

INVITED COMMENTARY

Predictive models, a new tool for managing organ procurement process

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Do we need models to predict the evolution to brain death?

Predictive models allow us to improve the understanding of the complex process that ends in brain death (BD). This increased knowledge about the process opens a wide range of possibilities: allow us to organize and plan health policies and programs, optimize clinical management, communicate and inform relatives more precisely, and eventually manage the process of organ procurement. Moreover, based on these models and taking in account data about local epidemiology and treated population, the potentiality of organ procurement in a given country, region, or hospital can be estimated. Knowing the estimated potential, we can document the efficiency of the organ procurement process to subsequently take action to improve it. Predictive models are therefore essential tools from the clinical point of view and have a privileged place in planning medium- and long-term transplant programs.

The mortality of patients with severe brain injury is high, a large portion of these deaths occur in BD. Which are the

main factors affecting this process? In other words, which are risk factors for death and if this happens which factors determine a higher risk of BD or cardiac arrest (CA). Naturally to make progress in this area of knowledge, we must thoroughly study each particular pathology because each one presents different epidemiological and evolutionary behavior with a highly variable attributable mortality. On the one hand, the incidence of each disease is different in different age and gender groups. Also some diseases, such as ischemic stroke, for example, are markers of the probable presence of atherosclerotic vascular disease whose presence reasonably modifies the risk of cardiovascular cause of death. Moreover, the increasing age increases the prevalence of chronic diseases such as hypertension and also cardiovascular reserve decreases. On the other hand, age increases the intracranial spatial buffer thus acting as a protective factor of evolution to BD in the case of the accumulation of new intracranial volumes. These aspects are just an example of the complex network of interactions that do most of the time difficult to predict the final outcome of a particular patient.

How important is the stroke in organ procurement?

Currently, most BD worldwide can be attributed to two conditions: the stroke in its different variants and severe traumatic brain injury (TBI). In the world, there is growing concern about the traumatic pathology and its consequences, and there is an increasing number of programs and public policies to control the occurrence of traffic accidents. It is expected that these actions will be more and more effective in preventing accidents, and consequently, the number of patients with TBI will decrease over time. It is in this context that is particularly important to understand the evolutionary profile of patients with stroke. The progressive aging observed in the population works in the same direction. In 2013, in France, place of origin of the research involving this comment, “stroke was the first cause of progression to BD” [1].

Referring to this research, what aspects should be mentioned?

It is an original, retrospective, and observational study conducted in several centers. A total of 400 consecutive patients with ischemic and hemorrhagic stroke, the latter being the largest group, were included.

I think it's worth emphasizing methodological strength and elegance with which deals with the study of the evolution to brain death of patients in the acute phase of severe stroke. The severity of the stroke is a subjective condition for which there is no international consensus. However, worthy of note that in this study the GCS of all patients was 6 ± 2 , this being an indicator of severity. Regarding the time of evolution of patients, this is another strength of the work as it refers to patients in the first 24 hours of evolution; in fact, the vast majority of patients were recruited in this period. This aspect makes it a study to consider

while managing the organ procurement process and it can help in making decisions. Interesting to note that prognostic scores commonly used in general critically ill patients were not specifically designed for patients with brain injuries, do not provide information about risk of brain death and to get forecasts some more hours are needed.

The third point and I think one of the strongest is the simplicity and practicality for use. Almost since the first hours after admission, supported by a routine clinical examination and imaging study, we will be able to collect simple variables that allow us to identify patients at high risk of progressing to BD. When applying the score, it is important to remember the data provided by the study of the area under the ROC curve and sensitivity and specificity of the proposed model, it is low for the lower grades and improves to the highest degree of score.

In conclusion, although there are some limitations due to study design, it is the first one that specifically developed a prognostic index of the evolution of brain death in stroke patients. Results should encourage researchers to continue this path. Now is the time for a prospective study, with a larger number of patients, clearly defining the variables and including new ones such as brain stem reflexes. This new prospective study will allow us to confirm results, avoid selection bias, test the feasibility, and eventually adjust the score.

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