Chapter 28

Applied Pervasive Patient Timeline in Intensive Care Units

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ABSTRACT

This study has the objective of introducing an innovative way of presenting and representing information concerning patients in Intensive Care Units. Therefore, the Pervasive Patient Timeline, which has the purpose of offering support to intensivists’ decision-making process, by providing access to a real-time environment, was developed. The solution is patient-centred as it can be accessed from anywhere, at any time and it contains patients’ clinical data since they are admitted to the ICU until their discharge. The environment holds data concerning vital signs, laboratory results, therapeutics, and data mining predictions, which can be analysed to have a better understanding of patients’ present and future condition. Due to the nature of the critical care environment, the pervasive aspect is crucial because it allows intensivists make decisions when they have to be made. The Pervasive Patient Timeline is focused on improving the quality of care by helping the intensivists perform better in their daily activity.

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INTRODUCTION

Medicine is a field of study where many changes have occurred over the course of the years. Research projects allowed for discovering new vaccines, drugs, methods, techniques that resulted in the ability of healing diseases which previously could not be cured. Technological advancement is directly related to, not all, but many medical discoveries since it became possible to test and observe ideas that without the technology would not be possible. Technologies and information systems are not only used in medical discoveries but also support and improve existing methods and techniques involved in the decision process. Therefore, it is possible to infer that the introduction of e-health technologies intended to increase the effectiveness and efficiency of healthcare facilities (Direção Geral de Saúde, 2003; Haux, Ammenwerth, Winter, & Brigl, 2004).

Over the last century, a new approach to medicine emerged as a result of multidisciplinary effort in areas, such as physiopathology, therapeutics, and technology, called Intensive Medicine (IM) (Direção Geral de Saúde, 2003). This subfield of medicine saw many new technological devices being added over time. These devices drastically increased patients’ chance of survival since they provide even more data and a constant feedback about the patients’ condition (Silva, 2007). The growth of devices resulted in an increase of available data (Morris & Gardner, 1992). Even though this is a good thing, it can also represent a problem because the number of variables to consider in the decision process is bigger, and therefore it is harder to combine and analyse (Silva, 2007). The use of various and different technologies in Intensive Medicine (IM) represents another major problem. Each device or system presents data in its way, being it tables, text, graphs or any other. As a consequence of this fact, the intensivists have to make additional efforts to understand how each device works to interpret its content and retrieve information.

That is where Decision Support Systems (DSS) come to play. In the field of information systems, DSS are characterized as computer based interactive systems that help, those who need to make decisions, using data and models to solve non-structured problems (Sprague & Ralph, 1980). In medicine, they are called as Clinical DSS.

Therefore, exploiting computers high processing capacity, they seek to alleviate intensivists’ difficulty in interpreting data and help them in making decisions. This study has the objective of filling this existent gap with the development of an interactive platform (pervasive timeline) that collects data from various devices and presents them into a single location with access in real-time and from anywhere. This platform standardizes the representation of data and sorts it chronologically, easing the interpretation of data and the observation of cause-effect relations.

The research project took place in the Intensive Care Unit (ICU) of the Hospital de Santo António, Centro Hospitalar do Porto, and ended with the development of the Pervasive Patient Timeline. The Pervasive Patient Timeline is an interactive web platform which seeks to address the difficulty felt by intensivists in having to deal with high amounts of data and the different ways the data is presented by each device or system. The platform developed solves this problem by collecting data from various devices/ data sources and presents the information sorted chronologically in the interface. At the same time, the data representation is homogenized, as all the data collected follow the same pattern. The timeline possesses characteristics, such as adaptability, interactivity, flexibility, scalability, real-time access and pervasiveness. These aspects provide a faster, more intuitive, easier and efficient access to data so that intensivists can perform better when making decisions.

Concerning the structure of the article, it is composed of five sections. The first section is the Introduction; in the second section comes the Background which provides a problem context and it is divided into
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