

Cardiopulmonary resuscitation in Sweden – yesterday, today and tomorrow

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Abstract

In Sweden, the reported incidence and outcome of out-of-hospital cardiac arrest (OHCA) vary between counties. In the mid -1980s, a national programme in cardiopulmonary resuscitation (CPR) was developed and rescuers have been educated in CPR. Since 1990, Swedish OHCA data are to be reported to the Swedish Cardiac Arrest Register (SCAR).

The aim of this thesis was to describe and analyse the incidence and outcome of OHCA and the amount of national training in CPR from data reported to the SCAR and to the CPR training register. The data on OHCA were related to a variety of epidemiological and quality indicators.

Methods: this thesis is based on register data from both the SCAR and the CPR training register. The inclusion criteria were treated OHCA (I-IV), witnessed treated OHCA (V) and rescuers educated in CPR (I). The number of participants were:

I: CPR training register, 1983-2007, n=2 million rescuers, and SCAR, 1990-2007, n=45,775, II: SCAR, 2008-2009, n=6,457 registered manually or on the web and n=3,522 registered on the web, III: SCAR, 2008-2010, n=2,398 prospectively registered and n=800 retrospectively registered, IV: SCAR, 1992-2011, n=59,926, V: SCAR, 2008-2010, n=11,005.

Results: since 1983, 5,000 instructor-trainers have trained more than 50,000 instructors who have trained almost two million of Sweden's nine million inhabitants to perform adult CPR. The number of bystander CPR attempts for OHCA in Sweden increased from 31% (1992) to 55% (2007) (I). In 2008-2009, the number of reported OHCA varied between 13 and 52 per 100,000 inhabitants and year. Bystander CPR, cardiac aetiology and longer emergency medical service (EMS) response times were more frequent in less populated areas, but survival was not associated with population density (II). A validation process showed that, there was a 25% missing rate between 2008 and 2010 of OHCA reported to the SCAR. In the non-reported OHCA, patients were older and had less frequently received bystander CPR, but, despite this, they also had a higher survival rate (III). From 1992 to 2011, the OHCA reported to the SCAR increased from 27 to 52 per 100,000 inhabitants and year. Survival to one month increased from 4.8% (1992) to 10.7% (2011), particularly among patients found in a shockable rhythm. This increase in survival was associated with signs of improvement in all four links of the chain of survival (IV). Furthermore, estimates indicate that, if the delay from collapse to 1) calling for an ambulance, 2) the start of CPR, and 3) the time to defibrillation is reduced to <2 min, <2min and <8 min respectively, approximately 300-400 additional lives could be saved (V).

Conclusions: there has been an impressive development in the preparedness for and treatment of patients suffering from OHCA in Sweden during the last 30 years. Improvements in various links in the chain of survival have resulted in a marked increase in survival after OHCA. It suggests that this figure will increase further if the delay to the start of treatment can be reduced still further.

Keywords: cardiac arrest, cardiopulmonary resuscitation, education, register, survival, validity

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Fakultetsopponent:
Professor Jo Kramer-Johansen
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This thesis is based on the following papers, referred to in the text by their Roman numerals:

- I. **Strömsöe A**, Andersson B, Ekström L, Herlitz J, Axelsson A, Göransson KE, Svensson L, Holmberg S. Education in cardiopulmonary resuscitation in Sweden and its clinical consequences. *Resuscitation*. 2010 Feb;81:211-6.
- II. **Strömsöe A**, Svensson L, Claesson A, Lindkvist J, Lundström A, Herlitz J. Association between population density and reported incidence, characteristics and outcome after out-of-hospital cardiac arrest in Sweden. *Resuscitation*. 2011 Oct;82:1307-13.
- III. **Strömsöe A**, Svensson L, Axelsson AB, Göransson K, Todorova L, Herlitz J. Validity of reported data in the Swedish Cardiac Arrest Register in selected parts in Sweden. *Resuscitation*. (E-pub 2013 Jan 8).
- IV. **Strömsöe A**, Svensson L, Axelsson AB, Claesson A, Göransson K, Nordberg P, Herlitz J. Improved long-term outcome in Sweden after out-of-hospital cardiac arrest due to improvements in the chain of survival with validated data. Submitted.
- V. **Strömsöe A**, Afzelius S, Axelsson C, Södersved Källestedt ML, Enlund M, Svensson L, Herlitz J. Improvements in logistics could increase survival after out-of-hospital cardiac arrest in Sweden. *J Intern Med*. (E-pub 2013 Jan 30).

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