

## Chapter 9

# Real-Time Healthcare Intelligence in Organ Transplantation:

## Real-Time Intelligence in Organ Transplantation

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### ABSTRACT

*Organ transplantation is the best and often the only treatment for patients with end-stage organ failure. However, the universal shortage of deceased donors results in a worrying situation that must be addressed. Brain dead donors constitute the largest share of organ donors, but identifying a patient that may progress to brain death can be a complex task. Therefore, the urgent need of intelligent solutions to support the decision-making process is crucial in critical areas as the organ transplantation is. This work aims at acquiring knowledge on the potential organ donor criteria for further detection and implementing a platform to assist the process of identification of potential organ donors at Centro Hospitalar do Porto – Hospital de Santo António. The developed system is currently implemented and displays a steady and competent behavior providing consequently a way to have more control of the information needed for the decision-making process*

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## INTRODUCTION

In the field of organ donation, an early detection of potential donors is crucial. There are many factors that influence the number of potential donors but, regardless of that, it is known that the main source of all deceased donations come from Brain Dead (BD) donors, implying that most potential deceased donors must be localized in the Intensive Care Units (ICUs) and Emergency Departments (EDs) in patients who are victims of stroke or other severe brain events (Rudge, Matesanz, Delmonico, & Chapman, 2012; Fernandes, Gomes, Ermida, & Vardasca, 2015).

A comprehensive review of organ donation considers BD patients as the ideal multiorgan donors and, as a result, the major source of solid organs for transplantation are provided by BD patients (Rudge, Matesanz, Delmonico, & Chapman, 2012; Erwin, Kompanje, Jansen, & de Groot, 2013).

Particularly focusing on BD donation, the main objective is to monitor deceased organ donation potential, evaluate performance and identify key areas for improvement (Matesanz, 2001).

In this regard, clinical medical records can be valuable if used to full advantage since they hold a wealth of information about the patient's medical history, prescriptions, physician notes, etc. collected from the various Healthcare Information Systems (HIS) (Gong, et al., 2008; Raja, Mitchell, Day, & Hardin, 2008; Zhou, Han, Chankai, Prestrud, & Brooks, 2006).

To grant accurate and timely information, these HIS that provide access to electronic patient records play an expressive role in optimizing the support of adequate decision-making. Therefore, it is no surprise that in hospitals, the complexity of environments where people and information are distributed expects considerable coordination and communication among the professionals that work in such settings (Machado, Alves, Abelha, & Neves, 2007).

Indeed, the exchange and share of clinical knowledge among medical information systems is an important feature to improve healthcare systems, quality of diagnosis, but mainly, to improve quality in patient treatment (Peixoto, Santos, Abelha, & Machado, 2012).

Another important part of this process is actual people. Individuals who are responsible for making decisions in organizations are aware that timely and precise information is powerful enough to improve business performance (Santos & Ramos, 2006). That's where a Decision Support System (DSS) fits in as a system that intends to support business decision makers in semi-structured or unstructured decision situations working with decision makers as adjuncts, extending their capabilities but not replacing their judgment. As a matter of fact, this type of systems was aimed at decisions that required judgment or could not be completely supported by algorithms (Turban, Sharda, & Delen, 2011).

That said, and knowing that coding, storing and transmitting knowledge in organizations is not new, recently the organizational and managerial practice has become more knowledge-focused, and hospitals are not indifferent to that (Hahn & Subramani, 2000; Alavi & Leidner, 2005).

To best describe the decision support solution's architecture and practice, the concept of Business Intelligence (BI) is gaining ground (Cortes, 2005). BI characterizes a variety of activities to collect all the necessary data to make solid business decisions such as creating a data warehouse and/or data mart to store the data and handling front-end analytical tools. Altogether, this set of tools delivers end-users a high-level solution so they can make better, informed decisions counting on reports, predictions and/or analytical views (Turban, Rainer, & Potter, 2005).

Thus, BI is mainly referred to as a broad category of applications and technologies for gathering, storing, analyzing and providing access to data in order to deliver decision makers all the tools they need

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