Abstract

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Bayesian neural network approach for determining the risk of re-intervention after endovascular aortic aneurysm repair

This article proposes a Bayesian neural network approach to determine the risk of re-intervention after endovascular aortic aneurysm repair surgery. The target of proposed technique is to determine which patients have high chance to re-intervention (high-risk patients) and which are not (low-risk patients) after 5 years of the surgery. Two censored datasets relating to the clinical conditions of aortic aneurysms have been collected from two different vascular centers in the United Kingdom. A Bayesian network was first employed to solve the censoring issue in the datasets. Then, a back propagation neural network model was built using the uncensored data of the first center to predict re-intervention on the second center and classify the patients into high-risk and low-risk groups. Kaplan–Meier curves were plotted for each group of patients separately to show whether there is a significant difference between the two risk groups. Finally, the logrank test was applied to determine whether the neural network model was capable of predicting and distinguishing between the two risk groups. The results show that the Bayesian network used for uncensoring the data has improved the performance of the neural networks that were built for the two centers separately. More importantly, the neural network that was trained with uncensored data of the first center was able to predict and discriminate between groups of low risk and high risk of re-intervention after 5 years of endovascular aortic aneurysm surgery at center 2 (p?=?0.0037 in the logrank test).