

# Cardiopulmonary Resuscitation for Out-of-Hospital Cardiac Arrest and the New Policy for Involving Schoolchildren

---

**Paolo Angelini, MD**  
**James T. Willerson, MD**

**C**urrently, it is estimated that 395,000 out-of-hospital episodes of sudden cardiac arrest (SCA) occur yearly in the United States. Out-of-hospital SCA, in >90% of cases, leads either to death or to significant, irreversible brain damage.<sup>1-3</sup> Improving the outcomes of this devastating and potentially preventable accident depends, at least partly, on introducing effective new policies that promote greater involvement of communities and medical professionals. School-based instruction in resuscitation techniques has recently been proposed as a means of upgrading social involvement<sup>4</sup>; in fact, such policies have already been approved in 21 of the 50 states.<sup>5</sup> In particular, the Texas Legislature approved a new law in 2013 (HB 897) that requires all schoolchildren in grades 9 through 12 to receive instruction from qualified personnel in “chest compression-only” resuscitation techniques at least once before graduation; however, instructions on artificial ventilation or on the use of automated external defibrillators will not be routinely provided during such initial intervention.<sup>6</sup> It is expected that 300,000 more individuals in Texas will be added each year to the pool of people with this level of knowledge about cardiopulmonary resuscitation (CPR).<sup>6</sup> Such practices might lead to significant improvements in the survival rates of individuals who have an out-of-hospital SCA, but this is only the start of a long process of education and training that must occur in conjunction with local hospitals and emergency medical services (EMS).<sup>7</sup> More people in the general population should be trained in CPR, and techniques to optimize the response times of expert resuscitators should be implemented more aggressively in a comprehensive, community-based effort.

A recent prospective study in North Carolina judged the relative value and timing of interventions initiated by bystanders (volunteers who happen to be present when an SCA occurs), first responders (certified emergency responders in the community, like police officers or firefighters), and EMS, in terms of fundamental CPR-associated endpoints.<sup>8</sup> It showed that bystander-initiated interventions increased after a campaign to improve community preparation and involvement, resulting in a substantial increase (27% during the 4-year study) in rates of patient survival with preserved mental status. Specifically, the rates of patient survival with a favorable neurologic outcome were 10.5%, 7.7%, and 7% when CPR was initiated by bystanders, first responders, or EMS, respectively; these findings are an important validation of involving the general public in out-of-hospital CPR.

Effective chest compression at 60 compressions per minute will probably provide acceptable coronary and cerebral flow for a short period,<sup>3</sup> especially in young patients in whom SCA is likely not caused by a coronary atherosclerotic occlusion but more likely by a coronary anomaly (such anomalies constitute approximately 50% of the causes of sudden cardiac deaths in youths).<sup>9</sup> It can be confidently predicted that having CPR-trained bystanders available at athletic events will be especially helpful in reducing SCA mortality and morbidity rates in athletes, which would be a great improvement in the long-standing quest to improve the safety of sports activities. Initiation of effective ventilation could potentially be tolerated, especially in young individuals, when delayed for only the 5 to 10 minutes commonly required for an EMS unit

**From:** Department of Cardiology, Texas Heart Institute, Houston, Texas 77030

**Address for reprints:**  
Paolo Angelini, MD, 6624  
Fannin St., Suite 2780,  
Houston, TX 77030

**E-mail:** PAngelini@  
leachmancardiology.com

© 2015 by the Texas Heart®  
Institute, Houston

to arrive on site and take over the resuscitation efforts completely. In seniors and other adults, however, SCA is more often caused by de novo occlusion of a major coronary artery, in which case myocardial reperfusion is crucial for recovery. For this population, safe transfer to a top-level cardiovascular care center might be urgently necessary because of the possible need for emergency revascularization procedures.

Although these policy changes primarily affect schools, it is important that medical professionals get involved and create better conditions to effectively integrate this small improvement (increased compression-only resuscitation in the field) throughout the community. One would hope that such a positive innovation will be associated with a much larger community-based life-support project.<sup>10</sup>

At this juncture, it would be useful to measure the de facto results of this innovative program in a prospective, population-wide coordinated study. In fact, localities in which public involvement and organization regarding SCA treatment and prevention are relatively advanced (for example, communities in the states of Washington and Minnesota) have seen reduced mortality rates (46%) in comparison with less involved communities (such as Detroit), in which the SCA mortality rate is 100%.<sup>7</sup> This fact should inspire the public to involve children early in this crucially important component of healthcare delivery in the field. The dismal SCA outcomes observed in unprepared communities can be changed dramatically with realistic and feasible improvements of the emergency healthcare system, starting with changes in the local community, where a crisis typically occurs unexpectedly.

## References

1. American Heart Association. Facts. A race against the clock. Out-of-hospital cardiac arrest [Internet]. Available from: [http://www.heart.org/idc/groups/heart-public/@wcm/@adv/documents/downloadable/ucm\\_461797.pdf](http://www.heart.org/idc/groups/heart-public/@wcm/@adv/documents/downloadable/ucm_461797.pdf) [2014 Mar; cited 2015 Jul 7].
2. Sasson C, Rogers MA, Dahl J, Kellermann AL. Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis. *Circ Cardiovasc Qual Outcomes* 2010;3(1):63-81.
3. White RD. 2005 American Heart Association guidelines for cardiopulmonary resuscitation: physiologic and educational rationale for changes. *Mayo Clin Proc* 2006;81(6):736-40.
4. American Heart Association. CPR in schools [Internet]. Available from: <http://www.heart.org/cpr/schools> [cited 2015 Jul 7].
5. Sorets TR, Mateen FJ. Mandatory CPR training in US high schools. *Mayo Clin Proc* 2015;90(6):710-2.
6. McKee C. CPR training now required for high school graduation in Texas [Internet]. Available from: [http://www.hillcountrynews.com/news/article\\_eacd89f6-3448-11e4-8bb9-0019bb2963f4.html](http://www.hillcountrynews.com/news/article_eacd89f6-3448-11e4-8bb9-0019bb2963f4.html) [2014 Sep 3; cited 2015 Jul 7].
7. Eisenberg M, White RD. The unacceptable disparity in cardiac arrest survival among American communities. *Ann Emerg Med* 2009;54(2):258-60.
8. Malta Hansen C, Kragholm K, Pearson DA, Tyson C, Monk L, Myers B, et al. Association of bystander and first-responder intervention with survival after out-of-hospital cardiac arrest in North Carolina, 2010-2013. *JAMA* 2015;314(3):255-64.
9. Angelini P, Cheong B, Uribe C, Ali SW, Elayda M, Willerson J. Results of systematic MRI-based pre-participation screening of school children: the sample size issue [abstract]. *J Am Coll Cardiol* 2015;65(10 Suppl):A1305.
10. ECC Committee, Subcommittees and Task Forces of the American Heart Association. 2005 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Part 2: ethical issues. *Circulation* 2005;112(24 Suppl):IV1-203.