

The head-up cardiopulmonary resuscitation method: Improving neurological outcomes

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The coronavirus disease 2019 (COVID-19) pandemic has significantly impacted the burden on the health service and its efficiency [1]. The pandemic contributed both to the increase in the rate of cardiovascular events as complications of the COVID-19 disease and to the issue of resuscitation and securing the respiratory tract due to the risk of infections [2–4]. For decades, the main form of management of patients experiencing cardiac arrest has been flat or supine cardiopulmonary resuscitation (CPR). No other technique has had a more significant impact on survival than conventional CPR, with the exception of fast defibrillation in appropriate situations. The novel head-up position method of CPR that incorporates controlled elevation of the head and thorax along with active compression decompression and an impedance threshold device has been shown to reduce intracranial pressure and enhance cerebral blood flow, cerebral perfusion pressure, and neurologically favorable survival. When tested on humans, the prefrontal region's median increase in cerebral blood flow in the head-up position was 14.6% higher than in the supine position and this was observed in 83.3% of the patients who were part of the analysis [5]. The main mechanism of benefit for head-up CPR is the use of gravity to improve venous drainage from the paravertebral venous plexus as well as the brain and cerebral venous sinuses, lowering intracranial pressure and opening the possibility for forward blood flow. Heads-up CPR also offers rebalancing blood flow through the lungs similar in manner to patients with heart failure sitting up straight. Another benefit is that compression during head-up CPR compared to conventional CPR is that it lowers

the pressure that is conveyed to the brain via the venous and arterial vasculature, thus preventing concussive damage [6, 7]. Numerous research studies have already proved this in-depth on animal models, but now some demonstrate its efficacy in people [8]. In human models when compared to conventional CPR, the survival rates for the vast majority of out-of-hospital cardiac arrest patients with non-shockable presentations were significantly improved with the head-up position method CPR. Additionally, shorter reaction times to the start of head-up position CPR increased survival odds within highly attainable response times [9]. A significant advantage of this method is the use of automatic chest compression devices, which also relieves the staff by allowing a limited number of people conducting CPR, especially in intensive care units with a large number of COVID-19 patients requiring emergency interventions [10]. Currently, there remains a lack of data on the new resuscitation technique and more extensive research on its use is needed, but the initial results seem convincing and will continue. Its use may be limited by the costs associated with the purchase of new devices — both for automatic chest compression, which are still lacking in many facilities around the world, and for head-up/torso-up positioning devices themselves, however, they can significantly minimize fatigue for emergency medical services personnel in the case of out-of-hospital cardiac arrest and increase the capacity of the hospital systems while significantly improving neurological outcomes. The aforementioned changes could benefit the entire healthcare system.

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