

Out-of-hospital cardiac arrest in Singapore: Can we do better?

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Cardiac arrests are unpredictable events that frequently result in death or significant residual morbidity among survivors. These sudden events affect not only the individual, but are understandably also significant life events and stressors for the family and friends. As such, the impact of cardiac arrests is felt on a societal basis, and significant efforts have been expended to try to improve outcomes.

In this issue of the *Annals*, we have more insight concerning out-of-hospital cardiac arrests (OHCA) in Singapore, specifically with regard to the temporal and inter-hospital trends in the post-resuscitation care provision and patient outcomes. Jaffar et al. observed that rates of advanced post-resuscitation interventions—such as therapeutic temperature management (TTM), emergency percutaneous coronary intervention (PCI), and extracorporeal membrane oxygenation (ECMO)—increased from 2010 to 2018.^{1,2} During the same period, the outcomes that they examined also improved significantly. Of particular interest, initial presentation to an academic hospital was associated with improved outcomes when compared to presentation at a non-academic hospital. They therefore concluded that these findings could serve to guide future policies for managing OHCA in Singapore.

Intuitively, it appears unsurprising that more post-resuscitative measures employed would result in better outcomes for OHCA patients. Therefore, given that these advanced therapies are usually based at academic hospitals, it would be logical that outcomes would be better at these centres. Hence, perhaps by making advanced therapies available at all hospitals, outcomes would improve across Singapore.

However, one should be cautious before leaping to these conclusions. As already highlighted by the authors, this dataset lacked individual patient factors that are known to impact OHCA survival.³ Without more granular data such as the prevalence of comorbidities (e.g. diabetes, known heart failure, renal failure, stroke, etc.), there is likely considerable residual confounding in the models employed by the authors to adjust for outcomes.

Furthermore, as the authors have also mentioned, we are not privy to the decision-making by treating physicians especially with regard to the provision of advanced therapies for different patients. We know that physicians may be more “aggressive” when treating patients whom they feel will likely do better, and vice versa.⁴ However, this physician-treatment benefit paradox means that it is difficult to tease out the true value and impact of these advanced therapies. This is especially so when randomised clinical trial data have not shown consistent benefits in OHCA for any of the advanced therapies examined by the authors.

Equally important, we should also not dismiss the potential of these advanced therapies to cause harm. For example, PCI is a common and low-risk procedure when performed in the elective setting. However, PCI becomes considerably more hazardous when performed in a resuscitated patient who may be more prone to bleeding, and yet, has to be anticoagulated and receive antiplatelet drugs for the PCI.⁵ Similarly, ECMO has a recognised list of serious complications including bleeding, limb ischaemia and infection.⁶ Therefore, we should have a proper understanding of the risks and benefits of these advanced therapies when applied to OHCA patients and tailor treatment appropriately.

Regardless of the considerations discussed above, the observed outcomes reported by Jaffar et al. confirm that OHCA remains a devastating event. Survival to 30 days (throughout the different years and hospitals reported) was generally less than 10%, and not all survivors had good neurological recovery. Although there was a statistically significant improvement in outcomes over time, the absolute increase in improved outcomes over time was, in our opinion, modest.

This is sobering because Singapore has what many would consider an efficient and mature pre-hospital treatment environment. Over time, public awareness of cardiac arrests has increased, as has community involvement in resuscitation efforts. We are particularly impressed by the findings reported in this study that bystander CPR increased significantly from about 20% in 2010 to more than 60% in 2018. Also, as stated

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by the authors, the emergency medical services paramedics in Singapore typically reach the scene of the cardiac arrest in under 10 minutes, and are trained in the use of defibrillators and other aspects of basic life support. Therefore, it is challenging to anticipate what further improvements can be made with regard to pre-hospital treatment of cardiac arrests in Singapore.

Does the answer to improved cardiac arrest outcomes in the future then depend on the hospitals procuring increasingly advanced and sophisticated technologies and techniques for post-resuscitation management? Should all hospitals in Singapore have access to emergency round-the-clock PCI (the reality is that almost all do now), or manage ECMOs in their intensive care units (ICUs)? We are not convinced that this study provides enough justification for this direction. Furthermore, in the context of escalating overall health costs, challenges in recruiting and retaining skilled healthcare professionals, and global economic uncertainties, there must be careful consideration on the most appropriate treatments for this group of patients who have such a guarded prognosis.

So what else could be done to improve outcomes in OHCA? First, we must continue to emphasise the importance of managing modifiable risk factors for cardiac arrest. While cardiac arrests are unpredictable, we do know that many are due to underlying coronary disease. We also now have a wealth of information with regard to reducing the risk of sudden coronary events. Especially pertinent in this aspect is the current drive towards “population health” in Singapore and the direction for the public healthcare clusters to pivot towards primary prevention and greater community engagement.⁷ For example, further driving down smoking rates or increasing awareness of blood pressure targets may have a greater impact on overall rates of cardiac arrest and hence outcomes, as compared to equipping the ICU with yet another piece of equipment.

Second, because we cannot totally eliminate cardiac arrests, the public must be continually made aware

of the poor outcomes of cardiac arrest highlighted by Jaffar et al. Empowering the public to start the process of advanced care planning early will help cushion the impact to loved ones if and when a cardiac arrest occurs. In the hospitals, we frequently encounter families who are shocked and distressed because the last memories of their loved ones involve invasive tubes and beeping machines.⁸ Not all OHCA patients want to be subject to advanced invasive therapies, yet when they are at their most vulnerable, they are not able to express their wishes.

In conclusion, Jaffar et al. have contributed an important study to further our understanding of outcomes and the management of cardiac arrest patients in Singapore. We agree that lessons must be learnt from this, and new paradigms created.

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