Care Delivery for Chronic Patients

Technology-Enabled Care & Support

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The “paradox” of successful Health Care Systems:
The lack of adherence and outcomes measurement
The patient does not play (yet!) an active role

The only part that is measured

Care provision of episodes

Long term patient compliance/Outcomes

Process
Need for **predictive** rather than reactive healthcare

using multiple sources of information to anticipate, for the individual patient, the development or progression of disease
To prevent, or reduce the impact of, disease by:

- **Risk assessment**

In order to enable:

- **Early diagnosis**
- **Cost-effective interventions**
Communication between the patient and his/her care givers

**Goal:** to increase patient’s involvement in their own health maintenance
Goal: to optimize patient management
Integrated Care is what we all want

Fiona Godlee, editor BMJ
(9 June 2012)
Catalonia

**Population** 7,5 millions

**Elderly** (≥65 yrs) 18%

**Life expectancy**
- 80 yrs men
- 85 yrs women

**Healthcare costs** 8% GDP

**Model** Beveridge
- One public payer

**Add. Private Insur.** 27% population
ICT-supported Integrated Care Services generate healthcare efficiencies

Milestones in the design of services and deployment at Barcelona-Esquerra

Creation of Case Managers (2000)

Conceptualization of the services (2006)

Controlled deployment 2006 – 2013
Fragmented healthcare systems

Behaviour and attitudes of health professionals.

Lack of education for professionals promoting coordinated efficient work.

Lack of citizen's education on a rational use of healthcare systems.

The payment systems that in many cases do not encourage coordinated work.

**Process Units**

- Hospital
  - Transplant
  - CHF
  - COPD
  - Dementia

- Community
  - Family physician
  - Nurse
  - Social worker
  - Home care

**Transferring Complexity to Primary Care and Community**
Adaptations of health system to chronic patients

*shared care arrangements across the system*

*transferring service complexities to Primary Care and Home*

**Strategic support**

- Hospital
- Consultant
- Mobile teams

**Coordinating role**

- Primary Care
- Case Manager
- Emergency team

**Self-management**

- Patient
- Relatives & care givers

**Integration Healthcare & Social Support**
Major European Programs are fostering health care transformation and active ageing

European Innovation Partnership for Active and Health Ageing (EIP-AHA) \( (since \ 2012) \)

European Innovation Technology – Health (EIT-Health) \( (since \ 2015) \)

Horizon 2020 \( (since \ 2014) \)
Research and Innovation Strategies \( (2016) \)
Digital Health
(2016-2018)

Regional deployment of ICT-supported integrated care services

Barcelona Virtual Health Practice (BVHP)
Hospital Clinic – Eurecat
Multimorbidity
(cardiac diseases; COPD; diabetes type II and anxiety-depression)

Design, evaluation and large scale implementation of interventions (Actions 3 and 4) generating healthcare-value at system level

The ultimate aim is to contribute to the Catalan test bed for large scale adoption of integrated care services
Digital Health – Innovation in Integrated Care Services for Chronic Patients

5 strategic actions (A1-A5) with a 3 stages lifecycle

- **A1**: Transfer of specialized diagnostic tools to Primary Care
- **A2**: Prediction of clinical risk and stratification
- **A3**: Self-management and promotion of healthy lifestyles
- **A4**: Management of Complex Chronic Patient
- **A5**: Digital Health framework for interoperability at Catalan level

Adaptive case management system

Dashboard

Primary care

Specialized care

Social care

Informal care environment

Self-management and monitoring
Digital Health
System of five ACTIONS for deployment of the Catalan "reference site"
The RIS3Cat program as accelerator

A1. Transfer diagnostic tools to the Community (forced spirometry)
A2. Individual risk prediction (GMA – clinical prediction)
A3. Healthy life styles (core) (primary/secondary prevention)
A4. Telemedicine deployment (core) (secondary/tertiary prevention)
A5. Interoperability (core) (personal health folder/i-ISSIS.Cat)
A1 – Transfer of diagnostic tools to Primary Care

Forced Spirometry Program
January 2016  DEPLOYMENT F.S. PROGRAM  December 2016

Three Healthcare Sectors  Entire Catalan Region

TRANSFERABILITY & DATA ANALYTICS

*P: Plan,  D: Do,  S: Study,  A: Act
A1 –Transfer of diagnostic tools to Primary Care

Objectives within RIS3CAT to be accomplished within 2016

O1.1. Regional deployment of accessibility of high quality forced spirometry across healthcare tiers in Catalonia completed, including the assessment protocol.

O1.2. Elaboration of a roadmap for generalization of the program to other diagnostic tests.

O1.3. To achieve self-sustainability of Action 1 between M12 and M18.
A2 - Individual Risk Prediction
## Population-based stratification

### Regions participating in Advancing Care Coordination and TeleHealth (ACT) – DG Sanco project 2013-15

<table>
<thead>
<tr>
<th>Scope of the stratification strategy</th>
<th>Basque</th>
<th>Catalonia</th>
<th>Groningen</th>
<th>Lombardia</th>
<th>Scotland</th>
<th>Barriers for comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entire population (population health)</td>
<td>Population (population health)</td>
<td>Program (population medicine)</td>
<td>Program (population medicine)</td>
<td>3.4 million people (toward population health)</td>
<td>Heterogeneous predictive modelling tools</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Current predictive modelling tool</th>
<th>Basque</th>
<th>Catalonia</th>
<th>Groningen</th>
<th>Lombardia</th>
<th>Scotland</th>
<th>Barriers for comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACG-PM (owned by the region)</td>
<td>ACG-PM</td>
<td>GMA</td>
<td>Not available</td>
<td>CReG, evolving toward a risk predictive modeling tool</td>
<td>SPARRA v3 (owned by the region)</td>
<td>Different statistics describing predictive power, different levels of flexibility</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of categories</th>
<th>Basque</th>
<th>Catalonia</th>
<th>Groningen</th>
<th>Lombardia</th>
<th>Scotland</th>
<th>Barriers for comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four</td>
<td>Four</td>
<td>Four</td>
<td>Four</td>
<td>Three</td>
<td>Four</td>
<td>Different criteria for risk categories leading to non-comparable population distributions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristics of reporting on top indicators</th>
<th>Basque</th>
<th>Catalonia</th>
<th>Groningen</th>
<th>Lombardia</th>
<th>Scotland</th>
<th>Barriers for comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional &amp; Micro-systems</td>
<td>Regional &amp; Four areas</td>
<td>Three programs</td>
<td>GReG cohorts</td>
<td>Sub-region</td>
<td>Heterogeneity of reporting allowed conceptual consensus but not comparability of results</td>
<td></td>
</tr>
</tbody>
</table>

ACG-PM® = Adjusted Clinical Groups-Predictive Model  
CReG = Chronic Related Group  
SPARRA V3 = Scottish Patients at Risk of Readmission and Admission- version 3
Catalonia – Whole Population Morbidity Dataset

Size – 7.5 million inhabitants
Periodic update – every 6 months
Variables – Use of healthcare resources; Incidence & Prevalence of key disorders; Pharmacy, Adjusted Morbidity Groups (GMA)
Outcomes – Population stratification; Risk assessment of clinical use

Table of insured people
PIC, demographic and territorial data
Number of registers: 10.121.539

Table of diagnostic
PIC, code, data of diagnosis, Provider, type of provider, pathologies
Number of registers: 405.025.533

Table of healthcare contacts
PIC, contact data, provider, type of provider, urgent, funding, Type of service
Number of registers: 296.479.140

Table of active principles
PIC, Type of active principle, prescription data, units, net amount
Number of registers: 417.598.507

Table of clinical measurements
PIC, date, lab, results
Population-based stratification

Catalonia-2014

Mortality

% of explained variability

Hospital admissions

Urgent admissions

Total expenses

A+SE
A+SE+CRG
A+SE+GMA

A+SE
A+SE+CRG
A+SE+GMA

A+SE
A+SE+CRG
A+SE+GMA

A+SE
A+SE+CRG
A+SE+GMA
Population-based stratification

Catalonia-2014

<table>
<thead>
<tr>
<th></th>
<th>% Pop.</th>
<th>Mortality</th>
<th>Admissions</th>
<th>Expenditure</th>
<th>% Expend.</th>
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</thead>
<tbody>
<tr>
<td>GMA-4</td>
<td>5</td>
<td>11,2</td>
<td>58,4</td>
<td>7.070</td>
<td>35,8</td>
</tr>
<tr>
<td>GMA-3</td>
<td>15</td>
<td>1,1</td>
<td>6,6</td>
<td>2.124</td>
<td>32,3</td>
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<tr>
<td>GMA-2</td>
<td>30</td>
<td>0,1</td>
<td>2,4</td>
<td>777</td>
<td>23,6</td>
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<tr>
<td>GMA-1</td>
<td>50</td>
<td>0,0</td>
<td>0,5</td>
<td>164</td>
<td>8,3</td>
</tr>
<tr>
<td>Catalonia</td>
<td>100</td>
<td>0,8</td>
<td>4,9</td>
<td>987</td>
<td>100,0</td>
</tr>
</tbody>
</table>

- Columns 1 and 2 - GMA levels by percentiles of the entire population
- Columns 3 and 4 - Rates of mortality and hospital admissions
- Column 5 - Cost per inhabitant per year expressed in €
- Column 6 (last) - % total healthcare expenditure by risk strata.
Novel CDSS approach
Prediction of risk for multi-morbidity in COPD
A2 - Individual Risk Prediction

Objectives within RIS3CAT to be accomplished within 2016

O2.1. To assess the potential of GMA to contribute to clinical risk prediction through an specific use case.

O2.3. To elaborate a roadmap for transferability of GMA at EU and international level

O2.4. To elaborate a roadmap toward personalized medicine (i.e. Net-Health program)

O2.5. To achieve self-sustainability of Action 2 between M12 and M18. International strategic plan for the period 2017-2018
A3 – Self-management
Wellness and rehabilitation

Enhanced HRQL & Daily Physical activity

Long-term sustainability of training induced-effects in COPD patients with ICS-ICT

Wellness and rehabilitation

High potential of the Personal Health Folder to enhance patient adherence

Wellness and rehabilitation

High potential of the Personal Health Folder for remote off-line monitoring and to enhance patient adherence

Deployment of collaborative self-management services promoting healthy lifestyles: physical activity
O3.1. Deployment and assessment of a community-based service to promote physical activity in the healthcare sector of Barcelona-Esquerra.

O3.2. To elaborate the roadmap for regional adoption of the service in Catalonia.
A4 – Telemedicine as a support of complex case management
• Management of cases with at least one of the three different levels that define complexity will be tackled by the action:
  ✓ Highly specialized services directly delivered into the community
  ✓ Need for coordination across healthcare tiers and home
  ✓ Management of frailty due to functional impairment and/or risk of social exclusion
A4 – Telemedicine as a support of complex case management

Focus and method for Action 4

• Adaptive Case Management will be a core component of the process design and implementation
The action aims at large scale deployment by enhancing ICT support to already successful clinical programs linking tertiary care with the community (i.e. Type I diabetes mellitus; rare diseases, LTOT, Non-invasive ventilation, Cardiac Failure, HIV-AIDS, COPD, Major ambulatory surgery, Sleep disorders, Home hospitalization; Support pre- and post-surgical high risk procedures, etc...)

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**A4 – Telemedicine as a support of complex case management**

*Focus and method for Action 4*
A4 – Telemedicine as a support of complex case management

Objectives within RIS3CAT to be accomplished within 2016

O4.1. Deployment and assessment of two use cases: i) Management of complex chronic patients; and, ii) Home hospitalization aiming at adoption as mainstream services in the region

O4.2. To elaborate the roadmap for general deployment and adoption of additional services at Hospital Clinic during the period 2017-2018.

O4.3. To elaborate the roadmap for transferability at regional level in Catalonia.
A5 – Interoperability – Digital Health Framework (DHF)
Telehealth in Catalonia

- Tele-ictus program
- Electronic prescription
  - 95% of primary care contacts
  - > 25% in specialized care
- > 90% in Primary Care

Shared Medical Record
E-Health
Electronical Medical Record
Personal Health Folder
Regional Interoperability (HC3)
The Personal Health Folder as a facilitator for convergence of formal, informal and social care.
A5 –Interoperability – Digital Health Framework (DHF)
Objectives within RIS3CAT to be accomplished within 2016

O5.1. Deployment and assessment of the Personal Health Folder (“Cat@Salut - La meva salut”) as a self-management tool for citizens/patients in Actions 3 and 4.

O5.2. To elaborate the roadmap for deployment of the DHF concept in Catalonia – Plan for development of an open platform supporting Adaptive Case Management

O5.3. To elaborate the roadmap for transferability of the DHF concept to other EU regions

O5.4. To elaborate a business model aiming at achieving progressive self-sustainability of Action 5 after M18 toward full sustainability by the end of the project M36
Digital Health – Innovation in Integrated Care Services for Chronic Patients

**5 strategic actions (A1-A5) with a 3 stages lifecycle**

**Early Diagnosis**
- **A1**: Transfer of specialized diagnostic tools to Primary Care

**Stratification and mapping**
- **A2**: Prediction of clinical risk and stratification

**Intervention and surveillance**
- **A3**: Self-management and promotion of healthy lifestyles
- **A4**: Management of Complex Chronic Patient

**A5 – Digital Health framework for interoperability at Catalan level**

- Adaptive case management system
- **Dashboard**
- Primary care
- Specialized care
- Social care
Patient Stratification
(early diagnosis, management, prognosis)

using Clinical Decision Support Systems

supported by Predictive Modeling

within a Coordinated Care scenario