



Emergency Medical Services Copenhagen Implementation of a state-of-the-art system





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Agenda

- Short introduction to Emergency Medical Services Copenhagen
- Our history of major changes in organization and patient care
- From silos to integrated and patient centered care
- Challenges and barriers for implementation
- Research and innovation



Health Care System in Denmark

- Population 5.8 million.
- A public Health Care System in 5 regions
- Equal and free access for all citizens
- Financed through taxes
- Emergency Medical Service (EMS) is an integrated part of the Health Care System



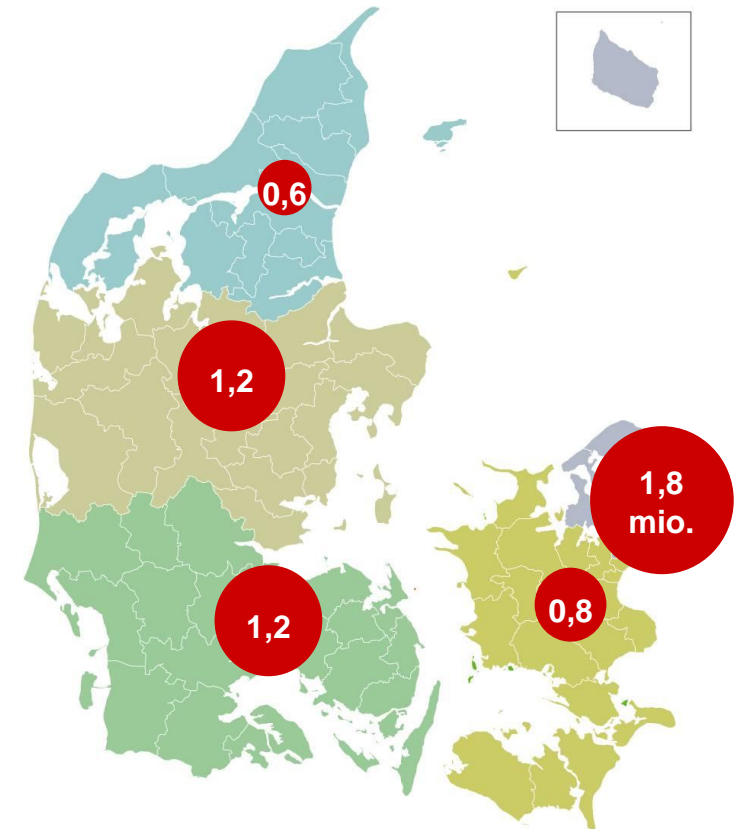
Capital Region of Denmark

One of five Administrative & Health Care Regions

- Population 1,8 mio.
- 1 hospital trust
- 6 University Hospitals
- 40.000 health care employees

Working together with

- 29 municipalities
- 4 police regions
- 7 fire and rescue services
- 1 private ambulance provider





REORGANISING EMS IN COPENHAGEN





Emergency Care Challenges: The changing community and population

- Growing population
- More elderly patients
- More patients with more co-morbidities
- Higher expectations from community for emergency care 24/7
- Demand for patient empowerment
- More advanced diagnostic tools and treatment available
- Challenges and new opportunities that require new solutions



EMERGENCY HEALTH CARE IN COPENHAGEN

FROM SILOS TO INTEGRATED AND PATIENT CENTRED CARE







Changes in Emergency Health Care in Copenhagen

Before 2008:

- Emergency care free of charge
- Emergency (1-1-2) call taking by police and triaged by police
- Four separate ambulance services and two separate dispatch centers
- Different Standard Operation Procedures and differences in medical supervision
- Out-of-Hours Service was a separate entity
- Stand-alone emergency departments and with walk-in patients
- 3 different hospital trusts and 12 independent hospitals



Today: Emergency Health Care in Copenhagen

- NEW: 1 hospital trust with 6 university hospitals in 9 locations and 1 EMS
- NEW: Health related emergency calls (112) part of EMS - triaged by medical dispatchers (nurses and paramedics) and medical control by physician on site
- NEW: All ambulance services part of EMS – same SOP and medical supervision 24/7
- NEW: Out-of-Hours services part is now part of EMS
- NEW: Referral of patients to emergency departments triaged by the EMS dispatch center through a separate telephone number (1813)
- Still free of charge (unchanged)



Main tasks for EMS Copenhagen (1.8 mio)

One Emergency Medical Command and Control Centre (Medical Dispatch Centre)

1. Health related emergency calls (1-1-2)
2. Medical help-line 1813 for health care advice and admission to Emergency Departments
3. Dispatch Centre for all prehospital resources



Data

130.000	Emergency medical calls (1-1-2)
1. million	Medical Helpline 1813
300.000	Emergency ambulance missions





Emergency Medical Dispatch Center in Copenhagen Command and Control Center

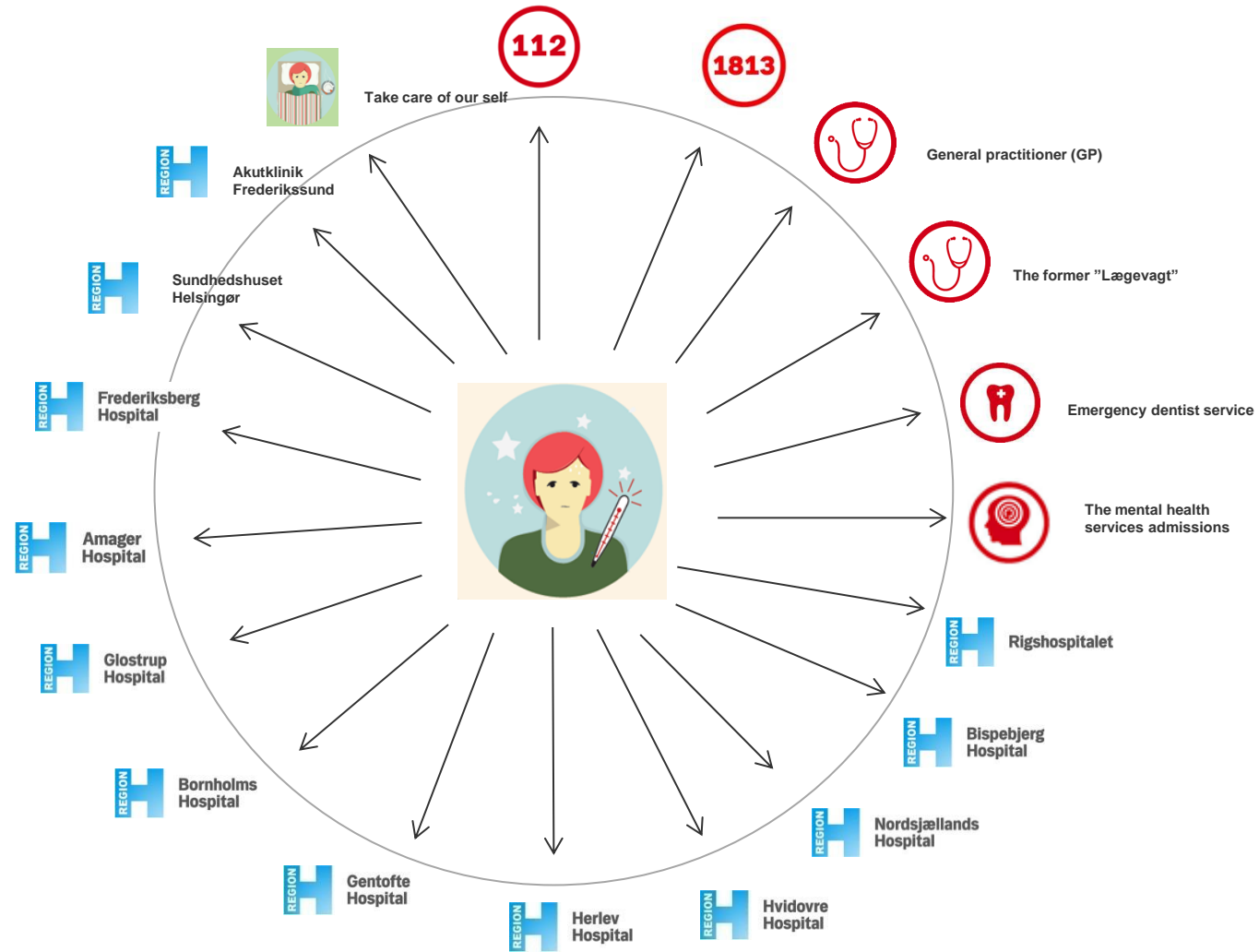




PATIENT CARE BEFORE 2014



Before 2014

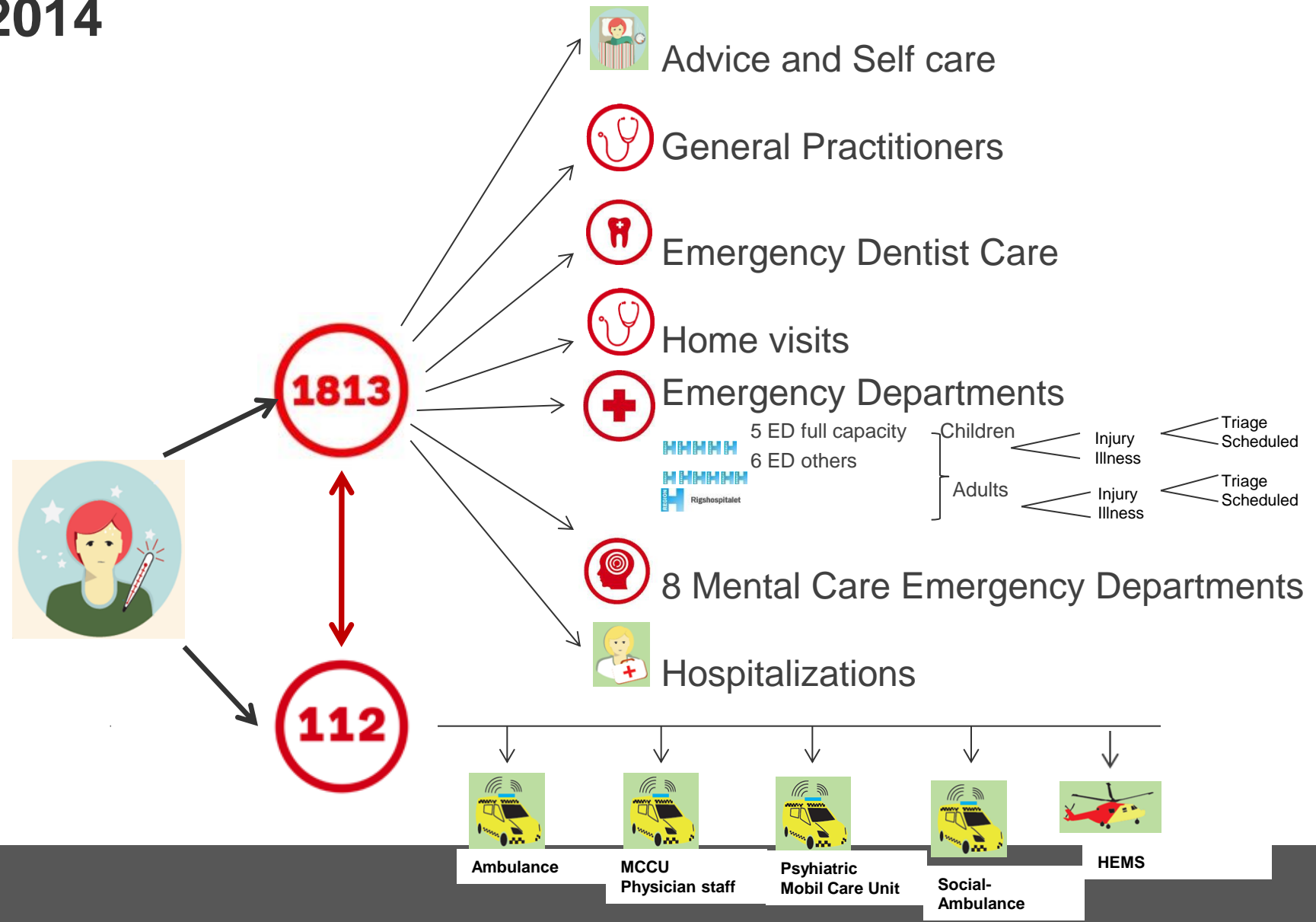




PATIENT CARE NOW



After 2014

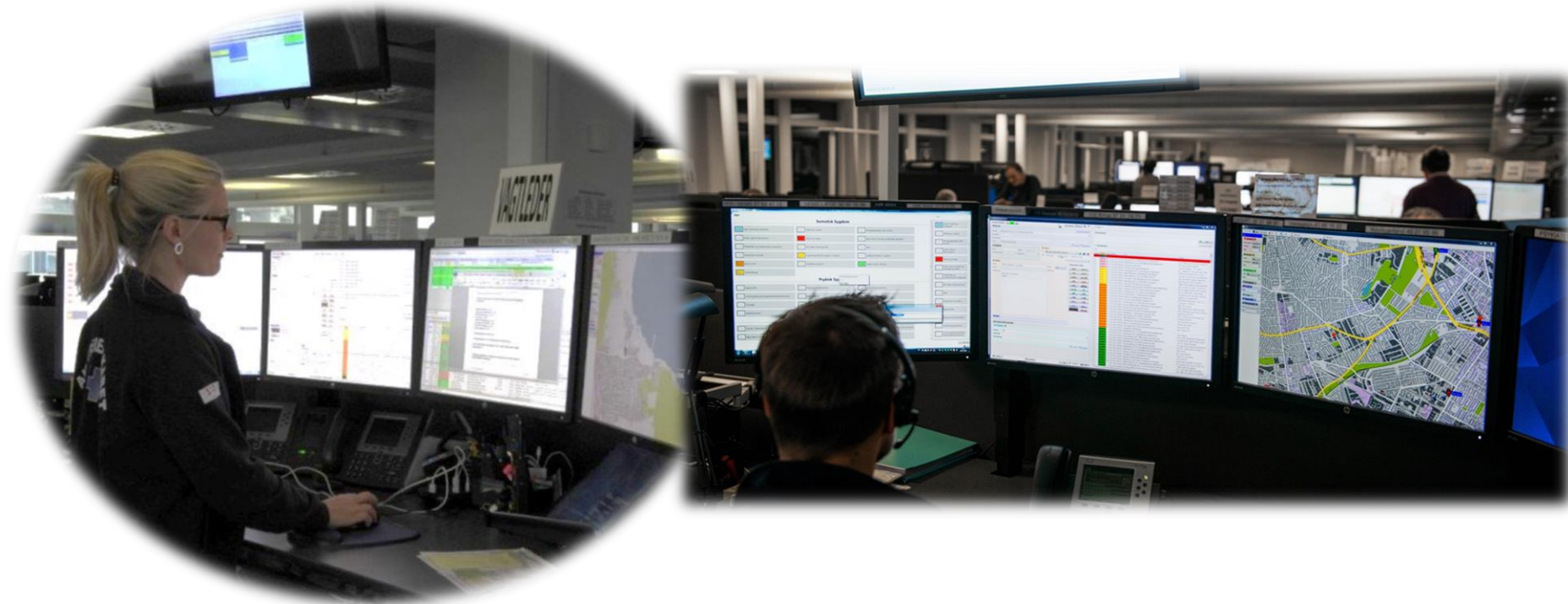




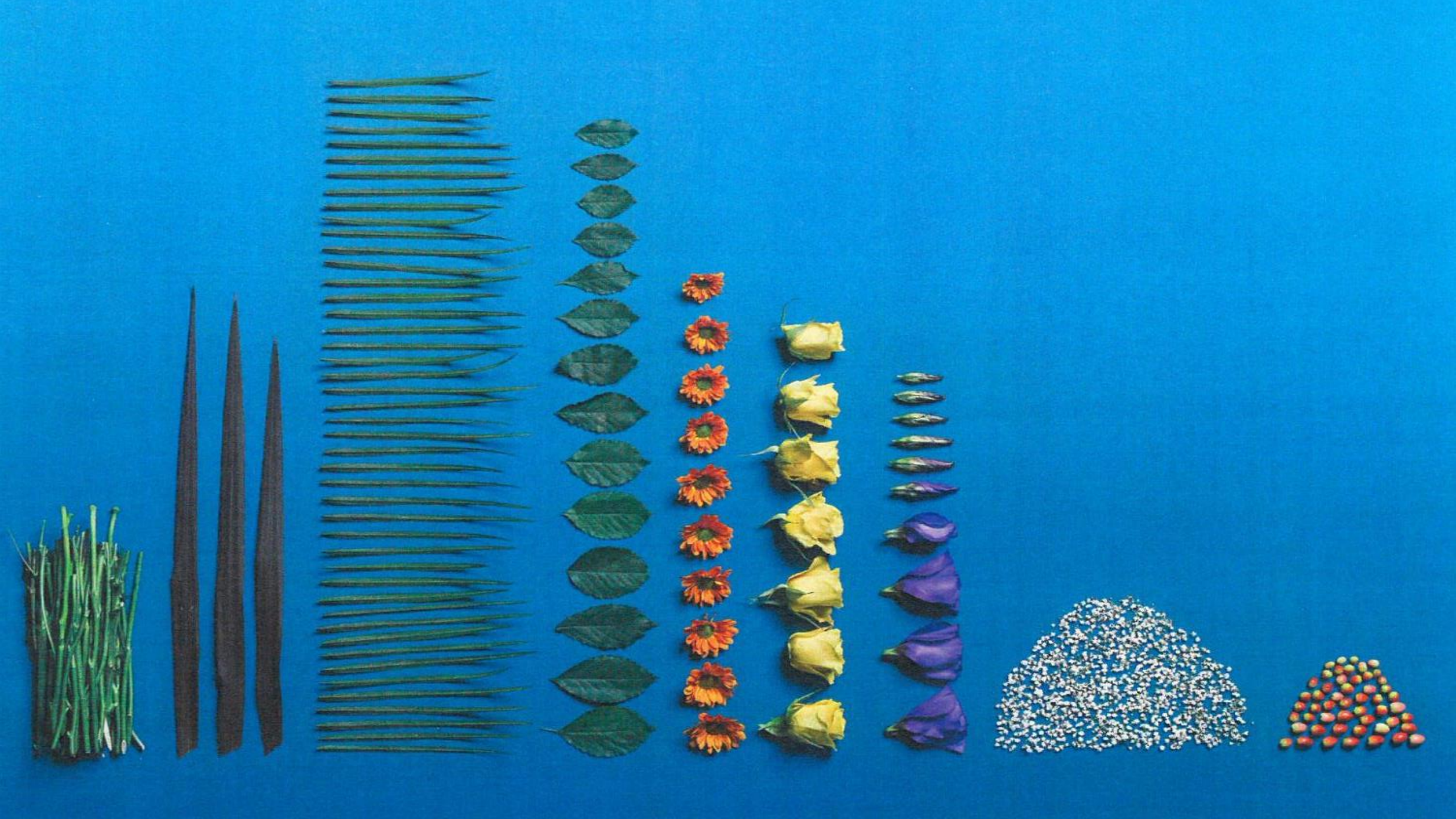
Proces

- Call received
- Triage to right responds,
- ex Emergency Department visit, appropriate facility competence and capacity, booking a time slot, sending information to hospital list and to patient by sms, following capacity and the individual patient
- Follow up with SMS for feedback from patient

Command and Control Center



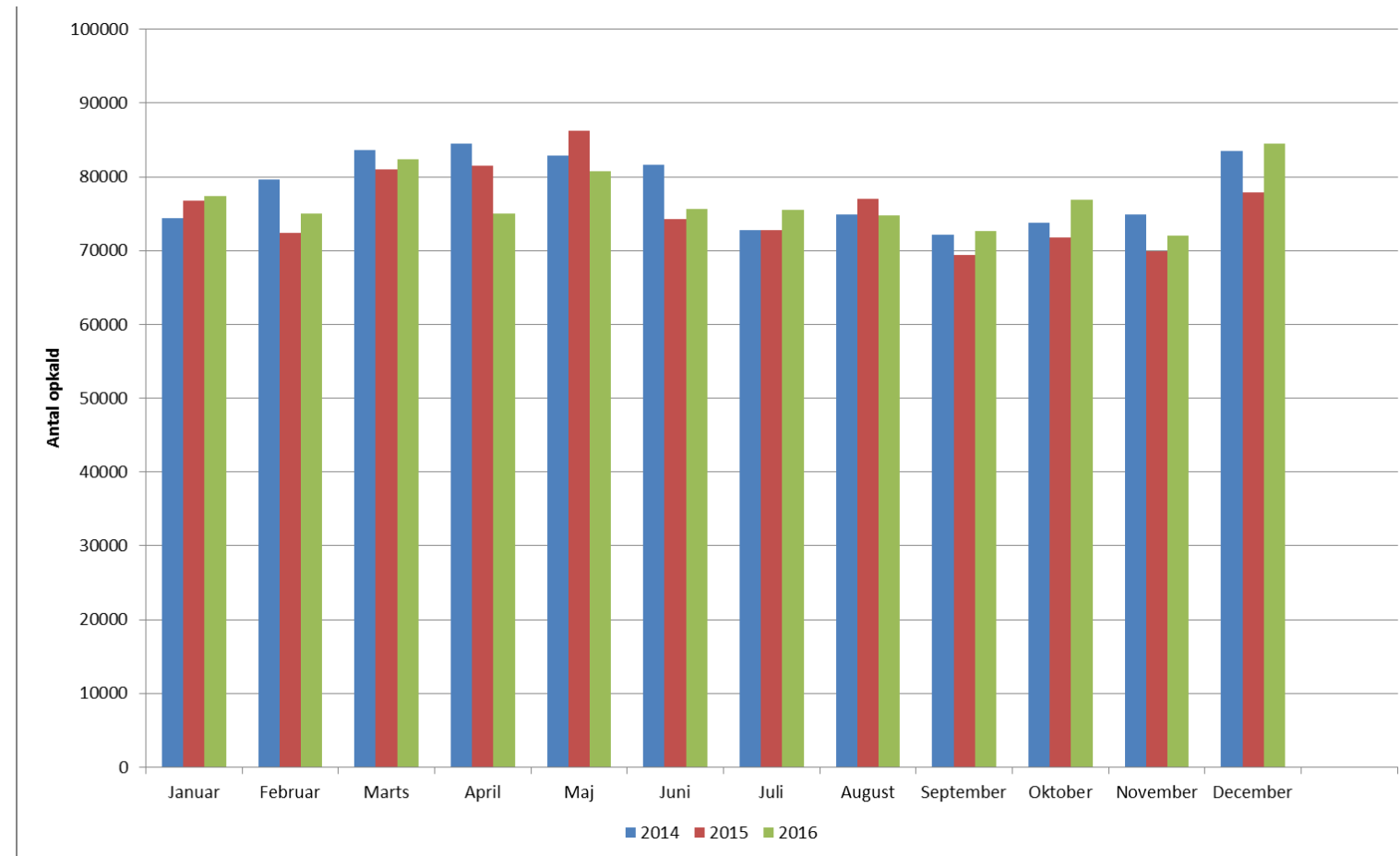






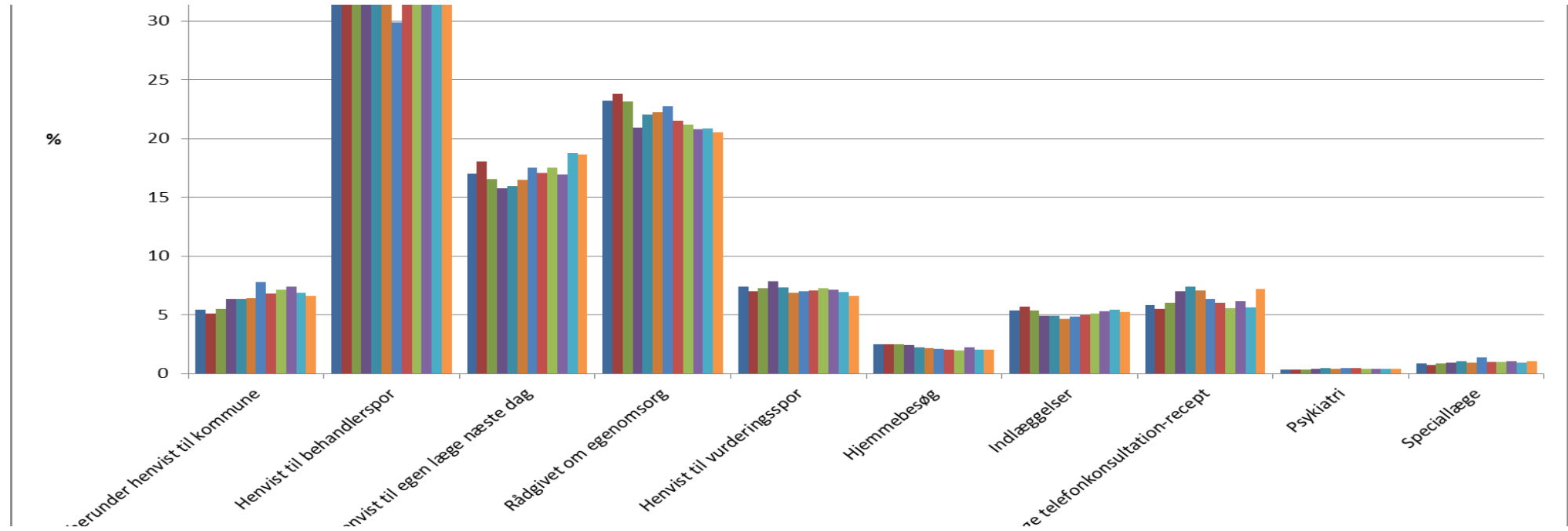


Call per month 2014-2016



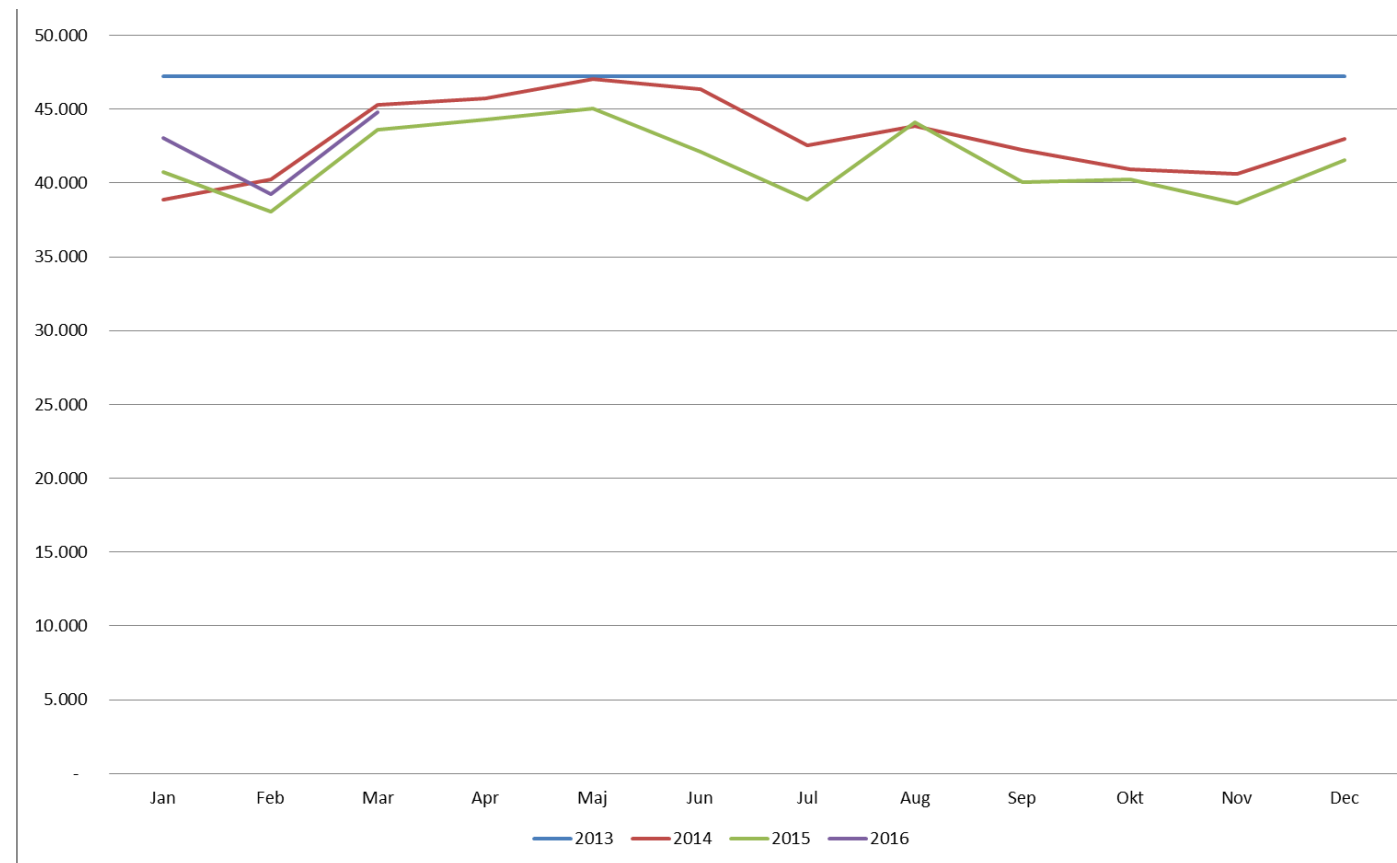


Respons following calls



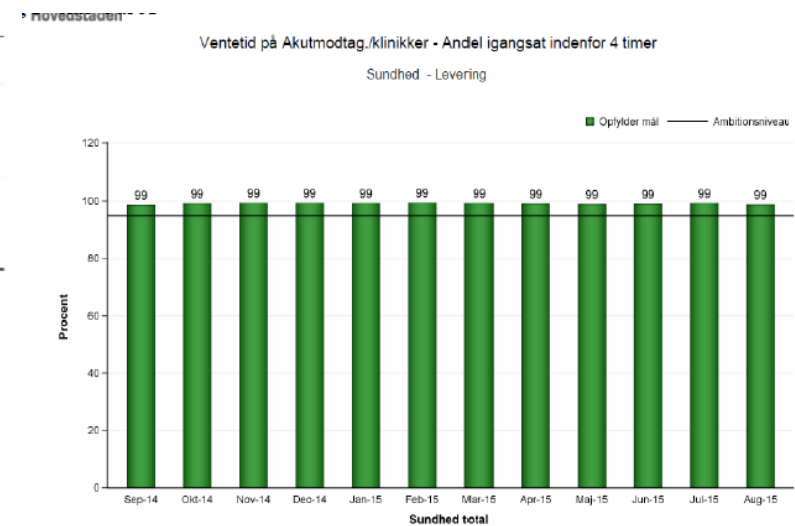
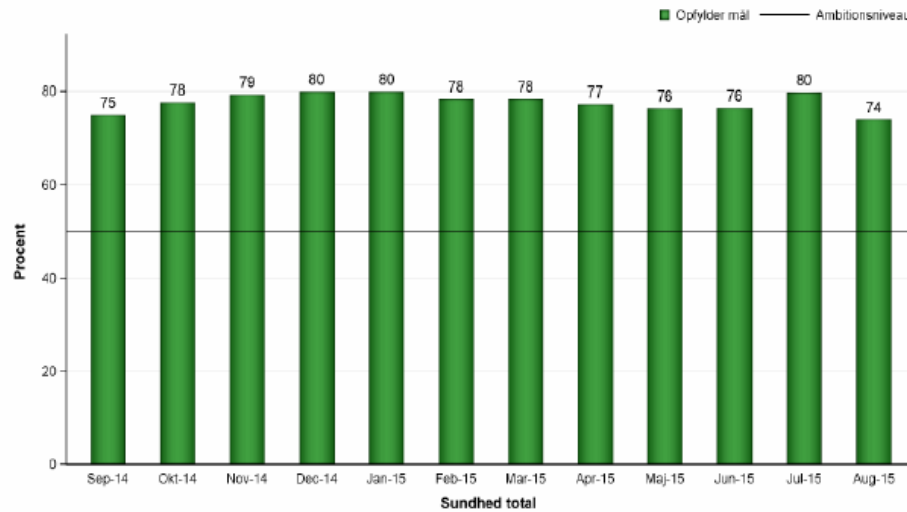


Emergency Visits in 2013 and 2014-2016





Emergency Departments - *achieving their goals for waiting time*





Emergency Department – waiting time

“Urgent”

- Time from arrival to start of treatment : **9-11 min.**
- Total time from calling us to start of treatment, including telephone call time, transport and waiting time at the emergency department: **60 min.**

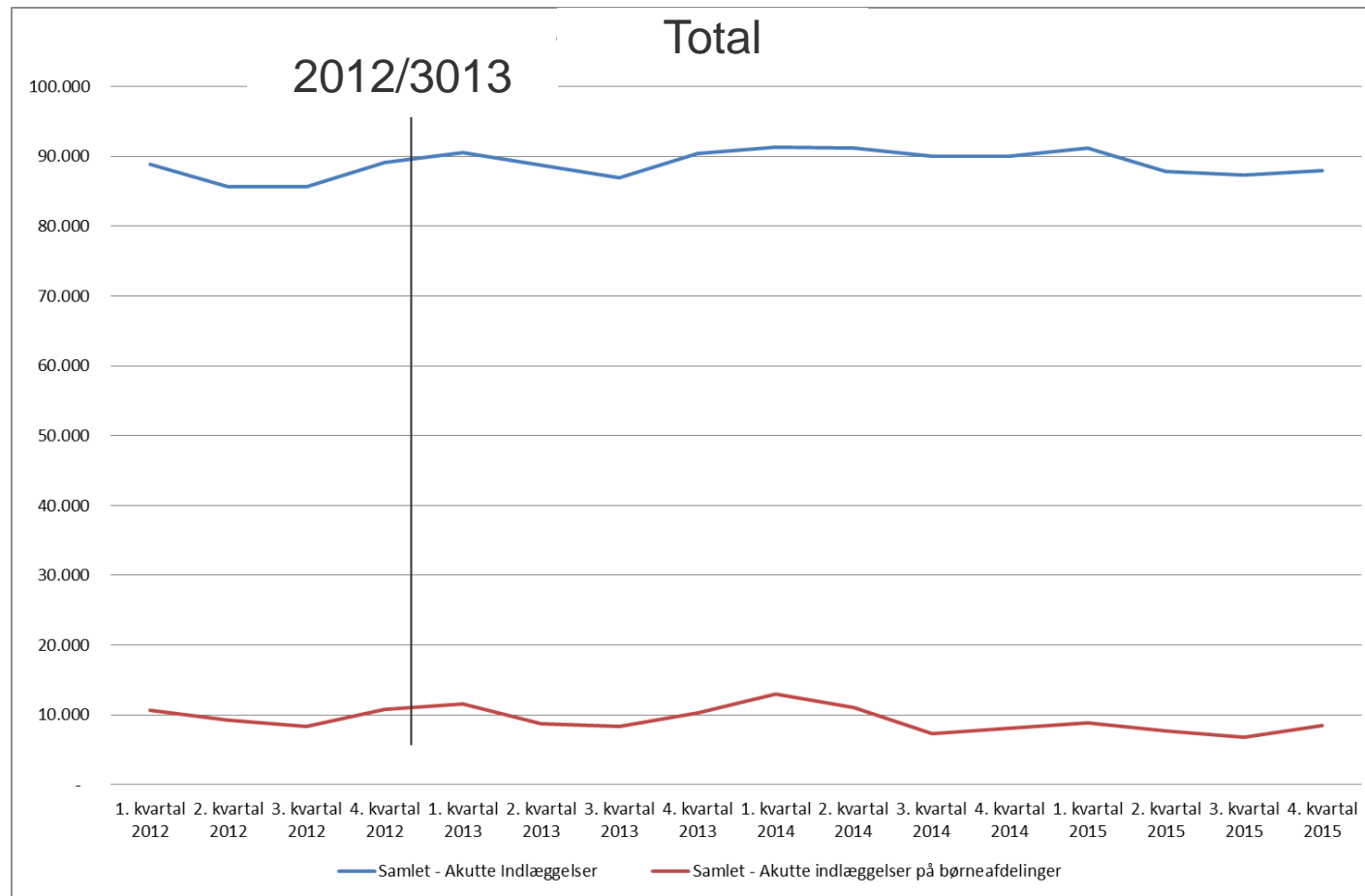
Non-urgent

- Time from arrival to start of treatment: **27 min.**
- Total time from calling us to start of treatment, including telephone call time, transport and waiting time at the emergency department: **93 min.**



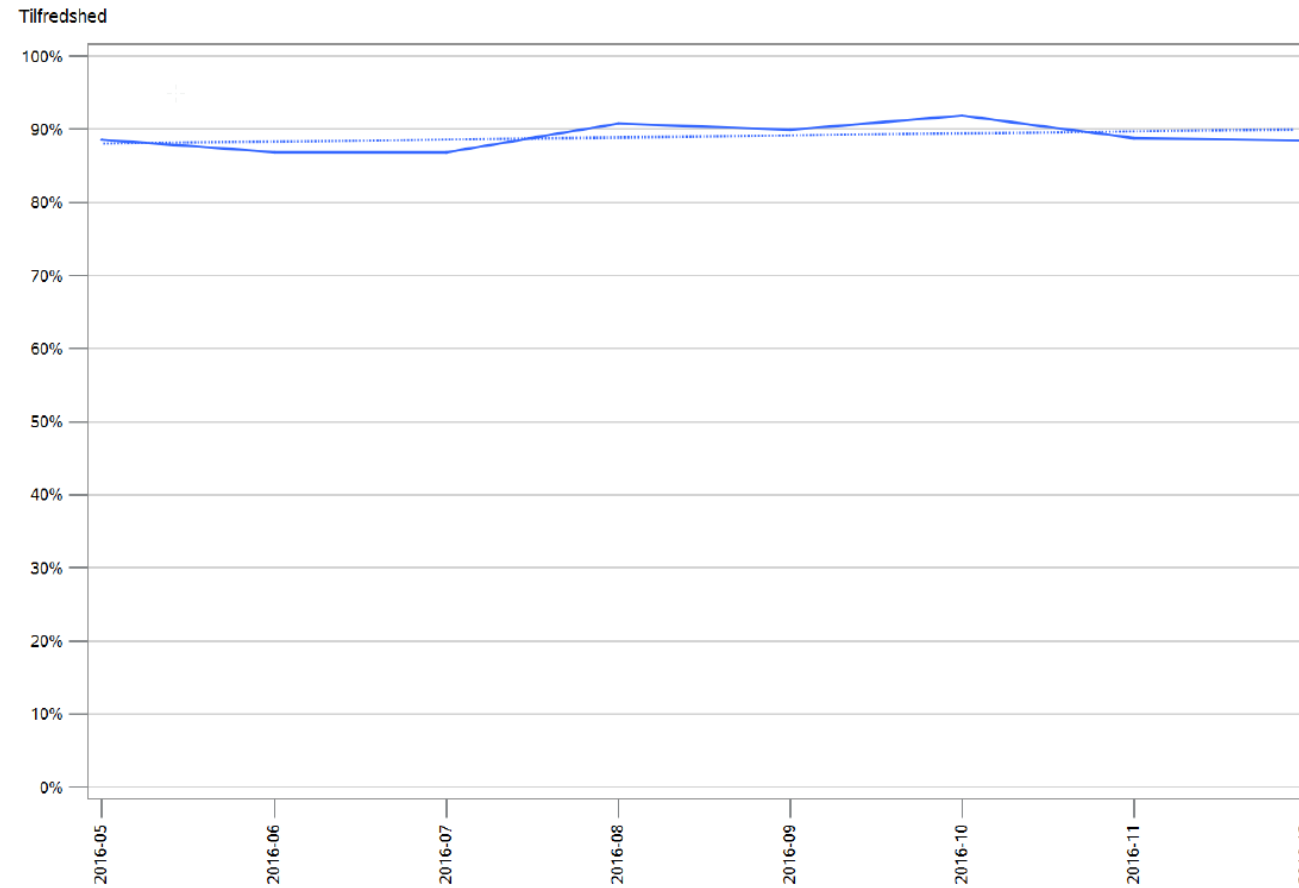


Hospitalizations 2012-2015





Patient satisfaction





Data summary 2017

- 945.000 + 130.000 calls per year for population of 1.8 mil
- Time to call answered: 5 seconds for the emergency number and <3 minutes for other calls
- Shortest waiting time in emergency departments ever
- Emergency departments visits reduced with 10%
- Fewer home visits by physicians
- Hospitalization rates unchanged
- Increase in ambulance mission (national trend – however, less than expected)
- Patient satisfaction high
- Few complaints (15 per months for 90.000 calls)
- Few patient safety issues, follow up on every single case daily
- Total lower costs in the system



Advantages of our Integrated Solution

- **For patients: Easy and simple access to emergency care 24/7 for any medical need or question for all patients**
- **Shortest waiting time ever in emergency departments**
- **Best use of ED and ICU capacity and resources 24/7**
- **Preparedness and operational coordination**
- **Available data for planning and research**





Challenges – it was not easy!



- Short implementation from political decision to launch
- Traditional thinking in hospital structure, facilities & logistics
- Physicians vs nurses, GP's vs other physicians
- General Practitioners Private Union
- And a fight about power and money among stakeholders



Research and innovation





New Projects ongoing

- 112 calls: Artificial Intelligence to support dispatcher recognizing cardiac arrest
- 112: Heart runner, dispatching volunteers for cardiac arrest including AEDs
- Ambulance: Biomarker analysis at scene for high risk cardiac patients
- Video project for 112- call taking and for 1813 call taking (children)
- Patient empowerment project: ask the patient
- 2019 app for integration data and make it available for the citizens

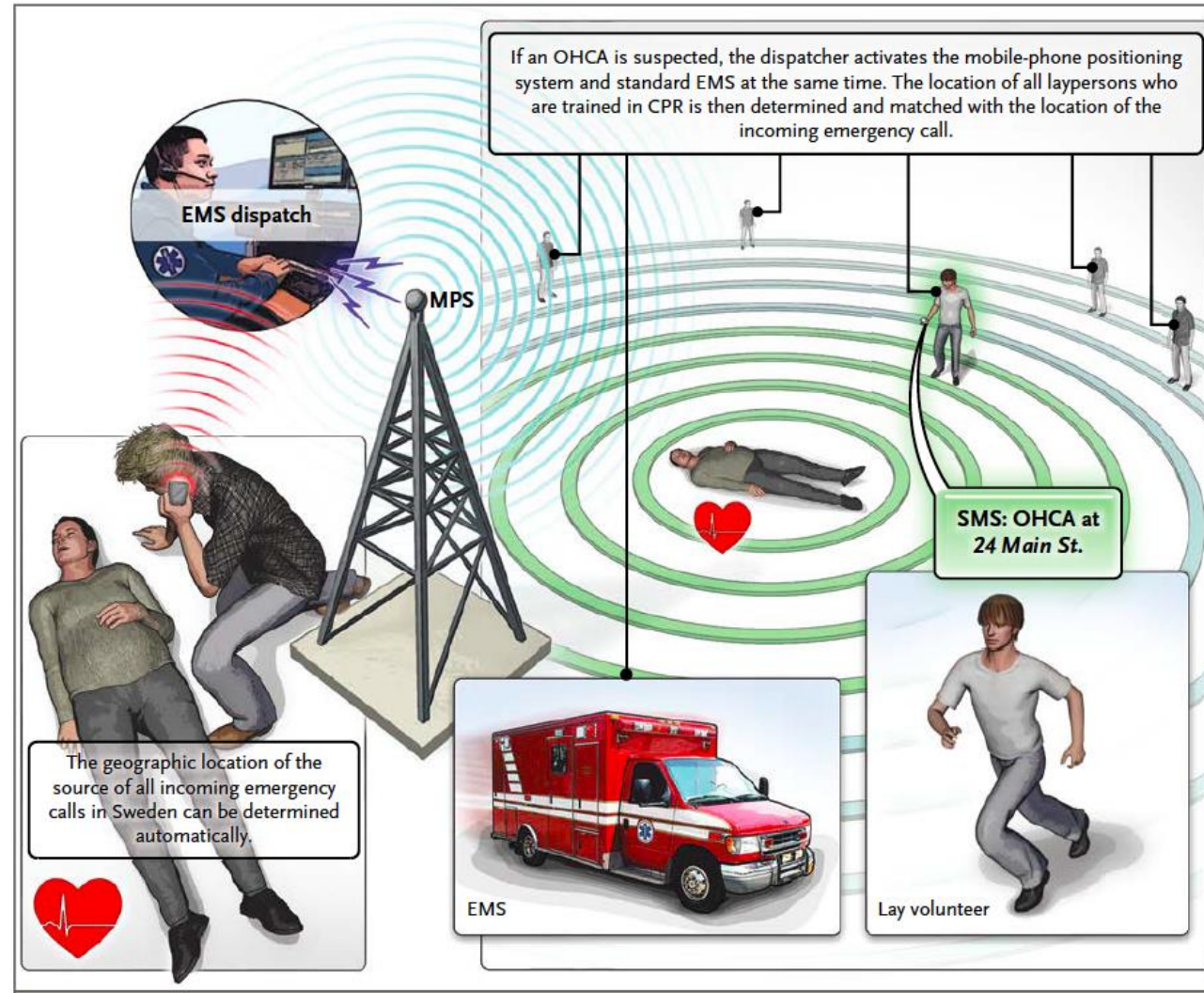
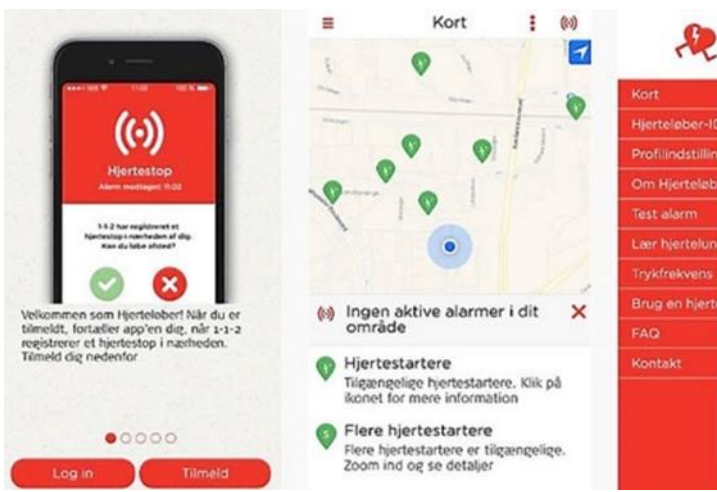
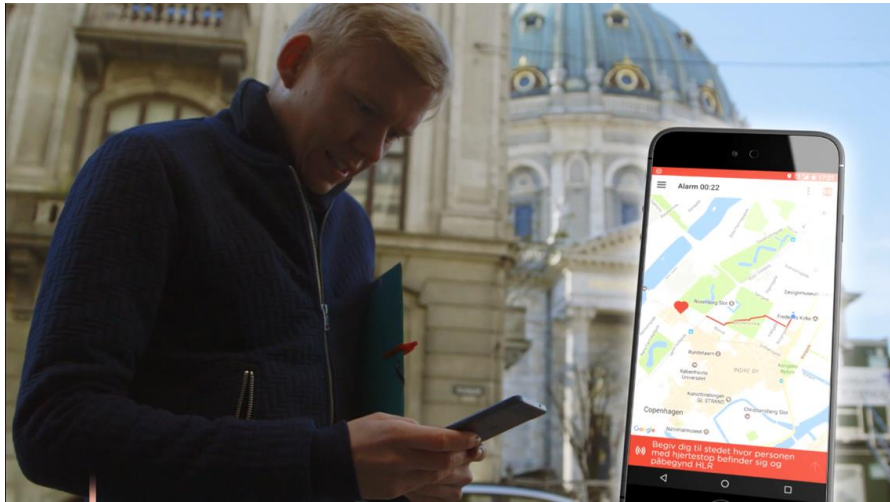
Innovation in EMS – AI for decision support in dispatch centre



Machine Learning

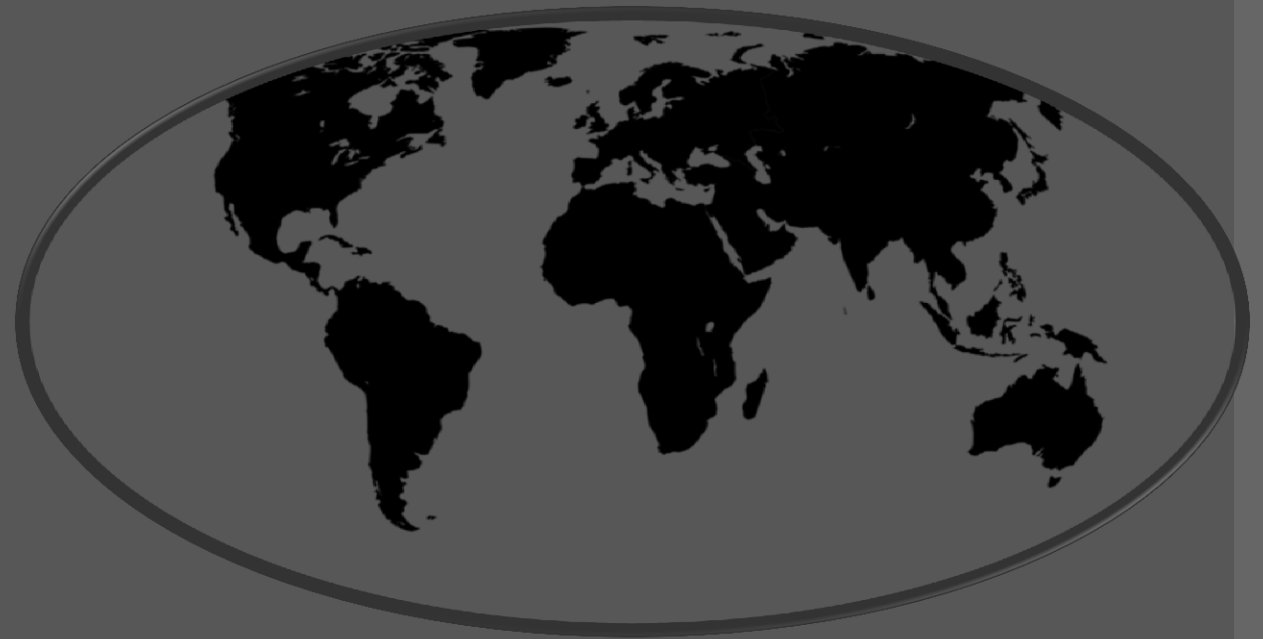
<https://www.youtube.com/watch?v=c1rJZQ-LAhw&feature=youtu.be>

The Capital Region of Denmark Emergency Medical Services Copenhagen





INTERNATIONAL COOPERATION





Global
Resuscitation
Alliance

Global Resuscitation Alliance Acting on the Call – Update 2018

http://www.globalresuscitationalliance.org/wp-content/pdf/acting_on_the_call.pdf

Improving Survival from Out-of-Hospital Cardiac Arrest:



A Call to Establish
a Global Resuscitation
Alliance



Global
Resuscitation
Alliance

Improving Survival from Out-of-Hospital Cardiac Arrest

Acting on the Call

2018 Update from the Global Resuscitation Alliance

Including 27 Case Reports



Global
Resuscitation
Alliance





The European EMS Leadership Network



Vision

- Improve survival and quality of emergency patient care in EMS
- Create and establish cooperation between the EMS systems in Europe
- Describe a vision for the European emergency care system, and recommend strategies needed to reach our common goals.

Members

- EMS Copenhagen, Denmark
- Berlin Feuerwehr, Germany
- SAMU Paris, France
- SUMUR Madrid, Spain
- Ireland Ambulance Services
- The Netherland Ambulance Services
- Scottish Ambulance Service
- South East Cost Ambulance Service UK
- and



EMS2019
MADRID



EMS2020
SCOTLAND



EMS2021
PARIS



EMS2022
BERLIN



Summary

- Short introduction to Emergency Medical Services Copenhagen
- Major changes in organization and emergency patient care
- From silos to integrated and patient centered care
- Using innovation, data and research to improve patient care and prepare for the future



For more information



EMS Copenhagen

www.regionh.dk/akutberedskabet



European EMS congress

www.emseurope.org



European EMS Leadership Network

www.emsleadershipnetwork.org



Global Resuscitation Alliance

www.globalresuscitationalliance.org



Resuscitation Academy

www.resuscitationacademy.org



Additional slides on EMS Copenhagen





JAMA The Journal of the
American Medical Association



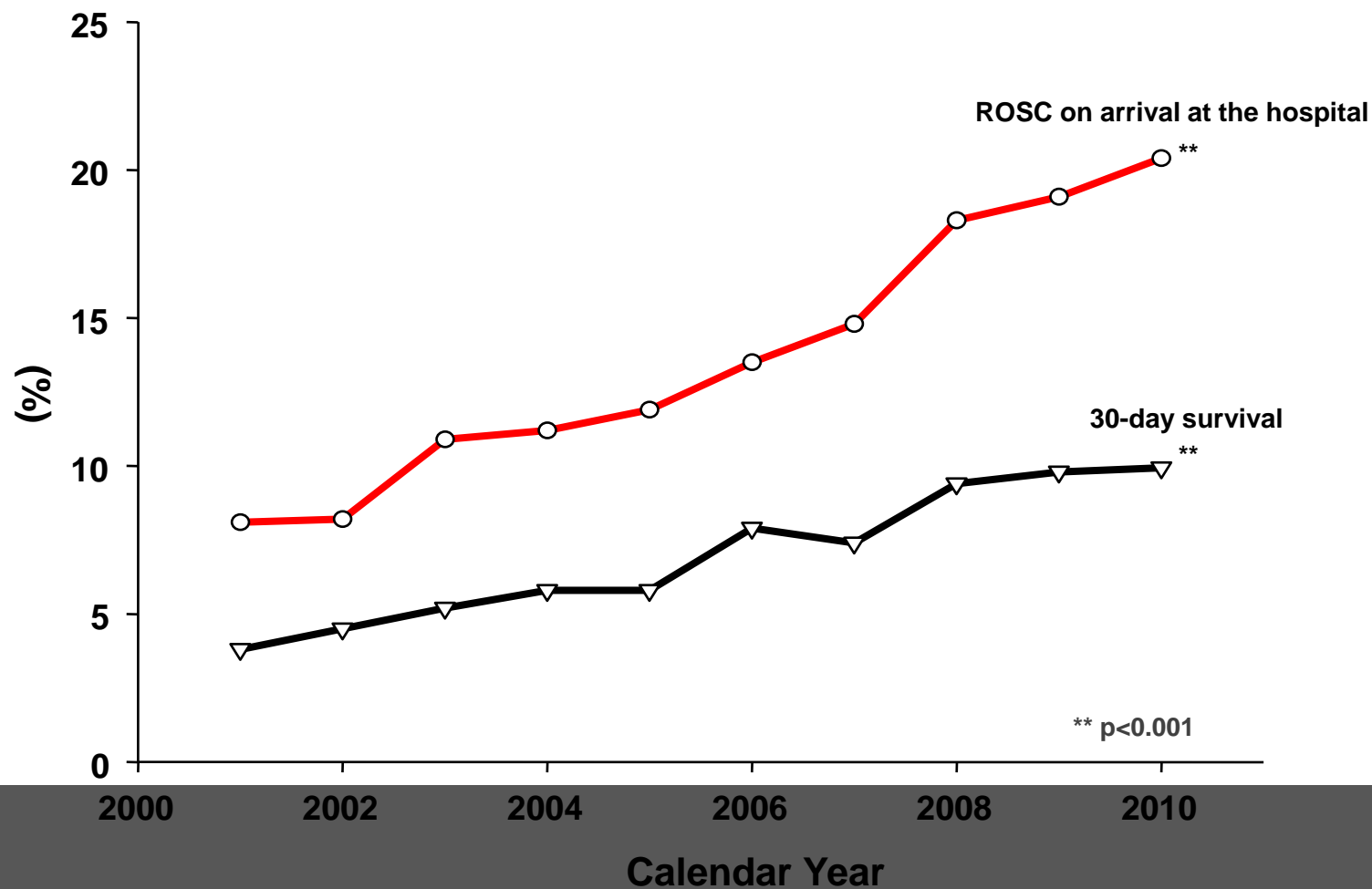
JAMA October 2013

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

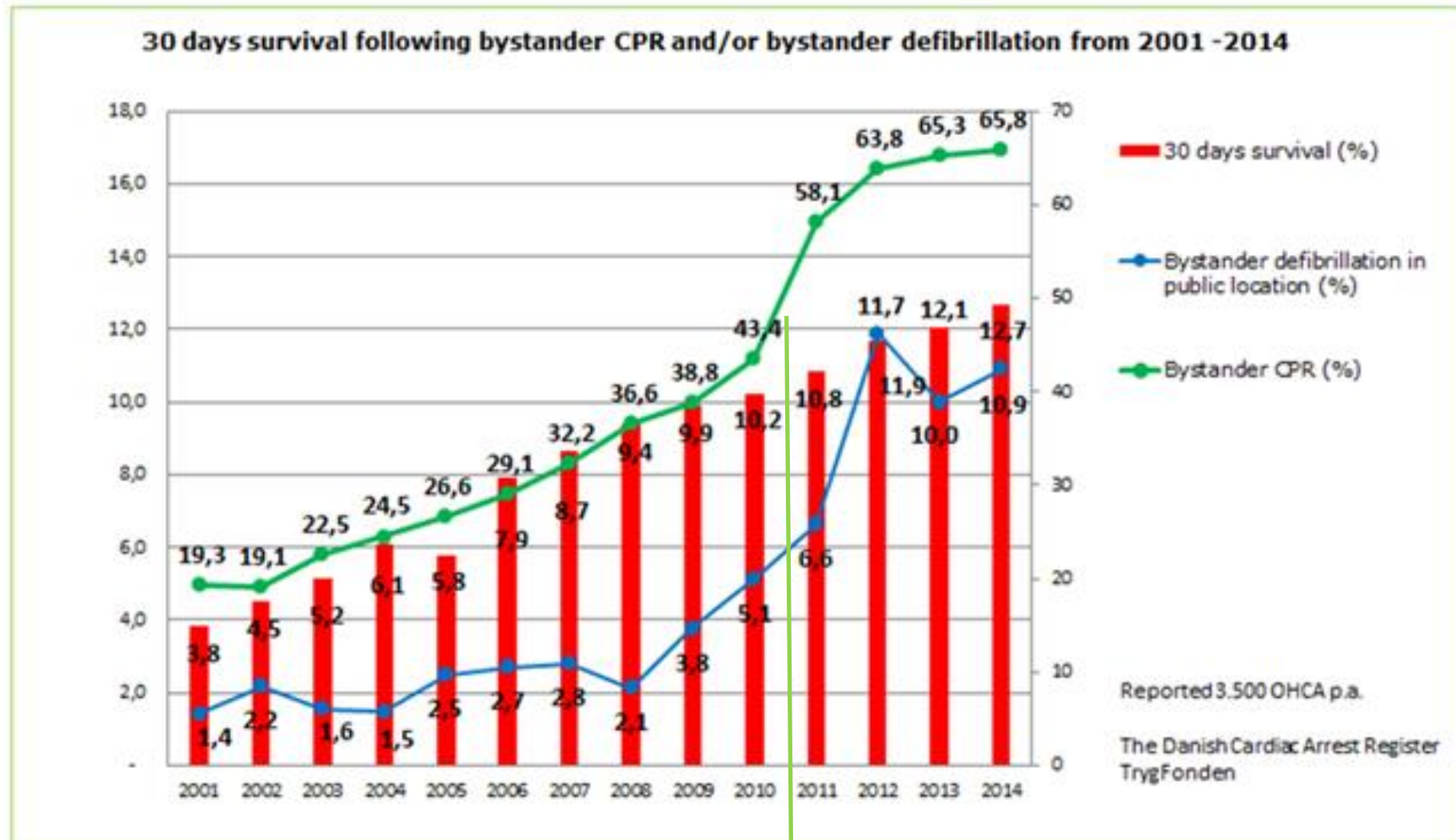




Temporal trends in ROSC on arrival at the hospital and 30-day survival



Emergency



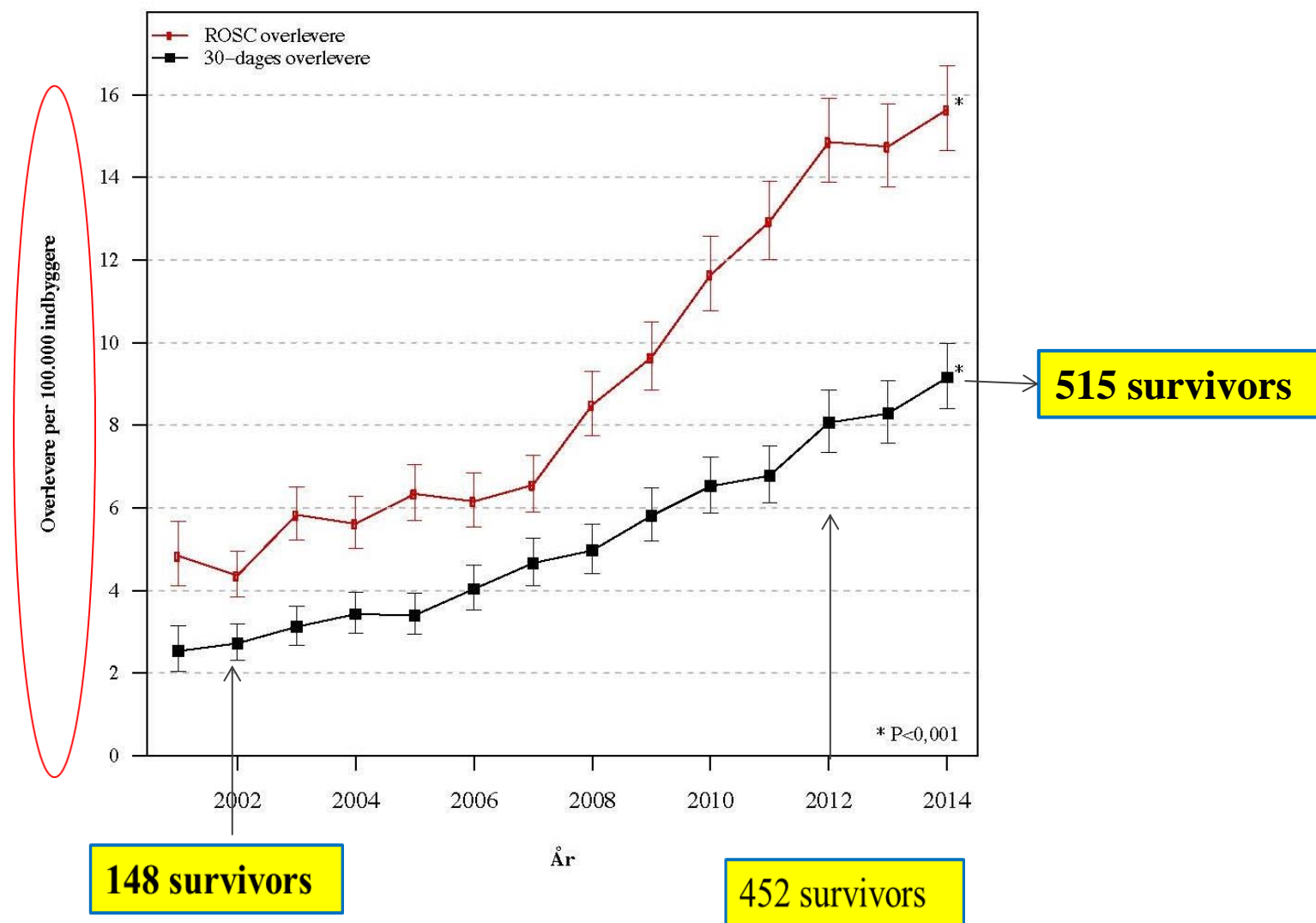
Reference: GRA Paper



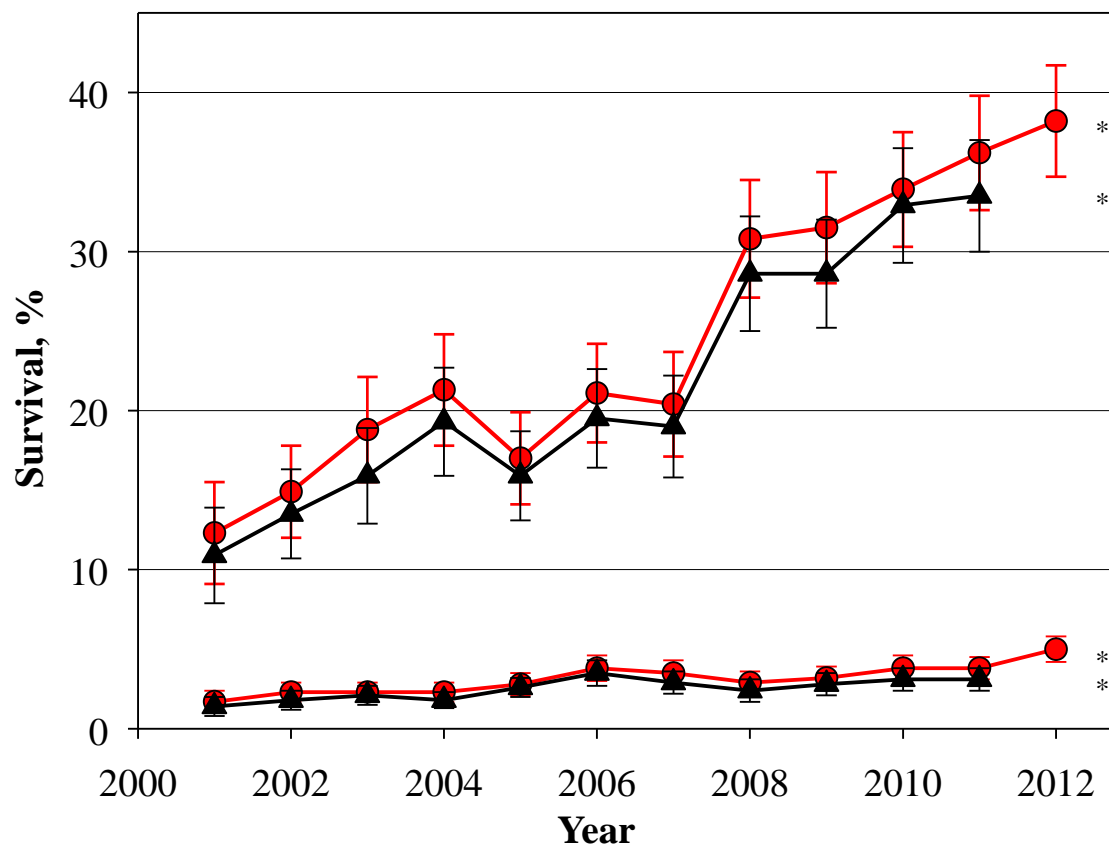
Global Resuscitation Alliance



Survivors from OHCA (ROSC and 30 days)



Long-Term Survival in relation to First Recorded Heart Rhythm, 2001-2012



- 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)

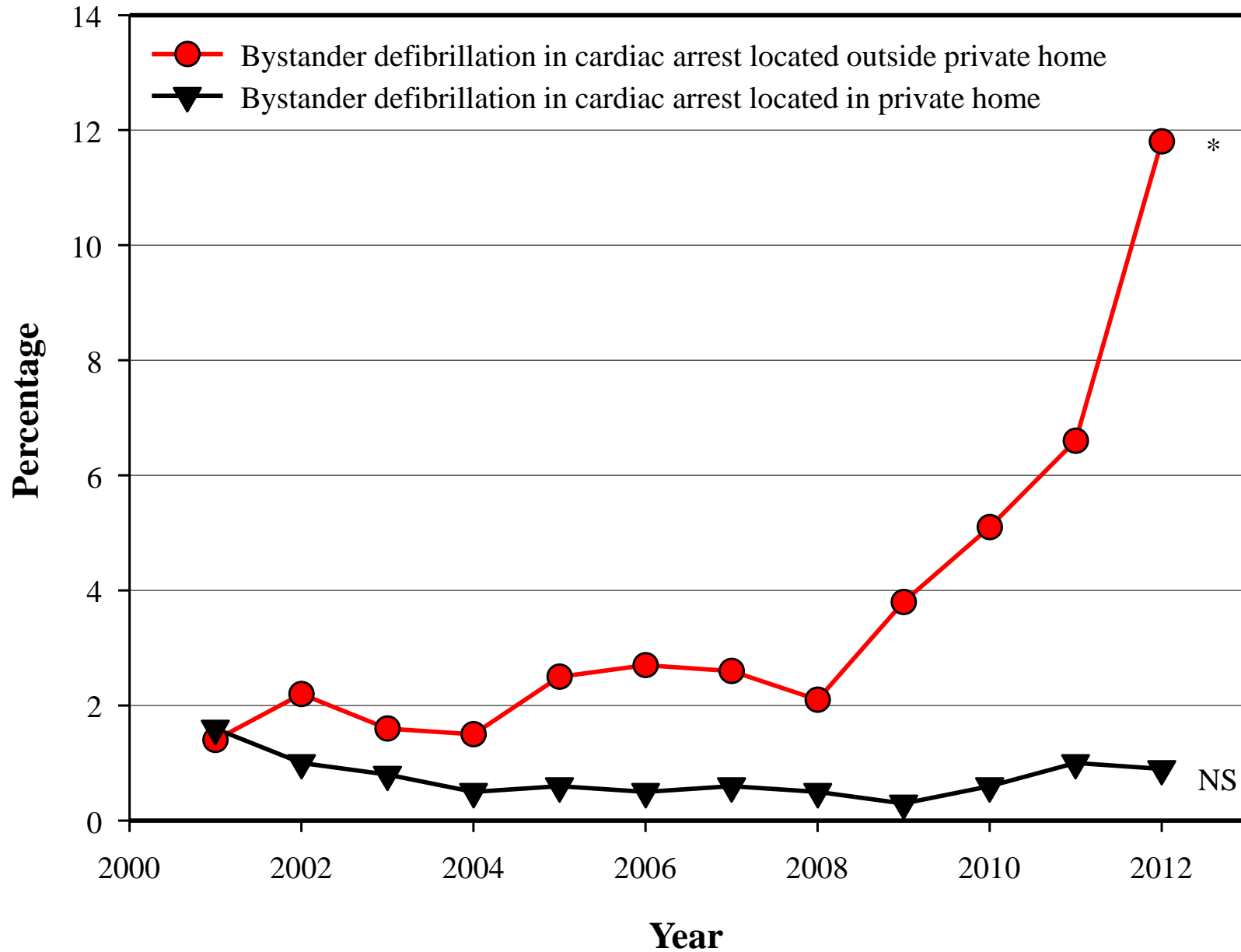
The association between HLR bystander CPR and Shockable Heart Rhythm

Shockable heart rhythm in patients **WITH** bystander CPR: 34.9%

OR 2.3 CI 2.17-2.48, after adjustment for sex, age witnessed status and time interval.

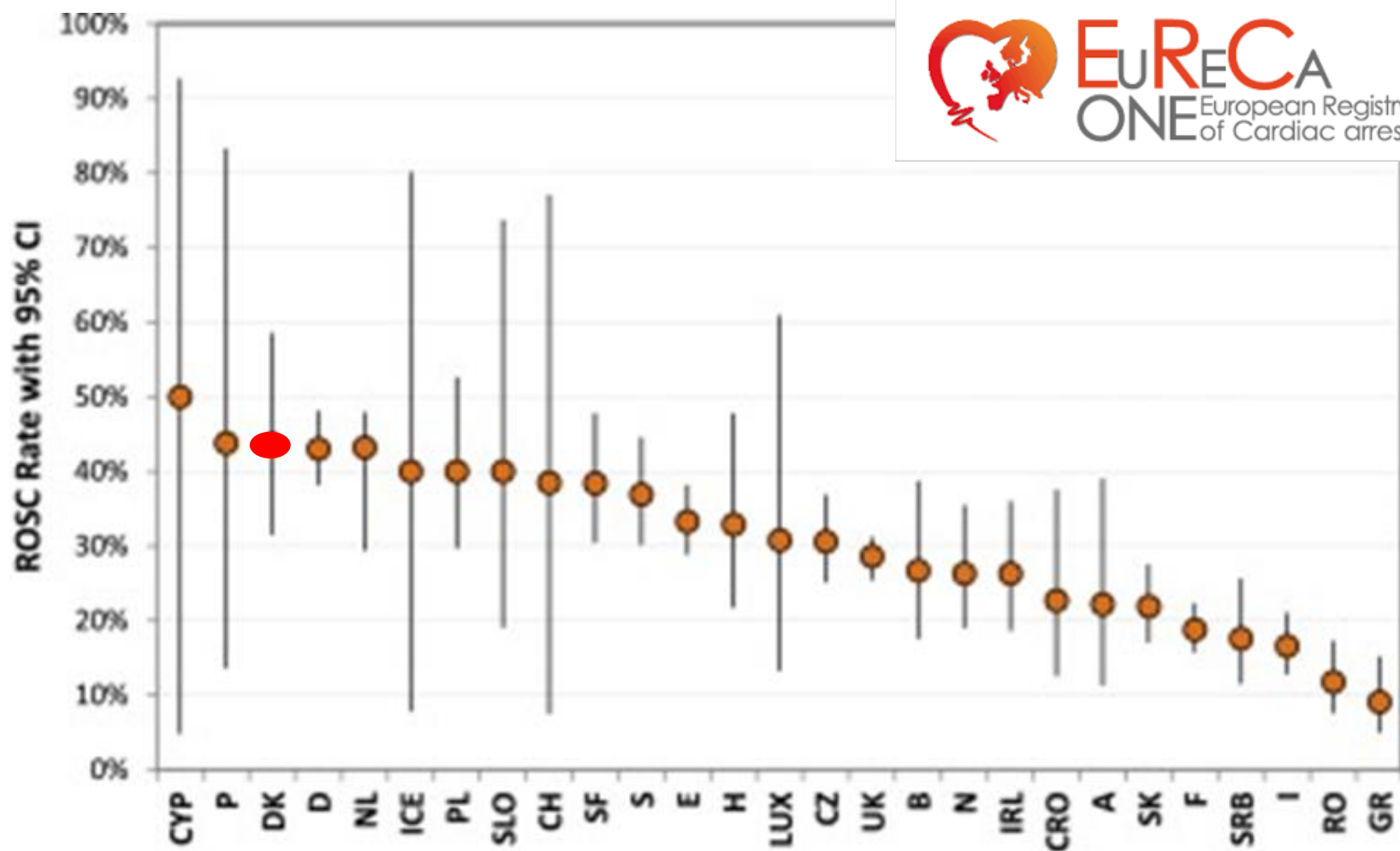
Shockable heart rhythm in patients **WITHOUT** bystander CPR: 16.5%

Bystander Defibrillation According to Location of Cardiac Arrest, 2001-2012



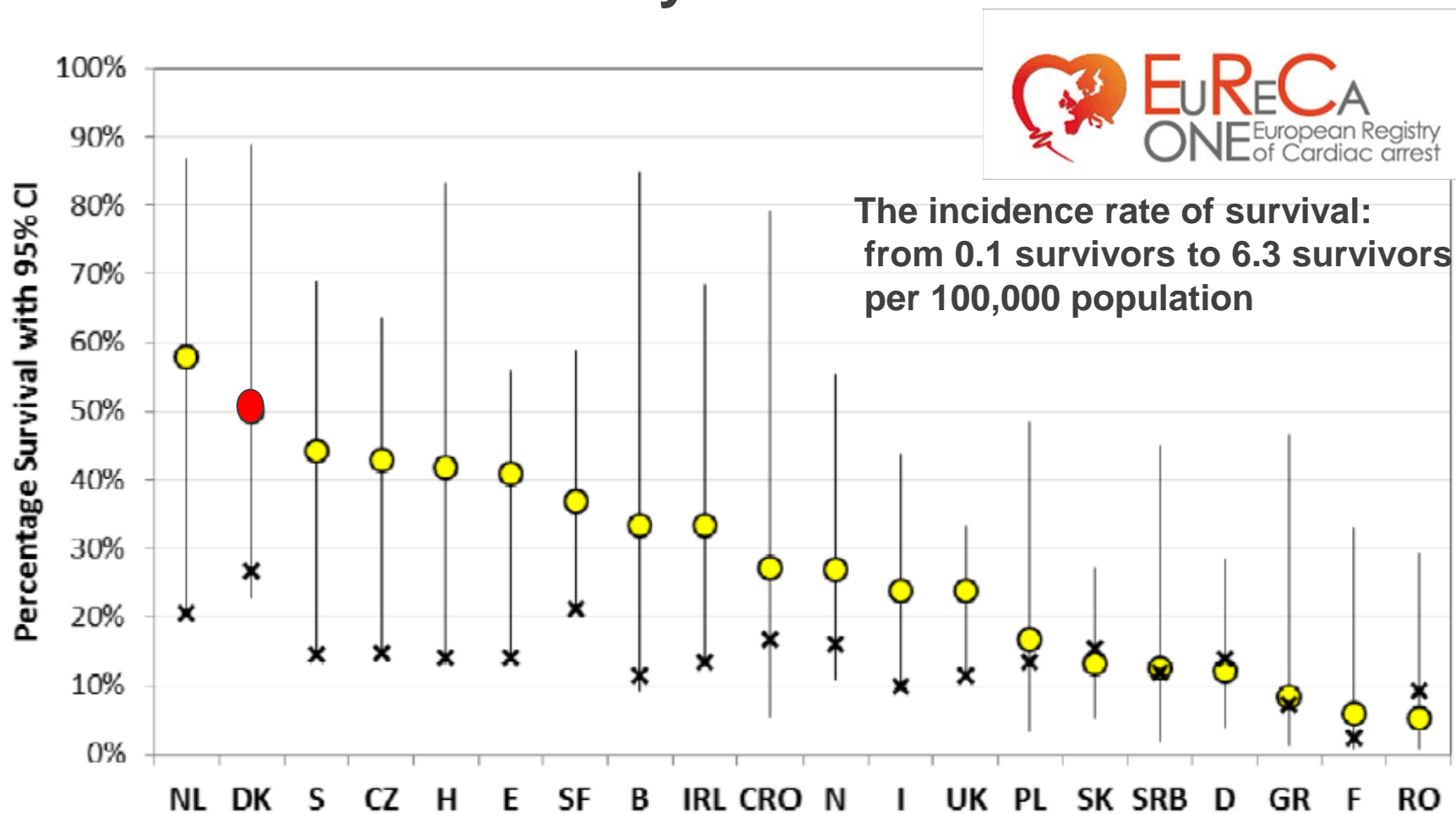
EURECA One in Resuscitation in 2016

ROSC rate in European Countries





Survival to Hospital discharge in witnessed and shockable rhythm



Cartoon on Case Denmark Everyone can save a life

Link: <https://www.youtube.com/watch?v=EDp4krk2--M>

Follow-up study: Do Cardiac arrest survivors return to work? Circulation 2015

Resuscitation Science

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

Link to NEJM 2017 Kragholm et al



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

It takes a system to save a life - so let's cooperate!

- <https://vimeo.com/218587538>





Few references

- Case Denmark: <https://www.youtube.com/watch?v=EDp4krk2--M>
- Ambulance from Denmark: <https://www.youtube.com/watch?v=i7BilUHlgSY>
- 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](#)
- <https://research.regionh.dk/en> (<https://bit.ly/2rLjPPB>)
- <http://www.nejm.org/doi/full/10.1056/NEJMoa1601891>