Resuscitation Academy
Case Denmark
Implementing the 10 steps/programs in Denmark
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Freddy-K-Lippert
The Capital Region of Denmark
Emergency Medical Services Copenhagen
Denmark known for…

• Danish Pastry
Denmark known for …

• The Little Mermaid
Denmark known for ....

The Danish Crown Princess Mary
Denmark known for….

• “The Danish Case”
  Tripling survival after OHCA
10 years of experiences in the next 15 minutes

- Case Denmark – Tripling survival
- How did we achieve this?
- How to improve further – next steps?
The past in Denmark....

In 2001 in Denmark ......

• Survival rate (30 days): 3%
• Bystander CPR rate: 20%
The past in Denmark….

- We had a vision
- We had no specific plan – trial and error
JAMA October 2013

• 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

Results  (JAMA 2013 Wisseberg et al)

• Bystander CPR increased from 21 % to 45 %
• Survival to hospital increased from 8 % to 22%
• 30 days survival increased from 3.5% to 10.8 %
• 1 year survival increased from 3.5% to 10.2%
Temporal trends in ROSC on arrival at the hospital and 30-day survival

Calendar Year


ROSC on arrival at the hospital

30-day survival

** p<0.001
Temporal trends in Bystander CPR, Witnessed status and Shockable heart rhythm

* P < 0.05  ** P < 0.001
Long-Term Survival in relation to First Recorded Heart Rhythm, 2001-2012

Year
Survival, %
0 10 20 30 40

30-day survival (patients with a shockable rhythm)
1-year survival (patients with a shockable rhythm)
30-day survival (patients with a non-shockable rhythm)
1-year survival (patients with a non-shockable rhythm)

Shockable heart rhythm in patients WITH bystander CPR: 34.9%

Shockable heart rhythm in patients WITHOUT bystander CPR: 16.5%
Follow-up study: Do Cardiac arrest survivors return to work?
Circulation 2015

Return to Work in Out-of-Hospital Cardiac Arrest Survivors
A Nationwide Register-Based Follow-Up Study

Kristian Kragholm, MD; Mads Wissenberg, MD; Rikke Normark Mortensen, MSc; Kirsten Fonager, MD, PhD; Svend Eggert Jensen, MD, PhD; Shahzleen Rajan, MD; Freddy Knudsen Lippert, MD; Erika Frischknecht Christensen, MD; Poul Anders Hansen, MD; Torsten Lang-Jensen, MD; Ole Mazur Hendriksen, MD; Lars Kober, MD, DSc; Gunnar Gislason, MD, PhD; Christian Torp-Pedersen, MD, DSc; Bodil Steen Rasmussen, MD, PhD
Follow-up study: YES!

- 75% of those at work before sudden cardiac arrest returned to work
- The number of survivors has increased

AND

- During the time period: The percentage and the numbers of those returning to work have increased even more
Link to NEJM 2017 Kragholm et al

NEJM 2017 Results

- Rate of bystander CPR increased from 66.7% to 80.6%
- Rate of bystander defibrillation increased from 2.1% to 16.8%
- Rate of brain damage or nursing home admission decreased from 10.0% to 7.6%
- Most important was bystander CPR and bystander use of AED
The Danish AED network

- Network founded in Copenhagen (20% of population covered)
- Linkage to EMD centers in Copenhagen
- Nationwide linkage to EMD centers

General dissemination of AEDs
30 days survival following bystander CPR and/or bystander defibrillation from 2001 - 2014

Reported 3.500 OHCA p.a.
The Danish Cardiac Arrest Register
TrygFonden
National Data 2016

• Incidence of cardiac arrest: 60 per million
• Incidence of survival per 100,000 population: 6.4
• Bystander CPR 67% total and for witnessed 80%
• Survival 30 days for all cardiac arrests: 10.4%
• Survival 30 days for shockable cardiac arrests: 43%
• Survival 30 days for cardiac arrest in public places: 23%
• AED used by bystander in public places: 14%
• Survival 30 days for shockable and bystander CPR and use of AED:
Looking back: 10 programs ...

• Cardiac Registry
• Community program
• Dissemination of AED
• New technology (AED network)
• Dispatcher assisted CPR
To programs....

+++ Establish a cardiac arrest registry
++ Begin telephone-CPR with quality improvement
(+) Implement high performance CPR
++ Start rapid dispatch
(+) Measure professional resuscitations
++ Establish an AED program for first responders
+++ Use smart technologies to extend CPR and identify AED locations
+++ Make CPR and AED training mandatory in schools and communities
++ Work towards accountability
(-) Work towards a culture of excellence
Bystander CPR – the first link
Impact on survival
The Capital Region of Denmark
Emergency Medical Services Copenhagen

Ressources used

Impact on survival
Resuscitation Academy in Denmark – a national initiative
To programs….

• Establish a cardiac arrest registry (electronic patient chart)
• Begin telephone-CPR with quality improvement (Quality improvement and feedback)
• Implement high performance CPR (Monitoring and feedback)
• Start rapid dispatch (optimizing)
• Measure professional resuscitations (monitoring and individual feedback)
• Establish an AED program for first responders (including fire and police and heart runner)
• Use smart technologies to extend CPR and identify AED locations (videocalls, AI)
• Make CPR and AED training mandatory in schools and communities (further awareness)
• Work towards accountability (on-line data reporting and benchmarking)
• Work towards a culture of excellence (as individuals and organizations)
National RA implementation programs

- Low Dose High Frequency Training
- First Responders (Fire and Police)
- Recognition of Cardiac Arrest by Dispatchers
- Optimal defibrillation Procedure
- DA-CPR
- High Performance Training
The important role of medical dispatch and the first resuscitation team
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Emergency Medical Services Copenhagen

If an OHCA is suspected, the dispatcher activates the mobile phone positioning system and standard EMS at the same time. The location of all laypersons who are trained in CPR is then determined and matched with the location of the incoming emergency call.
Innovation in EMS –
AI for decision support in dispatch centre

Machine Learning
https://www.youtube.com/watch?v=c1rJZQ-LAhw&feature=youtu.be
Linderoth: CCTV and Cardiac Arrest

Challenges in out-of-hospital cardiac arrest – A study combining closed-circuit television (CCTV) and medical emergency calls∗

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Hackathon September 14-16 2018 in Copenhagen
Case Denmark: Everyone can save a life

https://www.youtube.com/watch?v=EDp4krk2--M
Few references

- Case Denmark: https://www.youtube.com/watch?v=EDp4krk2--M
- Ambulance from Denmark: https://www.youtube.com/watch?v=i7BiUHlgsY
- Impressions from EMS2018 https://emseurope.org/impressions-from-ems2018/
- Artificial Intelligence: https://www.youtube.com/watch?v=c1rJZQ-LAhw&feature=youtu.be
- Research and publications:
  - Acting on the Call fra the Global Resuscitation Alliance