Chapter 21
Supporting Physicians in the Detection of the Interactions between Treatments of Co-Morbid Patients

Luca Piovesan
Università degli Studi di Torino, Italy

Gianpaolo Molino
Azienda Ospedaliera San Giovanni Battista, Italy

Paolo Terenziani
Università del Piemonte Orientale "Amedeo Avogadro", Italy

ABSTRACT

The treatment of patients affected by multiple diseases (comorbid patients) is one of the main challenges for modern healthcare. Clinical practice guidelines are widely used to support physicians, providing them evidence-based information of interventions, but only on individual pathologies. This sets up the urgent need of developing methodologies to support physicians in the detection of interactions between guidelines, to help them in the treatment of comorbid patients. In this chapter, the authors identify different levels of abstractions in the analysis of interactions, based on both the hierarchical organization of clinical guidelines (in which composite actions are refined into their components) and the hierarchy of drug categories. They then propose a general methodology (data/knowledge structures and reasoning algorithms operating on them) supporting user-driven and flexible interaction detection over multiple levels of abstraction.

DOI: 10.4018/978-1-5225-5643-5.ch021

INTRODUCTION

Background

Nowadays, the rationalization of the healthcare systems is a task of fundamental importance in order to grant both the quality and the standardization of healthcare services, and the minimization of costs. Clinical Practice Guidelines (CPGs) are one of the major tools that have been introduced to achieve such a challenging task. CPGs are, in the definition of the USA Institute of Medicine, “systematically developed statements to assist practitioner and patient decisions about appropriate health care in specific clinical circumstances” (Institute of Medicine, Committee on Quality Health Care in America, 2001). Thousands of CPGs have been devised in the last years. For instance, the Guideline International Network (http://www.g-i-n.net) groups 77 organizations of 4 continents, and provides a library of more than 5000 CPGs. CPGs are commonly recognized as a tool to encode and support the practical adoption of evidence-based medicine (EBM).

The adoption of computerized approaches to acquire, represent, execute and reason with CPGs can further increase the advantages of CPGs, providing crucial advantages to:

1. Patients, granting them that they will receive the best quality medical treatments (since CPGs are actually a way of putting EBM into practice);
2. Physicians, providing them with a standard reference which they may consult, with a way of certifying the quality of their activity (e.g., for insurance or legal purposes), as well as with advanced support to their decision-making activity;
3. Hospitals and health-care centers, providing them with tools to grant the quality and the standardization of their services, as well as with a means to evaluate quality, and to optimize costs and resources.

In recent years, the research about computerized guidelines has reached a relevant role within the Medical Informatics community, and many different approaches and projects have been developed to create domain-independent computer-assisted tools for managing, acquiring, representing and executing computer-interpretable clinical guidelines (henceforth CIGs). See e.g. the systems Asbru (Shahar, Miksch, & Johnson, 1998), EON (Shahar, Musen, & Tu, 1996), GEM (Shiffman, et al., 2000) GLARE (Terenziani, Molino, & Torchio, 2001) (Terenziani, et al., 2003), GLIF (Peleg, Boxwala, & Ogunyemi, 2000), GUIDE (Quaglini, Stefanelli, Lanzola, Caporusso, & Panzarasa, 2001), PROforma (Fox, Johns, & Rahmanzadeh, 1998), and the collections (Gordon & Christensen, 1995) (Fridsma, 2001) (Lucas & Ten Teije, 2008). One of such approaches is GLARE (Guideline Acquisition, Representation and Execution), which has been built starting from 1997 in a long-term cooperation between the Department of Computer Science of the University of Piemonte Orientale, Alessandria, Italy, and the Azienda Ospedaliera San Giovanni Battista in Turin (one of the largest hospitals in Italy). Besides supporting CIG acquisition, representation, storage and execution, GLARE is characterized by the adoption of advanced Artificial Intelligence and Temporal Databases formal techniques to provide advanced supports for different tasks, including reasoning about temporal constraints (Anselma, Terenziani, Montani, & Bottrighi, 2006), the treatment of periodic data (Stantic, Terenziani, Governatori G., Bottrighi, & Sattar, 2012), guideline versioning (Anselma, Bottrighi, Montani, & Terenziani, 2013), model-checking verification (Bottrighi,