

HC 4017 PatMan

Patient Workflow Management System

Short description and figure

PatMan proposes a methodology for building decision support systems that integrate the two key aspects of health care delivery

- *clinical procedures* and
- *organisational functioning*

thereby integrating guideline-based care with patient workflow management. The figure shows the relation between the main steps and components followed by PatMan for providing health care professionals with tools for building a decision support system.

Setting the Scene

The motivation for this project lies in the observation that hospital information systems often oversee the organisational knowledge that is essential to guarantee efficient delivery of quality care. Much effort has been put into developing clinical guidelines, which are intended to prevent dissimilarities, malpractice and waste of resources in patient treatment.

However, to be effectively implemented within an organisation such as a hospital or an outpatient department, a guideline (GL) requires a customisation process, suiting it to specific organisational and patient contexts. In sharp contrast to industrial and commercial environments, where the concept of Workflow Management (WfM) is an established and crucial element of management information systems, existing health care information systems have often neglected to consider organisational issues and characteristics.

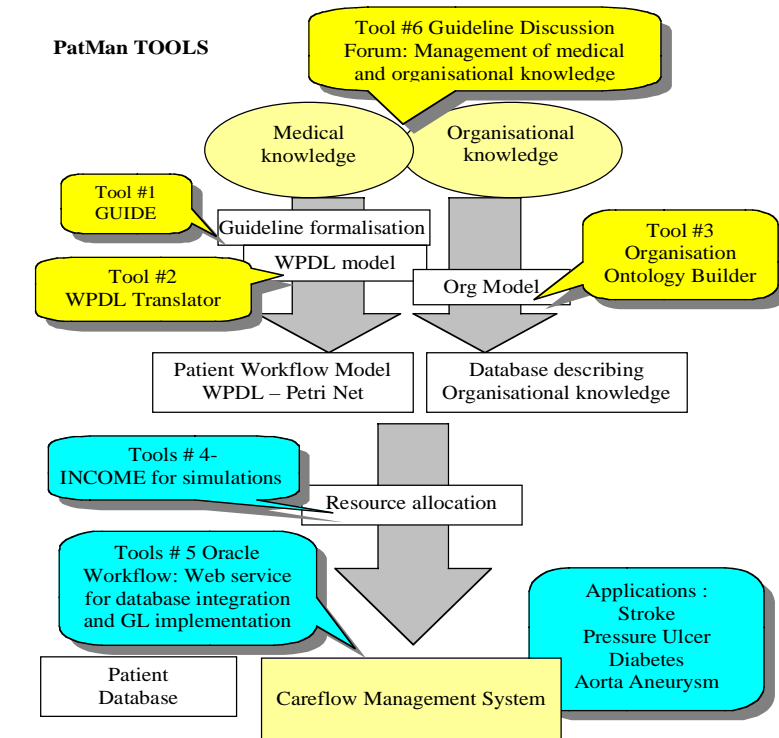
Approach

PatMan proposes a methodology for building decision support systems that integrate the two key aspects of health care delivery – *clinical procedures* and *organisational functioning*.

The aims:

to provide methodological and software support for site customisation of generic healthcare GLs.

to produce tools supporting the acquisition, modelling and management of both medical and organisational knowledge, based on conceptual models (i.e.ontologies).



to assist health practitioners in the management of health care protocols by means of patient workflow management systems (WfMS).

The activities:

- 1) Development of a representation formalism for clinical guidelines and protocols.
- 2) Development of a general methodology for the translation of a GL into a Petri net, in order to simulate GL implementation.
- 3) Development of a set of tools supporting the deployment of medical guidelines and protocols in the context of work practices in specific health care settings.
- 4) Empirical evaluation of these tools in specific health care domains, namely in relation to
 - management of patients with ischemic stroke
 - prevention of pressure ulcers
- 5) Theoretical evaluation of the same tools in other domains, namely a surgery guideline for the management of

abneurysm aorta abdominalialis and a follow-up guideline for diabetes.

Results and Achievements

The principle objective of this project was to demonstrate that health care organisations can benefit by the application of a *careflow management system*, which is a WfMS applied to specific patient situations. The project results show the benefits of providing a dynamic model of the workflow process in question, having all the involved entities explicitly defined. The dynamic model makes it possible:

- a) to simulate the process evolution to clarify where and when information and/or resources are produced and consumed,
- b) to implement GLs in the real clinical setting, by efficiently allocating the necessary resources.

The components of the guideline-based *careflow management system* can be accessed through an internet browser.

Users of the services are:

medical experts that are responsible for the guideline/ protocol formulation.

physicians and other health staff that are responsible for guideline implementation in daily routine.

resource managers, such as ward chiefs and administrative staff, who are responsible for the best allocation of resources.

The PatMan tools:

The PatMan tools comprise the following tools 1-3 that were completely developed under PatMan, tools 4-5 adapted within the PatMan project, and tool 6 that was adapted and refined from the previous HC-REMA project.

Tool no. 1: The Guideline editor, GUIDE, which computerises the representation of a guideline or protocol. The editor is written in Java. A GL written with GUIDE may also embed decision analysis models, such as decision trees.

Tool no. 2: The WPDL translator is a program that produces a representation of the Guideline as a WPDL (Workflow Process Definition Language) file. The translator is written in C++.

Tool no. 3: The Organisation Ontology Building tool is used for modelling the organisational aspects of the careflow. A prototypical ontology for health care organisations has been embedded. The tool is written in Visual Basic.

Tool no. 4: INCOME is a commercial product from the partner PROMATIS. This tool exploits a relational database. INCOME is able to simulate a Petri net representing the guideline/protocols. It embeds facilities to represent the behaviour model, the organisation model, and the information model.

Tool no. 5: Oracle workflow is a commercial product from ORACLE, which permits describing and implementing a workflow model on a real world setting. Three main modules compose this tool.

- The Builder allows the user to build the model as a sequence of tasks.
- The Monitor allows for viewing and administering the status of a specific instance of a workflow process.
- The Notification Mailer lets people receive notifications of work-items awaiting their attention via E-mail, and acts based on their E-mail responses.

Tool no. 6: Tool no. 6: The Guideline Discussion Forum (GDF) integrates several technologies supporting organizational management and customises them for supporting medical guide-

lines. The web-based support discussion and debate provides a web environment where both guideline developers and users can discuss and inspect guidelines. This facility is tightly integrated with knowledge modelling tools, so that semantic information retrieval is also supported. particular, users can use the LOIS query tool, to find information about a guideline through the associated knowledge model.

Demonstrators

To enable demonstration of the different functionalities of the tools and their interaction with data and knowledge stores, three demonstrators were assembled.

These PatMan results have been collected into a set of self-explanatory movies, enriched with sound (downloadable from the PatMan Web page). They concern

- the construction of a GL with the guideline editor (Guideline Management Tool applied to prevention of pressure ulcers),
- the simulation of the same GL through INCOME (INCOME Tool demonstrated on a specific ischemic stroke session),
- the implementation of the same GL into a real medical setting, once the GL has been integrated into the careflow management system (Careflow Tool Demonstrator developed for patients with acute ischemic stroke).

Particular attention has been paid to the management of possible exceptions that can arise in clinical routine.

Plans for the Future

The major current efforts of international co-operative research groups on GL development and diffusion are focussed on establishing standards for both representation and implementation. Future refinement of the PatMan tools will go in that direction, for example by exploiting the XML language in various phases of the modelling process.

Managing guidelines is a specific instance of the generic problem of managing organizational knowledge. The tools developed in the PatMan project are now being used in several organizational knowledge management projects. Hence, future developments will extend also beyond the healthcare domain and we will look at ways to integrate the PatMan tools into an integrated support infrastructure to manage the whole life-cycle of organizational knowledge.

WfMS developers and vendors are addressing the problem of exception

management, and not only in the health care sector. Within PatMan this problem has only been partially faced, simply because it was not one of the primary project aims. However in the future it will be seriously considered, because careflow systems will be accepted by users only if they are flexible enough to tackle tasks that may not belong to a predefined GL. In addition, actual WfMS mainly manage synchronous communications, while it should be very important to manage also asynchronous communications, still with the aim of improving flexibility.

Contact Details

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