Category :**Outcome scores/prognostication**

A286 - ***Machine learning improves icu admission based on lung ultrasound score***

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Introduction:

Can we improve how we look at lung ultrasound score (LUS)? LUS has been considered an effective metric for identifying COVID-19 patients who are likely to require ICU admission. However, different methods are proposed to compute LUS, and no standard currently exists. Therefore, in this study, machine learning (ML) models based on lung ultrasound (LU) were explored to improve decision on ICU admission.

Methods:

LU data from fifty-one COVID-19 patients were collected, along with ICU admission status [1]. LUSs were computed using three different methods [1,2,3], whereas individual LU findings (LUFs): B-lines; irregular pleura; subpleural, and lobar consolidations, were also considered. Then, support vector machine (SVM) models were built using the LUSs and LUFs as input features, and 10-fold cross-validation and Bayesian optimization were applied for robustness.

Results:

Table 1 shows the performances of SVM models based on LU in the prediction of ICU admission.
Among the previously proposed LUSs, LUS-C showed the highest Acc (82.4%), PPV (86.7%), and NPV (76.2%) values in the prediction of ICU admission. On the contrary, the LUS-A showed the highest AUC (79.0%). Moreover, when using individual LUFs as input for the SVM models, better predictions of ICU admission were obtained. In particular, when using LUF-1 (B-lines alone), higher performance values were obtained for all metrics in comparison with LUS-A and LUS-B. Finally, when using all individual LUFs together (LUF-4), instead of the original LUS-A, as input for the model, increases in Acc, NPV, and AUC values of 5.9%, 28.6%, and 7.7%, were respectively observed.

Conclusion:

The approach of using total values of LUSs seem to result in the loss of valuable information. In fact, by leveraging ML with individual LUFs, the prediction of ICU admission seems to be improved; nonetheless, warranting validation from clinical practice.

References:

[1]Leote,J. et al.Ultrasound J.14:28,2022
[2]Ji,L. et al.Crit Care.24:700,2020
[3]Dargent,A. et al.PloS One.15:e0236312,2020

Table:

Inputs for the Model	Acc (%)	PPV (%)	NPV (%)	AUC (%)
LUS-A	78.4	83.3	71.4	79.0
LUS-B	76.5	78.8	72.2	76.9
LUS-C	82.4	86.7	76.2	73.8
LUF-1 (B-lines)	80.4	86.2	72.7	81.0
LUF-2 (B-lines + Pleura)	82.4	80.6	86.7	89.0
LUF-3 (B-lines + Pleura + SubPCons)	84.3	82.9	87.5	87.9

LUF-4 (B-lines + Pleura + SubPCons + LobCons)	84.3	79.5	100.0	86.7

Accuracy (Acc); Positive Predictive Value (PPV); Negative Predictive Value (NPV); and Area Under the Curve (AUC) values of the machine learning models built using different inputs. Lung Ultrasound Scores (LUSs): LUS-A from [1]; LUS-B from [2]; and LUS-C from [3]; and individual lung ultrasound findings (LUFs): LUF-1 (B-lines); LUF-2 (B-lines+Pleura); LUF-3 (B-lines+Pleura+Subpleural consolidations (SubPCons)); and LUF-4 (B-lines+Pleura+SubPCons+Lobar consolidations (LobCons)), were considered.