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NORTH CAROLINA OFFICIAL ABSTRACT and CERTIFICATION

Title: MACHINE LEARNING-BASED PREDICTION OF ICU ADMISSION IN FEBRILE ONCOLOGY PATIENTS

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Abstract (start typing below at the left margin, 250 word maximum length):

Background: Febrile illness in cancer patients can range from self-limiting infections to life-threatening sepsis. Early identification of patients requiring ICU admission is crucial for appropriate triage and resource allocation.

Objective: To develop and validate a machine learning model for predicting ICU admission in oncology patients presenting with febrile illness.

Methods: We conducted a retrospective cohort study of 149 oncology patients. Clinical features including MASCC score, qSOFA, hypotension status, tumor type, neutropenia, metastatic status, infection focus, line of therapy, comorbidities, age, and gender were extracted. We developed an XGBoost classifier and compared it to logistic regression and clinical scores (MASCC, qSOFA). Performance was evaluated using 10×5-fold cross-validation with bootstrap confidence intervals.

Results: Among 149 patients, 81 (54.4%) required ICU admission. The XGBoost model achieved an AUROC of 0.934 (95% CI: 0.863-1.000), outperforming logistic regression (0.917), MASCC alone (0.656), qSOFA alone (0.838), and combined MASCC+qSOFA (0.864). The model demonstrated good calibration (Brier score: 0.092) and clinical utility across decision thresholds. Importantly, sensitivity analysis excluding hypotension (a near-deterministic ICU trigger) still achieved AUROC of 0.887, demonstrating the model's value beyond obvious clinical protocols.

Conclusions: A machine learning model incorporating routinely available clinical features can accurately predict ICU admission in febrile oncology patients, significantly outperforming already established clinical scores. Even without hypotension status, the model retains clinically useful discrimination. Prospective validation is required before clinical implementation.

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