

Category : **Outcome scores/prognostication**

A296 - Data-driven clinical decision support system applied to intensive care medicine: study in patients with sars-cov-2 pneumonia treated with ecmo

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Introduction:

The integration of Machine Learning (ML) into healthcare, particularly in intensive care, holds promise for enhancing quality and safety. This study aims to develop and validate an interpretable ML-based support system for managing patients with SARS-CoV-2 pneumonia treated with ECMO.

Methods:

In an ECMO referral center, following approval from the ethical committee, protocol-driven, prospective collected data was represented as multivariate time series (MTSs). Each time instant of the patient-specific MTSs was labeled by a blinded ECMO expert intensivist with a ternary value: -1, 0 or +1, representing, respectively, clinical deterioration, stabilization or improvement. The resulting datasets subsequently underwent additional processing and transformations for modeling. Different ML models were employed, including Support Vector Machine (SVM) with varying kernels, and Random Forest (RF). Training and validation feature sets were generated through random assignment of patient-specific sequences, each one comprised of 3 consecutive samples, using a split ratio of 4:1. Each sequence was assigned the label corresponding to the third sample, having been exclusively considered, during training, sequences with a label of -1 and +1.

Results:

82 patients with SARS-CoV-2 pneumonia treated with ECMO generated thousands of labeled sequences. After model training and validation, performance was rigorously assessed (Table 1), resulting in the selection of a high-performing, well-calibrated and interpretable RF model. A clinical prediction score based on the RF model demonstrated a high ability to anticipate major clinical inflections, suggesting potential for clinical use (AUROC: 0.9226 for 4h; 0.8940 for 8h; 0.8535 for 12h anticipation).

Conclusion:

Our study illustrates the potential impact of ML systems when applied to complex and sensitive medical contexts, such as intensive care medicine, promising transformative advancements in intensive care practices.

Table:

Metrics\Model	SVM (Linear)	SVM (Polynomial)	SVM (Radial Basis Function)	RF
Precision	0.9567	0.9918	0.9767	0.9959
Recall	0.9644	0.9526	0.9526	0.9565
F1-score	0.9606	0.9718	0.9659	0.9758
AUROC	0.9807	0.9906	0.9903	0.9938
AUPRC	0.9922	0.9962	0.9961	0.9973

ML Models