The Capital Region of Denmark
Emergency Medical Services Copenhagen

UNIVERSITY OF COPENHAGEN
FACULTY OF HEALTH AND MEDICAL SCIENCES

Laerdal
helping save lives

TrygFonden

Corti

REGION

Copenhagen EMS
Use of AI in medical dispatch

Stig Nikolaj Blomberg

Agenda

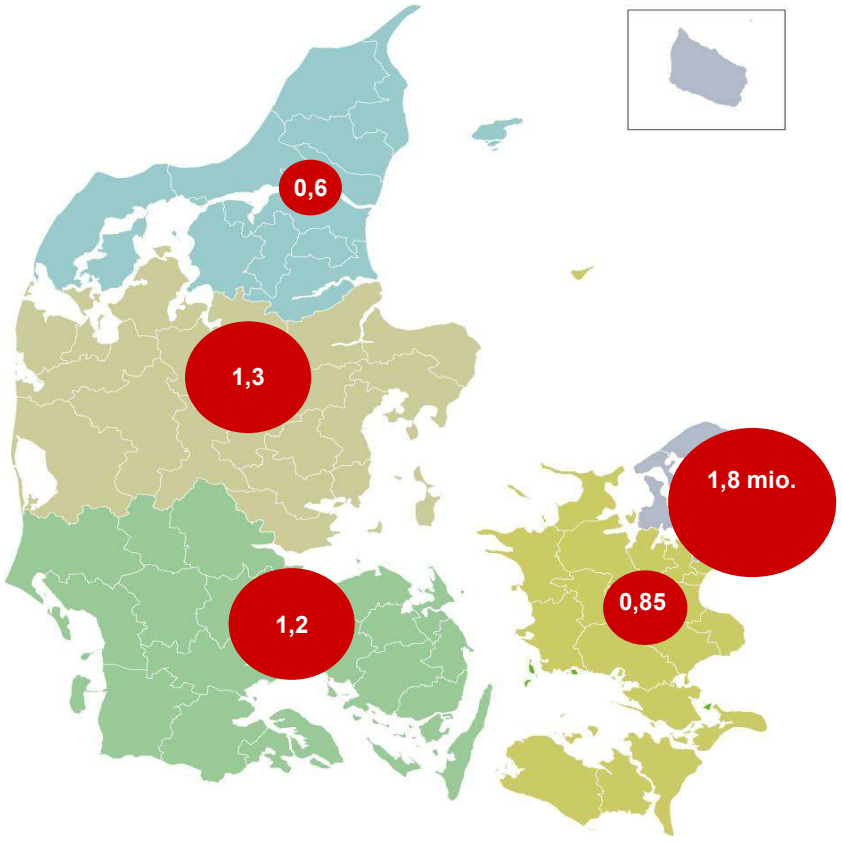
- Setting: Copenhagen EMS
- How can we use AI in medical dispatch
- Results/experience
- Heart-runner project

Capital Region of Denmark

One of five Administrative & Health Care Regions

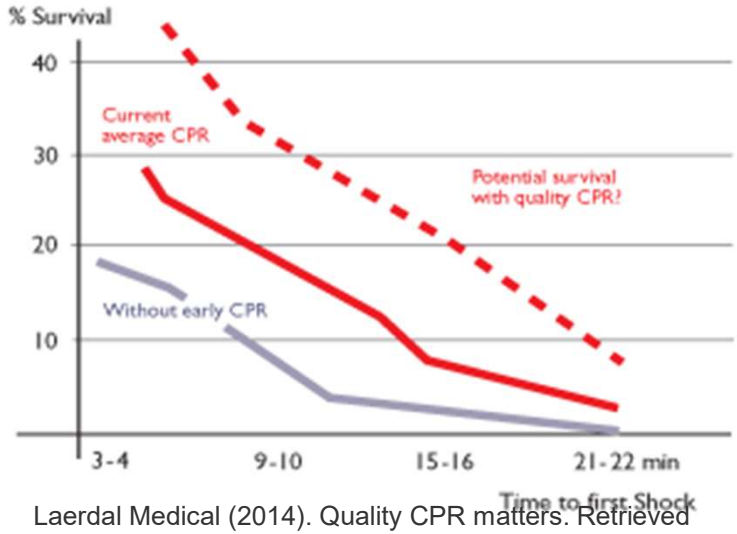
- Population 1,8 million
- 7 fire and rescue services
- 2 ambulance providers

One medical dispatcher centre



How can we use AI in medical dispatch
The Copenhagen EMS case

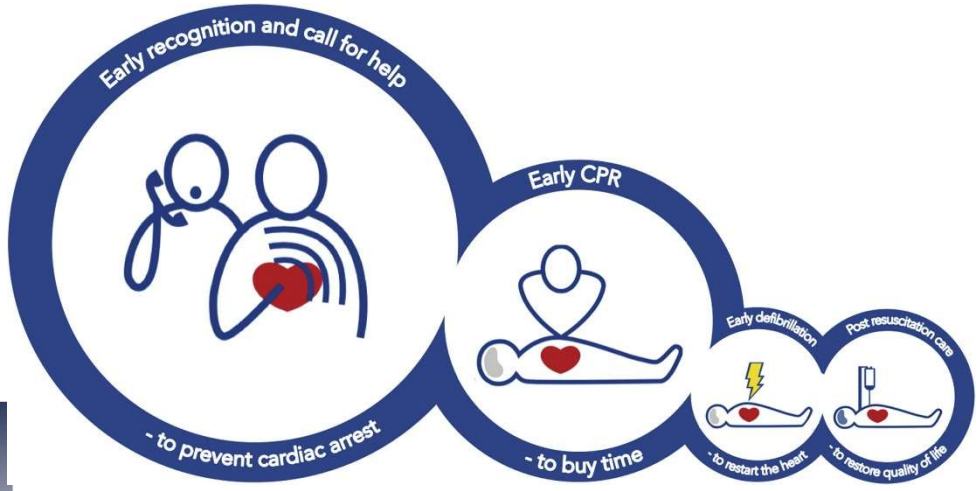
Why is artificial intelligence relevant for Out-of-Hospital Cardiac Arrest?

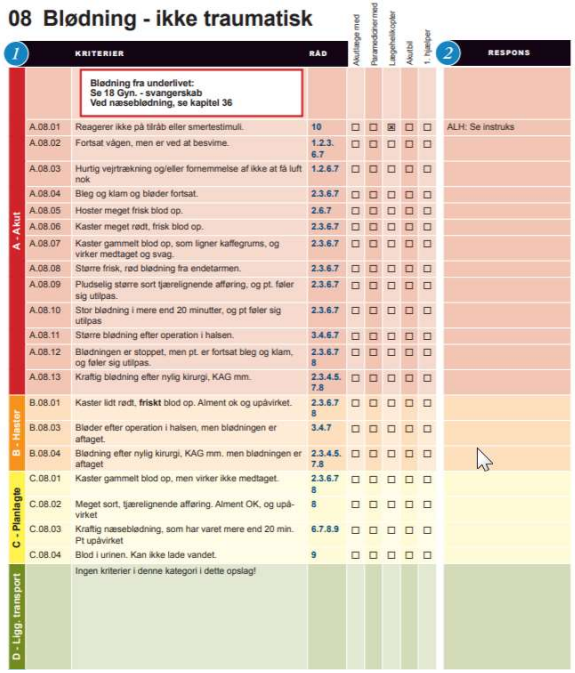


Laerdal Medical (2014). Quality CPR matters. Retrieved from http://www.laerdal.com/ca/docid/36691005/Quality-CPR-matters

Recognising 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 arrests





08 Blødning - ikke traumatisk

1		KRITERIER	RÅD	Akutlæge med	Paramediciner med	Lægehelikopter	Akutbil	1. hjælper	2 RESPONS
A - Akut		**Blødning fra underlivet: Se 18 Gyn. - svangerskab Ved næseblødning, se kapitel 36**							
	A.08.01	Reagerer ikke på tiltråb eller smertestimuli.	10	☐	☐	☒	☐	☐	ALH: Se instruks
	A.08.02	Fortsat vågen, men er ved at besvime.	1.2.3. 6.7	☐	☐	☐	☐	☐	
	A.08.03	Hurtig vejrtrækning og/eller fornemmelse af ikke at få luft nok	1.2.6.7	☐	☐	☐	☐	☐	
	A.08.04	Bleg og klam og bløder fortsat.	2.3.6.7	☐	☐	☐	☐	☐	
	A.08.05	Hoster meget frisk blod op.	2.6.7	☐	☐	☐	☐	☐	
	A.08.06	Kaster meget rødt, frisk blod op.	2.3.6.7	☐	☐	☐	☐	☐	
	A.08.07	Kaster gammelt blod op, som ligner kaffegrums, og virker medtaget og svag.	2.3.6.7	☐	☐	☐	☐	☐	
	A.08.08	Større frisk, rød blødning fra endetarmen.	2.3.6.7	☐	☐	☐	☐	☐	
	A.08.09	Pludselig større sort tjærelignende afføring, og pt. føler sig utilpas.	2.3.6.7	☐	☐	☐	☐	☐	
	A.08.10	Stor blødning i mere end 20 minutter, og pt føler sig utilpas	2.3.6.7	☐	☐	☐	☐	☐	
	A.08.11	Større blødning efter operation i halsen.	3.4.6.7	☐	☐	☐	☐	☐	
	A.08.12	Blødningen er stoppet, men pt. er fortsat bleg og klam, og føler sig utilpas.	2.3.6.7 8	☐	☐	☐	☐	☐	
	A.08.13	Kraftig blødning efter nylig kirurgi, KAG mm.	2.3.4.5. 7.8	☐	☐	☐	☐	☐	
B - Haster	B.08.01	Kaster lidt rødt, **friskt** blod op. Ailment ok og upåvirket.	2.3.6.7 8	☐	☐	☐	☐	☐	
	B.08.03	Bløder efter operation i halsen, men blødningen er aftaget.	3.4.7	☐	☐	☐	☐	☐	
	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.08.02	Meget sort, tjærelignende afføring. Ailment OK, og upåvirket	8	☐	☐	☐	☐	☐	
	C.08.03	Kraftig næseblødning, som har varet mere end 20 min. Pt upåvirket	6.7.8.9	☐	☐	☐	☐	☐	
	C.08.04	Blod i urinen. Kan ikke lade vandet.	9	☐	☐	☐	☐	☐	
D - Ligg. transport		Ingen kriterier i denne kategori i dette opslag!							

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 emergency number (1-1-2)
- 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

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

Blomberg, S. N., Folke, F., Ersbøll, A. K., Christensen, H. C., Torp-Pedersen, C., Sayre, M. R., ... & Lippert, F. K. (2019). Machine learning as a supportive tool to recognize cardiac arrest in emergency calls. *Resuscitation*.

RESUSCITATION 138 (2019) 322–329

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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

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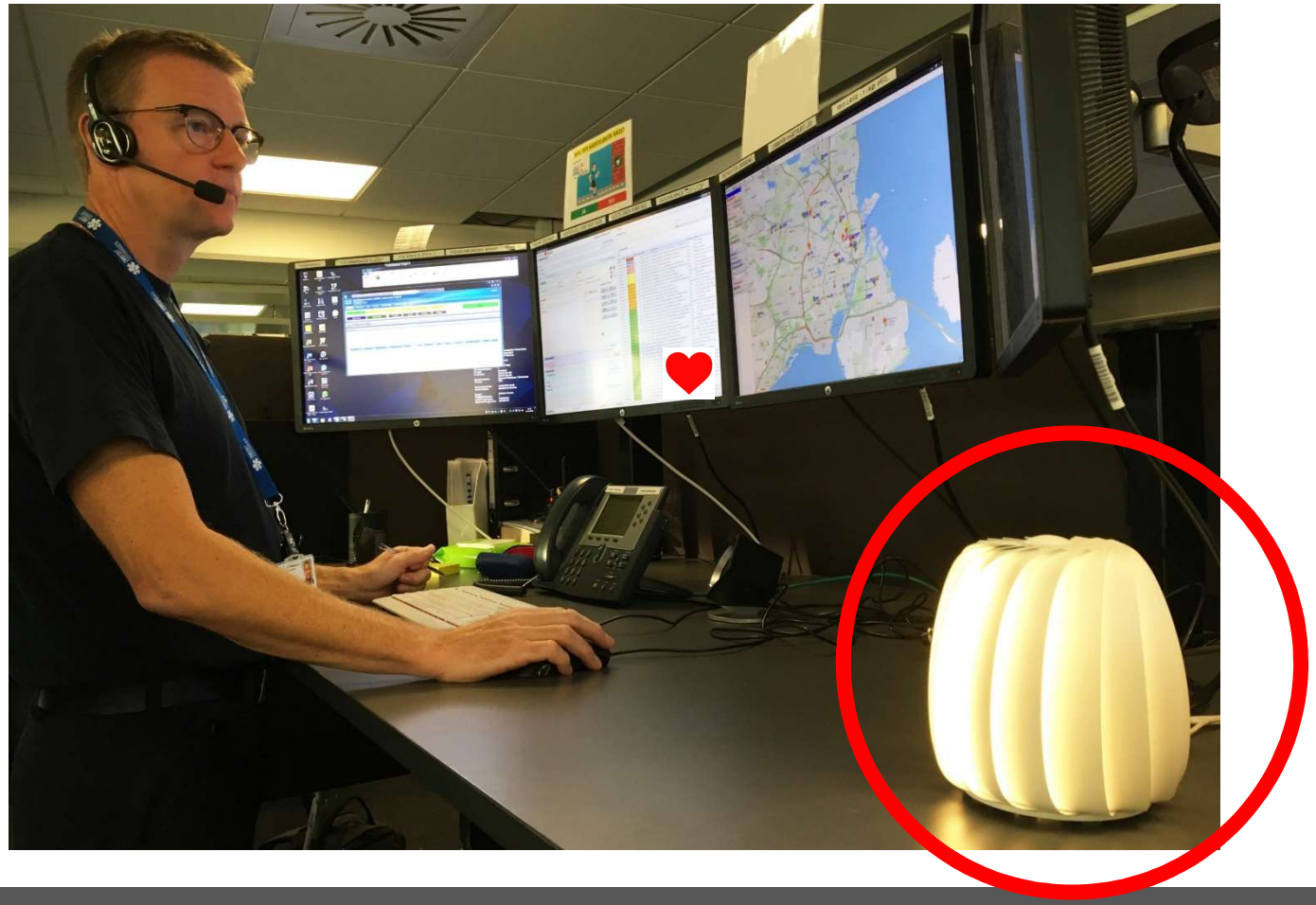
Multicenter study
Copenhagen-Seattle case

Can AI work on live audio in clinical practice?

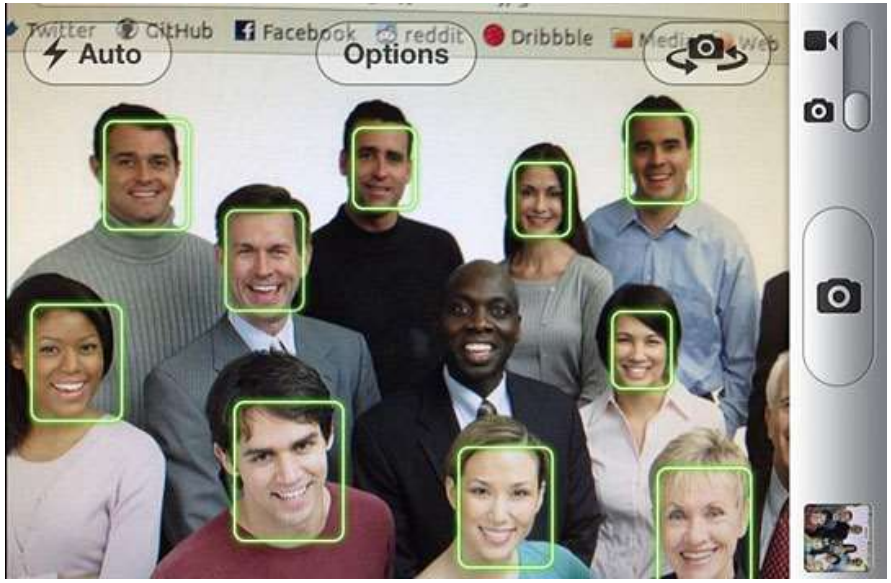
- Prospective randomised trial
- Started september 2018
- 12 months, at least 328 arrests in each group
- Dispatchers in intervention group will receive alert in case of AI recognised cardiac arrest

- Alert: Dispatch High-Priority light and sirens; repeat No-No-Go; Dispatch Citizen responders

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

Summary

AI can be trained to recognize Cardiac Arrest

AI can improve recognition of Cardiac Arrest

AI is a decision support tool

A randomized clinical trial is being performed, preliminary results expected autumn 2019

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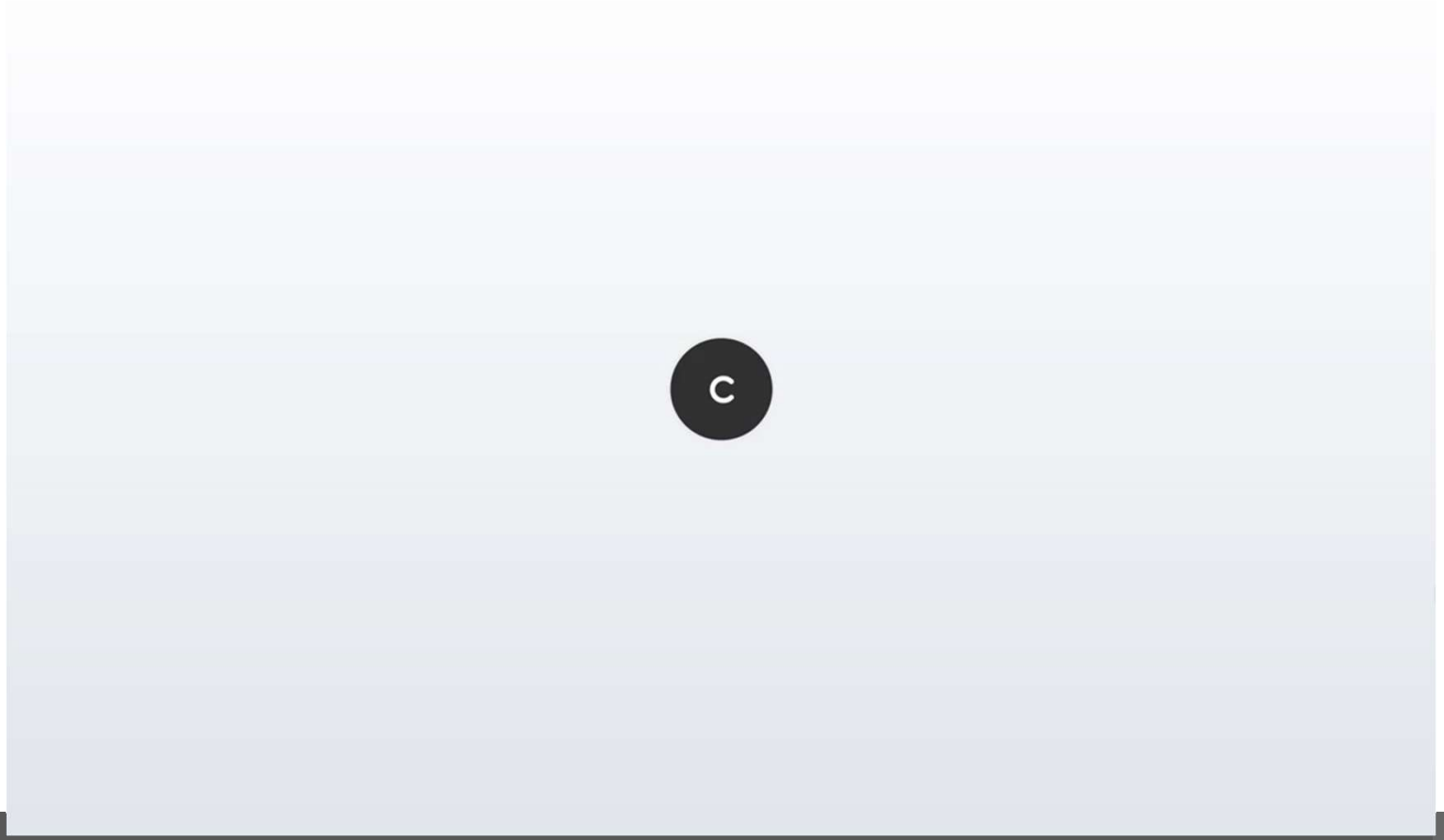
Demonstration