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## "Predicting Resurgery in Intensive Care - A data Mining Approach"

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### Abstract

Every day the surgical interventions are associated with medicine, and the area of critical care medicine is no exception. The goal of this work is to assist health professionals in predicting these interventions. Thus, when the Data Mining techniques are well applied it is possible, with the help of medical knowledge, to predict whether a particular patient should or not should be re-operated upon the same problem. In this study, some aspects, such as heart disease and age, and some data classes were built to improve the models created. In addition, several scenarios were created, with the objective can predict the resurgery patients. According the primary objective, the resurgery patients' prediction, the metric used was the sensitivity, obtaining an approximate result of 90%.

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### 1. Introduction

This study aims to use classification approaches in order to predict the patients who are resurgeried together with the medical knowledge in a view to helping the health professionals. It is expected that with the development of this study, it is possible to improve the performance of Intensive Care Units (ICUs) and assist their healthcare professionals in making decisions about their patients. The dataset used in this project was provided by Hospital Santo António in Porto, however, to improve the quality of the results, these have been modified. The strategies used was standardization of data to create the models, but without changing the accuracy of the results. The standardization of data is a set of

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rules that aims to reduce data redundancy and increase data integrity. Reinterventions have only recently been identified as a problem, which means that there is not a very extensive work in this area. Sometimes, health professionals have not a standard to understand if a particular patient should or should not be resurgery, so this project aims to help the reader understand that situation.

The objective of this study is to identify the health problems and the characteristics of resurgery patients in order to prevent them from being again intervened. This work was conducted by following the CRISP-DM methodology.

This work is divided into five sections. The first section is the introduction where the main ideas of this work are presented, the second is the background where the problem is defined as well as the theory behind the work, the third section is the description of the study methods, where the tools used are described. In the fourth chapter of this paper is the discussion where some views on the results are presented. Finally, the last section presents some conclusions and basic ideas about the work to be done in the future.

## 2. Background

This section aims allow collecting information about the work that has already been developed in practical and research terms. In practical terms, the works presented are similar to the one developed in this project. In terms of research, the concepts that are linked to this project were presented. First, important concepts for this work are presented, such as intensive care, INTCare, and Surgery and resurgery. After this, the data mining technique used are explained. Finally, the works that exist related to this project are presented.

### 2.1. Intensive Care and INTCare

In 90's experts realized that the knowledge gained so far was not enough to solve the complex problems that appeared in real life <sup>1</sup>. After the 90's, a change was made, having gained more interest because of the vast complexity of the data collected <sup>2</sup>. Intensive care is defined as a multidisciplinary field of medical science that deals with the diagnosis, prevention, and treatment of potentially reversible disease conditions in patients with imminent failure of vital functions <sup>3</sup>. In intensive care, risk forecast has always had an important role, being one of the areas of medicine with greater severity and which deserve more attention and research <sup>3</sup>. According to Silva <sup>3</sup>, intensive medicine increased the ability to save lives at risk. For this, it is necessary to make a correct diagnosis and develop treatment plans to improve the conditions of patients and save their lives <sup>4</sup>. Information Systems recently provided a lot of information for intensive care units that are well crafted, allowing health professionals in this area to make the best decisions for their patients. These information systems allow clinicians perceived the complexity of disease, improve monitoring of patients and increase the size of the resource. New technologies and progressive computerization units of intensive care have played a significant role AT this point <sup>3</sup>

The INTCare aims to develop an intelligent system with the ability to develop clinical events <sup>2</sup>. The INTCare is a system that was designed for use in ICUs, supporting the decisions of doctors, using Data Mining <sup>1</sup>.

The system can be accessed anywhere and anytime to obtain information such as the patient data, monitoring of clinical events, doctors scores and the organ failure probability. This system was developed based on an automated process paradigm and knowledge discovery and agents. The agents are social computing entities that are predefined by system creators whose activity contributes to the goal of the global system <sup>1</sup>. The main characteristics of these agents are that they have intelligent behavior, accuracy, robustness, flexibility, and efficiency <sup>1</sup>. These agents have important roles as the input of clinical data, pre-processing, data mining, performance, model initialization, data recovery, forecasting, assessing the scene and interface <sup>1</sup>. An essential requirement in achieving good results in knowledge discovery is the quality of data <sup>5</sup>.

### 2.2. Surgery and resurgery

Due to the evolution of science, surgical interventions came to be seen as a treatment. With the development of new techniques and the growth of knowledge, surgery methods have become crucial driven through the advances in anesthesia, antisepsis, radiology, blood transfusion as well as the use of the bone or the prosthesis <sup>6</sup>. However, in the

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