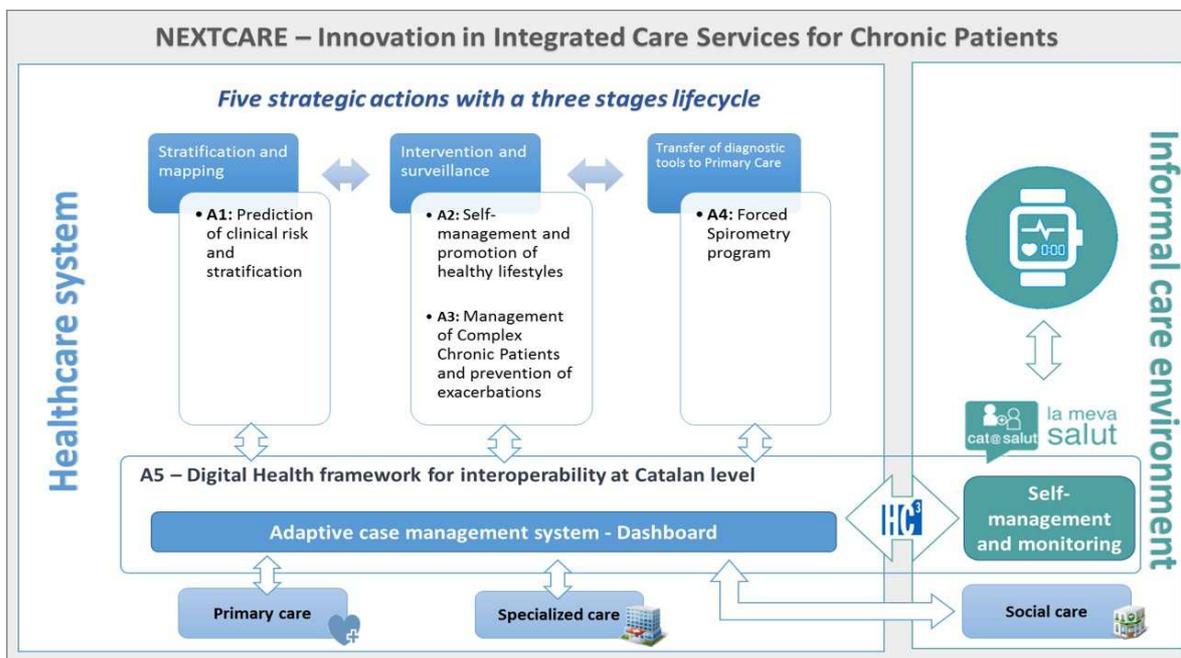


NEXTCARE Executive Summary

NEXTCARE is an innovation project belonging to the Healthcare Ris3Cat community lead by Biocat. It officially starts on October 2016 with a 4.5 years duration (2016-2021). The project focuses on integrated care services for chronic patients with a personalized medicine foundation. It has 3 main objectives: (i) regional deployment of services; (ii) Catalan test-bed for international leadership as 4-star EIP-AHA reference site; (iii) transfer and exploitation of new products and services which generate return value to the strategic healthcare Ris3Cat sector.

The project will operate through 5 main actions: (i) clinical risk assessment and stratification; (ii) self-management and promotion of healthy lifestyles; (iii) chronic complex patients' management: monitoring and prevention of exacerbations; (iv) transfer of specialized diagnostic tools to primary care; and (v) Digital Health Framework to achieve interoperability, as depicted in the graphical abstract.



The common ambition of the project, led by Eurecat, is to advance the co-design, development, implementation and evaluation of a new model of integrated care for the adaptive management of chronic complex patients which will incorporate collaborative case management tools for professionals and self-management tools for patients. The new model will facilitate interactions between health professionals and citizens. The ICT tools, embedded in cost-effective integrated care services, will provide intelligent support for early diagnosis, risk assessment and stratification, patient monitoring and self-management, decision sharing along patient journey, and ultimately prevention and quality of life improvement.

The project will have an impact at the Catalan level due to the co-leadership of Hospital Clínic de Barcelona-IDIBAPS and the participation of TicSalut Foundation and AQUAS agency, among several other companies and entities actively supporting the Catalan 4-star EIP-AHA reference site .

The project intends to overcome previous pilots linked to many previous and current projects at Regional, National and International level which we have been promoting and leading. For the purpose of reaching real world extensive deployment and trials, we have assumed that integration with current management systems using existing interoperability frameworks is a must. For example, we are planning that self-management tools for patients will be integrated to the Catalan Personal Health Folder-Cat@Salut La Meva Salut to enable secure access, authentication, and take advantage of underlying management features. Similarly, we are assuming that the collaborative case management tools for professionals will be integrated to the IS3 Interoperability framework for process exchange and HC3 for data sharing.

NEXTCARE strategic actions

Action 1 – Clinical risk stratification and prediction

Aim – This action will further develop the GMA (Adjusted Morbidity Groups) predictive model (*Monterde, D. Vela, E., et al., Aten Primaria. 2016; Dueñas I et al BMJ Open, 2016*), owned by Catalonia. GMA is a population-based risk prediction tool that serve for commissioning of healthcare services, as well as to identify highly vulnerable patients allocated at the tip of the risk pyramid (case finding). Comprehensive clinically applicable subject-specific health risk assessment constitutes a necessary step for patient stratification aiming at generation of healthcare efficiencies.

Background – The current GMA version covers four key requirements: i) a population health approach using the entire source population of 7.5 million inhabitants of the region, with a bi-annual update of the risk pyramid distribution; ii) publicly owned without licensing constraints; iii) open source computational algorithms; and, iv) the GMA morbidity grouper relies only on statistical criteria, without expert-based criteria, thus facilitating quick adaptation to different territories.

2017 Work plan – Four main areas for action have been identified as critical steps to be accomplished during the first year of the project:

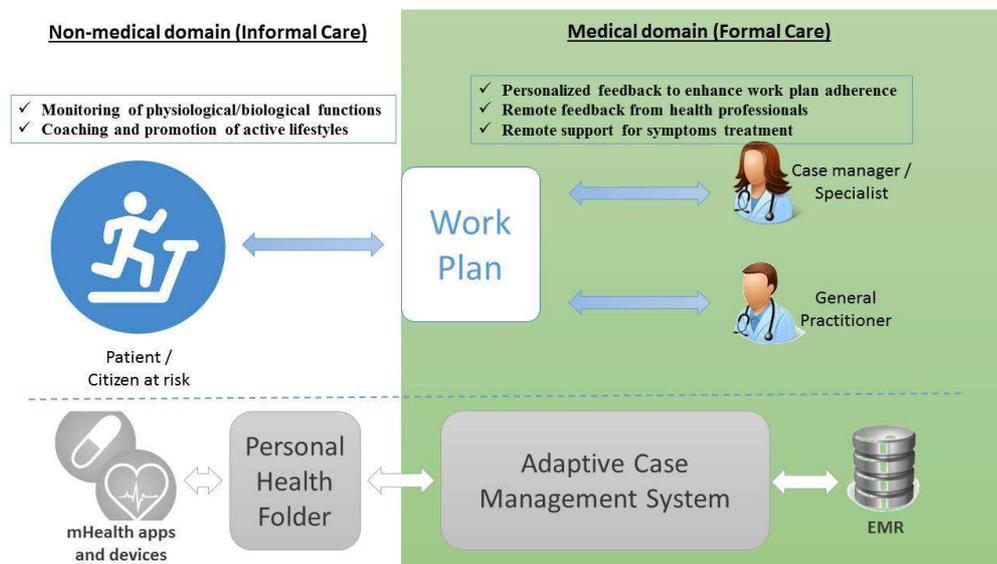
1. Active international dissemination (academic articles and conferences) of the characteristics and the potential of the GMA tool to enhance clinical prediction.
2. Complete ongoing studies on specific use cases (i.e. Catalan COPD registries, transitional care, etc...) exploring the GMA potential for enhanced clinical prediction.
3. Generate a complete practical example (i.e. COPD cohort) to validate a short-term strategic approach (contribution to enhanced clinical COPD stratification

combining clinical and health surveillance datasets) and a medium-term approach (personalization of COPD management combining informal care, registries, clinical information and omics information) with the support of a Digital Health Framework (DHF).

Action 2 - Promotion of Physical Activity in chronic cases with different levels of severity: Pre-habilitation intervention in high risk candidates for major surgery

Aim - The intervention encompasses a portfolio with customized ICT-supported self-management services aiming at promoting daily physical activity in chronic patients. The aims are to increase accessibility, cost-effectiveness and sustainability of effects of rehabilitation programs. It targets three layers of candidates proposing different modular services in each of them: (i) citizens at risk and patients with mild disease; (ii) community-based program for clinically stable chronic patients; and, (iii) pre-habilitation program for candidates to high-risk surgery. The latter will be extended to a general program for prevention of surgical complications currently being implemented at Hospital Clinic.

The setting aims to solve current practical limitations for extensive deployment of the service(s), namely: i) accessibility, ii) behaviour change component; and, iii) financial sustainability; so that the service(s) can become operational as a standard of care intervention. From a technological point of view, the following figure depicts the different tools that are envisaged as facilitators both at the medical (right hand-side) and the informal care (left hand-side) domains:



Background - A recent randomized controlled trial on the pre-habilitation program has been completed at Hospital Clinic with highly positive results demonstrating efficacy (publication in preparation). The intervention, as well as customized versions of the approach for lower risk patients, deserve large scale deployment as mainstream services for candidate patients to assess cost-effectiveness. Moreover,

ICT-support to the program is being developed by Eurecat. A self-management tool for promotion of daily physical activity (ActivApp 0.1.0) is available.

2016 Work plan

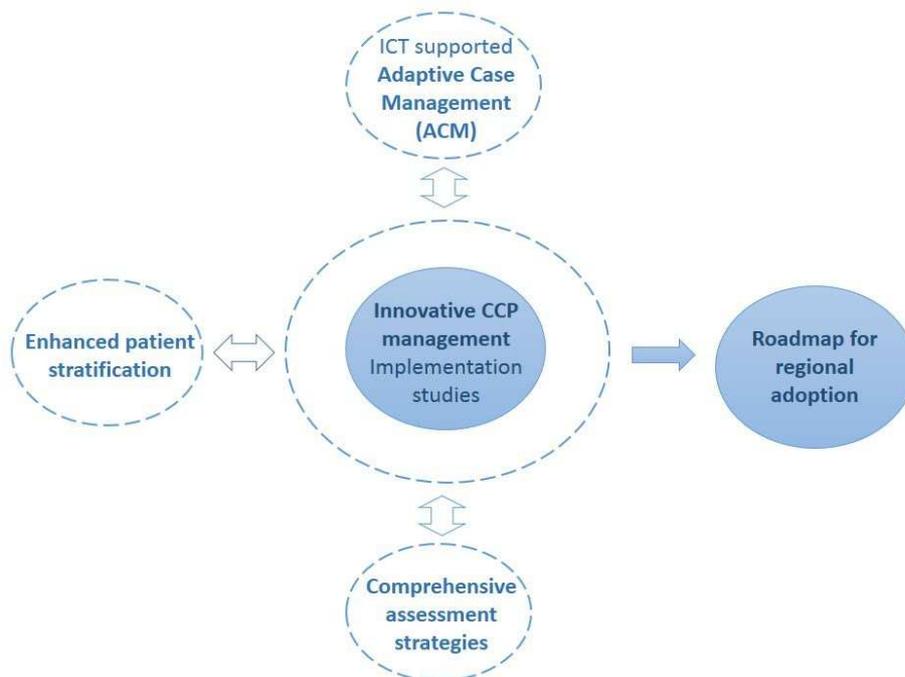
- Complete current Activ-App trials in order to have a product available in December 2016.
- Elaborate the roadmap for adapting the PHF (La Meva Salut) to support the surgical program of the action during 2017.
- Elaborate the clinical protocols for the community-based and the patients at risk programs.

2017 Work plan

- Technological developments of the PHF (La Meva Salut) to support the surgical program as mainstream service within 2017.
- Assessment of both community-based and the patients at risk programs at small pilot level.

Action 3 - Collaborative management of complex chronic patients

Aim - The program addresses core aspects of the management of Complex Chronic Patients (CCP) across the healthcare tiers, as illustrated in the figure:



- Implementation of clinical processes resulting in integrated care interventions for two use cases: a) Community-based management of CCP including transitional care and long-term care; and, b) Integrated care for patients under long-term oxygen therapy.

- Adoption of collaborative and adaptive case management (ACM) (Cano, I. et al., J. Biomed. Inform. 2015 55, 11–22) for the two use cases indicated above.
- Evaluation of the impact of enhanced clinical health risk assessment and stratification (Dueñas-Espin, I. et al., BMJ Open. 2016 15;6(4)).
- Innovative assessment of healthcare value generation of the services, both during the deployment phase and after regional scale-up of the novel services.

Background – Proven efficacy of integrated care interventions assessed through randomized controlled trials may not translate into effectiveness at health system level (Hernández, C. et al., NPJ Prim. Care Respir. Med. 2015 25, 15022). In this respect, preparation of the workforce and enhanced clinical stratification have been identified as two key limiting factors for successful deployment of integrated care. Both factors are taken into account in the two target use cases. Moreover, implementation research strategies will be used to assess adoption.

2016 Work plan

- Completion of clinical protocols definition as well as ICT-support required.
- Elaborate the roadmap for adapting the PHF (La Meva Salut) to support the uses cases during 2017.

2017 Work plan

- Technological developments of the PHF (La Meva Salut) to support the use cases.
- Assessment of the ICT-support of the two uses cases at pilot level.
- Prepare design for deployment of the two use cases as mainstream programs beyond 2017, as well as generalization of the approach to other uses cases.

Action 4 - Transfer of specialized diagnostic tools to primary care: forced spirometry as use case

Aim – This action addresses high quality forced spirometry (FS) for diagnosis and management of chronic respiratory conditions in primary care. The main aim is regional deployment the five pivotal components of a collaborative FS program in Catalonia. This is:



- Enhanced automatic FS quality assessment;
- Accessibility to standardized (and quality-labelled) FS testing across healthcare tiers;

- Generation of an individual FS report including historical information of lung function;
- Data analytics allowing longitudinal assessment of lung function changes with relevant implications in future personalised patient management; and,
- Accessibility to the FS report and access to off-line remote support by specialized professionals.

Background – The FS program (*Vargas, et al., NPJPCRM. 2016 26, 16024*) emerges from a series of studies reporting on articulated applications covering unmet needs for collaborative FS testing. The studies were initiated within the EU project NEXES and specific parts of the overall setting have already been successfully evaluated in the Basque Country. The FS program has been designed as part of the regional deployment of integrated care services in Catalonia. It consists of the two lines of activity ultimately aiming at (i) regional adoption of the FS program and (ii) generalization of the approach to other areas, as well as to other testing procedures.

2016 Work plan

- Adjustment of current guide for implementation of HL7 CDA for FS documents with the Catalan Shared Electronic Health Record (HC3)
- Prepare logistics for implementation of the quality control algorithm into a commercial spirometer.
- Prepare the logistics for a pilot of the full circuit in one Primary Care unit.
- Prepare the logistics for deployment in three areas: Barcelona, Lleida and Vic.

2017 Work plan (completion of the FS program)

- Complete the pilot in one Primary Care Unit (end-February 2017).
- Advanced progress in the deployment in the three areas (July 2017).
- Assessment of the initial six-month pilot deployment (July 2017).
- Dissemination at international level (September 2017).
- Prepare data analytics, complete deployment (end-2017).

Beyond 2017 Work plan

- The action will explore the use of the background methodology to other fields of diagnosis of chronic disorders, as well as to other geographical areas with different interoperability approaches.

Action 5 – Interoperability in a Digital Health Framework

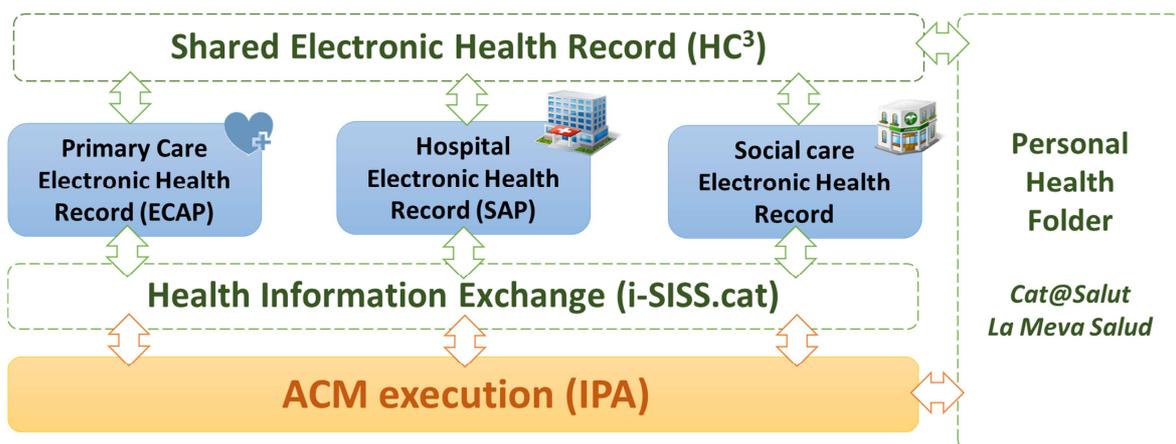
Aim – This action aims to provide digital health solutions to achieve interoperability at the level of the Catalan health system and with informal care (social care, wellness, self-management, etc.) and with biomedical research based on existing platforms and initiatives. The main aims of the action are:

- i) Deployment of an empowerment tool for self-management in the informal care environment (Action 2) that should be articulated with the Personal Health folder (La Meva Salut).

- ii) Deployment of an open platform for Adaptive Case Management articulated with current clinical workstations (SAP, eCAP) using existing initiatives (IPA - innovation Processes of the HCB, and IS3).
- iii) Elaboration of a road map for the articulation of biomedical research with clinical activity

Background – The current regional (Catalan) **digital health framework** is composed of the following main components (also illustrated in the figure below):

- The **Catalan health information exchange system** (i.e. WiFiS) leads the integration of basic highly standardized processes, namely: medical appointments, clinical data exchange, medical referral, etc., among healthcare providers with heterogeneous proprietary systems (moreover, it could also perform sectorial message routing and message delivery control).
- The **shared electronic health record** (i.e., HC3) of Catalonia is a single system of medical records shared between different actors. The HC3 allows to: i) display information about socio-demographic data of the citizen, documents or reports, prescriptions and immunization plus a summary screen with the most recent and relevant references; ii) provide direct messaging between professionals to facilitate their cooperation; iii) add at a later date (with ad hoc rules) clinical data provided by the private health sector or the proper citizen.
- The **Personal Health Folder** (i.e., Cat@Salut LMS) of Catalonia is linked to HC3, and provides citizens with an access point to information about their health insurance. Cat@Salut LMS can also act as the citizen entry point for some of the supported processes (e.g. Medical appointments) and for informal health data sources (e.g. mobile health applications, community medical devices, etc.) via the APPsalut approach (<https://appsalut.gencat.cat>).



2016 Work plan

- Elaborate the roadmap for the two main technological initiatives. That is, adaptation of the PHF (La Meva Salut) and implementation of an open collaborative and adaptive case management (ACM) platform.

2017 Work plan

- Technological developments for adaptation of the current PHF (La Meva Salut). Actions 1, 2 and 3 should be used as use cases.
- Technological developments for implementation of an ACM platform. Actions 1, 2 and 3 should be considered as uses cases.
- October 2017 – Initiation of the assessment of two uses cases (Actions 2 and 3) at pilot level.