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Managing Voluntary Interruption of Pregnancy using Data Mining

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Abstract

When a woman aims to terminate an unplanned pregnancy, she must go to a specialized healthcare unit, such as Júlio Dinis Maternity Hospital. In this unit, the procedures of voluntary interruption of pregnancy are done by two kinds of drug administration: the first one is always done by a nursing team, the second one can be performed at home or by a nursing team, depending on patient features. It is important to give the best option to the pregnant. In this paper, it is proposed to predict whether the second drug phase is done at home or at the hospital. The use of Data Mining (DM) helps in performing this step. Throughout this study, DM models capable to make predictions in a real environment using real data were induced. It was adopted the Cross-Industry Standard Process for Data Mining (CRISP-DM) methodology. Four distinct techniques were considered: Decision Tree (DT), Naïve Bayes (NB), Support Vector Machine (SVM) and Generalized Linear Models (GLM) to perform classification tasks. Using these techniques it was possible to obtain acceptable results for each model. A value greater than 89% of accuracy and 91% in sensibility was achieved in some models.

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1. Introduction

Currently, in the information age, organizations are able to respond to new challenges and new requirements as well as constant changes. It is needed to adjust to these new realities, in order to maintain competitiveness in the market and provide quality services. Information and communication technology support information systems, which are a set of procedures that when executed, produce useful information for decision-making process (DMP)

and organization management [1]. In health sector, the technologies change processes by providing full and reliable information for health professionals and to support the decisions of managers and regulators [1].

The implementation of information systems focused on helping nurses, like the Support Nursing Practice System – SNPNS a.k.a. SAPE, gave the redefinition of activities for the delivery of nursing care to the patient. The SAPE was created with the aim to give visibility to the work performed by nursing professionals, since these are users who more produce, process and provide clinical information [1].

With the storage of all data relating to the processes of patients in the SAPE, it becomes possible to use this information to obtain useful knowledge in practical nursing.

In this case, it is possible the application of Data Mining (DM) on the same data, which allow to obtain predictive models for certain interventions. This works intended, through the techniques of DM, to provide situations for the Voluntary Interruption of Pregnancy (VIP) module, at Júlio Dinis Maternity hospital (MJD) in Oporto.

MJD is one of the four constituent hospitals of Centro Hospitalar of Oporto. The remaining three are the Hospital de Santo António, Hospital Maria Pia and Hospital Joaquim Urbano. This merge of hospitals started in 2007.

In MJD, there is a Voluntary Interruption of Pregnancy module, where pregnant women who wish to abort are addressed. The termination of pregnancy can be medicinal or surgical. The use of medicines to end the pregnancy provides the removal of the fetus and placenta from the uterus of the woman. In the surgical event, it is necessary to perform an operation to terminate the pregnancy. The termination of pregnancy can be accomplished when the developing baby has a birth defect or genetic problem, the pregnancy is harmful to the woman's health (therapeutic abortion), the pregnancy resulted after a traumatic event such as rape or incest, or the woman may not wish to be pregnant (elective abortion)[2]. Portuguese legislation (Law no. ° 16/2007 of 17 April) allows the termination of pregnancy for the woman's choice, up to 10 weeks of gestation, and the consequent creation of health services for the care of women who choose this practice[3].

The main goal of this work was achieved using DM techniques to induce classification models in order to predict if a woman in VIP will interrupt pregnancy in the maternity hospital or at home, based on some influential factors. The achieved results were very interesting to the clinical context (sensitivity 91% and accuracy 89%).

Besides the introduction, this article includes six sections. The second is related to the background knowledge, which describes the process of VIP and a brief look is taken about Interoperability and SAPE. Subsequently, section three describes the process of Knowledge Discovery in Databases and the method of Crisp-DM, based on DM techniques and some of the statistical metrics applied. In the fourth section, it is described each stage of Crisp-DM method and the remaining two sections are for discussion and conclusion.

2. Background and Related Work

2.1. Voluntary Interruption of Pregnancy

In the VIP module of MJD is used non-surgical methods to perform the process of termination of pregnancy. More specifically, it was adapted the method recommended by WHO (World Health Organization) that consists in administering specific drugs, because it's a safe and efficient methodology. The medication administered is the combination of *mifepristone* and *misoprostol*.

The VIP process consists of several steps, being the first conducted before the implementation of abortion. It includes a mandatory appointment with a physician, a reflection period of three days and still optional consultations with a psychologist or social worker.

Later, when the patient did not have doubts of its decision, the following three procedures are accompanied by a monitoring of the nursing team. The first is a consultation with a nurse, where it is given the first dose of medication and triage is performed to verify if the patient is able to make the administration of the second dose of medication at home or whether she needs monitoring. If she requires monitoring, the second dose of medication will be applied with the monitoring of a nurse in ambulatory, as set in the protocol.

Finally, after performing the abortion, it's necessary to go to a doctor's appointment to control and there is a collaboration of the nursing team in a family planning consultation [4].

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