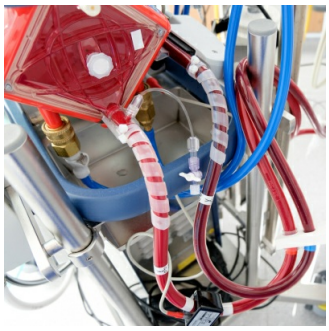
ICU
MANAGEMENT & PRACTICE

Models for predicting outcome in patients under VA-ECMO



Despite limited evidence, veno-arterial extracorporeal membrane oxygenation (VA-ECMO) is increasingly used for the management of refractory cardiogenic shock (RCS) while awaiting myocardial recovery or the bridge to long-term assistance or transplantation. However, despite technological advances and better quality of care, mortality still remains at a high rate (nearly 50 percent). Furthermore, even in survivors, long-term health-related quality of life parameters are also impaired.

To improve selection of patients who may benefit from such therapy, many teams have developed predictive scores (PSs) for RCS patients under VA-ECMO. These prediction models could help the physician at bedside by providing information on outcome prediction as well as be of interest for research purposes. In all instances, however, PSs should never be used as a decision tool to indicate or to limit access to VA-ECMO.

Aside from complex statistical considerations, it is imperative to recognise certain key facts regarding prediction models:

- The development of a PS, which is one sub-category of prediction models, should follow the TRIPOD checklist (see www.tripod-statement.org).
- A prediction model should be developed on a large (meaning multicentric) specific population (ideally prospective) with a clearly defined outcome (most often short-term mortality for patients under VA-ECMO).
- The cornerstone of the statistical analysis is most often (for short-term mortality) the multivariable logistic regression model on which the independent predictive variables are defined.
- Model performance should be provided with both internal and external validation.

From these general considerations, it is clear that the development of a PS under VA-ECMO is a complex and challenging process.

The first PS, developed by Schmidt et al. in 2015, aimed to predict in-hospital survival in patients under VA-ECMO for RCS. The authors used a large retrospective multinational cohort of 3,846 patients in which 12 variables were extracted to create the Survival After Veno-Arterial-ECMO (SAVE) score. Although constructed on a strong methodology (i.e., large multicentric population, validation cohort, etc), this PS also suffered from several limitations. For instance, being based on a registry, the percentage of missing data was high and certain relevant biomarkers such as lactate or troponin were not included. This general PS notably did not address specific populations such as patients in cardiac arrest.

Muller et al. and more recently Wang et al. developed PSs for specific populations: respectively acute myocardial infarction and post-coronary artery bypass grafting. The major pitfalls of these two PSs were: 1) the population was small, mono- or bicentric; and 2) the absence of an external validation cohort.

While the development of a PS is a complex process, the interpretation and “operating instruction” of such PSs for clinicians is even more challenging. Indeed, clinicians are tempted to use PSs at bedside for the wrong reasons. All of these scores were designed to predict outcome in patients who are already under VA-ECMO. Thus, they are not intended to determine whether an individual patient should be cannulated.

Moreover, these PSs were all designed, as mentioned above, at a given time for a specific population. Rapid changes in practices in the field of RCS and VA-ECMO are expected and a PS may very quickly become obsolete. Thus, these PSs should be regularly updated.

Source: Critical Care
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