

Chapter 5

Categorize Readmitted Patients in Intensive Medicine by Means of Clustering Data Mining

Rui Veloso

University of Minho, Portugal

Filipe Portela

University of Minho, Portugal

Manuel Filipe Santos

University of Minho, Portugal

José Machado

University of Minho, Portugal

António da Silva Abelha

University of Minho, Portugal

Fernando Rua

Centro Hospitalar do Porto, Portugal

Álvaro Silva

Centro Hospitalar do Porto, Portugal

ABSTRACT

With a constant increasing in the health expenses and the aggravation of the global economic situation, managing costs and resources in healthcare is nowadays an essential point in the management of hospitals. The goal of this work is to apply clustering techniques to data collected in real-time about readmitted patients in Intensive Care Units in order to know some possible features that affect readmissions in this area. By knowing the common characteristics of readmitted patients it will be possible helping to improve patient outcome, reduce costs and prevent future readmissions. In this study, it was followed the Stability and Workload Index for Transfer (SWIFT) combined with the results of clinical tests for substances like lactic acid, leucocytes, bilirubin, platelets and creatinine. Attributes like sex, age and identification if the patient came from the surgical block were also considered in the characterization of potential readmissions. In general, all the models presented very good results being the Davies-Bouldin index lower than 0.82, where the best index was 0.425.

DOI: 10.4018/978-1-7998-2451-0.ch005

INTRODUCTION

This study was based on two previous studies in this thematic. One for predicting readmissions in Intensive Care Units (ICU) (Braga et al., 2014) and another about the use of clustering to understand the variables that can influence readmissions and non-readmission in ICU (Veloso et al., 2014). The attained results with the first study did not allow for an efficient patient's characterization. The second one using clustering proved that it was possible to characterize patients that are likely to be readmitted or non-readmitted. This third study arises as an improvement of the earlier studies, adopting new data and adding other variables that may contribute to the characterization of readmitted patients. The objective was to identify and declare features that influence and they are important to analyze at the moment of discharge in order to reduce the readmissions rate. In this study, it is used only readmitted patient data, being the main goal to classify readmitted patients and understand which group of variables / values can help to predict a further readmission. This study presented very interesting results being the best Davies-Bouldin index equal to 0.425, which means that it was possible to create a group of variables very well separated in the space. At the same time, it was possible to identify the variables platelets count, bilirubin and PaO₂/FIO₂ as the ones that mostly contribute to predict future readmissions.

This article is divided in five sections. The first one, Introduction, presents the basis for this work. The second one will define the problem and present the theory behind the work and his concepts. The third section describes the methods and tools used, business and data understanding, data preparation and evaluation. On the fourth section, Discussion, are presented some points of view on the results obtained with this study. In the last section are presented the achieved conclusions and launched the basis for further work.

BACKGROUND

Intensive Medicine

In the field of Medicine there is a particular area having as main goal to diagnose and treat patients with serious illnesses and restore them to their previous health condition (Silva et al., 2008), namely Intensive Medicine (IM). This type of patients is usually admitted to intensive care units (ICU). In ICU, the patients can maintain their physiological functions through various life-support devices. In these units, the patients are normally mechanical ventilated and the vital functions are continuously monitored as well as the status of each of the organic systems: neurological, respiratory, hepatic, hematological, cardiovascular and renal. In order to ensure the life and patient condition these functions can be supported through therapeutic plans, clinical procedures or by mechanical means until the patient has again its functions independently (Ramon et al., 2007). An interesting definition of intensive medicine can be: a multidisciplinary area that addresses specifically three moments, the prevention, diagnose and therapy of patients and physiopathology conditions potentially reversible that threaten or present the failure of one or more vital functions (Silva, 2007).

Clinical Analysis

Clinical Analysis consists in the use of data from laboratories. These data include results from blood and urine test analysis and microscopic studies like the analysis of tissues.

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