Abstract

Nosocomial infection is one of the most important issues in the intensive care units and it's also the most common cause of mortality and morbidity. The three major factors contributing into nosocomical infection are sources of infection, route of transmission, and susceptible host. The aim of this study was to develop a scientific scoring system by using artificial neural network simulation to analyze data collected from patient's clinical characteristics, environmental sampling, and infection control of the route of transmission in the hospital and to give an index factor to predict the probability of nosocomial infection or outbreak in the hospital. Finally, by simulation of artificial neural network to make recommendations on cost-benefit profit, to reduce the rate of nosocomial infection by active improvement of procedures of infection control, and to reduce the use of antibiotics and to curb the emergence of antimicrobial resistance. The study was focused on the four water-borne pathogens in the hospital, which including Pseudomonas aeruginosa, Acinetobacter baumannii, Stenotrophomonas maltophila, and Seratia marcescens. The patients included in the study were those hospitalized in the ICUs. We prospectively collected the clinical characteristics of these susceptible patients in the ICUs. , risk factors made by invasive procedures, and screening the distribution of environmental water-borne pathogens in the water distribution system in the ICUs and comparing the antibiograms and genotypes by pulsed-field gel electrophoresis between environmental and clinical isolates. The data was keyed into database in the computor for comparing and analyzing. The results of this study found that P. aeruginosa and A. baumannii were the most prevailing water-borne pathogens in the ICUs. The frequency of occurrences and distribution of P. aeruginosa in the ICUs were correlated to the frequency of related nosocomial respiratory tract infection. In addition, the antibiogram was identical or similar in 40% of clinical and environmental isolates. However, for the other three water-borne pathogens, there was no relationship between the distribution of the bacteria in the water and the occurrence in nosocomial infection. In the training course of neural network model, we found that an impractical prediction existed because that the low infection rate (4.65%) caused by the water-borne pathogens resulted into that the accuracy of prediction of no infection would be as high as greater than 95% when the neural network models were all set as no infection "0".

In conclusion, the preliminary data obtained supports that the nosocomial respiratory tract infection caused by P. aeruginosa in the ICUs are related to its distribution in the water distribution system. Therefore, periodically surveillance of the distribution of P. aeruginosa in the water in ICUs and finding the efficient methods for disinfection of water colonized with P. aeruginosa will be the target in future study. In addition, the artificial neural network in the development of scoring system in prediction of nosocomial infection in the ICUs was not practical in this study; however, the data collected in this study can be used to evaluate the efficiency of infection control procedures in the hospitals.

Keywords：intensive care unit；nosocomial infection；water-borne pathogen；artificial neural network