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Letter to the Editor

Reply to "the futility of resuscitating an out-of-hospital cardiac arrest cannot be summarized by three simple criteria"

To the Editor,

We thank Javaudin et al. for their thoughtful response to our recent publication *A simple decision rule predicts futile resuscitation of cardiac arrest*, in which they apply our decision rule to the French National Cardiac Arrest Registry.

We developed the simplest decision rule (non-shockable initial rhythm, unwitnessed arrest, and age $\geq$ 80 years) that excluded any survival to hospital discharge in our derivation cohort. Because survival is hugely multifactorial, any rule simple enough for use in the prehospital setting, even if very specific, is ultimately a probabilistic instrument, and we would not expect to achieve 100% specificity in application to other cohorts. Javaudin et al. report a 30-day survival rate of 0.8% in a large French cohort identified by our rule, which from our perspective supports the general utility of our approach, and provides valuable data about implications of its use. For instance, in the cohort identified by our rule, Javaudin et al.'s results suggest a "number needed to resuscitate" of 125 patients in order for one patient to survive to 30 days. Ultimately, 30-day survival, or even survival to hospital discharge, is necessary but not sufficient for a desirable patient outcome. We would be interested to learn the neurological and quality-of-life outcomes for Javaudin et al.'s reported survivors.

Ethical discussion[1] and expert consensus[2] suggest that probability of survival less than 1% is medically futile, but any threshold is somewhat arbitrary. As we argue in the article, the determination of a threshold for futile resuscitation is primarily a societal decision, not a scientific one. In making such decisions, we must weigh factors beyond potential survival of the patient. Use of lights and sirens entails significant risks of death and injury to providers and bystanders: in the United States, ambulance crashes cause an average of 33 deaths and 1500 non-fatal injuries annually.[3] Families who witness traumatic resuscitation of an elderly loved one may suffer trauma of their own, and the patients identified by our rule are particularly susceptible to broken ribs, pulmonary lacerations, bleeding from the airway, hypoxic brain injury, and other catastrophic functional compromise even if they do survive the initial arrest and resuscitation. Finally, health system resources used in maximal responses to probable futile resuscitations are resources unavailable for other emergencies.

Javaudin et al.'s findings support the broad applicability of our rule for identifying potentially futile cardiac arrest resuscitations. In practice, our rule might be used in combination with clinical judgment, or as the basis for more complex rules for EMS systems equipped to incorporate additional elements. Whether and to what extent the addition of other factors including "maximum theoretical no flow duration," comorbidities, $ETCO_2$ measurement, agonal breathing, or point-of-care ultrasound findings would improve discrimination remains an empirical question. We thank Javaudin et al. for their contribution to this emerging discussion, and invite other researchers and EMS systems to test our rule and modifications thereof in their own patient populations, and to explore the difficult but unavoidable problem of setting nonzero thresholds for potential survival.

Conflicts of interest

None.

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