Chapter 2
Evaluation of Nosocomial Infection Risk Using a Hybrid Approach

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ABSTRACT

Nosocomial infections have severe consequences for the patients and the society in general, being one of the causes that increase the length of stay in healthcare facilities. Therefore, it is of utmost importance to be preventive, being aware of how probable is to have that kind of infection, although it is hard to do with traditional methodologies and tools for problem solving. Therefore, this work will focus on the development of a decision support system that will cater for an individual risk evaluation tool with respect to catch nosocomial infections. The Knowledge Representation and Reasoning procedures used will be based on an extension to the Logic Programming language, allowing the handling of incomplete and/or default data. The computational framework in place will be centered on Artificial Neural Networks. It may be emphasized that in addition to the nosocomial infections risk evaluation, it is provided the Degree-of-Confidence that one has on such a happening.

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INTRODUCTION

Nosocomial infections are contagions that have been caught in a hospital and are hypothetically caused by organisms that may be resilient to antibiotics. A nosocomial infection is specifically one that was not present or incubating prior to the patient's being declared to the hospital, but occurring within 72 hours after admittance, 30 days after surgery or for 3 days after discharge (Inweregbu, Dave, & Pittard, 2005; Rigor, Machado, Abelha, Neves, & Alberto, 2008; World Health Organization [WHO], 2011). According to the World Health Organization (2011), in developing countries, 10% of the hospitalized patients contract a nosocomial infection, while for developed countries this rate is about 7%. Moreover, each year more than 4 million patients are affected by nosocomial taints in Europe and 1.7 million in the USA. It must be also stated that inside Intensive Care Units there is a higher probability of occurrence of nosocomial infections, not only owing to the immune status of patients admitted but also due to the invasive procedures in place.

From an economic point of view, a patient with an infection acquired in the hospital stays longer in the healthcare facility, and may need to be readmitted, resulting in additional costs to the organization (Damani, 2003; Inweregbu et al., 2005; Rigor et al., 2008), i.e., on the one hand, nosocomial infections has much impact on mortality and morbidity of patients in a healthcare facility, on the other hand, these infections are a very important indicator to evaluate the quality of care. Consequently, its control and prevention are essential, allowing for cost savings, reducing the risk of infection as well as cutting the discomfort and suffering of patients.

According to Inweregbu et al. (2005), about one third of nosocomial infections can be prevented and controlled through the implementation of appropriate control and prevention procedures. In addition, the healthcare organizations must monitor the results of such programs through the periodic data collection and by the analysis of specific indicators. These indicators are parameters that make possible the characterization of the problem like the rate of nosocomial infection. The analysis of these factors allow the identification of critical activities and/or processes within of the hospital environment, clinical specialties where the implementation of measures is essential to ensure the safety and welfare of patients, priority areas where measures should be implemented urgently. Thus, it is possible to plan and implement targeted and efficient programs to reduce the incidence rate of nosocomial infection and increase the quality of care.

There are several factors that contribute to Nosocomial Infection Predisposing (NIP), namely the age and the immune status of the patient, the length of stay in the healthcare facility, the undergone medical procedures, the use of antibiotics, the diagnostics used, i.e., the hospital also has many infection foci, objects and/or