industry, health researchers and policy makers together and they are promoting in silico medicine (predictive computer modelling).

avicenna-isct.org

Duration: 2013-2016

EURECA

The EURECA project allowed faster eligible patient identification and enrolment in **clinical trials**, providing access to the large amounts of patient data and enabling long term follow up of patients. This avoids the current need for multiple data entry in the various clinical care, faster transfer of new research findings and guidelines to the clinical setting.

eurecaproject.eu

Duration: 2012-2015

Linked2Safety

Linked2Safety provided a **secure medical information space** for semantically interconnecting anonymous EHRs to advance clinical practice, to accelerate medical research, to improve the quality of healthcare, and to enhance patients' safety.

www.linked2safety-project.eu

Duration: 2011-2014

Salus

The Salus project provided a standard-based interoperability framework of electronic health records that enables the execution of **drug safety studies** áfter the drugs have come out on the market.

www.salusproject.eu

Duration: 2012-2015

SemanticHealthNet

The purpose of this project was designing a semantic interoperability infrastructure of clinical and biomedical knowledge (a so called Network of excellence in semantic interoperability) and a roadmap for governments and other stakeholders. They wanted to help ensure that EHR systems are optimised for patient care, public health and clinical research across healthcare systems and institutions.

www.semantichealthnet.eu

Duration: 2011-2014

REPO-TRIAL

REPO-TRIAL will develop an innovative in-silico based approach to improve the efficacy and precision of **drug repurposing trials**. The aim is to establish generally applicable in silico trials for other mechanistically related or defined disease phenotypes, for which size, duration, and risks will be reduced and precision increased.

This generates rapid patient benefit, reduces drug development costs as well as risks, and enhances industrial competitiveness. Scientifically, the project aims to reduce the uncertainty and vagueness of many current disease definitions that describe a symptom or apparent phenotype in an organ rather than defining diseases mechanistically as disturbance of self-regulation equilibria of biomolecular processes.

www.repo-trial.eu

Duration: 2018-2023

STriTuVaD

The STriTuVaD project (In Silico Trial for Tuberculosis Vaccine Development) aims to deliver a computer-generated ("in silico") trial platform to simulate the human physiology and physiopathology in patients affected by **tuberculosis**.

Virtual populations of individuals will be created in order to study the effects of tuberculosis treatments, allowing for simulating vaccination strategies and predicting treatment outcomes for a more personalised medicine approach.

The in silico trial will predict, explore and inform if vaccination strategies are efficient or not. The predictions will be simultaneously validated with a phase II clinical trial that will take place in India.

An in silico trial approach, if efficient, could not only reduce human testing, it could also drastically reduce the cost of innovation in this critical sector of public healthcare.

Tuberculosis is one of the world's deadliest diseases. It is getting more dangerous due to the increased mobility of the world's population and the appearance of several new bacterial strains that are multi-drug resistant (MDR). The biggest issues especially in development countries are the duration of the therapy, because of the high costs involved, the increased chances of non-compliance (which increases the probability of developing an MDR strain), and the time the patient is still infectious to others.

www.strituvad.eu

Duration: 2017-2022

TRANSFoRm

TRANSFoRm developed a '**rapid learning healthcare system**' driven by advanced computational infrastructure that can improve both patient safety and the conduct and volume of clinical research in Europe.

www.transformproject.eu

Duration: 2010-2015

4. ICT FOR ACTIVE AND HEALTHY AGEING

4.1. Robotics for Ageing Well

ACANTO

The goal of ACANTO (CyberphysicAl social NeTwOrk using **robot friends**) is to spur older adults into a sustainable and regular level of physical **exercise** under the guidance and supervision of their carers.

The key elements of ACANTO are

- a robotic friend (the FriWalk) that supports the user in the execution of daily activities that require physical exercise;
- an intelligent system that recommends activities which are compelling and rewarding for the senior user.

The FriWalk takes the form of a standard walking assistant, but it is in fact an intelligent robot that is able to localise itself, to sense the surrounding environment, to plan a course of action that suits the user needs and to guide the user along safe routes. The FriWalk is also a personal trainer that can support the user in the execution of a training programme, monitor the motion of the user in search of muscular or gait problems and report them into the user profile.

www.ict-acanto.eu

Duration: 2015-2018

ACCRA

The mission of ACCRA is to develop advanced **robotics** based solutions for extending active and healthy ageing in daily life by defining, developing and demonstrating an agile **co-creation development process**.

To this end, a four-step methodology (study, co-creation, experimentation, sustainability analysis) will be defined and applied in three applications (support for walking, housework, conversation rehabilitation) and assessed in France, Italy, the Netherlands and Japan. The three applications will be based on a FIWARE platform integrating a number of enablers including features of the universAAL project and supporting two robotics solutions, Astro (Robot) and Buddy (Robot companion).

The MAST impact assessment framework will be used integrating the following dimensions: user perceptions, user outcomes, ELSI, economic aspects, technical aspects, organisational aspects. ACCRA is a joint European-Japanese initiative including a multidisciplinary team of 6 European partners and 3 Japanese partners.

www.accra-project.org

Duration: 2016-2019

CARESSES

Culture Aware Robots and Environmental Sensor Systems for Elderly Support

The need for cultural competence has been deeply investigated in the nursing literature. However, it has so far been neglected in Robotics.

Not anymore: the EU-Japan co-funded CARESSES project aims to build care robots that are able to autonomously re-configure their way of acting and speaking, to match the **culture, customs and etiquette** of the person they are assisting.

www.caressesrobot.org

Duration: 2017-2020

ENRICHME

ENRICHME tackles the progressive decline of cognitive capacity in the ageing population. An **integrated platform for Ambient Assisted Living (AAL)** and a **mobile service robot** for long-term monitoring and interaction will help the elderly to remain independent and active for longer.

The system will enable caregivers and medical staff to identify evolving trends of cognitive impairments and to detect immediate emergencies. ENRICHME will use new qualitative models for rich yet compact representations of daily life activities.

www.enrichme.eu

Duration: 2015-2018

GrowMeUp

The main goal of this project is to provide an affordable **robot that is able to learn** from older people's routines and habits, therefore enhancing and adapting its functionality to dynamically compensate the deteriorating cognitive ability of individuals, while simultaneously ensuring a consistent service provision and quality of life throughout the aging process.

Moreover, **cloud-computing technologies** are explored and developed so as to allow different robots to share information between each other, where each unit will be able to capitalise from a collective knowledge base of service information.

www.growmeup.eu

Duration: 2015-2018

I-SUPPORT

I-SUPPORT (ICT-Supported Bath Robots) aims to develop a **robotic shower system** to assist frail persons with the movements associated with showering. The proposed system will be equipped with three service robotic devices:

- A motorised shower chair dedicated to the provision of the stand-to-sit and sit-to-stand functionality.
- A robotic shower hose dedicated to the provision of pouring water, soaping, etc.
- A robotic washer/wiper dedicated to the provision of scrubbing, wiping and drying.

The robotic shower hose will make it easier to wash difficult–to-reach parts such as the back or the feet. It will be made of soft materials and its design will resemble that of a conventional shower hose.

The system will move either semi-autonomously (partially controlled by the computer and partially by the person) or will be tele-manipulated using a device very much similar to a TV remote control.

www.i-support-project.eu

Duration: 2015-2018

MARIO

During the three years of the project, three pilot studies of **robots interacting with people with dementia** are undertaken:

- In the West of Ireland, organised by NUI Galway's School of Nursing and Midwifery;
- In Stockport, UK, organised by the city's healthcare managers;
- In Italy, organised by the leading research hospital Casa Sollievo della Sofferenza.

The technology at the heart of MARIO is the robot Kompai, designed and developed by a consortium partner, the French company Robosoft. Other partners in the consortium are providing technological expertise in the areas of robotic applications and semantic computing.

www.mario-project.eu

Duration: 2015-2018

RADIO

The RADIO consortium is pursuing a novel approach to **acceptance and unobtrusiveness** of technology in active and healthy ageing, and for integrating robots and smart home sensors/Internet of Things.

The project's research has four main dimensions: User acceptance; integrated and power-aware data collection/transmission/processing; user interfaces and architecture.

The sensors for health monitoring take the form of an integrated smart home/assistant robot system. This way the attention lies on the functionality of the sensors rather than on the sensors themselves. In this manner, sensors do not need to be discrete and distant or masked and cumbersome to install; they do however need to be perceived as a natural component of the smart home/assistant robot functionalities.

www.radio-project.eu

Duration: 2015-2018

RAMCIP

Robotic Assistant for Mild Cognitive Impairment (MCI) patients at home.

The RAMCIP project is working towards future service robots for assisted living environments that can provide safe, proactive and discreet assistance in daily life, ranging from food preparation, eating and dressing activities, through to managing the home and keeping it secure.

The robot should help users to maintain a positive outlook and also to exercise their cognitive and physical skills, embedding exercise in their daily behaviour. Key research strands are:

- Cognitive functions, allowing the robot to decide when and how to assist, acting autonomously or in cooperation with the user;
- Communication interfaces, with a strong emphasis on empathic communication and augmented reality displays;
- Advanced, dextrous and safe robotic manipulation capabilities, for the first time applied in service robots for assisted living environments, enabling grasping and manipulation of a wide variety of home objects, as well as safe physical human-robot interaction.

www.ramcip-project.eu

Duration: 2015-2018

ROBOT-ERA

Research on implementation and integration of **advanced robotic systems** and **intelligent environments** in real scenarios for the ageing population.

Robot-Era.implemented and demonstrated the general **feasibility**, scientific/technical **effectiveness** and social/legal **plausibility** and **acceptability** of advanced robotic services, integrated in intelligent environments. The project experts developed domestic, condominium and even outdoor robotic platforms.

www.robot-era.eu

Duration: 2012-2015

SILVER

The SILVER procurers searched for new robotics based technologies to help older people living independently at home even if they have physical or cognitive disabilities.

After a Pre-Commercial Procurement (PCP) process, the outcome is the LEA robot developed by Robot Care Systems. This **mobile personal assistant in the shape of a walker** can help with daily routines and housekeeping.

It also stimulates the elderly to stay active and can act as a personal trainer - or even as a dancing partner. Because of these functionalities, LEA can be used also for rehabilitation. Furthermore, in Phase 3, cognitive software will be added in order to enable LEA to remember and recognize objects, faces and places, for example.

www.silverpcp.eu

Duration: 2012-2016

4.2. Innovative solutions for independent living

SMART BEAR

The aim of the SMART BEAR platform is to integrate heterogeneous sensors, assistive medical and mobile devices to enable the continuous data collection from the everyday life of the elderly, which will be analysed to obtain the evidence needed in order to offer personalised interventions promoting their healthy and independent living. The platform will also be connected to hospital and other health care service systems to obtain data of the end users (e.g., medical history) that will need to be considered in making decisions for interventions. SMART BEAR will leverage big data analytics and learning capabilities, allowing for large scale analysis of the above mentioned collected data, to generate the evidence required for making decisions about personalised interventions.

www.streamvision.com/en/e-health/european-project-smart-bear

Duration: 2019-2023

WorkingAge

WorkingAge will use innovative HCI methods to measure the user **emotional/cognitive/health state** and create communication paths. At the same time with the use of IoT sensors will be able to detect environmental conditions. The purpose is to promote healthy habits of users in their working environment and daily living activities in order to improve their working and living conditions. By studying the profile of the >50 year old workers and the working place requirements in three different working environments, both profiles (user and environment) will be considered. Information obtained will be used for the creation of interventions that will lead to healthy aging inside and outside the working environment. This innovative system will provide workers assistance in their everyday routine in the form of reminders, risks avoidance and recommendations. In this way the WorkingAge project will create a sustainable and scalable product that will empower their user's easing their life by attenuating the impact of aging in their autonomy, work conditions, health and well-being.

www.cordis.europa.eu/project/rcn/219015/factsheet/en

Duration: 2019-2022

sustAGE

sustAGE aims to develop a person-centered solution for promoting the concept of "sustainable work" for EU industries. The manifold contribution focuses on the **support of the employment and later retirement of older adults** from work and the optimization of the workforce management. The sustAGE platform guides workers on work-related tasks, recommends personalized cognitive and physical training activities with emphasis on game and social aspects, delivers warnings regarding occupational risks and cares for their proper positioning in work tasks that will maximize team performance.

www.sustage.eu

Duration: 2019-2021

SmartWork

SmartWork builds a worker-centric AI system for **work ability sustainability**, integrating unobtrusive sensing and modelling of the worker state with a suite of novel services for context and worker-aware adaptive work support. The unobtrusive and pervasive monitoring of health, behaviour, cognitive and emotional status of the worker enables the functional and cognitive decline risk assessment. The holistic approach for work ability modelling captures the attitudes and abilities of the ageing worker and enables decision support for personalized interventions for maintenance/improvement of the work ability. The SmartWork services and modules also empower the employer with AI decision support tools for efficient task completion and work team optimization through flexible work practices. Formal and informal carers are able to continuously monitor the overall health status and risks of the people they care for, thus providing full support to the older office worker for sustainable, active and healthy ageing.

www.smartworkproject.eu

Duration: 2019-2021

See Far

See Far project aims to develop and validate a digitally enabled adaptive solution supporting ageing **workforce with vision loss**, an age-related condition, to remain actively involved in professional life. The See Far solution consists of two components: See Far smart glasses where the display lenses are adapted to the needs of the users and optimize their view and See Far mobile application allowing monitoring of the central vision evolution and prediction of the risk for the presence of disease.

The combination of the output of the See Far mobile application with the output of the See Far smart glasses will lead to the provision of suggestions, through augmented reality, to the user supporting independent active and healthy lifestyles.

www.see-far.eu

Duration: 2018-2021

CO-ADAPT

CO-ADAPT proposes a framework that provides principles for a two-way **adaptation in support** of ageing citizens: 1) Human Adaptation Support: CO-ADAPT empowers ageing citizen to adapt to changed conditions through a personalised Artificial Intelligence (AI) conversational agent providing comprehensive change support based on language and physiological analytics; 2) Work Systems Adaptations: CO-ADAPT defines three types of smart adaptations in work systems with different level of technology sophistication to age thresholds in smart shift scheduling tools, to individual capabilities considering cognitive workload in assembly stations, adaptations to work tasks in contextually recommending people, documents and applications for cognitive augmentation. The evaluation approach is focussed on quantifying economic benefits in terms of improved work ability.

www.coadapt-project.eu/

Duration: 2018-2022

BIONIC

Our overall objective is to develop a holistic, unobtrusive, autonomous and privacy preserving platform for realtime **risk alerting and continuous coaching**, enabling the design of workplace interventions adapted to the needs and fitness levels of

specific ageing workforce. Gamification strategies adapted to the needs and wishes of the elderly workers will ensure optimal engagement for prevention and self-management of musculoskeletal health in any working/living environment. The BIONIC concept will be a game changer in medical wearable technology integrating sensor modules in multi-purpose and configurable Body Sensor Networks (BSNs). Results will be validated in real workplace environments by two prominent European Enterprises from the Construction and the Manufacturing sectors.

www.bionic-h2020.eu

Duration: 2019-2021

AgeingatWork

Ageing@Work will develop a novel ICT-based, personalized system to support ageing workers into designing fit-for-purpose work environments and managing flexibly their evolving needs. Advanced dynamically adapted virtual models of workers will incorporate specificities in respect to skills, physical, cognitive and behavioural factors, being extended from the work context to personal life aspects interacting with workability, health and wellbeing. Virtual workplace models will encode characteristics of the workplace, at both physical and semantic, resource/process levels. Computational intelligence will be responsible to assess user specificities and needs and perform personalized predictive simulations on workability, health and well-being. Recommendations will then be provided both to the worker and company, on how the working conditions must adapt. On top of these, a novel Ambient Virtual Coach (AVC) will encompass an empathic mirroring avatar for subtle notifications provision, an adaptive Visual Analytics –based personal dashboard, and a reward-based motivation system targeting positive and balanced worker behaviour at work and personal life.

www.ageingatwork.eu

Duration: 2019-2021

ACTIVAGE

ACTIVAGE aims to prolong and support independent living of older adults in their living environments and responding to real needs of caregivers, service providers and public authorities. The project is deploying innovative and user-led large-scale pilots across nine sites in seven European countries based on **Internet of Things** (IoT) technologies.

This way, ACTIVAGE will build the first European interoperable and open IoT ecosystem, reusing and scaling up underlying open and proprietary IoT platforms, technologies and standards, that will enable the deployment and operation at large scale of Active & Healthy Ageing IoT based solutions and services.

www.activageproject.eu

Duration: 2017-2020

ALFRED

ALFRED developed a mobile, personalised **assistant for your smartphone** that helps elderly people stay independent, coordinate with their carers and foster their social contacts.

The ALFRED app is based on advanced technology such as speech interaction, so you can give voice commands instead of having to type. Overall, the smart phone assistant is meant to be very easy to use and provides context-sensitive services related to social inclusion, care, physical exercise and cognitive games.

alfred.eu

Duration: 2013-2016

eWALL

eWALL is a screen-like solution that can be mounted on an existing wall. It enables a number of services that make life easier, taking into account cardiopulmonary conditions, muscle functions, declines in neuromuscular control of movements which cause higher risks of fall, declines in memory, the ability to orientate and coping with complex situations.

The project carried out multi-disciplinary research and validated the wall concept with clinical evidence. This included both technical-, user- and legal-evaluation, to measure the impact on the quality of life. The project also performed socio-economic studies to deliver recommendations for the health sector resulting in mid- and long-term benefits for the sustainability of national health systems.

ewallproject.eu

Duration: 2013-2016

Miraculous-Life

This project designed, developed and evaluated an innovative user-centric technological solution - the 'Virtual Support Partner' – a digital persona attending to a senior's daily activities and safety needs, while the senior goes about his normal daily life.

A crucial asset of the Virtual Support Partner is its capacity for behavioural and emotional understanding: It is able to fuse facial expressions, intonation, gestures and other contextual information of the user's environment to provide empathic responses and services. As such, it can support daily activities, in a human-like way. This in turn stimulates and motivates older people to stay active.

www.miraculous-life.eu

Duration: 2013-2016

PhysioDom-HDIM

PhysioDom–HDIM proposes an ICT platform that offers a new service: Home Dietary Intake Monitoring based on readings and monitoring of weight, lean/fat ratio and physical activity, complemented with an intervention structure and strategy – the Home Diet Coaching.

This enhances living conditions for senior citizens, as well as improving the efficiency and integration of health and social care systems.

The PhysioDom HDIM system was tested in a small French pilot, the Reseau Vercors Sante project, which trialled the system in 50 homes and engaged with 70 health and social care professionals. This two-year pilot delivered positive results and acceptance by its users. It now waits to be deployed on a larger scale that involves all of the players - from institutions to end-users at home.

physiodom.viveris.fr

Duration: 2014-2016

UNCAP

This project has developed an open, scalable and privacy-savvy ICT infrastructure designed to help aging people live independently while maintaining and improving their lifestyle. They had 10 pilot sites with a focus on prevention and integrated care. Outcome: real products that are available on the market.

www.uncap.eu

Duration: 2015-2017

EMPATHIC

Empathic, Expressive, Advanced Virtual Coach to Improve Independent Healthy-Life-Years of the Elderly

The EMPATHIC project will research, innovate, explore and validate new paradigms and platforms, laying the foundation for future generations of Personalised Virtual Coaches to assist elderly people living independently at and around their home.

Innovative multimodal face analytics, adaptive spoken dialogue systems and natural language interfaces are part of what the project will research and innovate, in order to help dependent ageing persons and their carers.

The project will use remote non-intrusive technologies to extract physiological markers of emotional states in real-time for online adaptive responses of the coach, and advance holistic modelling of behavioural, computational, physical and social aspects of a personalised expressive virtual coach. It will develop causal models of coach-user interactional exchanges that engage elders in emotionally believable interactions keeping off loneliness, sustaining health status, enhancing quality of life and simplifying access to future telecare services.

www.empathic-project.eu

Duration: 2017-2020

NESTORE

Novel Empowering Solutions and Technologies for Older people to Retain Everyday life activities

NESTORE will develop an innovative, multi-dimensional, personalised coaching system to support healthy ageing by:

1. Generating and sustaining motivation to take care of your health;
2. Suggesting healthy nutrition and personalised physical and mental coach, as well as
3. Social interaction, to prevent decline and preserve wellbeing.

The main concept is to develop NESTORE as a friend and a coach able to support both the individual and the social dimension. By understanding the emotional status as well as the 'weaknesses' of the user, NESTORE can propose actions and activities that improve and maintain wellbeing. A key innovation element in NESTORE is the design of 'pathways of interest' able to provide hints and services according to the user's preferences, while ensuring that the overall wellbeing and health status is maximised.

www.nestore-coach.eu/home

Duration: 2017-2020

CAPTAIN

Coach Assistant via Projected and Tangible Interface

CAPTAIN will create an innovative projective environment to provide useful and effective contextualised (i.e. directly projected onto the real world) assistance and virtual coaching to the elderly living at home.

To maximise its effectiveness, the coaching interface will blend with the home environment where personalised aid is based on the use of Artificial Intelligence. This system will act as a constant, vigilant, and pleasant companion in the house, ubiquitously present wherever and whenever needed, that provides contextualised advice to help preserving the elderly's mental, physical (promoting exercise in a playful manner), cognitive (constantly stimulating the elderly during daily activities), and social (facilitating access to social interactions) well-being.

www.captain-eu.org

Duration:2017-2020

4.3. Innovating elderly care

DECI

The DECI project aims to design and demonstrate the value of feasible interventions on **business models in elderly care**, enabled by ICTs, to be scaled across National Healthcare Systems.

DECI will propose ways to strengthen traditional care organisation models through the support of digital tools targeted for elderly with Cognitive Impairments, based of innovative technologies, information sharing, data interoperability and replicable logics.

Four living lab pilots will assess feasibility, effectiveness and benefits within local healthcare systems and real-life environments in Israel, Italy, Spain and Sweden.

www.deci-europe.eu

Duration: 2015-2018

ehcoBUTLER

A **global ecosystem** for the independent and healthy living of elder people with mild cognitive impairments.

The ehcoBUTLER project is testing an open ICT platform that enables elderly to simply integrate their leisure and care apps. The ehcoBUTLER platform also helps the family, caregivers and social care systems to share information on activities, conditions and moods of those they care about. Finally it also provides a trusted ecosystem for apps providers.

ehcoBUTLER will demonstrate the socio-economic benefits from ICT pilot projects with real users, including how the platform can help translate promising results into scalable practice across Europe. To that end the ehcoBUTLER platform is tested in 7 countries on 8 pilot sites, with different business cases, assessing their returns of investment as well as social returns on investment, including profitability, health care cost reduction and increased independence and quality of life. Countries involved are Italy, France, Serbia, Israel, Greece, Spain and Netherlands.

www.ehcobutler.eu

Duration: 2015-2017

IN LIFE

Building on existing knowledge and tested AAL technology/services IN LIFE has offered **19 different services**, which were further optimised and adapted to the particular needs and wants of various elderly groups, including mild cognitive impairment (MCI), early dementia and cognitive impairment with co morbid conditions, plus formal and informal caregivers. These interoperable services were integrated into an open, cloud- based, reference architecture and were successfully tested in 6 Europe-wide pilots in Greece, Netherlands, Slovenia, Spain, Sweden, and UK, with over 1200 elderly with cognitive impairments, 600 formal and informal caregivers, and 60 other stakeholders.

Attention was paid to issues concerning multilingual and multicultural environments. The project has established and extensively tested new business models for a new taxonomy of elderly with cognitive impairments, encompassing those that are clustered as 'dependent', 'at risk', 'assisted' or 'active' and formulating and accessing new business scenarios, such as the 'user-centric', 'service provider-centric' and 'data exploitation-centric' ones.

www.inlife-project.eu

Duration: 2015-2018

STOPandGO

The overarching strategy of STOPandGO (Sustainable Technology for Older People – Get Organised) has been to pilot an **innovative procurement process** to improve the lives of older citizens. Through Public Procurement of Innovative Solutions (PPI), the project produced and validated a standard 'European Specification Template' that was enacted in a coordinated manner in six localities.

STOPandGO showed that an innovative procurement process based on a service delivery approach prioritised clearly defined clinical and social outcomes.

The procurer teams are ready with appropriate patient groups in four countries, which make up more than 5,000 users. Relevant services and suppliers were invited to an open tender. The approach emphasised the importance of developing outcome-based service specifications with clear built in key performance indicators.

www.stopandgoproject.eu

Duration: 2014-2018

SAAM

Supporting Active Ageing through Multimodal Coaching

The expected result of the 3-year innovative project is the creation of a virtual assistant supporting active ageing. The end goal is to extend, as much as possible, the active and independent life of people over 60 years of age living in their own homes, as well as to support the work of those taking care of them (family, friends, and social carers).

www.bilsp.org/saam-active-ageing

Duration: 2017-2020

vCARE

The vCare project (Virtual Coaching Activities for Rehabilitation in Elderly) addresses both a **participatory design** driven by users' needs, and the **personalisation** of the care pathways enabled by technology. A rehabilitation process is an ideal setting to improve this as users (physicians and patients) interact together for a long period in a clinic (from two weeks to two months).

This is an opportunity to embed the clinical profiles and the pathways that will drive the behaviour of the virtual coach at home into the knowledge of the system.

www.helict.de/index.php/en/research/127-vcare

Duration: 2017-2021

4.4. Better connected through integrated care

Beyond Silos

Learning from integrated eCare practice and promoting deployment in European regions.

By providing the ICT tools necessary to join up care pathways across organisations, in particular between social and health service providers, BeyondSilos enables delivery of **integrated care** to older Europeans to support them to live independently within the community.

The project gives common access to client data to cross-sectoral teams. BeyondSilos brings together pioneers from seven EU regions. It intends to provide pathway-based, ICT-supported, integrated care to >10.000 older citizens during the lifespan of the project.

www.beyondsilos.eu

Duration: 2014-2017

C3-Cloud

C3-Cloud will establish an ICT infrastructure enabling a collaborative **care and cure cloud** to allow continuous coordination of care activities by a multidisciplinary care team and patients and informal care givers. A Personalised Care

Plan Development Platform will allow, for the first time, collaborative creation and execution of personalised care plans for multi-morbid patients through systematic and semi-automatic reconciliation of clinical guidelines, with the help of Decision Support Modules for risk prediction and stratification, recommendation reconciliation, poly-pharmacy management and goal setting.

www.c3-cloud.eu

Duration: 2016-2020

CAREWELL

CareWell worked on delivering **integrated healthcare to frail elderly patients** in a pilot setting through comprehensive multidisciplinary integrated care programmes where the role of ICTs can foster the coordination and patient centered delivery care.

Carewell focused on complex, multi-morbid elderly patients, who are most in need of health and social care resources (35% the total cost of Health Care System) and of more complex interventions due to their frailty and comorbidities (health and social care coordination, monitoring, self-management of the patient and informal care giver).

www.carewell-project.eu

Duration: 2014-2017

CONNECARE

Personalised Connected Care for Complex Chronic Patients

Seven out of ten hospital beds across Europe are occupied by people with chronic long term conditions. CONNECARE is developing a novel smart, adaptive integrated care system to streamline **chronic care management**. This will save European healthcare organisations huge sums whilst improving patient outcomes.

CONNECARE will provide decision support for the adaptive management of personalised clinical pathways and will deliver tools to monitor patients' activities and status, thus empowering them and providing them with recommendations to self-manage their condition.

To prove improvements in outcomes and efficiency, clinical trials will be held in three leading regions in integrated care uptake: Catalonia, Israel, and Groningen. Consortium members are active in the EIP AHA B3 Action Group. This way transfer of results to relevant stakeholders across Europe, beyond the stakeholders in CONNECARE, is guaranteed.

www.connecare.eu

Duration: 2016-2019

ICT4Life

ICT4Life is developing a solution for individuals with **early stage cognitive impairment living alone**. The system will give doctors and caregivers information about the users for taking the best medical or social actions, while extending their independence in a user friendly way. People with dementia, in general and, in particular, with Alzheimer at an early stage, and with Parkinson's, constitute the main target group ICT4Life is focussing its analysis on.

www.ict4life.eu

Duration: 2016-2018

INCA

INCA is a **cloud-based integrated care platform** solution. The system puts the patient at the centre of a personalised network of stakeholders (social services, health providers, caregivers…), empowering them to communicate directly with their circle of care.

The INCA project proved that their solution reduces hospital admissions, improves the patient experience and overall achieves greater efficiency from health delivery systems and reduces costs. The platform is currently deployed in Spain, Cyprus, Latvia, UK and Croatia.

www.in3ca.eu

Duration: 2014-2016

SmartCare

SmartCare defined a common set of standard functional specifications for an open ICT platform enabling the **delivery of integrated care** to older European citizens. A total of 24 regions and their key stakeholders are defining a comprehensive set of **integration building blocks** around the challenges of data-sharing, coordination and communication.

System integration will allow efficient cooperative care delivery and empower all older people in effective management of their health, and maintain their independence despite frailty. This in turn will support long term sustainability and upscaling of services.

www.pilotsmartcare.eu

Duration: 2013-2016

PICASO
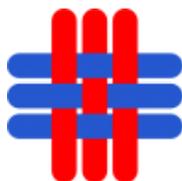
The PICASO project is developing an ICT platform to support coordination of care plans for people diagnosed with **co-occurring chronic diseases**. The goal of this Europe-wide Continuum of Care service platform is to:

- Improve cooperation and exchange of knowledge between caregivers in health, rehabilitation and social care domains and actively include patients and their relatives;
- Bring about improvements in health outcomes, daily activities, and quality of life by personalising care management programmes to the patients' profiles and support adherence to care plans;
- Reinforce medical knowledge and create new care models for management and treatment of patients with multi-morbidity conditions;
- Allow more cost-effective care management through increased skills and collaboration of care professionals and more automated and efficient workflows, which leads to better health outcomes and less hospitals admissions, and thus contributing to the sustainability of health and social care systems in Europe.

To demonstrate the platform and its wide applicability, the technologies will be trialled in two different national settings with two different patient groups, involving 60 patients.

www.picaso-project.eu

Duration: 2016-2019

POLYCARE

POLYCARE is developing and testing an integrated, patient-centred care model, supported by advanced ICT systems and services that allow the monitoring and care of **older chronic patients in acute phases** at home.

The system will form a collaborative, information sharing environment between health and social care services. A Decision Support System will provide alerts, recommendations and adverse effects due to the interaction of medicaments in the case of poly-medicated patients.

The POLYCARE researchers also empower the patients by providing them with devices and personalised apps for being involved in their self-health management and for interacting with medical and social care services.

www.polycare-project.com

Duration: 2016-2018

ProACT

Through integrated technology ecosystems for patient centred care, this project targets Europe's 50 million **multimorbid patients** to proactively self-manage their diseases.

ProACT aims at providing and evaluating a cloud based open application programming interface to integrate a variety of new and existing technologies to advance home based integrated care. The ProACT researchers are examining four models of care/support for effective, continued and coordinated patient-centric care/self-management. Trial sites (Ireland and Belgium) will use Living Lab facilities to ensure co-design (with persons aged 65 and over) of ProACT technologies, and implement proof of concept trials involving national health services, patients and their formal and informal care networks.

Clinical status information, therapies and activity tools will be deployed for chronic heart failure, diabetes and chronic obstructive pulmonary disease (COPD). Tools to support mild cognitive impairment and detect early onset dementia are included.

www.proact2020.eu

Duration: 2016-2019

4.5. Frailty, early detection and intervention

eCARE

eCARE project aims to deliver disruptive digital solutions for the prevention and comprehensive management of frailty to encourage independent living, wellbeing and to relieve health and care services budget pressure. Solutions should improve outcomes for frailty in old adults entailing the physical and the psychosocial factors. The target group are the pre-frail/frail old adults with emphasis on those that feel lonely and/or isolated. The project will procure the development, testing and implementation of digital tools/services and communication concepts to facilitate the transition to integrated care models across health and social services and country-specific cross-institutional set-ups, including decentralised procurement environments and collaboration across institutions.

eCARE Cordis website

Duration: 2019-2023

DOREMI

The DOREMI project focused on three main aspects related to **frailty** in older people:

- Unhealthy nutrition;
- Sedentariness;
- Cognitive decline.

These aspects are at the basis of the DOREMI environment: A **context-aware and smart system** able to learn and reason about the users, their intentions, preferences and aims. The system is able to provide feedback and propose solutions to improve their lifestyle. The specialist will be able to select and assign a personalised lifestyle protocol that will be associated to a set of game typologies (cognitive games, social games or exercise games).

At home, seniors will be able to select the game scenario which best corresponds to their personal preferences and habits. Subsequently, the system will follow a monitor-learn loop to understand how the senior evolves according to the compliance of the assigned protocol.

The effectiveness and impacts, on both users and on the healthcare system, has been positively tested in a set of pilots in Italy and UK, involving both elderly users and care providers.

www.doremi-fp7.eu

Duration: 2013-2016

My-AHA

My-AHA (My Active and Healthy Aging) will **empower seniors to better manage their own health**, resulting in healthcare cost savings. my-AHA will use state-of-the-art analytical concepts to provide new ways of health monitoring and disease prevention through individualised profiling and personalised recommendations, feedback and support.

An ICT-based platform will detect defined risks in the **frailty** domains early and accurately via embedded sensors and data readily available in the daily living environment of older adults. When risk is detected, my-AHA will provide targeted ICT-based interventions with a scientific evidence base of efficacy. These interventions will follow an approach to motivate users to participate in exercise, cognitively stimulating games and social networking.

www.activeageing.unito.it

Duration: 2016-2019

City4Age

City4Age is enabling Ambient Assisted Cities, or **Age-friendly Cities**, to help elderly people deal with mild cognitive impairment or frailty, so they can maintain their independence for longer.

A range of unobtrusive ICT tools and services is being developed to improve the early detection of risks related to cognitive impairments and frailty of elderly people, whether they are at home or on the move within the city.

The City4Age project will also facilitate the role of social and health services, as well as the role of family and caregivers. Pilots will take place in Madrid, Athens, Montpellier, Lecce, Birmingham and Singapore.

city4age.lst.tfo.upm.es

Duration: 2015-2018

Frailsafe

The goal of the FrailSafe project is ambitious: **delaying frailty** as much as possible by developing a set of measures, tools, and recommendations to reduce its onset. FrailSafe is working on state of the art information technologies such as a personalised **'Virtual Patient Model'** and a **virtual supermarket game**.

FrailSafe aims to:

- Better understand frailty and its relation to co-morbidities;
- To identify quantitative and qualitative measures of frailty through data mining,
- Use these data to predict short and long-term outcome and risk of frailty;
- To develop a platform for real-life sensing (physical, cognitive, psychological, social) and intervention (guidelines, real-time feedback, AR serious games);
- To provide a digital patient model of frailty sensitive to several dynamic parameters, including physiological, behavioural and contextual;
- Use this model as the key for developing and testing pharmaceutical and non-pharmaceutical interventions;
- Create 'prevent-frailty' evidence-based recommendations for the elderly;

- Strengthen the motor, cognitive, and other 'anti-frailty' activities through the delivery of personalised treatment programmes, monitoring alerts, guidance and education; and to achieve all with a safe, unobtrusive and acceptable system for the ageing population while reducing the cost of healthcare systems.

www.frailsafe-project.eu

Duration: 2016-2018

PERSSILAA

This project aimed at the development and validation of a new service model that **addresses frailty** in community dwelling for older adults.

PERSSILAA's main focus was to:

- Develop remote service modules for screening, monitoring and training;
- Enable a transition of our care services from fragmented reactive disease management to preventive personalised services, that are offered locally, supported by proactive caregivers and health professionals, which is integrated into existing healthcare services;
- Set up a technical service infrastructure to support these multiple services and users in an efficient, reliable and easy way which will entail gamification, interoperability and clinical decision support.

The validation was done in the Enschede region in the Netherlands and the Campania region in Italy.

www.perssilaa.eu

Duration: 2013-2016

PreventIT

PreventIT will develop and test an ICT based **mHealth** System (iPAS) for the consumer market that:

1. Enables **early identification of risk of age-related functional decline**;

2. Engenders **behavioural change** in seniors in order to adopt a healthy, active lifestyle.

The project will use an integrated system of a smartphone and smartwatch as frontend technology, and a protected cloud-based solution for handling personal data as backend technology.

The researchers will develop online instruments for risk-screening, complexity metrics, motivation for behavioural change, and a method for personalised exercise by phenotype, based on currently available big data sets.

www.preventit.eu

Duration: 2016-2019

REACH2020

This project is working to integrate personalised medically and ethically acceptable solutions **in, and around, buildings** (home, care homes, clinical environments). These solutions will allow an intelligent **prediction** (considering both personal medical history as well as real-time gathered data from a series of embedded sensors) about the health status of seniors.

Based on this forecast, the researchers want to develop suitable interventions (customised services and products for the living environment including physical activity, training, food and nutrition, mobility, motivation, etc.) to prevent a declining health status of the elderly and reduce Long Term Care admissions.

The ultimate goal is to allow European industry, including SMEs, to capitalise on the European high-tech-knowhow, to make Europe a market leader in prevention technologies, services and underlying healthcare ICT platforms, and at the same time encounter the ultimate cause of rising healthcare expenditures.

reach2020.eu

Duration: 2016-2020

WE4AHA

WE4AHA is working on widening the support for a large scale uptake of digital innovation for active and healthy ageing. Digital innovation has the potential to ensure that elderly remain independent, active and live longer in their homes and communities. The efficiency of health and social care systems can also be increased and new sectors of the economy are enhanced, creating economic growth and jobs in the Silver Economy.

WE4AHA will build on a comprehensive set of support and promotion services. Relevant stakeholders will be mobilised to help further develop or implement three EU guided activities:

1. Innovation to Market (I2M),
2. Blueprint Digital Transformation of Health and Care for the Ageing Society, and
3. European Innovation Partnership on Active and Healthy Ageing.

https://open-evidence.com/project/we4aha/

Duration: 2017-2020

4.6. Fall Prevention

E-NO FALLS

European Network for Fall Prevention, Intervention & Security

This **thematic network** integrated and brought together knowledge, experiences and best practices acquired at European and international level in the area of fall prevention, intervention and safety, with the aim of coordinating ongoing activities and creating the necessary conditions and consensus on action plans, standards and specifications in view to ensure the widest future replication and co-deployment of innovative solutions (with special emphasis on ICT-based ones).

www.e-nofalls.eu

Duration: 2013-2016

FARSEEING

FAll Repository for the design of Smart and sElf-adaptive Environments prolonging INdependent living

FARSEEING has been collecting data about real-life falls of older adults, in order to better understand the risk factors for falls. This database will, for the first time, enable researchers to study the nature of a fall based on enough objectively measured data. In addition, FARSEEING researchers have studied how to encourage older adults to take-up and maintain use of keep fit technologies.

www.farseeingresearch.eu

Duration: 2012-2014

FATE

FATE validated an innovative ICT-based solution for the **detection of falls** in ageing people. A portable and easy-to-use fall detector runs a specific algorithm to accurately detect falls, thanks to a robust and reliable telecommunications layer (based on ZigBee and Bluetooth technologies) which can send alarms regardless of the user being inside or outside of the home.

The system can be complemented by e.g. a bed presence sensor and the i-Walker, an intelligent robotic walker. The system as a whole ensures the successful prevention and detection of falls in all circumstances. It has been tested and validated in pilot studies involving real living scenarios, in Spain, Italy and Ireland, in close collaboration with public authorities. The system is now commercially available via spin-off company SENSE4care.

www.project-fate.eu

Duration: 2012-2015

I-DONT-FALL

Integrated prevention and Detection sOlutioNs Tailored to the population and Risk Factors associated with FALLs

The I-DONT-FALL **integrated platform** is flexibly configured to the needs of specific target groups and **risk factors** associated with fall incidents. End-users are offered tailored **fall technological solutions**, while medical experts and health professionals have access to a wide range of tools, enabling them to customize fall solutions to the end-users' needs. The effectiveness of the solutions has been tested by over 500 elderly users/ patients across different countries, cultures, age groups and fall risk factors.

The project also elicited best practices for tailoring fall management solutions to specific risk factors, root causes and users' (fallers') needs.

www.idontfall.eu

Duration: 2012-2015

ProFouND

Prevention of Falls Network for Dissemination - This network has been dedicated to the dissemination and implementation of **best practice in falls prevention** across Europe.

ProFouND aimed to influence policy and to increase awareness of falls and innovative prevention programmes, amongst health and social care authorities, the commercial sector, NGOs and the general public. Through this work ProFouND has facilitated communities of interest and disseminated the work of the network to target groups across the EU.

profound.eu.com

Duration: 2013-2016

WIISEL

Wireless Insole for Independent and Safe Elderly Living - The WIISEL system is a non-invasive ambient device, designed to monitor gait parameters and assess fall risk in elderly wearing the WIISEL **sensing insoles**. It continuously captures data related to human gait and balance from a user in his home as well as in any other locations he may go by foot.

WIISEL is made of 3 main components:

•   One pair of instrumented insoles with embedded pressure and inertial sensors

•   A smartphone (off the shelf)

•   A back-end server with administrative web application and the Gait Analysis Tool software for analysing and presenting data to medical professionals.

www.wiisel.eu

Duration: 2011-2015

4.7. Knowledge sharing and standardisation related to ageing well

Homes4Life

Homes4Life addresses smart living environments for ageing well by contributing to the development of a **common European framework** for age friendly living environments, and defining the Homes4Life certification scheme to tackle end-users' needs and requirements through a holistic and life-course approach integrating Construction and ICT solutions. The different socio-economic conditions (housing ownership, family structure, health system, etc.) and building typologies among the EU member states will be analysed in detail to provide the necessary flexibility to map the Homes4Life certification scheme to the specificities of each country with a user-centric approach. The scope of Homes4Life scheme will cover both new and existing buildings. The strategy to define the certification scheme will be: i) analyzing the main difficulties and needs faced by older people to age at home, ii) identifying the physical and digital solutions that increase their quality of life and wellbeing, iii) assessing the availability, functionality and quality of service of the existing solutions on a specific home.

www.homes4life.eu

Duration: 2018-2020

J-Age II

How can we **collaborate and coordinate European R&D** better? By jointly writing our research programmes: 15 European countries plus Canada and Israel are driving a Joint Programming Initiative (JPI) called *'More Years, Better Lives - The Potential and Challenges of Demographic Change'.* This enhances coordination and collaboration between European and national research programmes related to demographic change.

The J-Age II project is supporting and fostering the overall management of the JPI, updating the strategic research agenda and supporting implementation through joint activities between member states.

Furthermore, the project is exchanging information with scientific and societal stakeholders, policy makers and research funders as well as performing an evaluation and monitoring exercise.

Ultimately, the project and the JPI seek to stimulate the alignment of relevant national programmes and EU initiatives, strengthen the base of multi-disciplinary and holistic ageing research in Europe and to provide scientific evidence for policy responses to demographic change.

www.jp-demographic.eu

Duration: 2015-2018

MAFEIP

The **online MAFEIP tool** estimates the **health and economic outcomes** of your social and technological innovations in the health and care sector relative to current care. Examples of innovative interventions include new care pathways, devices, surgical techniques, organisational models, among others.

This supports **evidence-based decision-making** for all institutions and users in the health and care sector.

Those interested can join the MAFEIP user community and collaborate with others in assessing innovative interventions in the health and care domain through the MAFEIP methodology.

The project also offers specific training and personalised support. Training and supporting materials include a user's guide manual, informative videos and introductory presentations, among others. All these materials are available in the support section of the website.

www.mafeip.eu[1]

Duration: 2017-2018

PROGRESSIVE

By establishing norms and requirements for technical systems, **standardisation** makes our lives safer, simpler, more comfortable and more efficient. Especially in the digital field, standards can ensure compatibility between products and provide better accessibility of goods and services.

The PROGRESSIVE project will provide a dynamic and sustainable framework for standards and standardisation around ICT for active and healthy ageing. It will establish parameters by which good practice in standards and the standardisation process can be identified. A platform to be developed will promote discussion and debate.

The work will lay the foundation for standards that will be increasingly fit for purpose – with potential benefits to all our lives.

www.age-platform.eu/project/progressive

Duration: 2016-2019

ReAAL

The research community has spent a lot of resources developing personalised solutions covering the different perspectives of independent living, such as safety, mobility, reminders, home management, telehealth and telecare. These specific solutions have turned out hard to integrate or combine with other services. The Universaal and ReAAL projects promoted a more integrated approach, based on open standards, to **overcome this siloisation** of ICT-based services for ageing well.

ReAAL measured the return of investment of the pilot deployment of services to more than 5000 users across seven countries in Europe. The project also gathered the feedback from actors involved such as developers and service providers. This work contributed to the Action Group on Independent Living of the European Innovation Partnership on Active and Healthy Ageing (EIP AHA).

www.cip-reaal.eu

Duration: 2013-2016

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[1] The tool will stay available until further notice.

SEACW

Social Ecosystem for Anti-Aging, Capacitation and Wellbeing

SEACW has created a pilot **ecosystem** including tools on **awareness, information, training, e-literacy and training** on ICT for active and healthy aging. 'Action for Healthy Ageing' is the name of this first European ecosystem for promoting healthy, active aging using new technologies.

With the goal of being effective and dynamic, the SEACW ecosystem enabled users to find news, forums, videos, a social network, mobile applications, games that foment mental activity and even a training program for active, healthy ageing through the use of ICTs. The offer reached approximately 20,000 users.

www.seacw.org

Duration: 2013-2015

SEED

Supporting the Recognition of the Silver Economy in Europe in the Digital Era.

SEED has launched the European-level **Silver Economy Awards** rewarding innovative solutions that demonstrate a significant impact on the quality of life of the ageing population. The new award scheme aims to mobilise a wide range of stakeholders across Europe. It is envisaged that the award scheme will be maintained under the auspice of the recently launched European Covenant on Demographic Change.

https://silvereconomyawards.eu/background#awards_secretariat

Duration: 2016-2018

PIPPI

PIPPI project will create a cross-border Community of Practice of European university hospitals that will **bring together experts** from the demand and supply side to identify common clinical needs for digital healthcare solutions and procurement of innovation knowledge. The project will engage relevant stakeholders involved throughout the innovation procurement process at a regional, national and European level. The consortium with its network partners such as industry and payers of healthcare, will gather best practices, and develop structural capital and tools around procurement that will be shared through a knowledge brokerage platform on a European level. The consortium will identify major clinical needs from 10 university hospitals spread around Europe and compile a short-list of challenges that are suitable to solve with digital solutions and for procurement of innovation. PIPPI project will develop a business and implementation plan with the ultimate aim to improve patient outcome, decrease healthcare costs, create growth for European life science industry and create new markets.

https://pippi.meduniwien.ac.at/

Duration: 2018-2021

4.8. Active and Assisted Living (AAL) Programme

The **AAL Programme** is a funding activity that aims to create better living conditions for older adults with the help of technology, as well as to strengthen the international industrial opportunities in the area of information and communication technology (ICT).

It carries out its mandate through funding cross-national projects (at least three countries involved) that involve small and medium enterprises (SMEs), research bodies and end-user organisations (representing seniors).

AAL projects are financed by the European Commission and the 18 countries that constitute the partner states of this joint initiative: Austria, Belgium, Cyprus, Hungary, Ireland, Israel, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

More information: www.aal-europe. eu

The following projects won Call 2016, call challenge: Dementia

ELLA4LIFE

My name is Ella. I am your **personal assistant**. I am always with you on your smartwatch, your smartphone or your tablet. On your tablet, I am an Avatar you can talk to, that answers and does what you want. Most of all I am fun to use. I help you lead a pleasant, more healthy life, manage your agenda and select your favourite news articles. When you have a – chronic – disease I help you handle it. I will remind you to take your medication, do the necessary checks like weight, blood pressure or insulin checks and consult your hospital. I'll get to know you so, when time comes that physical or cognitive capabilities decline, I recognise that and will assist you. Tell me and I will close your window or put on the light. You will never forget an appointment because I help you with daily structure. Feeling restless? I will play your favourite music. In case of emergency, I will inform your family or professional help. I will do everything to help you stay as healthy, happy and independent as possible. Together we can relieve your informal caregivers and help your professionals provide you with an even better care.

www.ella4life.eu

Duration: 36 Months

i-evAALution

The bundle includes a smart home solution with voice control, a mobile safety solution, an online care community solution and a communication and entertainment device including a care management system. Extensive testing and evaluation during a 16-months pilot phase within a randomized controlled trial with large numbers of end-users allows to assess meaningful and significant effects of the technologies on the quality of life of the end-users. i-evAALution addresses older adults living at home and incorporates their social environment including family and friends as well as informal and formal care giving organisations and service providers.

In order to integrate the single solution, existing interfaces and tools are used: this includes expandable APIs and middleware such as the OSGi based universAAL middleware framework to ensure built-in flexibility.

To ensure a commercialisation of the bundle, the 'ievAALution association' will be founded. Through consulting centres in every partner country, end-users can receive a counselling service for choosing the appropriate and customizable AAL bundle. The end-users are relayed to the solution providers, which will install the bundle at the end-user's home. Another service of these consulting centres is to evaluate and certificate AAL and other ICT solutions to include them in bundles.

www.i-evaalution.eu

Duration: 30 Months

FreeWalker

FreeWalker is an **innovative localization device** that will be combined with a learning system to improve today's static fence approach by adapting to each user-specific walking behaviour.

The localization device will be bought by the customer with a service running on a central server that will be licensed on a monthly basis to the customer. Within the project consortium the technological partners will license the software components to the industrial partners who will market the solution.

This AAL-solution is integrating previous AAL projects solutions:

- The logic engine that will be the basis for the integration of the existing components localisation, emergency database and user interface has been developed in the previous AAL project "DayGuide";

- Additionally, the basic signal functionality of project "signAAL" will be used;

- Optionally the results of "HappyWalker" can provide additional benefits.

The target groups are:

1) Individuals with subjective cognitive impairment (SCI), mild cognitive impairment (MCI) and early-mild to middle stage dementia (all kinds) with GDS 2 – 5, who are mobile and not at a risk of falling;

2) secondary end-users: partners, family members, friends or caregivers who see the patients on a daily or near to daily basis and are willing to participate and to report experiences (informal carer);

3) end-users, who provide paid professional care to the primary end-user (formal carer); tertiary end-users who have a management function in the care organization where the primary end-users receive his/her care.

www.freewalker-aal.eu

Duration: 36 Months

INCARE

INCARE offers a fully integrated solution that enables flexible, scalable and sustainable services to support elderly people with various backgrounds and age-related impairments to **self-manage** their daily life, increase their sense of wellbeing, and prolong their involvement in the society while reducing the burden on their formal and informal caregivers. The INCARE solution goes beyond concatenation of functionalities by providing a seamless access of its users to a wealth of interconnected services with added functionalities.

www.aal-incare.eu

Duration: 36 Months

DAPAS

DAPAS focuses on **everyday-support and safety**, ensures easy communication with carers and the user's wellbeing status, and provides pluggable framework for integration, including administrative parts (user management, profile, etc.) and complementing the features with Smart Home integration by adding an integration layer with off-the-shelf sensors that can be used for features in the areas of everyday-support, home safety as well as wellbeing detection.

www.dapas-project.eu

Duration: 36 Months

IOANNA

The IOANNA project focuses on **mobility and social engagement**. With the additional contribution of new mechanisms, it will assist its users into their

everyday needs through crowdsourcing. More specifically, IOANNA will allow its users to securely wander around the town through a service that informs their care-takers in case something happens to them, help them find community services or job offerings, organize their shopping list and find the products and services they are looking for close to their location in fair prices. The main target group of IOANNA is the senior adults, aiming to help them live better, letting them be active citizens. Other target groups include local stores and other professionals that will be able to promote their products and services through IOANNA, as well as the community and local companies who will be able to take advantage of the experience that senior users of IOANNA will have.

www.ioanna-project.eu

Duration: 30 Months

frAAgiLe

What frAAgiLe plans to do is **analyze the status of the person**, physically and mentally, in terms of fragility, and offer physical and mental exercises to avoid the risk of possible falls using an accessible and affordable solution that combines videos for exercises and serious games to both train and detect physical or cognitive fragility.

The system will assign a value to that risk, combining both mental and physical fragility risks using only tablets and wearables. Cognitive impairment detection and stimulation using serious games will also be an important part of the platform. The system will also promote exercises to improve the fragility level risk.

https://listes.unige.ch/sympa/info/fraagile

Duration: 36 Months

LIFANA

The goal of the LIFANA solution is to **support healthy nutrition** through all phases of ageing, from active seniors to elderly users and patients in need of daily care. Individual meal recommendations and decision support in the supermarket will assist users to change their eating habits in order to maintain a healthier lifestyle. We will integrate, adapt and extend existing components.

Particularly, older persons will benefit from personalised nutrition recommendations since they are vulnerable to malnutrition. Older adults often struggle with making the right decisions regarding meal preparation and neglect nutrition. Dietary changes seem to positively affect risk-factor levels.

We will integrate a meal recommender system, semantic food knowledge base (to uniquely identify food concepts for interoperability), food composition databases, and a grocery shopping assistant into an existing smartphone solution.

www.lifana.eu

Duration: 30 Months

POSITIVE

Project POSITIVE aims at designing, building and commercialising a digital platform for healthy, mobile seniors to **prevent future cognitive and physical decline**. The platform tackles a problem of growing loneliness and apathy amongst seniors, caused not necessarily by social isolation resulting from immobility but by a lack of meaningful connections and a clear purpose in life.

Seniors desire to be not only consumers but also creators. This frequently overlooked fact creates a disconnect between what seniors want and what society and companies offer them. To alleviate that, REALL is designed to address self-actualization needs of seniors. REALL consists of online physical events facilitation and content.

Both parts are co-created and sustained by the end users - seniors. The events are led by seniors or external organisations and have a personalized broad range from educational topics to organizing start-ups. The content part includes possibilities to share knowledge, learn, track health and be entertained.

Duration: 30 Months

PELOSHA

The PELOSHA project aims **supporting older adults in managing their health** as they age. The system will provide a personalisable environment in which all key aspects of an older adult's health can be addressed with specialized AAL services. The package will allow to select services adequate to the current needs of the end user, starting with simple preventive services from the range of physical fitness and living environment health monitoring through services targeted at detecting mental stress or symptoms of frailty to the management of chronic diseases with the use of telehealth means. The PELOSHA system will adapt to the needs of the end users, enabling them to adequately react to the changes in healthcare needs as they age and become more prone to age-related health risks. It will facilitate uptake of fitness or medical interventions related to the ongoing life challenges.

www.pelosha.eu

Duration: 36 Months

SALSA

Maintaining an active lifestyle or **recovering from injury/illness** is a challenge, especially for the elderly and motivation is a key factor. SALSA supplies a smart, app-based-solution that optionally includes (body) sensors to **support physiotherapy** and all aspects of starting and maintaining an active lifestyle for older adults – age 55+ – with or without the supervision of a physiotherapist.

SALSA specifically targets seniors in terms of design, functionality and content underpinned by gamification elements, which boost motivation and adherence. It offers comprehensive social community and scheduling functions, which increase motivation, connection and community building. The content appeals to users of all fitness levels and ensures personalisation and adaptability. SALSA integrates body sensors that allow an in-depth evaluation of movements for feedback used in video exercises and exergames. It offers special functionalities for therapeutic use that deliver more information about the client's state, which leads to an increase in quality of treatment.

Duration: 36 Months

POSTHCARD

Taking care of people with Alzheimer is not harmless. Many formal and informal caregiver feel under a great pressure due to the difficulty to deal with the evolving and erratic behaviour of their relative. The lack of experience of these caregivers is a trouble for them and for the patient that does not receive the optimal care. In this project we aim at empowering and supporting caregivers by providing them with an **educational platform** containing several services such as an easy information access and forum but centered on a serious game allowing caregivers to practice difficult situations with a virtual patient. If informal caregivers are our primary end-users, homecare professionals will also benefit from the platform to train themselves to deal with problematic caring situations and to facilitate the communication. Finally, public bodies and associations will benefit from the platform to support the community.

www.posthcard.eu

Duration: 36 Months

GtG

The project aims to co-create a novel **collaborative economy initiative**, which both assists and activates the elderly population. It will be giving elderly without a local support network the chance to receive help from other senior citizens. It is senior-to-senior platform that can enable a task force of helpers to assist other less resourceful with help in and around their homes.

The GtG project will develop this novel senior-to-senior civic citizenship-based service through the assessment of user and market needs, co-creation of a helper-user interface in workshops and small pilots, and ICT research and prototyping.

www.aal.civics.eu

Duration: 6 Months

ReMIND

The ReMIND project aims to enhance the quality of life of patients with **mild neuro-cognitive impairments** by stimulating the cognitive and physical activity through music, pictures and physical exercises; to evoke positive moods and emotions and to support social interactions.

The holistic ReMIND solution is an interactive combination of robot and tablet that integrates existing modules. The system is able to autonomously connect to additional supporting devices such as flat screens, computers, tablets and smartphones. This will additionally result in decreased stress for care givers and allow them to provide higher quality care.

www.zorarobotics.be

Duration: 36 Months

HiStory

The HiStory project aims to use the concept of **storytelling as a means to foster the social inclusion** of older people. Talking about their personal stories to others helps to maintain their confidence and self-esteem and keeps them socially and cognitively active and connected.

The proposed project aims to create a solution that lets people tell, share and consume stories and connect them through a shared experience. The solution will be constructed from existing building blocks: story recording, story sharing, story authoring, story consuming and connecting through stories.

Duration: 36 Months

SFL

The ultimate goal of the StayFitLonger (SFL) **training programme** is **to perpetuate independent** living at home by maintaining, and where possible, improving, good physical and intellectual shape as well as social interactions while staying at home.

SFL mainly targets retired seniors over 60 years. Secondary end-users will be vulnerable seniors at risk of developing physical and cognitive impairment, in particular those feeling first signs of frailty and mild cognitive impairment.

SFL will propose physical, cognitive and physical & cognitive exercises combined. Innovative features are the real-time feedback on both physical and motor performance, and the virtual coach to guide training and maximize adherence through motivation.

www.stayfitlonger.eu

Duration: 30 Months

HELP ME BRUSH

The HELP ME BRUSH project will build and evaluate a new and innovative ICT-based care product for improving the **oral hygiene** of elderly residents living in a nursing home. The system can identify residents that have not received the minimum oral care needed and remind the caregivers to facilitate the missing tooth brushing actions and notify informal caregivers as relevant.

www.aliviate.dk

Duration: 6 Months

SOULMATE
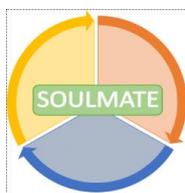
With ageing, travel becomes more and more complex. SOULMATE offers a non-intrusive and personalised mobility package solution that evolves with the end-user across his different life stages to allow him to travel more safely.

The SOULMATE target group is aged 65+, living at home or in a care institution, not being linked with a specific health problem but facing a gradual decline in mobility.

SOULMATE aggregates 3 types of **mobility support**: indoor virtual training of the route, monitoring by a coach at a distance during the trips and active routing during the trips. For each individual, the desired or needed functionalities can be chosen, based on his specific abilities and travel needs.

www.soulmate-project.eu

Duration: 27 Months

U-TOPIA

Project U-TOPIA sets the first step towards the empowerment of **older HIV patients**. The project has been designed to develop, through co-creation and explorative market analysis, sustainable concept(s) for supportive technology that match the needs of older persons living with HIV to manage and improve their quality of life.

www.great.labs.fhv.at

Duration: 6 Months

vINCI

vINCI proposes the development of an integrated and validated evidence-based Internet of Things (IoT) framework to deliver **non-intrusive monitoring and support** for older adults to augment professional health care giving. By integrating proven open-data analytics technology with innovative user-driven IoT devices in four standardised kits, and with business models, vINCI aims to assist caregivers and provide smart care for older adults at out-patients clinics and outdoors. An integrated technology platform will unobtrusively monitor, through sets of pluggable technologies, the older adult, and will analyse and extract information to be delivered to his caregivers for early detection of symptoms related to impairments associated with old age. The final goal is to demonstrate a systematic approach to ensure the highest level of quality control, automated monitoring, and data governance.

www.vinci.ici.ro

Duration: 36 Months

VirtuAAL

The goal of this project is to develop immersive **serious games** to increase motivation in elderly patients in nursing homes or daily centers and, above all, test the using of these technologies in combating cognitive impairment. We would specially focus on some mental capacities that could be trained and measures, such as attention or executive functions.

Duration: 6 Months

VITAAL

The Geriatric Giants are the major categories of impairment that appear in elderly people. These include immobility, instability, incontinence and intellectual impairment. The system will provide **physical activity interventions** targeting urinary incontinence, by training the pelvic floor muscle in a functional standing position and achieving better bladder control. Also, specific physical activity interventions will be provided for fall prevention. Sarcopenia is also related to immobility and instability and can be prevented by specific physical exercises. This new system will provide cognitive-motor interventions that reduce the incidence of mental disorders.

The final system will act as an umbrella for these major categories of impairments associated with age and should feature a "basket" of interventions that are tailored to each users' needs. It will provide multi-modal interfaces and a sensorisation layer based on inertial sensors to monitor the interventions.

www.vinci.ici.ro

Duration: 36 Months

CARA

Securing the safety of **older drivers** must be a concern of society. CuARdian Angel focusses on car mobility within an ageing population. We aim to fulfil the following objectives:

1) Allow ageing car users to maintain mobile longer, under safe conditions, by using personalised Advanced Driver Assistance Systems (ADAS);

2) Provide stakeholders with a measurable basis to identify safe and unsafe behaviour, which can be used for different target groups.

CuARdian Angel proposes to gain insight on older driver's attitudes and expectations in relation to the use of state-of-the-art technology. Sensor technology, akin to the technology used in autonomous vehicles, is used to measure and monitor the driving style. This data would be analysed and used to give concrete advice to the drivers, focussing on maintaining or improving a safe driving behaviour.

www.cuardian-angel.eu

Duration: 6 Months

AgeWell

A **virtual coach supports older employees** in their retirement process and guides them to a meaningful life and healthy lifestyle. The virtual coach in form of an avatar, or optionally a social robot, gets personalized with the help of an assessment by help of a questionnaire. Models of the theory of positive psychology, in combination with innovative methods for emotion recognition and expression as well as modern speech recognition software form a novel way of interaction, motivation and provision of information. Additional health related services and support for activities of daily life can be added when required.

With this modular and adaptive architecture, it is possible for AgeWell to adopt changing needs with the ongoing age of the user. In general, all people who are in a challenging or changing phase of life (e.g. unemployed, refugees, etc.) can benefit from AgeWell.

Duration: 36 Months

MagicTABLE

There is an increasing focus on the concept of 'Positive Health', in which life **happiness and fun** is a major contributor to good health. Serious games are a type of AAL solution that use the elements of fun and entertainment to motivate people to train and learn. The serious game system 'Tovertafel' was specifically developed to support people in intramural care settings in stimulating both physical and cognitive activities and encouraging social interaction.

www.linkedin.com/company/magictable/

Duration: 6 Months

ActiVITAE

ActiVITAE aims to help people ageing well by alleviating geriatric chronic pain using our completely novel and patented, ICT-based **pain management system**. The solution, Vibration Induced Treatment by Abdominal Excitation (VITAE), is disruptive, evidence-based and provides a pleasant, non-invasive, neural stimulation of the abdominal Pacinian corpuscles. VITAE takes advantage of a well-documented principle based on the induction of nerve signals which travel through the body to the brain – when combined with a relaxing audio track, the pain and anxiety centers in the brain are stimulated, reducing symptoms of not only chronic pain but also depression, which often accompanies chronic pain. The VITAE treatment is provided by a vibro-tactile transducer, which is applied to the patient, and a pair of headphones. The device operated through a smartphone, which controls the vibration stimuli and the relaxing audio track. A treatment session takes around 25 minutes, and data are stored on a server, providing the medical staff with a log of the sessions.

www.pacinimedico.com

Duration: 10 Months

IANUS

The Home Care Platform is based on an IoT (Internet of Things) 3D sensor technology, which locates the position of the client and/or service personnel with high precision (20 cm) in the house. To this end, patients and personnel are equipped with wearables. These are continuously charged by the IoT infrastructure and operate 7/24 without intervention.

By continuously monitoring the client in 3D and **analysing the (non)-movements** using big data algorithms, various incidents or conditions (e.g.falling, insomnia, lethargy) can be reliably reported in real-time in a very intuitive and non-intrusive way, hence alerting care givers.

www.listes.unige.ch/sympa/info/ianvs

Duration: 24 Months

CARU cares

CARU cares is about a new way to combine **emergency calling** functionalities to support professional caregivers and house care workers in the process of documenting their caring activities. The result is not only an attractive, non-stigmatizing way to call for help with an increased sense of safety and quality of life for the older people living in assisted living environments. It also adds value to professional caregivers by actually helping them to save time, improving the quality of the care documentation process and letting them focus more on the care activities themselves.

Applying state of-the-art audio and speech recognition technology as well as sensor technology allows to:

• Reliably detect sounds of people actually calling for "help" without the need for body-worn sensors;

• Provide low-barrier, voice-controlled communication features such as opening a synchronous voice channel between the person at home and the caregiver or posting asynchronous voice messages;

• Identify voice commands from caregivers in order to document their care activities immediately, keep their hands free and transfer the information safely to the electronic documentation tool.

www.caruhome.com

Duration: 36 Months

TACTILE

The main challenge of TACTILE is to **prevent elderlies from mental and physical decline**, which leads to a reduced risk to suffer from dementia or the Alzheimer disease in the future. Therefore, TACTILE addresses the following three challenges:

1) Social interaction: TACTILE mainly targets the need of elderly persons to interact with their family or friends living apart or not having enough time to visit on a regular basis. This interaction will take place by playing board games remotely together within a common mixed reality;

2) Mental health: TACTILE targets the challenge of insufficient mental and intellectual activity of elderly persons. Playing board games is an optimal way to achieve brain training combined with entertainment that motivates elderly people to proceed and play on a regular basis;

3) Physical health: TACTILE addresses the challenge of insufficient physical activity of elderly persons. TACTILE helps to maintain and improve the physical fitness. The exercises offered by the system are highly motivating thanks to the unique mixed reality design that includes a virtual assistant demonstrating the movements.

Duration: 30 Months

COGNIVITRA

COGNIVITRA targets people above 50 years old at risk of **cognitive impairment** and with at least one risk factor for mental health. COGNIVITRA will engage end-users in co-creation and co-design of the COGNIVITRA product.

The COGNIVITRA product will integrate components for supporting cognitive and physical exercises – dual-task training - (web-based tools and movement sensors), a centralized platform that will facilitate the interface and communication between patients and care providers.

www.ipn.pt/laboratorio/LAS/projecto/101

Duration: 36 Months

RESILIEN-T

The RESILIEN-T project aims to deploy in the private market an innovative modular ICT solution for **self-management of Cognitive Impairment**, to reinforce the self-monitoring ability of people with a diagnosis, with the aim of slowing the progression of the disease. The ICT solution will leverage the most up-do-date scientific evidence to empower Patients with Cognitive Impairment (PwCI) to live an active and meaningful life, to maintain independence in daily activities and live safely at home, with dignity and with satisfaction during the course of the illness. The solution will cover multiple domains of preventive measures: nutritional guidance; physical exercise promotion; cognitive training; social activity and positive care planning.

Duration: 36 Months

Toilet4me

The Toilet4me project addresses older people and the needs they have when **using a toilet outside** of their home in (semi-)public environments. The vision of Toilet4me is to develop and provide ICT-enhanced toilet systems which are able to adapt themselves to the individual needs and preferences of the older person currently using the toilet. The core solution is a motorised toilet able to support the sitting and the stand-to-sit and sit-to-stand transition with the possibility to re-use adjustment data from preferences at home.

This area is very attractive as availability of suitable toilets will empower and support older persons to leave home and to actively participate in society.

www.toilet4me-project.eu

Duration: 6 Months

CoachMyLife

The project proposes a sophisticated **digital memory aid**. Its goal is to increase the user's independence and quality of life. The CoachMyLife solution will use sensors to recognise the users' context and intent, so that it will be able to offer guidance appropriate to their current activity.

Furthermore, the proposed solution will train the user's memory and executive function using a technique called errorless learning, which is particularly suitable for people with memory impairment.

https://listes.unige.ch/sympa/info/coachmylife

Duration: 36 Months

SAVE

The SAVE system is an incorporated solution which main goal is to support end-users in **staying in their family surroundings** for as long as possible, while still being safe and optimally cared for. Secondly, SAVE **supports informal caregivers**, like relatives, by providing optimal care for their loved ones, while maintaining their professional and private life. Additionally, SAVE enables professional caregivers in the development of an optimal support planning and achievement, involving also volunteering associations.

The SAVE project aims at moulding its services upon a profound knowledge of actual needs and related opportunity areas. SAVE will best suit the elderly persons, suffering of age-related chronic illnesses, mild cognitive issues/disabilities, cognitive decline - after the age of 50 years. Preventing such issues, SAVE could avoid psychosocial exclusion of the enlarged end-users circle and optimise the individual's life, caregiving resources and preserving as much as possible the familiar environment in which the end-user can exercise his autonomy and self-management.

Duration: 36 Months

TURNTABLE

TURNTABLE primarily addresses the challenge of **vitality and ability of the elderly**. As people age, they tend to become more sedentary and less active.

TURNTABLE is an extensible ICT platform integrating solutions for the most pressing daily needs of the elderly. It ensures usability of all solutions within the platform and is thus a 'one-stop shop' for ICT solutions for the elderly. It is extensible, which means that other components can be added also from 3rd party providers.

Duration: 36 Months

GREAT

Applying ambient lighting, sound and scents can **support people with dementia** and their caregivers in their daily activities and structure, and positively influence erratic behaviour (depression and agitation) of dementia sufferers.

The project aims to develop, implement and validate as well as commercialise an intelligent, modular, persuasive ambient system which prepares dementia patients for new or changing activities during the day and thereby assist the care recipients as well as the caregivers.

Participating countries: Austria, Italy and Switzerland.

www.great.labs.fhv.at

Duration: 36 Months

MI-TALE

Memories are important for **dementia patients**; they influence how they act and feel nowadays. However, for people around them, it is often hard to explore what is really going on in their beloved one's mind.

MI-Tale is working on a digital and interactive game to recall and record memories. This tool contains existing material such as historical pictures and video's, but also allows the user to add own material. This way it helps to discover what the elderly person is thinking and feeling and it promotes conversation among generations. It also allows players to complete a personal life-story book.

Participating countries: Austria, Cyprus and the Netherlands.

www.mi-tale.eu

Duration: 24 Months

MEDGUIDE
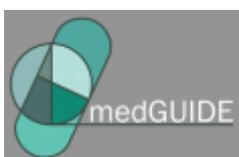
The European project MedGUIDE helps **seniors with dementia** with their medication adherence through smart pill boxes and social networking.

This innovative project aims to:

1. Provide insight in the actual needs of elders with dementia (based on input from the patient, the network of informal caregivers, and contextual data from IoT devices);
2. Provide insight in actual medication use, side effects and adherence;
3. Provide support for improving the care and medication adherence through direct reminders and personalised roadmaps leveraging the network of informal caregivers.

Participating countries: Cyprus, Norway, Romania, the Netherlands, Switzerland

www.medguide-aal.eu

Duration: 30 Months

PETAL

The PETAL project is working on a platform able to increase seniors' autonomy and assist them in carrying out daily activities. In particular, it aims to support older adults affected by **mild dementia**. This will be achieved through an intelligent platform able to monitor users' behavior (movements, speech, and interactions) and support personalised control of lights and appliances in their environment.

Participating countries: Austria, Italy, Romania and Spain.

www.aal-petal.eu

Duration: 36 Months

PLAYTIME

This project develops an integrated 'theratainment' (therapy and entertainment) **solution for care, rehab and diagnostics**. PLAYTIME motivates in a playful manner to perform exercises which stimulate cognitive processes, physical activity and social inclusion. The objective is to motivate dementia users to enter a positive feedback cycle of periodic training with sensors that enable diagnostics on a daily basis and to receive recommendations on the basis of these data that propose more personalised and better-suited exercises for improved training.

Participating countries: Austria, Belgium, The Netherlands.

www.aal-playtime.eu

Duration: 36 Months

SUCCESS

Through an **interactive avatar**, gamification, training and role play, SUCCESS (SUccessful Caregiver Communication and Everyday Situation Support in dementia care) supports both dementia patients and carers in their day-to-day lives.

The tool increases the users' knowledge about dementia and how to interact with someone suffering from this disease. SUCCESS also aims at creating meaningful activities for people with dementia in order to maintain a sense of purpose at their individual level of ability. Emotional support is provided as to help carers to keep a balance between care responsibilities and personal needs.

Participating countries: Austria, Canada, Cyprus, Norway, Romania

www.success-aal.eu

Duration: 36 Months

TV-ASSISTDEM

In this project, an innovative **patient support tool** is being built to provide healthcare over a distance specifically targeted to patients with mild dementia that enables the interaction of voice, video, and health-related data using ordinary telephone lines connected to internet.

Participating countries: Italy, Romania, Spain, Switzerland.

www.tvassistdem-aal.eu

Duration: 36 Months

5. PROJECTS FUNDED BY THE SME INSTRUMENT

*The European Union supports Small and Medium Enterprises (SMEs) in the field of ICT for health and ageing well through the topic H2020-SMEInst-06-2016-2017: **Accelerating market introduction of ICT solutions for Health, Well-being and Ageing Well** and others like H2020-SMEInst-2018-2020-2.*

This challenge aims to help overcome the current gaps in exploitation of promising research results in the field and to stimulate increased availability and market uptake of relevant ICT products and services. This concerns both interoperable and secure eHealth solutions for consumers and institutional healthcare delivery building on standards and new ICT solutions and innovation ecosystems for ageing well building on open software platforms, in order to deliver new and more efficient care to European citizens and respond to new market opportunities for SMEs.

ReHub

Majority of **rehabilitation programmes for chronic musculoskeletal disorders** (MSD), such as rheumatoid arthritis, neck, lumbar and shoulder pain, are not followed consistently and a staggering 80% of patients abandon their treatment prematurely, increasing likelihood of reinjure.

To solve this problem, ReHub tele-rehabilitation solution offers support for diagnosis and delivers effective, personalised therapy for MSD sufferers. Wearable sensor and intelligent algorithms help physiotherapists creating a rehabilitation programme based on objective measurements of a patient's muscle strength and joint movement, whilst monitoring their progress remotely, adjusting the exercises on the fly if needed.

For the patient, ReHub guides them through each custom-tailored home exercise and empowers them with real-time performance biofeedback. And, with an innovative B2B2C business model, the Physician, Physiotherapist and Patient can stay connected via an easy-to-use online platform.

www.dycare.com/rehub

Duration: 2018-2020

V-LAP

Heart failure (HF) is a chronic condition affecting 1 in 5 people aged over 65 worldwide. There is today a global call to increase awareness in HF, whose management is still highly ineffective. Acute HF is indicated by increase in left ventricular filling pressure (LV). Vectorious' disruptive device is a miniaturized, battery-free, **implantable hemodynamic monitor** capable of detecting the rise in LV during patient's daily life. The implantable, completely covered by Vectorious' patents portfolio, is deployed through a minimally invasive, catheter-based procedure. A belt-like external device is worn by the patient over the clothes 3 min/day: via inductive AC coupling, the implantable is powered so pressure data can be collected and sent back to the external unit which synchronize with the patient's mobile device and with a dedicated website for the healthcare provider. A green/yellow/red color code widely known among HF patients allows them to promptly adjust their medications, according with their clinicians' prescription. V-LAP will be able to predict at least 98% ADHF events, HF management will become as simple as manage glucose levels in diabetes.

www.linkedin.com/company/vectorious-medical-technologies

Duration: 2018-2020

OR4.0

MYSPHERA has identified the need for **real-time locating systems (RTLS) for surgery wards**, which has no current solution in the market. By leveraging its cutting edge RTLS technology, MYSPHERA presents a unique and pioneering service in this project that will transform the delivery of healthcare in hospitals. Automating information, events and tasks will transform hospitals into proactive organisations. In turn, MYSPHERA will change its product portfolio to move into a higher position in the value chain. OR4.0 is an opportunity to boost one of the most prominent companies in the emerging RTLS healthcare market, which is dominated by strong US companies, and, in turn, to improve the performance of hospitals in Europe and elsewhere.

www.linkedin.com/pulse/or40-new-iot-healthcare-project-from-mysphera-rooms-rovira-simón

Duration: 2016-2018

GENBIO

Genome Biologics provides a unique combination of tools – GENIMAPS and GENISYST – to provide an integrated platform, with a disruptive effect on the time, cost and risk of **drug discovery and pre-clinical trial development**. GENIMAPS combines big data, artificial intelligence and a unique multi-omics approach to make rapid and precise matches between disease indicators and compound behaviours, allow rapid identification of targets, genetic expression, and compound matches. As well as precision medicine, GENIMAPS also allows the rapid evaluation of an existing pipeline, allowing repositioning of a company's existing, FDA approved assets (or orphan drugs) – increasing the return on public and private investment.

www.genomebiologics.eu/technology

Duration: 2018-2021

AI4EMS

AI4EMS is the first and only **smart digital assistant for Emergency Medical Services** dispatchers dealing with Out-of-Hospital Cardiac Arrest (OHCA) that supports the triage decision-making by: 1) processing and analysing emergency calls in real-time; 2) recognising OHCA in an evidence-based process from large amounts of historical data (unfeasible to humans); and 3) presenting the most important insights to the EMS dispatcher in a user friendly manner. AI4EMS allows for faster and more accurate OHCA recognition by leveraging advanced speech analytics and artificial intelligence. We offer a user-friendly and secure SaaS solution capable of communicating using Natural Language, accessed via a Nvidia TX1-based device. We provide disruptive ICT technology to improve EMS dispatch efficiency and triage accuracy – which will impact the economy and society at large.

www.cordis.europa.eu/project/rcn/217377/factsheet/en

Duration: 2018-2020

VECMAP IPM

Avia-GIS is a leading Belgian innovative has developed a unique, disruptive software suite - VECMAP® - that will support society to overcome one of its important health threats, the **spreading of pests** of public health importance.

www.avia-gis.com/vecmap

Duration: 2018-2021

Lung EpiCheck

Nucleix has developed a highly innovative process for **cancer diagnostics**. The company plans to introduce Innovative Technique for Lung Cancer Diagnostics via identification of changes in DNA Methylation in Blood Samples. Nucleix breakthrough innovations are in the area of cancer detection using a unique combination of a best-in-class biochemical tool, combined with advanced big-data bioinformatics analysis.

www.nucleix.com/lungs-cancer

Duration: 2018-2020

RedStroke

German SME company Preventicus developed a smart ICT solution for **accurate and cost-efficient atrial fibrillation (AF) screening**, aiming to prevent stroke, based on technologies present in a standard smartphone. Preventicus has set-up clinical grade services surrounding its 'core' technology, e.g. Telecare service to verify AF suspects, to safeguard timely referral of the screened AF-patients to a cardiologist for AF confirmation and treatment initiation.

www.preventicus.com/en

Duration: 2018-2020

SAVANA

In order to uncover unknown disease models from EHRs, precision medicine requires massive research studies on thousands of patients (often in several countries). Currently there is no tool capable of automating the **extraction of data from EHRs**, and also, solving the privacy concerns raised by EHRs. SAVANA RESEARCH uses Natural Language Processing to extract data from massive amounts of EHRs' clinical narratives. It has the following advantages intended to make a leap in clinical research efficiency: 1) It uses only de-identified clinical records and ensures state of the art technologies to protect data privacy; 2) It is capable of decoding ten times more EHRs in half of the time; 3) It is capable of identifying 100 times more variables from EHRs; 4) And it costs 40% less.

www.savanamed.com

Duration: 2018-2020

BOND

More than 25% of **diabetics** depend on insulin injections daily, and it is estimated that 2/3 of insulin volume is injected via injection pens. By automatically recording all critical information related to insulin in-taking for diabetes treatment and storing this data in a secure way, INSULCLOCK® helps diabetics and their caregivers in self-managing their disease.

Bambi Medical, a rising med-tech company, responds to this market need with the introduction of the Bambi Belt. The Bambi Belt is an innovative wireless and non-invasive system that can measure the vital signs of pre-terms (premature newborns, ranging from 24 to 32 weeks of gestation). With the Bambi Belt sensors are kept in place via an elastic belt that does not harm the fragile pre-term skin. In addition, the system is wireless and therefore parents are enabled to give significant more Kangaroo Mother Care. This will improve the development of the pre-term and reduce both short-term (less hospital days) and long-term (less costs due to development delays) healthcare costs. These benefits of the Bambi Belt result in a higher quality of care and a more cost-effective solution.

www.insulclock.com

Duration: 2016-2018

D2P

Diabeloop is intended for type 1 diabetes patients and its "artificial pancreas" solution aims to **mimic the glucose regulating function** of a healthy pancreas. The core of our "artificial pancreas" solution is an artificial intelligence: algorithms based on physiological models continuously calculate the most appropriate and personalised dose of insulin. Insulin is then automatically delivered to the patient. Diabeloop goals are to reduce hypoglycaemia and hyperglycaemia periods, alleviate the day-to-day burden and avoid long-term complications.

Diabeloop's first generation solution is integrated in a closed-loop system made of three components: a continuous glucose monitoring sensor, a connected insulin pump, and a handset hosting algorithms and controlling the pump. Diabeloop's solution integrates a telemedicine program through highly secured data exchange, storage and healthcare professional identification. Clinicians may access the patients' data and suggest treatment adjustments as necessary, for an improved system customisation and long-term regulation.

www.diabeloop.com

Duration: 2019-2021

SERAS_v4.0

MJN Neuroserveis has developed SERAS, a non-invasive, discrete and wearable device that **predicts an epileptic seizure** before it occurs. The device consists of an earpiece that reads the electroencephalogram, and a cloud-connected mobile application containing an artificial intelligence algorithm that alerts the user, their environment, and medical services one minute before a seizure occurs. In addition, the device permanently monitors a patient's brain activity, allowing for the generation of medical reports, the number of seizures suffered, their intensity and frequency.

SERAS is a disruptive solution unique in monitoring brain signals and predicting epilepsy seizures with enough time to avoid accidents.

www.mjnseras.com

Duration: 2019-2021

INSULCLOCK

More than 25% of **diabetics** depend on insulin injections daily, and it is estimated that 2/3 of insulin volume is injected via injection pens. By automatically recording all critical information related to insulin in-taking for diabetes treatment and storing this data in a secure way, INSULCLOCK® helps diabetics and their caregivers in self-managing their disease.

www.insulclock.com

Duration: 2016-2018

JUMPAIR

JUMPAIR will benefit a large number of patients who are suffering of **decubitus ulcers** (**bed sores**) or are running the risk to suffer it. The system will remotely monitor ulcer biomarkers for early diagnoses and prevention. Additionally, JUMPAIR will also offer a rehabilitation programme for patients who suffered bedsores during the bedding in their house or hospital. The final product will not only contribute to prevent bedsores, it will also contain healthcare expenditure avoiding unnecessary hospitalisations and therapeutic treatments.

www.fabiodisconzi.com/open-h2020/projects/199251/index.html

Duration: 2017-2019

MARSI

Disruptive technologies for effectively rehabilitating chronic **ambulatory disability**: Worldwide, about 60 million people have difficulty walking related to a neurological disorder (stroke, dementia, neuromuscular diseases, etc). The percentage is highest in Europe. An active lifestyle is the most effective treatment, but the loss of muscle strength often impedes this. The need is for a device allowing them to walk effortlessly and safely in everyday activities. Marsi Bionics has developed powered orthoses for in-house rehabilitation of patients affected by muscle weakness disorders, covering the needs of people with a wide range of neurological disorders. Marsi products will be commercialised under renting models allowing patients to acquire them for daily use. This technology will improve life quality and enlarge life expectancy.

www.marsibionics.com

Duration: 2017-2018

MOWOOT

Up to 15% of the EU population suffer from **chronic constipation**. MOWOOT is a medical device that gives you a massage like the one that physiotherapists administer to solve this problem.

It is an entirely safe device, developed in collaboration with the rehabilitation centre Institut Guttmann and certified by the European Union. A pilot study with chronically constipated patients has shown that the daily use of MOWOOT ameliorates idiopathic chronic constipation.

www.mowoot.com

Duration: 2017-2019

mPOWER: TiredofCancer app

To empower **cancer patients with fatigue**, oncology specialists and researchers have designed the TiredofCancer app. The application has proven efficacy in the clinic as well as in a web-based environment; it is easily accessible for any end user with a smartphone or tablet and ultimately it will be integrated into clinical practice to provide health and care professionals with guidelines to help tired patients.

The tool has been put on the market by the Dutch spin out Tired of Cancer BV.

www.tiredofcancerapp.com

Duration: 2017-2019

OrmoSys

200,000,000 people in the EU currently suffer pain due **to improperly formed feet** and inadequate orthopedic support. This number is expected to rise sharply in the next years due to aging demographics and decreased physical activity.

Based on the knowledge acquired from extensive diagnosing and treating, the German SME OrmoSys offers a complete system for the diagnosis and treatment of foot and postural ailments. By combining a limited number of shapes and materials, it allows for 39,744 different insole types which precisely address the patients' problems.

www.ormosys.de

Duration: 2016-2018

PARK-IT 2.0

PARK-IT technology is designed for continuous monitoring of **Parkinson** motor symptoms in ambulatory conditions in a real environment, based on unique complex algorithms able to detect ON/OFF fluctuation. It provides quantitative insights to inform patients and their health professional about their PD status and evolution.

PARK-IT is supposed to reduce the costs related to PD by 30%, and improve the effectiveness of medication and the quality of life of PD.

www.sense4care.com/park-it

Duration: 2017-2019

ScanZ

The ScanZ device is a digital **acne assessment tool** enabling acne diagnosis in a cost and time efficient way. The aim of the project is to make it clinically and commercially qualified for the market as a medically certified IP protected user-centred designed system to be sold to hospitals. This will both improve the quality of life for acne sufferers and working conditions for medical professionals.

www.scanz.info

Duration: 2016-2018

PLATINUM

This project is developing, prototyping, validating and bringing to market a portable assay system for **prediabetes and diabetes diagnosis** and control, consisting of a disposable medical device equipped with a Lab-on-Chip (LoC) used for Point of Care or Self-Monitoring of protein biomarkers in biological fluids, like Glycated Hemoglobin (HbA1c).

The medical device relies on a unique technology for diagnosis via protein biomarkers analysis, comprising a separation and a labelling stage of target molecule to detect and quantify the amount of glycated Hemoglobin in a drop of blood. The project already received the EC's Seal of Excellence in 2015.

www.dianax.eu/platinum-project

Duration: 2016-2018

SEIZSAFE

Globally, an estimated 2.4 million people are diagnosed with **epilepsy** each year. When patients suffer convulsions there is a risk for them of being injured or having a cardiac arrest. The problem worsens when seizures occur at night-time. SEIZSAFE is a patient-self-adaptive system for detection, recording and alert to caregivers of night-time seizures, linked to a private cloud platform for patient tracking and big data exploitation.

www.seizsafe.com

Duration: 2016-2018

SmartECG

The SmartECG tool for primary care physicians enables an automatic interpretation of electrocardiogram (ECG) analysis data from any monitoring device. A simple international **telemedicine** service platform can be used for requesting fast consolations from cardiologists. This innovation helps to address the severe **cardiovascular diseases** (CVD) challenge - the most critical and expensive healthcare problem in EU with more than 2 million casualties and €200 billion cost each year. By 2020, the SmartECG platform will be used by more than 10 000 GPs and specialist physicians, serving approximately 800,000 patients annually.

www.public.remotea.com/smartecg

Duration: 2017-2019

SOMA

The SOMA project will demonstrate the Kelaa app: a non-obtrusive smartphone-based solution able to detect and manage **work-related stress** based on the analysis of speech and sleep patterns. The solution prototype now includes a diagnostic module (smartphone sensors used to gather and analyse stress biomarkers), an interventional module (smartphone apps used to reduce stress levels) and a big data analytics module (anonymous data aggregation used to identify specific HR issues such as abnormal stress levels in specific departments).

In 2013, the costs of work-related depression in the EU was estimated to be €617 Bn annually. The Kelaa app can contribute to cost reductions of 30% for healthcare providers and corporate while improving the wellbeing of employees.

www.soma-analytics.com

Duration: 2016-2018

Tech4Freedom 2.0

In 2010, there were 285 million **blind and visually impaired** people in the world - a 77% increase from 161 million in 2002, and that number is still rising.

In line with the European Disability Strategy 2010-2020 and to provide a technological solution for the visually impaired to increase their level of security and independence, the Tech4Freedom team has been developing a kit of small, assistive devices controlled by a visually impaired-friendly mobile app. The T4F 2.0 Kit will make daily tasks easier for blind and visually impaired people.

www.tech4freedom.net

Duration: 2016-2018

6. FUNDING TOOLS

Horizon 2020 is the current EU funding instrument of research and innovation. It entered into force in 2014 and will run until 2020.

This EU Framework Programme for Research and Innovation replaces the 7th Framework Programme (FP7) 2007-2013 and CIP ICT Policy Support programme as a way of improving better coherence across different funding instruments. The final goal of Horizon 2020 is to add value to the entire innovation cycle, from research, to product development and market deployment.

Other funding sources are available through the EU Structural Funds and the AAL Europe Programme.

Interested to propose a project? Visit the Horizon 2020 website for finding a call: ec.europa.eu/programmes/horizon2020

7. INDEX

Explanation of acronyms:

AAL	Active and Assisted Living (funded through the AAL Programme)
CIP	Competitiveness & Innovation Programme; funding tool of innovation projects (2007-2013)
CSA	Coordination and Support Action (funded through H2020)
EHR	Electronic Health Record
FP7	7th Framework Programme; funding of research projects (2007-2013)
H2020	Horizon 2020 funding programme for research & innovation (2014-2020)
IA	Innovation Action (funded through H2020)
ICT	Information and Communication Technology
NETW	Project related to networking (funded through FP7)
PCP	Pre-Commercial Procurement
PGS	Personal Guidance System (funded through FP7)
PHS	Personal Health System (funded through FP7)
PPI	Public Procurement of Innovation
RIA	Research and Innovation Action (funded through H2020)
SME	Small and medium-sized enterprise (funded through the H2020 SME Instrument)
VPH	Virtual Physiological Human (in silico medicine, computational modelling)