Artificial Neural Networks: a Supporting Role in Improving Prediction of Benign Prostatic Obstruction Evaluated by the International Prostate Symptom Score

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Introduction and Objective: The International Prostate Symptom Score (IPSS) is used exclusively for evaluating patients with a prostatic condition and for following various treatment modalities. This non-invasive tool is insufficient for final clinical diagnosis. To evaluate the performance of an artificial neural network(NN) in the diagnosis of men with lower urinary tract symptoms and to compare its performance to that of a traditional linear regression(LR) model for evaluating prostatic obstruction.
Methods: 331 qualified patients visiting outpatient clinic at the hospital between 2001 and 2003 received routine investigation, consisting of transabdominal sonography of the kidney, urinary bladder, and prostate, serum prostate specific antigen measurement, assessment of urinary symptoms and quality of life by the IPSS, urinary flowmetry with determination of maximum flow rate, and voided volume estimated based on all available non-invasive diagnostic test results plus patient age. Total patients were randomly assigned 50 times into 2 groups, training and test groups. The performance of the NN was quantified by using hit ratios. The 50 results of the NN approach were compared wtih those of LR analyses by independent t-tests. Results: There were five different sets of results for test groups:IPSS-7(urinary symptoms in IPSS), Logi-7(urinary symptoms in IPSS by LR), Logi-8(IPSS by LR), NN-7(urinary symptoms in IPSS by NN),and NN-8(IPSS by NN).
Results: The results of theNNs showed better predictive values concerning the outcome of final diagnosis. Use the same seven urinary symptom questions, the mean estimated hit ratio was 69.9% by NN(NN-7) and that by IPSS(IPSS-7) was 65.9%($p<0.01$). The eighth question in the IPSS, which is assessment of quality of life, showed its critical role as an important factor in the NNs(hit ratio 74.1% in NN-8 and 69.9% in NN-7, $p<0.01$).
Conclusions: In the computerized medical environemnt, this study shows that the neural network could be an acceptable and useful tool for the clinical help in the prediction of prostatic obstruction.