"Doctor, Is My Child Going to Survive?" Does a New Score to Predict Mortality Following Pediatric In-Hospital Cardiac Arrest "GO-FAR" Enough?*

I was not predicting the future, I was trying to prevent it –Ray Bradbury

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Survival outcomes following pediatric in-hospital cardiac arrest have markedly improved in the last 2 decades, specifically due to improved early recognition of impending arrest, quality of cardiopulmonary resuscitation (CPR) by caregivers, and postresuscitation care (1, 2).

However, there is high variability in survival rates across different centers, partly attributable to variable hospital prevention strategies, resuscitation preparedness, performance, and quality of care (3, 4). Nevertheless, approximately half of the children who have return of a sustained circulation following in-hospital cardiac arrest still die before discharge, and neurologic sequelae are observed in a substantial number of survivors (5).

Thus, it is critically important for healthcare providers to have specific tools in the early postarrest phase capable to reliably predict patients with the best chance to survive to hospital discharge and those where continued aggressive care is likely to be futile.

In fact, predictors of survival and favorable outcome have been investigated by several authors in adult patients suffering an episode of cardiac arrest, both in out-of-hospital and in-hospital settings (6–10). In addition, several scoring systems have been proposed to identify patients at the highest risk of mortality in case of in-hospital cardiac arrest despite CPR (11). In general, the aim of these scoring systems is to assist clinicians as well as patients and families in the decision-making regarding resuscitation and do-not-attempt-resuscitation (DNAR) orders.

To this end, Ebell et al (6) developed and validated the "Good Outcome Following Attempted Resuscitation (GO-FAR) Score" to predict good neurologic survival after in-hospital cardiac arrest in adults. Such scoring system can be used upon admission of patients to hospital, providing useful information when counselling patients and family members about DNAR orders and end-of-life decisions. Recently, the GO-FAR score has been successfully validated also in Sweden, showing accurate prediction of probability of survival with good neurologic outcome (7)

Currently, data on validated models for predicting survival to hospital discharge following sustained return of circulation following pediatric in-hospital cardiac arrest are scant.

In this issue of *Pediatric Critical Care Medicine*, Holmberg et al (12) present a new score to predict mortality in children following return of a sustained circulation after in-hospital cardiac arrest. Similar to the GO-FAR score validation in adults, the authors derived and validated the predicting score using data from the largest registry of in-hospital cardiac arrest, the American Heart Association's Get with the Guidelines Resuscitation Registry (12). The authors investigated an appropriate and well-defined category of patients, namely those showing a sustained return of spontaneous circulation (ROSC) after an index (i.e., first) episode of in-hospital cardiac arrest.

The study was large, including more than 5,000 pediatric patients: 3,893 for the derivation cohort and 1,297 for the validation cohort. Seventeen key variables were independently associated with mortality, and each of them was assigned a weighted coefficient, to allow the score calculation. Of note, the score performed well, with a consistent stepwise increase in mortality as the score increased, both in the derivation and the validation cohorts. There was good discrimination and calibration. In addition, the authors evaluated the robustness of the model and the applicability of the score by performing several post hoc sensitivity analyses, most importantly analyses including only events in a contemporary cohort (within the past 5 yr), only patients with a loss of pulse, only patients without a loss of pulse, and age-stratified analyses. Overall, discrimination remained good and calibration moderate. Finally, the model performed well not only for survival to hospital discharge, but also for short-term neurologic outcome measured at hospital discharge.

The authors should be applauded for providing a new interesting tool, easy to calculate, which may enhance the confidence of clinicians when counselling parents and family members after a dramatic event such as a cardiac arrest. In their conclusions, the authors claim that this prediction score may be useful for several purposes: 1) prognostication following cardiac arrest, 2) stratifying patients for research, and 3) guiding quality improvement initiatives. However, they also clearly state such score should not be used for "individual" withdrawal of

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life-sustaining technology decisions, given its inability to identify mortality with 100% specificity (12).

Does this pediatric "GO-FAR" tool "GO-FAR" enough? Could this prediction tool be helpful in other important clinical decision-making, in the early phase following the index cardiac arrest?

Let us consider a patient showing ROSC after prolonged CPR, generating a very high score value, for example, at high risk of in-hospital mortality. Could this score prompt clinicians to change their judgment and decision making? Would this lead to a "self-fulfilling" prophecy? Indeed, a very high prediction score may have a double-sided effect, either urging an escalation of care, for example, making extracorporeal membrane oxygenation CPR immediately available in case of a cardiac arrest relapse, or orienting toward a more compassionate care in case of further cardiac arrest episodes, to avoid futility.

Clearly, several other factors should be taken into account in such a complicated decision process, and clinicians should rely upon their clinical judgment, while considering family's expectations and wishes, as well as possible ethical implications. However, this score and decision tool are a first step and one tool to help clinicians decide whether we have "gone far enough" or whether to pursue "go further" in the future.

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