PROJECT OVERVIEW
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NEXTCARE is an innovation project belonging to the Healthcare Ris3Cat community lead by Biocat.

It focuses on integrated care services for chronic patients with a personalized medicine foundation.

The project has 3 main objectives:
  • regional deployment of services;
  • Catalan test-bed for international leadership as 4-star EIP-AHA reference site;
  • transfer and exploitation of new products and services which generate return value to the strategic healthcare Ris3Cat sector.

The Project is structured along the 5 following activities:
  1. Clinical risk assessment and stratification
  2. Self-management and promotion of healthy lifestyles
  3. Chronic complex patients’ management
  4. Transfer of specialized diagnostic tool to primary care
  5. Digital health framework to achieve interoperability.
CONCEPT

NEXTCARE – Innovation in Integrated Care Services for Chronic Patients

Five strategic actions with a three stages lifecycle

- **Stratification and mapping**
  - A1: Prediction of clinical risk and stratification

- **Intervention and surveillance**
  - A2: Self-management and promotion of healthy lifestyles
  - A3: Management of Complex Chronic Patients and prevention of exacerbations

- **Transfer of diagnostic tools to Primary Care**
  - A4: Forced Spirometry program

A5 – Digital Health framework for interoperability at Catalan level

Adaptive case management system - Dashboard

Primary care  →  Specialized care  →  Social care
A1. Clinical risk stratification and prediction
The current GMA tool covers four key requirements:

- 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;
- publicly owned without licensing constraints;
- open source computational algorithms; and,
- the GMA morbidity grouper relies only on statistical criteria, without expert-based criteria, thus facilitating quick adaptation to different territories.
264,830 cases with COPD diagnosis in Catalonia

*Dueñas-Espín, I. et al. Proposals for enhanced health risk assessment and stratification in an integrated care scenario BMJ Open; May 2016. doi:10.1038/clpt.2013.24.52*
The population-based risk assessment tool (GMA) shows potential to predict (ROC)

- Use of healthcare resources (0.763)
- Mortality (0.829)
- Unplanned admissions (0.766)
- Multiple admissions (0.803)

in patients with Chronic Obstructive Pulmonary Disease

*Dueñas-Espín, I. et al. Proposals for enhanced health risk assessment and stratification in an integrated care scenario BMJ Open; May 2016. doi:10.1038/clpt.2013.24.52*
a) To assess the potential of the Catalan Health Surveillance System (CHSS) and its population-based health risk assessment tool based on adjusted morbidity groups (GMA) to enhance clinical risk prediction*; and,

b) To use multiple sources of information to refine clinical risk prediction for the individual patient. The ultimate aim is to support early diagnosis and preventive interventions, using:

- Electronic Medical Records,
- Registry data (CHSS & GMA),
- Informal care data (Personal Health Folder), and
- Biomedical research info (“omics”).

Clinical risk assessment strategies

Enhanced clinical prediction resulting from the novel modelling approaches will feed clinical decision support systems displayed in the professional workstation.

Decision support for enhanced service selection

- To optimize care during the HH/ED period.
- For transitional care purposes after HH/ED discharge.


Initial risk models are expected for Home Hospitalization / Early Discharge (HH/ED) on July 2017
Data extraction strategy

The ultimate aim of the data extraction strategy is to integrate several data sources containing health related patient information, namely:

1. **Electronic Medical Records** (SAP EMR, eCAP EMR),
2. **Registry data** (CHSS & GMA),
3. **Informal care data** (self-management and lifestyle via personal health folders), and
4. **Biomedical research data** ("omics")
A2. Promotion of physical activity in chronic cases
Background

The preHABilitation program ("pre-habilitation of high risk patients undergoing major surgery") at Hospital Clinic has proven highly positive results demonstrating efficacy.

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.

ICT-support to the program is needed: Self-management tools for promotion of daily physical activity.
RCT preHABilitation intervention results

Previous study – Project ISCIII: Randomized control to assess the efficiency of personalized prehabilitation program (4 to 6-week outpatient fitness program) on decreasing postoperative complications in high-risk patients undergoing elective major abdominal surgery.

**Postoperative Complications (primary end-point):**

<table>
<thead>
<tr>
<th></th>
<th>Control (n = 63)</th>
<th>Intervention (n = 62)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients suffering postoperative complications</td>
<td>39 (62%)</td>
<td>19 (31%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Medical complications</td>
<td>0.9 (1.2)</td>
<td>0.2 (0.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Surgical complications</td>
<td>0.5 (0.6)</td>
<td>0.3 (0.7)</td>
<td>0.119</td>
</tr>
<tr>
<td>Hospital days of stay</td>
<td>13 (20)</td>
<td>8 (8)</td>
<td>0.078</td>
</tr>
<tr>
<td>ICU days of stay</td>
<td>4 (13)</td>
<td>1 (2)</td>
<td>0.078</td>
</tr>
<tr>
<td>In-hospital mortality</td>
<td>1 (2)</td>
<td>1 (2)</td>
<td>1.000</td>
</tr>
</tbody>
</table>
Holistic evaluation

- Aerobic capacity, comorbidities, special conditions, etc.
- Logistic characteristics (proximity to the hospital, etc.)
- Adherence profile.

TRImodal preHAB:

i. Personalized training program
   i. Supervised training sessions
   ii. Promotion of physical activity

ii. Nutritional Intervention

iii. Emotional support
   i. Empowerment for self-management
   ii. Educational content aiming at generating behavioral change
   iii. Mindfulness
Promotion of physical activity in chronic cases

Non-medical domain (Informal Care)
- Monitoring of physiological/biological functions
- Coaching and promotion of active lifestyles

Medical domain (Formal Care)
- Personalized feedback to enhance work plan adherence
- Remote feedback from health professionals
- Remote support for symptoms treatment

Work Plan

Patient / Citizen at risk

Personal Health Folder

mHealth apps and devices

Adaptive Case Management System

EMR

Case manager / Specialist

General Practitioner
ActivApp – Service of physical activity prescription and tele-monitoring and promotion of healthy habits

App for patients

Activity tracker

Dashboard for healthcare professionals
A3. Collaborative management of complex chronic patients
Proven efficacy of integrated care interventions assessed through randomized controlled trials may not translate into effectiveness at health system level*.

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.

Moreover, implementation research strategies can be used to assess adoption.

Consolidation of HH/ED as the first choice service to be considered for most of the patients admitted in the Emergency Department.

The service has increased the initial average of 12 beds per day during the study period to 36 beds per day in 2016.

The current HH/ED is active on a 24x7 basis over the entire year with economic incentives that ensure sustainability of the service.

The current reimbursement of the HH/ED stays are equivalent to those of the in-hospital stays.

We also identified the need for appropriately designed transitional care.
General Aims

Enhanced management of cases with at least one of the three factors defining complexity:

1. Highly specialized services directly delivered into the community
2. Need for coordination among specialists and across healthcare tiers & home
3. Management of frailty due to functional impairment and/or risk of social exclusion

Smart Adaptive Case Management (SACM) is a core component of the process design and implementation
Case Management Model and Notation™ (CMMN™ 1.1)

CMMN: a standard notation for modeling and graphically expressing an adaptive case management process

www.omg.org/spec/CMMN/
Bridging lack of collaboration through **case management** will trigger the needed shift from acute care at hospitals towards prevention at home.
Towards management of complex chronic patients
A4. Transfer of specialized diagnostic tools to primary care
Background – Forced Spirometry

The Forced Spirometry (FS) program emerges from a series of studies reporting on articulated applications covering unmet needs for collaborative FS testing*.

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.

* Vargas, et al., NPJPCRM. 2016 26, 16024
General Aims

Access to forced spirometry testing (raw data, clinical results, quality control and historical data) from any clinical work-station of any healthcare provider.

The new system leads to the implementation of a "data analytics" strategy with impact on case management.

Transferability of the model to other healthcare environments and other diagnostic techniques will be analyzed (e.g. OSA diagnosis).
Transfer of specialised tools to primary care

1. Spirometer
2. Automatic spirometry quality control
3. Standardized spirometry document
4. Shared Electronic Health Record
5. Individual historical report
6. Clinical workstation
7. Inter consultation with specialists

CDSS
Objectives

1. Complete the pilot of the complete workflow in one Primary Care Unit
2. Regional deployment in 3 different areas across Catalonia.
3. Assessment of the initial six-month pilot deployment.
4. Data analytics strategy in place
5. Dissemination at international level
6. Exploitation plan
A5. Interoperability in a Digital Health Framework
The current regional interoperability framework in Catalonia is composed of the following main components:

- The Catalan Health Information Exchange system (iS3)
- The shared electronic health record (HC3)
- The personal health folder (Cat@Salut LMS)
General Aims

Main milestones involve integration of 2 following types of tools:

- **Self-Management Systems (SMS)** -> wearables and Apps
- **Smart Adaptive Case Management (SACM)** tools -> process engine across healthcare tiers
General Aims – Digital Health Framework

Sharing **data + processes** across healthcare tiers

**Multi-level and multi-scale data**
- Socioeconomics
- Environmental data
- Clinical data
- Functional data
- Biological data

**Heterogeneous sources of information**
- Adherence profiles
- Life style risk factors
- Wellness Social support
- Informal Care
- Patient self-management
- Primary care
- Specialized care

**Health Care**
- Clinical trials

**Biomedical Research**
- Public Health
- Systems Medicine
- Clinical trials

**Transcriptomics**
- Epigenetics
- Metabolomics
- Genetic data
- Proteomics

**Informal Care**
- Genetic data
- Proteomics
Relation to regional interoperability components

Shared Electronic Health Record (HC³)

- Primary Care Electronic Health Record (ECAP)
- Hospital Electronic Health Record (SAP)

Health Information Exchange (iS3)

- iS3 Connector

Professional Interface

- SACM

Professional staff

SMS

- App #0
- App #n

Patient

Personal Health Folder

Cat@Salut
La Meva Salud
Objectives

1. **Roadmap** alignment for the two main technological initiatives. That is,
   1. implementation of **SMS** tools aligned to **La Meva Salut**, and
   
      2. Implementation of **SACM** tools aligned to iS3 (Health Information Exchange) and HC3 (Shared Health Record)

2. **Adaption and deployment** of **SMS** tools for the patient. Actions 2 and 3 as use cases.

3. **Adaption and deployment** of **SACM** tools for the professional. Actions 2 and 3 as uses cases.

4. **Assessment** of both uses cases (Actions 2 and 3).

5. **Dissemination**

6. **Exploitation**.
Nextcare: Integrated care for the Complex Chronic Patient

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THANKS

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