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## Editorials

### Drugs for resuscitation after cardiac arrest

*CPR and defibrillation are higher priorities*

Sudden cardiac arrest, in which cardiac output abruptly ceases, is one of the most time sensitive disease processes in medicine. When a lethal cardiac arrhythmia results in the cessation of blood flow, mortality increases about 5-10% for every minute without treatment.<sup>1</sup>

This year is the 50th anniversary of modern cardiopulmonary resuscitation (CPR).<sup>2</sup> The current approach to sudden cardiac arrest involves the "chain of survival" paradigm,<sup>3</sup> a stepwise set of actions that includes prompt recognition of arrest and notification of the emergency medical system, immediate delivery of CPR, electrical defibrillation if appropriate, and rapid delivery of the patient to healthcare professionals who can administer advanced cardiac life support. Advanced cardiac life support involves the use of airway adjuncts, ventilation with supplemental oxygen, and the administration of drugs such as adrenaline, atropine, or amiodarone.

Cohort studies suggest that immediate CPR doubles the likelihood of survival to hospital discharge compared with delaying CPR until the arrival of trained rescuers.<sup>4</sup> CPR is highly accessible—it can be administered by laypeople and healthcare professionals. People can be trained to perform CPR through instructor led courses, internet programmes, and even self instructional videos. Recent advances that have improved the ability to manage the quality of CPR include emergency dispatcher assisted CPR and real time CPR sensing or audiovisual feedback via defibrillators.<sup>5 6</sup>

If CPR can be broadly taught, rapidly performed, and has great potential to save lives, what extra value do drugs used in advanced cardiac life support have in sudden cardiac arrest? For decades we have relied on trained professionals to administer drugs during sudden cardiac arrest, yet this approach has never been critically evaluated in a randomised controlled trial. Recently a group of investigators from Oslo, Norway, performed just such a trial.<sup>7</sup> The nature of this work is daunting. Controlling and measuring the level of emergency medical system care and following patients to hospital discharge in several different hospitals is challenging enough. In addition, such trials require the waiver of patient consent, given the emergency nature of the intervention, and therefore raise ethical concerns that needed careful navigation by the investigative team.

The trial randomised more than 900 patients with out of hospital sudden cardiac arrest to emergency medical system care that involved the standard advanced cardiac life support protocol (including intubation, defibrillation, and intravenous drugs) or a protocol that omitted the use of drugs.<sup>7</sup> The trial found no significant difference in survival to hospital discharge between the two groups (10.5% in the standard care group v 9.2% in the no drugs group; P=0.61). Importantly, the investigators found no significant difference in the quality of CPR during resuscitation care between the groups. The results rightly call into question the value of drugs in sudden cardiac arrest.

Important caveats remain, however. Survival to hospital admission (the initial ability of emergency medical systems to resuscitate patients) was higher in the standard care group than in the no drugs group (40% v 25%; P<0.001). Although survival to hospital discharge is the more important clinical outcome, patients may die in hospital for many reasons—including infection or other post-arrest complications—that might greatly reduce the treatment effect size. The study may not have been sufficiently powered to find a survival benefit to hospital discharge with the use of drugs. Therapeutic hypothermia and angiography, both important post-arrest interventions,<sup>8</sup> were not uniformly used (about 70% of study patients received therapeutic hypothermia and 45% received angiography), which may also have confounded the association between initial care and survival to discharge.

Whether drugs truly improve the outcome of sudden cardiac arrest or not, their effect on survival is modest at best. Conversely, a growing body of work suggests that the consistent provision of high quality CPR may have a much larger effect on outcomes. For example, a recent out of hospital retrospective study in Arizona documented that by delaying intubation and focusing on early continuous chest compressions and defibrillation, survival to discharge after sudden cardiac arrest tripled.<sup>9</sup> This finding has been replicated in other emergency medical system settings.<sup>10</sup> Another out of hospital retrospective study, which looked at more than 500 people with sudden cardiac arrest, suggested that chest compression fraction (the fraction of time without a pulse in which compressions are given) is highly correlated with successful resuscitation.<sup>11</sup> Finally, several studies have supported the dramatic life saving potential of rapid defibrillation for patients with sudden cardiac arrest.<sup>12</sup>

All this evidence shows that we should not focus on drugs to the detriment of high quality "basic" care to support circulation—namely, excellent CPR and prompt defibrillation. An approach that focuses on the fundamentals of care is simpler, more accessible to all, and will save lives.

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**Competing interests:** The author has completed the Unified Competing Interest form at [www.icmje.org/coi\\_disclosure.pdf](http://www.icmje.org/coi_disclosure.pdf) (available on request from the corresponding author) (URL) and declares (1) No financial support for the submitted work from anyone other than his employer; (2) He has received research grants and honorariums from Philips Healthcare and research grants from the American Heart Association and the National Institutes of Health; he also does consultancy work for Philips Healthcare; (3) No spouse, partner, or children with relationships with commercial entities that might have an interest in the submitted work. (4) No non-financial interests that may be relevant to the submitted work.

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