REGION

Leitstelle Kopenhagen – Use of AI in medical dispatch

EMDC-Copenhagen case

Disclosure

I have no actual or potential conflict of interest in relation to this research project

- Received an unrestricted research grant from TrygFoundation

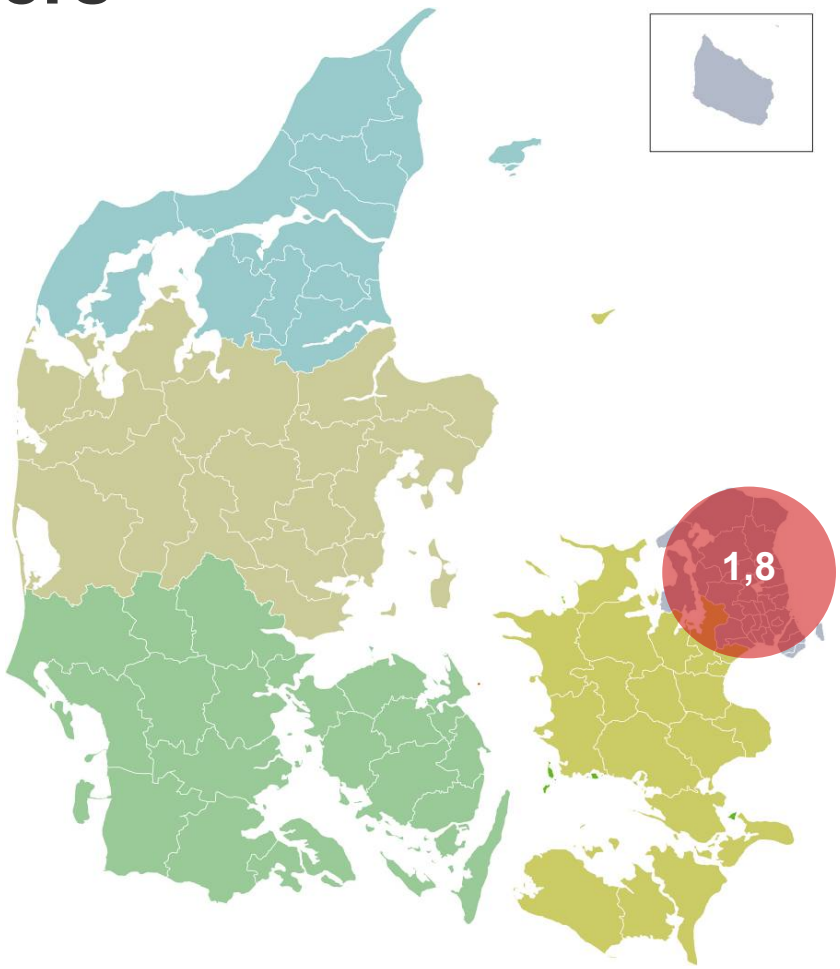
- Received centresupport from Laerdal

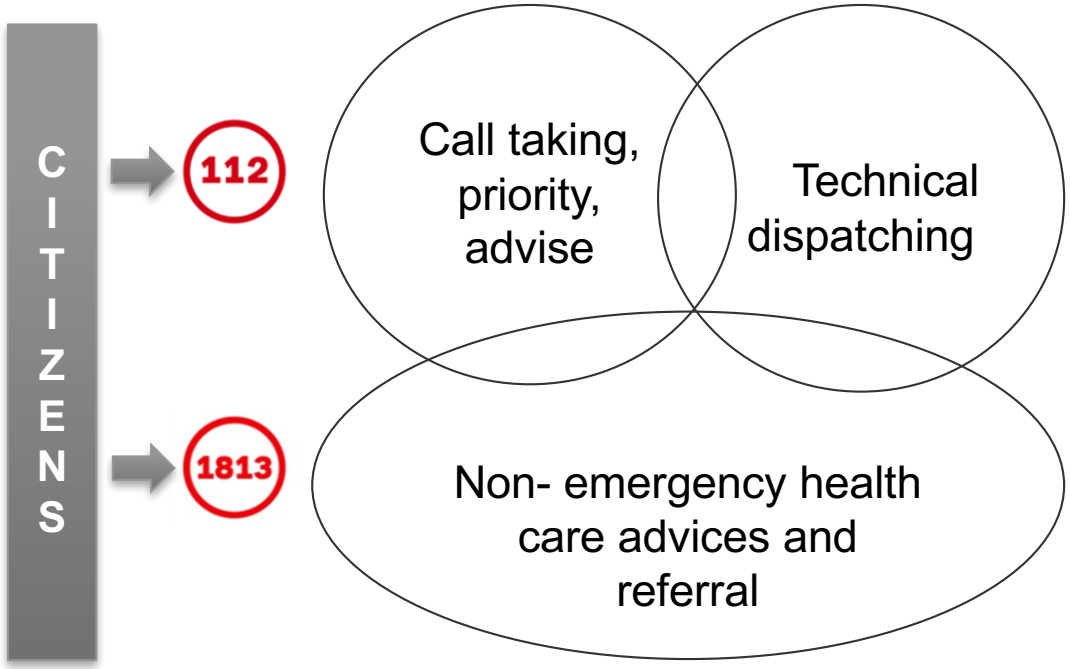
Health Care System in Denmark

- Population 5.6 mio
- A public health care system
- Equal and free access for all citizens
- Financed through general taxes
- EMS is part of the Health Care System

Kopenhagen – in numbers

- Population 1,8 million
- 29 municipalities
- 40.400 employees
- 1 Emergency Medical Dispatch Service
- 5 university hospitals
- A level 1 trauma Centre





- Ambulance with EMT
- Ambulance with PM
- MCCU
- HEMS
- Patient Transfers
- Psychiatric MCU
- Advise and self care
- ED referral
- Psychiatric referral
- Dental Care
- Hospitalization
- GP
- Others

Activities per year

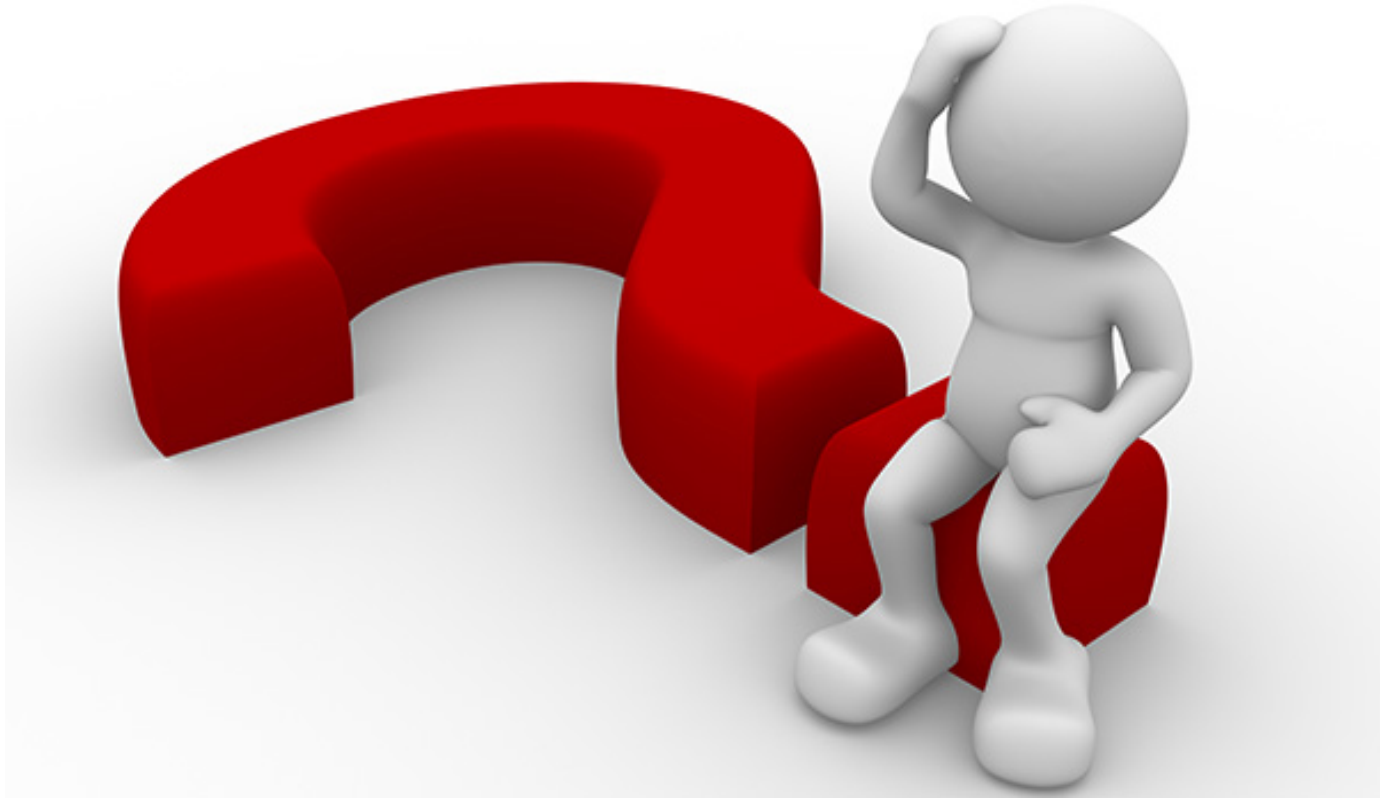
134.000 Emergency medical calls (1-1-2)

923.000 Calls to the Medical Helpline 1813

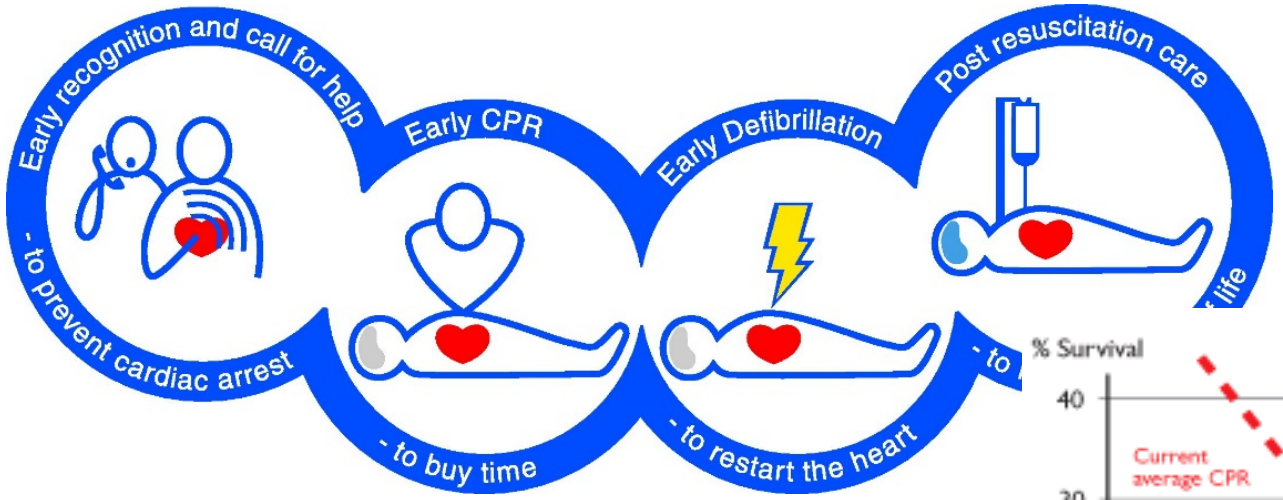
154.000 Emergency ambulance missions

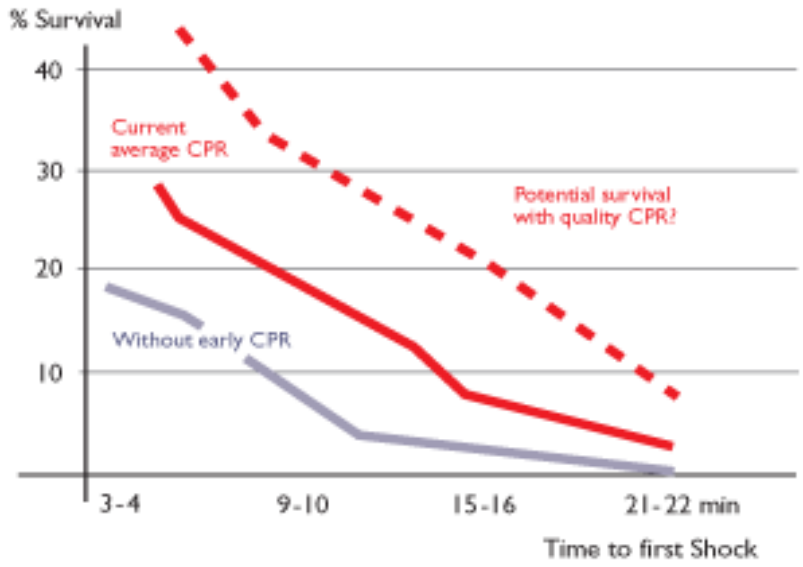
17.000	Mobile Critical Care Unit (Physician-staffed) missions
10.000	Inter-hospital transfers
24.000	Scheduled ambulance tasks
63.000	Patient transfers – non-emergency
1.000	Mobile prehospital psychiatric care unit tasks
15.000	Home consultations
1.000	Helicopter Emergency Medical Services missions

How can we use AI in medical dispatch
The EMDC-Copenhagen case



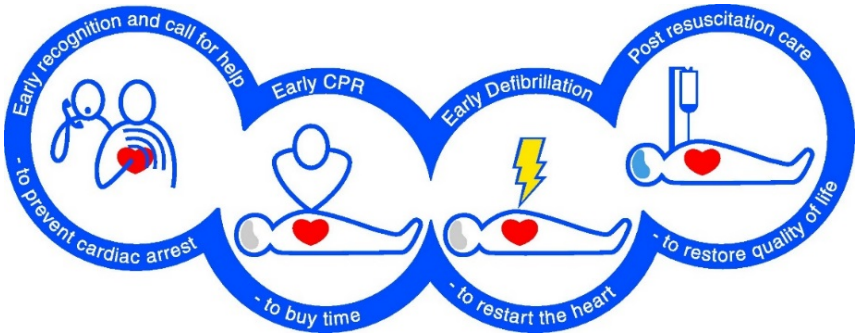
Why is artificial intelligence relevant for Out-of-Hospital Cardiac Arrest?

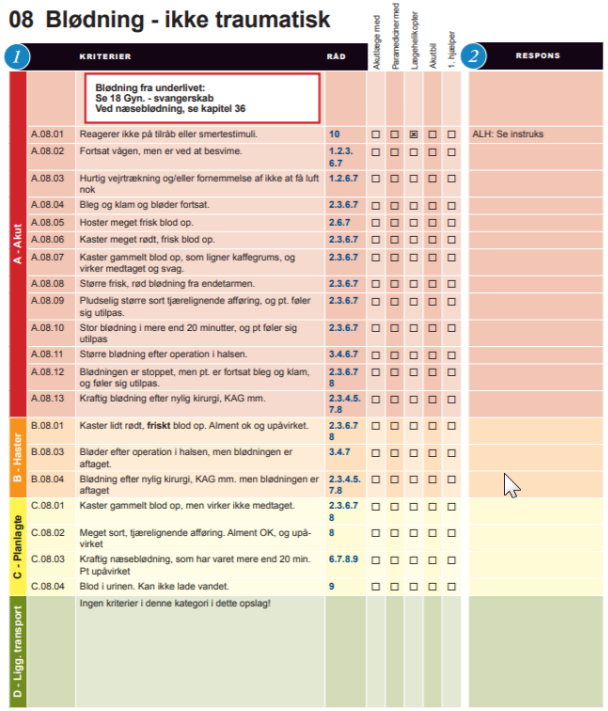




Out-of-hospital cardiac arrest is the challenge

- We have trained dispatchers in recognising OHCA
- We use decision support tools
- Still, we recognize just about 75% of all cardiac arrest on phone

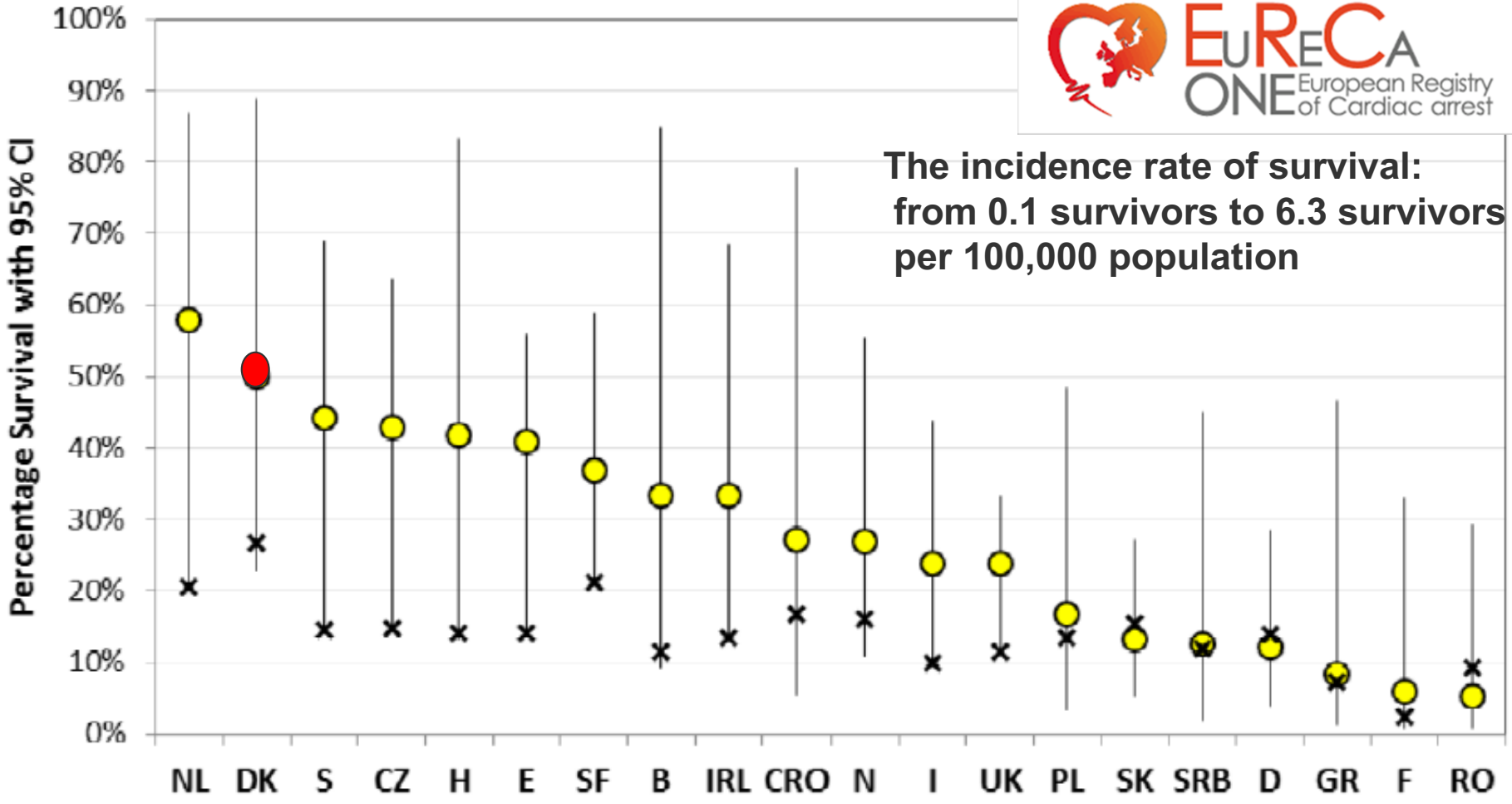




08 Blødning - ikke traumatisk

1	KRITERIER	RÅD	Akutlæge med	Paramediciner med	Lægehelikopter	Akutbil	I hjemler	2 RESPONS
A - Akut	**Blødning fra underlivet:** **Se 18 Gyn. - svangerskab** **Ved næseblødning, se kapitel 36**							
A - Akut	A.08.01 Reagerer ikke på tiltråb eller smertestimuli.	10	☐	☐	☒	☐	☐	ALH: Se instruks
A - Akut	A.08.02 Fortsat vågen, men er ved at besvime.	1.2.3.6.7	☐	☐	☐	☐	☐	
A - Akut	A.08.03 Hurtig vejrtrækning og/eller fornemmelse af ikke at få luft nok	1.2.6.7	☐	☐	☐	☐	☐	
A - Akut	A.08.04 Bleg og klam og bløder fortsat.	2.3.6.7	☐	☐	☐	☐	☐	
A - Akut	A.08.05 Hoster meget frisk blod op.	2.6.7	☐	☐	☐	☐	☐	
A - Akut	A.08.06 Kaster meget rødt, frisk blod op.	2.3.6.7	☐	☐	☐	☐	☐	
A - Akut	A.08.07 Kaster gammelt blod op, som ligner kaffegrums, og virker medtaget og svag.	2.3.6.7	☐	☐	☐	☐	☐	
A - Akut	A.08.08 Større frisk, rød blødning fra endetarmen.	2.3.6.7	☐	☐	☐	☐	☐	
A - Akut	A.08.09 Pludselig større sort tjærelignende afføring, og pt. føler sig utilpas.	2.3.6.7	☐	☐	☐	☐	☐	
A - Akut	A.08.10 Stor blødning i mere end 20 minutter, og pt føler sig utilpas	2.3.6.7	☐	☐	☐	☐	☐	
A - Akut	A.08.11 Større blødning efter operation i halsen.	3.4.6.7	☐	☐	☐	☐	☐	
A - Akut	A.08.12 Blødningen er stoppet, men pt. er fortsat bleg og klam, og føler sig utilpas.	2.3.6.7 8	☐	☐	☐	☐	☐	
A - Akut	A.08.13 Kraftig blødning efter nylig kirurgi, KAG mm.	2.3.4.5.7.8	☐	☐	☐	☐	☐	
B - Hastor	B.08.01 Kaster lidt rødt, **friskt** blod op. Ailment ok og upåvirket.	2.3.6.7 8	☐	☐	☐	☐	☐	
B - Hastor	B.08.03 Bløder efter operation i halsen, men blødningen er aftaget.	3.4.7	☐	☐	☐	☐	☐	
B - Hastor	B.08.04 Blødning efter nylig kirurgi, KAG mm. men blødningen er aftaget	2.3.4.5.7.8	☐	☐	☐	☐	☐	
C - Planlagte	C.08.01 Kaster gammelt blod op, men virker ikke medtaget.	2.3.6.7 8	☐	☐	☐	☐	☐	
C - Planlagte	C.08.02 Meget sort, tjærelignende afføring. Ailment OK, og upåvirket	8	☐	☐	☐	☐	☐	
C - Planlagte	C.08.03 Kraftig næseblødning, som har varet mere end 20 min. Pt upåvirket	6.7.8.9	☐	☐	☐	☐	☐	
C - Planlagte	C.08.04 Blod i urinen. Kan ikke lade vandet.	9	☐	☐	☐	☐	☐	
D - Ligg. transport	Ingen kriterier i denne kategori i dette opslag!							

EURECA One study in Resuscitation 2016
Survival to Hospital discharge in witnessed and shockable rhythm



EuReCa ONE European Registry of Cardiac arrest

The incidence rate of survival: from 0.1 survivors to 6.3 survivors per 100,000 population

Can AI help ?
How EMDC-Copenhagen uses AI.

- We set out to investigate if AI can be used as a desicion support tool in medical dispatch
- It is a tool for support, not a final bottom line

Can AI recognize cardiac arrest from audio. Retrospective study all calls in 2014

- 108,607 incidents with call to -1-2
- 918 calls regarding cardiac arrest
- 84.1% recognised by AI (95% CI: 81.6-86.4)
- 72.4% (95% CI: 69.4-75.3). Recognised by Dispatch
- 107 previously unrecognised OHCA recognised

Status	Medical dispatch	Machine learning framework
Recognized cardiac arrests	665	772
Unrecognized cardiac arrests	253	146
Cardiac arrest in population	**918**	**918**

ELSEVIER

Available online at www.sciencedirect.com

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

EUROPEAN RESUSCITATION COUNCIL

Clinical paper

Machine learning as a supportive tool to recognize cardiac arrest in emergency calls

Stig Nikolaj Blomberg[a,b,*], *Fredrik Folke*[a,b,c], *Annette Kjær Ersbøll*[d], *Helle Collatz Christensen*[a], *Christian Torp-Pedersen*[e,f], *Michael R. Sayre*[g], *Catherine R. Counts*[g], *Freddy K. Lippert*[a,b]

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Multicenter study – Seattle case

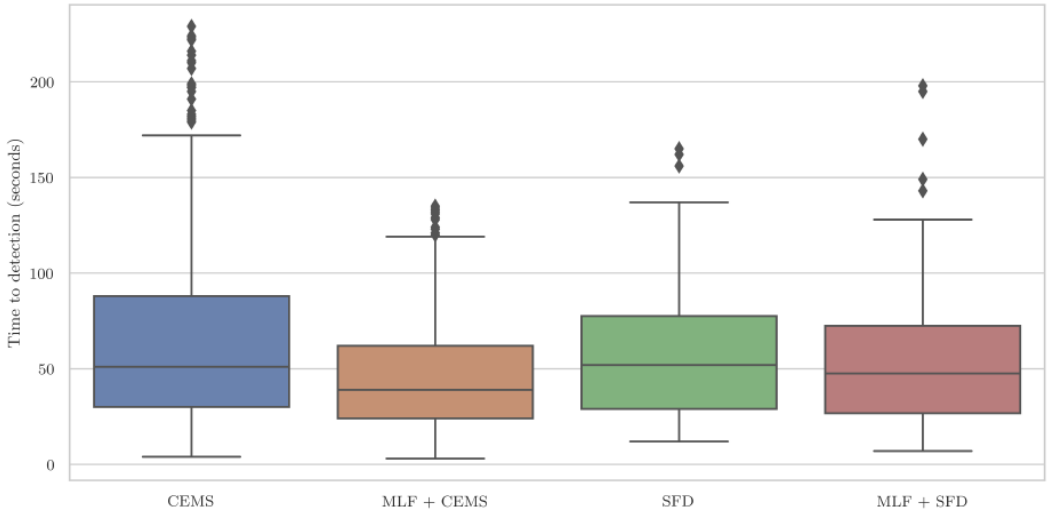


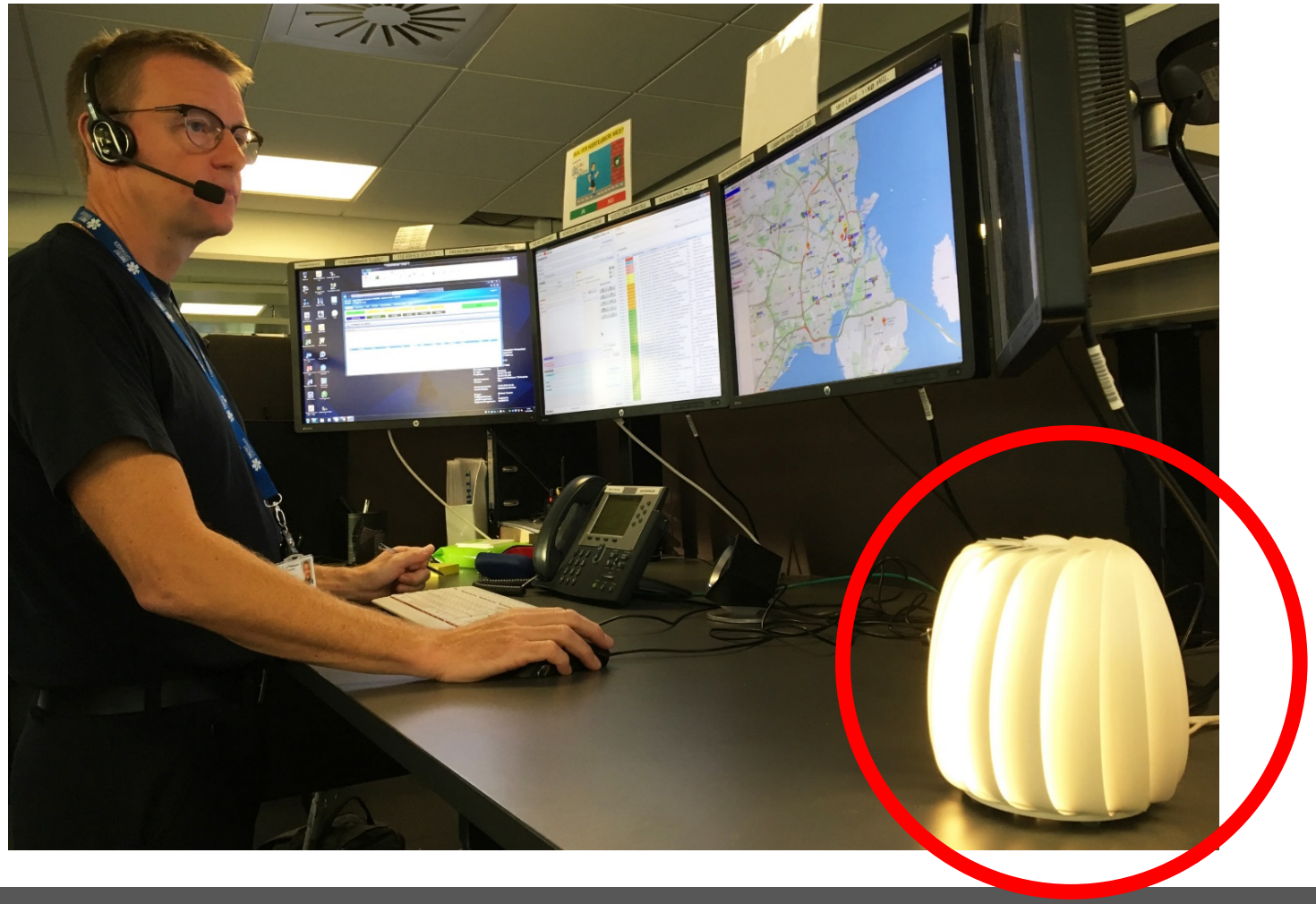
Figure 8: Boxplot comparing time-to-detection (TTD) of OHCA for the combination of MLF+CEMS and MLF+SFD as opposed to the EMDs at CEMS and SFD. Top 5% is excluded.

Can AI work on live audio in clinical practice

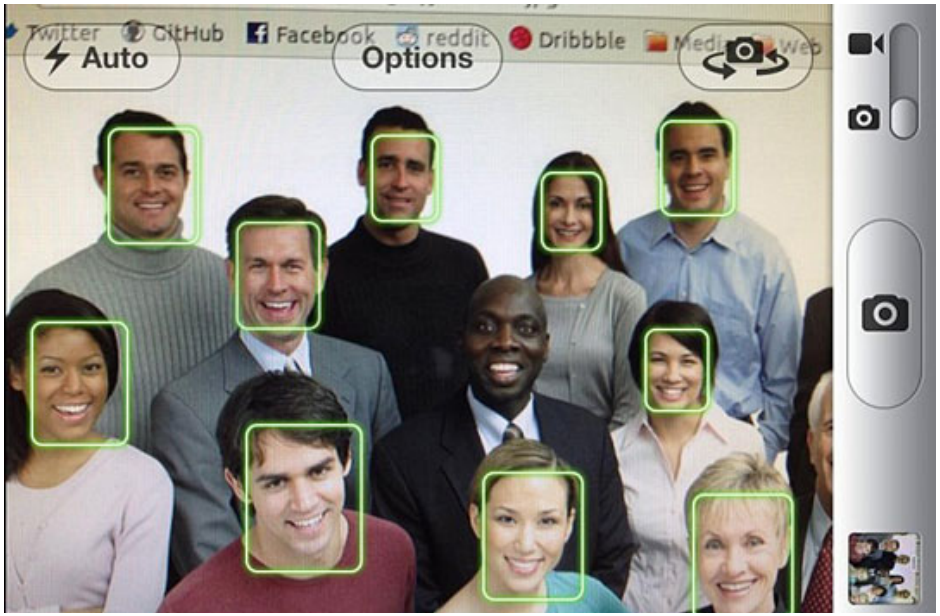
- Prospective randomised trial
- Started september 2018
- 8-9 months, at least 328 stops in each group
- Dispatchers in intervention group will receive alert in case of AI recognised cardiac arrest

- Alert: Dispatch A1; repeat No-No-Go; Dispatch Heartrunners

Happening right now



Challenges using AI



- Data ethics
- Overfitting model
- Public opinion on data usage
- Data validation and “time changes”
- Black box vs known impact of single factors

Thank you.

My supervisors

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MSc, PhD, Professor, National Institute of Public Health

Laerdal helping save lives

TrygFonden

Corti

Demonstration