A Framework for Modeling Workflow Execution by an Interdisciplinary Healthcare Team*

Mounira Kezadri-Hamiaz[a], Daniela Rosu[a], Szymon Wilk[b], Craig Kuziemsky[a], Wojtek Michalowski[a], Marc Carrier[c]

[a] *Telfer School of Management, University of Ottawa, Canada*
[b] *Institute of Computing Science, Poznan University of Technology, Poland*
[c] *Ottawa Hospital Research Institute, The Ottawa Hospital, Canada*

Abstract

The use of business workflow models in healthcare is limited because of insufficient capture of complexities associated with behavior of interdisciplinary healthcare teams that execute healthcare workflows. In this paper we present a novel framework that builds on the well-founded business workflow model formalism and related infrastructures and introduces a formal semantic layer that describes selected aspects of team dynamics and supports their real-time operationalization.

Keywords:

Patient Care Team; Workflow; Health Information Systems.

Introduction

Patient management processes are being standardized and formalized as workflows, which in healthcare environment are executed by an interdisciplinary healthcare teams (IHTs). While there has been extensive research on the formalization and execution of business workflows [1], its applicability in the healthcare domain is limited. Limited expressiveness of the business workflow models restricts the ability to represent operations of an IHT, in particular the role of Most Responsible Physician (*MRP)*, team member's role variability and membership dynamics [2]. Role variablity implies that team members may play multiple and different roles when executing a workflow tasks, while membership dynamics means that members may join and leave team at any time. Thus, to improve expressiveness of workflow models, a dedicated modeling framework needs to formalize the structure and behavior of an IHT.

Methods

In this paper we present the *Team and Workflow Management Framework* (TWMF) that extends business workflow models to support the behavior (understood as team formation, management and task-practitioner allocations) of an IHT. The TWMF is designed to be executed in an environment where multiple patients are managed simultaneously by diferent IHTs and it relies on a set of assumptions that are briefly discussed below. An IHT is formed when a new patient with a certain presentation is admitted and her management (according to a disease-specific workflow) starts. Each IHT includes a MRP who is responsible for patient management and has special duties such as handling exceptional situations. The IHT members are recruited and released dynamically from among available practitioners, as dictated by the execution of the tasks in the workflow. The recruitment and assignment of team members to tasks is done by matching their clinical expertise with the expertise required for completing the tasks. We assume that a practitioner possesses several regularly updated capabilities each with a specific competency level, and that a task execution requires one or more capabilities with associated competency levels. A practitioner can be assigned to a task if she possesses the required capability at a competency level that is at least as good as the competency level identified for the task. TWMF introduces a semantic layer that fomalizes all these aspects through the ontology describing all required concepts, behavioral rules describing team behavior, and an instance base containing all necessary instances of the ontology concepts. The semantic layer is encoded in First-order logic (FOL) [3] formalism.

Results

TWMF is operationalized through a *Team and Workflow Controller* which interfaces with the *Hospital Information System* and the FOL *Reasoner* that operates on the semantic layer and drives workflow execution by an execution engine (such as IBM's Business Process Manager).

Conclusions

We have presented a novel framework for modeling workflow execution by an IHT. It relies on a semantic layer that captures team behavior and team dynamics.

We are testing a framework for diferent clinical scenarios and we are working on its extension to include durative tasks.

References

[1]van Der Aalst WM, et al. Business process management: a survey. Business Process Management: Springer; 2003: 1-12.

[2]Andreatta PB. A typology for health care teams. Health Care Management Review. 2010;35(4): 345-54.

[3]Smullyan RM. First-order logic: Springer; 1968.

* This research was supported by grants from the NSERC CREATE Program and the Telfer School of Management.