

Virtual Coaching Activities for Rehabilitation in Elderly

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D1.3 Narratives representation for automatic reasoning

Extended summary

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The scope of the document is to provide a framework of the “knowledge domain” from which the **vCare** virtual coaching will gather its behaviour. A body of formally represented knowledge is based on a conceptualization: the objects, concepts, and other entities that are presumed to exist in some area of interest and the relationships that hold them. A conceptualization is an abstract, simplified view of the world that we wish to represent for some purpose. Every knowledge base, knowledge-based system, or knowledge-level agent is committed to some conceptualization, explicitly or implicitly.

The conceptualization in this document refers to a clinical ontology depicted for each of the four clinical profiles addressed in the project. The clinical perspective will provide a global overview of what could be considered in scope of the project, making some assumptions on what could be “automated” in terms of reasoning.

This document provides an overview of possible use cases for the automatic reasoning of the **vCare** system. The technical team will identify the reasoning of the **vCare** platform which could be considered the “automated” part, starting from the premise that the reasoning described in this report is provided by the clinical team as acceptable for this purpose.

BACKGROUND

The task “T1.3 – Knowledge representation requirements”, aimed at modelling and representing medical knowledge by making use of pathways, patient/treatment profiles (diseases, user interaction, coaching services, treatment activities, performance requirements, and technical environments) and ontologies.

This document investigates the key elements of the “reasoning” around the patient involved in the rehabilitation pathway, in order to provide a wide vision to technical partners of what could be automated according to the clinical perspective.

It is structured in two main blocks:

- A first one addressed as the “theoretical” block. It is called “narrative representation for automatic reasoning”, and intends to provide some definitions (i.e., automatic reasoning and ontology) and to present the approach to ontology description, illustrating from a general perspective the classes included in the ontology.
- A second one which covered the “operational” block. It is called “knowledge representation”, and aims to provide a description of different dimensions of the ontology, according to the different rehabilitation pathways impacted. For each one of the four clinical centres it has been described the parameters of the different classes which compose the ontology.

THEORETICAL BLOCK

As a first step, we conducted an analysis of the existing literature on automatic reasoning and ontology as widespread concepts in artificial intelligence domain. Hence, a new **clinical pathway ontology**, based on existing literature, was designed (see Figure).

The “dimensions” which have been taken in consideration within the ontology are the following (in brackets the classes of the ontology to which they correspond):

- Personal conditions (personal state, clinical state and patient profile), as a starting point of the sphere of action of the “automatic reasoning”, as off the result of the clinical activity inside the hospital. It represents the baseline to set up the action of the Virtual Coach, driving the dynamical adaptation of the clinical pathways;
- Environmental context, together with patient profile, it is outside the sphere of action of the “automatic reasoning”, even if it represents the baseline to set up the action of the Virtual Coach;
- Flow of action (process flow, actions, roles, time events): some flow of actions have been depicted, to state the kind of reasoning behind the “deployment” of the use cases (D1.2) to the patient; they include both the “clinical” reasoning and the “automatic reasoning” (decisions/suggestion which is acceptable to delegate to a virtual coach);
- Documents and evidence indicators: are both provided by clinical reports (usually represented in a standardized way, called “evaluation scales”) and by instrumental parameters. The automatic reasoning compares the values included in the assessment document with the evidence indicators. Based on the discrepancies among the expected behaviour and the results of the actions performed, the reasoner selects the best suggestion and directions for the patient. These modifications will be recognized in order to find the appropriate treatment/suggestion for the patient;
- Feedback: this section has the aim to give responses and comments; through these lasts, virtual coaching should “empower” the patients, according to the rules embedded in the automatic reasoning.

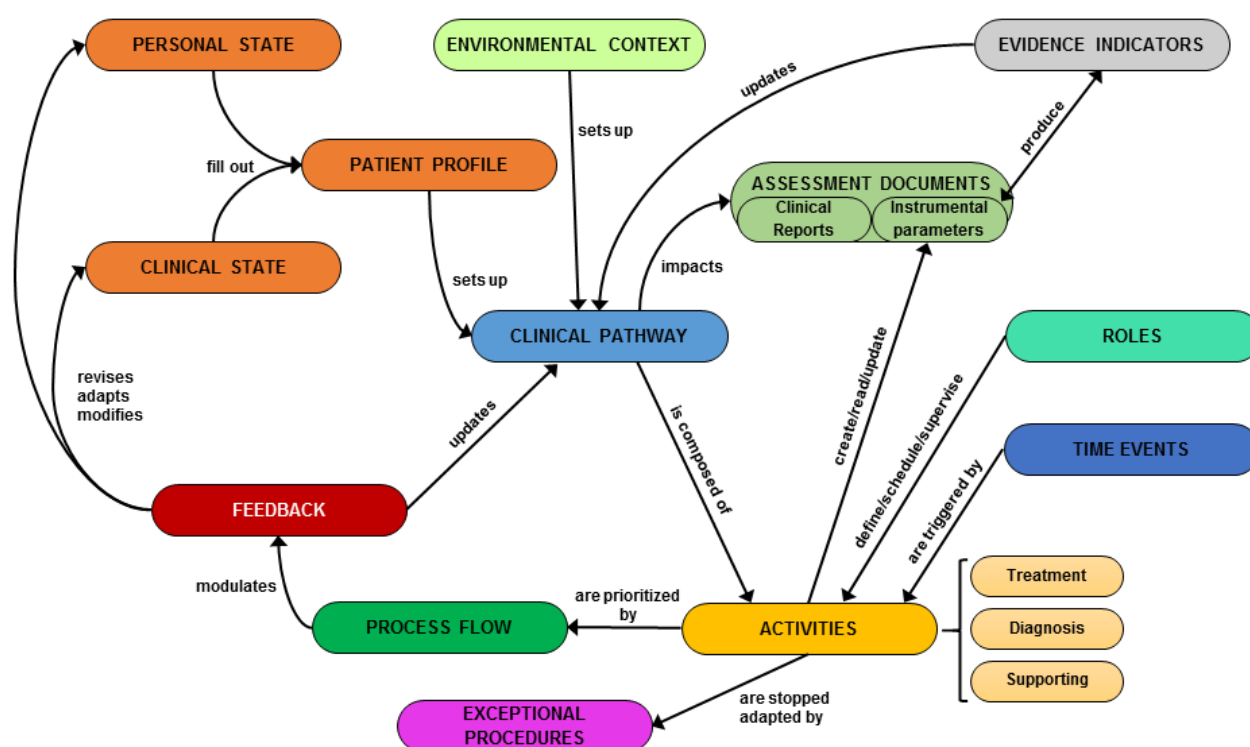


Figure: Proposed vCare Clinical Pathway ontology, based on Braun, Richard, et al. "BPMN4CP: Design and implementation of a BPMN extension for clinical pathways." 2014 IEEE International Conference on Bioinformatics and Biomedicine (BIBM), IEEE, 2014

OPERATIONAL BLOCK

Once the reasoning ontology was defined, its classes will be described related to the four diseases and the rehabilitation programmes included in **vCare** project.

In this report all the information contents are detailed, for each pathology, in *ad hoc* tables.

Table contents need to be interpreted given the main three application areas of **vCare** platform:

- The *health coaching*, to support the rehabilitation of patients (motor and/or cognitive rehabilitation);
- The *behavioral coaching*, to support the risk reduction and the adherence to the care plane and the lifestyle;
- The *well-being coaching*, to promote a proactive life, social activities and relationship.