

## Chapter 9

# Pre-Triage Decision Support Improvement in Maternity Care by Means of Data Mining

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### ABSTRACT

*A triage system aims to make a correct characterization of the condition of patients. Because conventional triage systems like Manchester Triage System (MTS) are not suitable for maternity care, a decision model for pre-triaging patients in emergency (URG) and consultation (ARGO) classes was built and incorporated into a Decision Support System (DSS) implemented in Centro Materno Infantil do Norte (CMIN). Complementarily, DSS produces several indicators to support clinical and management decisions. A recent data analysis revealed a bias in the classification of URG cases. Frequently, cases classified as URG correspond to ARGO. This misclassification has been studied by means of Data Mining (DM) techniques in order to improve the pre-triage model and to discover knowledge for developing a new triage system based on waiting times and on a 5-scale of classes. This chapter presents a kind of sensitivity analysis combining input variables in six scenarios and considering four different DM techniques. CRISP-DM methodology was used to conduct the project.*

## INTRODUCTION

Nowadays, we live in an age where information, knowledge and globalization are important issues. Organizations should be able to respond to new challenges and new demands in an environment of constant change. In the healthcare sector, information technologies, providing complete and reliable information for healthcare professionals support their clinical and administrative decisions (Khodambashi, 2013). One example is the system of triage in the hospital emergency unit.

In a hospital setting, various types of triage systems are used. The most commonly used consider five levels of severity, the Emergency Severity Index (ESI), the Manchester Triage System (MTS) and the Canadian Triage and Acuity Scale (CTAS). The main limitation of this type of scales is the lack of flexibility, since they usually are used only in emergency units in general and not specific for emergency units (Portela et al., 2013).

In Centro Hospitalar do Porto (CHP), in particular the women emergency care of Gynecology and/or Obstetrics (GO), it was found that the MTS system, implemented in the urgency service is not the most accurate for specific cases of triage such as obstetrics and gynecology. This happens due to most of the questions used for triage determined that urgent cases were identified when in fact they were not (false positives). Such approach increases the number of patients in emergency and, consequently increasing waiting times of patients who actually need priority attention.

Due to the limitations identified, a new system has been developed in order to reduce the false positive rate. An Intelligent Decision Support System (IDSS) has been implemented for pre-triaging patients into two different classes: Urgent (URG) when the patient should be treated at the emergency service in CMIN; and Less Urgent (ARGO), when patient is oriented for a consultation in CMIN. The IDSS will be able to be executed in real time and

will include business intelligence components (e.g. indicators of Voluntary interruption of pregnancy, triage indicators) and Data Mining.

This system is implemented since 2010 (Cabral, A., Pina, C., Machado, H., Abelha, A., Salazar, M., Quintas, C., Portela F., Machado, J., Neves, J. & Santos, M., 2011) and along four years of existence, the number of GO patients in the urgency of the CHP decreased significantly. However, this only solves part of the problems inherent to an emergency department because it only makes an efficient analysis of the patient and it is not performing a priority triage according to patient symptoms. Further work is needed in order to understand and improve pre-triage rules.

Data Mining (DM) techniques have been used to determine the level of accuracy of the implemented pre-triage system, identifying opportunities to improve the quality of patient care. To this end classification models were induced to predict whether the assignment of URG and ARGO occur according to the questionnaire for evaluating clinical characteristics of the patient.

The best result obtained was in the study without ARGO and without URG (accuracy close to 100%). Results demonstrate the reliability of the system for pre-triage. However, other scenarios (accuracy of around 80% in the worst case) demonstrate the need for transformation of the pre-triage system on 5-level priority system to allow better categorization of patients.

Beyond this introductory chapter, the document includes more five sections. The first is related to the background and related work which describes the context in which the problem occurs and describes the process of Knowledge Discovery from Databases and the method CRISP-DM. The second section presents a DM case study following the CRISP-DM methodology. The results are discussed in the third section. In the fourth section are presented some conclusions and, finally, in section five some future directions are pointed.

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