Chapter 11

A Multi Agent Pharmacoinformatics Reference Model for the Improvement of Hospital Management

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ABSTRACT

The question of drug and the improvement of pharmaceutical care services is moving to the front line agenda of policy makers in the healthcare system. The expansion of drug-related problems and medical errors motivated healthcare organizations to focus on the adoption of information systems and technologies in pursuit of improving communications, signaling, analyzing, and reporting of adverse drug reactions and facilitating scenario-based interventions. This chapter focuses on the development of a reference pharmacoinformatics model that can be used to improve the quality of pharmaceutical care provided and the management of hospitals. The material used in this chapter was synthesized to document and analyze the main variables that derive the context of pharmaceutical care in local settings. It also benefited from international data managed by international organizations such as WHO and the information systems used to mine data related to adverse drug events at the level of national Pharmacovigilance Centers. The proposed intelligent multi-agent Pharmacoinformatics decision support model included a process model, a multi-agent architecture, and an integrated data processing model with clear description of agent functionalities. The model reflects three main modules: a data capture and update module, diagnosis module, and a pharmaceutical care and drug monitoring module. The chapter also reflects on the practical and managerial environment of the model and the basic considerations to be taken into account.

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INTRODUCTION

The use of information systems for the improvement of healthcare is gaining paramount importance. They increase information accessibility to healthcare providers (Makus, 2001) and increased convenience for patients (Fitzgerald, Piris, & Serrano, 2008; Glaser & Foley, 2008). Their deployment by pharmaceutical care assists in the assessment and management of therapeutic outcomes in patients as well as in detecting, signaling, evaluating, and solving potential and actual drug-related problems (including adverse drug reactions or drug interactions). Within the context of a wider hospital management system, the use of information systems to assist in pharmacy-related decision-making is known as “pharmacoinformatics.” In addition to databases, such systems make use of different technological settings (including informatics, the internet, and interactive technologies) to assist in improving pharmaceutical care, patient safety and enhancing hospital management processes. They aim at improving the capacity of clinical practitioners to efficiently acquire and develop new treatment strategies. The use of such systems by practitioners tends to focus on three main areas: facilitating information exchange, detecting and managing adverse drug reactions and enabling the supply chain management process.

However, despite the potential outstanding benefits to be gained by hospitals as a result of the deployment of powerful pharmacoinformatics applications, the realization of such applications is still limited. Currently, pharmacoinformatics applications are used as sub-modules of the corporate information system. Their roles tend to be limited to stock control, monitoring drug availability, and issuance at outpatient and ward pharmacies. Even for stock control, there seems to be no emphasis on the use of electronic ordering and procurement processes for which no standard operating procedures exist. The analysis of drug therapies and management of prescription inconsistencies are not supported by the current pharmacoinformatics applications in use. Moreover, there is a considerable lack of emphasis on developing and deploying information systems for signaling and detecting adverse drug reactions manifested in patients and recorded by healthcare professionals. While the role of Pharmacovigilance centres in analyzing and managing adverse drug reactions is fundamental, there is a considerable lack in using information systems to establish relationships between such centres and hospitals through which adverse events can be reported and tracked. As a result, hospitals tend to miss the technical support provided by national Pharmacovigilance centres.

Therefore, the aim of this chapter is to develop a reference multi-agent pharmacoinformatics model to assist in detecting adverse drug reactions and drug interactions, as well as improving hospital management. The model will be based on the use of multi-agent technologies which has proven to be suitable for tackling large, real-world problems (Gasmelseid, 2006).

SIGNIFICANCE OF THE STUDY

The significance of the study originates from the following considerations:

a. This study deals with the context of health-care with emphasis on the improvement of pharmaceutical care processes as basic elements in the delivery of improved healthcare services.

b. The growing importance of the deployment of advanced information systems in response to the fundamental changes exhibited in the healthcare system and its subsystems. The growing incidence of medical errors and adverse drug reactions, the complications of communications among medical professionals in many hospitals (mainly physicians and pharmacists), and the escalation of drug procurement costs, are signs that motivate the emphasis on pharmacoinformatics.
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