

A regional model to predict, identify and manage multimorbidity and frailty

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Primary care in Emilia-Romagna.....





A few figures (2017*)

	Emilia-Romagna	Italy
Residents (x 1,000)	4,457	60,589
% > 65 yrs	23.7	22.2
GDP (000's €), per capita	33.6	27.1
Infant mortality ‰	2.37	2.90
Public health expenditure (€), percapita	1,890	1,846
Hospital beds ‰ residents	3.9	3.2

Source: Health for all Italy (2017)

* Or nearest year

The Regional Health Service

- ✓ 8 Local Health Units
 - 38 Health Districts
 - 53 Hospitals
- ✓ 5 Hospital Trusts (4 Teaching)
- ✓ 4 Research Hospitals



60.528 dipendenti del Ssr

tra cui:

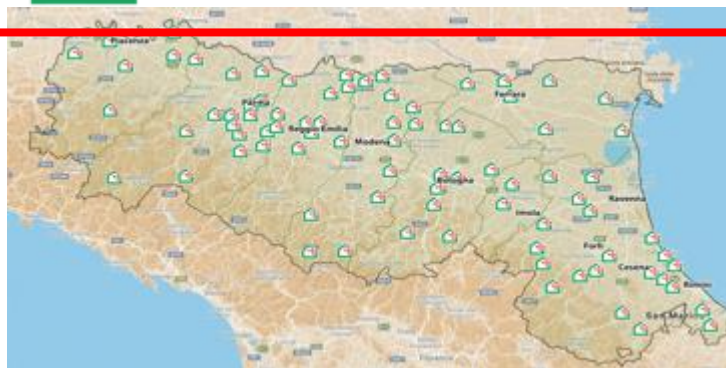
- 26.154 infermieri
- 4.494 medici

2.993 GPs

18 Community Hospitals



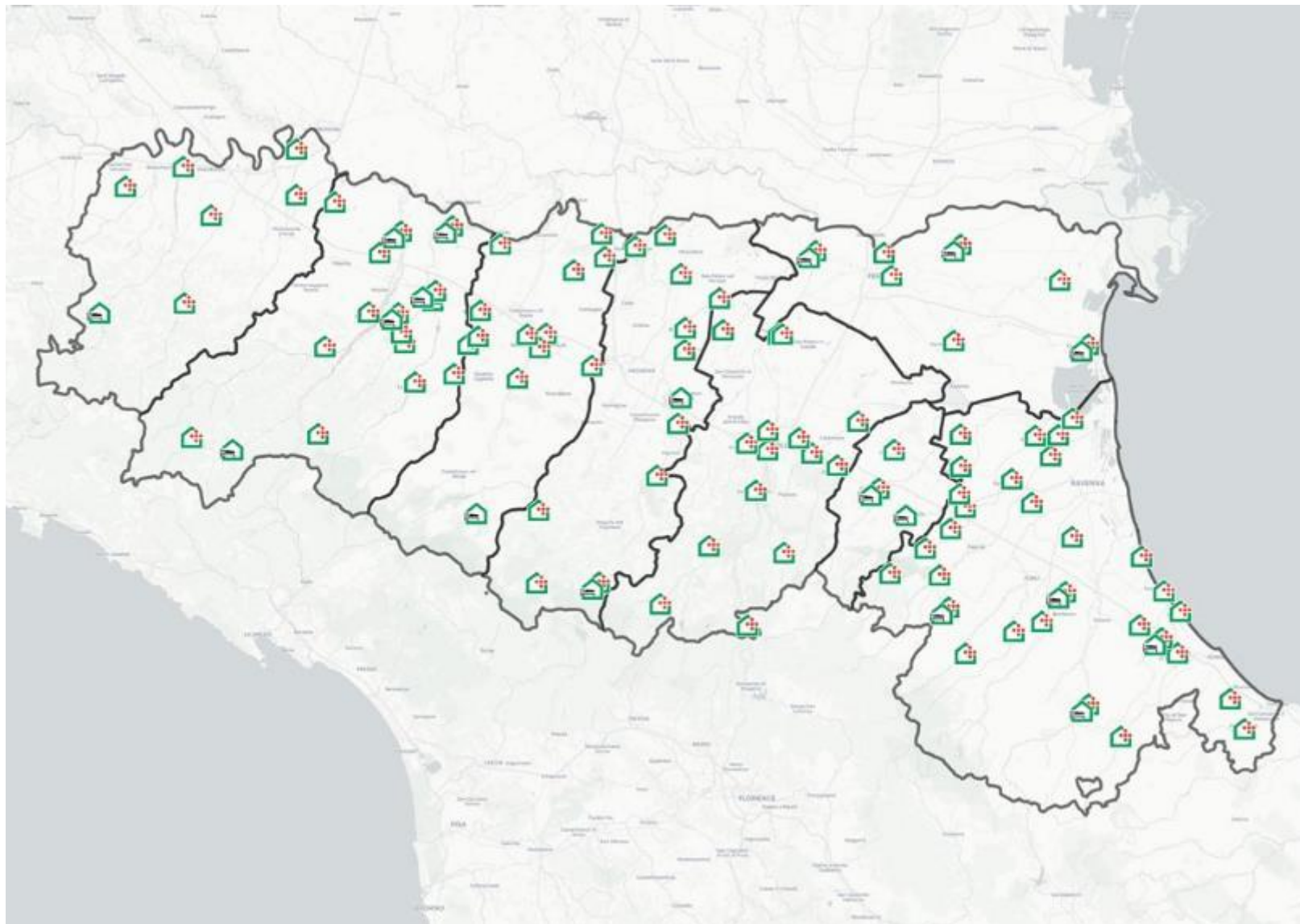
102 Community Health Centres



Community Health Centers

- single point of access for citizens
- continuity of care
- coordination of responses for citizens
- integration with the hospital
- integrated handling of patients with mental health problems
- prevention programs
- promotion of citizens' participation
- ongoing education and training for healthcare workers

102 Community Health Centers (Casa della Salute) 2 million residents

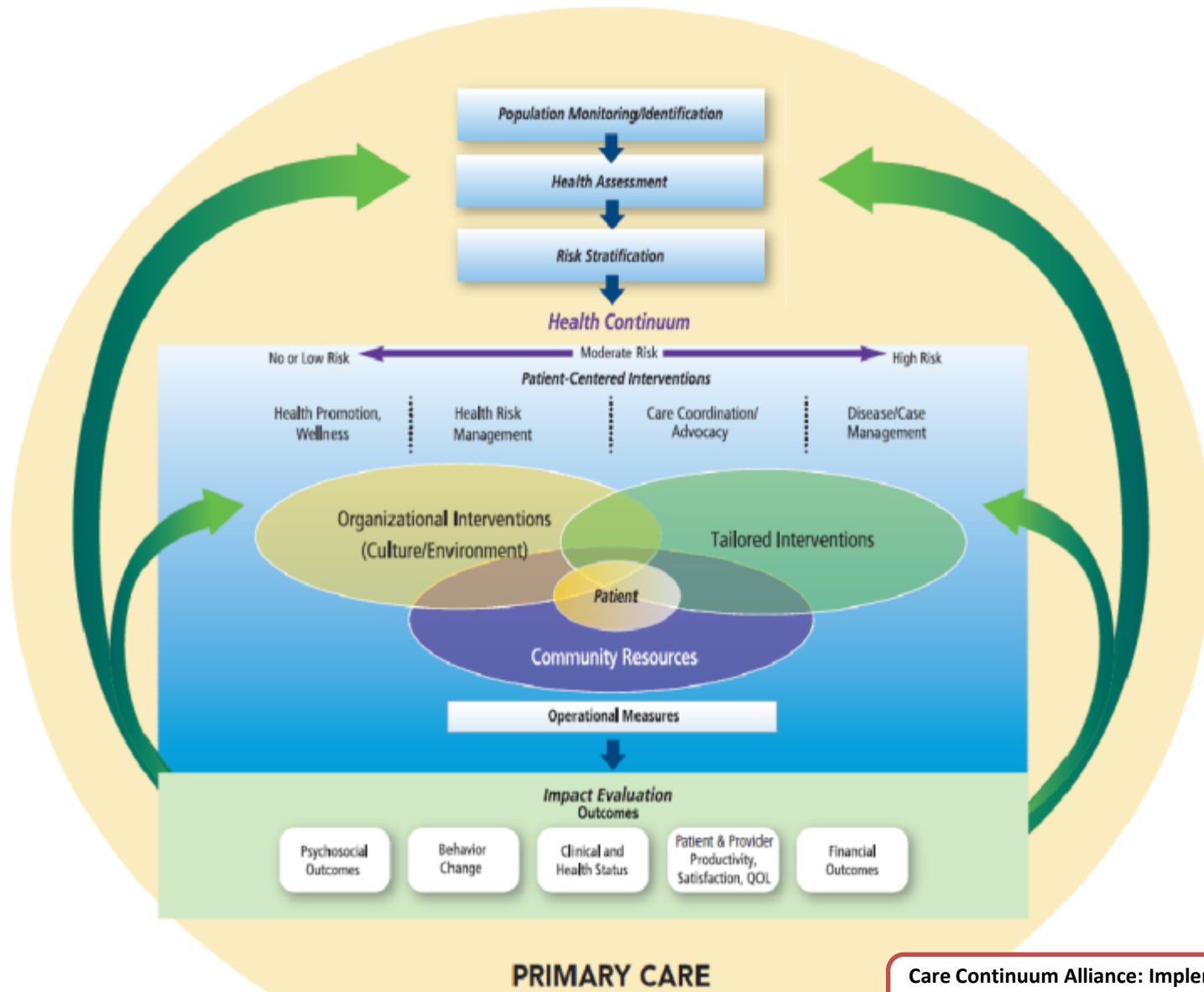




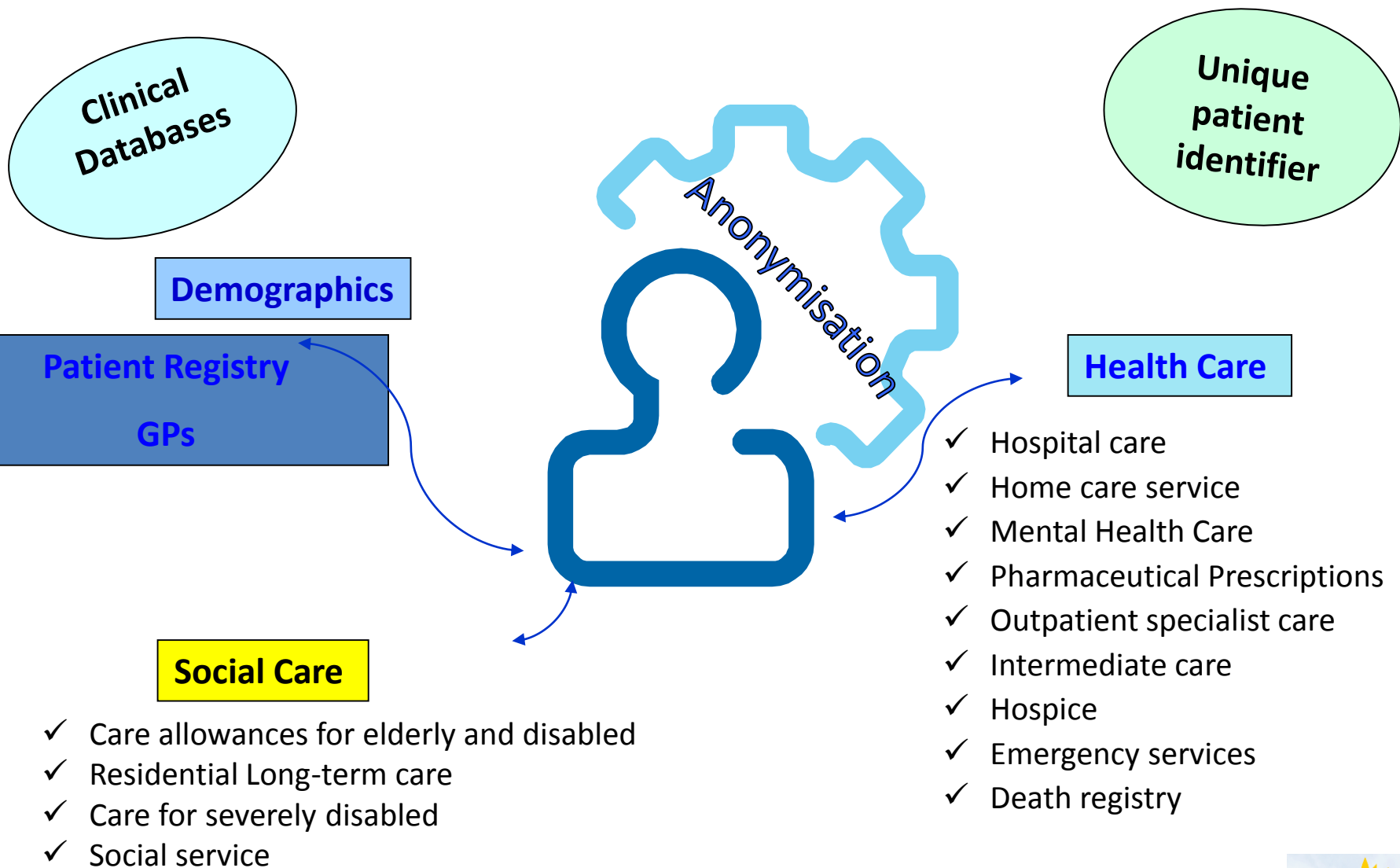
Innovation...



Population Health Management



Emilia-Romagna clinical-administrative database



A Regional Predictive Model

- predictive model to identify patients at high risk of hospitalization and frailty
- ‘patient risk profiles’ providing information on high-risk patients to general practitioners (GPs) and nurses in the Case della Salute (Community Health Centers)
- assessment of the extent to which this model provides additional information useful for identification of patients who may benefit for case management or disease management purposes

A Regional Predictive Model (II)

- risk of hospitalization for ACSC or death
- adult population of the Region
- use of regional health/administrative data
- Risk Score calculation
- high level of statistic accuracy (C= 0.85)

BMJ Open Predicting risk of hospitalisation or death: a retrospective population-based analysis

Daniel Z. Lewis,¹ Mary Robinson,¹ John McAra,² Vittorio Maio,² Scott W Keith,³ Mengdan Liu,¹ Joseph S Gonnella,¹ Roberto Grill⁴

To cite: Lewis DZ, Robinson M, McAra J, et al. Predicting risk of hospitalisation or death: a retrospective population-based analysis. *BMJ Open* 2014;4:e005273. doi:10.1136/bmjopen-2014-005273

• Predictions history and additional material is available. To view please visit the journal (<http://dx.doi.org/10.1136/bmjopen-2014-005273>).

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For related articles on this topic, see the end of article.

ABSTRACT
Objective: Develop predictive models using an administrative healthcare database that provide information for Patient-Centered Medical Homes to proactively identify patients at risk of hospitalisation or death that may be impacted through improved patient care.

Design: Retrospective healthcare utilization analysis with multivariate logistic regression models.

Data: A population-based longitudinal database of residents served by the Emilia Romagna, Italy, health services in the years 2004–2012 including demographic information and utilization of health services by 3 726 380 people aged >15 years.

Outcome measures: Models designed to predict risk of hospitalisation or death in 2012 for patients that are potentially avoidable were developed and evaluated using the area under the receiver operating curve (AUC), in terms of their sensitivity, specificity and positive predictive value, and for calibration to assess performance across levels of predicted risk.

Results: Among the 3 726 380 adult residents of Emilia-Romagna at the end of 2011, 449 163 (12.1%) were hospitalised in 2012, 4.2% were hospitalised for the selected conditions or died in 2012 (3.6% hospitalised, 1.2% died). The C-statistic for predicting 2012 outcomes was 0.858. The model was well-calibrated across categories of predicted risk. For those patients in the highest predicted risk decile group, the average predicted risk was 23.9% and the actual prevalence of hospitalisation or death was 24.2%.

Conclusions: We have developed a population-based model using a longitudinal administrative database that identifies the risk of hospitalisation for residents of the Emilia-Romagna region with a level of performance as high as, or higher than, similar models. The results of this model, along with profiles of patients identified as high risk are being provided to the physicians and other healthcare professionals associated with the Patient-Centered Medical Homes to aid in planning for care management and interventions that may reduce their patients' likelihood of a preventable, high-cost hospitalisation.

Strengths and limitations of this study

- The study included the entire adult population of the Emilia-Romagna Region of Italy, over 3.7 million people.
- The study used an existing longitudinal administrative healthcare database with both the advantage of much lower cost than new data collection and the disadvantage of potential errors in administrative data.
- The results of the study are being used to assist in the development of newly formed Patient-Centered Medical Homes.

patients' problems, is shifting to a more proactive model designed to take the initiative in providing care for an increasingly older population that has a greater prevalence of chronic conditions, often with multiple medical and social needs. These changes are driving the reorganisation of the primary care system, emphasising coordination and cooperation among healthcare professionals.^{1–6} Among the approaches to addressing this need has been the establishment of Patient-Centered Medical Homes, organisations to which teams of healthcare providers are engaged in delivering comprehensive, coordinated, patient-centred care to patient-defined populations. Primary care has a central role in the Italian National Health Service (NHS). Twenty-two regional governments are responsible for ensuring the delivery of a health benefits package through a network of geographically defined, population-based Local Health Authorities. Primary care physicians work for these authorities as independent contractors and act as 'gatekeepers' for specialty and other medical services for their patients.⁷ With the belief that a strong primary care system is conducive to improved population

Methods

Independent variables

- ✓ Demographic data
 - ✓ Age
 - ✓ Sex
 - ✓ Living conditions (town, hills, mountains)

- ✓ **Morbidity and severity** indicators

- ✓ Health care quality indicators
 - ✓ Polypharmacy
 - ✓ DDI (drug-to-drug interaction)
 - ✓ Potentially inappropriate drug prescription
 - ✓ Appropriate management of chronic conditions

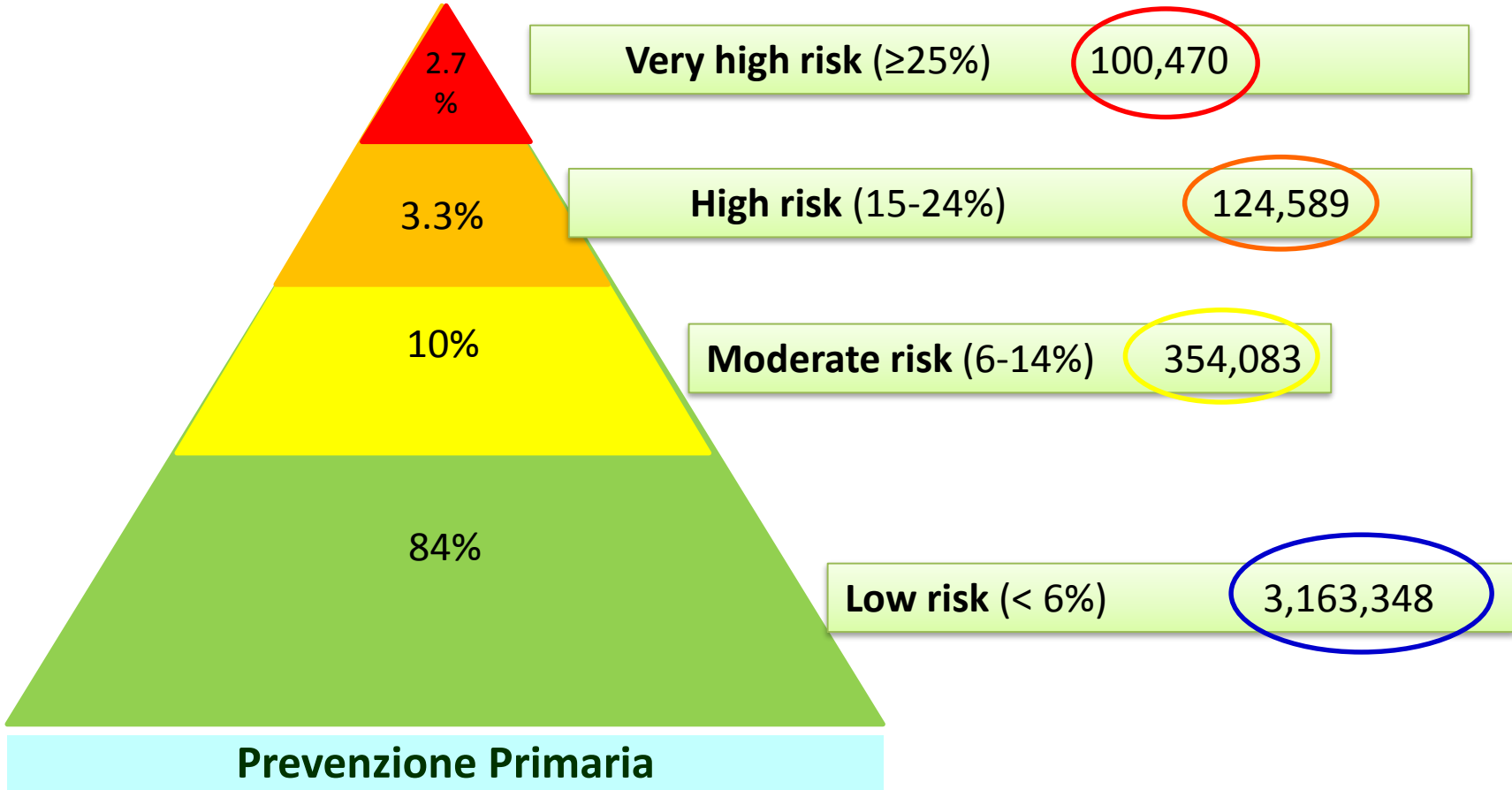
- ✓ Health care consumption indicators as a **proxy** of severity: hospitalisation, ER visits, outpatient care...



Population risk stratification - 2016

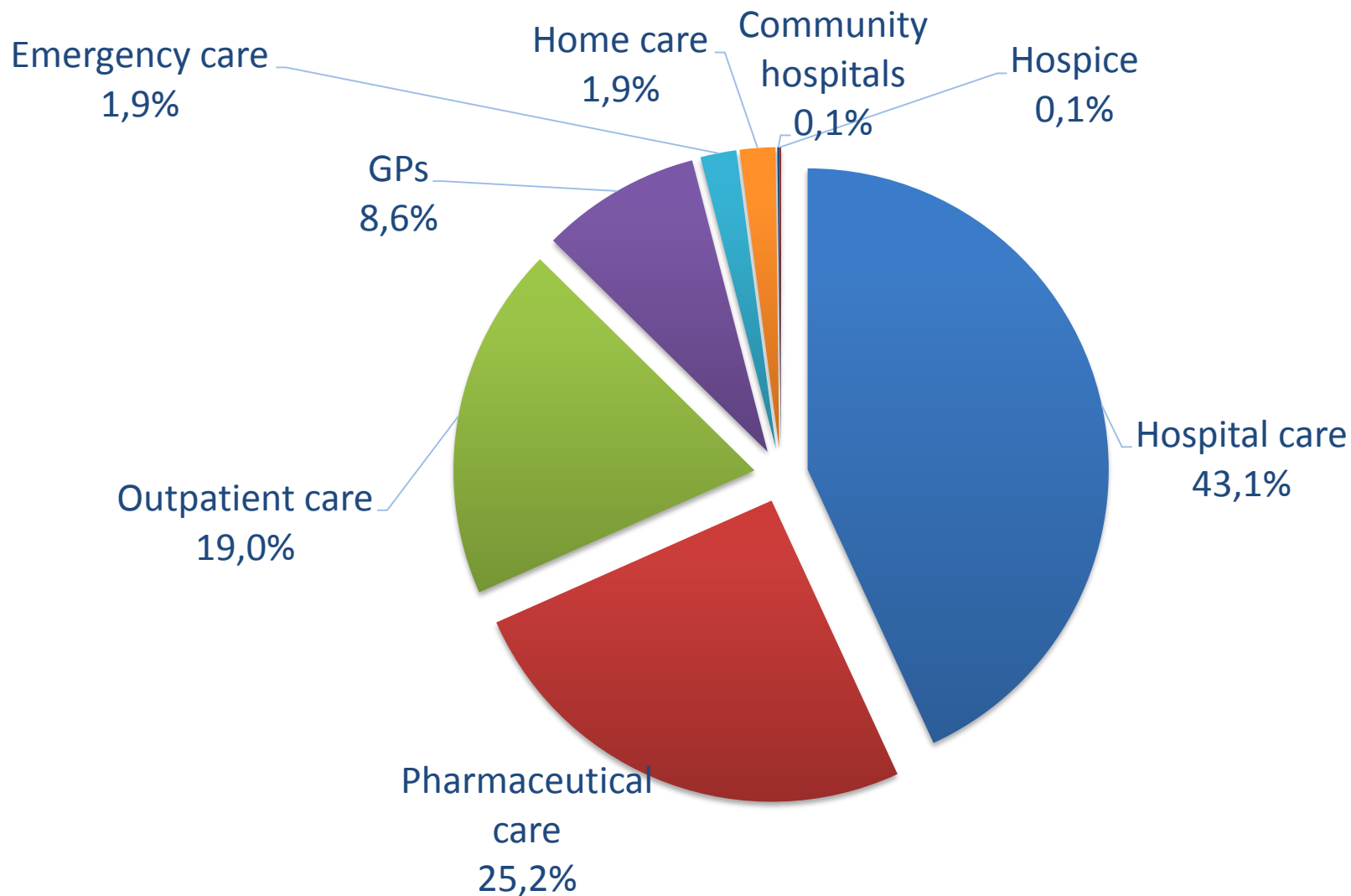
Case/Disease
Management

Self Management

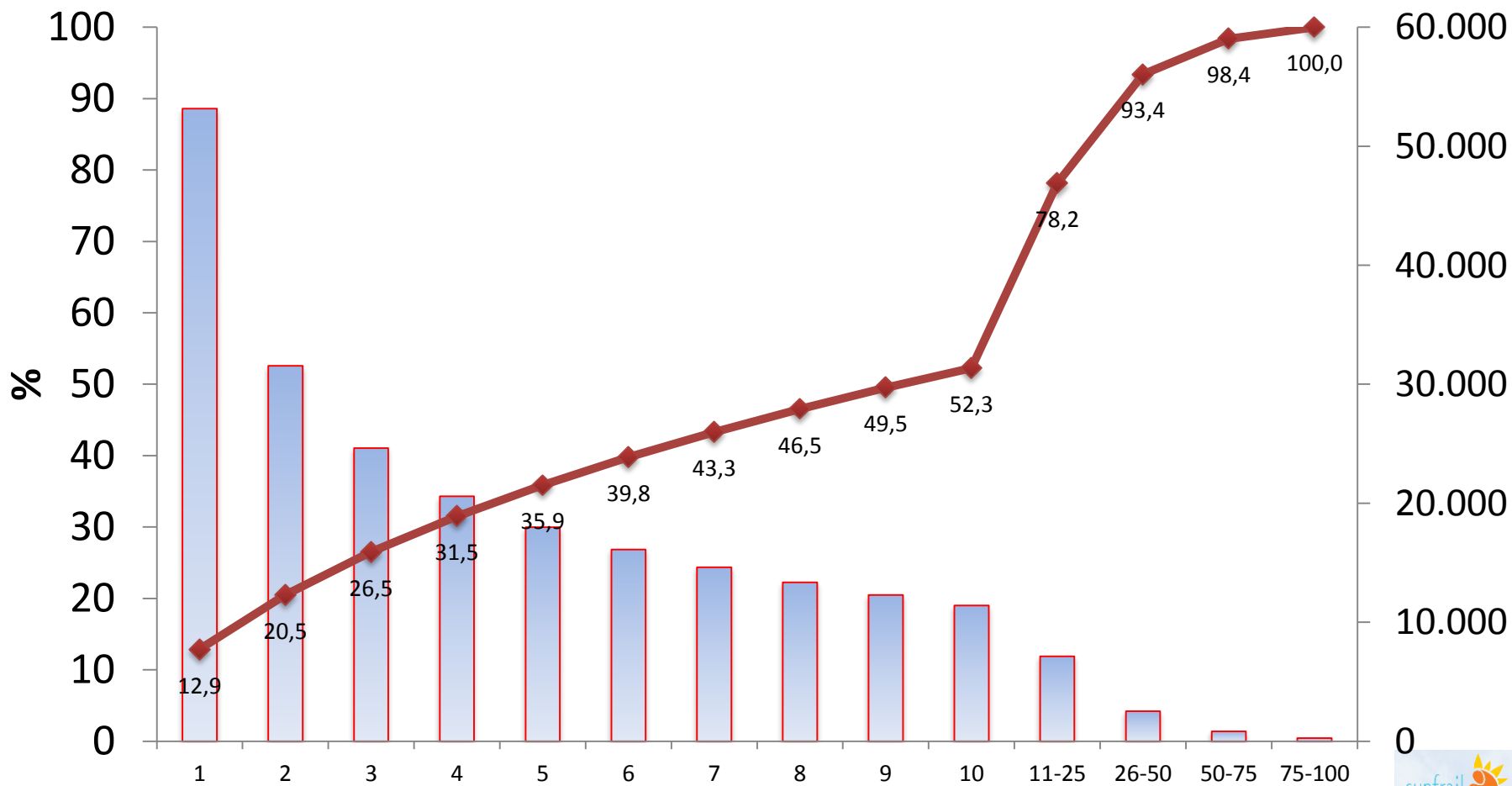


Population 18+ = 3,765,891

4,46 billion €



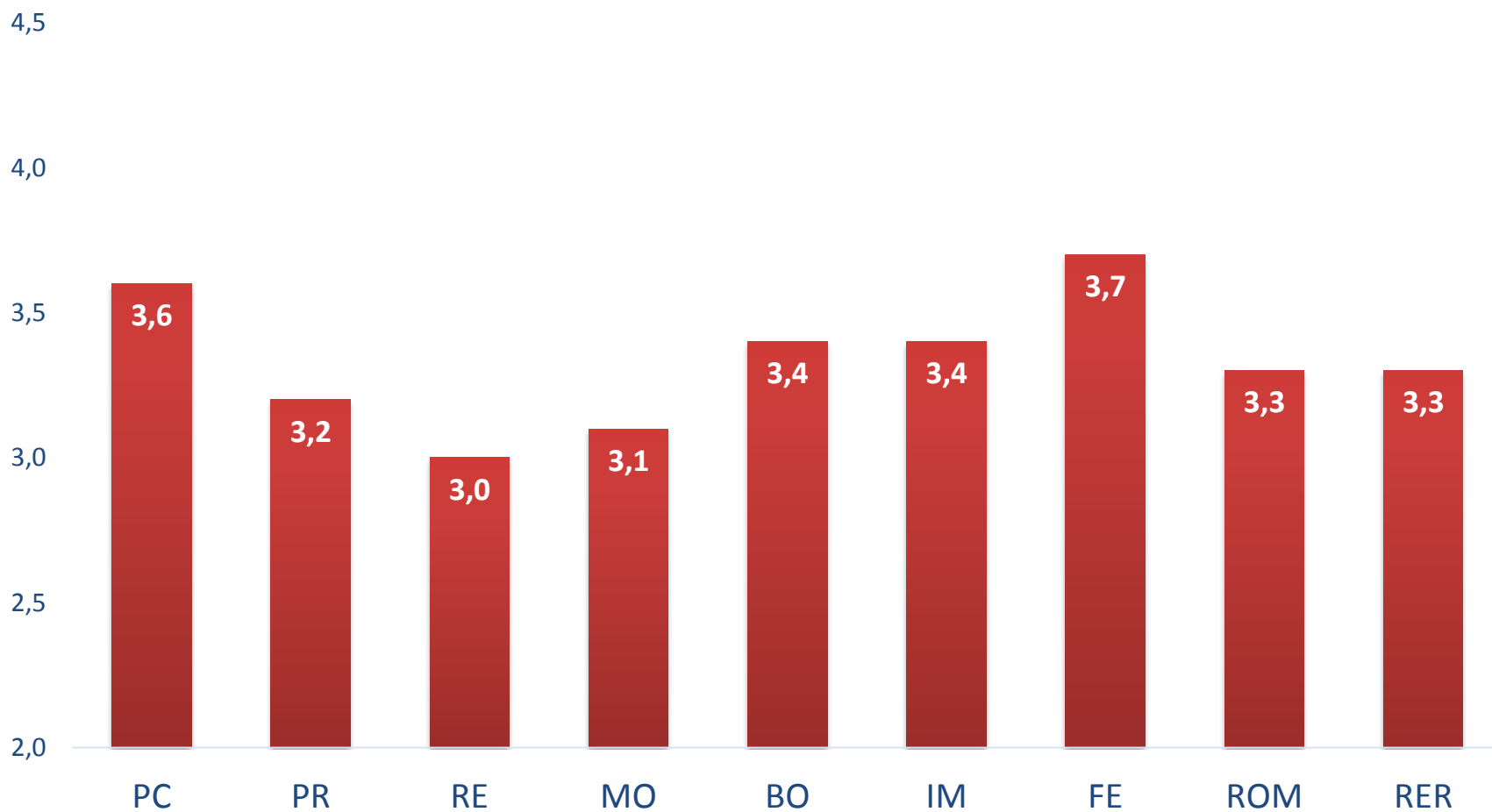
Concentration of expenditure: 1% patients...13 % expenditure



84% of the residents are low risk...



....3.3% are very high risk



Testing the tool

Community Health Centres

- GPs
- Hospital specialists
- Nurses
- Social workers
- FKT
- Voluntary sector

Categorie di Rischio di Ospedalizzazione e morte		
Ad rischio molto alto	Rischio Previsto	Rappresenta circa il 4% della popolazione adulta
Ad alto rischio	2.25%	Rappresenta circa il 6% della popolazione
A rischio moderato	tra il 15 e il 20%	Rappresenta circa il 75% della popolazione - il rischio è inferiore al livello medio di ospedalizzazione
A basso rischio	18%	



2 reports

CHC Summary

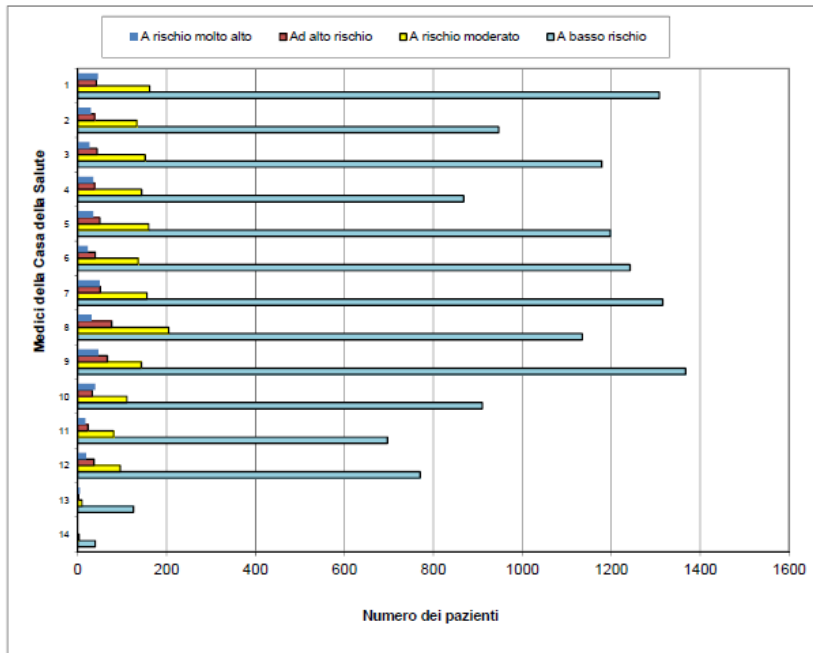
Patient level report

Casa della Salute: Crevalcore	Distretto: PIANURA OVEST
Sommario - Pazienti adulti (n=15337)	

I dati dei pazienti della Casa della Salute sono relativi ai servizi sanitari utilizzati nell'anno 2013. Tali dati sono stati quindi usati per predire nella popolazione adulta il rischio di ospedalizzazione o morte per le condizioni selezionate per il 2014.

A rischio molto alto	Il rischio previsto di ospedalizzazione è $\geq 25\%$	Rappresenta circa il 4% della popolazione
Ad alto rischio	Il rischio previsto di ospedalizzazione è fra il 15 e il 24%	Rappresenta circa il 6% della popolazione
A rischio moderato	Il rischio previsto di ospedalizzazione è fra il 6 e il 14%	Rappresenta circa il 15% della popolazione - l'intervallo di rischio è stato scelto in base al livello medio di rischio di ospedalizzazione o morte della popolazione adulta
A basso rischio	Il rischio previsto di ospedalizzazione è $\leq 5\%$	Rappresenta circa il 75% della popolazione - Il rischio è inferiore al livello medio di rischio di ospedalizzazione o morte della popolazione adulta

Numero dei pazienti per tutti i medici nella Casa della Salute in base alla categoria di rischio di ospedalizzazione



Paziente: 1094553 Patient

Sesso: F Età: 44

Rischio di ospedalizzazione previsto per il 2013:

Molto alto

Il grafico mostra il cambiamento nel tempo del rischio di ospedalizzazione previsto per il paziente



Questo documento è un sommario delle informazioni di natura amministrativa per un paziente previsto a probabile 'rischio molto alto' di ospedalizzazione nel 2013 in base ai consumi sanitari del 2012.

Patologie croniche (in base al sistema eziologico)

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> Cardiovascolari | <input type="checkbox"/> Genitourinarie | <input type="checkbox"/> Oftalmologiche |
| <input type="checkbox"/> Dermatologiche | <input type="checkbox"/> Ginecologiche | <input type="checkbox"/> Otorinolaringoiatriche |
| <input type="checkbox"/> Ematologiche | <input type="checkbox"/> Immunologiche | <input checked="" type="checkbox"/> Psichiatriche |
| <input type="checkbox"/> Endocrine | <input type="checkbox"/> Infettive | <input type="checkbox"/> Respiratorie |
| <input checked="" type="checkbox"/> Epatiche | <input type="checkbox"/> Muscoloscheletriche | <input type="checkbox"/> Sistema Genitale Maschile |
| <input checked="" type="checkbox"/> Gastrointestinali | <input checked="" type="checkbox"/> Neurologiche | <input type="checkbox"/> Tumorali |

Ospedalizzazione 2012 - N. di ricoveri eccorsi al paziente: 1

N. 1 Degenza ordinaria presso Ospedali Riuniti-Pr

02/01/12 - 02/02/12 gg_deg: 31 Dimissione: Ordinaria a domicilio

Patologia principale del ricovero: 785.50 Altro Shock Senza Menzione Di Trauma

Comorbidità: 789.5 Ascite

571.2 Cirrosi Epatica Alcolica

570 Necrosi Acuta E Subacuta Del Fegato

307.1 Anoressia Nervosa

070.54 Epalite C Cronica Senza Menzione Di Coma Epatico

Procedura: 42.91 Legatura Di Varii Esofagee

Prese Soccorse 2012 - N. : 3

Presso Ospedali Riuniti-Pr

13/02/12 - 13/02/12

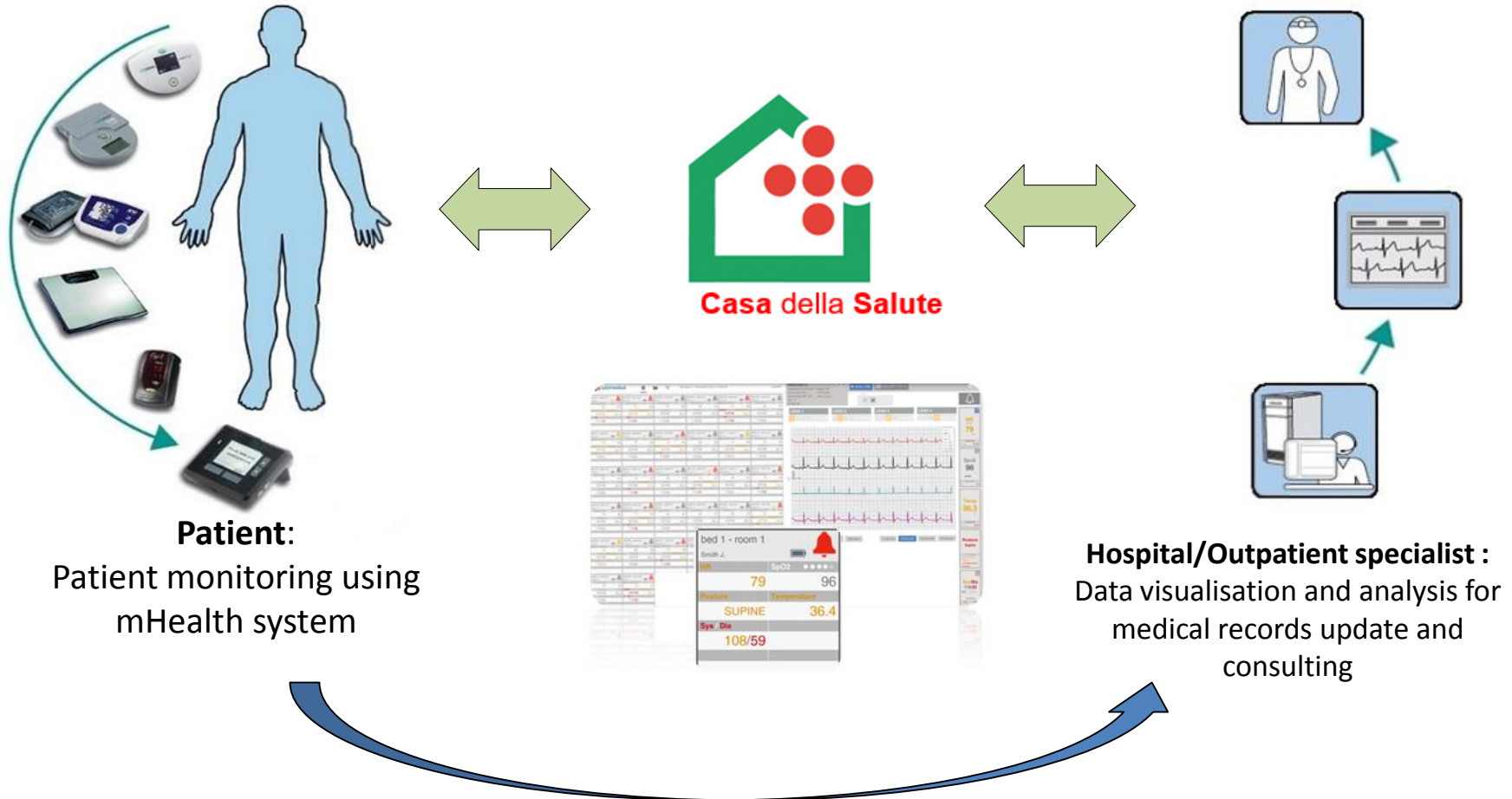
Altri Sintomi O Disturbi

- ✓ Risk Profiles provided to GPs
- ✓ Activation of Professional Teams
 - ✓ GPs, specialists, nurses, physiotherapists, social workers
 - ✓ a proactive response...
- ✓ Interdisciplinary Paths
 - ✓ prevention, clinical appropriateness and adherence, health
- ✓ Participation of Community,
 - ✓ Patients, Caregivers, Associations
- ✓ Telemedicine tools



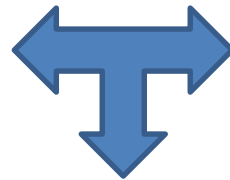
Community Health Centre Operations center – Chronic disease unit

Telemedicine tools

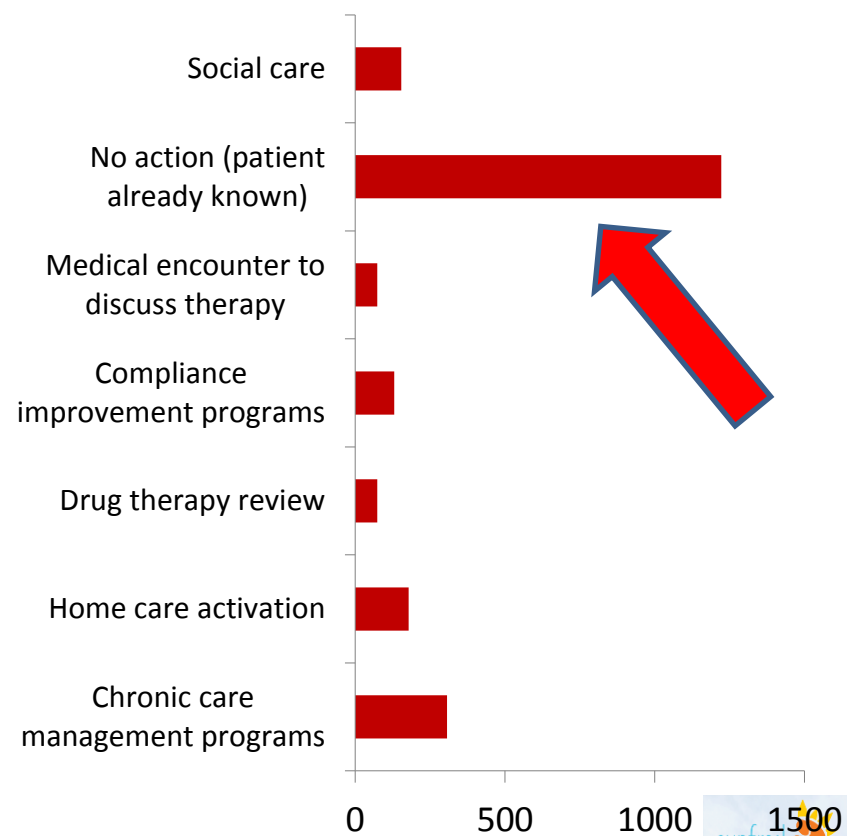
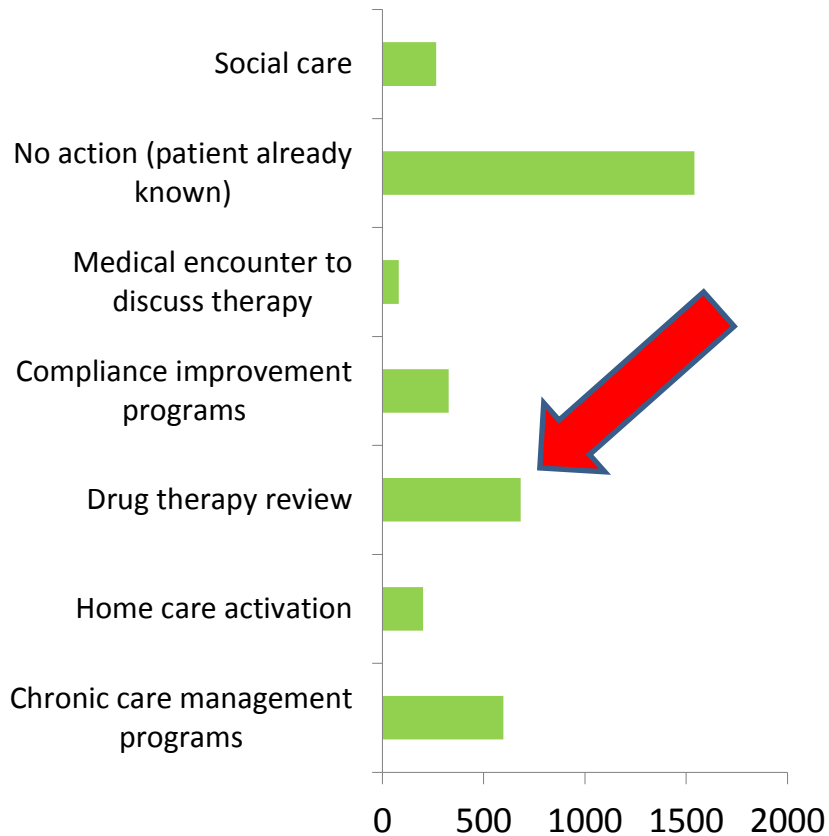


In practice.....activation in 6 CHC

3.453 high risk patients



2.568 very high risk patient



Evaluation of disease management programs in the RHO test sites

Patient Assessment Chronic Illness Care-PACIC



Patients point-of-view in cooperation with patients' associations (CHF, diabetes, COPD, ESRD)

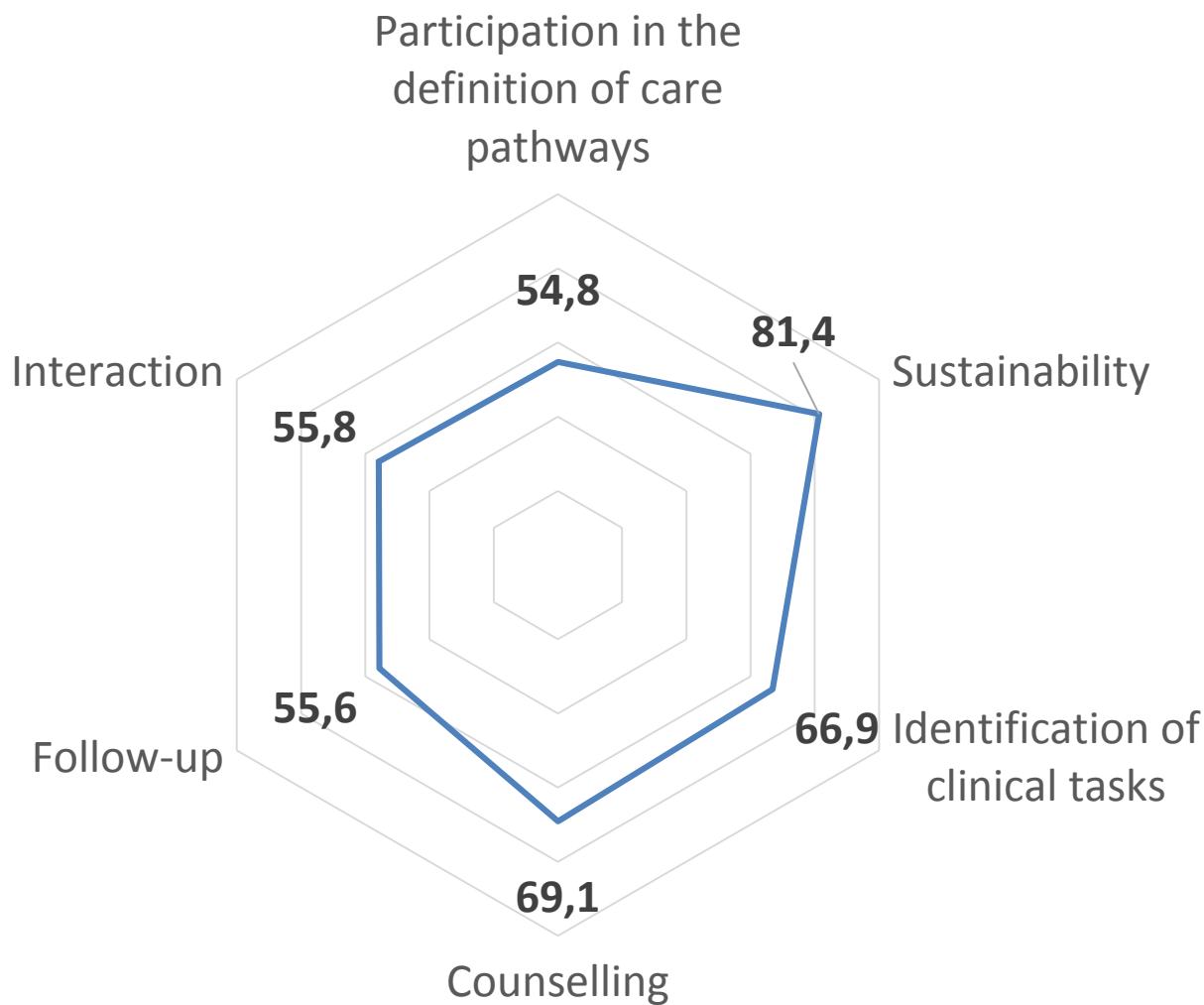
Assessment Chronic Illness Care- ACIC

Health care team point-of-view focus-group:

GPs, nurses, social workers, ambulatory specialists, Primary Care Department)



Patient Assessment Chronic Illness Care- PACIC – 202 patients



Ministry of Health grant (CCM)

- Economic evaluation of risk stratification
- Impact of risk stratification on outcome indicators
- Analysis of motivational tools (counselling, conversation maps, Barrows Cards,...)
- Impact on professional integration (PACIC, ACIC)



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