

Predicting hypotensive episodes during spinal anesthesia with the application of artificial neural networks

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摘要

Abstract

Hypotension is one of the most frequent adverse effects of spinal anesthesia. Several factors might be related to the occurrence of hypotension. Predictions of the hypotensive event, however, had been addressed by only a few authors using logistic regression (LR) models. Artificial neural networks (ANN) are pattern-recognition tools that can be used to detect complex patterns within data sets. The purpose of this study was to develop the ANN-based predictive model to identify patients with high risk of hypotension during spinal anesthesia. From September 2004 to December 2006, the anesthesia records of 1501 patients receiving surgery under spinal anesthesia were used to develop the ANN and LR models. By random selection 75% of data were used for training and the remaining 25% of data were used as test set for validating the predictive performance. Five senior anesthesiologists were asked to review the data of test set and to make predictions of hypotensive event during spinal anesthesia by clinical experience. The ANN model had a sensitivity of 75.9% and specificity of 76.0%. The LR model had a sensitivity of 68.1% and specificity of 73.5%. The area under receiver operating characteristic curves were 0.796 and 0.748. The ANN model performed significantly better than the LR model. The prediction of clinicians had the lowest sensitivity of 28.7%, 22.2%, 21.3%, 16.1%, and 36.1%, and specificity of 76.8%, 84.3%, 83.1%, 87.0%, and 64.0%. The computer-based predictive model should be useful in increasing vigilance in those patients most at risk for hypotension during spinal anesthesia, in allowing for patient-specific therapeutic intervention, or even in suggesting the use of alternative methods of anesthesia.