Comparison of predictive risk modeling among 5 European regions in the ACT project

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Outline

• ACT Programme
• Work Package 5
• Background and Objective
• Methods
• Results
• Conclusions
What is ACT?

“Identify ‘best practice’ organizational and structural processes supporting integration and implementation of telehealth in a care coordination context for routine management of chronic patients”

First time in Europe

- Five leading regions in four countries
  - Experienced in delivering telehealth / coordinated care
  - At least 3,000 CHF, COPD, DM patients per region
- Leading medical experts
- Fully aligned with EC strategy on active and healthy ageing (EIP-AHA)
- Iterative improvement to arrive at a toolkit for care coordination & telehealth use across EU
  - Spread plan to 15-20 other EU regions
What are we evaluating?
ACT Regions and Programmes

- Elderly at home
- Ambulatory intensive care program
- Long term chronic care program
- Transitional care/ post discharge
- Patient self-care management
- HEALTHY

Catalonia, Basque Country, Groningen, Lombardy and Scotland.
ACT evaluation Framework

4 Work Packages
Domains and Subdomains

WP4: Organization and Workflows
WP6: Patient adherence and staff engagement

WP5: Patient Stratification
WP7: Efficacy & efficiency

Questionnaires

Indicators

Programme Directors
Frontline Staff
Patients

Key Drivers

Regional Dashboards

Key Results
Population stratification

Purpose
When
Frequency
Combination method
Severity
Co-morbidities
Hospitalization
Visits
Past use of HC resources
Deprivation index
Age
Drugs
Diseases
WP 5

Patient stratification

Purpose
When
Frequency
Combination method
Disease severity
Disease activity
Care complexity
Fall risk
Social
Function
Care resource use
Frailty
Health status
Age
Capabilities
Education
Skills
Attitude
Deprivation
WP 5

Education
Deprivation
Skills
Attitude
Deprivation
Age
Capabilities
Health status
Fall risk
Social
Function
Care resource use
Frailty
WP 5

Past use of HC resources
Deprivation index
Age
Drugs
Diseases
WP 5
WP5: Patient Stratification

Background

• Predictive risk modelling elaborated from large population-based datasets have shown to be useful for helping to delineate health policies for preventing hospitalizations, improving health outcomes or reducing costs.

Objective

• To compare the predictive risk strategies (case findings tools) adopted in the five regions participating in the ACT project.
Method

• Online questionnaire elaborated by Opimec:
  – Responsible persons for the predictive risk strategy in each region
  – Information on: type of risk assessment approach; statistics; target population…

• In-depth phone interviews were held with the responsible of the programs in each Region to complement the information of the online questionnaire
## Results

### Table 1. Characteristics of the stratification tools

<table>
<thead>
<tr>
<th>Region</th>
<th>Basque</th>
<th>Catalonia</th>
<th>Groningen</th>
<th>Lombardy</th>
<th>Scotland</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
<td>Predictive</td>
<td>Explanatory</td>
<td>N.A.</td>
<td>N.A.</td>
<td>Predictive</td>
</tr>
<tr>
<td><strong>Sample</strong></td>
<td>2.100.000</td>
<td>7.800.000</td>
<td>12.000</td>
<td>10.000.000</td>
<td>500.000</td>
</tr>
<tr>
<td><strong>Math model</strong></td>
<td>Linear &amp; logistic reg.</td>
<td>Generalized linear models</td>
<td>Comparison between groups</td>
<td>Classification model</td>
<td>Logistic reg.</td>
</tr>
<tr>
<td><strong>Statistics</strong></td>
<td>Odds ratio, %, R2, AUC</td>
<td>% probability CI</td>
<td>--</td>
<td>--</td>
<td>Odds ratio, Sensitivity, Specificity, AUC</td>
</tr>
<tr>
<td><strong>Updates</strong></td>
<td>Annual</td>
<td>Semester</td>
<td>Daily</td>
<td>Once</td>
<td>Monthly</td>
</tr>
</tbody>
</table>
Results

Table 2. Characteristics of the stratification tools

<table>
<thead>
<tr>
<th>Region</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Population-based use</strong></td>
<td>Selection of population for intervention</td>
<td>-Informative -Selection of population for intervention</td>
<td>-Informative -Education data collectors</td>
<td>-Selection of population for intervention</td>
<td>-Selection of population for intervention</td>
</tr>
<tr>
<td><strong>Clinical use</strong></td>
<td>All levels of care can see the same information. Medical doctors receive a risk score for each patient in the EHR.</td>
<td>Used for clinical criteria of the end user, validation of patients by clinicians. Clinicians used the model as a tool for estimating the risk of certain outcomes</td>
<td>Only Pulmonologist can use for clinical criteria of the end user</td>
<td>All levels of care can see the same information. Clinicians have the possibility to assess and validate the patients. Used for Clinical criteria of the end user</td>
<td>All levels of care can see the same information. Clinicians have the possibility to assess and validate the patients.</td>
</tr>
</tbody>
</table>
## Results

### Table 3. Variables included in the stratification tools

<table>
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<tr>
<th>Region</th>
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<th>Scotland</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variables</strong></td>
<td><strong>Mainly</strong>: Health costs</td>
<td><strong>Mainly</strong>: Unscheduled admission.</td>
<td><strong>Mainly</strong>: individual’s risk of emergency hospital inpatient admission over the next twelve months</td>
</tr>
<tr>
<td></td>
<td>Other models: Unplanned hospital days.</td>
<td>Other models: Death Length of unplanned Hospital stay ER visits, GP visits Pharmacy expenditure Health cost consumption.</td>
<td>Other models: Unplanned hospital readmission Unplanned hospital days Functional decline Cognitive decline</td>
</tr>
<tr>
<td></td>
<td>-Pharmacy expenditure -Health resource consumption</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
<td>-Demographic information -Diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Co-morbidity (using co-morbidity grouper)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In Summary

- **Basque Country and Scotland** provide predictive models estimating risk of mortality and acute events that may generate emergency room admissions and unplanned hospitalizations. The statistics generated by these predictive risk models provide quantitative estimation of sensitivity and specificity.

- **Catalonia** is a explanatory model for estimating unscheduled admissions and other resource utilization (cross sectional approach).

- The outcomes of these three are connected with the electronic health record for case finding purposes.
In Summary

**Groningen** provided information on a promising evolving setting based on interoperability with electronic health records, but currently there is not a predictive risk modelling in place.

**Lombardy** indicated that the program relies on stratification tools essentially built-up on healthcare cost categories.
Conclusions

- As a general limitation of the models, **there are no individual variables of functional performance** and severity/activity of disease (s)

- The different regional approaches are essentially based on past-use of healthcare resources and are **focused on identification of subjects with high risk of presenting undesirable health events** (case finding).
Conclusions

• A common problem is that dynamic update of the predictive risk models and their articulation with clinical use (patient-based stratification) is not in place.

• Current challenges of this type of risk assessment were identified.

• It seems timely to generate recommendations, within the ACT lifespan, aiming to standardize population-based risk assessment at European level.
Thank you very much for your attention!

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