



Predicting Declined Quality of Life in Cancer Survivor Treated with Radiation: Exploring Key Impact Factors using Machine Learning-based Random Forest

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Introduction

The objectives of radiotherapy include prolonging survival and alleviating symptoms, focusing on improving patients' quality of life (QoL). However, it is common for QoL to decline during and after radiotherapy, and there is a lack of predictive methods for identifying decreased QoL. This study aimed to develop a machine learning-based random forest model for predicting decreased QoL in cancer survivors undergoing radiation treatment.

Methods

A total of 1,436 participants were prospectively enrolled in this cross-sectional study conducted in a cancer center in mainland China from May 2023 to October 2023. Participants were randomly assigned to training and validation cohorts at a 7:3 ratio. The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) was utilized to assess the QoL, with decreased QoL defined as an EORTC QLQ-C30 score below 60 points. The M.D. Anderson Symptom Inventory was employed to evaluate symptoms experienced by the participants. A random forest model was developed to predict the occurrence of decreased QoL in cancer survivors who received radiation treatment.

Results

Among cancer survivors who underwent radiotherapy, the average QoL score was 79.82 ± 0.511 . Approximately 19.37% (233 out of 1,203) of participants experienced decreased QoL. The primary symptom reported was pain and fatigue, as observed in the symptom scale, while functional scales indicated social functioning dysfunction. The top ten most important indices affecting QoL were pain, fatigue, nausea, distress, depression, working affected, shortness of breath, type of cancer, insomnia, and numbness. For the random forest prediction model, the areas under the curve in the training and validation cohorts were 0.811 and 0.832, respectively.

Conclusions

The current study suggested that the random forest model employed for predicting decreased QoL in cancer survivors treated with radiation exhibited a notably high level of accuracy.