Virtual Coaching Activities for Rehabilitation in Elderly

Call: H2020-SC1-2016-2017

Grant Agreement Number: 769807

D6.2 Pathways editor and Template management

Extended summary

The **vCare** project starts from the assumption that rehabilitation provides an ideal setting for the adoption of a Virtual Coach. Rehabilitation at home, supported by virtual coaches, can improve a patient's transition from clinic to home.

The document provides an overview of the **tool and technical repository** of the **graphical representation of the clinical rehabilitation pathways**, which are integrated as templates in the vCare system. They are **adapted at runtime** in order to take into consideration the preferences and choices of the user. Medical knowledge is thus formally represented and made accessible to the technical layers of the vCare project to create the node for the implementation of the activities of the virtual coach. The deliverable also explains how it makes use of the FHIR specification.

Clinical pathways (CPs) are a central instrument to describe in a structured way description the clinically relevant procedures a patient should follow. vCare aims at significantly improving the continuum of care between the hospital and the home environments while supporting a collaborative approach including multiple caregivers and the virtual coach. vCare has thus adapted the concept of CPs to describe a *personalized home rehabilitation care pathway* within a multidisciplinary setting. After hospital discharge, traditional rehabilitation programmes are usually static and do not adapt to take into account the current situation of the patient. The vCare coaching activities together with adapted communication interactions with the coach should thus improve therapy adherence as the virtual coach adapts the programme considering difficulties encountered in everyday life as well as personal habits and preferences.

The care pathway system is thus the core of the coaching activities. It will trigger smart reminders, timely advice, guidance and proactive and personalised recommendations. Thus, starting from a pre-defined clinical baseline, the Virtual Coach will be able to personalise and adapt goals according to the situation and choices of the patient and the progress achieved in the impairments' recovery. Medical professionals can also monitor the patient's progress and adapt clinical pathways and recommendations (via a dedicated user interface of the professional portal).

PRIMARY OUTCOMES

The project deliverable D6.2 provides a technical overview of the *Pathways editor and Template management tool*. It also provides an access to the tool itself. The tool is meant to design generic care pathway *templates*. The template is *instantiated*/chosen for a particular patient and a particular plan for each patient is then assigned.

The development of the pathway tool is part of the vCare solution's pathway layer providing the capability to graphically represent and adapt rehabilitation care pathway templates. Functionally it allows physicians to assign a particular pathway to each patient and personalise it while permitting further adaptation through automatic reasoning mechanisms.

Two primary components can be distinguished:

- The **pathway editor** is meant to ***graphically model*** the foreseen process flow for a group of patients (compiling a **pathway template**). After an initial investigation, we have chosen to use ***BPMN***[1] (with a few adaptations) as graphical conceptual modelling language CPs for the Pathway Editor.
- The **pathway repository** has been created to store the modelled pathway information using a standardised format so that other components of the overall vCare solution can easily access the pathway information in terms of the foreseen rehabilitation procedure.

We make use of the ***HL7 FHIR*** specification[2] which is becoming the mainstream standard for data exchanges between software systems in the healthcare sector. FHIR describes data formats and elements as so-called "resources" and provides an interface to exchange them. We make use of two of the resources (see Figure 1 for an overview):

- The ***PlanDefinition***[3] resource is the technical representation of the graphically modelled patient-independent rehabilitation care pathway *template*.
- The PlanDefinition resource is then mapped to the ***CarePlan***[4] resources after the physician has assigned a rehabilitation care pathway template to a particular patient. By doing so, a *patient-specific instance* of the template is generated.
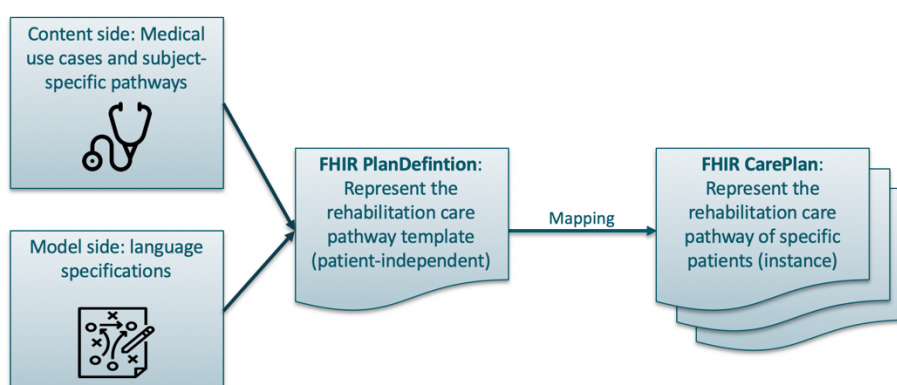

Figure 1: Relation of FHIR's PlanDefinition and CarePlan for vCare's purposes

Overall, the Pathway Template System is thus a combination of two interlinked components: the editor and the repository (see Figure 2, left part). The core component of the editor uses the bpmn.io[5] library, which has been modified according to the modelling language considered as relevant in the clinical domain. As template repository, we integrated a HL7 FHIR-based implementation[6] that enables a database persistence and a REST-based access to the developed templates. The endpoint for the REST-based access is provided by a web servlet. It provides the basic CRUD-operations for pathway templates. This also is the access point to gather the pathway information for both the professional portal (to assign a particular pathway

---

[1] See: https://www.omg.org/spec/BPMN/2.0/
[2] See: https://www.hl7.org/fhir/; FHIR (Fast Healthcare Interoperability Resources).
[3] See: http://hl7.org/fhir/r4/plandefinition.html
[4] See: https://www.hl7.org/fhir/careplan.html
[5] See: https://github.com/bpmn-io
[6] See: https://hapifhir.io

instance by the physician for a particular patient) and the knowledge layer (the wrapper transfers pathway information into the ontology's structure in order to perform reasoning queries and personalization based on machine learning; see Figure 2, right part).
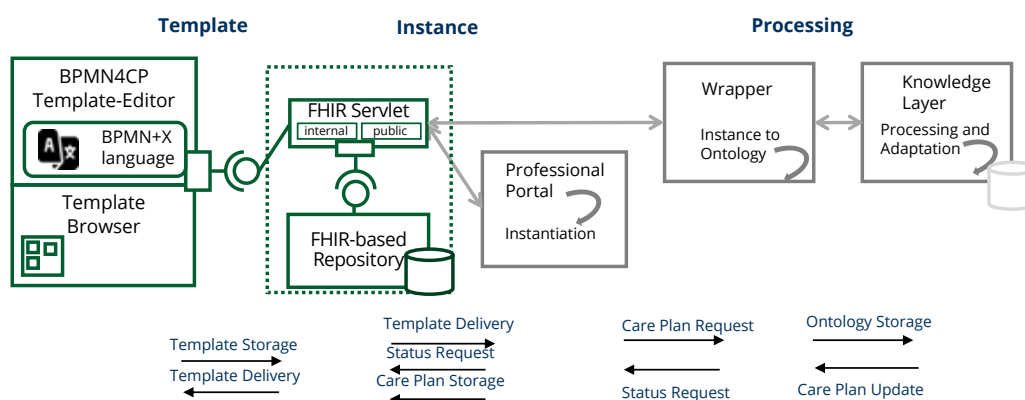

Figure 2: Core Components for the application of the Clinical Pathways in the vCare-Ecosystem