Chapter 12
Pervasive Business Intelligence Platform to Support the Decision-Making Process in Waiting Lists

Marisa Esteves
University of Minho, Portugal

Filipe Miranda
University of Minho, Portugal

António Abelha
University of Minho, Portugal

ABSTRACT

In recent years, the increase of average waiting times in waiting lists is an issue that has been felt in health institutions. Thus, the implementation of new administrative measures to improve the management of these organizations may be required. Hereupon, the aim of this present work is to support the decision-making process in appointments and surgeries waiting lists in a hospital located in the north of Portugal, through a pervasive Business Intelligence platform that can be accessed anywhere and anytime by any device connected within the hospital's private network. By representing information that facilitate the analysis of information and knowledge extraction, the Web tool allows the identification in real-time of average waiting times outside the outlined patterns. Thereby, the developed platform permits their identification, enabling their further understanding in order to take the necessary measures. Thus, the main purpose is to enable the reduction of average waiting times through the analysis of information in order to, subsequently, ensure the satisfaction of patients.

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INTRODUCTION

Over the past few years, the Business Intelligence (BI) technology has been increasingly a major interest to health professionals and Information Technology (IT) professionals due to its applicability in the Electronic Health Record (EHR) (Bonney, 2013). In short, BI is a process of extraction, collection, storage, processing, analysis and access to information and data from information systems in order to support and improve the decision-making process (Chaudhuri, Dayal, & Narasayya, 2011; Hočevar & Jaklič, 2010a).

On the other hand, the increase of average waiting times is an issue that has been recently felt in health institutions (Ballini et al., 2015; Barros, 2008; Miyanji et al., 2015; Moscelli, Siciliani, & Tonei, 2016; Odorico, 2014). Thus, the implementation of new administrative measures to improve the management of these organizations may be required. One of the main problems caused by delays lies in the possibility of causing serious adverse consequences to patients' health (Ballini et al., 2015; Barros, 2008; Miyanji et al., 2015; Moscelli et al., 2016; Odorico, 2014).

Thus, due to the current needs of generating clinical and performance indicators of waiting lists (appointments and surgeries) in a hospital located in the north of Portugal, allied to the benefits of using the BI technology, this study was carried out. A clinical decision support system (CDSS) was designed and developed to support the decision-making process regarding waiting lists, namely a pervasive BI platform, for the scheduled appointments and surgeries in the hospital units of the health institution.

The realization of this project included the Extract, Transform and Load (ETL) of the data from information systems, followed by the construction of a data warehouse (DW). It also involved the creation of clinical and performance indicators, and their subsequent integration into the Web application developed.

The next section of this chapter presents the state of the art associated with this study (section "State of the Art"). After that, in section "Research Methodologies", the research methodologies adopted are briefly described. The section "Case Study" explains succinctly the problem and main motivations behind this project, and the key steps followed throughout its realization. Thereafter, the results are presented and discussed in section "Results and Discussion". This section is followed by the "Proof of Concept" section, which consists essentially of a strengths, weaknesses, opportunities and threats (SWOT) analysis. The conclusion and future work conclude this chapter (section "Conclusion and Future Work").

STATE OF THE ART

This section intends to highlight briefly the main theoretical topics addressed throughout this chapter, namely clinical decision support systems (CDSSs) and Business Intelligence (BI) and clinical information, including the Extract, Transform and Load (ETL) process, and data warehousing.

Clinical Decision Support Systems

In recent years, the recognition of the importance of CDSSs as practical tools has increased exponentially (Castaneda et al., 2015; Marins, Cardoso, Esteves, Machado, & Abelha, 2017; Musen, Middleton, & A.Greenes, 2014). This promising trend is largely due to the inexorable growth in the complexity and unnecessary costs associated with the delivery of healthcare services, the rising challenges of offering personalized medical services to each patient (according to his/her needs), the increasingly felt pressure to adopt Electronic Health Record (EHR) processes in health institutions, as well as the increasingly