Chapter 10
Nosocomial Infection Prediction Using Data Mining Technologies

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ABSTRACT

The existence of nosocomial infection prediction systems in healthcare environments can contribute to improve the quality of the healthcare institution. Also, can reduce the costs with the treatment of those patients. The analysis of the information available allows to efficiently prevent these infections and to build knowledge that can help to identify the eventual occurrence of nosocomial infections. Good models induced by the DM classification techniques SVM, DT and NB, were achieved (sensitivities higher than 91.90%). Therefore, this system is able to predict these infections consequently, reduce the nosocomial infection incidence. The platform developed presents important information, as well as supports healthcare professionals in their decisions, namely in planning infection prevention measures. So, the system acts as a CDSS capable of reducing nosocomial infections and the associated costs, improving the healthcare and, increasing patient's safety and well-being.

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INTRODUCTION

A nosocomial infection is one that occurs during the first 48 hours after the patient's hospitalization, during three days after his/her discharge or during the 30 days that follow a surgery. Also, this infection must not have been present or in incubation at the moment of the patient's admission (Clean Care is Safer Care Team, 2011; Inweregbu, Dave & Pittard, 2005; Rigor, Machado, Abelha, Neves & Alberto, 2008). These infections also include healthcare institution's occupational infections (Clean Care is Safer Care Team, 2011).

A patient with a nosocomial infection stays more time hospitalized resulting in an additional financial burden for the healthcare institution (Inweregbu et al., 2005; Rigor et al., 2008). Moreover, nosocomial infections have a great impact on patient's morbidity and mortality. Especially in intensive care units where the occurrence of nosocomial infections is significantly higher. This happens because of the compromised immune systems of the patients in these units, as well as the invasive procedures and treatments performed there (Inweregbu et al., 2005; Rigor et al., 2008). These reasons make the control and prevention of nosocomial infections crucial for healthcare institutions.

So, the occurrence of these infections can be used to evaluate the quality of the care delivered in the healthcare units and the effectiveness of the infection control and/or prevention plans implemented.

Besides that, according to Inweregbu et al. (2005), it is proved that about one third of nosocomial infections can be prevented by implementing appropriate infection control measures.

There are several factors that contribute to the occurrence of a nosocomial infection, for instance the patient's immune status, his/her age, the hospitalization duration, the use of antibiotics, the diagnostic and treatment methods used, etc. (Rigor et al., 2008). Besides that, great amounts of microorganisms exist in healthcare units, therefore, even a small flaw in the infection prevention programs can easily contribute to the occurrence of an infection.

Thus, it is very important to prevent nosocomial infections. This prevention can be accomplished by performing predictions using data that is capable to characterize the patient health status, as well as his/her hospitalization period and the procedures performed during that period. Data mining (DM) technologies can be used to create predictive models about data. Said that, it is possible to make predictions by applying these models to the new data.

The present work arises from the need to prevent the occurrence of nosocomial infections. It is also related to the healthcare professional's need to take fast, reasoned and accurate decisions to improve the efficiency as well as the productivity of the healthcare organization and the quality of the delivered care.