Model to Predict the Risk of COVID-19 Acute Respiratory Distress Syndrome in Patients With Rheumatic Diseases

Acute respiratory distress syndrome (ARDS) affects about 5% of all patients with COVID-19, and a third of hospitalized patients. It carries a high mortality risk and often leads to lifelong consequences, such as cognitive impairment or physical weakness. In this study, we developed 1) a tool (prediction model) to determine a patient’s probability of developing ARDS and 2) a simple risk score calculator to help physicians decide on the course of treatment.

Because ARDS is a rare event, machine learning provided an approach with the potential to improve predictions. Using 83 variables collected at the time of COVID-19 diagnosis, machine learning determined 10 predictors as the key risk factors for developing ARDS. In order of importance, age, average daily prednisone-equivalent glucocorticoid dose, and pulmonary hypertension were the most influential predictors for developing ARDS. The model was tested on data from the COVID-19 Global Rheumatology Alliance Registry resulting in a 71% probability of correctly identifying the development of ARDS. The results were confirmed with data from four other independent registries resulting in sensitivity ranging from 61% to 80%.

We gathered data from March 24, 2020, to May 12, 2021. The study included 8633 patients from 74 countries, of whom 523 (6%) had ARDS. It is the first study predicting COVID-19 ARDS among individuals with rheumatic diseases. The prediction model was trained and verified on data from all over the world leading to generalizable patient characteristics associated with ARDS. Among limitations is the fact that the model relies on reporting from providers which might create bias. Also, we were unable to account for other important medical, sociodemographic, or environmental factors.

Further studies are needed that include vaccinated individuals and COVID-19 variants, such as Omicron, to evaluate the utility of this risk score calculator in classifying patients as low, moderate, or high risk for ARDS. The model can also serve to inform preventative measures against and treatment for COVID-19 in high-risk patients with rheumatic diseases.

We want to thank all healthcare providers who participated in the registry, and as such contributed to a better understanding of the interplay between COVID-19 and rheumatologic diseases.
Study Title
Development of a Prediction Model for COVID-19 Acute Respiratory Distress Syndrome in Patients With Rheumatic Diseases: Results From the Global Rheumatology Alliance Registry

Link to original paper

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Authors of original paper
Zara Izadi, Jinoos Yazdany, et al.

Lay summary contributors & reviewers
Annie-Danielle Grenier, Maureen Smith and Nadine Lalonde