



**ECCU 2017 CONFERENCE & EXHIBITION • A CALL TO ACTION...AND ALL THAT JAZZ!**

# **Improving Resuscitation: If at First You Don't Succeed: A Tale of 3 Systems**





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MEDICAL SCIENCES  
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**TrygFonden**

- Unrestricted research grants from the Laerdal Foundation



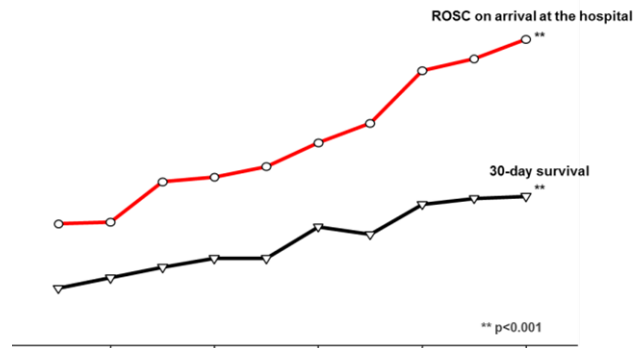
Laerdal Foundation  
helping save lives

**ECCU2017**   
Emergency Cardiovascular Care Update

 **CITIZEN CPR  
FOUNDATION**  
helping citizens and communities save lives

# Case Denmark

- The fairytale of the Ugly Duckling





# The past in Denmark....

In 2001 in Denmark .....

- Survival rate (30 days): 3%
- Bystander CPR rate: 20%
- We had a vision
- We had no plan – trial and error



# The journey to improving survival

1. In-hospital Critical Care
  2. In-hospital Emergency Department
  3. Prehospital care
  4. Emergency Medical Dispatch
  5. Community engagement and citizens CPR
- Data collection and research...
  - MiniAnne, School project, AED-location and AED-network and community programs

- 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
- JAMA. 2013;310(13):1377-1384.  
doi:10.1001/jama.2013.278483

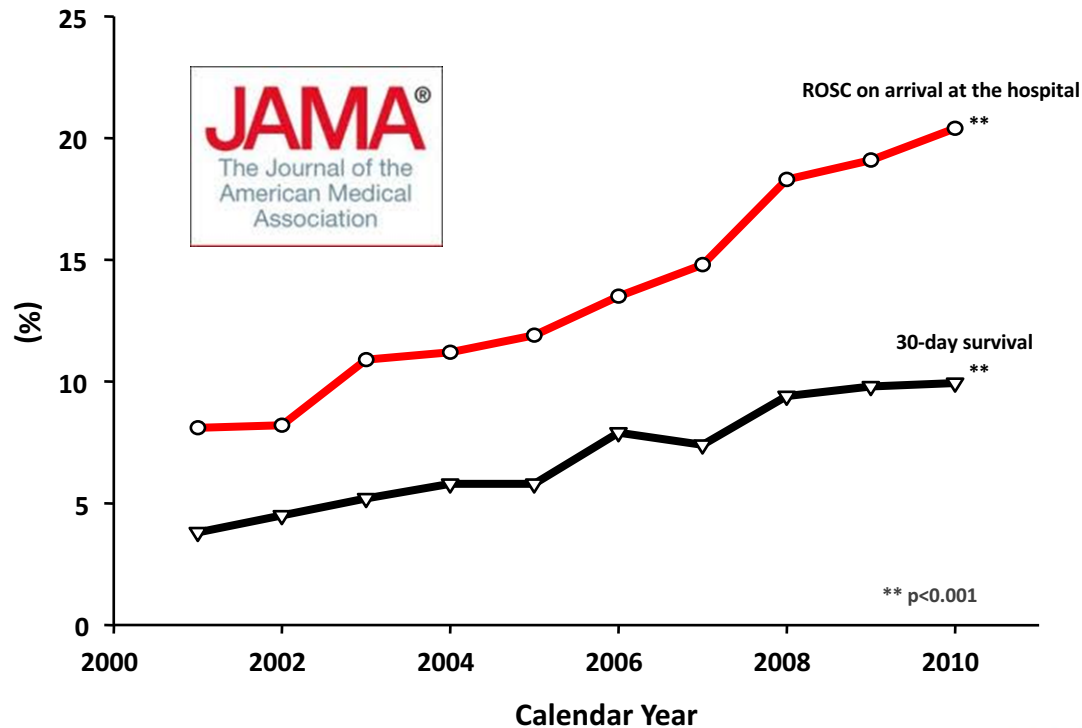


# Results



- 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%

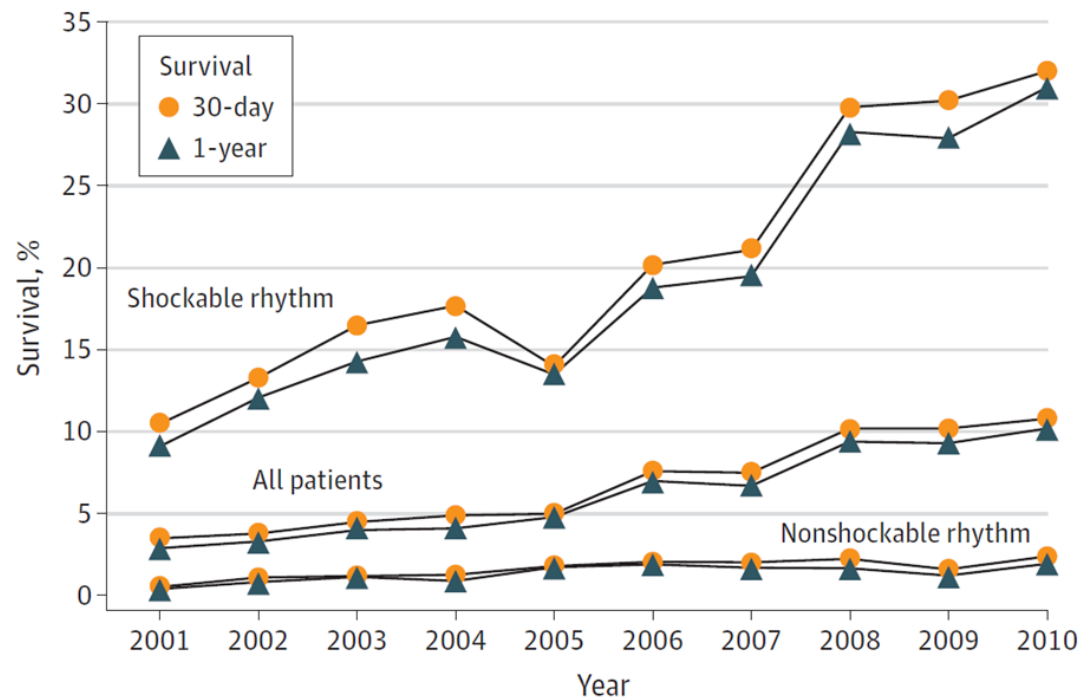
# Temporal trends in ROSC on arrival at the hospital and 30-day survival



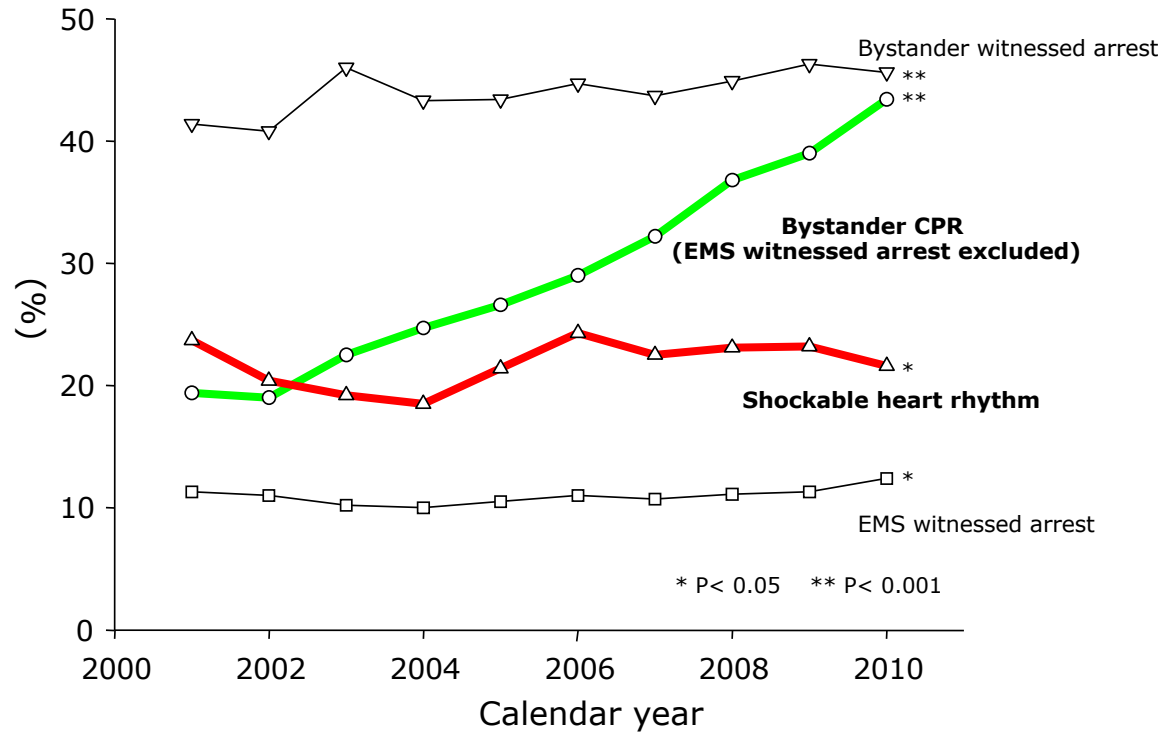


# Temporal trends in ROSC on arrival at the hospital and 30-day survival

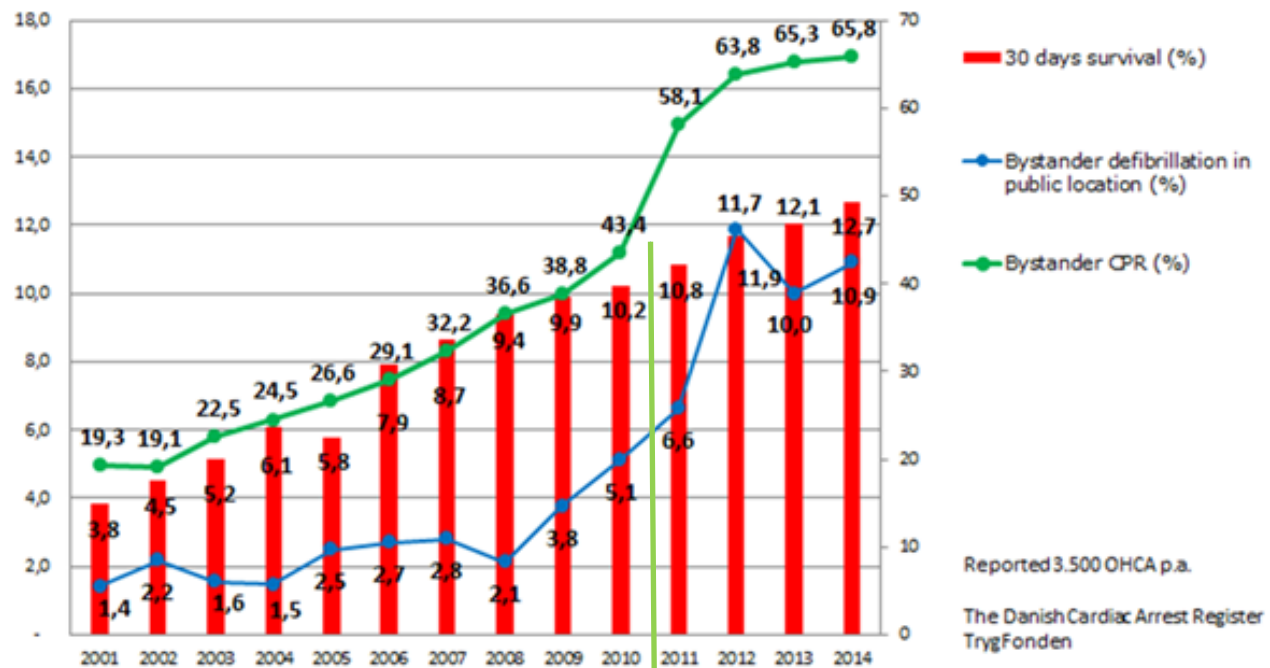
Figure 3. Survival Following Out-of-Hospital Cardiac Arrest, 2001-2010



# Temporal trends in Bystander CPR, Witnessed status and Shockable heart rhythm



30 days survival following bystander CPR and/or bystander defibrillation from 2001 -2014



Reference: GRA Paper



Global  
Resuscitation  
Alliance

Research

JAMA Cardiology | **Original Investigation**

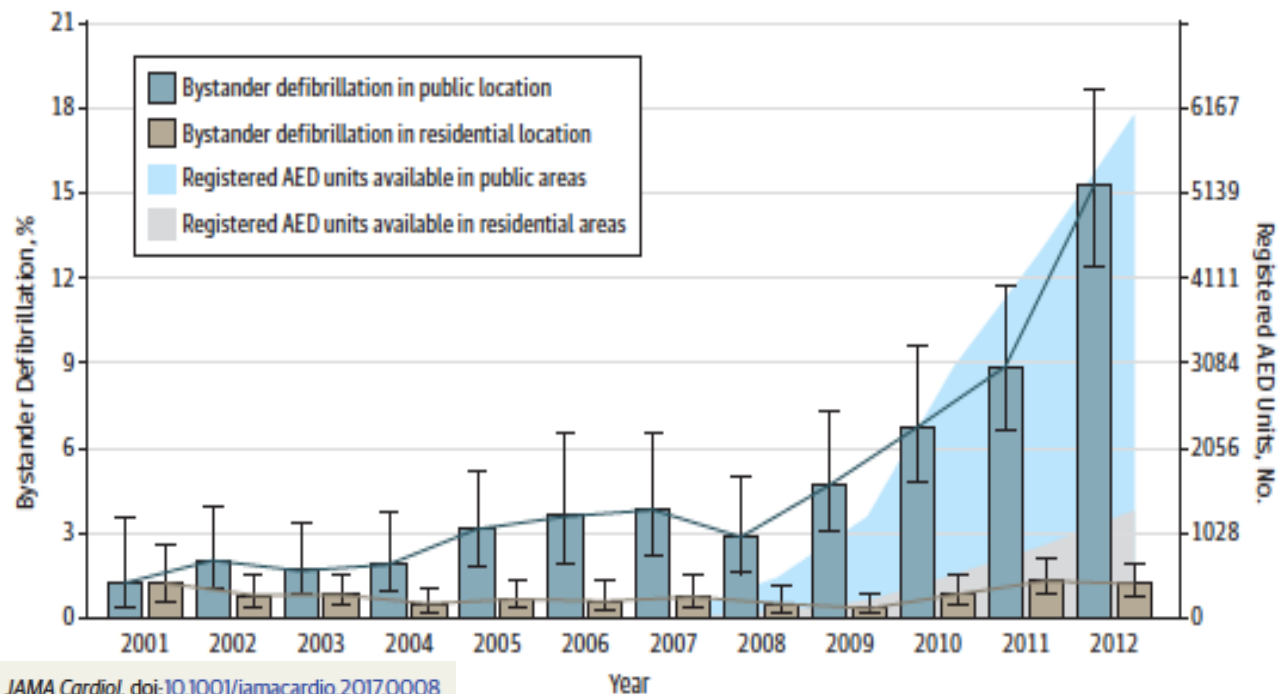
## Bystander Defibrillation for Out-of-Hospital Cardiac Arrest in Public vs Residential Locations

Steen Møller Hansen, MD; Carolina Malta Hansen, MD, PhD; Fredrik Folke, MD, PhD; Shahzleen Rajan, MD; Kristian Kragholm, MD, PhD; Linda Ejlskov, MSc, MA; Gunnar Gislason, MD, PhD; Lars Køber, MD, DMSc; Thomas A. Gerdts, Dr.rer.nat; Søren Hjortshøj, MD, PhD; Freddy Lippert, MD; Christian Torp-Pedersen, MD, DMSc; Mads Wissenberg, MD, PhD

*JAMA Cardiol.* doi:10.1001/jamacardio.2017.0008  
Published online March 15, 2017.

# Use of AEDs in Denmark 2001-2012

Figure 3. Bystander Defibrillation According to the Location of the Out-of-Hospital Cardiac Arrest (OHCA) and Registered Automated External Defibrillator (AED) Units



JAMA Cardiol. doi:10.1001/jamacardio.2017.0008  
Published online March 15, 2017.



# Follow-up study: Do Cardiac arrest survivors return to work?



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

Kristian Kragholm, Mads Wissenberg, Rikke Normark Mortensen, Kirsten Fonager, Svend Eggert Jensen, Shahzleen Rajan, Freddy Knudsen Lippert, Erika Frischknecht Christensen, Poul Anders Hansen, Torsten Lang-Jensen, Ole Mazur Hendriksen, Lars Kober, Gunnar Gislason, Christian Torp-Pedersen and Bodil Steen Rasmussen

*Circulation*. 2015;131:1682-1690; originally published online May 4, 2015;  
doi: 10.1161/CIRCULATIONAHA.114.011366

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Print ISSN: 0009-7322. Online ISSN: 1524-4539



# Follow-up study: Yes

- 75% of those at work before sudden cardiac arrest returned to work

AND

- Both the percentage and the numbers of those returning to work have increased even more during the study period



The NEW ENGLAND JOURNAL of MEDICINE

**Link to NEJM 2017 Kragholm et al**



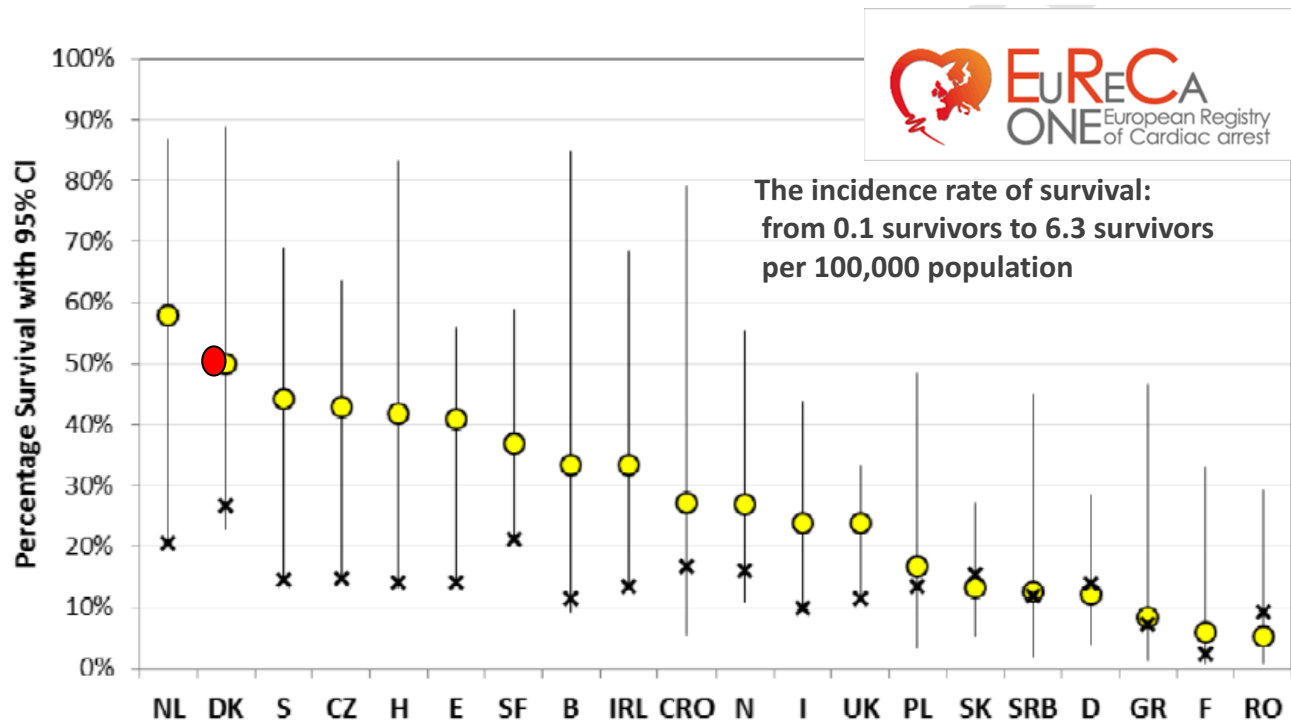
<http://www.nejm.org/doi/full/10.1056/NEJMoa1601891>

# 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%
- Bystander CPR has a huge impact on risk of brain damage or nursing home admission

# EURECA One study in Resuscitation 2016

## Survival to Hospital discharge in witnessed and shockable rhythm





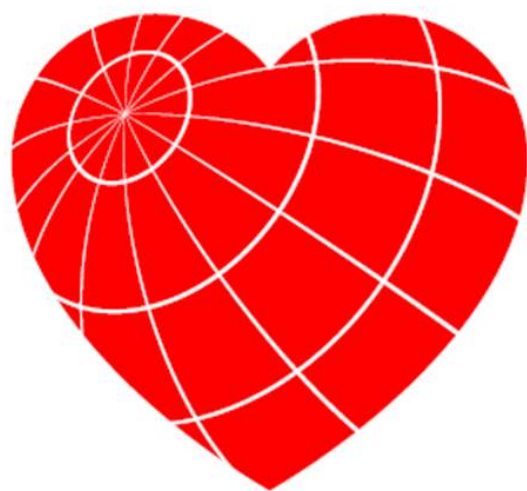
# How did we achieve this?

- We had an ambition: to increase bystander CPR
- Engaged the community and increasing bystanders CPR through a national cardiac arrest registry, AED-network, public awareness and collaboration with media, documentation and scientific data
- Political awareness and support
- Commitment and support from the Danish Foundation TrygFonden
- National EMS Collaboration









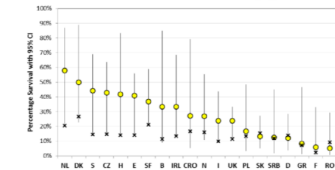
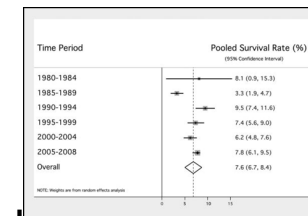
**Global  
Resuscitation  
Alliance**

- We have science and consensus
- We have the chain of survival
- We have education
 

The Utstein Formula for Survival

```

      graph LR
      A[Medical Science] -- x --> B[Educational Efficiency]
      B -- x --> C[Local Implementation]
      C -- = --> D[Survival]
      
```
- We have seen very little progress in survival
- We have huge disparity in outcome





# Utstein meeting 2015 and follow up meeting in 2016 in Copenhagen



- Utstein Meeting on Implementing Best Practices of EMS and Community Programs to Improve Survival from Out-of-Hospital Cardiac Arrest:
- What to do now?
- Outcome: The Global Resuscitation Alliance



Improving Survival from Out-of-Hospital Cardiac Arrest:



## A Call to Establish a Global Resuscitation Alliance



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Alliance

## Best Practice on Implementation

### 10 Steps to Improve Survival from OHCA

1. Cardiac arrest registry
2. Telephone CPR for more and better CPR
3. High performance EMS CPR
4. Rapid dispatch
5. CPR performance data
6. First responder AED programs
7. Smart technologies to expand CPR and PAD
8. CPR/AED training in schools and the community
9. Accountability
10. Work towards a culture of excellence

### Link to GRA white paper

<https://foundation915.files.wordpress.com/2016/07/a-call-to-establish-a-global-resuscitation-alliance-2016.pdf>





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## Programs

- Cardiac arrest registry
- Telephone CPR
- High performance CPR
- Rapid dispatch
- Measurement of professional resuscitation
- AED program for first responders
- Smart technologies for CPR and AED
- Mandatory training for CPR and AED
- Accountability
- Culture of excellence

Improved  
Survival

## Actions

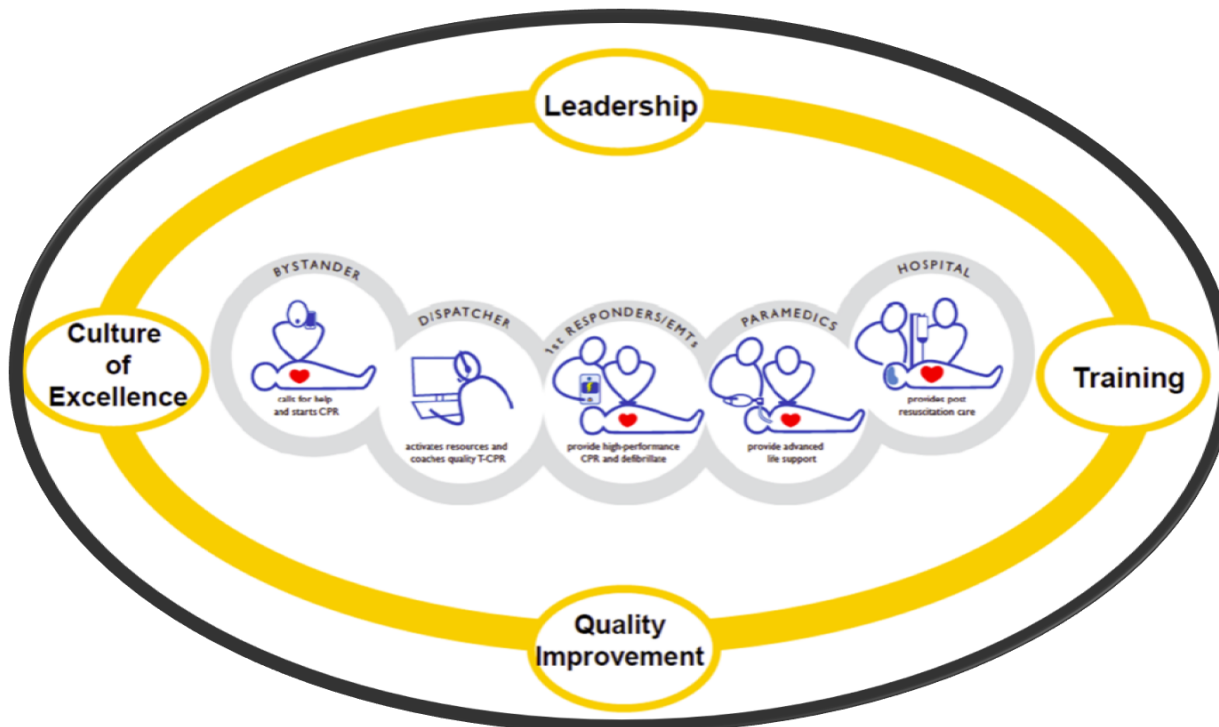
- Form a team
- Select programs
- Plan implementation strategy
- Set specific goals
- Achieve buy-in
- Establish standards
- Pilot the program
- Consult experts
- Communicate progress
- Support, advocate, celebrate





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# Global Resuscitation Alliance Resuscitation Academy





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**A Call to Action to Increase Survival  
from Out-of-Hospital Cardiac Arrest by 50%**



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- **Asia: AAEMS** - Asian Association of EMS represented by Marcus Ong (Singapore) and Sang Do Shin (Korea)
- **Australasia: CAA** - Council Ambulance Authorities represented by Tony Walker and David Waters
- **Europe: EMS Europe** - European EMS Leadership represented by Fionna Moore (UK) and Freddy Lippert (Copenhagen)
- **US:** Mickey Eisenberg, Tom Rea, Michael Sayre, Peter Kudenchuk, King County Seattle
- **Resuscitation Academy Foundation (RAF):** Ann Doll
- **Laerdal Foundation:** Tore Laerdal



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Resuscitation  
Alliance

- Developing an assessment tool for EMS systems
  - Developing a dispatcher assisted CPR standard and educational program
  - Developing a high performance CPR program
  - Adaptation of 10 steps for developing EMS Systems
- 
- Update the GRA paper – submit your cases to be included in the next update of the GRA paper
  - Scientific paper on science of implementation has been submitted

# In summary

- We tripled survival in Denmark and improved quality of life of survivors
- We did that by engaging the community and through increasing bystander CPR
- Dispatch centre and bystander interaction is the key to improve further including smart technology
- Global Resuscitation Alliance and Resuscitation Academy offers the tools for local implementation