

2016 Call Reference Sites

EUROPEAN INNOVATION PARTNERSHIP ON
ACTIVE AND HEALTHY AGEING



CATALONIA HEALTH ECOSYSTEM

GOOD PRACTICES EXAMPLES OF INNOVATIONS

Partnership:

- *Ministry of Health Catalonia. Agency for Health Quality and Assessment of Catalonia (AQUAS)*
- *Ministry of Health Catalonia. TICSALUT Foundation*
- *Health Universitat de Barcelona Campus (HUBc)*

Barcelona, 15 April 2016

Health Campus of the University of Barcelona

NEXTCARE: Personalized care of chronic patients in a digital health framework



1. Summary

Project title: Personalized care of chronic patients in a digital health framework (NEXTCARE)

Organisation name: Health Campus of the University of Barcelona

N. of projects included in Nextcare: 5

Developers: Developed within the umbrella of Barcelona Digital Health Practice (BCN-VHP) led by EURECAT and Hospital Clinic

Partners: Partners involved from the reference site organization (Ferrer International, IDIBAPS, Hospital Clinic, EURECAT, TICSALUT, AQUAS, IBEC, University of Barcelona).

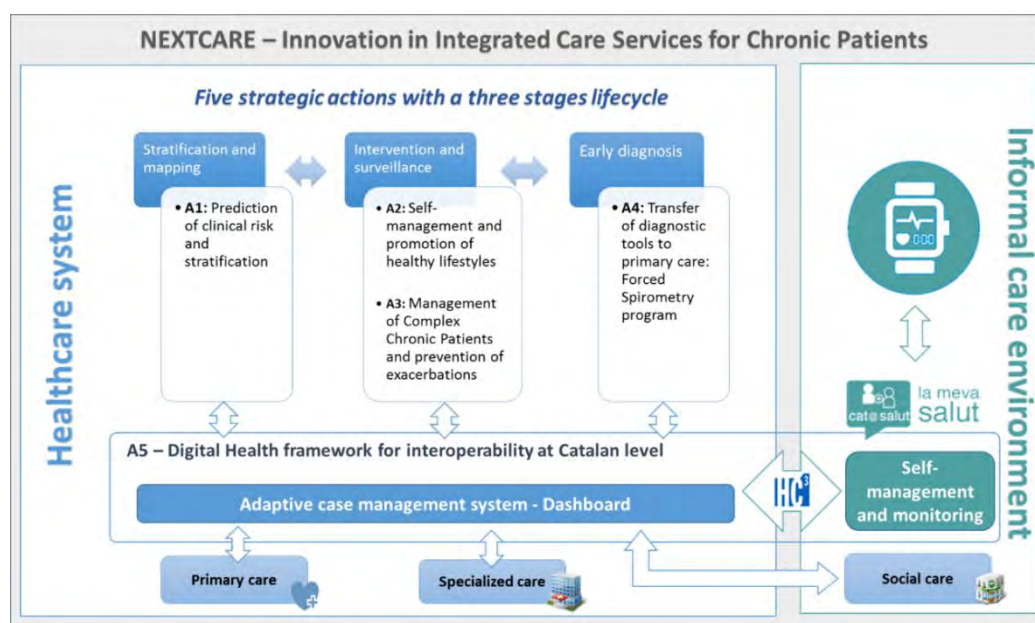
2. Description

In order to face the technical and commercial challenges associated to the above objectives, **NEXTCARE** aims to progress in the co-design, development, deployment and evaluation of a novel integrated care model for the adaptive case management of complex chronic patients. The new model facilitates interactions among healthcare professionals and citizens. The ICT support provides intelligent tools for early diagnosis, health risk assessment and stratification, monitoring, patient self-management and shared decision making with respect to their healthcare conditions and to improve citizen's quality of life while reducing their risk to fall ill.

Catalonia was honoured with three stars for the project NEXES (Supporting Healthier and Independent Living for Chronic Patients and Elderly) on the European Commission's Reference Site Ceremony which took place on 1st July 2013 in Brussels. The project has been developed by **HUBc InnoHealth -TicSalut Foundation** consortium and supported by the Department of Health of the Government of Catalonia. It was selected for its promotion of innovation in health and care systems tailored to the needs of an ageing population. NEXES received three stars which is the top award conferred.

3. Objectives

NEXTCARE (2016-2018) is a project for innovation in health services with three main objectives: (i) Regional deployment of integrated care services for chronic patients with a personalized medicine approach; (ii) Development of a test bed, willing for international leadership, for the use of Information and Communication Technologies (ICT) in novel services that generate value in the healthcare system of Catalonia; and, (iii) Development and monetization of novel products and services with a high level of transferability to other healthcare systems, contributing to strength Catalan industrial competences. NEXTCARE builds –up on achievements of the NEXES program awarded in 2013.



NEXTCARE objectives are worked around five actions with important synergies among them. There are 4 actions (A1-A4) linked to: (i) health risk assessment and stratification, (ii) personalized interventions and case management, and (iii) early diagnosis; and a 5th technological action crucial for supporting all other actions (A1-A4), as depicted below in the graphical abstract.

4. Pillars

a. Pillar I: Prevention, Screening and Early Diagnosis

Nextcare (WP1) develops the potential of the current population-based health risk prediction tool currently used in Catalonia, known as GMA (Adjusted Morbidity Groups), for clinical risk identification and patient stratification. The contribution of GMA for enhanced clinical risk prediction is currently explored in all cases with diagnosis of chronic obstructive pulmonary disease (COPD) in Catalonia.

Nextcare (WP4). The regional deployment of a collaborative Forced Spirometry (FS) program across healthcare tiers in Catalonia has a twofold purpose: i) Early diagnosis of patients with chronic obstructive pulmonary disease (COPD); and, ii) It is a specific use case of a general program to transfer other diagnostic tests from specialized care to primary care. The program overcomes historical limitations for extensive use of FS in Primary Care, due to suboptimal quality of testing. Moreover, evidence of cost-effectiveness has been generated. The four pivotal components needed for regional deployment in Catalonia of the collaborative FS program are: i) Enhanced automatic FS quality assessment; ii) Accessibility to standardized (and quality-labeled) FS testing information across healthcare tiers; iii) Generation of an individual FS report including historical results from a given patient; and, iv) Clinical decision support systems (CDSS) in the clinical workstation of primary care professionals.

b. Pillar II: Care and Cure

Nextcare (WP3). The project aims at extensive deployment of a program addressing adaptive case management of complex chronic patients (CCP). It is acknowledged that CCP generate high burden on healthcare systems worldwide. Three well-differentiated categories of cases with profound implications in terms of healthcare services organization are targeted:

1. Cases involving highly specialized services directly delivered at home and/or requiring enhanced transition to the community (i.e. home hospitalization program);
2. Community-based management of patients needing coordination among specialists, and/or ICT support at home.
3. Frail patients in the community (long-term care).

The core hypothesis is that well standardized, but flexible, care workflows following a collaborative case management approach across healthcare tiers may cover unmet needs and produce healthcare efficiencies.

The site is one of the four urban healthcare sectors of Barcelona area (Barcelona-Esquerra –AISBE- covering 540 k inhabitants with 3 hospitals and 19 primary care centres). It shows high score in the maturity matrix of EIP-AHA for deployment of integrated care.

The program builds-up on current deployment experiences aiming to move from large pilots to mainstream ICT-supported integrated care services. The two principal goals are: 1. Adoption of the program addressing adaptive case management of CCP (inclusion of 3.000 patients in two years); and, 2. Technological convergence of several ICT-based integrated care services currently active at Hospital Clínic.

c. Pillar III: Active Ageing and Independent Living

Nextcare (WP2) Deployment of community-based services to promote physical activity (PA) using tailored self-management programmes with remote professional support. The hypothesis is that the design and adoption of modular ICT-supported services, based on self-management, can generate a positive impact in health. Recent pilot studies supporting this hypothesis, as well as a detailed description of the ICT products, services and implementation strategies, have been generated on site and reported.

The use of the personal health folder to support self-management and proper integration of the ICT-support into healthcare (EHR, electronic health record) are distinct features of the program. The focus is on Physical Activity (PA) in citizens at risk and in chronic patients in order to generate value at health system level contributing to its long-term sustainability. Three groups of individuals are targeted:

GROUP I - Patients undergoing high risk surgical interventions (pre-habilitation program); GROUP II: Clinically stable chronic patients (COPD, CHF and/or type II diabetes mellitus/obesity) in primary care; and; GROUP III - citizens at risk for developing target chronic disorders that that can benefit from enhanced aerobic capacity.

The program will address the three groups mentioned above: Group I (500 patients / year after the second year); Group II (1000 patients after the second year); and GROUP III (2000 citizens at risk during the first year). The programme covers the following items: i) Workflow design of the PA services engaging both patients and health professionals following and adaptive case management approach; ii) Definition and development of ICT requirements; iii) Development of an evaluation strategy based on PDSA iterative cycles including collection of structured indicators; and, iv) Deployment of the novel service in the healthcare sector including innovative reimbursement incentives.

d. Horizontal issues

Nextcare (WP5). The aims are twofold: i) Elaboration of the roadmap for deployment of the Digital Health Framework; and, ii) to perform specific technological developments to test the roadmap. The digital health framework should provide interoperability among: (i) healthcare providers; (ii) informal care, including environmental factors, lifestyle and socioeconomic conditions that influence the citizens' health status; and, (iii) biomedical research, as described in Annex V of the project proposal. The developments will be done in the context of interoperability project approved by the Catalan government. WP5 is the transversal program in Nextcare providing support to the different WPs (WP1-WP4).

To this end, the specific aims are to support: (i) adaptive case management (ACM) and collaborative work between specialised care and the community; (ii) citizen empowerment to self-management of his/her health status; and, (iii) the development of a roadmap for the future deployment of interoperability between formal care and biomedical research, with a systems medicine approach

Based on previous experiences of adopting ACM approaches to design and implement integrated care services, we have identified a common set of required high-level functionalities specific to the integrated care domain, and architectural requirements, outside the integrated care domain, to effectively support community-based care coordination of complex chronic patients, following an adaptive case management (ACM) approach that will be developed in the project.

From an architectural point of view, large-scale adoption of ACM approaches requires interoperability at healthcare system level (i.e., at least exchange of healthcare data among electronic health records of in-place healthcare provider(s)), so that all-important information for the case is facilitated to case managers. To this end, the provision of a minimum set of health information exchange connectors with in-place EHRs of the different healthcare levels (e.g., specialized care, primary care, social care, etc.) and/or 3rd party healthcare providers, is anticipated.

The COLONPREV Study: Programmatic Screening for Colorectal Cancer

Health Universitat de
Barcelona
Campus

1. Summary

Project title: COLONPREV Study, Programmatic Screening for Colorectal Cancer

Organisation name: Hospital Clinic de Barcelona. (University Hospital of Barcelona University)

2. Description

The **COLONPREV** study¹ is an ongoing multicentre pragmatic, non-inferiority, randomized controlled trial (ClinicalTrials.gov NCT00906997) aimed at evaluating the efficacy of once-only colonoscopy and biennial fecal immunochemical testing with respect to the reduction of Colorectal Cancer (CRC) related mortality at 10 years in average-risk CRC screening population.

COLONPREV is carried out in eight Spanish regions with the participation of 15 tertiary hospitals, which began in June 2009 and the first round was finished in June 2011². Results reported at the first screening round of the study reported that performance of one-time screening with Fecal Immunochemical Test (FIT) was equivalent to colonoscopy with respect to CRC detection rate and diagnostic yield, with no differences in tumour staging. This finding was mostly related to the fact that compliance to FIT was markedly increased as compared to the colonoscopy strategy.

¹ Quintero E, Castells A. **Programmatic screening for colorectal cancer: the COLONPREV study.** Dig Dis Sci. 2015 Mar;60(3):672-80.

² Quintero E, Castells A, Bujanda L, et al. **Colonoscopy versus fecal immunochemical testing in colorectal-cancer screening.** N Engl J Med. 2012;366:697–706.

In this regard, FIT has potential advantages for massive, programmatic screening from a logistical perspective, and overcomes colonoscopy regarding implications in terms of human, technical, and financial resources, a critical aspect in population-based screening programs³.

This study, along with the NordICC⁴ and the CONFIRM studies, may contribute to definitely demonstrate the usefulness of colonoscopy on CRC screening, as well as to establish the most cost-effective strategy in a programmatic setting.

3. Pillars

a. Pillar I: Prevention, Screening and Early Diagnosis

COLONPREV reports that performance of one-time screening with Fecal Immunochemical Test (FIT) was equivalent to colonoscopy with respect to CRC detection rate and diagnostic yield, with no differences in tumour staging. This finding was mostly related to the fact that compliance to FIT was markedly increased as compared to the colonoscopy strategy. In this regard, FIT has potential advantages for massive, programmatic screening from a logistical perspective, and overcomes colonoscopy regarding implications in terms of human, technical, and financial resources, a critical aspect in population-based screening programs.

³ Segnan N, Patnick J, von Karsa L. **European guidelines for quality assurance in colorectal cancer screening and diagnosis**. Luxembourg: Publications Office of the European Union; 2010.

⁴ Kaminski MF, Bretthauer M, Zauber AG, et al. **The NordICC Study: rationale and design of a randomized trial on colonoscopy screening for colorectal cancer**. *Endoscopy*. 2012;44:695–702.

Institut Català de la Salut (ICS)

GeriatrICS project: Support to chronicity
and prescription adequacy in nursing homes



1. Summary

Project title: GeriatrICS project, support to chronicity and prescription adequacy in nursing homes

Organisation name: Catalan Institute of health and IDIAP Jordi Gol

Supporting Organisations:

- Catalan Institute of Health
 - o Health Professionals: General practitioners, nurses and pharmacist of primary care.
 - o Electronical medical records
 - o Data repository
- Institut Universitari d'Investigació en Atenció Primària Jordi Gol (IDIAP Jordi Gol): Support Research.
- Nursing Homes' management: formal agreements to connect the NH to the data repository and to collaborate with our programme (education, information).
- Departament de Salut (Catalan Department of Health): data repository.
- Departament de Benestar Social i Família (Social Care Department).

2. Description

The healthcare model in our setting was based on primary care teams providing on demand assistance when required by the nursing homes. And while the prevalence of dementia was known, comorbidity, dependency and frailty were under-registered. Indeed, these elderly patients often attended emergency services and experienced multiple hospital admissions, while medication was not adequately reviewed in terms of efficacy, safety, cost and adequacy of prescription.

In June 2012 the promoter group with GPs, nurses, pharmacists and one epidemiologist was created.

The healthcare model of the intervention was developed to ensure its consistency and to achieve healthcare objectives determined by proactive healthcare formulae (comprehensive evaluation and requirements plan) and to avoid the reactive approach to demand. Chronic complex patients that required the intervention of the case managers were considered particularly important.

Primary Care Teams were reorganized with doctor-nurse healthcare units, with the additional support of a professional from the administrative staff; these teams acquired specific skills to assist institutionalized patients.

The collaborative healthcare model with strategic alliances and coordination between the different healthcare levels was particularly important to guarantee continuity of care. In turn, a better use of health resources was put in place to decrease emergency admissions and non-essential medical tests and to improve safety and efficiency of prescription.

The Pharmacotherapeutic Guidelines **Farmageriàtrics**[®] were created based on the STOPP-START and the Beers [<https://farmageriatrics.wordpress.com>] criteria to avoid inappropriate prescriptions and to make sure that these prescription criteria were shared between primary care and nursing home professionals.

Primary care electronic medical records (ECAP) became also accessible to professionals in nursing homes to facilitate the register of all clinical events and drug prescription in particular.



The new model also included the approach to a consistent quality end-of-life care based on the NECPAL CCOMS-ICO@10 project criteria and the training of healthcare professionals to support the end-of-life process.

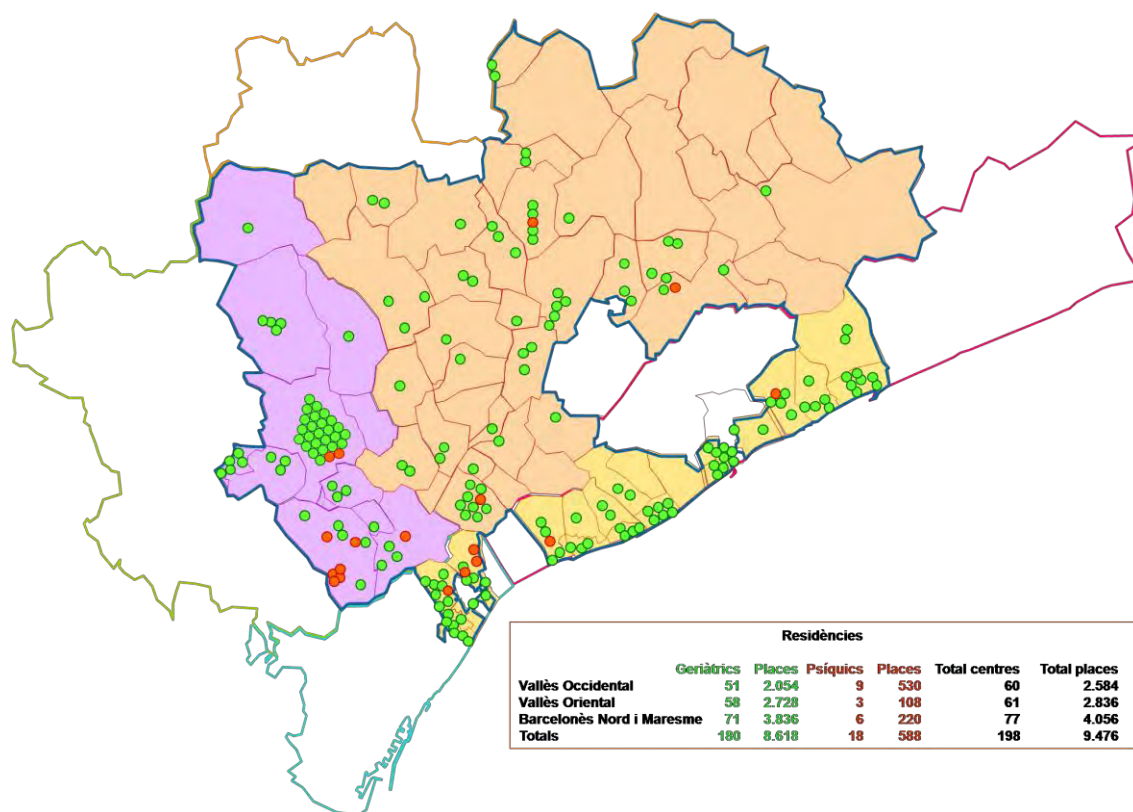
Services included: correct administrative and diagnostic identification, proactive healthcare, comprehensive assessment of the elderly, personalised healthcare plan, review and adequacy of pharmacological treatment, coordination with other levels of care to guarantee continuity of care and the correct treatment of exacerbations.

A team of experts (GPs, nurses, epidemiologists and pharmacists) took part in the design of the guidelines' indicators. Indicators were divided into administrative data (number of registered patients and allocated primary care teams), clinical and frailty profile of institutionalized patients (Barthel and Pfeiffer tests, risk of ulcers, dementia diagnosis and treatment prescribed), patients in Clinical Risk Groups (CRG) 6-7, patients with chronic complex conditions (PCCC) and patients with advanced chronic diseases (ACDP).

One of the main aspects was to assess the use of health resources, hospital admissions, attendance to hospital and primary care emergency services and the pharmacological prescriptions of the nursing homes (QC annex).

Other indicators relate to the quality of pharmaceutical prescription, in essence taking into account patient safety: adherence to Pharmacotherapeutic Guidelines, potential inappropriate medication for patients over 74 years of age, adequacy of antiulcer agents, antipsychotic drug use in dementia and duplication of antidepressants and anxiolytic drugs.

These indicators retrieve data from the primary care electronic medical records (ECAP), from the Hospital Discharge and A&E Minimum Data Set (MDS), and from pharmacy invoice data (CatSalut). These data are electronically available in a website that can be accessed by all professionals involved in the project. The data are updated every three months and made accessible through hyperlinks.



Nursing Homes map – North Metropolitan Area

3. Objectives

1. To provide a high-quality, comprehensive care to elderly, with the guiding patient centred care would reduce hospital admissions and avoid unnecessary visits to ER (Emergency Room) in institutionalized patients.
2. To develop a program based on patient safety, and review adequacy of treatments, with efficacy, and efficiency and focused on FarmageriatrICS guideline in order to avoid inappropriate prescriptions.
3. Coordination between other levels of care Stakeholders: hospital, Emergency Room (ER), community pharmacists, NH, etc., to ensure continuum of care (7days x 24hours) to ensure round-the-clock continuum care.



4. ICT Innovations:

- Connection computerized medical record from NH.
- Electronic prescription: Access to electronic prescribing.
- Blog: FarmageriatriCS guideline [<https://farmageriatrics.wordpress.com>]
- Monitoring indicators: are electronically available in a website that can be accessed by all professionals involved in the project. The data are updated every three months and made accessible through hyperlinks.
- Economic objectives:
- Streamlining healthcare resources
- Reduce inappropriate prescriptions.

IDIAP Jordi Gol in collaboration with “Institut Català de la Salut”

EIP on AHA Task Force on Synergies: Impact of Community-based Program on Frailty Prevention and Frailty Mitigation (ICP – FPM)



1. Summary

Project title: EIP on AHA Task Force on Synergies. Impact of Community-based Program on Frailty Prevention and Frailty Mitigation (ICP – FPM)

Organisation name: IDIAP Jordi Gol in collaboration with “Institut Català de la Salut”

Supporting organisations:

-IDIAP Jordi Gol, Barcelona, Spain (AGs A3, A1) in collaboration with “Institut Català de la Salut”

-University College Cork, Ireland,

-National University of Ireland, Galway,

-UNIFAI/ICBAS-University of Porto, Porto, Portugal.

- Medical University of Graz

- University of Naples “Federico II” – PERSSILAA project - Italy

- Community of Sant’Egidio – Long Live the Elderly programme – Rome, Italy

- University of Twente – PERSSILAA project, The Netherlands

- University of Parma – Emilia Romagna Region, Italy

- University of Salerno , Italy

- University of Valencia , Spain

- VIVISOL – Italy

- Nevelők Háza Egyesület, Pecs, Hungary

2. Description

Frailty is a common geriatric syndrome that places older adults at high risk for major adverse health outcomes, including disability, falls, institutionalization, hospitalization, and mortality. Frailty includes and interacts with many prevalent geriatric conditions and therefore must be approached in a multifactorial way.

Several research projects involving multifactorial interventions to modify frailty progression, functional decline and falls are being conducted.

- Effectiveness of a multifactorial intervention to modify frailty parameters in elderly population. Aims to evaluate the effectiveness of a multifactorial intervention program based on physical activity groups and nutrition advice and protein supplementation, memory workshops and review of medication, to modify frailty parameters, muscle strength and physical and cognitive performance in people 65 years or older with a positive screening for frailty. Secondly, aims to assess yearly improvements in quality of life, nutritional risk, the reduction in falls incidence, disability, hospital readmissions, home-care inclusion or institutionalization. Evidence of the impact is being provided and the final reports will be provided by 2017.
- Effectiveness of an intervention using the Nintendo Wii to improve balance and reduce falls in older people in Primary Care. Aims to evaluate the effectiveness of a low cost console like the Wii to improve balance in the elderly, with a personalized treatment that works the balance, giving positive feedback and reducing the fear of falling and increasing the sense of efficacy. Previously, a pilot study found that older people accept new technologies as a means of treatment. Evidence of the impact will be provided by 2017.
- Effectiveness in reducing falls by a physical intervention with the OTAGO exercise program for people over 75 to 90 years living in the community. PRECIOSA Project.



This project aims to analyse the effectiveness of an intervention based on the OTAGO exercise program to reduce falls, fractures and fear of falling in the elderly aged 75 to 90 years old. It also aims to improve physical frailty parameters (strength, balance, flexibility, endurance). It is a simple tailored exercise program that has shown good results in New Zealand and the UK, practicable standing and / or sitting in a chair. There is a training phase guided by a physiotherapist and a second phase supervised by the primary care nurse. The study is ongoing, and evidence of the impact will be provided in 2017-2018.

- Multifactorial intervention and targeted assessment to reduce falls among the oldest old living in the community. A randomized controlled trial. Aims to determine the effectiveness of an individualized multifactorial intervention to reduce falls and malnutrition in community-dwelling persons aged 85 years old. A specifically-designed algorithm to detect risk factors for falls and malnutrition is used to provide recommendations and specific, standardized interventions for risk reduction, along with 3 In-home visits made annually by a trained nurse or physician complemented by two biannual analytical studies. Participants are followed-up for hospitalizations, falls and weight using a monthly calendar. Two face-to-face interventions are carried out and telephone calls are made to reinforce adherence. Evidence of the impact has been provided in 2015.
- Effectiveness of a multifactorial community intervention for the prevention of falls in the elderly. Evaluated the effectiveness of Community Activities involving health care professionals and other community figures, such as: Drawing competition for schools "Caring for the elderly", Interventions in the media (radio, local magazines), Editing leaflets and posters. Informative conferences in institutions and centers for the elderly, Exercise programs for seniors who had fallen, Popular walks organized annually, Publication and dissemination of a specific video, Collaboration with local councils to reduce barriers, Regular contacts with community representatives (council of elders).



Prevention and early diagnosis of frailty and functional decline (Action Group- AG A3) are closely related with the integrated care of chronic diseases (AG B3). Both operate primarily in the community and rely on integrating primary, secondary and social (community) care. Both require this integration of health and social care, either to deliver complex assessment (e.g. Comprehensive Geriatric Assessment) or for the implementation of tailored interventions to frail individuals. This is a vulnerable group of individuals, often unknown to general practitioner or overlooked by single dimensional disease-specific guidelines used in clinical practice, that require a more comprehensive approach in order to prevent disability, recurrent hospitalizations and related health-social care costs. To be successful in the care of frail older adults with chronic diseases, interventions must integrate adequate health care with a supportive social environment able to foster the patient through different stages of diseases. Empirical evidence shows that women have higher rates of frailty both physical and cognitive and that the distribution of chronic diseases varies by sex. Thus, interventions must be gender and cultural sensitive.

Adherence to prescribed therapy (AG A1), or to a physical rehabilitation program, especially for older adults with initial physical or mental impairment, are good examples that show the need for integrated care. However, the prevention of frailty also needs integrated interventions to slow psychological, physical and mental decline. A new public health approach, able to offer appropriate care to these patients through the different stages and severity of disease states, should be set up. Pro-active assessment of frailty (AG A3) could become an entry point for patients and healthcare professionals to access integrated care, while the integrated management of chronic disease and frailty prevention programs could offer appropriate tailored care pathways to each patient. Together these could represent the continuum of care that patients need; this approach should be able to multiply the impact of care on patients' health status as well as on their use of health services.



In this field, inequalities across European countries and within each country are deep. Assessment of frailty does not represent a common step for accessing appropriate care: however, several EU countries have developed models of frailty assessment and good practices in the integrated management of chronic diseases that have been implemented locally or regionally in several member states. In Ireland, the Community Assessment of Risk and Treatment Strategies (CARTS) integrated care pathway is being implemented in the South of Ireland, in Barcelona, Spain, in the North of Portugal and a non-EU site, Fremantle in Western Australia. In Italy, the Long Live the Elderly Program is a large scale initiative that involves more than 4000 community dwelling older adults to screen for and prevent frailty and its consequences, through a strict monitoring of a number of parameters. The EU has also funded similar initiatives, incorporating some members of action groups (A3) such as the PERsonalised ICT Supported Service for Independent Living and Active Ageing (PERSSILAA) project, the Frailty management Optimisation through EIP AHA Commitments and Utilisation of Stakeholders input (FOCUS) and the “Sunfrail” program.

Despite these potential examples, most EU countries are struggling to align social and health care at the community level, not least because of the different organizational arrangements between services. To create synergy, healthcare planners should join the assessment of frailty with good practices already in the field with the aim of building up a continuum of care model, testing the impact of this model in terms of quality of life and cost effectiveness. The partners are connected by other stakeholders including civil society organizations and SMEs that could maximize the impact of the program. The proposal is fully aligned with the objectives of EIPAAHA.

Contribution to the Scaling Up Strategy of the EIP on AHA:

The proposal include projects already developed in six European countries and is going to include organization based in two more countries. Objective of the proposal is to represent all the European Regions.

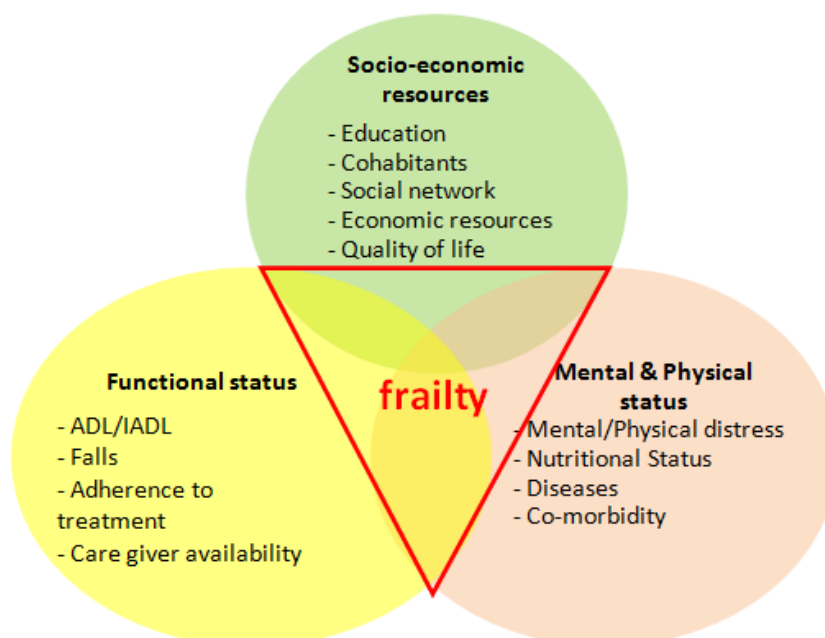
Fig 1. Key elements of the synergy



Contribution to MAFEIP (Monitoring and Assessment Framework for the European Innovation Partnership on Active and Healthy Ageing):

MAFEIP indicators include primary and secondary indicators that have been assessed for their contribution to define frailty⁵. Many of the indicators tested are included in the present proposal to be assessed in the framework of a primary level assessment, which is obviously performed by administering a short questionnaire(s). In addition, some indicators that are markers of the availability of socio-economic resources will be also assessed for their impact on frailty because of their strong relation with mortality rate and an increased use of health resources such as hospitalization and institutionalizations (fig 1). This is a further contribution to develop a comprehensive picture of frailty and the way to assess it. Moreover other indicators will be tested at the different sites according to the activities carried out by the partners involved in the proposal. All these information represent an added value to enrich the MAFEIP.

Fig 2 Frailty detection according to domains and indicators



⁵ C Boehler, F Abadie, R Sabes-Figuera. Monitoring and Assessment Framework for the European Innovation partnership on Active and Healthy Ageing (MAFEIP) - Second report on outcome indicators. ISBN 978-92-79-44718-1 (PDF); ISSN 1831-9424 (online); doi:10.2791/171684; Luxembourg: Publications Office of the European Union, 2014
© European Union, 2014

3. Objectives

General Objective:

1. To set up a public health approach.
 - to prevent, identify and manage frailty in community dwelling older adults, to be validated in different EU member states,
2. To identify the factors that can be targeted in order to, delay or postpone further decline and disability.

Specific objectives

1. To join systematic frailty assessment with good practices in frailty prevention and management, by counteracting social isolation, and improving nutrition, adherence to therapy and physical activity.
2. To promote the continuum of care by integrating social and health care at primary, secondary and tertiary levels.
3. To assess the impact of this public health model to manage frailty in the community in terms of cost effectiveness, use of health services, acceptance by citizens and patients' QOL.
4. To test the relation between a set of indicators and the prevalence of frailty
5. To exploit existing ICT-supported assessment and intervention tools.
6. To describe caregiver network's weaknesses and strengths, and implement strategies to maintain, supplement and improve this network

Pere Mata Institute University Psychiatric Hospital

Mental Health Platform from Tarragona Province



1. Summary

Project title: Mental Health Platform from Tarragona Province

Organisation name: Pere Mata Institute University Psychiatric Hospital

Human Resources: Informatics' engineering team expert in medical data management, Researcher team (biology, psychiatry, psychology) and epidemiology team.

Informatics support: Access to programs, equipment and local own servers with high security.

2. Description

Mental health is a broad issue talking about well being in all ages, from childhood to elderly. Preventing mental health diseases and controlling them is a key issue in healthy ageing.

In the province of Tarragona several entities of Pere Mata Group offer this public service to the society, being the pioneers of Catalunya for some specialties. The **Pere Mata Group** entities cover all mental health services from community network centers, day centers and residences day hospitals, acute hospital units, long stay hospital units and psychogeriatric residences. The Pere Mata Group, through an agreement with the Rovira i Virgili public local University has a University Hospital and carries out important teaching, now from more than 25 years. Also Group Pere Mata is a stakeholder of Fundació Institut d'Investigació Sanitària Pere Vergili, and all research is managed through it. Activities to promote the job placement of Mental Health patients are organized by the Pere Mata Foundation.



Tarragona province has 800.000 habitants with socio-economical threats that resemble those of the mean European population. Therefore, data from Tarragona province could be an interesting pilot case study for Europe. Fifty % of the Tarragona Province population lives in the main cities, the rest have some difficulties to access to Pere Mata mental health centers and units, whom can be monitored by TIC solutions in order to ensure their well-being.

Every year Pere Mata Group attends more than 100.000 mental health visits from around 20.000 patients.

The following main tasks are developed currently with several local stakeholders:

- School conferences
- Planning activities with the local patients and their families associations
- Family support programs
- Elderly support programs

Pere Mata Group is an official center of training psychiatrists, clinical psychologists and mental health nurses.

Tarragona Mental Health Platform is a service led by mental health and computational experts. The aim is adding value to the electronic clinical record data to monitoring the activity indicators in order to help management, research, and population mental health as a final main outcome.

Tarragona Salut Mental Platform is supervised by the Catalan Agency for personal data protection and a local Ethics Committee and Data Protection Committee.

3. Objectives

1. Having a tool that facilitates the generation of indicators of mental health care for managers.
2. Having a tool that using Big Data techniques for collecting and analyzing data on mental health.
3. Be a reference service providing mental health data (for the public administration , patients/end-users , companies, etc).
4. Be an attractive service for scientific studies or proof of concept in mental health that require monitoring.

4. Impact

a. Sharing learning, knowledge and resources for innovation

Our institution shares knowledge through university (teaching, developing research and training activities) and through associations of users and affected, schools and in coordination with the administration.

b. Contributing to European cooperation and transferability

In the past we have participated in projects with European funding (European Science Foundation FP7) related to mental health and the health of people with disabilities, evident in scientific publications .

Our informatics team also coordinates the European project K4CARE - Knowledge - Based Care Home- eServices for an Ageing Europe.

We are part of the national network of biomedical research in mental health CIBERSAM and we receive financing to develop projects from Ministry of Economy and Competitivity with FEDER co-financing.

As a university hospital we have Erasmus students interested in research in mental health.

c. Delivering evidence of impact against the triple win (healthy living, efficiency and market growth)

Platform Tarragona Mental Health has and can have even more in the future impact on:

1. Valorization of the electronic medical mental health data
2. Develop tools for mental health Big Data that can be applied to the this population and therefore improve their welfare
3. Welcoming observational projects (transversal or longitudinal) to test the efficacy of new drugs , new therapeutic and preventive strategies , etc.
4. Provide information to better manage resources (if we know the behavior patterns of the population we could distribute resources more equitably)

All that will benefit the individual patient's health, professionals (improved and more effective organization) and industry (development of ICT tools to support and monitor the elderly for example).

d. Scale of demonstration and Deployment of innovation

Tarragona Mental Health Platform was established in 2015 being still in development so we can not provide current examples of scalability . But if we can anticipate that it can facilitate the verification and monitoring of the implementation of preventive activities and support for older people with mental health problems (which can be 20% of the population over 65 years). If it proves effectiveness the same tools could be applied to other health specialities other than mental health. Currently with the development of the platform we are implementing various innovations that will impact economic and social welfare.

Institut de Recerca Biomèdica de Lleida Fundació Dr. Pifarré (IRBLleida)

ILERVAS: El Bus de la Salut



1. Summary

Project title: ILERVAS, El Bus de la Salut

Organisation name: Institut de Recerca Biomèdica de Lleida Fundació Dr. Pifarré (IRBLleida)

Resources:

- Material:

A bus equipped with medical equipment

Caravan

- Personal:

3 nurses

1 imaging technique

1 nursing assistant and bus driver

1 computer technician

1 epidemiologist

1 doctor

1 administrative and communication technician

2 project coordinators



2. Description

The **‘ILERVAS. El Bus de la Salut’** project is an ongoing project that aims to evaluate whether the ambulatory use of some Hospital-based diagnostic techniques (vascular ultrasound) will improve the health status of the population of rural areas. A bus equipped with medical equipment and health personnel will travel for 3 years (2015-2017) different municipalities of the province of Lleida. This bus, that travel along the province of Lleida, will be conducted various tests to assess the health status and renal blood. Furthermore it will provide with an epidemiological view of the occult vascular and renal disease. The project is an interventional, randomized prospective study in which the population with one cardiovascular risk factor, attended in primary care units across the territory of Lleida, will be randomized to attend to a specialized bus in which a complete vascular study will be made. Furthermore, several validated questionnaires in which the general health status and the dietary habits will be recorded. The information obtained will be forwarded in a report form to the primary care physician. A blood and urine sample will be stored to determine biomarkers which could be of interest to the diagnosis or the progression of the vascular and renal conditions. Thus, the outcomes of this project will be an epidemiological picture of the asymptomatic vascular and renal diseases in the rural areas of Lleida, and its relationship with dietary, an assessment of whether an ambulatory program of vascular and renal disease screening would decrease the vascular and renal outcomes in population living far away from big hospitals, and a collection of biological samples which could serve to find new biomarkers or even risk factors for vascular and renal diseases. This project will reveal the prevalence of subclinical vascular disease and hidden kidney disease, determine whether or not their early diagnosis brings health benefits and will also allow investigation of new risk factors.

3. Objectives

1. To determine the prevalence of subclinical arterial disease (atheromatosis) and hidden kidney disease (GFR alteration, microalbuminuria) on a sample of 9.000 people in the province of Lleida.
2. To assess the prevalence of abdominal aortic aneurysm in the sample of male population over 60 years.
3. To analyze different biomarkers associated with atheromatous disease and kidney disease.
4. To study the relationship between lung capacity and cardiovascular risk.
5. To analyze the burden of ages and its relationship with cardiovascular risk.
6. To diagnose atrial fibrillation as a risk factor for stroke.

4. Impact

a. Sharing learning, knowledge and resources for innovation

This is the first time that four organizations in a same zone work together in order to impulse a medical bus. This project creates a close cooperation between: la Diputació de Lleida, la Fundació Renal Jaume Arnó, the Health Department of the Generalitat de Catalunya and UDETMA Unit of the Biomedical Research Institute of Lleida. The 'quadruple helix' have planned this project with the aim of become Lleida a pioneer in the prevention of cardiovascular and kidney diseases and promoting health policies in this area.

All the medical results of 'El Bus de la Salut' are included in the medical history of each patient, so the Catalan Health System and the Biomedical Research Institute of Lleida work together with this information.

This Reference Site plans:

- To avoid cardiovascular events such as stroke, heart attacks, ischemia patients... as well as advanced renal disease.
- To reduce costs and expenses in the Health Service in the treatment of cardiovascular and kidney disease advanced.
- To approach the population. The special characteristics of the province of Lleida with a big extension and dispersed population, brings this experience promotes patient loyalty, as are medical tests that come to the person, instead of doing it in reverse. To share this project in other provinces in order to promote this innovative project and his results.

b. Contributing to European cooperation and transferability

This innovation is only being adopted in Lleida, but it can be developed in other regions in Europe. This project takes part of the Observatory of Innovation in Healthcare Management, the instrument used by the Catalan health system to catalogue the efforts made by organisations in innovating in several spheres of management. For an experience to be included in the Observatory the following criteria must be met:

- Initiative being implemented within an organization;
- Initiative bringing about a change;
- Initiative having an impact on resource optimization
- Initiative affording capacity to transfer the experience to other organizations and systems.



c. Delivering evidence of impact against the triple win (healthy living, efficiency and market growth)

The project will enable several improvements in society and in the quality of life of people included in the project but also other people around:

- Approach of the technology that normally is only used in hospitals to the whole population, both cities located farthest from the capitals of the region.
- Knowledge of the importance of organ donation, through an information leaflet included in the bus and therefore, as a result, we will encourage the donation
- Promotion of healthy eating and the benefits of physical exercise, through two surveys and a bookmark.
- Awareness of cardiovascular diseases (first cause of death in Catalonia) and his consequences (angina, stroke, risk of amputations in the lower extremities).
- Promoting prevention and creating a need on the part of the population of this request prevention of cardiovascular disease prevention trials.
- Recognition of the importance of scientific research.

d. Scale of demonstration and Deployment of innovation

After a year of circulation of El Bus de la Salut, from January to December 2015, the project has visited 50 municipalities and 2.776 (1.434 women and 13.42 men) people have been in the bus on 2015. The average age for women is 59 years and men, 55 years.

Reasons for inclusion in the study:

Hypertension: 38.5%

BMI> 30: 29%

Dyslipidemia: 52.7%

Smoking: 55.5%

The results shows that the 65% of the 2.776 patients, that have undergone preventive testing, have some kind of atheromatous disease and the 16,5% kidney disease.

5. Pillars

a. Pillar I: Prevention, Screening and Early Diagnosis

Cardiovascular diseases are still the leading global cause of morbidity and mortality and current preventive measures are insufficient. The classical cardiovascular (CV) risk factors (hypertension, dyslipidemia, obesity, smoking and diabetes) explain only 50% of CV events. We propose a new strategy to prevent cardiovascular and renal events based on the intensive management of subclinical atheromatosis and new potential risk factors: the use of non-invasive and most sensitive diagnostic tools for the identification of atherosclerosis disease and to establish implements individualized prevention guidelines for each patient.

The main basis of cardiovascular disease is atheromatosis (presence of plaques in the arteries), and atheromatosis is a progressive disease of long evolution. The arterial ultrasounds appears as a validated technique, economic, portable and free of contraindications, which allows “watch” the vessel directly and meet the direct effect of risk factors on the health of the arteries in each individual.

From 2015 to 2017, 9.000 people aged between 45 and 70 years without previous history of cardiovascular disease and with at least one cardiovascular risk factor will be randomly selected from the primary health care centres across the province of Lleida. A team of experts will travel around in a mobile unit to carry out the following baseline tests on the intervention group: Artery ultrasound; (carotid, femoral, transcranial and abdominal aorta); ankle-brachial index; spirometry; determination of advanced glycation end products; dried blood spot and urine spot tests. Additionally, blood and urine samples will be collected and stored in the biobank to identify new biomarkers using omics studies.

The test results are included in the medical history of each patient, so that the family doctor can determine the diagnosis for each person to establish, if necessary, appropriate action in each case.

Fundació TicSalut

AppSalut website and Digital Health Platform



1. Summary

Project title: AppSalut website and Digital Health Platform

Organisation name: Fundació TicSalut

2. Description

AppSalut website is a showroom of mobile applications related to health and social care sector, which have passed an accreditation process that TicSalut Foundation had defined. The applications included in the site may be recommended by a professional to its users/patients. The users who use some app included in the AppSalut website and generate data is able to shared it with her/his professionals through the Digital Health Platform. At its turn, the professional who consider one of this data relevant, can selected from the Digital health Platform, and incorporate it into the patient's clinical history.

The **Digital Health Platform** is a data base in that all citizens who use one of the mobile applications included in the AppSalut website, and accepted share the data generated with his or her professionals, will send the information. Also the Digital Health Platform has a data viewer that shows the data in organized way to the user/patient and to the professional.

Resources

Regarding to the AppSalut website, the resources used in the development come from TicSalut Foundation which is the Organization that define the model and how it has to work and subcontract the technical development to a third organization specialist in this field.



On the other hand, the part of the project related with the Digital Health Platform, the budget to developed come from a joint venture between TicSalut Foundation and in2, a company specialist in technological developments and innovation projects. Both companies handed the 50% of the propriety of this platform.

3. Objectives

1. Offers to the health and social care professionals, and also to the citizens a place in which they can find in easy way a group of app's that has passed a homologation process based in a public set of criteria grouped in four main areas (Technological, Usability, Security and Contents) and, in consequence the good use of them could be useful for the professionals and its patients/users.
2. Take and advantage of the reality that a huge percentage of citizens haves smartphones and used to use app to monitories their own daily activity, keep on mind their health appointments or control their vital signs. In this line, this project wants not only develop an app showroom, but also capture all this information, if the patients/users who generated it accept to share with his/her health and social care professionals, and offers to the professionals an innovative tool to monitor their users in continuous, and consequently have more information to decide the best treatment to the user, increasing the personalization of treatments and diseases fellows.
3. Give the option to both the users and health and social care professionals who has recommended the use on one or more app to a patient and, after hi/she accepts share its data, see in just one screen all information generated using one or different app's. These avoid the actual situation to have small pieces of information in different platforms associated with different app's. The professionals can also select one or more than one date that they consider relevant and can incorporate it directly from the Digital Health Platform that is the data base in which all the shared data is stored, to the health records of the patient who generated it.

4. Impact

a. Sharing learning, knowledge and resources for innovation

In order to sharing the Catalan experience in mHealth, develop and homologate health and social care app, TicSalut Foundation has created the mHealth Office to drive the deployment of mobility applications, initiatives and projects in Catalonia, create guidelines and standards as support tools in the mHealth development strategies. The Office also accompanies and advises on the development of mobility projects.

b. Contributing to European cooperation and transferability

TicSalut foundation is involved in the workgroup that European Commission created to promote a guidelines related to a health app assessment and to create and mHealth policies. In both groups the Catalan experience is considerate as a study case. In both cases the results of this workgroups is expected that have a European and transcontinental repercussion.

c. Delivering evidence of impact against the triple win (healthy living, efficiency and market growth)

AppSalut project has a great impact in the citizen's life, due to since they use and share information with their professionals, the treatments will be more personalizes and adapted to the real patients need and health states of each moment. The project also has impact in the industry, because since there will be a homologation process that its requirements will be publics, they can develop their apps to obtain the mark that homologate it as useful. Also this is an advantage to developers that want differentiate their product in front of the competence to focus them to the seniors and other specific target groups.

IS3: Integration of social and healthcare systems



1. Summary

Project title: Integration of social and healthcare systems (IS3)

Organisation name: Fundació TicSalut

2. Description

IS3 is a continuity of care and integrated care processes project, under a social citizen-centric vision, adapted to the reality of each district and placed at the service of professionals and citizens. The project provides interoperability scenarios to facilitate the integration between different information systems of healthcare providers and social services. The project is led by The TicSalut Foundation and is planned to last 5 years from 2014. Its scalable approach allows a gradual uptake across territories, being adapted to the technologies and needs of every care centre and incorporating all detected improvements.

Resources

More of 2500 healthcare, engineers and technological professionals of CatSalut (Ministry of Health), The TicSalut Foundation and The Government of Catalonia's Telecommunications and Information Technology Centre.

3. Objectives

1. Create a holistic vision of the patient through all the healthcare organizations (acute, primary and chronic)
2. Implement a case management tool that supports the model, include interoperability and analytics capabilities
3. Design and to implement a tool to interact with the citizen, specially aged people.

Vall d'Hebron Research Institute & Hospital

Ictus project



1. Summary

Project title: Ictus project

Organisation name: Vall d'Hebron Research Institute & Hospital

2. Description

Stroke, also known as cerebrovascular accident (CVA), cerebrovascular insult (CVI), or brain attack, is when poor blood flow to the brain results in cell death. There are two main types of stroke: ischemic, due to lack of blood flow, and hemorrhagic, due to bleeding. Both of them result in part of the brain not functioning properly. In 2013 approximately 6.9 million people had an ischemic stroke and 3.4 million people had a hemorrhagic stroke. Treatment to try recover lost function is called stroke rehabilitation and ideally takes place in a stroke unit; however, these are not available in much of the world or some difficulties arise in development countries due to patients' age or distance between Center and home.

For most people with stroke, physical therapy (PT), occupational therapy (OT) and speech-language pathology (SLP) are the cornerstones of the rehabilitation process.

Some current and future therapy methods include the use of remote ICT (Information and Communications Technology) for rehabilitation. These forms of rehabilitation offer potential for motivating patients to perform specific therapy tasks that many other forms do not. Many clinics and hospitals are adopting the use of these off-the-shelf devices for exercise, social interaction and rehabilitation because they are affordable, accessible and can be used within the hospital and home.

From VHIR, several projects are being developed in order to complete a pipeline of best practices in the rehabilitation processes based in OT. In both cases, the application of ICT in improving the control and correction of vascular risk factors and secondary prevention with the active participation of the patient is being investigated at the Neurovascular Unit from Hospital Universitari de la Vall d'Hebron (HUVH) being the Principal Investigator (Dr.Marc Ribó Jacobi). Now two major projects are described.

The first project consists in developing and validating a digital platform for smartphones designed to raise conscience in patients about the need to perform healthy lifestyle changes and to improve communication with Medical staff and increase compliance with therapeutic guidelines and treatment, with three related phases on 36 months. The project consists of three stages: first, platform execution; second, recruitment and clinical trial execution, 120 patients; third, Data Evaluation and communication actions (congresses, publications, etc). Fundació i2Cat (i2Cat) has a solid background and expertise in telemedicine and is still our partner in this project.

As the second project, remote rehabilitation through a new platform (Mefacilyta) will provide a personalized and interactive multimedia environment aimed at people with disabilities, through which the occupational therapist programs the appropriate activities for every patient, including video and images, conducted by a tablet with 4G system. After this, every patient should send a video of the execution and will receive feedback later. This project is being performed between VHIR and Fundación Vodafone España, with a budget of EUR 45.000 with an initial timeline of 12 months and additional 2-3 months for Data analysis and communication actions (congresses, publications, etc).

The Neurovascular Unit from **Hospital Universitari de Vall d'Hebron** serves more than 1,000 patients per year and reclutes more than 150 patients per year on Clinicat Trials. 8 neurologists and 2 specialized nurses complete the Team.

3. Impact

a. Sharing learning, knowledge and resources for innovation

Bringing together key partners as foundations (Vodafone España and Fundació i2Cat) to develop innovative assistive technologies, platforms, person-centred support and feedback systems as secondary prevention with the active participation of the patient. Development of e-health based tools for stroke recovery patients that will target middle-aged and older adults with these kind of disabilities. Scientists, clinicians, nurses, patients, caregivers and home care providers will be educated through short courses to ensure correct and efficient use of these new tools in Health centres and home. The projects will result in harmonised processes, new cost-effective guidelines and more accurate recovery time for these patients. Innovation will be included on all stages of these projects.

b. Contributing to European cooperation and transferability

VHIR and HUVH are Best-in-class organizations in Healthcare research, technology, education, business creation, as well as both social and pharma-biotech innovation. Other core and associate local partners (Spanish Node) related with EIP on AHA are collaborating with VHIR in several projects (Inveniam, CSIC (Spanish National Research Council), AQUAS, CERCA, UB (Universitat de Barcelona), IBEC, Hospital Clínic, Ferrer, etc) and other regional partners and pharma and med-tech companies as Medtronic, Roche, Ferrer, etc are common VHIR-HUVH partners also.

c. Delivering evidence of impact against the triple win (healthy living, efficiency and market growth)

Self-management of Health is a business objective in the promotion of healthy living. At present, more than 10 million people per year are affected by strokes worldwide. It is estimated that a significant reduction in risk factors and involving and active OT in addition, could prevent a new stroke and to get an early recovery. This personalized therapy (videos and feedback from clinicians) will reduce societal costs through fewer visits to hospitals, better diagnosis and simplification of treatment. It will increase



perceived quality of life by improving performance (oral, written, communication, etc) and postponing a dependent life for people affected. Overall recovery of functions is highly dependent on the individual, for this reason, the active participation of the patient and caregivers through the platform could be definitive. In addition, VHIR Business Development Area will be involved in the market preparation and potential expansion.

d. Scale of demonstration and Deployment of innovation (economic and social factors).

Fewer visits per patient and hospital stays and additional complications, a better perceived quality of life, improved physical and cognitive capabilities of the affected population etc., means saving resources for Healthcare Systems and European society in the order to several billion Euros by 2030, and the Deployment of innovation is a key element in the Neurological Units. Current partners committed to these projects foresee an important potential turnover in the relevant sectors.

Garraf Healthcare Consortium

Innovative technology for Comprehensive Geriatric Assessment (CGA)



1. Summary

Project title: ECHORD++

Organisation name: Garraf Healthcare Consortium

2. Description

The European Coordination Hub for Open Robotics Development Plus Plus ECHORD++ [<http://echord.eu/>] is part of a larger project called **ECHORD++** which belongs to 7th framework program of the European Community. The European Coordination Hub for Open Robotics Development want stimulates the interaction between robot manufacturers, researchers and users. This goal uses the implement of three different instruments: the Experiments, Public end-user Driven Technological Innovation (PDTI) and the Robotics Innovation Facilities (RIF).

Healthcare and Urban Robotics have been identified as scenarios for which different public bodies have submitted their technology needs. ECHORD++ offers research and development consortia the possibility to develop robots according to the needs of public bodies with a Public end-user Driven Technological Innovation (PDTI) scheme.

Our Hospital “**Consorti Sanitari del Garraf**” by the research foundation ABAT won a call on the challenges of robots in health in the near future. A panel of experts has selected the challenge “Innovative technology for Comprehensive Geriatric Assessment (CGA)” in the Healthcare scenario.



With the financial support of ECHORD++ the consortia will develop the required technology in three competitive phases:

1. System design (duration 6 months, 3 consortia per scenario)
2. Prototyping (12 months, 2 consortia per scenario)
3. Small-scale test series (12 months, 2 consortia per scenario)

At the end of each stage a small pilot tests will be done at our center in an outpatient of geriatrics.

The Comprehensive Geriatric Assessment (CGA) is a diagnostic instrument designed to collect data on the medical, psychosocial and functional resources and problems of elderly patients. The information gathered is used to create an overall plan for treatment and follow-up.

Currently, CGA is performed by social and clinical professionals involved in the care of elderly people: physiotherapists, occupational therapists, nurses, social workers, psychologists, medical doctors, etc. Utilizing robotic technology to conduct geriatric tests will reduce the time medical professionals have to spend with purely mechanistic tasks (like documentation). Thus, they will gain time to developed individualized care plans for their patients. The possibility to assess and record the cognitive and physical status of a patient increases transparency and objectivity of the assessment. The interim results of the technology development will be evaluated in our geriatric hospital under natural circumstances.



3. Impact

a. **Sharing learning, knowledge and resources for innovation**

The main "ECHORD" project already includes partners from different European countries and of different types (universities, robotics companies, technology centers and Public Administration). But in turn looks towards public end users and their needs. And, last but not least, creates the competitive participation of new consortia of partners from various countries and compounds of different types.

The presence of a robot in query geriatrics is a phenomenon never used in routine practice. This phenomenon is novel. That this technology allows health professionals to have more time and be close to the patient, without losing effectiveness, is an innovative phenomenon.

If we are able to overcome this challenge, and share it, we believe that the effects on knowledge not add, but rather multiply. The system will allow improve, we will have created a new paradigm of collaborative innovation.

b. **Contributing to European cooperation and transferability**

Projects like ECHORD have collaboration between multiple European partners. The nature of this project provides the possibility of bringing progress to the industry for the manufacture and marketing of new robots in health care. In a way that which researches and develops will end being a part in routine practice.

c. **Delivering evidence of impact against the triple win (healthy living, efficiency and market growth)**

This project is intended to increase the health of older people making more efficient and safer comprehensive geriatric assessment. We want the time used by the health care professional be more humane and aimed at increasing the doctor-patient interaction. All this involve the creation of business, with new fabrications and marketing. And also, the business in the sector in provision of health services will grow, where public administration in many areas of Europe represents a guarantor.

Guttmann Institute

Guttmann NeuroPersonalTrainer® (GNPT)



1. Summary

Project title: Guttmann NeuroPersonalTrainer® (GNPT)

Organisation name: Guttmann Institute

2. Description

Guttmann NeuroPersonalTrainer® (GNPT) addresses cognitive training, rehabilitation and stimulation based on advanced technologies and knowledge, grounded on cognitive neuroscience, plasticity and neuropsychology (traditional rehabilitation experience and strategies). It allows the provision of individualized and personalized services, improving the traditional on-site rehabilitation/training processes. Besides, as one of its most differential distinctiveness, integrates a decision support system that systematizes the classification of each patient's individual characteristics, it identifies the comparable cases, and it provides to the therapist the most successful experiences stored in the system for his or her consideration. This procedure empowers the therapist to design the personalized plans based on the highest degree of evidence available at any moment. Summarizing, GNPT is conceived as a large-scale and holistic solution, enabling to complete and extend the traditional rehabilitation process beyond the rehabilitation centers towards day centers or patients' homes.



3. Impact

a. Sharing learning, knowledge and resources for innovation

GNPT aims for the integration of innovative technological and clinical resources to meet societal and health challenges. Therefore it allows an iterative and interactive co-creation process at different levels.

- At the first level, it allows us, as clinical providers, to re-design our own services, by means of GNPT as an IT platform.

- At a second level, it allows to establish an open innovation service partnership in collaboration with other clinical providers, supporting them to redesign their own services, based on GNPT platform. Win-win is achieved, as using GNPT platform reverts in a common knowledge repository about efficacy of cognitive interventions. This knowledge is iteratively integrated to the platform (by means of a proprietary algorithm), optimizing personalization of therapeutic plans for further users, where both parties contribute to data generation and data exploitation to produce new knowledge that is in turn integrated to the platform therefore re-starting the cycle.

As the licenses to access the services is directly provided by GNPT website, the clinical provider doesn't need to further invest nor increase their fees in order to be able to offer it to their patients (assessment, diagnosis, follow-up, etc.).

At the third level, it allows to enter in a co-creation process with other healthcare providers, focused on other clinical aetiologies, but sharing cognitive deficit as a common clinical and technical challenge. They offer a different portfolio of services, with different end-users specifications. This co-creation process is supported by GNPT as a common IT platform. New functionalities and singularities are therefore added, making GNPT more competitive, aiming for the creation of new services and targeting new population segments. Innovation at management level is therefore leveraged supporting for new scale economies. Therefore in this approach, partnership for innovation is twofold: clinical extension partners (aiming for new clinical services) and

knowledge partners such as Mental Health (e.g. schizophrenia, Bipolar disorder, autism spectrum disorders,...), Intellectual Disabilities, Aging, Frailty detection and prevention, Dementias, etc., oriented towards the design and co-creation of customized new services.

This collaboration is based on own funding as well as in cooperative racing for competitive funds at local, national and European level, allowing to accelerate innovation processes, the incorporation of new partners and driving the involvement of public administrations.

b. Contributing to European cooperation and transferability

GNPT contributions at European level materializes through the involvement at different FP7 ICT programmes such as Personalised health, active ageing, and independent living or ICT for Ageing Well.: CLEAR (Clinical Leading Environment for the Assessment of Rehabilitation protocols in home care) a project funded under the ICT Policy Support Programme – CIP-ICT-PSP-2007.2.2 CLEAR involved four Member States of the European Union (Italy, Spain, The Netherlands, Poland). A large scale Pilot study has been conducted to demonstrate the feasibility of Tele-rehabilitation services. It involved an heterogeneous group of common chronic diseases, chosen on the basis of their impact on the Health Systems, namely, osteoarthritis; paretic upper limb in stroke survivors; acquired brain injury (ABI) and mild cognitive impairments; chronic back pain (CBP) and whiplash injury (WAD); chronic obstructive pulmonary disease (COPD). Patients received customized physical and cognitive rehabilitation sessions, and execute the specific session exercises at home or in the nearest kiosk.

PERSSILAA (PERsonalised ICT Supported Service for Independent Living and Active Ageing) a project funded under the ICT-2013.5.1 -. The consortium consists of 8 partners from 5 different countries across Europe (The Netherlands, Ireland, Portugal, Italy and Spain). It addresses frailty in community dwelling for older adults. focusing on screening, monitoring and training at cognitive, physical and nutritional levels targeted for early detection, and interventions through remote service modules offered through local communities.

c. Delivering evidence of impact against the triple win (healthy living, efficiency and market growth)

Healthy living

In order to assess impact on healthy living, the major cognitive domains involved in activities of daily living (such as selective, sustained and divided attention, visual, verbal and working memory, planification, sequencing, inhibition and categorization) have been addressed. Therefore a battery of standardized cognitive tests covering such implied domains has been applied to a random selection of acquired brain injury patients (traumatic brain injury, stroke and degenerative diseases). Statistical comparisons before and after GNPT treatment, (having completed a minimum of 12 weeks sessions) show that 72% of analyzed patients exhibit a global improvement in main cognitive functions ($n = 670$). These results, are comparable to the best reported outcomes documented in the literature, both considering face-to-face rehabilitation treatments or tele-rehabilitation programs.

Besides, no statistically significant differences have been found between patients treated at Institut Guttmann, other clinical centers participating in the analysis or home treatments, allowing us to conclude that the system provides a high level of accessibility to treatments.

Furthermore, the system allows the incorporation of technical aids or assistive devices to replace the standard mouse or keyboards, and even for collecting inputs on touch screens (PC).

Particularly, when disaggregating the results into cognitive functions, 58% of analyzed patients improve in attention, 64% improve in memory and 64% in executive functions.

Regarding traumatic brain injury patients ($n=329$) 76% of analyzed patients show improvement in any of the trained cognitive functions 62% of analyzed patients improve in attention, 71% improve in memory and 67% in executive functions.

Concerning stroke patients (n=208) 74% of analyzed patients show improvement in any of the trained cognitive functions, 55% of analyzed patients improve in attention, 68% improve in memory and 64% in executive functions.

In relation to degenerative brain damage patients (n=132) 60% of analyzed patients show improvement in any of the trained cognitive functions, 51% of analyzed patients improve in attention, 51% improve in memory and 56% in executive functions.

Efficiency

In terms of fixed costs we differentiate between those centers carrying out treatments in their facilities or exclusively home care. When sessions take place in clinical settings the main necessary investment involves as many informatic equipments as the number of persons treated by professionals physically on site. Highly satisfactory results are obtained at Institut Guttmann when a relation of 1 clinical assistant for 7 patients takes place in one dedicated room. Additionally, professionals from clinical extension centers receive intensive (4 hours) training sessions. For example one dedicated room with 7 places, that can be extrapolated to an standard healthcare institution would entail the following start-up costs:

$7 \times 500\text{€}$ (single informatics equipment cost) + $4\text{H training} \times 40\text{€/H XHUP}$ = 3660€.

In summary, fixed costs can be quantified in terms of the initial setting of required equipments to be determined by each clinical setting and the training sessions for clinical professionals on functioning and administration of the GNPT platform.

When treatments are remotely provided, fixed costs are avoided since patients are in charge of the basic informatics equipment costs. Only should account for costs associated with the training of the involved professionals required for each clinical center for providing the services. So far training has been implemented face to face, but in a future scalability model it can be provided online, therefore increasing efficiency and reducing costs to the same extent.

In summary, for each patient, each therapist will have to dedicate a total of 3 hours to monitor the treatment, instead of the 60h (60 sessions 1H each) initially established, therefore a cost efficiency ratio of 1:20 therapist costs i.e. € 120 instead of € 2400.

It is considered that when patients achieve a significant clinical improvement, efficacy is equivalent to face to face treatment, and therefore efficiency is improved in a 1:20 ratio.

Market growth

The consequences of neurological diseases are a growing problem and their incidence (new cases) and prevalence (affected people) have turned them into one of the major public health problems worldwide.

According to the predictions by the WHO for 2030, disability of brain origin will include 5 of the 10 causes with major economic impact measured by years of life lost to disability (DALYs): Stroke, traffic accidents (SBI and SCI), degenerative diseases, depression, etc.

- In Catalonia 30,000 new cases per year and 450,000 people affected.
- In Europe 2,000,000 new cases per year and 25,000,000 people affected.
- The increase in life expectancy (15% of the Spanish population is older than 65 years) results in an increase of neurodegenerative diseases.

In this scenario, the focus of health provision is turning from been more effective and efficient in treating disorders towards being smarter in disease prevention and, even earlier, health promotion.

Maintenance of the functional capacity of the nervous system has been set as one of the priorities of biomedical research in the XXI century.

Brain Health is defined as the age-appropriate state of brain function that allows an individual to maintain social engagement, a level of autonomy sufficient to live meaningful and independent lives, and resist and recover from injuries or illnesses.



There are important individual differences in the capacity of response to the same insult. This phenomenon has been identified as Cognitive Reserve.

The nervous system has the intrinsic ability to change its function and structure to promote new abilities and adapt to environmental challenges and changes (Neural plasticity).

Harnessing neural plasticity and promoting individual Cognitive Reserve will optimize each individual brain health.

Based on this, there is an increasing interest in finding new strategies to improve brain health and reduce the global burden of neurological diseases. The estimation of economic activity in the digital industry around Brain Health 2012 was a billion dollars and the expectation for 2020 is 6 billion.

d. Scale of demonstration and Deployment of innovation (economic and social factors).

System Usability Scale (SUS) has been applied in order to assess end users satisfaction. Usability analysis in this study we have differentiated 3 groups of users: 10 Therapists, 25 Patients and 13 end users with functions of System Administrator. Considering the usability evaluation performed, SUS results (when maximum punctuation is 100) for each group of users is the following:

- Therapists: 80,83
- Patients: 70,00
- System Administrator: 75,58

Agency for Health Quality and Assessment of Catalonia (AQuAS)



Public procurement of Innovation in healthcare sector

1. Summary

Project title: Public procurement of Innovation in healthcare sector

Organisation name: Agency for Health Quality and Assessment of Catalonia (AQuAS)

2. Description

The ageing population is a challenge all healthcare systems across Europe are currently facing. Chronic conditions, age-related diseases and dependency have become major priorities in health systems strategic plans.

Catalan Ministry of health, responsible of healthcare delivery to the Catalan population, assumes the economic and organisational burden of that demographic fact.

Catalan Agency for Health Quality and Assessment (AQuAS) is a non-profit public agency of the Catalan Health Ministry in charge of exploring different instruments to integrate innovative solutions in healthcare system to face this challenge. In this sense, AQuAS is committed to the promotion of innovation in the health field in Catalonia and aims to foster the participation of the Catalan entities in innovative projects to provide the health system with the most advanced and efficient solutions available.

One of the main instruments of the health system to foster innovation is public procurement. AQuAS, accordingly to its responsibility of promoting innovation, is leading the implementation of that instrument in the Catalan public healthcare system.

AQuAS is a reference in public procurement of innovation (hereafter PPI) in Spain due to its experience in carrying out regional innovation procurement (e.g.: drug storage

and dispenser, mental health genetic-pharmacological service) and through the international projects. AQuAS is either coordinating or actively collaborating (DECIPHER – (as coordinator and leader of Coordinating PCP activities WP and Evaluation WP), PRO4VIP (as coordinator), INSPIRE, NYMPHA-MD (as advisory board member), STOP&GO and ECHORD++.

Furthermore, PPI is included as one of the main policy instruments in the Research Innovation Strategies for Smart Specialisation (RIS3CAT), the Smart Specialisation Strategy, in which the healthcare sector is one of the leading strategic areas.

Resources

AQuAS allocates a significant volume of resources in innovation: Innovation unit is mainly focusing in project of innovation integration, particularly in the field of public procurement of innovation. Innovation unit coordinates EU-funded projects, and its staff liaises with partners for many other projects. The Observatory of Innovation in Healthcare Management is also an initiative fully dedicated to the integration of innovation in the system, mainly by providing visibility to best practices in innovation across the Catalan health system.

3. Objectives

The instrument of PPI has the following objectives in the Catalan healthcare system:

- To foster social and technological innovation among the Catalan health system stakeholders, especially among the public healthcare suppliers,
- To improve services by enhancing their efficiency and/or improving their health outcomes.
- To trigger the Catalan healthcare sector's market in the development of innovative solutions.



4. Impact

a. Sharing learning, knowledge and resources for innovation

The Observatory of Innovation in Healthcare Management in Catalonia [<http://oigs.gencat.cat/>] collects efforts made by organisations in innovating in several spheres of management.

Although the primary field of actions centres on the Catalan health system, the Observatory has an international calling and seeks to showcase the innovative experiences in management from other autonomous communities, EU countries and indeed the world at large.

This instrument is intended for healthcare professionals and the managers of public and private health centres in the Catalan health system. Through the innovation community challenges are launched to address customer needs more efficiently and effectively.

The Observatory offers:

1. A forum for learning about management innovations
2. A management innovation community
3. Assessment quality certification process
4. Identification of strategic alliances in the Catalan healthcare system
5. Best practices sharing

Currently, there are more than 180 innovative experiences and 600 registered users in the innovation community.

b. Contributing to European cooperation and transferability

AQuAS has actively participated in EU projects within programmes such as FP7 Framework, H2020 or EIT-KIC Health. Projects related with public procurement either precommercial or innovative solutions have been coordinated by AQuAS and TicSalut. DECIPHER PCP (Distributed European Community Individual Patient Healthcare Electronic Record - FP7-ICT-2011-7) [<http://www.decipherpcp.eu/call-tender>] ; STOPandGO (Sustainable Technology for Older People–Get Organised - CIP-ICT PSP Call 7); [<http://stopandgoproject.eu/>], PRO4VIP ("Innovative PROcurement for Visual Impaired People" ICT-35-2014) [<http://www.pro4vip.eu/>].

AQuAS contributes to increasing competitiveness of European industry, and improving the quality of life of Europe's citizens and the sustainability of healthcare system by participating in the EIT Health consortium <https://eit.europa.eu/eit-community/eit-health>. EIT Health was designated as an EIT Knowledge and Innovation Community (KIC) by the EIT Governing Board on 09 December 2014.

Collaboration with other European network activities are related to health technology assessment, telemedicine and health care evaluation services such as the European Health Telematic Association [<https://www.ehtel.eu/>], the International Network of Agencies of Health Technology Assessment (INAHTA) [<http://www.inahta.org/>], the Health Technology Assessment International (HTAi) [<http://www.htai.org/>], the CIBER group (Networked Biomedical Research Centers) in Epidemiology and Public Health, the REDISSEC (Spanish Research Network on Health Care in Chronic Diseases) and the European Momentum for Mainstreaming Telemedicine Deployment in Daily Practice [<http://www.telemedicine-momentum.eu/>].

AQuAS participates in CORAL <http://www.coral-europe.eu/>, an European network of regions collaborating in the field of Ambient Assisted Living and Active and Healthy Ageing. Through a process of open innovation to solve the barriers implementing AAL and AHA solutions and services. CORAL focuses on 'regional policies about Active and Healthy Ageing' and 'Ambient Assisted Living'.



c. Delivering evidence of impact against the triple win (healthy living, efficiency and market growth)

ECHORD++ pretends to impact on the market growth through fostering the participation of healthcare entities in competitive processes aiming at developing technological solutions for service providers. This projects can be considered a in-field training for both entities identifying needs and those applying for funding. On the other hand, the solutions developed in the framework of **ECHORD++** have to address a challenge for the efficiency of the service of detection and diagnosis for the aged population, which has a notable margin of improvement.

The expected improvements in efficiency will come either from the optimisation of the resources by using robotic technologies for the identified routine tasks and for the increase of the quality of life achieved due to a closer follow-up and further sophisticated detection and warning systems. It is relevant to consider that these solutions will be introduced in-routine by the entities participating in the project, so clinical evidence will result from the project.

In regard to **STOPandGO**, and particularly Sant Pau's new service, there will be a significant impact in the Triple Win as far as:

- a) The prevention of complications is expected to reduce the mortality and the number of episodes among the elderly population, rising the life expectancy among the target population and therefore increasing their quality of life. The implementation of the new service will also lead to a reduction of a number of in-office visits, that represent a significant economic and personal burden for the patients, most of them belonging to aged population that have to move to the hospital periodically;
- b) The fully-implemented remote monitoring system and its integration with the hospital medical processes will improve the efficiencyby avoiding the unnecessary in-office visits. Moreover, the sharing-risk service deployment will

change the way the complications are managed, by allocating the responsibility to the source and efficiently distributing the cost assumed to solve the complications.

- c) The new procurement model implemented will change the whole medical implantable devices market; a new kind of product is requested by the demand, so the companies are being pushed to offer new services instead of units of devices. This will facilitate the introduction of new companies in the sector and making the market more balanced and competitive.

PRO4VIP will result in a clear roadmap on how to integrate innovation to a specific service. This is aligned to the EIP on AHA initiative as much as it contributes to all three objectives of the Triple-Win strategy:

- a) Increasing the quality of life of the patients (by researching on assistance solutions for persons with low vision condition and providing evidence);
- b) optimising the resources allocated to a specific field (by focusing on the early detection of a degenerative disease, whose treatment has a huge economic burden);
- c) and fostering the economic development of the sector (by stimulating the market by public procurement of innovation).

d. Scale of demonstration and Deployment of innovation (economic and social factors).

Public procurement of innovation is still a instrument in development and it is at early stages of implementation across Europe, especially in the healthcare sector. EC-funded projects represents the a huge part of the European PPI initiatives. Meanwhile, the EU Directive largely regulating the instrument (2014/24/EU) is being transposed in 2016, and it is being directly applied in those countries that have not do so. The imminent application of the directive will allow the deployment of this instrument at regional level, which will be possible thanks to the experience acquired in the participation in a number of European-level projects.