The National Danish Registry on Out-of-Hospital Cardiac Arrest
National Danish Register on Out-of-Hospital Cardiac Arrest

- Freddy Lippert,
- EMS Copenhagen, University of Copenhagen
- Chair of Steering Committee of the NDR OHCA
- On behalf of the steering Committee
National Danish Registry on Out-of-Hospital Cardiac Arrest

- The history
- The organization
- The data collection
- The results
- The lessons learned
- The future
The short story with data

- [https://vimeo.com/109105704](https://vimeo.com/109105704)

I foråret 2013 falder Ebbe om på sin arbejdsplads – heldigvis er der mennesker omkring ham, der er parate til at redde hans liv
The National Danish Register on Out-of-Hospital Cardiac Arrest

- Established in 2000
- First data from July 2001
- National Register
  on all out-of-hospital cardiac arrests
The National Danish Register for Out of Hospital Cardiac Arrest

Organisation

- The Database is owned by the pre-hospital organisations (EMS) in the five health care regions
- The steering committee: Medical directors of 5 EMS and TrygFonden
- Associated members: for research
- Financial support (unrestricted grant) by private foundation www.TrygFonden.dk
National Danish Register on Out-of-Hospital-Cardiac Arrest

EMS medical directors
- Freddy Lippert Region Hovedstaden (Chair)
- Erika Christensen Region Midt
- Ole Mazur Hendriksen Region Sjælland
- Torsten Lang-Jensen Region Syd
- Poul A. Hansen Region Nord

Associated researcher
- Christian Torp-Pedersen, professor
- Mads Wissenberg, Ph.d. student

Funding
- Grethe Thomas, TrygFonden (www.trygfonden.dk)
The National Danish Register for Out-of-Hospital Cardiac Arrest

Data collection
- Data collection by EMS (ambulances and physician manned mobile emergency care units – “lægebiler”)
- National Unique personal identification number (unique ID)
- Quality control by local ambulance services and research-group
- Combining data with other national registries
- Statistical analyses
Danish Cardiac Arrest Register

Data registration Utstein template

- **Patient data**
  - Civil registration number ~ gender, age, vital status, etc.

- **Factors directly related to the cardiac arrest**
  - Date and time of event
  - Location of arrest
  - Witnessed or not
  - Presumed aetiology (cardiac or non-cardiac)
  - Bystander intervention (CPR and AED use)
  - First recorded cardiac rhythm
  - Time intervals (estimated time of arrest, arrival of EMS)
  - ROSC
  - Status on arrival at the hospital
  - Status on survival – 1 year follow up

Inclusion criteria: CPR attempted by laypersons or EMS
Study Setting:

5.7 millions inhabitants and a 43,000 km² area
June 2001–December 2011 in Denmark

Study population:

All patients with OHCA confirmed by;
Clinical cardiac arrest with resuscitation attempt
CPR and/or defibrillation)

32,883 patients were included

~ 57.4 per 100,000 persons per year
Association of National Initiatives to Improve Cardiac Arrest Management With Rates of Bystander Intervention and Patient Survival After Out-of-Hospital Cardiac Arrest

Wissenberg et al

Original Investigation

Association of National Initiatives to Improve Cardiac Arrest Management With Rates of Bystander Intervention and Patient Survival After Out-of-Hospital Cardiac Arrest

Mads Wissenberg, MD; Freddy K. Lippert, MD; Fredrik Folke, MD, PhD; Peter Weeke, MD; Carolina Malta Hansen, MD; Erika Frischknecht Christensen, MD; Henning Jans, MD; Poul Anders Hansen, MD; Torsten Lang-Jensen, MD; Jonas Bjerring Olesen, MD; Jesper Lindhardsen, MD; Emil L. Fosbol, MD, PhD; Søren L. Nielsen, MD; Gunnar H. Gislason, MD, PhD; Lars Kober, MD, DSc; Christian Torp-Pedersen, MD, DSc

IMPORTANTCE Out-of-hospital cardiac arrest is a major health problem associated with poor outcomes. Early recognition and intervention are critical for patient survival. Bystander cardiopulmonary resuscitation (CPR) is one factor among many associated with improved survival.

OBJECTIVE To examine temporal changes in bystander resuscitation attempts and survival during a 10-year period in which several national initiatives were taken to increase rates of bystander resuscitation and improve advanced care.

DESIGN, SETTING, AND PARTICIPANTS Patients with out-of-hospital cardiac arrest for which resuscitation was attempted were identified between 2001 and 2010 in the nationwide Danish Cardiac Arrest Registry. Of 29,111 patients with cardiac arrest, we excluded those with presumed noncardiac cause of arrest (n = 7,390) and those with cardiac arrests witnessed by emergency medical services personnel (n = 2,253), leaving a study population of 19,468.
Results

• Cardiac arrest ~ 57.4 per 100,000 inhabitants
• Number of survivals per 100,000 inhabitants increased significantly from 1.4% to 3.7%
• Number of lives saved per year increased from 75 in 2002 to 195 in 2010 (one year survival)

• For witness cardiac
  • survival rate: 6.1% without bystander CPR
  • survival rate 19.4% with bystander CPR.
Survival with or without bystander CPR!

**WITHOUT** bystander CPR

**With** Bystander CPR
Table 1. Changes in Characteristics for Patients During the Study Period

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OHCA, No. (%)</td>
<td>1262 (6.5)</td>
<td>2282 (11.7)</td>
<td>2278 (11.7)</td>
<td>2100 (10.8)</td>
<td>2095 (10.8)</td>
<td>1890 (9.3)</td>
<td>1819 (9.5)</td>
<td>1849 (10.2)</td>
<td>1987 (10.2)</td>
<td>1906 (9.8)</td>
<td>19468 (100)</td>
<td>0c</td>
</tr>
<tr>
<td>Age, median (IQR, y)</td>
<td>71 (62-80)</td>
<td>71 (61-80)</td>
<td>71 (61-80)</td>
<td>72 (61-81)</td>
<td>72 (61-81)</td>
<td>72 (61-81)</td>
<td>71 (61-80)</td>
<td>72 (61-81)</td>
<td>73 (63-81)</td>
<td>&lt;.001</td>
<td>72 (61-80)</td>
<td>0c</td>
</tr>
<tr>
<td>Men</td>
<td>71 (61-78)</td>
<td>70 (59-78)</td>
<td>70 (59-79)</td>
<td>70 (60-79)</td>
<td>70 (61-78)</td>
<td>70 (60-79)</td>
<td>70 (61-79)</td>
<td>70 (60-79)</td>
<td>70 (61-79)</td>
<td>.60</td>
<td>70 (60-79)</td>
<td>0c</td>
</tr>
<tr>
<td>Women</td>
<td>73 (63-82)</td>
<td>75 (65-82)</td>
<td>73 (63-83)</td>
<td>75 (65-83)</td>
<td>75 (64-83)</td>
<td>75 (65-83)</td>
<td>77 (64-84)</td>
<td>75 (65-85)</td>
<td>76 (65-85)</td>
<td>&lt;.001</td>
<td>75 (63-85)</td>
<td>0c</td>
</tr>
<tr>
<td>Men, No. (%)</td>
<td>884 (70.1)</td>
<td>1509 (66.1)</td>
<td>1531 (67.2)</td>
<td>1386 (66.0)</td>
<td>1432 (68.4)</td>
<td>1297 (68.6)</td>
<td>1207 (66.4)</td>
<td>1252 (67.7)</td>
<td>1355 (68.2)</td>
<td>1258 (66.0)</td>
<td>13111 (67.4)</td>
<td>0c</td>
</tr>
<tr>
<td>Cardiac arrest in private home, No. (%)</td>
<td>601 (69.6)</td>
<td>1243 (72.2)</td>
<td>1309 (72.4)</td>
<td>1279 (73.7)</td>
<td>1331 (74.1)</td>
<td>1080 (77.2)</td>
<td>1146 (75.8)</td>
<td>1260 (75.5)</td>
<td>1447 (75.0)</td>
<td>1387 (75.5)</td>
<td>10832 (74.2)</td>
<td>3182 (16.3)</td>
</tr>
<tr>
<td>Bystander-witnessed arrest, No. (%)</td>
<td>599 (51.6)</td>
<td>992 (48.8)</td>
<td>1113 (53.2)</td>
<td>971 (50.2)</td>
<td>996 (50.4)</td>
<td>898 (52.7)</td>
<td>844 (51.2)</td>
<td>972 (53.3)</td>
<td>1069 (53.9)</td>
<td>1020 (52.4)</td>
<td>9474 (52.0)</td>
<td>1231 (6.3)</td>
</tr>
<tr>
<td>Bystander CPR, No. (%)</td>
<td>247 (21.1)</td>
<td>408 (20.0)</td>
<td>496 (23.6)</td>
<td>492 (25.4)</td>
<td>539 (27.2)</td>
<td>514 (29.2)</td>
<td>563 (24.1)</td>
<td>714 (30.2)</td>
<td>799 (40.5)</td>
<td>849 (44.0)</td>
<td>5621 (20.8)</td>
<td>1193 (6.1)</td>
</tr>
<tr>
<td>AED use by bystander, No. (%)</td>
<td>13 (1.1)</td>
<td>23 (1.1)</td>
<td>21 (1.0)</td>
<td>18 (0.9)</td>
<td>33 (1.7)</td>
<td>22 (1.3)</td>
<td>29 (1.8)</td>
<td>22 (1.3)</td>
<td>24 (1.4)</td>
<td>36 (1.4)</td>
<td>241 (1.4)</td>
<td>1829 (9.4)</td>
</tr>
<tr>
<td>Time interval, median (IQR, min)</td>
<td>11 (6-19)</td>
<td>11 (6-18)</td>
<td>10 (5-17)</td>
<td>10 (6-17)</td>
<td>11 (6-17)</td>
<td>11 (6-18)</td>
<td>12 (7-17)</td>
<td>12 (7-19)</td>
<td>13 (8-20)</td>
<td>&lt;.001</td>
<td>11 (6-18)</td>
<td>3394 (17.4)</td>
</tr>
<tr>
<td>Shockable heart rhythm, No. (%)</td>
<td>351 (32.2)</td>
<td>498 (25.6)</td>
<td>484 (23.5)</td>
<td>457 (22.6)</td>
<td>542 (26.5)</td>
<td>559 (30.8)</td>
<td>488 (29.4)</td>
<td>513 (29.9)</td>
<td>570 (30.4)</td>
<td>&lt;.001</td>
<td>4981 (27.6)</td>
<td>1429 (7.3)</td>
</tr>
<tr>
<td>Survival, No. (%)</td>
<td>91 (7.9)</td>
<td>140 (9.8)</td>
<td>202 (10.2)</td>
<td>193 (10.4)</td>
<td>203 (10.4)</td>
<td>211 (12.5)</td>
<td>217 (13.8)</td>
<td>310 (18.8)</td>
<td>362 (20.7)</td>
<td>&lt;.001</td>
<td>2283 (13.2)</td>
<td>2145 (11.0)</td>
</tr>
<tr>
<td>30-d</td>
<td>44 (3.5)</td>
<td>86 (3.8)</td>
<td>102 (4.5)</td>
<td>102 (4.9)</td>
<td>104 (5.0)</td>
<td>143 (7.6)</td>
<td>136 (7.5)</td>
<td>189 (10.2)</td>
<td>203 (10.8)</td>
<td>&lt;.001</td>
<td>1315 (6.8)</td>
<td>0c</td>
</tr>
<tr>
<td>1-y</td>
<td>37 (2.9)</td>
<td>75 (3.3)</td>
<td>90 (4.0)</td>
<td>87 (4.1)</td>
<td>100 (4.8)</td>
<td>133 (7.0)</td>
<td>122 (6.7)</td>
<td>173 (9.3)</td>
<td>184 (10.2)</td>
<td>&lt;.001</td>
<td>1196 (6.1)</td>
<td>0c</td>
</tr>
</tbody>
</table>

Abbreviations: AED, automated external defibrillator; CPR, cardiopulmonary resuscitation; IQR, interquartile range; OHCA, out-of-hospital cardiac arrest.

a 2001 consists of 7 months from June to December.

b P < .05 considered statistically significant.

c Patients with invalid or missing civil registration number, used to link information on patient’s age, sex, and survival status, were excluded from the analysis.

d Estimated time interval from recognition of OHCA to rhythm analysis by emergency medical service.
Lessons learned

- Commitment from organizations /key persons, motivation and contracts
- Commitment from ambulance personal: motivation and contract
- Continually follow-up of data collection
- Strong team of statisticians and researchers
- Funding - ongoing
Lessons learned

- Clearly define inclusion criteria
- Make data collection as simple as possible (Utstein) and as good as possible
- Ensure a simple procedure for handling the collected data
- Data registration must be well-defined (who, when and how) and only changed if absolutely necessary
- Minimize time from event to final validation of data
- Early follow-up of data / missing data
The future...

- Electronic data collection as part of electronic patient chart in ambulances
- Electronic recording of all time intervals and vital signs
- On-line data to emergency medical dispatch center
- Early feedback to ambulance personnel
- Benchmarking of performance (local, regional and international)
The reward – You get...

- National data on performance on a key indicator of EMS and the four links in the chain of survival
- Important information on how to improve your system and prepare for tomorrow
- A treasure of data for research and scientific publications
The reward – You get...

- Norway will be part of the exclusive international elite of countries with national and validated data on out-of-hospital cardiac arrest
- Sweden, Denmark and Norway!
- Japan...
Establishing a national registry on OHCA has been a long and difficult process and complicated by local interest, a paper based registration and lack of funding for getting data out.

It has all been worthwhile for society, for the emergency medical services, for research, and for future patients!

We now know where we are and what direction to go!