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Letter to the Editor

Resuscitation meets precision medicine: Towards a model of patient-centered, perfusion-guided cardiopulmonary resuscitation

To the editor,

Sudden cardiac arrest (SCA) represents a major global health burden, with clinical outcomes remaining poor despite advancements in medical care. Of patients who survive SCA, a significant proportion (up to one-third) are left with permanent neurological and/or cognitive consequences, secondary to ischemic injury in the brain.[1] With technology now available to monitor key physiological parameters during resuscitation (e.g. cerebral perfusion), it is imperative that efforts focus on translating scientific gains made in the experimental setting to patient care.[2] As our understanding of the impact of current cardiopulmonary resuscitation (CPR) practices continues to evolve, there is a pressing need to optimize not only resuscitation of the heart, but also other delicate organ systems that affect long-term patient-centred outcomes. Moreover, better understanding the value of new monitoring technologies will pave the way for personalized, perfusion-guided resuscitation – rather than a suboptimal 'one-size-fits-all' approach to CPR.

The use of epinephrine to treat SCA, for example, has been a standard practice for decades.[3] In both animal models and human clinical data, epinephrine has been shown to improve rates of return of spontaneous circulation and survival to hospital admission.[4] However, it may be deleterious for cerebral perfusion and oxygenation.[4,3] Thus, research efforts must focus on understanding optimal doses and timing of epinephrine during CPR, to maximize cardiac outcomes while minimizing injury to the brain. Translational work between animal models of SCA and human subjects will be essential in identifying best practices, informing clinical trials, and subsequently updating guidelines to reflect these findings.

One potential solution to minimize neurologic insult during SCA lies in real-time monitoring of cerebral perfusion.[5] Near-infrared spectroscopy (NIRS) holds great potential as a non-invasive method to actively track brain oxygenation levels, which could guide emergency responders when administering CPR.[5] Despite its promise for mitigating devastating neurologic injury, target ranges for both pediatric and adult populations remain to be validated. NIRS – and other novel technologies – hold the capacity for tailoring treatments to a patient's organ perfusion level, but this revolution to personalized CPR will require the interplay between basic science and clinical research.[2] We would like to highlight the paucity of translational science infrastructure in this field, and advocate for governments, funding agencies, and research institutions to provide better long term support for translational research in cardiac arrest care.

As precision medicine continues to advance across specialties, approaches to resuscitation should be no different. It is imperative that research focused on optimizing CPR techniques take place 'at the bench' as well as 'at the bedside.' Given the far-reaching impacts of cardiac arrest and its complications – for patients, providers, and the healthcare system – work in this area has the power to dramatically improve both short- and long-term SCA outcomes.

Conflicts of interest

None.

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