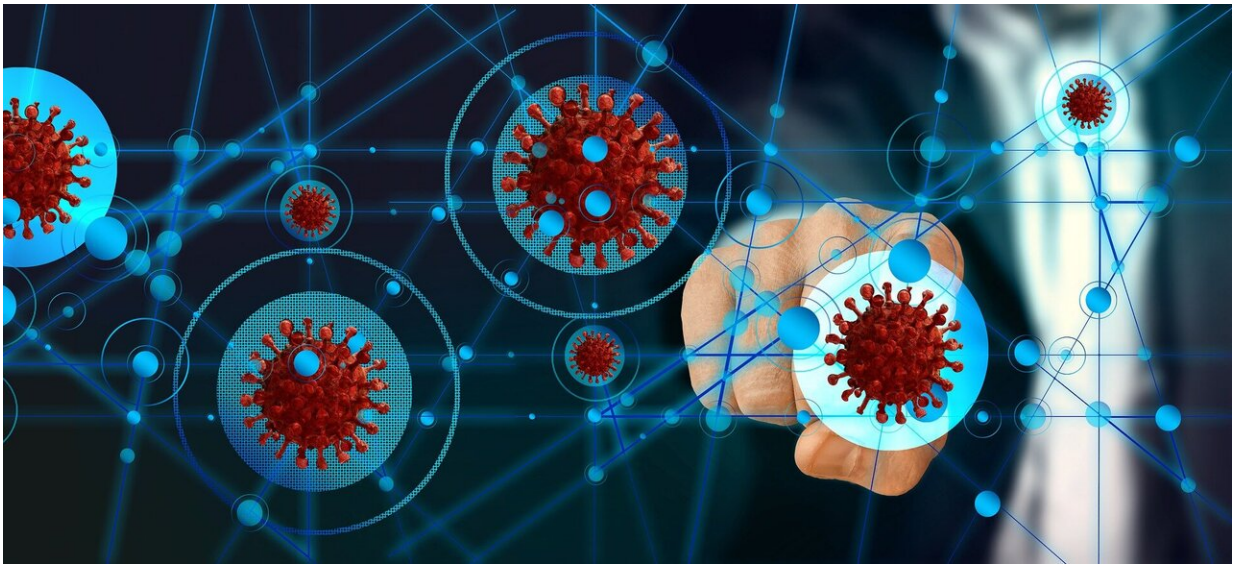


Developing models that predict poor clinical outcome in COVID-19 patients

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Using basic information on 380,081 patients in the Basque Autonomous Community infected by the SARS-CoV-2 virus, collaboration between mathematicians from the University of the Basque Country (UPV/EHU) and medical staff from the Galdakao-Usansolo Hospital has led to the proposal of a set of risk scales that are very easy to calculate, have a high predictive capacity and also function with the omicron variant. These scales may be of use in primary care, emergency departments and hospital admissions.

Many aspects of COVID-19 remain unknown, especially because the infection itself and the characteristics of each of its variants are variable. The disease is not expected to disappear in the short or medium term, so the associated characteristics and factors related to poor outcome need to be continually analyzed so that treatments can be adapted rapidly and, if necessary, the health care system can be reorganized.

It is therefore essential for [health care services](#) to develop predictive models to make available more information on the health status of patients and to predict the risk of deterioration or having to be admitted to an ICU.

Researchers in the UPV/EHU's Department of Mathematics together with medical and research staff from the Galdakao-Usansolo Hospital have used data from 380,081 patients infected with SARS-CoV-2 in the ACBC between 1 March 2020 and 9 January 2022 to come up with a predictive model. The research is [published](#) in the *International Journal of Medical Informatics*.

The UPV/EHU lecturer Irantzu Barrio explained that "we have identified factors related to hospital admissions of people who have been infected, have poor evolution (having to be treated in the ICU or dying) and mortality. We have seen which factors in the general population of the ACBC (Basque Autonomous Community) can be used to predict one of the three situations mentioned and, based on the model developed, we have created a set of scales to measure how severely affected the patients are."

The model was developed before the omicron variant emerged, so it has been validated with data on infections acquired with this variant as well. The members of the research team are satisfied with the good results achieved. "We have come up with a good model that can also be used with new variants." The researcher also pointed out that this is a study

carried out on a population level, in other words, "We have used a large quantity of data, and in statistics, the more data used to create models, the better and more rigorous the results obtained will be."

So using basic information, a set of risk scales are proposed; they are very easy to calculate and have a high predictive capacity. "We have not used many variables, only baseline variables: other diseases of the patients, treatments, age, sex, etc. In fact, the collection of data at the [population level](#) makes the database very complex," said Barrio.

These scales can be of great help to [primary care](#), emergency department and hospital care professionals. "Not so much to make medical decisions, but to know the degree of risk a SARS-CoV-2 infected patient has, depending on their characteristics and other ailments, of evolving poorly in the short term," explained the lecturer.

A journey over many years

The UPV/EHU's Mathmode research group, which Irantzu Barrio belongs to, has expertise in the development, validation and subsequent preparation of [predictive models](#) by means of computer tools which can be used by professionals. This is not the first time they have worked together with the Galdakao-Usansolo Hospital. In fact, they have been collaborating for many years on statistical research relating to various diseases.

"We have explored the evolution of people who have had some kind of cancer, [chronic obstructive pulmonary disease](#), [heart failure](#) or the quality of life of oncology patients, etc." Barrio said, stressing the importance of teamwork.

"It is very important for professionals from different areas to collaborate and complement each other. They set objectives and we have to be able

to see which alternatives are the most methodologically appropriate for investigating it." The researchers are currently continuing to work with the database created for this research, and analyzing other aspects.

More information: Janire Portuondo-Jiménez et al, Clinical prediction rules for adverse evolution in patients with COVID-19 by the Omicron variant, *International Journal of Medical Informatics* (2023). [DOI: 10.1016/j.ijmedinf.2023.105039](https://doi.org/10.1016/j.ijmedinf.2023.105039)

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