CyMED: a Platform for Supporting Collaboration and Coordination of Home Care Teams using a Process Oriented Approach

Awatef Hicheur Cairns, Nathalie Dos Reis, Andrew Cairns, Christophe Lefrère, Gilles Leloup, Jean-Luc Strauss
Context

Optimize the way health services are provided

- Collective services at home
- Home Health-Care + e-Health
Homecare ecosystem

Medico-social services
- Pharmacy
- Medico-social services
- Service home nursing
- Social service providers (home-help, Meals-delivery)

Social Services
- Associations
- Other service provider
- Relatives, friends
- Insurance, Financers
- Social Security Services

Financial Services
- Coordinating Organization
- Medical Services
- Hospital
- Medical Laboratory
- Medical Imaging

Medical Services
- General Practitioner
- Nurse (independent)
- Retirement Home

Context
- Homecare processes
- Flexible workflow approach
- The CyMED platform
- CyMED’s services
- Conclusion and future works
Homecare ecosystem

➢ Coordination media: nurses’ / service providers’ logbook

2 août : N° 01, miss à son traitement le midi.

13 août : Repas Hôpital - repas de cheval.

21 août : Frais de traitement $32.08 à 15h15.

Décédé le 25.08 - 22h21.

Informations sur la tâche réalisée.

Informations logistiques.

Informations sur l'état de la personne prise en charge.

Altran Research
Homecare processes map
Characteristics of Homecare processes

✓ **Personalized**
  - Each patient has specific conditions and hence personalized process

✓ **Collaborative under a loosely-coupled governance**
  - Responsibilities are distributed between different organizations delivering services of diversified nature

✓ **Dynamic**
  - Adaptation of the processes to take into account exceptions.

✓ **Time constrained**
  - the defined personalized patient agenda is constrained by a protocol listing the various tasks with different temporal characteristics (scheduled, non-scheduled, changes in frequency over time, etc...), but subject to random changes

✓ **Regulated**
  - Healthcare protocols, data privacy and actions’ traceability.
Types of home care processes

CyMED: a platform to help manage Home Care processes smoothly with efficiency and patient comfort oriented

CyMED users
- Patient

CyMED users
- Relatives, health providers, social assistance providers, ...

Authorities, Financers, Supervisors

Collaborative Communication
- Processes and agenda orchestration
- Data management

Services Management
- Flexible Workflow Module
- Declarative Workflow Module
- Process Mining Module
- Planification Module
- Knowledge Management Module

Administration
- Monitoring, Control, Reports, Security & Privacy
A Flexible workflow engine to manage homecare processes and a Process mining engine to generate recommendations

- Loosely structured workflows
- Ad-hoc workflows
- Complexes workflows (cancellation,..)
- Late biding

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**Context**

- Homecare processes
- Flexible workflow approach
- The CyMED platform
- CyMED’s services
- Conclusion and future works

**The CyMED platform**

**CyMED’s services**

**Flexible workflow approach**

**A Flexible workflow engine to manage homecare processes and a Process mining engine to generate recommendations**

**Recommendations of tasks**
A complex coordination process

Proclets: choice between several sub-processes

Declarative sub-process

CyMED’s services

Flexible workflow approach

Homecare processes

Context

Conclusion and future works

YAWL

Leading the World in Process Innovation

Process Cancellation

Prescription cancellation

Prescription

Medicines preparation

Medicines delivery

Treatment supervision

Injection - Medicine Y

Give - Medicine X

Wait

Wait

Pillbox filling - Medicine X

Check blood pressure

Ask for the drug tolerance

Give breakfast

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CyMED: Technology Stack

CyMED users
- Patient
- Relatives, health providers, social assistance providers, ...

CyMED users
- Authorities, Financers, Supervisors

Collaborative Communication
- Administration
- Monitoring, Control, Reports, Security & Privacy

Processes and agenda orchestration
- Flexible Workflow Module
- Declarative Workflow Module
- Process Mining Module
- Planification Module
- Knowledge Management Module

Data management
CyMED main services: The homecare social network

Community group

- Private group
  - Dependant person group, including: referent, GP, specialized doctor, paramedical, home-helper

Community Objectives

- Inform
  - News wall

- Communicate
  - Private messaging

- Plan
  - Appointments management

- Follow up
  - Treatment and other tasks tracking

- Alert
  - Emergency notification

- Geolocate
  - Community member positioning
## CyMED main services: The homecare social network’s KPI

<table>
<thead>
<tr>
<th>Social network capital</th>
<th>Number of contacts with a direct relationship with the patient and thus part of its private community</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>It is measured by yearly total volume of contacts, vol. and % of contacts /category</td>
</tr>
<tr>
<td>Number of social network gaps</td>
<td>Number of contacts categories (e.g. generalist practitioner) within a patient private community with no contact. It may lead to automated caregivers recommendations.</td>
</tr>
<tr>
<td></td>
<td>It is measured by total volume of contacts categories with 0 contact per private community.</td>
</tr>
<tr>
<td>Patient medical data exceptions</td>
<td>Number of patient health abnormal data requiring to take action, e.g.: number of medications administrated but not taken.</td>
</tr>
<tr>
<td></td>
<td>It is measured by daily total volume of exceptions notified</td>
</tr>
<tr>
<td>Level of engagement the community</td>
<td>Number of new events (direct messages, posts, meetings, tasks or alerts) submitted by private community members</td>
</tr>
<tr>
<td></td>
<td>It is measured by monthly total volume of events generated by the private community, or by a category of the community or by a member of the private community</td>
</tr>
<tr>
<td>Quality of service provided by the community</td>
<td>Share of alerts and/tasks managed and completed by the private community</td>
</tr>
<tr>
<td></td>
<td>It is measured by monthly total volume of managed alerts and total volume of completed tasks by the community, or by a category of the community or by a member of the community</td>
</tr>
</tbody>
</table>
CyMED main services: The homecare social network’s KPI

- Patient network engagement level

![Graph showing patient network engagement levels for different components of the system.](image)

**Level of engagement may be measured at the scale of:**
- the whole private community
- a category of the community (e.g., doctors)
- a member of the community (e.g., the patient’s son)

1. High level of community engagement and interaction: 120 interactions/year
2. Predominant use of information and meetings set-up: 80%
CyMED main services: liaison notebook

Miss Cairns liaison notebook:

- **Edouard Nigil**
  - 21/10/2014
  - The patient does not support intravenous

- **Edouard Nigil**
  - 15/10/2014
  - Message status: not listened
    - **Audio:** 0:00 - 0:16
    - Archive | Delete

- **Edouard Nigil**
  - 13/09/2014
  - The patient does not like the morning's appointments
CyMED main services: The to-do-list

<table>
<thead>
<tr>
<th>Check for proper consideration of drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affected to Doctor Vladimir</td>
</tr>
<tr>
<td>✅ Task Performed the 12/12/2014</td>
</tr>
<tr>
<td>Note: The patient can not tolerate the anti-inflammatory</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Check blood pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affected to several peoples</td>
</tr>
<tr>
<td>🔴 Task not yet performed</td>
</tr>
<tr>
<td>Note: None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Groom the patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affected to several peoples</td>
</tr>
<tr>
<td>✅ Task Performed the 12/12/2014, by Doctor Stinger</td>
</tr>
<tr>
<td>Note: None</td>
</tr>
</tbody>
</table>
CyMED main services: The optimal planning service

- **General constraints**
  - Matching between availability of patients and various actors
  - Automatic rescheduling when an actor fails to fulfill its tasks with minimal perturbation regarding the protocol constraints
  - Delivery of material resources before their use by qualified personnel
  - Usability delays of perishable material resources
  - Qualifications required for person carrying out action / providing care
  - Synchronization of stakeholders involved in the case of shared visits
  - Minimum waiting time between successive visits
  - Precedence of tasks (coordination workflows)
CyMED main services: Health monitoring and detection of loss of autonomy

- **Prevent** degradation of the patient’s status

- Based on information reported by:
  - ✔ sensors used at home
  - ✔ comments from the patients and their homecare providers

- Detected **risks trigger**
  - ✔ A reorganization of the care process
  - ✔ Alert the members of the patient’s community
    - Alert thresholds customized per patient
    - Diffusion process depend on the patients’ context
Process Mining

The CyMED platform

Homecare processes

Flexible workflow approach

CyMED’s services

Conclusion and future works

CyMED's services

Flexible workflow approach

The CyMED platform

Homecare processes

Context
Conclusion and future works

- An efficient **coordination** approach using **advanced process oriented technologies** for data **sharing**, **communication**, process **orchestration** and resource **planning**.

**Future works**

- Deploy CyMED in **real-life environments**;
- Implement and **synchronize** the optimal planning service with YAWL system;
- **Customize** DECLARE **constraints** for homecare;
- Introduce **ontologies** to represent **domain knowledge**;
- Use **process mining** to **improve** homecare processes;
- Adapt the **recommendation** mechanism of DECLARE to **homecare**.
The Seventh International Conference on eHealth, Telemedicine, and Social Medicine

Thank you for your attention!

Questions?

Jean Luc Strauss (jeanluc.strauss@altran.com)

eTELEMED 2015
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PRESENTER: Jean–Luc STRAUSS

SCIENTIFIC BACKGROUND OF MAIN AUTHOR:
- Specialist in Workflow Modelling
- Thesis in 2009 with CNAM (France) on Workflow Modelling
- Currently: Research Leader on 2 Research Projects With Altran Research
Panel Discussion Topic

Patient Self-Management Tools: 
*Categories of Tools and how they support Self-Management and Empowerment*

Åsa Smedberg
The Department of Computer and Systems Sciences, Stockholm University
Patient Self-Management

“the tasks that an individual must undertake to live well with one or more chronic conditions. These tasks include gaining confidence to deal with medical management, role management, and emotional management.” McGowan, 2005, p. 3

“the individual’s ability to manage the symptoms, treatment, physical and psychosocial consequences and life style changes inherent in living with a chronic condition.” Barlow, et al., 2002, p. 178
Patient Self-Management Tools

Barrett, 2005, p. 9
Patient Empowerment

• Empowerment refers to
  – experiencing personal growth through developing skills and abilities along with a more positive self-image
  – ability to make personal decisions, to exercise critical thinking and to access relevant resources
  – ”power to..” and ”power over..”

• Brings new patient role and relations to healthcare
Empowerment in Online Patient Self-Help Groups

• “Reliance on self and peers rather than on authoritative professionals contributes to gaining a sense of personal competence”
  (Barak et al., 2008, p. 1869)

• Voluntary participation and free choice contribute to feelings of self-determination

• Social engagement through helping others and socially identifying with others
Online Peer Conversations for Learning

- Statements
- Requests on neutral issues - fact queries
- Requests on personal issues:
  - Setbacks
    - Personal experiences of recurrent breakdowns
  - Obstacles
    - Foreseen difficulties to overcome
  - Incentives
    - Motivational factors, induce action or motivate effort
Suggested Discussion for the Future...

• What is needed to successfully address self-management and the use of tools for patients and their close ones?
• Are there obstacles? How to overcome?
• New criteria for measuring effectiveness of patient care....
HealthCare Platforms: Lessons Learned and Future Challenges

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Healthcare platforms – lesson learned

- Web access, mobile devices are popular and attractive both to the users and developers
- The use of telemedicine solutions increases
- New technical solutions such as robots (daVinci)
- There is significant progress in the HCI, especially to enter and display data on the mobile devices
  - still formal problems while used for diagnosis and medical treatment
- The data has to be store and process somewhere (cloud, grid, ...)
  - Security is a concern
  - Formal problems including different national regulations
- There are some application areas where data cannot be processed using smartphone, tablet or PC.
Healthcare platforms – challenges

- There are some application areas where data cannot be processed using smartphone, tablet or PC.
  - Genetics based treatment (NGS,...)
  - Image processing
  - Personalized medicine
  - Surgery planning

- Example approaches:
  - Virtual Physiological Human
  - Human Brain Project

- Requirements:
  - Store and process large data sets in the short time (minutes note days)
  - Strong security
  - Easy of use
Four (modest) lessons learned

eTELEMED 2015
Panel discussion on Health Care Platforms:
Lessons Learned and Future Challenges

Ruud Janssen
Research Group IT-innovation in Health Care
Windesheim University of Applied Sciences
Zwolle, The Netherlands
SenseMedic & DiMove: real-time medication monitoring

Evidence is just one way to convince stakeholders (and often it's not enough)

Panel discussion, eTELEMED 2015, Lisbon, Portugal, 22-27 February 2015
HighTech@Home: open source home care technology

Open Source is not about cost savings, it is about investment

Panel discussion, eTELEMED 2015, Lisbon, Portugal, 22-27 February 2015
TalkMeHome: guiding a lost person home safely

A seemingly straightforward task can in fact be very complicated

Panel discussion, eTELEMED 2015, Lisbon, Portugal, 22-27 February 2015
The Smart Floor: fall detection

Even an obvious solution needs someone willing to own the problem

Panel discussion, eTELEMED 2015, Lisbon, Portugal, 22-27 February 2015