

## Bystander CPR for paediatric out-of-hospital cardiac arrest



Tetsuhisa Kitamura and colleagues' study<sup>1</sup> in *The Lancet* today is the largest that has analysed out-of-hospital cardiac arrest in children. Overall survival was 9% and only 3% of children had a good neurological outcome, as has been reported before.<sup>2-5</sup> The prognosis does not seem to have improved much despite advances in cardiopulmonary resuscitation (CPR).

Today's study also confirms that early bystander-initiated CPR is one of the fundamental factors to improve prognosis, in adults<sup>6</sup> and children.<sup>5</sup> In Japan, with CPR training for 1.4 million citizens each year, bystander-initiated CPR happens only in 50% of out-of-hospital cardiac arrests, although that rate is higher than in many countries. Teaching on how to behave in emergency situations in the school curriculum could be the best way to train the whole population.<sup>7</sup>

To maintain knowledge over time, resuscitation must be simple to learn and do. The International Liaison Committee on Resuscitation has proposed a universal bystander CPR algorithm for cardiac arrest of any cause in patients of any age, which recommend chest compression plus ventilation.<sup>8</sup> In recent years, experimental and clinical studies have found that compression-only CPR achieves better survival and neurological outcome in cardiac arrest of cardiac origin, particularly in ventricular fibrillation, than does compression plus ventilation.<sup>6,9,10</sup> Those findings, and the fact that citizens are unwilling to do mouth-to-mouth ventilation on adults<sup>11</sup> and that learning compression-only CPR is easier than compression plus ventilation, have led to a proposal to change the international guidelines for bystander-initiated CPR, with the recommendation of compression-only CPR for out-of-hospital cardiac arrest in adults.<sup>12</sup> However, some experimental studies found compression plus ventilation to be superior to compression-only CPR in cardiac arrest of non-cardiac origin.<sup>13</sup> Additionally, compression-only CPR has not been shown to be superior to compression plus ventilation in adults with cardiac arrest of non-cardiac origin.<sup>6,14</sup>

Until today's study, compression-only CPR had not been compared with compression plus ventilation in children. Compression plus ventilation was associated with greater survival and a better neurological outcome in children with cardiac arrest of non-cardiac

origin than was compression-only CPR, and there were no differences between the two manoeuvres in children with arrest of probable cardiac origin. Today's data underline the importance of not extrapolating findings from adults to children, because cardiac arrest in children has specific characteristics. In adults, 65% of out-of-hospital cardiac arrests are of cardiac origin,<sup>6</sup> whereas in children at least 71% are of non-cardiac origin. 71% is probably an underestimate because the diagnosis of cardiac origin was by exclusion in today's study and, in other studies, cardiac causes accounted for less than 10% of cases.<sup>2,3,5</sup>

Is this an appropriate time to make changes to international CPR recommendations for bystanders? By contrast with changes in clinical practice for health professionals, teaching and learning processes aimed at the general population are protracted, expensive, and complex. All previously trained people would need to be retrained to give compression-only CPR. Furthermore, to change back if the new measures were not found to be as effective as might be thought would be tremendously complex.

Kitamura and colleagues propose a double training strategy. Because adults more often have cardiac arrest than do children, the suggestion is to teach compression-only CPR to the general population and compression plus ventilation to those who are more likely to have to do paediatric CPR, such as health personnel, parents, and educators. But such a strategy could mean that most

Published Online  
March 3, 2010  
DOI:10.1016/S0140-6736(10)60316-9  
See Online/Articles  
DOI:10.1016/S0140-6736(10)60064-5



children would be resuscitated with compression-only CPR, reducing their possibility of survival.

There are other possibilities, such as teaching compression plus ventilation to the whole population, maintaining the universal algorithm, and explaining that, in the adult, if cardiac arrest of cardiac origin is suspected, it would be better to do compression only, or teach the whole population compression-only CPR for adults and compression plus ventilation for children. But further research is needed.

Another important finding of today's study was the confirmation of low survival and poor neurological outcome in children younger than 1 year,<sup>2,5</sup> a population that has 40% of all cardiac arrests in children. Interestingly, in this age group, no differences were observed by Kitamura and colleagues in survival or neurological outcome between patients who received bystander-initiated CPR and those who did not, nor between the two modes of resuscitation, independently of the type of cardiac arrest. Measures that could improve prognosis in this group need further analysis.

Although further studies are necessary, we believe that no changes should be made to recommendations for paediatric bystander-initiated CPR. Chest compression plus ventilation should continue to be the standard, a technique that should be taught to the whole population.

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We declare that we have no conflicts of interest.

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