

# AEDs

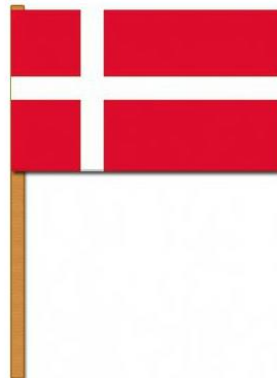
How it started, where is it now  
and (maybe) where it will go

Ruud Koster  
Academic Medical Center  
Amsterdam



Conflict of interests: many!

- Physio-Control (now Stryker)
- HeartSine
- Zoll Medical
- Philips Medical
- Cardiac Science
- Defibtech
- Netherlands Heart Foundation



## What will I tell?

Development of AEDs

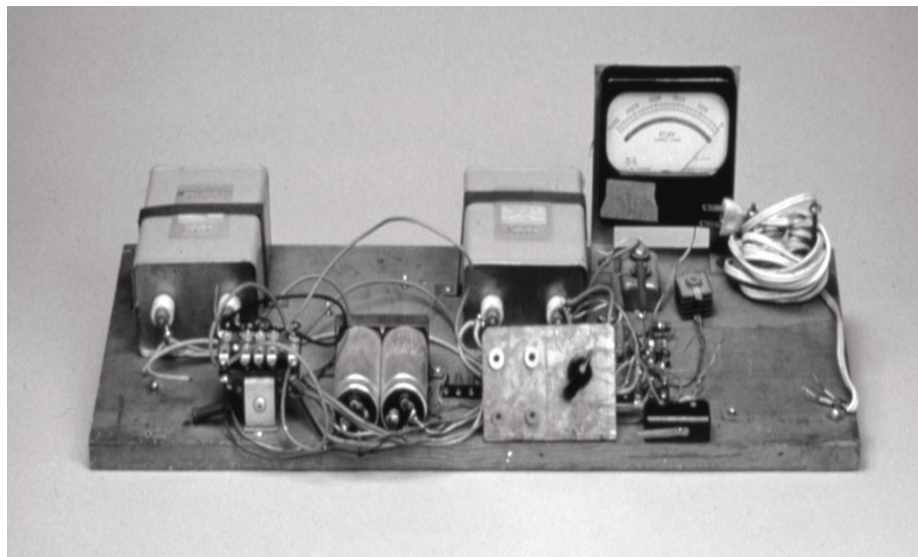
Waveforms

What we achieved

What can/must we expect in the next years?



Dr. Edmark

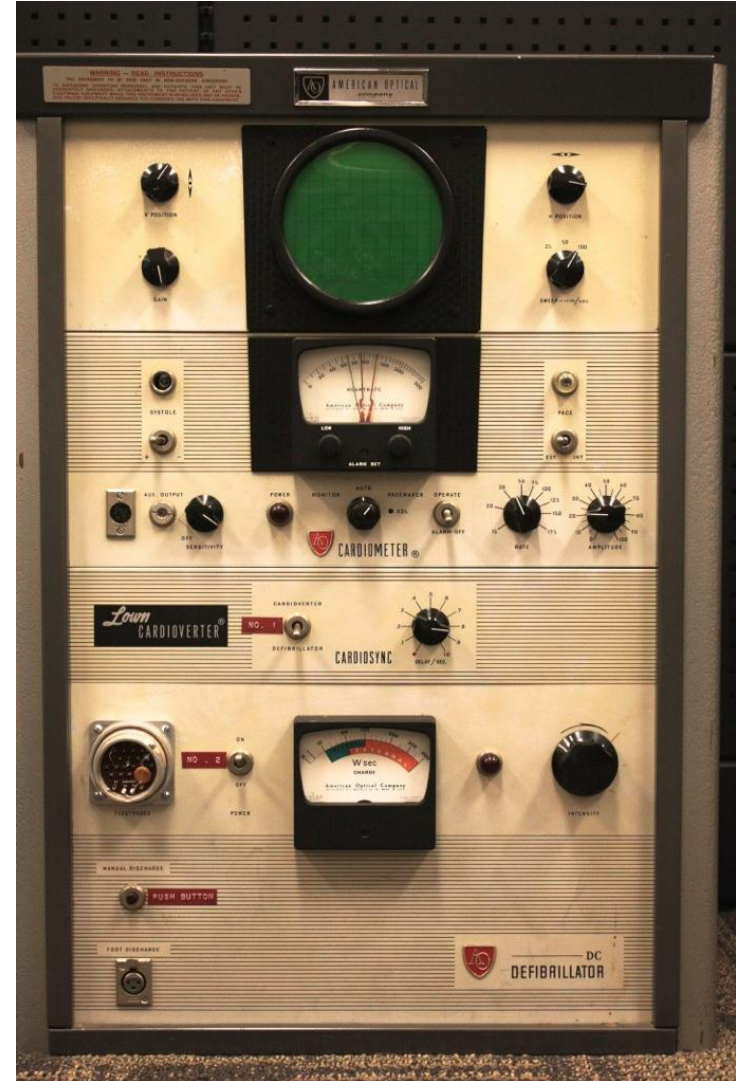
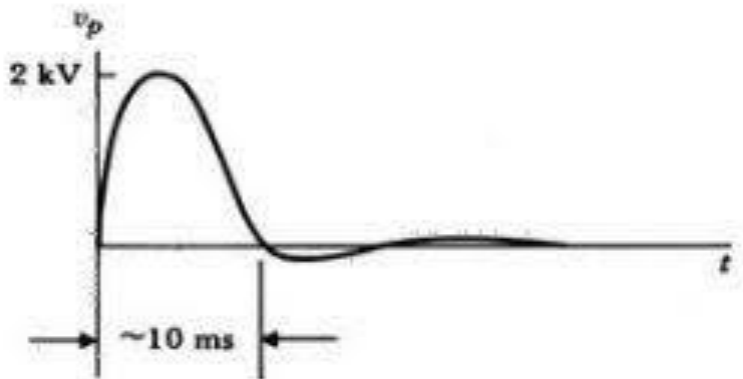


1955



1961

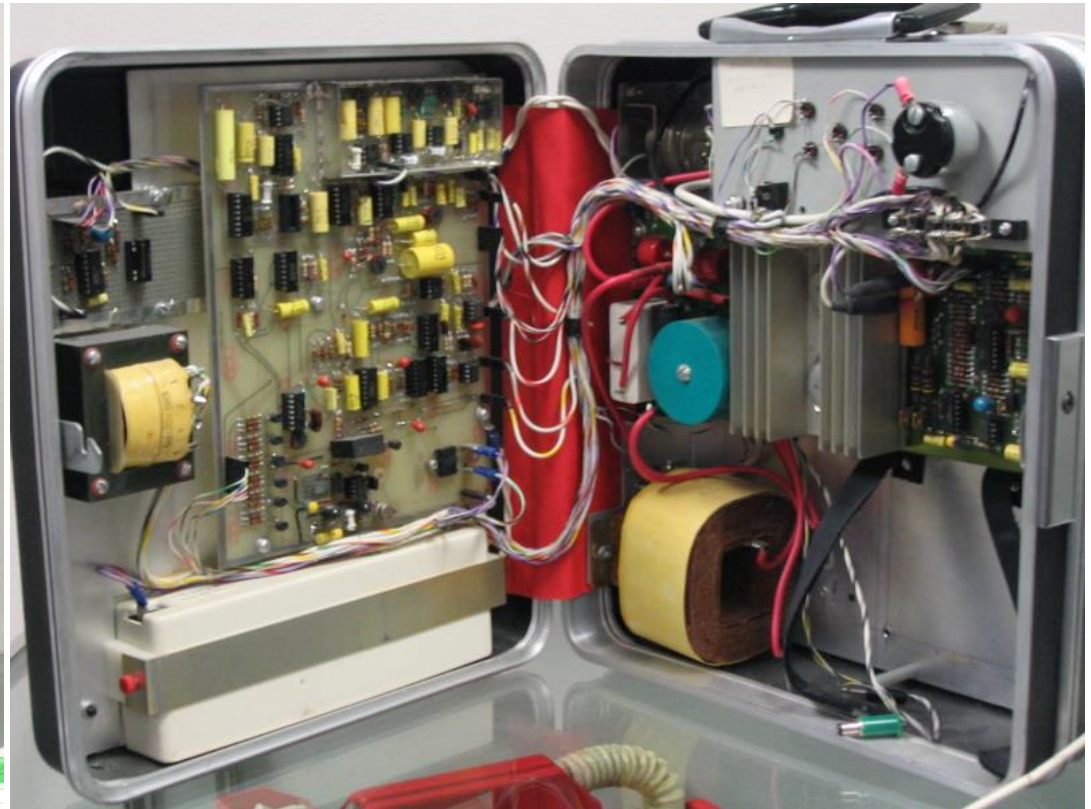
## 1961: Lown Defibrillator





# Automatiske Externe Defibrillator: AED

1978: Cardiac Resuscitator



# Automatic Externe Defibrillator: AED

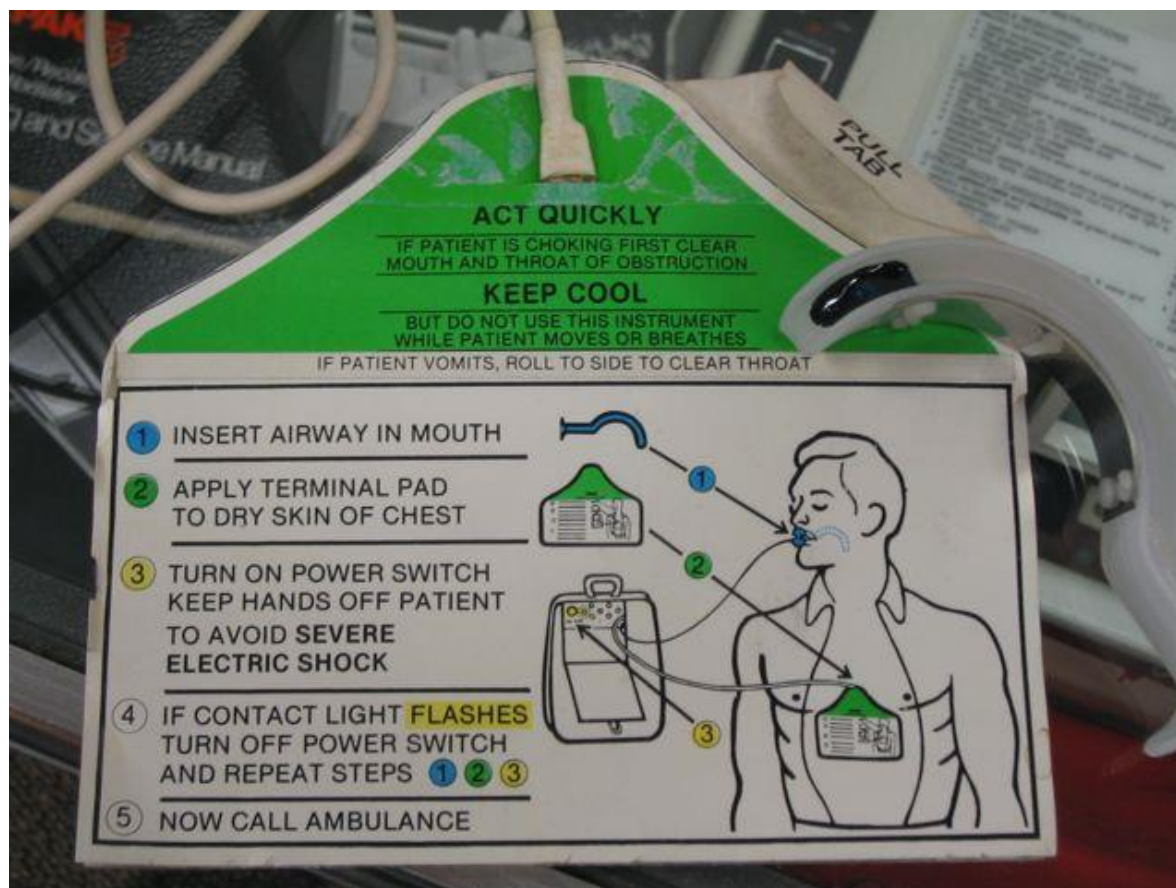
## 1978: Cardiac Resuscitator



## 1987: Heart Aid







## 1987: CRC Heart Aid 80



## Physio Control Lifepak 100

- First use 1987
- Much experience
- safe, effective





## the AED anno 1999

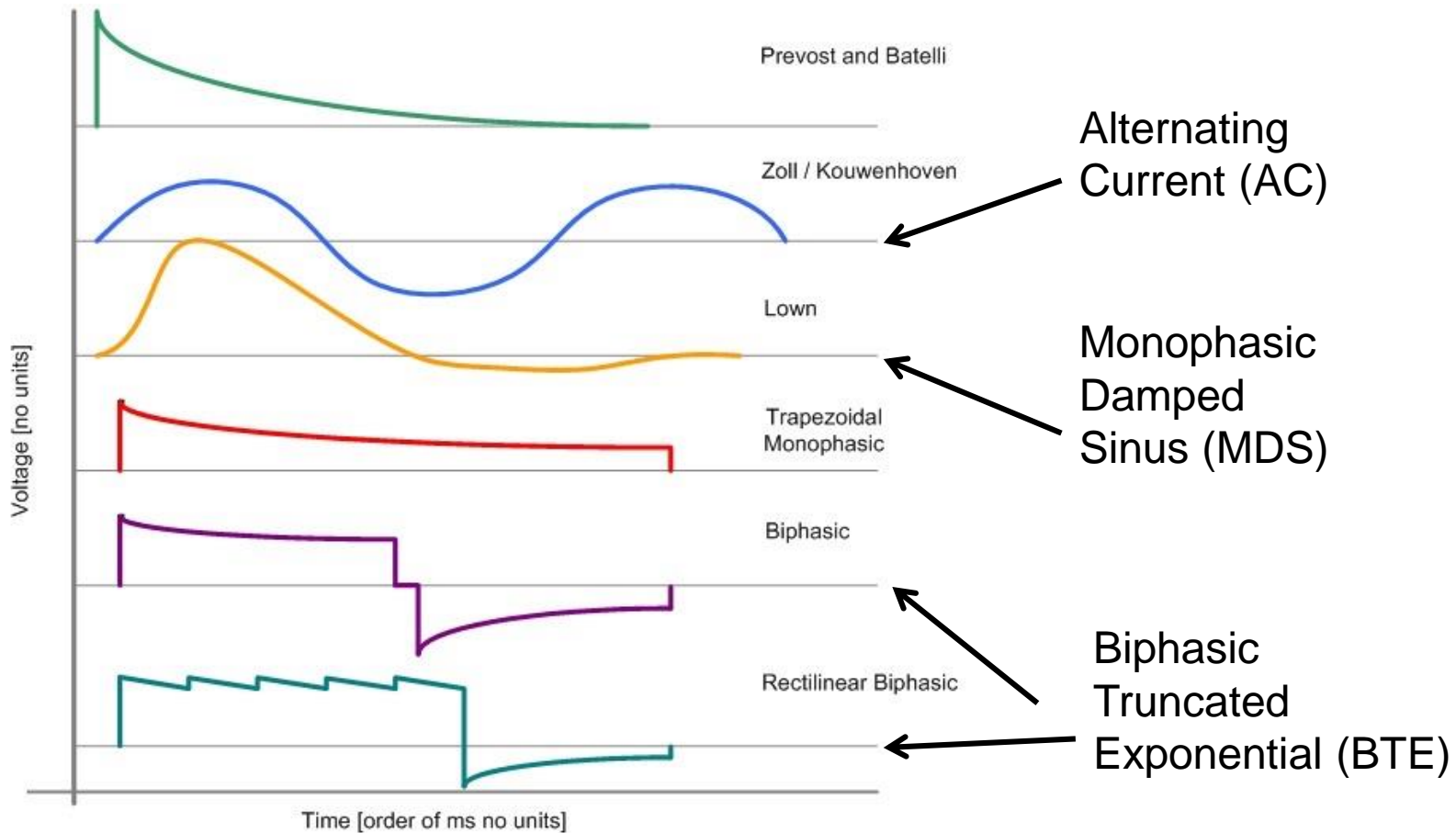


Heartstream FR1 BTE

## Lifepak 500 MDS and BTE



## Waveforms





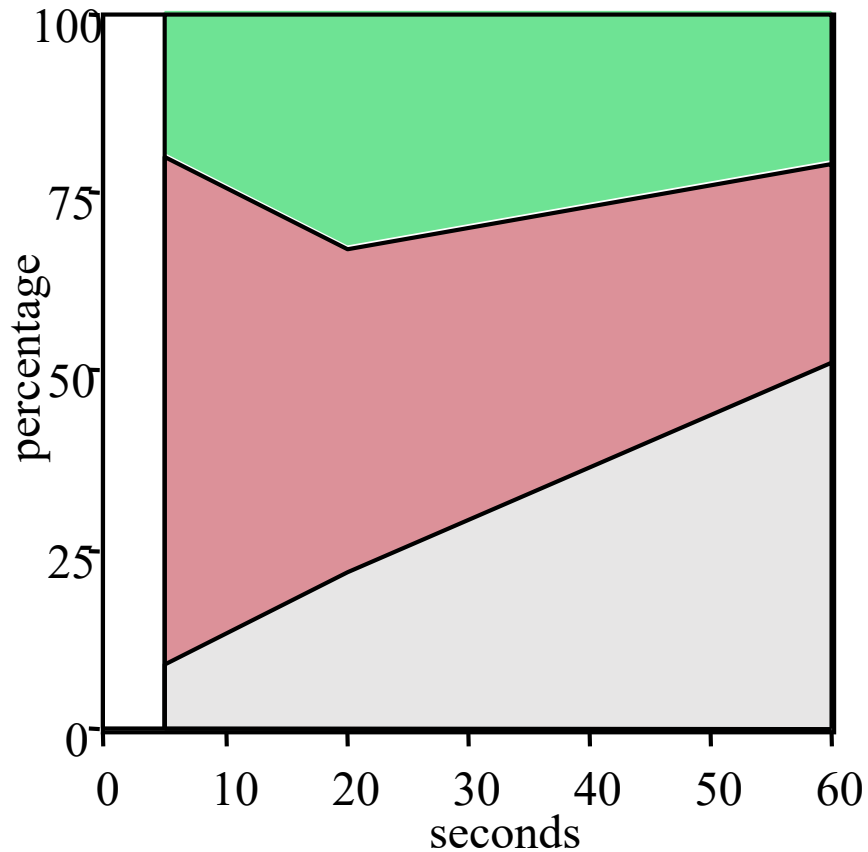


**ARREST**

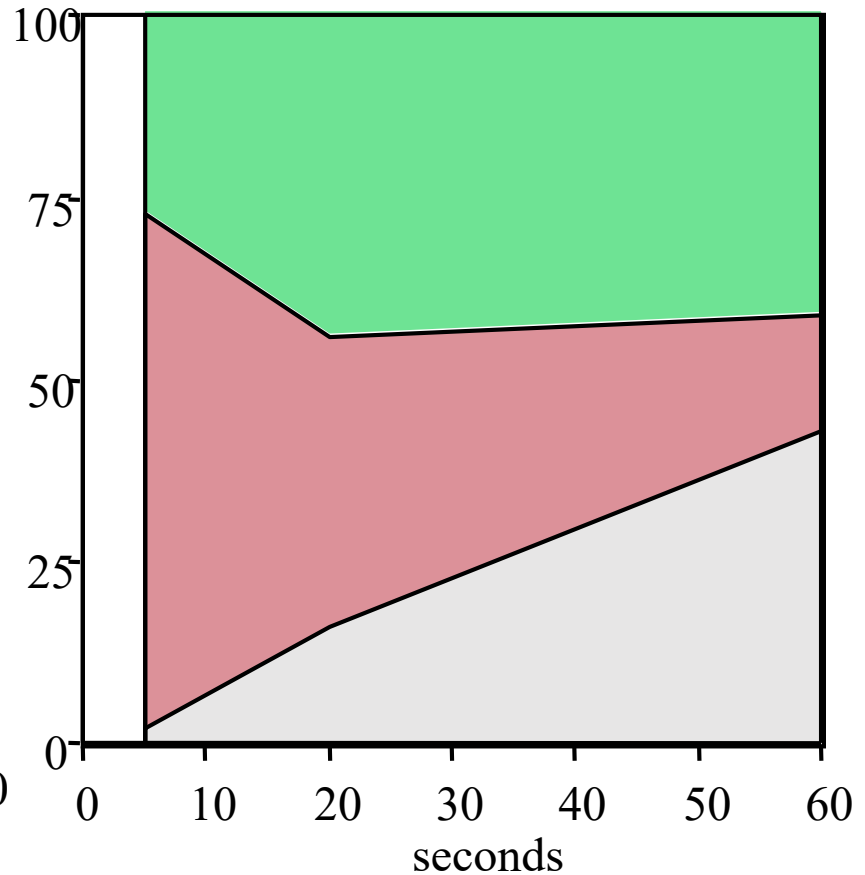
- organized
- asystole
- VF

## Randomized comparison for VF

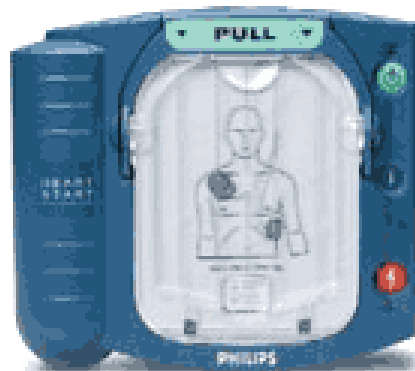
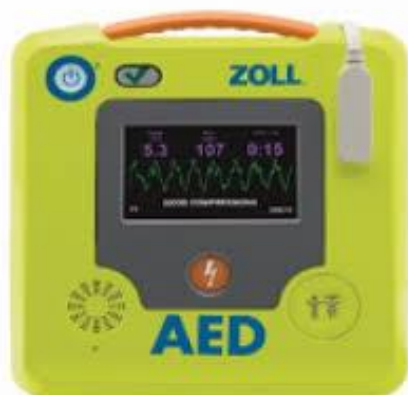
MDS waveform, n=69



BTE waveform, n=51



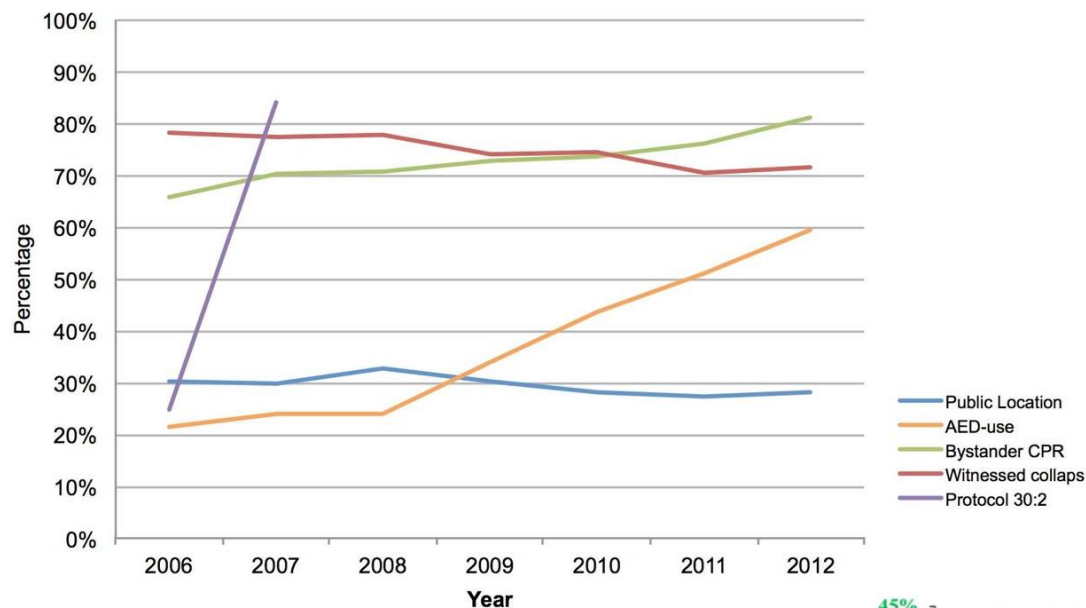
## AEDs 2019



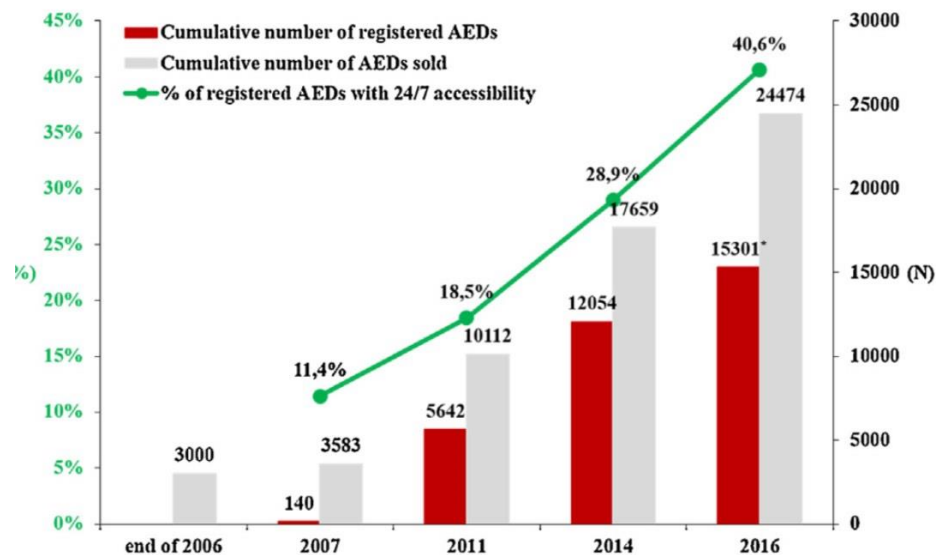
## AEDs through time



DANSK  
RÅD FOR  
GENOPLIVNING



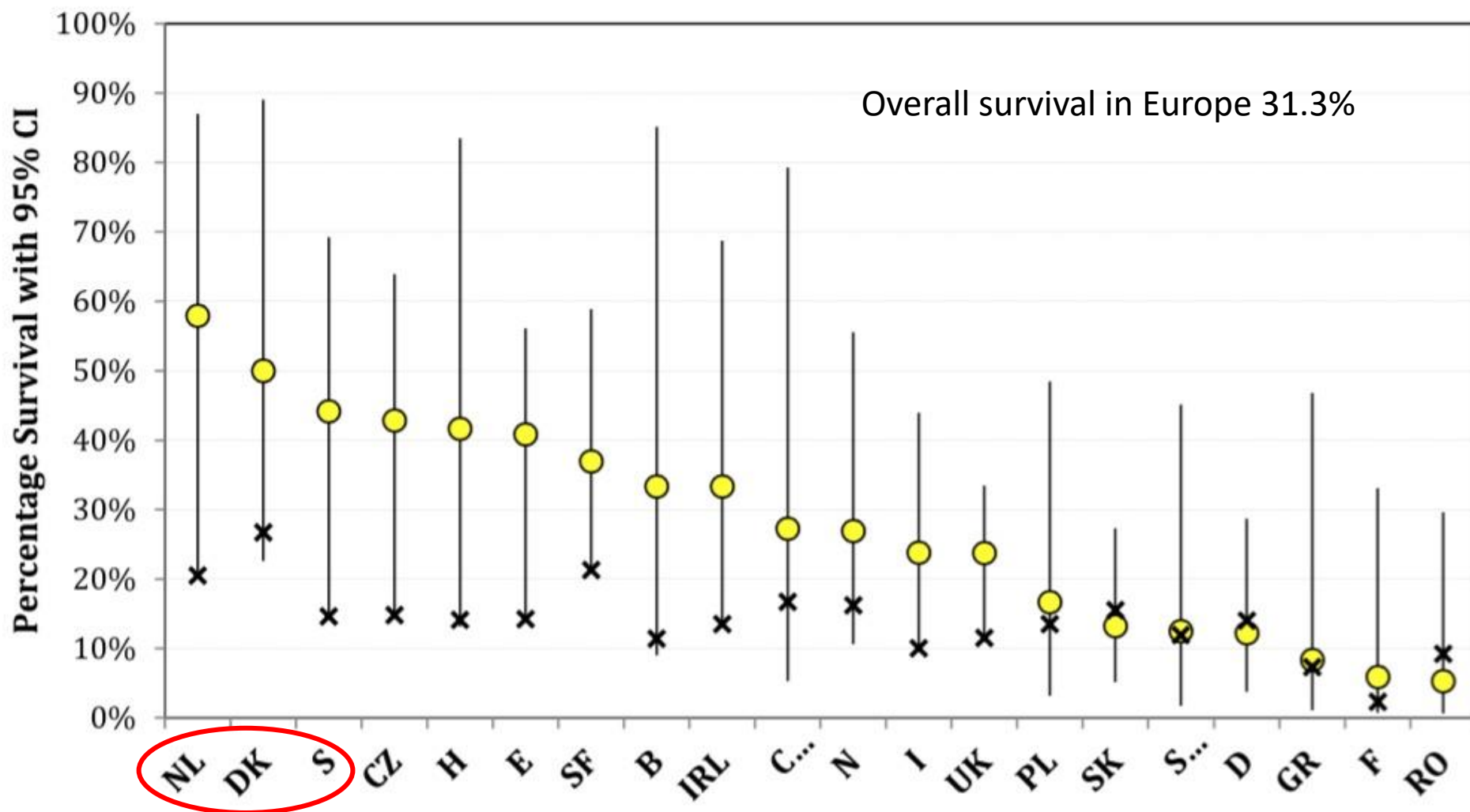
Blom Circulation 2014



Karlsson Resuscitation 2019

## EuReCa One study

Survival 2017 shockable rhythm: Utstein comparator

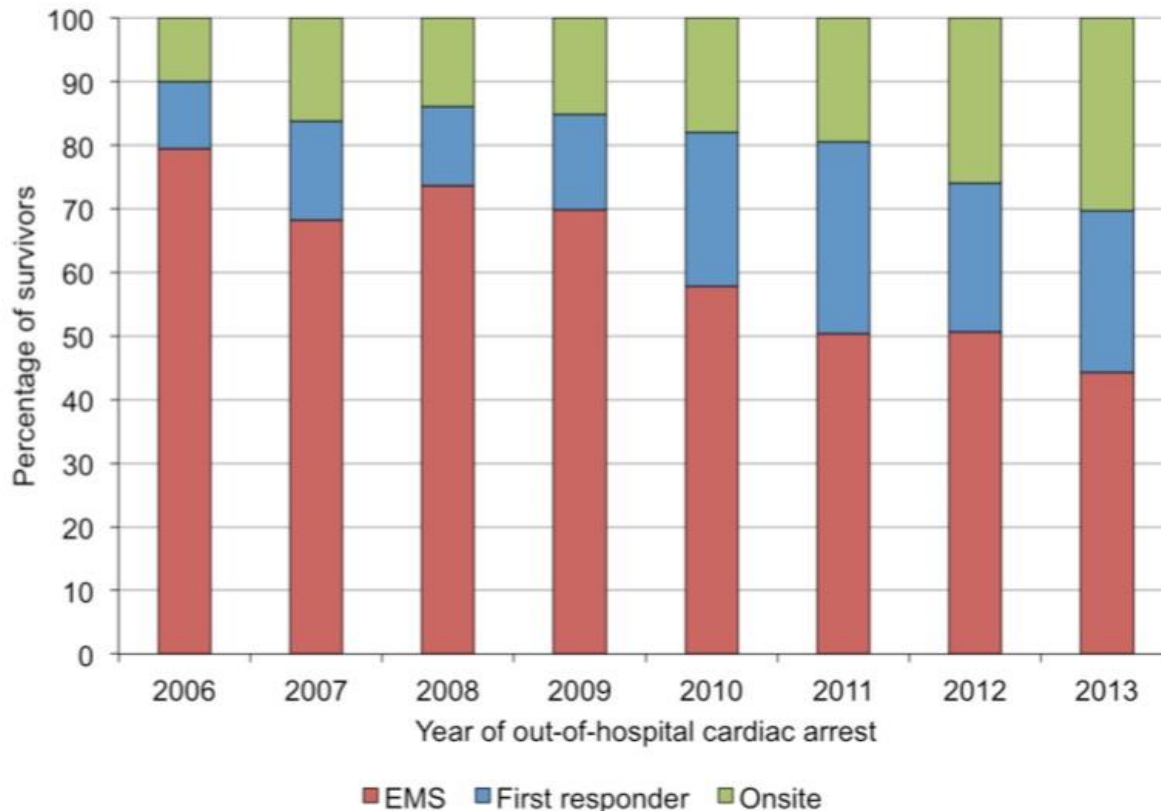


## ORIGINAL RESEARCH ARTICLE

## Different defibrillation strategies in survivors after out-of-hospital cardiac arrest

Jolande A Zijlstra,<sup>1</sup> Rudolph W Koster,<sup>1</sup> Marieke T Blom,<sup>1</sup> Freddy K Lippert,<sup>2</sup> Leif Svensson,<sup>3</sup> Johan Herlitz,<sup>4</sup> Jo Kramer-Johansen,<sup>5</sup> Mattias Ringh,<sup>3</sup> Mårten Rosenqvist,<sup>6</sup> Thea Palsgaard Møller,<sup>2</sup> Hanno L Tan,<sup>1</sup> Stefanie G Beesems,<sup>1</sup> Michiel Hulleman,<sup>1</sup> Andreas Claesson,<sup>3</sup> Fredrik Folke,<sup>2</sup> Theresa Mariero Olasveengen,<sup>5</sup> Mads Wissenberg,<sup>7</sup> Carolina Malta Hansen,<sup>7</sup> Søren Viereck,<sup>2</sup> Jacob Hollenberg,<sup>3</sup> for the COSTA study group

Heart 2018





What holds the (near) future?



As we speak:

Public vs residential use of AEDs

Nearby responders with smart phones + GPS

Near future:

CPR during rhythm analysis

Connectivity: remote surveillance and patient data

Possible future:

Standardization of design? Connections



As we speak:

Public vs residential

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## Where are we using AEDS? Public vs Residential?

### Facts:

“Public Access Defibrillation” PAD = use in Public  
Of all cardiac arrest 25% in public; 75% residential  
Public 70-80% VF; residential 40-50% VF

### Simple math:

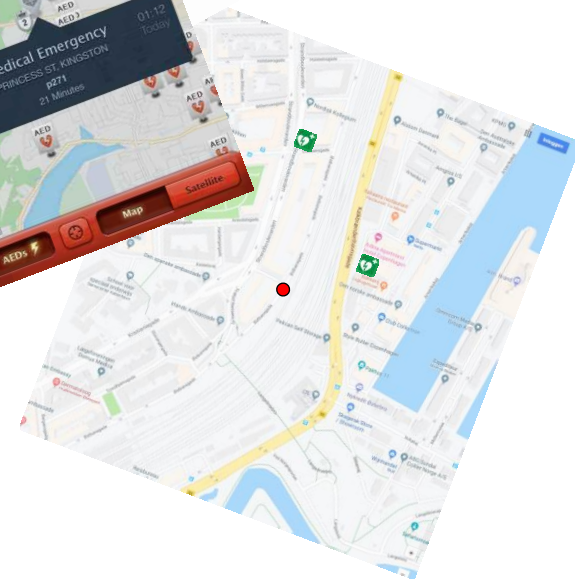
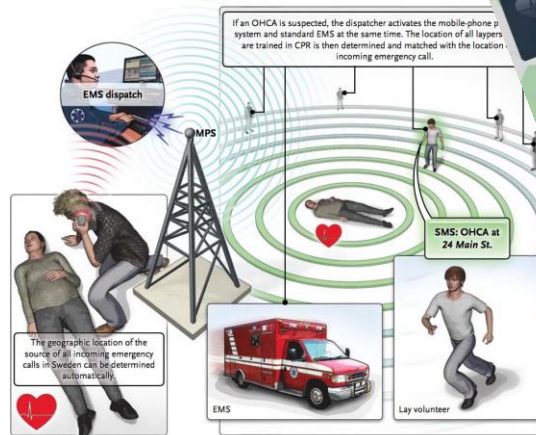
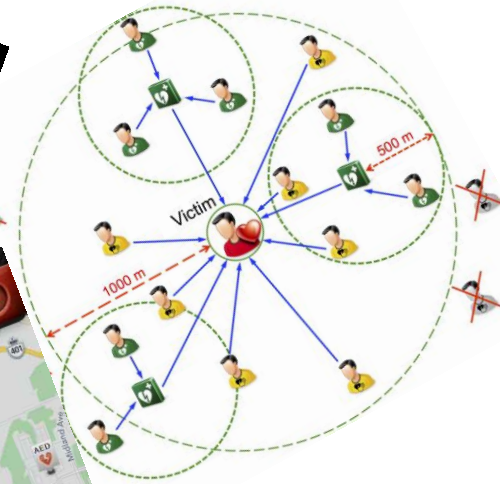
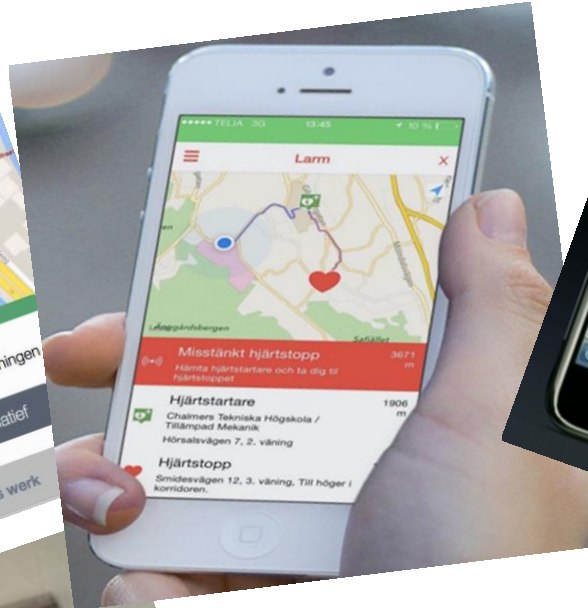
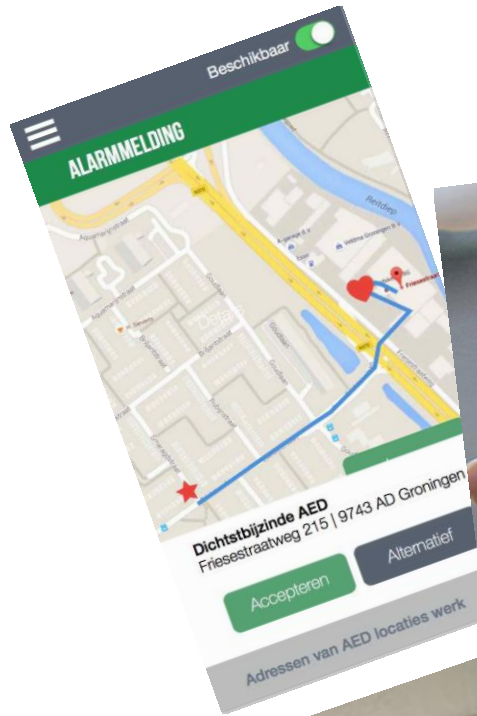
How many with shockable rhythm?

Public: 80% of 25% = 19%

Residential: 50% of 75% = 38%

AED in residences reach twice as many patients as in public!

## Nearby rescuers





As we speak:

Public vs residential

Nearby responders with smart phones + GPS

Near future:

CPR during rhythm analysis

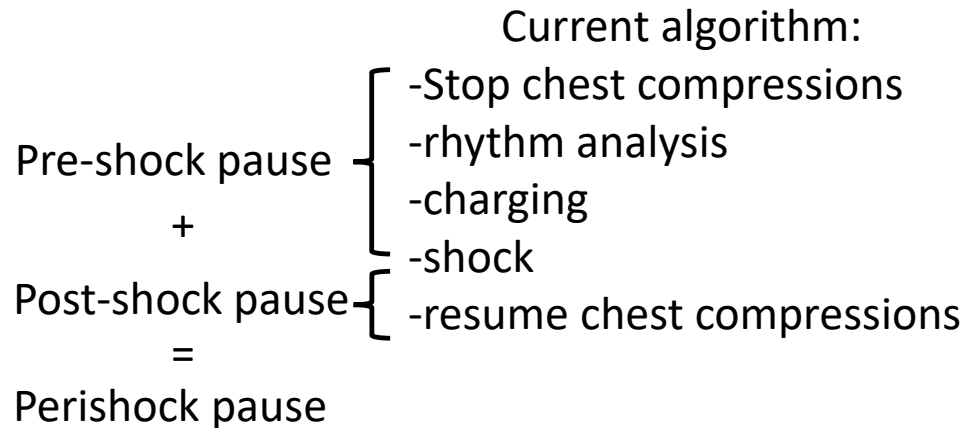
Connectivity: remote surveillance and patient data

Possible future:

Standardization of design? Connections



# Rhythm analysis during chest compressions

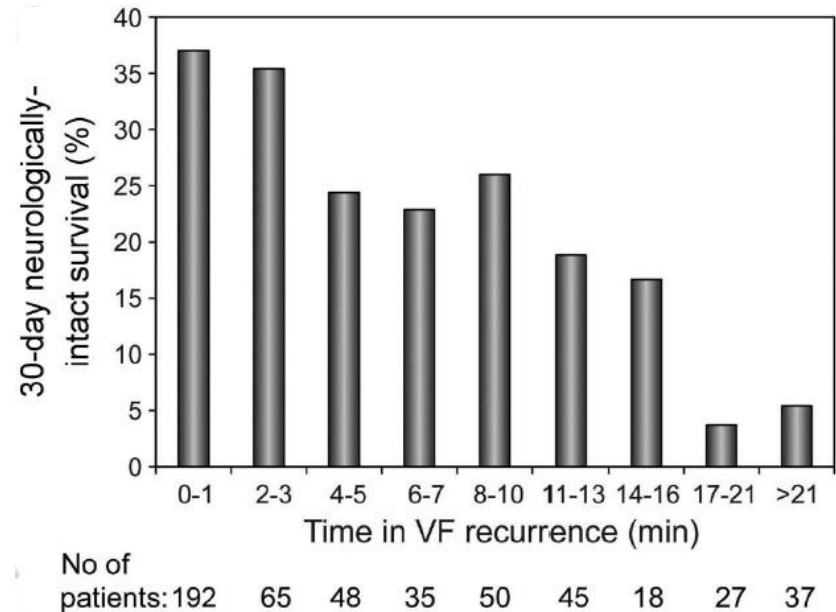
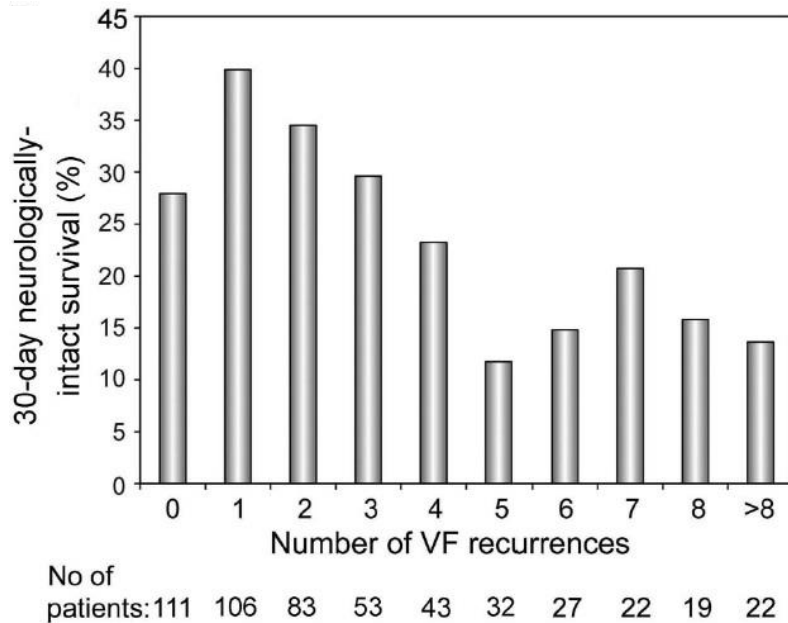


**Table 3. Survival to Hospital Discharge as a Function of Maximum\* Shock Pause**

				<i>P</i>
Preshock pause, s	<10	10–19	≥20	
Survival, %	35.1	35.5	25.1	0.02
Postshock pause, s	<10	10–19	≥20	
Survival, %	31.8	30.8	22.7	0.06
Perishock pause, s	<20	20–39	≥40	
Survival, %	32.6	31.9	20.3	0.01

\*Limited to first 3 shocks.

# These algorithms have far more potential!



Time in recurrence (median (IQR) 12 minutes (6-18))

As we speak:

Public vs residential

Nearby responders with smart phones + GPS

**Near future:**

CPR during rhythm analysis

**Connectivity: remote surveillance, patient data**

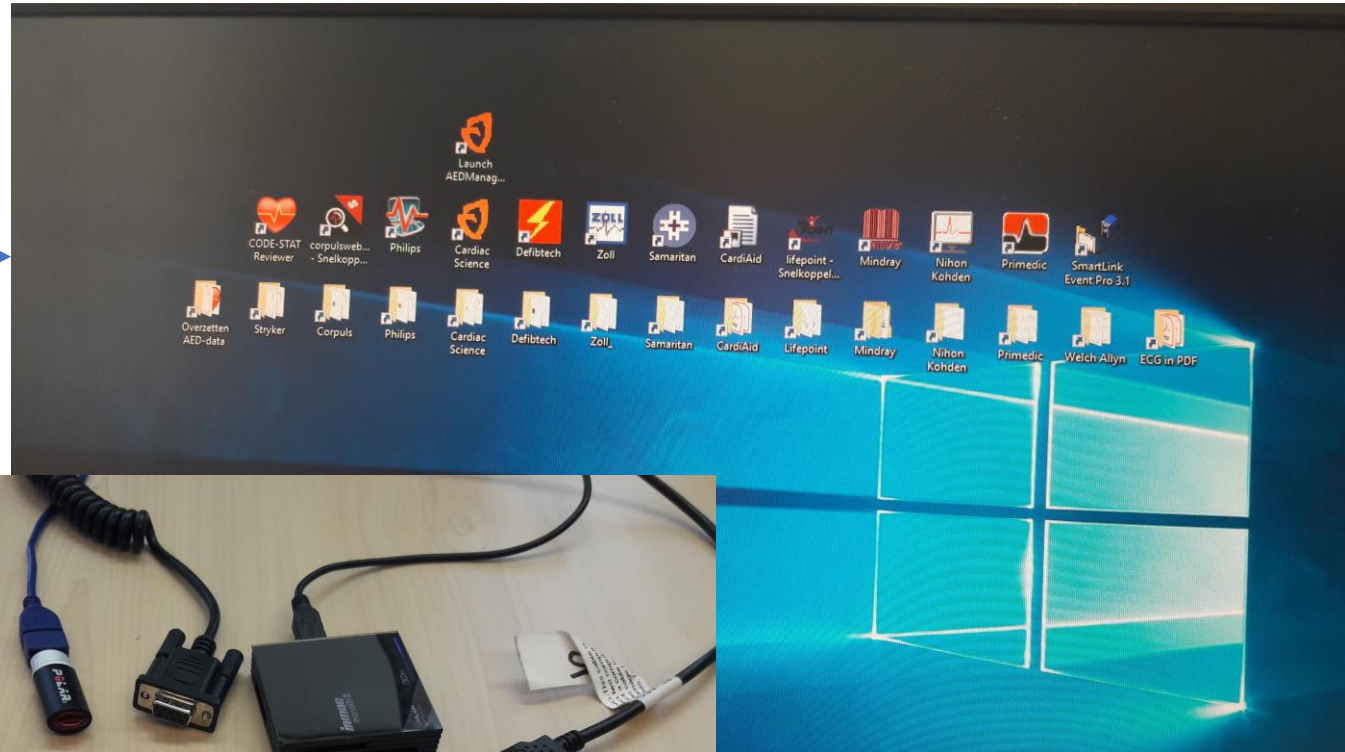
Possible future:

Standardization of design? Connections



## Standardization? No change since 2011....

14 apps →



← 10 cables and tools



Some progress....

WiFi



Zoll AED3  
Patient+status

WiFi/GSM



Stryker Lifepak CR2  
Patient+status

WiFi



Mindray BeneHeart D1  
Status

But only part of the story....  
Who will receive the patient information?  
Local? Industry? National?

One last thing:

Long term and good outcome of cardiac arrest  
is mainly determined  
in the first 10 minutes after collapse

AED 1978



