

# "Kids Save Lives": Educating Schoolchildren in Cardiopulmonary Resuscitation Is a Civic Duty That Needs Support for Implementation

Bernd W. Böttiger, MD, ML, DEAA, FESC, FERC; Federico Semeraro, MD, FERC; Sabine Wingen, MA

C udden out-of-hospital cardiac arrest (OOHCA) is most D probably the third leading cause of death in industrialized nations.<sup>1</sup> We expect that up to 400 000 people will die of OOHCA in the United States each year, and the same applies to Europe and many areas of the world.<sup>2,3</sup> The most important measure to improve survival from cardiac arrest with good neurologic function is the immediate start of cardiopulmonary resuscitation (CPR) procedures by bystanders.<sup>4</sup> Following cardiocirculatory arrest and no blood flow, the brain can survive for only 3 to 5 minutes without any damage; however, emergency medical service systems anywhere in the world likely will not arrive until more than 6, 8, 10, or more minutes have passed, depending on the country, system configuration, geography, and other factors.<sup>4</sup> Consequently, in almost all cases, emergency medical services come too late for those with OOHCA.

It is well known and scientifically proven that initiation of CPR by lay bystanders increases survival rates at least 2- to 3-fold.<sup>4-6</sup> In this respect, lay CPR is much better and more effective than any other therapeutic intervention following OOHCA.<sup>4</sup> In most countries, however, lay CPR rates are <30%. In very few countries are lay CPR rates 40% to 60%—or maybe >70%.<sup>7</sup>

If we could achieve lay CPR rates of 60% to 80% all over the world, this would immediately result in 200 000 to 300 000 additional survivors after OOHCA.<sup>4</sup> There are several effective

ways to increase lay CPR rates, for example, through continuous media activities, dispatcher-assisted "telephone CPR," CPR education in adults, CPR education in schoolchildren, and first-responder systems.<sup>4,6</sup> All of these options are recommended in the 2015 CPR guidelines,<sup>8,9</sup> and all are useful and feasible.

We have seen in several countries that educating schoolchildren in CPR is particularly associated with an



**Figure 1.** The international "Kids Save Lives" initiative is represented by this logo that was developed by the Italian Resuscitation Council (IRC). The IRC has approved use of this logo at no cost for all Kids Save Lives activities and campaigns. Reproduced with permission from Elsevier.<sup>10</sup>

The opinions expressed in this article are not necessarily those of the editors or of the American Heart Association.

From the Department of Anesthesiology and Intensive Care Medicine, University Hospital of Cologne, Germany (B.W.B., S.W.); Department of Anesthesia and Intensive Care Medicine, Maggiore Hospital, Bologna, Italy (F.S.).

**Correspondence to:** Bernd W. Böttiger, MD, ML, DEAA, FESC, FERC, Department of Anesthesiology and Intensive Care Medicine, University Hospital of Cologne, Kerpener Straße 62, Köln D-50937, Germany. E-mail: bernd.boettiger@uk-koeln.de

J Am Heart Assoc. 2017;6:e005738. DOI: 10.1161/JAHA.117.005738.

<sup>© 2017</sup> The Authors. Published on behalf of the American Heart Association, Inc., by Wiley Blackwell. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.





increase in lay CPR rates and survival following OOHCA.<sup>6,10–12</sup> Training schoolchildren in CPR is easy and cost-effective and has already become a worldwide initiative (Figure 1).<sup>10</sup> We know that such training should start by age  $\leq$ 12 years and should last for at least 2 hours per year as long as children go

to school.<sup>10–13</sup> Training can be conducted effectively by both medical professionals and educated teachers, and high-fidelity or low-cost manikins and equipment can be used successfully.<sup>10,14–16</sup> Educating schoolchildren in CPR not only increases their capabilities in CPR but also enhances social

interaction and social competencies and is often a lot of fun for the pupils and the teachers.<sup>10</sup> Following their training, schoolchildren serve as multipliers. A homework assignment could be to show 10 additional people how to do CPR within the next 2 weeks.<sup>10</sup>

It is no wonder that several US states, although not all, have started to educate schoolchildren in CPR. In Europe, educating schoolchildren in CPR is mandated by law in 5 countries and recommended in another 16 countries of 34 that took part in a recent survey of the European Resuscitation Council Research Network (Figure 2).<sup>17</sup>

This issue of *JAHA* includes a nationwide investigation by Carolina Malta Hansen and coworkers of CPR training in schools 8 years after mandating legislation in Denmark,<sup>18</sup> where a national initiative started in 2001 to increase lay CPR rates throughout the country.<sup>6</sup> Using a practical approach with media campaigns and many other measures, and with implementing mandatory education of schoolchildren in CPR in 2005, the survival rates following OOHCA increased 3-fold by 2010.<sup>6</sup>

The current article investigates the effectiveness of the Danish law on educating schoolchildren.<sup>18</sup> The results are not as encouraging as hoped. CPR education in schoolchildren is not implemented in many schools in Denmark.<sup>18</sup> There is much room for improvement. Nevertheless, survival rates following OOHCA tripled within a 10-year period following the Danish national initiative.<sup>6</sup> Additional work to implement nationwide training of schoolchildren in CPR could increase the survival rate following OOHCA even more. The present study also demonstrates that even in a country with engaged medical professionals, politicians, teachers, educators, and pupils and with a strong national initiative, more support is needed to promote education of schoolchildren in CPR in all Danish schools.<sup>18</sup>

Denmark is one of the most active countries in furthering the national initiative to increase lay CPR rates.<sup>6</sup> And it is one of 5 European countries in which legislation for CPR education in schools exists.<sup>17</sup> Despite the fact that, since 2005, legislation has mandated that students should be trained in CPR by the time they graduate from middle school,<sup>6</sup> CPR training of schoolchildren in Denmark has not been implemented successfully.<sup>18</sup> This situation is likely even worse in other countries. Several factors were associated with completed CPR training in schools in Denmark: belief that other schools were conducting training, awareness of mandating legislation, presence of a school CPR training coordinator, teachers who felt competent to conduct training, and easy access to CPR training material.<sup>18</sup> In addition to legislation, implementation is a key issue to increase the number of schoolchildren educated in CPR. Additional efforts are necessary to successfully implement CPR training in all schools, and the factors listed above should be emphasized for further

improvements. Moreover, teachers should probably be trained in CPR education while at university, as in Norway, and legislation must always include clear sources of adequate funding.<sup>18</sup>

Today we know that one of the most effective ways to increase lay CPR rates in a country is by educating schoolchildren in CPR.<sup>6,10</sup> With such an approach and with schoolchildren as multipliers, lay CPR rates can be increased successfully and rapidly throughout a country.<sup>6</sup> Such an approach should be mandated by law in all countries around the world, as stated in the interdisciplinary "Kids Save Lives" statement that was endorsed by the World Health Organization in 2015.<sup>19</sup> We can see in Denmark and elsewhere that such a law must be followed and supported by an effective implementation strategy throughout the country.<sup>20</sup>

### Acknowledgments

Böttiger is supported by the European Resuscitation Council Research Network.

### **Disclosures**

Böttiger is the European Resuscitation Council Board Director of Science and Research; Associate Editor of the *European Journal of Anaesthesiology*; Speakers honorarium from Medupdate, FoMF, Baxalta, Bayer Vital; Chairman, German Resuscitation Council; Board Member, German Society of Interdisciplinary Intensive Care and Emergency Medicine; Associated Editor, Resuscitation. Federico Semeraro is Chairman, Italian Resuscitation Council (IRC). Wingen has no conflicts. Böttiger is member of the Advanced Life Support Task Force of the International Liaison Committee on Resuscitation (ILCOR).

#### References

- 1. Taniguchi D, Baernstein A, Nichol G. Cardiac arrest: a public health perspective. *Emerg Med Clin North Am.* 2012;30:1–12.
- 2. Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, Das SR, de Ferranti S, Després JP, Fullerton HJ, Howard VJ, Huffman MD, Isasi CR, Jiménez MC, Judd SE, Kissela BM, Lichtman JH, Lisabeth LD, Liu S, Mackey RH, Magid DJ, McGuire DK, Mohler ER III, Moy CS, Muntner P, Mussolino ME, Nasir K, Neumar RW, Nichol G, Palaniappan L, Pandey DK, Reeves MJ, Rodriguez CJ, Rosamond W, Sorlie PD, Stein J, Towfighi A, Turan TN, Virani SS, Woo D, Yeh RW, Turner MB; American Heart Association Statistics Committee; Stroke Statistics Subcommittee. Executive summary: heart disease and stroke statistics—2016 update: a report from the American Heart Association. *Circulation*. 2016;133:447–454.
- Strategies to Improve Cardiac Arrest Survival. Available at: http://www.na p.edu/catalog/21723/strategies-to-improve-cardiac-arrest-survival-a-time-toact. Accessed February 12, 2017.
- Böttiger BW. "A Time to Act"—Anaesthesiologists in resuscitation help save 200,000 lives per year worldwide: school children, lay resuscitation, telephone-CPR, IOM and more. *Eur J Anaesthesiol.* 2015;32:825–827.
- Böttiger BW, Grabner C, Bauer H, Bode C, Weber T, Motsch J, Martin E. Long term outcome after out-of-hospital cardiac arrest with physician staffed emergency medical services: the Utstein style applied to a midsized urban/ suburban area. *Heart*. 1999;82:674–679.

- Wissenberg M, Lippert FK, Folke F, Weeke P, Hansen CM, Christensen EF, Jans H, Hansen PA, Lang-Jensen T, Olesen JB, Lindhardsen J, Fosbol EL, Nielsen SL, Gislason GH, Kober L, Torp-Pedersen C. Association of national initiatives to improve cardiac arrest management with rates of bystander intervention and patient survival after out-of-hospital cardiac arrest. *JAMA*. 2013;310: 1377–1384.
- Gräsner JT, Bossaert L. Epidemiology and management of cardiac arrest: what registries are revealing. *Best Pract Res Clin Anaesthesiol.* 2013;27:293–306.
- Neumar RW, Shuster M, Callaway CW, Gent LM, Atkins DL, Bhanji F, Brooks SC, de Caen AR, Donnino MW, Ferrer JM, Kleinman ME, Kronick SL, Lavonas EJ, Link MS, Mancini ME, Morrison LJ, O'Connor RE, Samson RA, Schexnayder SM, Singletary EM, Sinz EH, Travers AH, Wyckoff MH, Hazinski MF. Part 1: executive summary: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation.* 2015;132:S315–S367.
- Perkins GD, Handley AJ, Koster RW, Castrén M, Smyth MA, Olasveengen T, Monsieurs KG, Raffay V, Gräsner JT, Wenzel V, Ristagno G, Soar J; Adult basic life support and automated external defibrillation section Collaborators. European Resuscitation Council Guidelines for Resuscitation 2015: section 2. Adult basic life support and automated external defibrillation. *Resuscitation*. 2015;95:81–99.
- Böttiger BW, Bossaert LL, Castrén M, Cimpoesu D, Georgiou M, Greif R, Grünfeld M, Lockey A, Lott C, Maconochie I, Melieste R, Monsieurs KG, Nolan JP, Perkins GD, Raffay V, Schlieber J, Semeraro F, Soar J, Truhlář A, Van de Voorde P, Wyllie J, Wingen S; Board of European Resuscitation Council (ERC). Kids Save Lives—ERC position statement on school children education in CPR.: "Hands that help—Training children is training for life". *Resuscitation*. 2016;105:A1–A3.
- Bohn A, Lukas RP, Breckwoldt J, Böttiger BW, Van Aken H. 'Kids save lives': why schoolchildren should train in cardiopulmonary resuscitation. *Curr Opin Crit Care*. 2015;21:220–225.
- Böttiger BW, Van Aken H. Training children in cardiopulmonary resuscitation worldwide. *Lancet.* 2015;385:2353.
- 13. Greif R, Lockey AS, Conaghan P, Lippert A, De Vries W, Monsieurs KG; Education and implementation of resuscitation section Collaborators.

European Resuscitation Council Guidelines for Resuscitation 2015: section 10. Education and implementation of resuscitation. *Resuscitation*. 2015;95: 288–301.

- De Buck E, Van Remoortel H, Dieltjens T, Verstraeten H, Clarysse M, Moens O, Vandekerckhove P. Evidence-based educational pathway for the integration of first aid training in school curricula. *Resuscitation*. 2015;94:8–22.
- Lukas RP, Van Aken H, Mölhoff T, Weber T, Rammert M, Wild E, Bohn A. Kids save lives: a six-year longitudinal study of schoolchildren learning cardiopulmonary resuscitation: who should do the teaching and will the effects last? *Resuscitation*. 2016;101:35–40.
- Plant N, Taylor K. How best to teach CPR to schoolchildren: a systematic review. Resuscitation. 2013;84:415–421.
- Semeraro F, Wingen S, Schroeder DC, Ecker H, Scapigliati A, Ristagno G, Böttiger BW. KIDS SAVE LIVES implementation in Europe: a survey through the ERC Research NET. *Resuscitation*. 2016;107:e7–e9.
- Malta Hansen C, Zinckernagel L, Kjær Ersbøll A, Tjørnhøj-Thomsen T, Wissenberg M, Knudsen Lippert F, Weeke P, Hilmar Gislason G, Køber L, Torp-Pedersen C, Folke F. Cardiopulmonary resuscitation training in schools following eight years of mandating legislation in Denmark: a nationwide survey. J Am Heart Assoc. 2017;6:e004128. DOI: 10.1161/JAHA.116.004128.
- Böttiger BW, Van Aken H. Kids save lives—Training school children in cardiopulmonary resuscitation worldwide is now endorsed by the World Health Organization (WHO). *Resuscitation*. 2015;94:A5–A7.
- KIDS SAVE LIVES—saving a life is a child's play (video free for distribution in all channels). Available at: https://www.youtube.com/watch?v=0Yf 4umHnD3c. Accessed March 5, 2017.

**Key Words:** Editorials • bystander cardiopulmonary resuscitation • cardiac arrest • cardiopulmonary resuscitation • KIDS SAVE LIVES • schoolchildren education in cardiopulmonary resuscitation





## "Kids Save Lives": Educating Schoolchildren in Cardiopulmonary Resuscitation Is a Civic Duty That Needs Support for Implementation Bernd W. Böttiger, Federico Semeraro and Sabine Wingen

J Am Heart Assoc. 2017;6:e005738; originally published March 14, 2017; doi: 10.1161/JAHA.117.005738 The Journal of the American Heart Association is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231 Online ISSN: 2047-9980

The online version of this article, along with updated information and services, is located on the World Wide Web at: http://jaha.ahajournals.org/content/6/3/e005738

Subscriptions, Permissions, and Reprints: The *Journal of the American Heart Association* is an online only Open Access publication. Visit the Journal at http://jaha.ahajournals.org for more information.