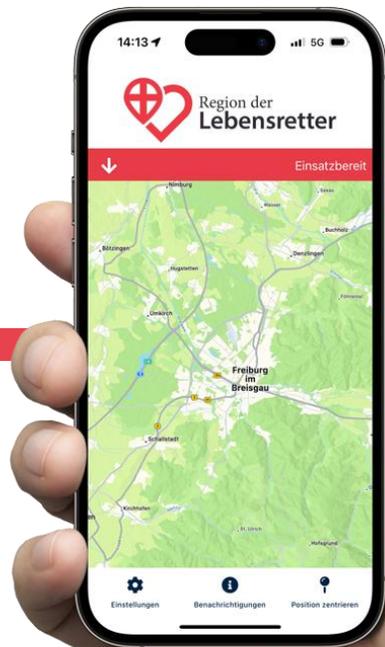


Region der
Lebensretter



It takes a system **to save lives**

App-basierte Ersthelfersysteme: Was lernen wir aus der
Forschung und wie können wir noch mehr Leben retten?

Michael Müller
20.3.2026, Nottwil

Interessenskonflikte

- 1. Vorsitzender, Region der Lebensretter e.V.
- Mitglied des Exekutivkomitee, Deutscher Rat f. Wiederbelebung e.V. (GRC)

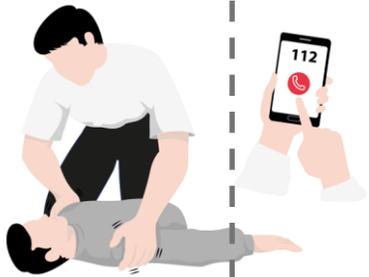
Warum überleben nur 10%?

112



Warum überleben nur 10%?

112



Kollaps

0 min

1-2 min

**Weil 8-15 Minuten
nichts passiert...**

... in 50% der Fälle



ALS / RD

8-15 min

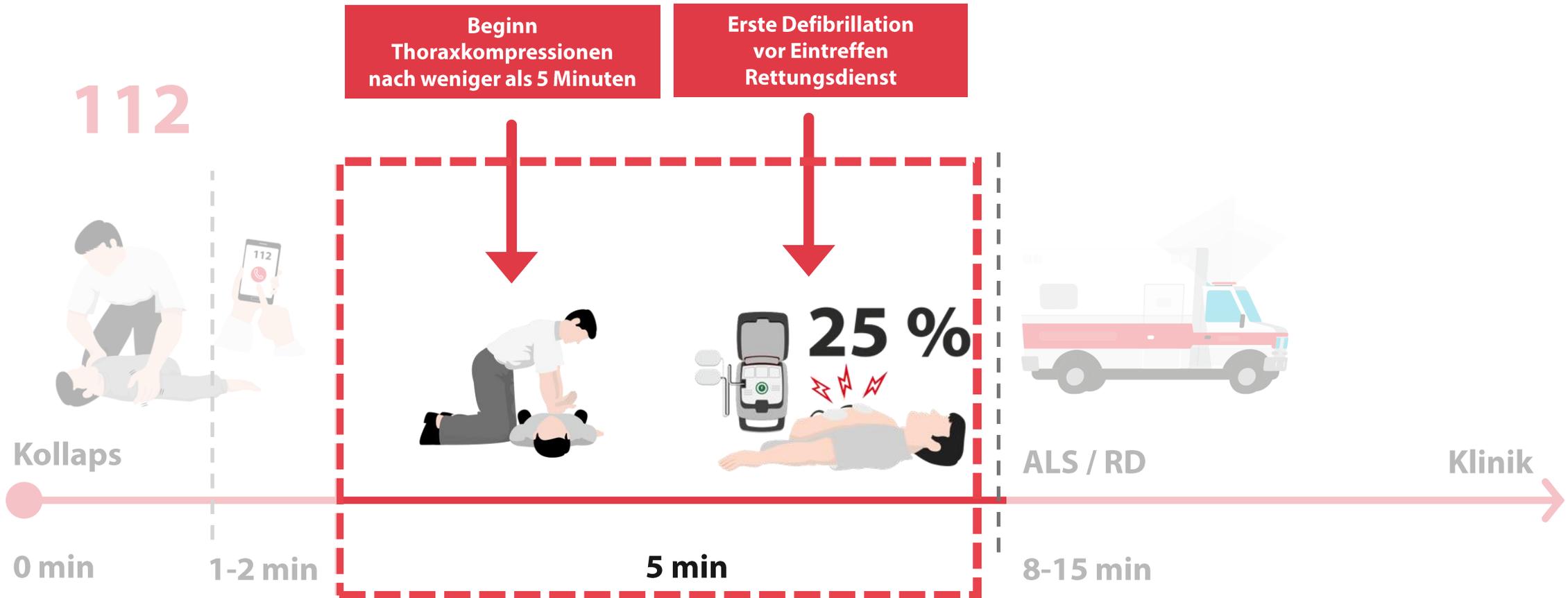
Klinik



Warum überleben nur 10%?

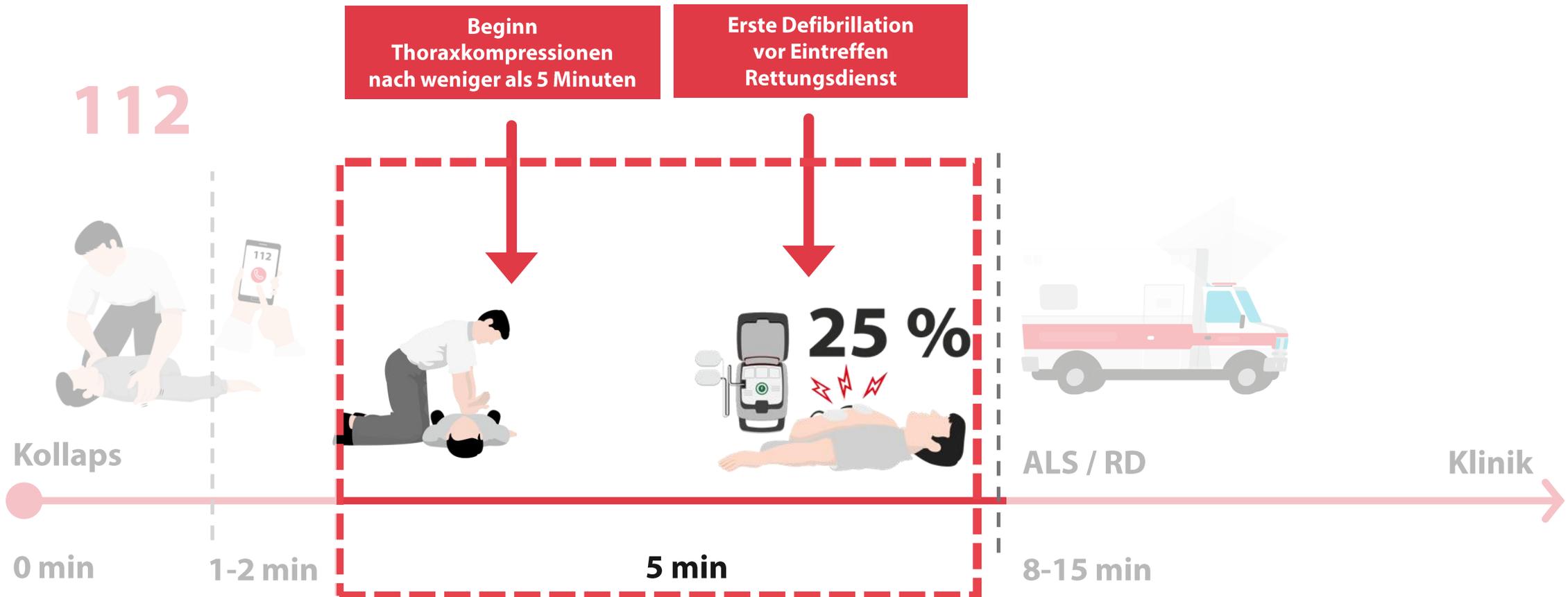


Ein perfektes System?

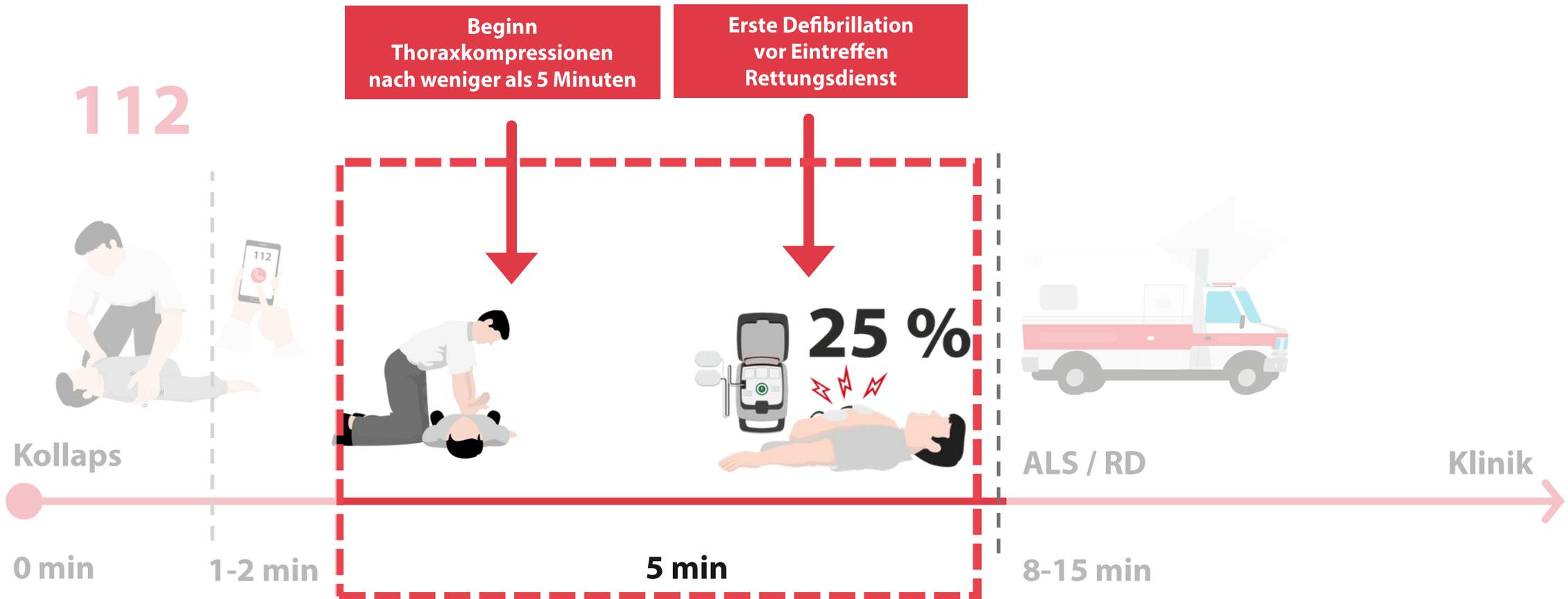


Ein perfektes System?

**Jede Sekunde
rettet Leben!**

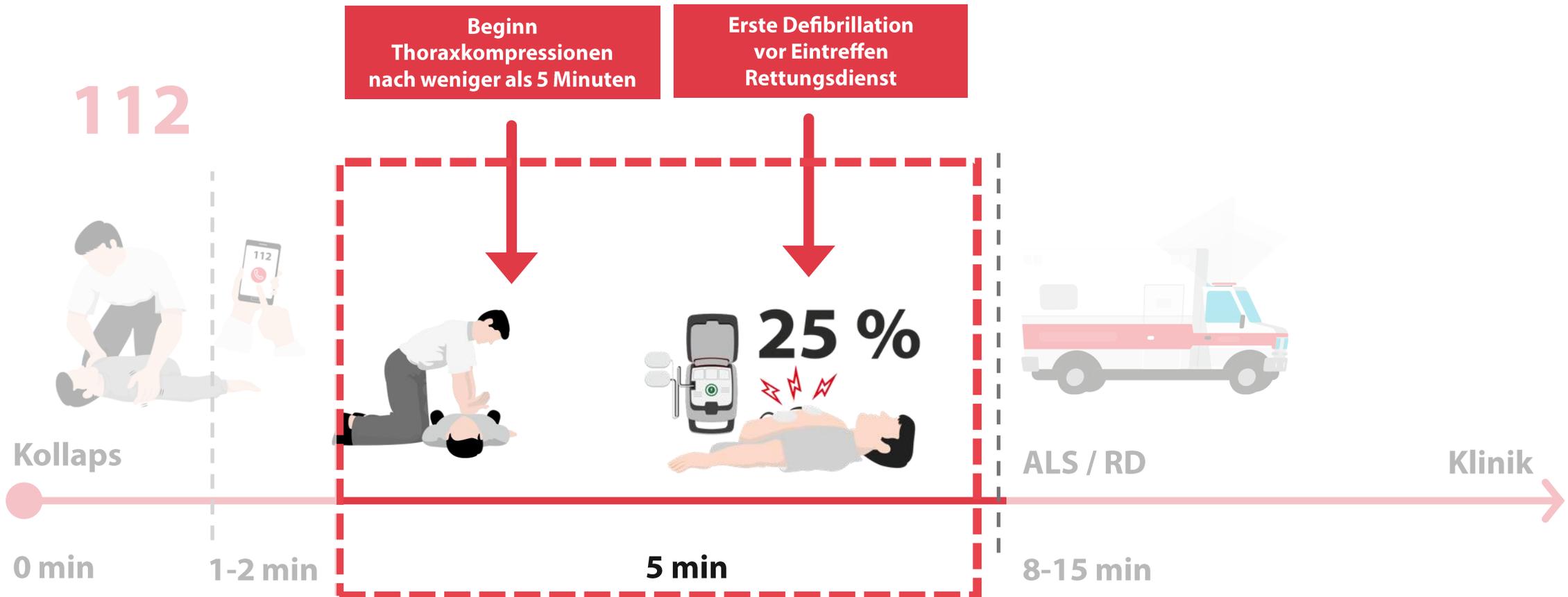


Ein perfektes System?



Ein perfektes System?

**Jede Sekunde
rettet Leben!**



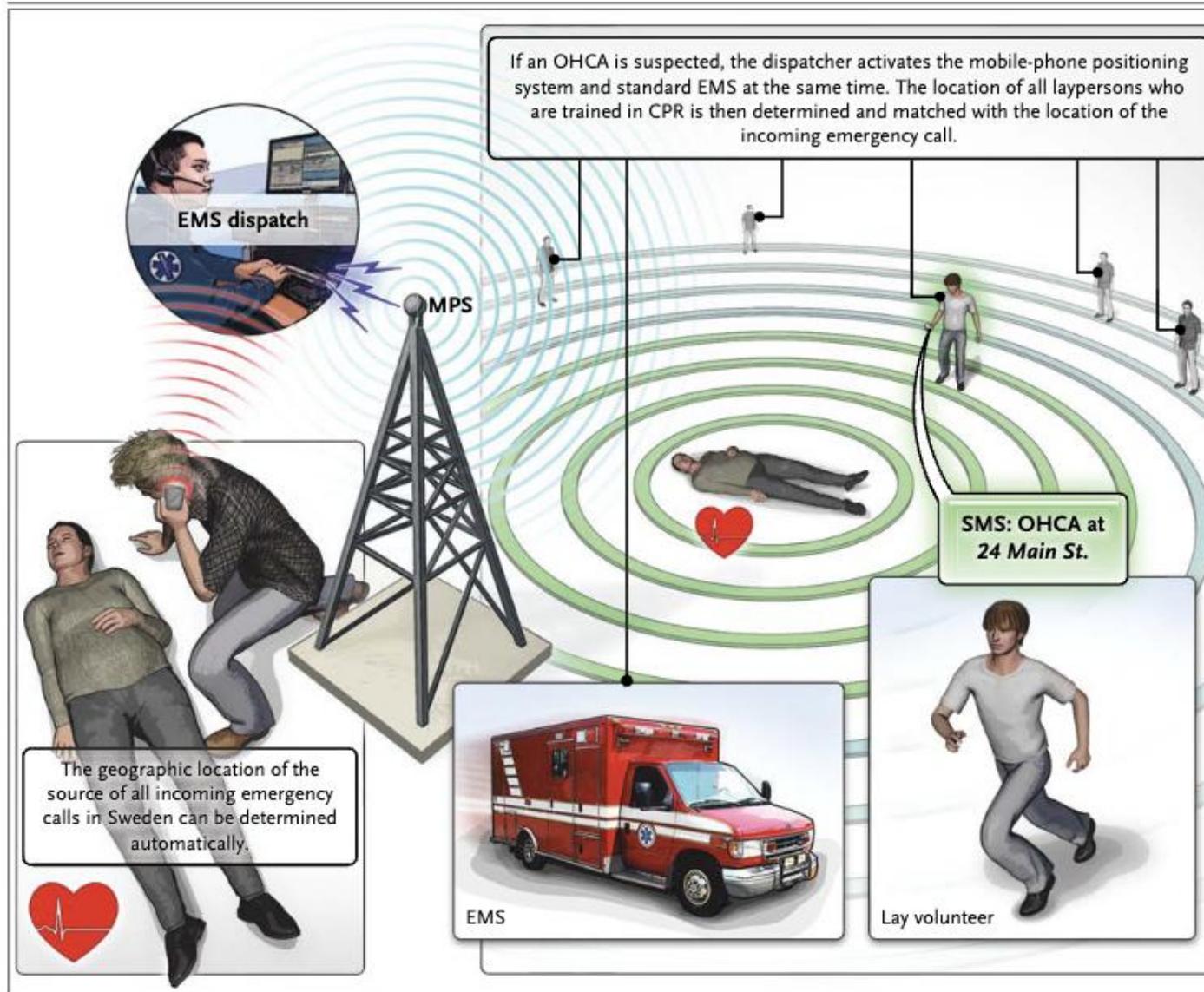


Figure 1. Mobile-Phone Positioning System.

Dispatchers were instructed to activate the mobile-phone positioning system (MPS) in cases of suspected out-of-hospital cardiac arrest (OHCA). Lay volunteers who were trained in cardiopulmonary resuscitation (CPR) and who were located within a 500-m radius of patients who were randomly assigned to the intervention group were contacted by means of short-message-service (SMS) messaging and a computer-generated voice call to their mobile phones. Patients with a cardiac arrest that was witnessed by emergency-medical-services (EMS) personnel and patients in whom resuscitation was not attempted by the EMS personnel (because of ethical reasons or obvious signs of death) were excluded from the final analysis.

Mobile-Phone Dispatch of Laypersons for CPR in Out-of-Hospital Cardiac Arrest

Mattias Ringh, M.D., Mårten Rosenqvist, M.D., Ph.D., Jacob Hollenberg, M.D., Ph.D., Martin Jonsson, B.Sc., David Fredman, R.N., Per Nordberg, M.D., Hans Järnbert-Pettersson, Ph.D., Ingela Hasselqvist-Ax, R.N., Gabriel Riva, M.D., and Leif Svensson, M.D., Ph.D.

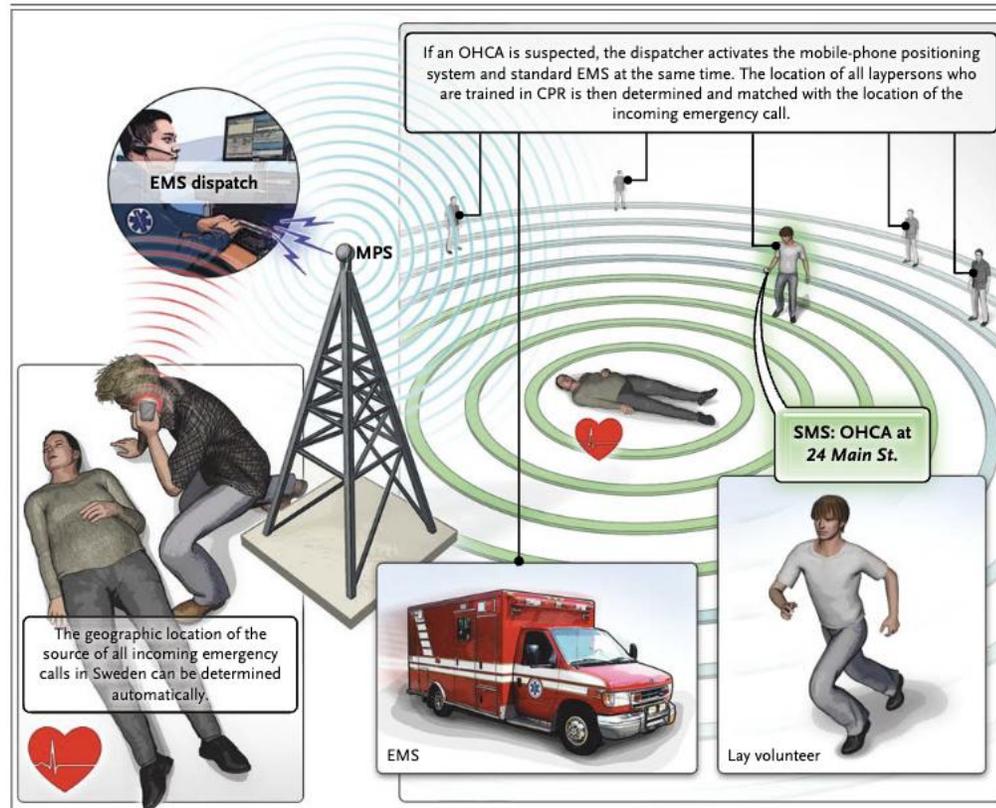


Figure 1. Mobile-Phone Positioning System.

Dispatchers were instructed to activate the mobile-phone positioning system (MPS) in cases of suspected out-of-hospital cardiac arrest (OHCA). Lay volunteers who were trained in cardiopulmonary resuscitation (CPR) and who were located within a 500-m radius of patients who were randomly assigned to the intervention group were contacted by means of short-message-service (SMS) messaging and a computer-generated voice call to their mobile phones. Patients with a cardiac arrest that was witnessed by emergency-medical-services (EMS) personnel and patients in whom resuscitation was not attempted by the EMS personnel (because of ethical reasons or obvious signs of death) were excluded from the final analysis.

• Alarmierungsradius 500 M

PRIMARY AND SECONDARY OUTCOMES

The primary outcome was the rate of bystander-initiated CPR before the arrival of an ambulance or first responders. Cases in which CPR was administered only with the help of instructions for how to perform CPR given over the telephone (i.e., not by trained volunteers) were not considered to be bystander-initiated CPR.

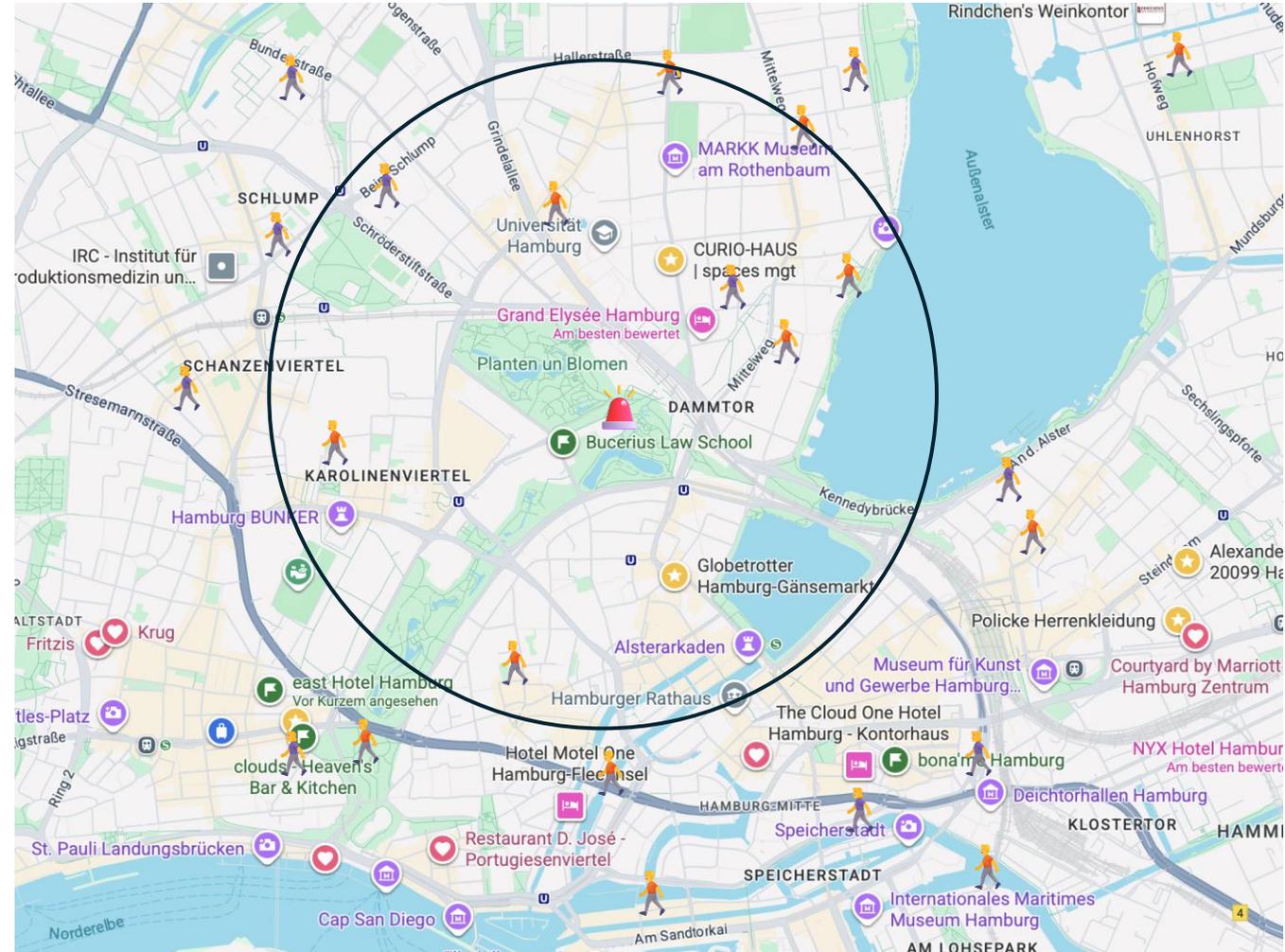
Secondary outcomes were bystander-initiated CPR, including CPR that was given only with the help of instructions given over the telephone, findings of ventricular fibrillation or ventricular tachycardia at the first electrocardiographic assessment, return of spontaneous circulation, and 30-day survival.

Table 2. Primary and Secondary Outcomes.*

Outcome	Intervention	Control	Difference (95% CI)	P Value
	no. of patients/total no. (%)	no. of patients/total no. (%)		
Primary outcome: bystander-initiated CPR	188/305 (61.6)	172/360 (47.8)	13.9 (6.2 to 21.2)	<0.001
Secondary outcome				
30-day survival	32/286 (11.2)	28/326 (8.6)	2.6 (−2.1 to 7.8)	0.28
Return of spontaneous circulation	90/306 (29.4)	105/361 (29.1)	0.3 (−6.5 to 7.3)	0.93
Shockable rhythm: ventricular fibrillation or ventricular tachycardia	58/301 (19.3)	60/347 (17.3)	2.0 (−4.0 to 8.0)	0.52
Bystander-initiated CPR including CPR performed with telephone instructions	196/305 (64.3)	197/360 (54.7)	9.5 (2.0 to 16.9)	0.01

App-basierte Ersthelfersysteme

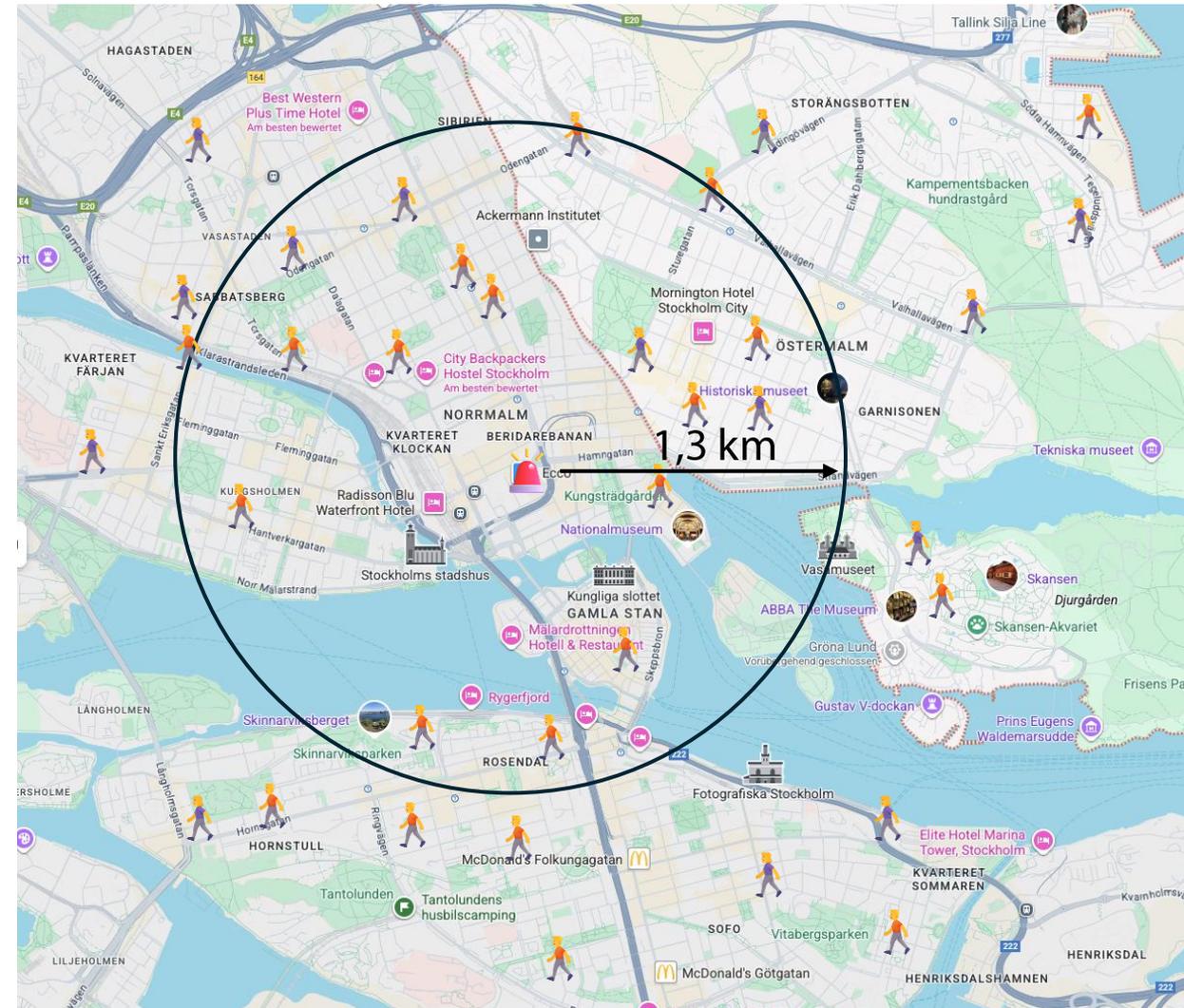
- Georeferenzierte Alarmierung von registrierten Ersthelfenden in der Nähe des Notfallortes
- Verbunden mit AED-Datenbank



App-basierte Ersthelfersysteme: Strategien

Stockholm

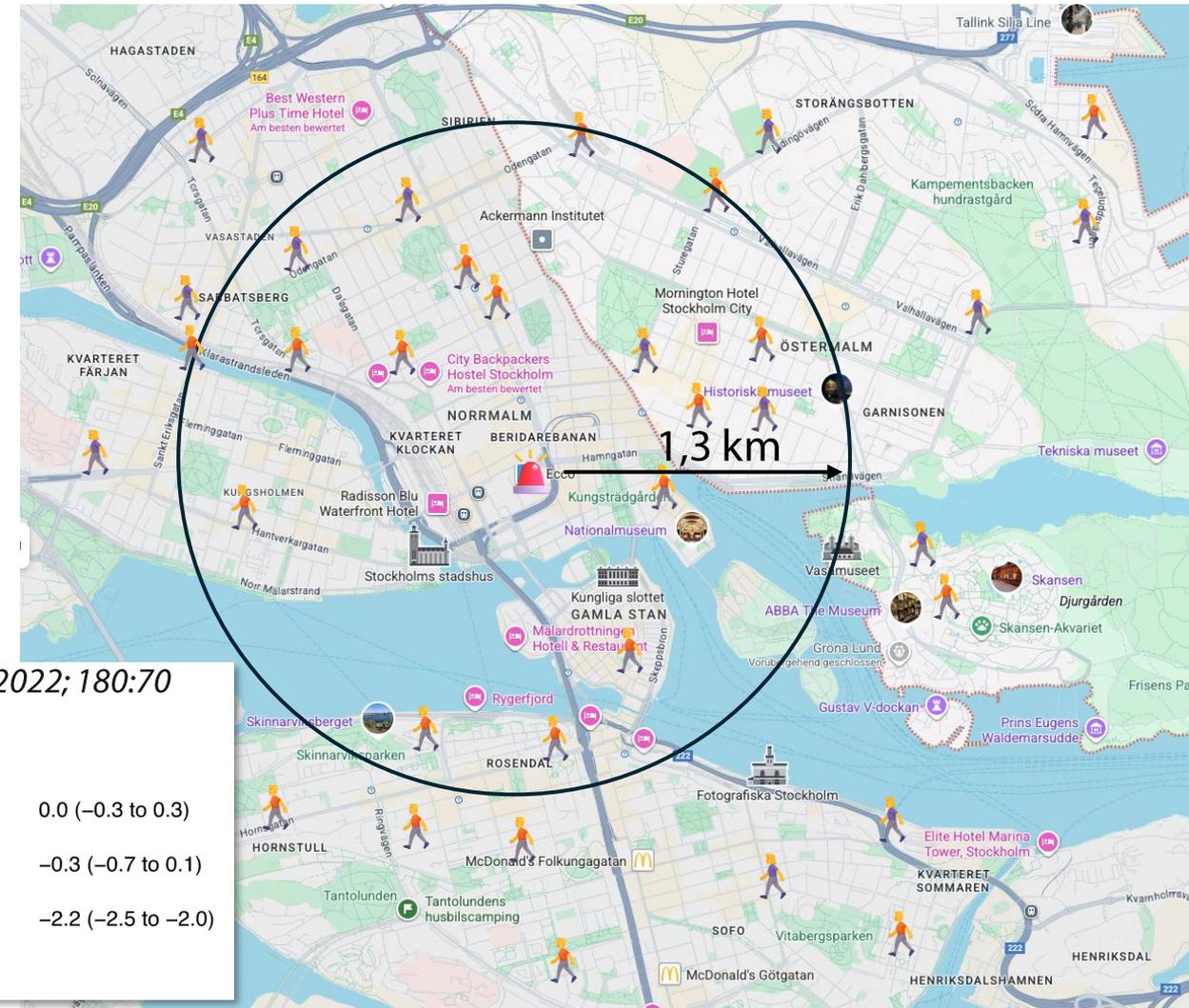
- 30 Helfer im Radius von 1,3 km
- EH-Dichte 3,75/ km²
- Die ersten 5 Helfer sollen AED holen



App-basierte Ersthelfersysteme: Strategien

Stockholm

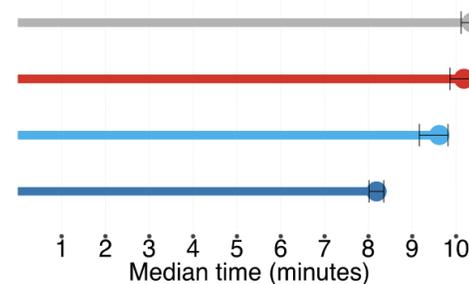
- **30 Helfer** im Radius von 1,3 km
- EH-Dichte 3,75/ km²
- Die ersten 5 Helfer sollen AED holen



C. Total response time (call – arrival)

EMS	10.4 (10.1 to 10.6)	7.7, 14.8
Fire fighter	10.2 (9.9 to 10.4)	8.2, 13.4
Volunteer-responder AED	9.6 (9.2 to 9.8)	7.3, 13.3
Volunteer-responder CPR	8.2 (8.0 to 8.3)	6.2, 10.8

Resuscitation 2022; 180:70

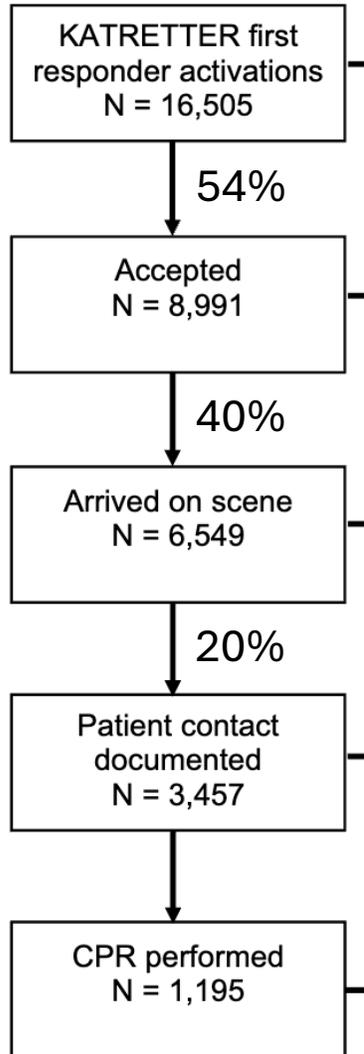


0.0 (-0.3 to 0.3)

-0.3 (-0.7 to 0.1)

-2.2 (-2.5 to -2.0)

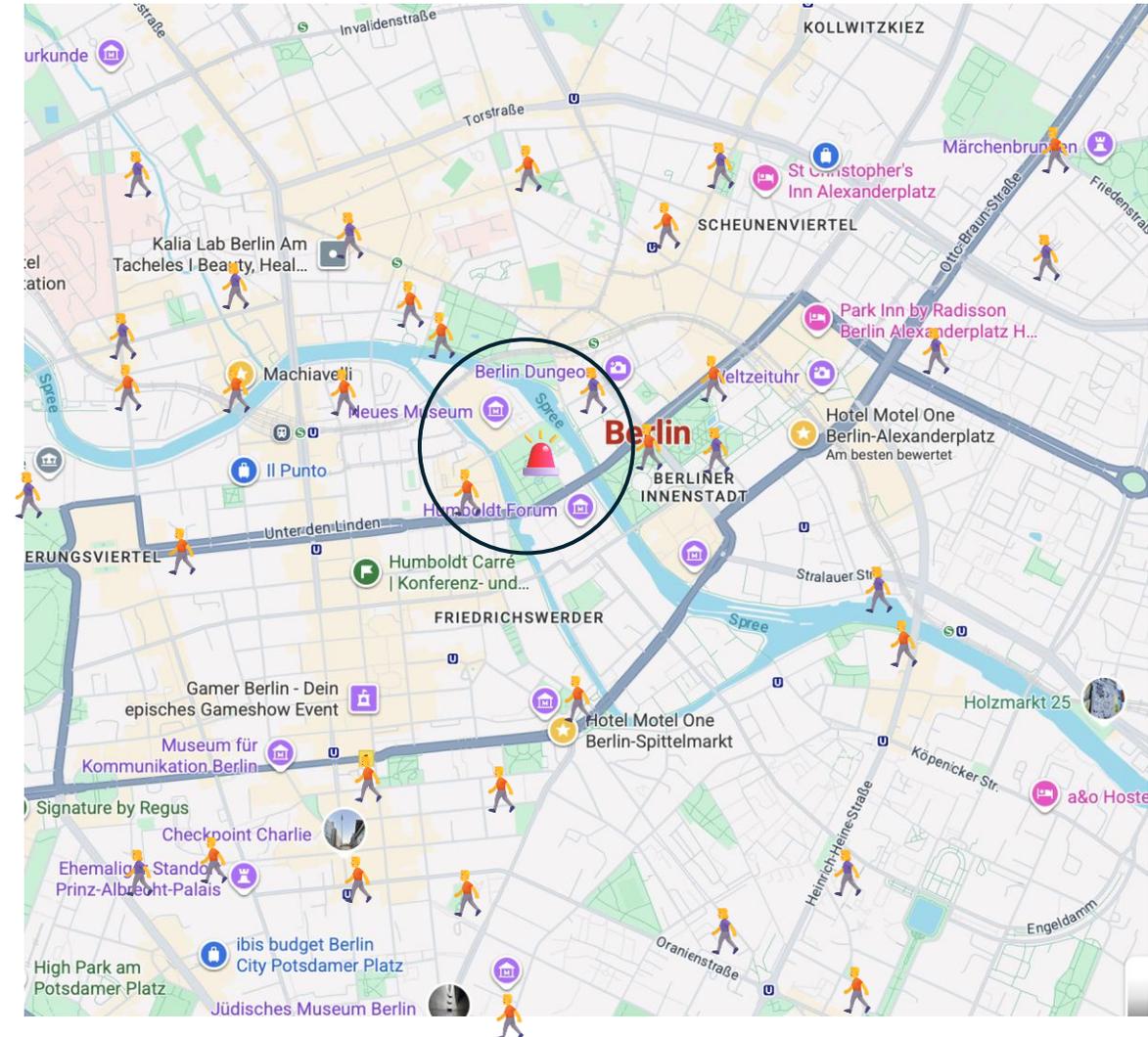
App-basierte Ersthelfersysteme: Strategien



Berlin (11 CFR/ km²)

- Bis zu 3 Helfer im Radius von 0,5 km (Zentrum) bzw. 1 km (Vororte)
- Keine AED-Disposition

A total of 12,979 first responders accepted the activation. In 57.0% (n=7403) of the cases examined, first responders terminated their mission without providing treatment. The most common reason, accounting for 58.9% (n=4357) of these cases, was that the rescue service had already arrived at the scene. In 21.1% (n=1564)





Clinical paper

Mobile phone-based alerting of CPR-trained volunteers simultaneously with the ambulance can reduce the resuscitation-free interval and improve outcome after out-of-hospital cardiac arrest: A German, population-based cohort study

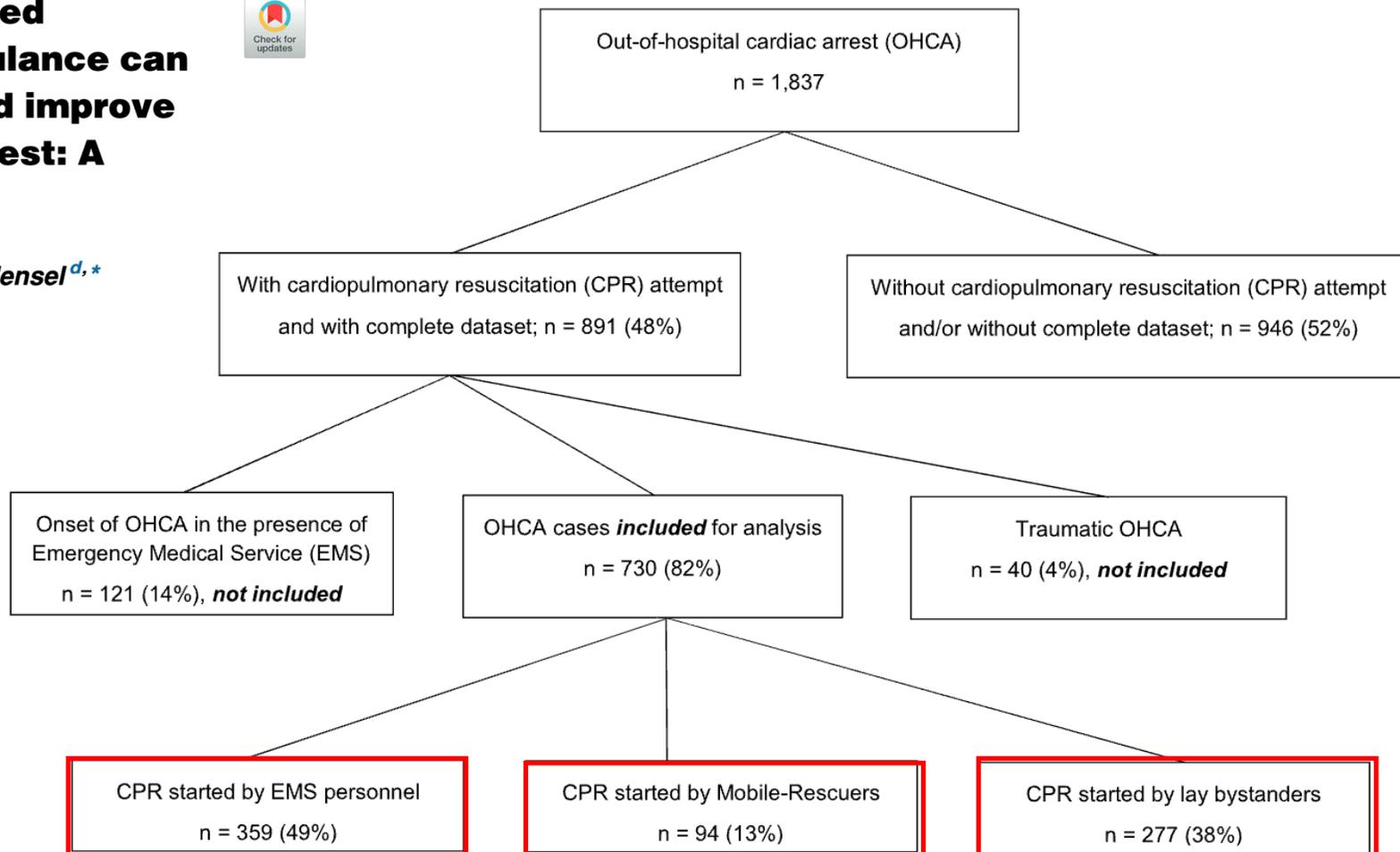
Ralf Stroop^{a,1}, Thoralf Kerner^{b,1}, Bernd Strickmann^c, Mario Hensel^{d,*}

emergency scene. However, Mobile-Rescuers are only alerted if the estimated response time is 8 minutes or less. This decision is based on GPS positioning data (distance between mobile phone and emergency scene) and estimated values regarding mobility aspects (arrival by car: assumed average speed of 40 kilometers per hour; arrival on foot is assumed if the detected distance between mobile phone and emergency scene is 300 meters or less). In addition, a general set-up time of 1 minute is taken into account. As already mentioned above,

Clinical paper

Mobile phone-based alerting of CPR-trained volunteers simultaneously with the ambulance can reduce the resuscitation-free interval and improve outcome after out-of-hospital cardiac arrest: A German, population-based cohort study

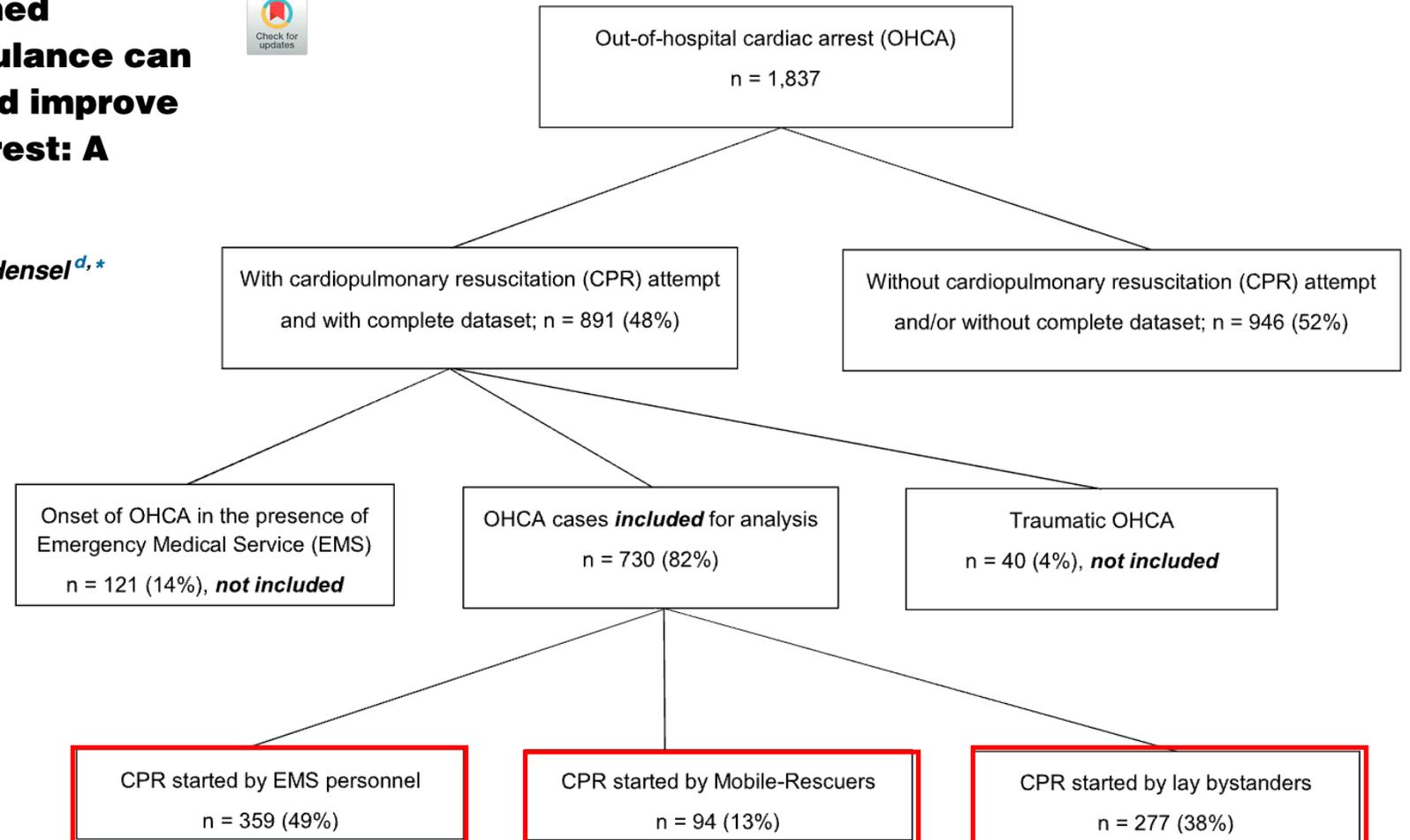
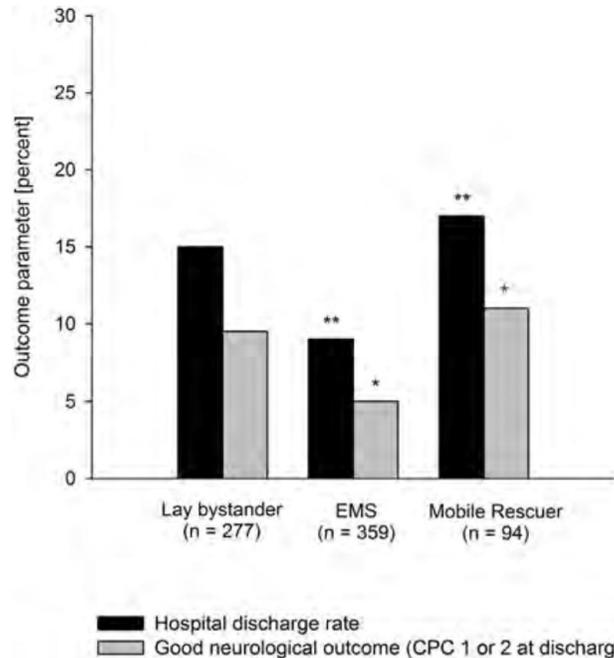
Ralf Stroop^{a,1}, Thoralf Kerner^{b,1}, Bernd Strickmann^c, Mario Hensel^{d,*}



Clinical paper

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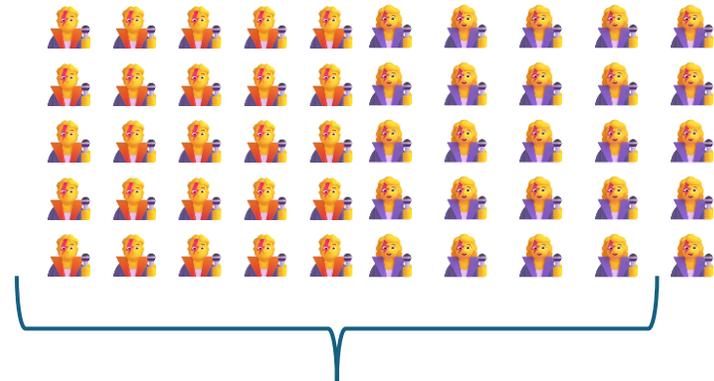
Hat ein App-basiertes Ersthelfersystem Vorteile... gegenüber der (aktuellen) Standardversorgung?

OHCA-Fälle



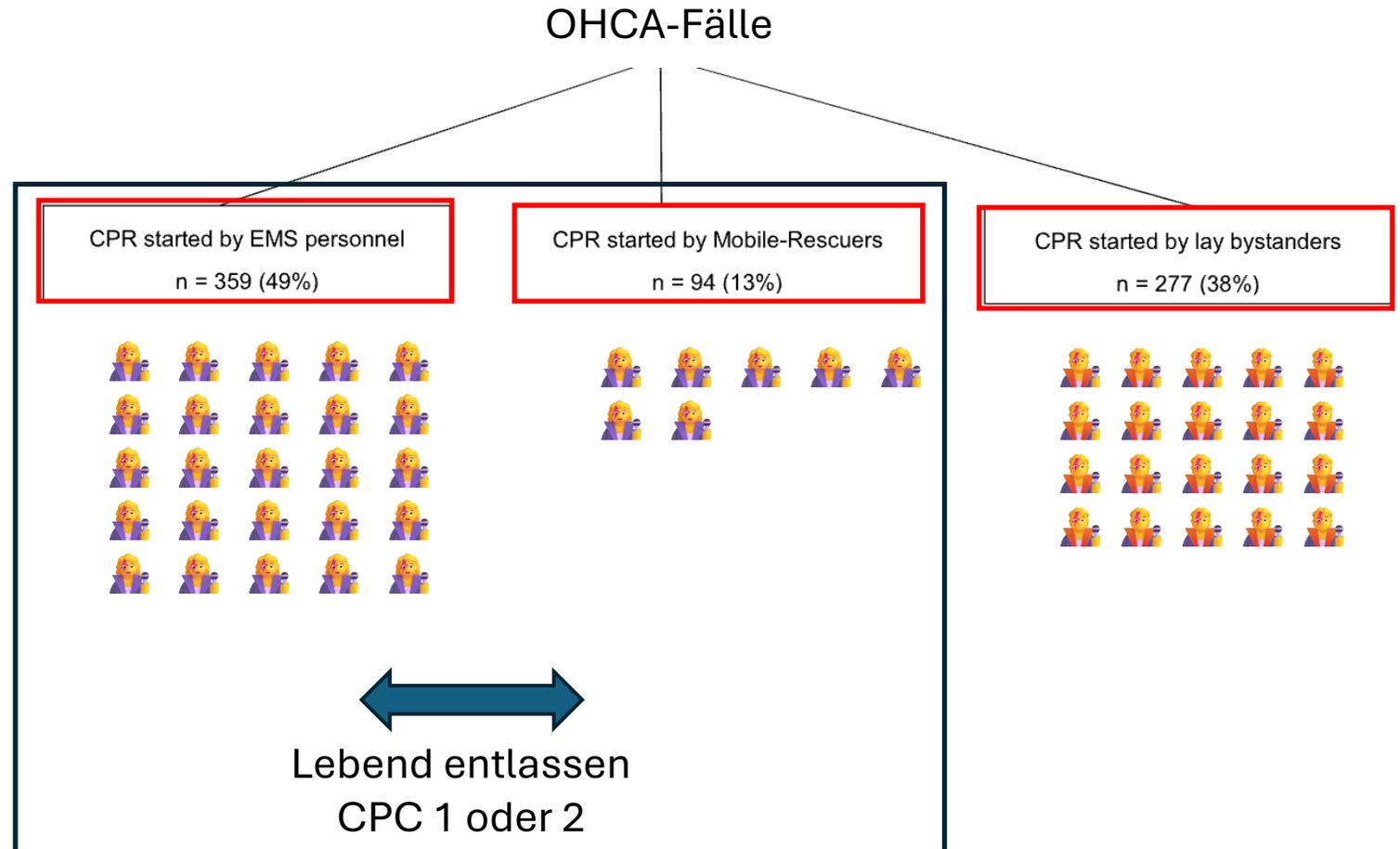
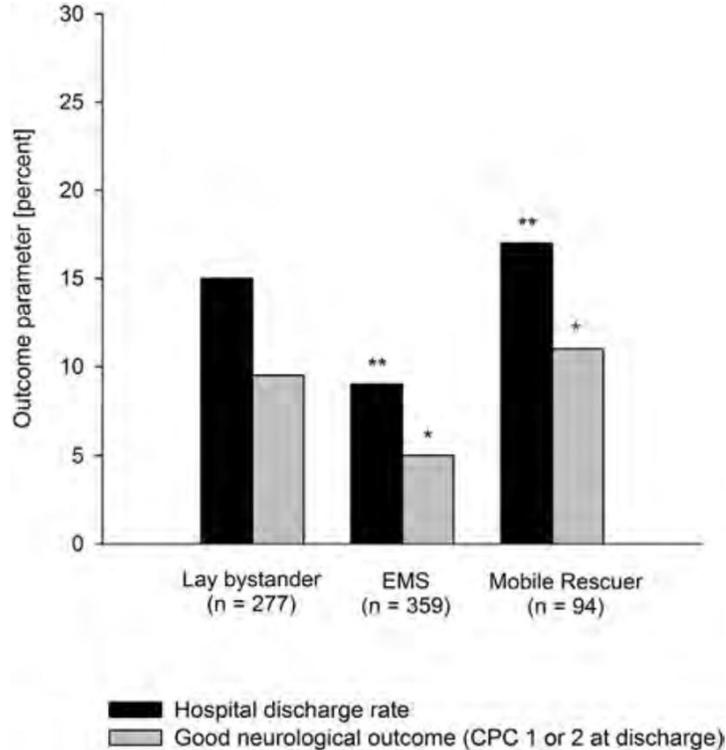
10,5% überleben
ohne Ersthelfersystem

OHCA-Fälle



XYZ % überleben
mit Ersthelfersystem

Hat ein App-basiertes Ersthelfersystem Vorteile... gegenüber der (aktuellen) Standardversorgung?



10 Jahre Ersthelfersystem Gütersloh

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Online version at <https://www.minervamedica.it>

Minerva Anestesiologica 2025 May;91(5):422-9
DOI: 10.23736/S0375-9393.25.18786-5

ORIGINAL ARTICLE

Influence of smartphone-based first aid systems on the outcome of out-of-hospital cardiac arrest

Sissy K. LINDER ¹*, Dennis BRUENTJE ², Martin DEIKE ^{3,4}, Ulrich K. FETZNER ⁵,
Julia J. GRANNEMANN ⁶, Annika HOYER ⁷, Lydia J. KOLAPARAMBIL VARGHESE ⁸,
André KOBIELLA ⁶, Jan SCHMITZ ⁹, Bernd STRICKMANN ⁵,
Jochen HINKELBEIN ⁸, Gerrit JANSEN ⁸

rescue service. However, in the present study, we were unable to demonstrate a positive impact on treatment outcome, both in terms of achieving ROSC and good neurological outcome. While

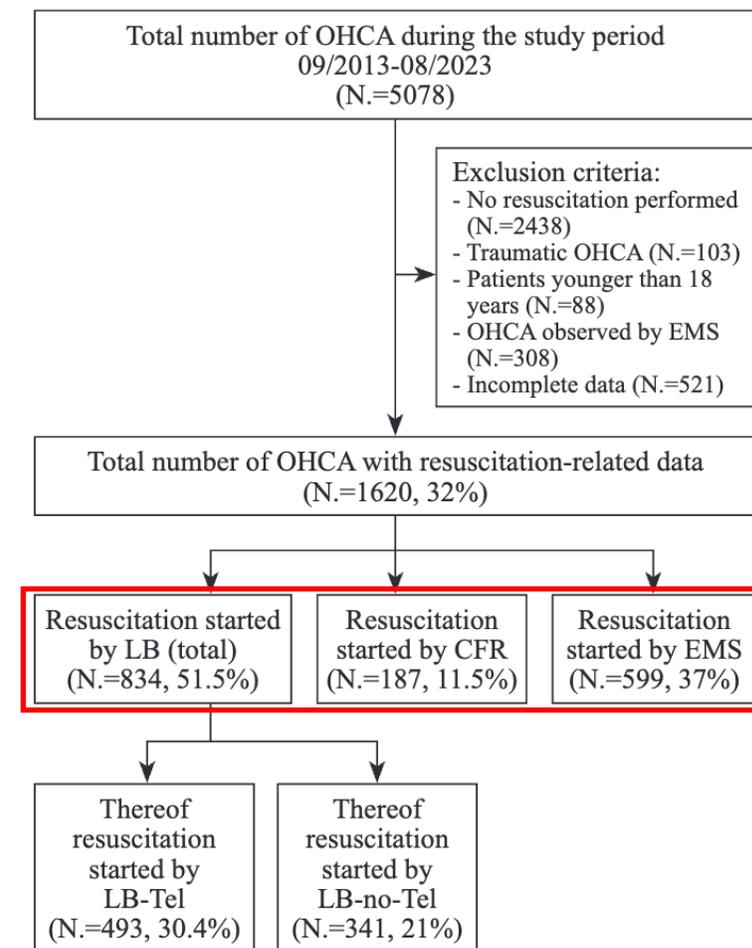


Figure 1.—Flow chart.
OHCA = out-of-hospital cardiac arrest; EMS = Emergency medical services; LB = Lay bystander; LB-Tel= Lay bystander with phone-CPR; LB without Tel = Lay bystander without phone-CPR; CFR = Community first responder.

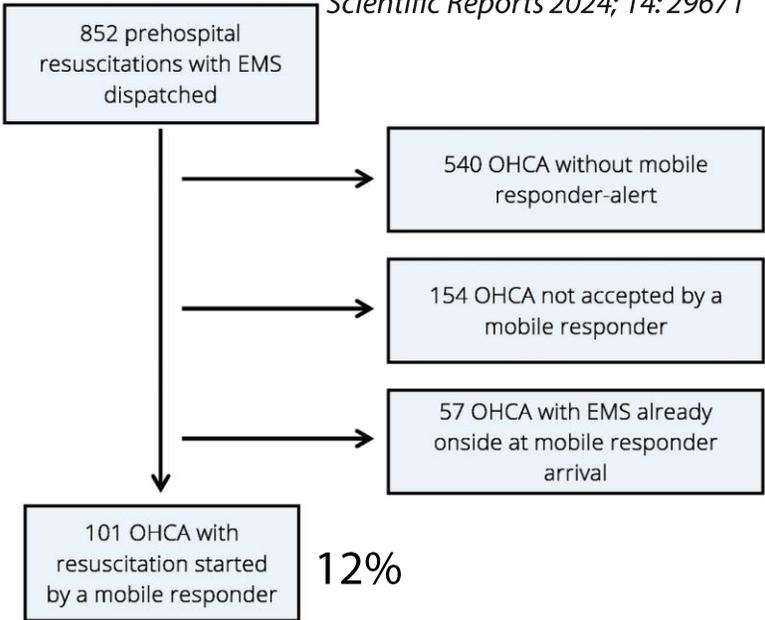
OPEN **The impact of smartphone-dispatched CPR-trained volunteers on OHCA outcomes is influenced by patient age**

Check for updates

Johanna Fabianek^{1,2}, Marc Felzen^{1,2,3}, Kim R. Riester^{1,2}, Stefan K. Beckers^{1,2,3}, Rolf Rossaint¹, Hanna Schröder^{1,2,3} & Mark Pitsch^{1,2}

The early initiation of cardiopulmonary resuscitation (CPR) measures by non-professionals before the arrival of Emergency Medical Service (EMS) is known to be crucial for improving outcomes after out-of-hospital cardiac arrest (OHCA). We assessed the impact of deploying CPR-trained volunteers via a smartphone-based alerting system on the outcome of OHCA patients. In a retrospective nonrandomized cohort study, all OHCA cases in the city of Aachen over a six-year period were analysed. We compared patient data, CPR metrics, alerting system data as well as outcome data between the intervention and control groups. From June 2017 to May 2023, 101 out of 852 resuscitations were initiated by volunteers alerted via a smartphone-based alerting system in OHCA events. We found no overall rise in the return of spontaneous circulation (ROSC) rate. An age-dependent subgroup analysis indicated an increased incidence of initially shockable rhythms and an increased ROSC rate for patients younger than 60 years in the intervention group, while implying a lower ROSC rate in patients older than 80 years after mobile responder CPR. Although this study was underpowered to yield statistically significant results, our findings suggest the need for an age-sensitive approach when evaluating the effects of first-responder systems on OHCA cases.

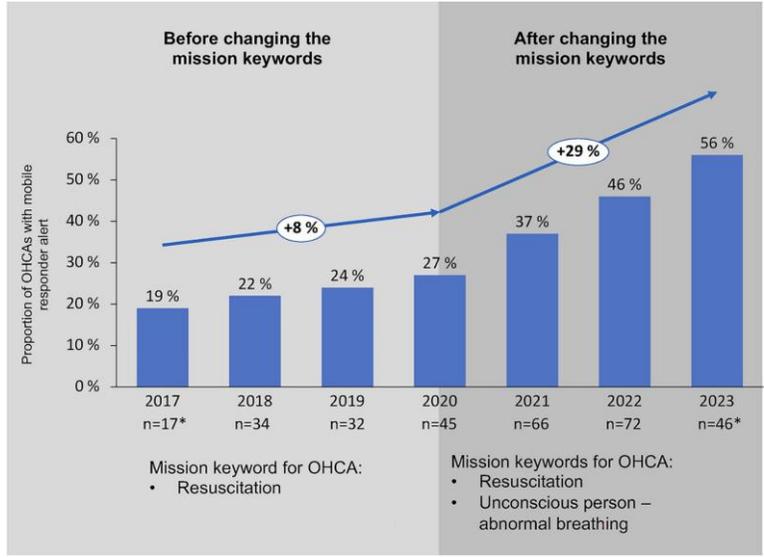
Scientific Reports 2024; 14: 29671



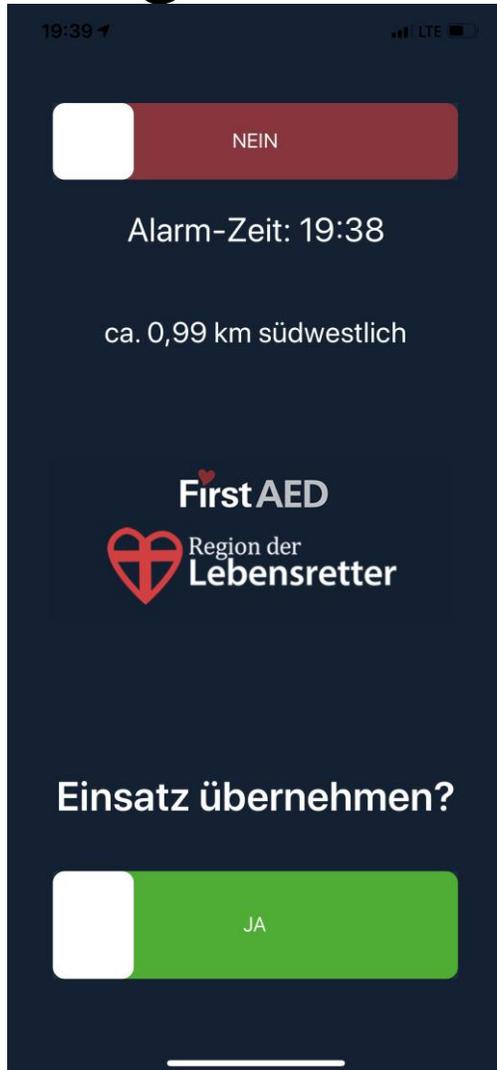
	Mobile responder-initiated CPR	EMS-initiated CPR	p-value
	(n = 101)	(n = 751)	
Age in years, median [25th–75th]	73 [60–85]	72 [59–82]	0.2565
Age in years, n (%)			
< 60	23/101 (23%)	191/751 (25%)	
60–79	45/101 (45%)	324/751 (42%)	
> 80	33/101 (32%)	236/751 (31%)	0.8454
Gender; n (%)			
Female	36/101 (36%)	262/751 (35%)	
Male	65/101 (64%)	489/751 (65%)	0.9117

Initial rhythm; n (%)			
VT/VF	27/101 (27%)	172/751 (23%)	
PEA or asystole	74/101 (73%)	579/751 (77%)	0.3831
AED use private/public	1/101 (1%)	10/751 (1%)	> 0.9999
ROSC ever; n (%)	41/101 (41%)	314/751 (42%)	
ROSC never; n (%)	60/101 (59%)	437/751 (58%)	0.8308
Initial outcome n (%)			
ROSC at hospital admission	32/101 (32%)	251/751 (33%)	
Hospital admission under ongoing CPR	8/101 (8%)	74/751 (10%)	
Death on the scene	61/101 (60%)	426/751 (57%)	0.7274
RACA-Score; median [25th–75th]	35 [24.00–52.75]	35 [23.00–50.00]	0.7814

CPR = cardiopulmonary resuscitation; EMS = emergency medical service; OHCA = Out of Hospital cardiac Arrest; PEA = pulseless electrical activity; RACA = ROSC-after-cardiac-arrest; ROSC = return of spontaneous circulation; VF = ventricular fibrillation; VT = ventricular tachycardia

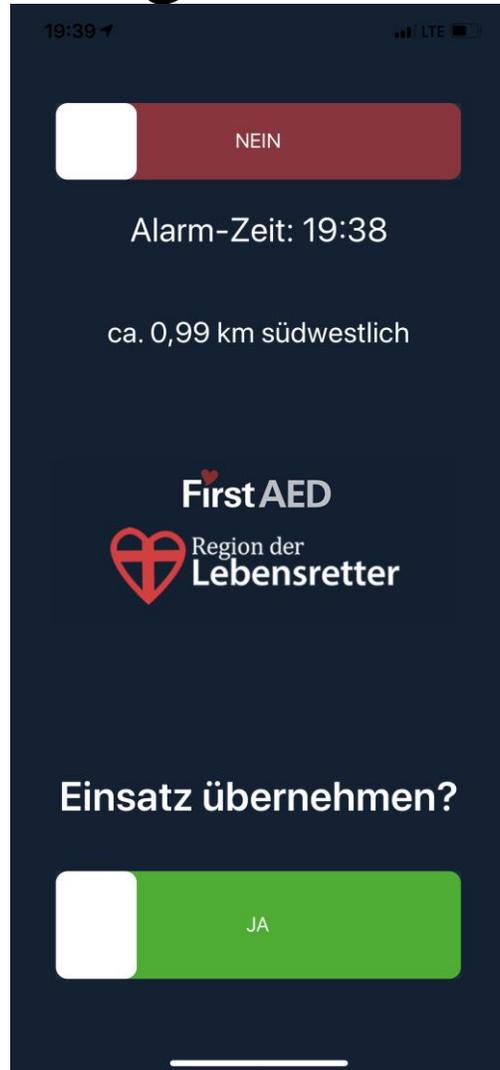


Region der Lebensretter 1. Generation... zum Glück keine RCT!



- Luftliniendistanz (Alarmierungsradius)
Ersthelfender – Notfallort
- Keine Berücksichtigung des Verkehrsmittels
- Keine angemessene Integration der AED-Aufgabe

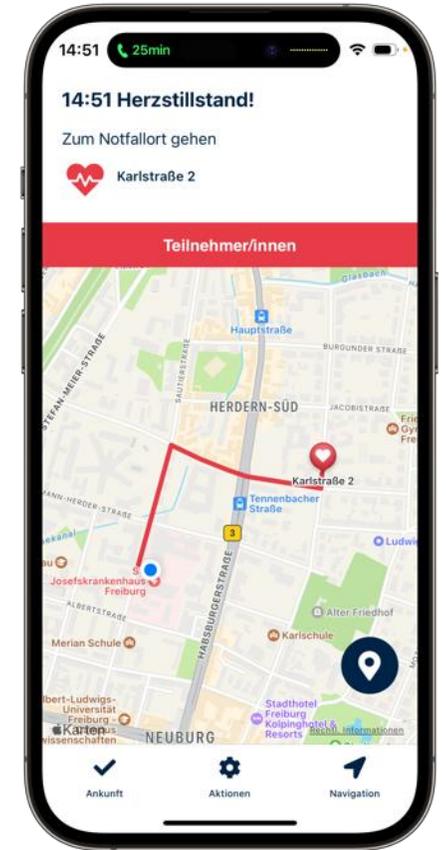
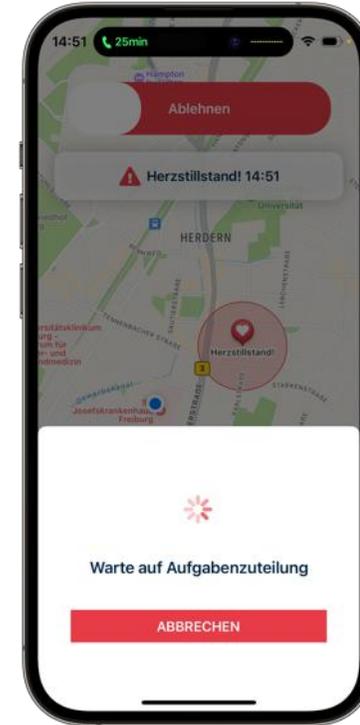
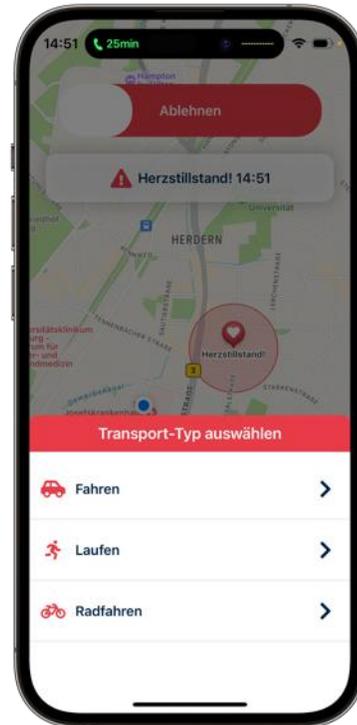
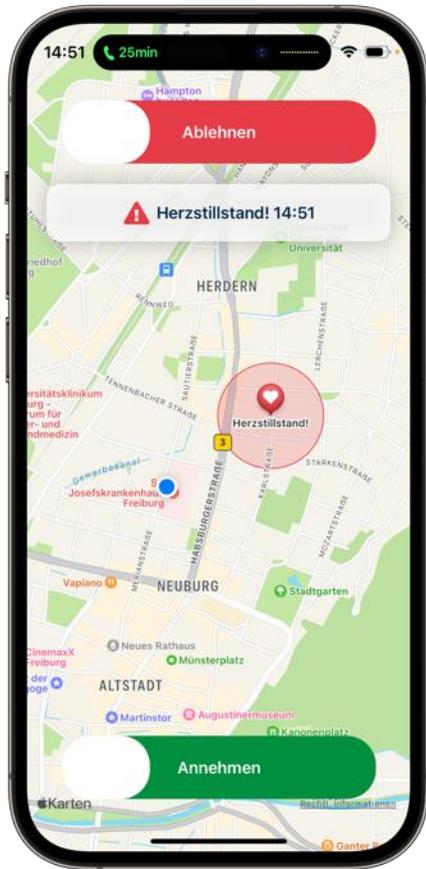
Region der Lebensretter 1. Generation... zum Glück keine RCT!



- Luftliniendistanz (Alarmierungsradius)
Ersthelfender – Notfallort
- Keine Berücksichtigung des Verkehrsmittels
- Keine angemessene Integration der AED-Aufgabe

- 6 Jahre Forschung und Verbesserung auf der Basis der
Ergebnisse
- Dann eine RCT???

Die App Region der Lebensretter

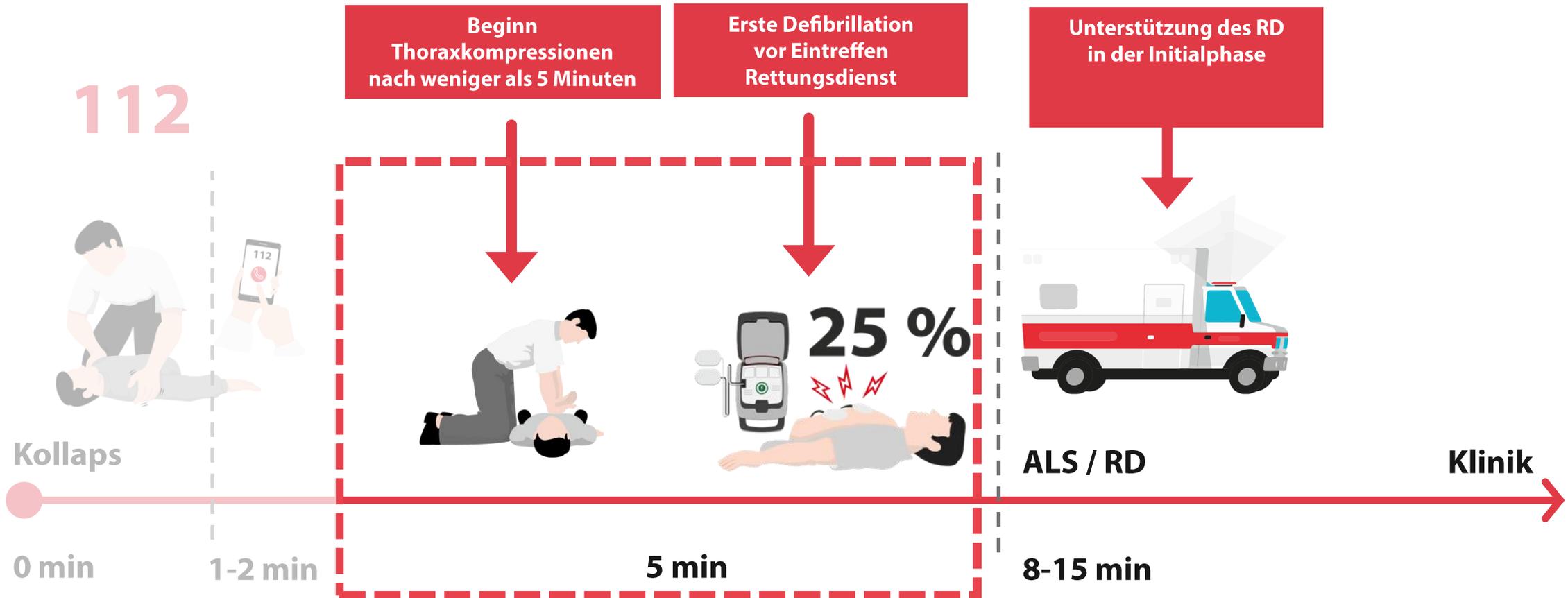


Voralarm



Aufgabe

Ein perfektes System?

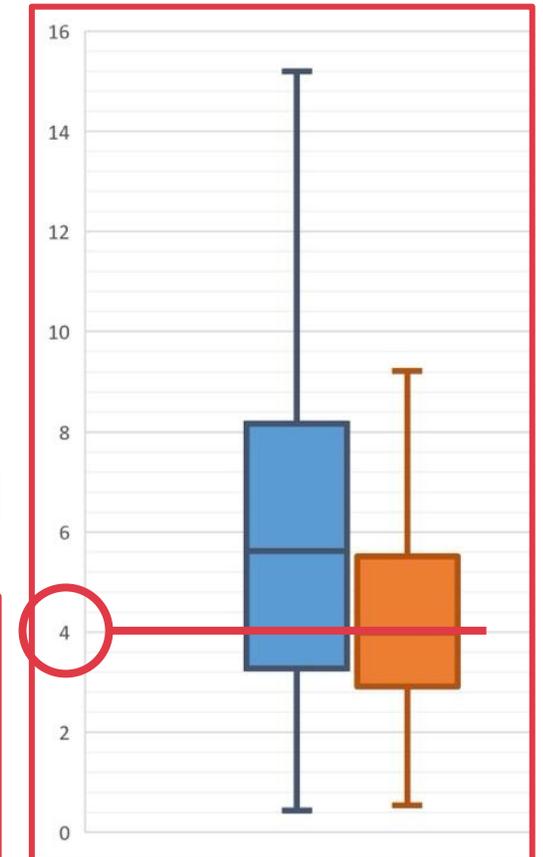
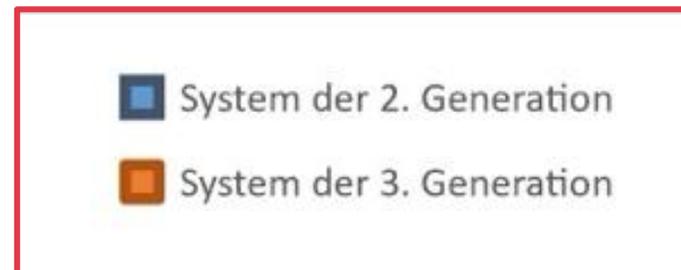


Ersthelfersystem der 3. Generation Intelligenter Alarmierungsalgorithmus

Tab. 1 Die Eintreffzeiten wurden mittels GPS-Position der Ersthelfer bestimmt. Angegeben sind Median und Interquartilsabstand (1. Quartil; 3. Quartil)

Zeitraum	April 2023	Mai 2023	Juni 2023	August 2023	September 2023	Oktober 2023
Anzahl registrierte Ersthelfer [n]	1652	1689	1712	1152	1184	1225
Einsatzübernahmequote [%]	62% (69/111)	65% (75/116)	64% (69/108)	62% (64/104)	60% (67/112)	66% (81/123)
Davon Einsätze mit 4 Ersthelfern [%]	32% (22/69)	32% (24/76)	26% (18/69)	17% (11/64)	10% (7/67)	14% (11/81)
Einsätze mit AED-Disposition [%]	38% (26/69)	28% (21/76)	26% (18/69)	27% (17/64)	16% (11/67)	28% (23/81)
Eintreffzeit der ersteintreffenden Ersthelfer [min]	05:50 (03:24; 08:06)	04:51 (03:21; 07:45)	05:38 (03:23; 09:20)	04:12 (02:48; 05:42)	04:19 (02:56; 05:21)	03:47 (03:05; 05:02)
Luftliniendistanz zur Einsatzstelle bei Einsatzzerhalt (Ersthelfer 1) [m]	560 (292; 1132)	561 (233; 1047)	577 (195; 1042)	399 (168; 805)	461 (212; 1009)	425 (231; 1553)

05:50 (03:24; 08:06)	04:51 (03:21; 07:45)	05:38 (03:23; 09:20)	04:12 (02:48; 05:42)	04:19 (02:56; 05:21)	03:47 (03:05; 05:02)
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RESUSCITATION xxx (2025) xxx-xxx



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Resuscitation

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Original paper

Turnout time in smartphone alerting systems: underestimated entity in the development of smartphone-related dispatch algorithms

Julian Ganter^{a,*}, Simon Mei^b, Jan-Steffen Pooth^b, Thomas Brucklacher^c, Georg Trummer^b, Hans-Joerg Busch^b, Michael Patrick Mueller^d

Abstract

Introduction: Smartphone alerting systems (SAS) for out-of-hospital cardiac arrest (OHCA) are requiring continuous further development. One important element herein is the algorithm, dispatching only those community first responders (CFR) capable of reaching the scene within the shortest possible time. Currently, no data exist regarding the interval between the initial alert and departure to the scene (=turnout time, ToT), despite the critical importance of this information for optimizing dispatch algorithms.

Methods: In this retrospective observational study, 4138 operations of CFR who participated in the SAS "Region of Lifesavers" between 01 August 2023 and 15 March 2024 were analysed. Upon receiving an alert, a CFR smartphone was tracked via Global Positioning System (GPS). Turnout was recorded when the device left a fenced area of 20 m from the alert acceptance point. Ethical approval was obtained (DRKS00032957).

Results: The median ToT was 1:45 min, which corresponds to one third of the response time (1:45 of 5:22 min). Nighttime had the strongest influence, with significantly longer ToT (2:22 min) compared to daytime (1:42 min, $p < 0.001$). The day of the week, mode of transport, and assigned task had a minimal impact.

Conclusion: The ToT has a relevant proportion of the response time until CFR arrive at the scene. Relevant factors influencing the ToT were identified and should be taken into account when developing smart alerting algorithms to ensure the efficient dispatch of CFR.

Keywords: First responder system, Intelligent dispatch, Cardiac arrest, Automatic external defibrillator, Emergency response system

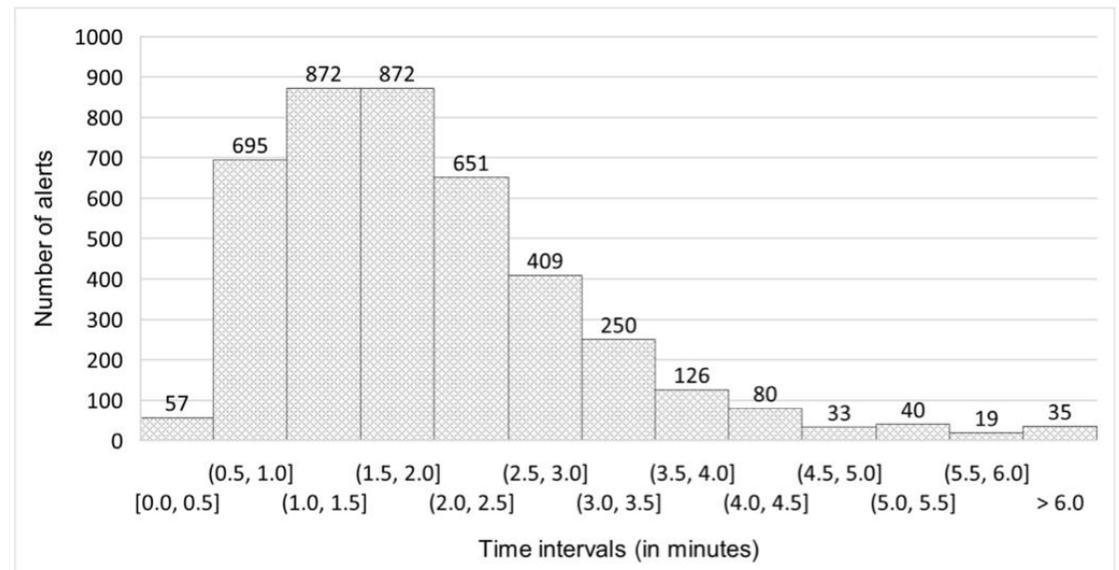
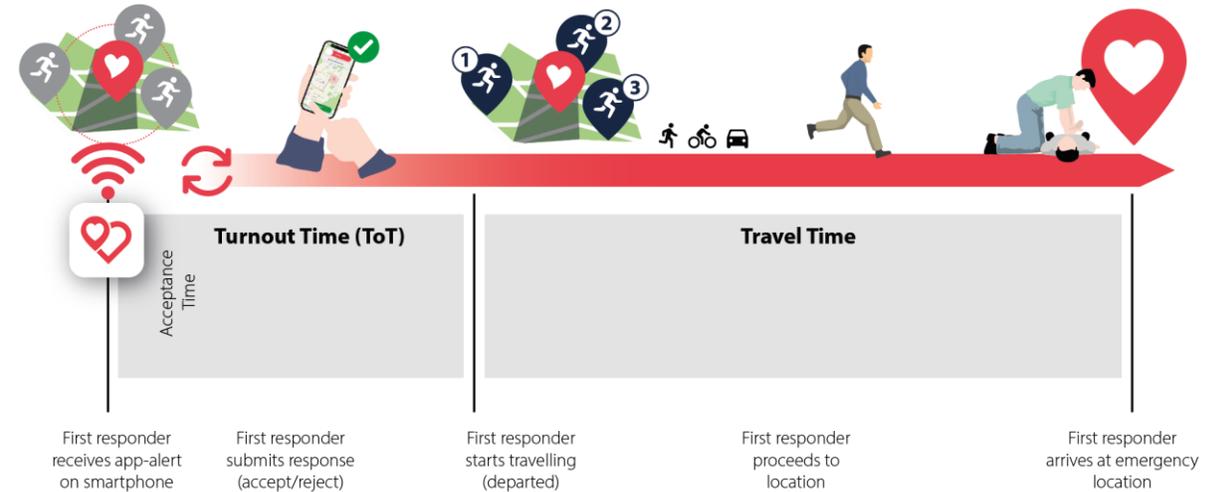


Fig. 3 – A histogram of all alerts (datasets) divided into time-intervals of 0,5 min, n = 4138.

HEROES: Fallzahlplanung

- **Annahmen:**

- Krankenhausentlassrate Phase 1: 11% (Dt. ReaReg 2022: 10,7 %)
- Einführung des Systems führt zu Steigerung der Überlebensrate um 4% auf 15% (Phase 3)

- **Fallzahlplanung:**

- Chi-squared-Test, Power 80%, Signifikanzniveau 5%
- Fallzahl pro Gruppe: **min. 1.109**

RESUSCITATION PLUS 17 (2024) 100564



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Clinical paper

Out-of-Hospital cardiac arrest & Smartphone RespOnErS trial (HEROES Trial): Methodology and study protocol of a pre-post-design trial of the effect of implementing a smartphone alerting system on survival in out-of-hospital cardiac arrest



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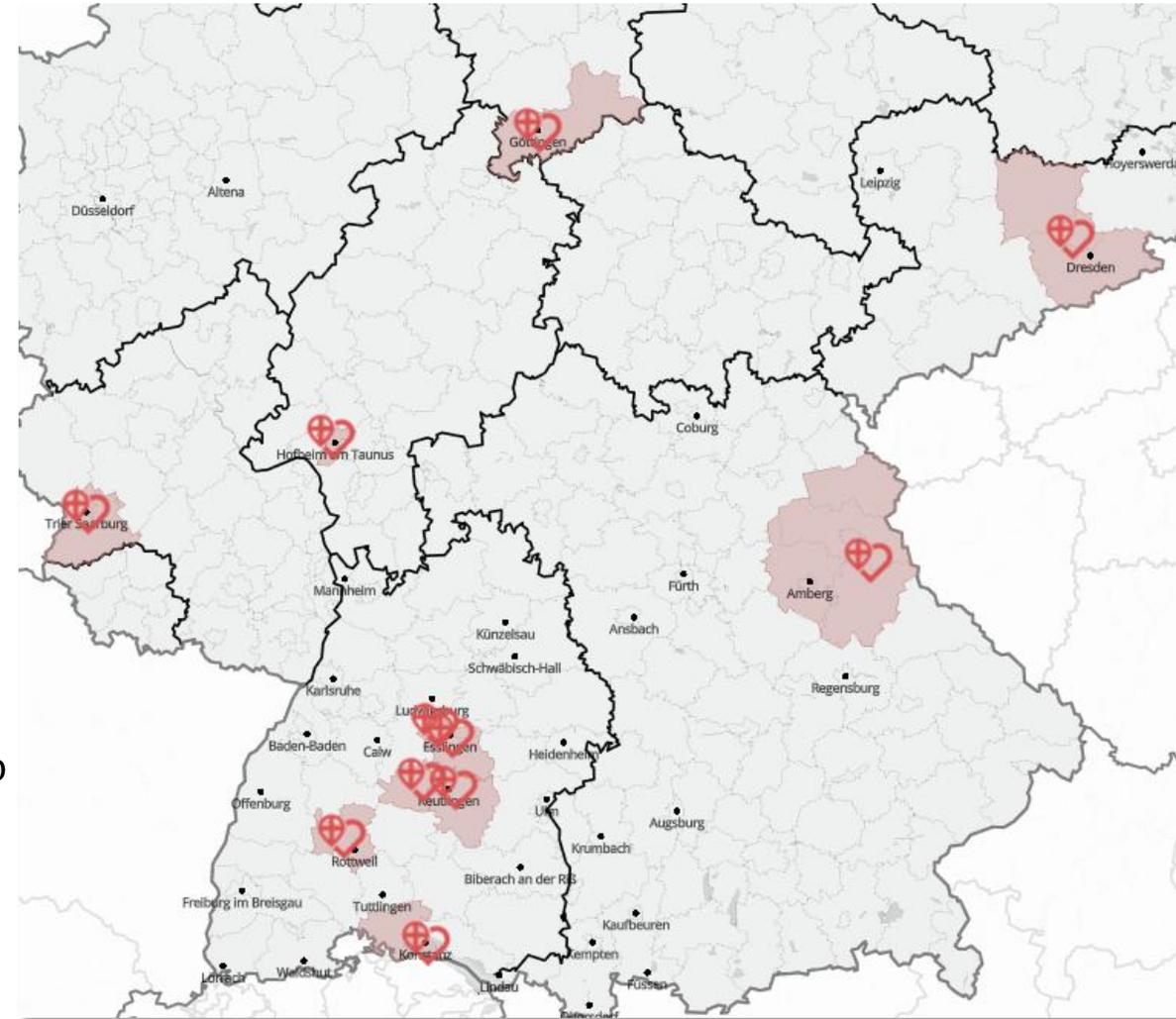
HEROES: Fallzahlplanung

- **Annahmen:**

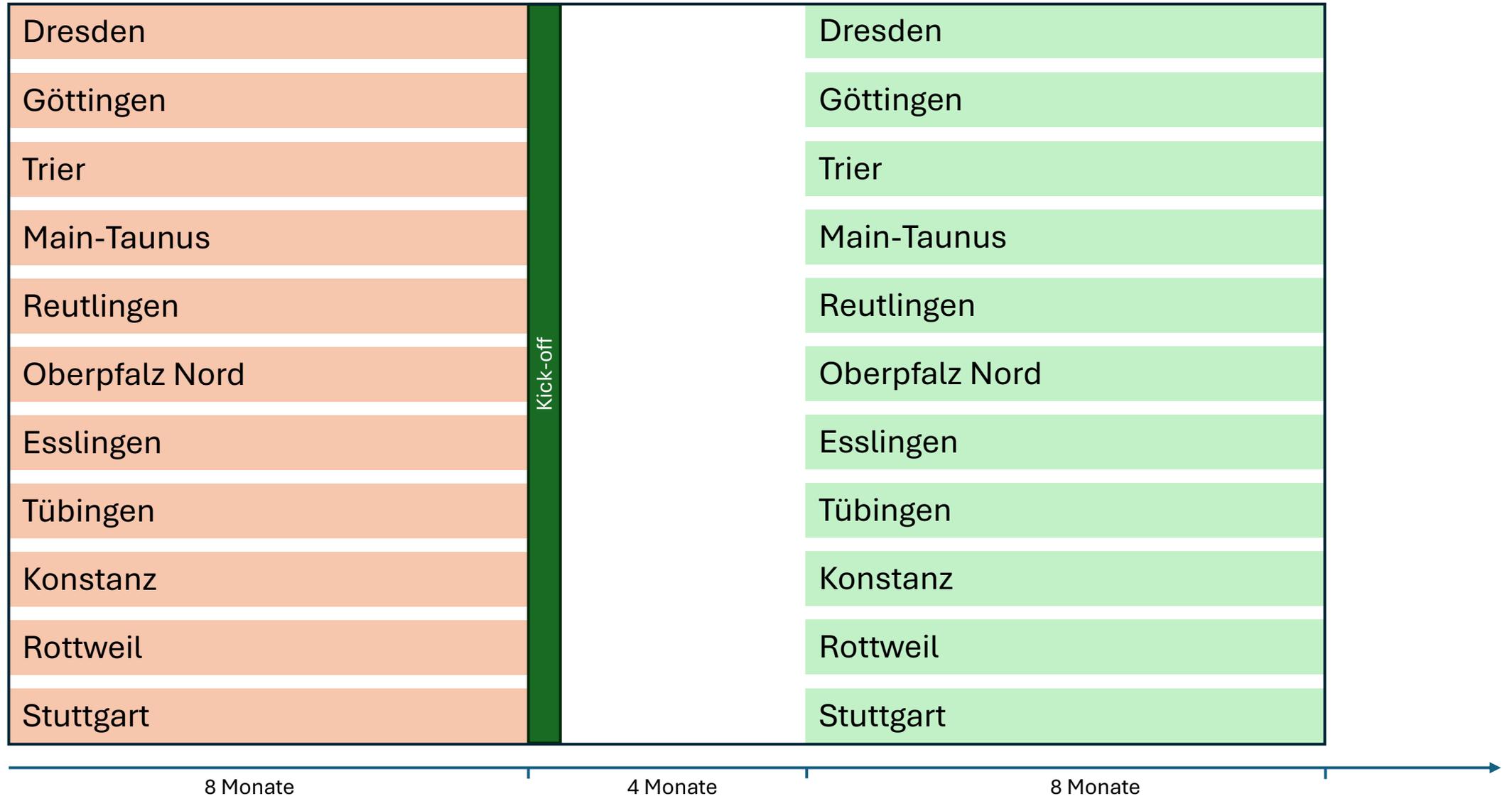
- Krankenhausentlassrate Phase 1: 11%
(Dt. ReaReg 2022: 10,7 %)
- Einführung des Systems führt zu Steigerung der Überlebensrate um 4% auf 15%
(Phase 3)

- **Fallzahlplanung:**

- Chi-squared-Test, Power 80%, Signifikanzniveau 5%
- Fallzahl pro Gruppe: **min. 1.109**



HEROES-Studie: Ablauf

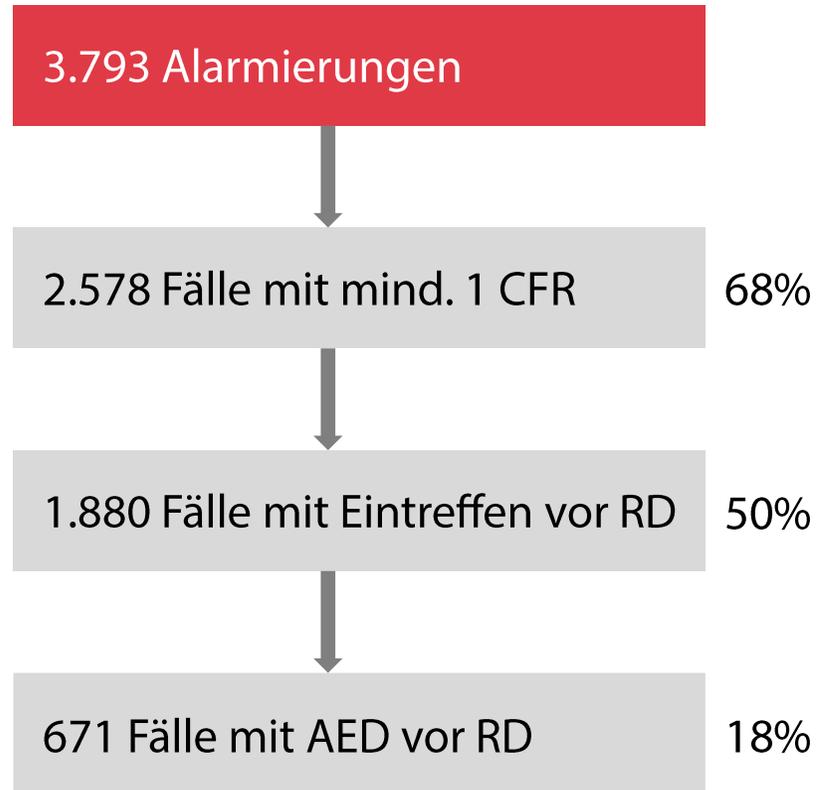


HEROES: Ergebnisse

	Fläche qkm	Einwohner	Ersthelfende /km ²		Ersthelfende /km ²	
			Januar	Januar	August	August
1 Dresden	3.435	1.044.462	1437	0,42	1886	0,55
2 Esslingen-Nürtingen	642	522.000	485	0,76	604	0,94
3 Göttingen	1.755	328.952	883	0,50	1129	0,64
4 Konstanz	818	291.974	591	0,72	753	0,92
5 Main-Taunus-Kreis	223	243.307	461	2,07	598	2,68
6 Oberpfalz Nord	5.347	504.224	1004	0,19	1152	0,22
7 Reutlingen	1.093	292.000	514	0,47	614	0,56
8 Rottweil	769	142.593	207	0,27	250	0,33
9 Stuttgart	207	633.484	452	2,18	699	3,38
10 Trier	1.219	260.636	565	0,46	745	0,61
11 Tübingen	519	234.777	1262	2,43	1341	2,58
	16.027	4.498.409				

	Fläche qkm	Einwohner	AED (verifizie /km ²		AED (verifiziert) /km ²	
			Januar	Januar	August	August
1 Dresden	3.435	1.044.462	65	0,02	219	0,06
2 Esslingen-Nürtingen	642	522.000	51	0,08	160	0,25
3 Göttingen	1.755	328.952	53	0,03	102	0,06
4 Konstanz	818	291.974	158	0,19	176	0,22
5 Main-Taunus-Kreis	223	243.307	28	0,13	64	0,29
6 Oberpfalz Nord	5.347	504.224	116	0,02	198	0,04
7 Reutlingen	1.093	292.000	67	0,06	97	0,09
8 Rottweil	769	142.593	73	0,09	90	0,12
9 Stuttgart	207	633.484	44	0,21	90	0,43
10 Trier	1.219	260.636	33	0,03	81	0,07
11 Tübingen	519	234.777	172	0,33	205	0,39
	16.027	4.498.409				

HEROES: Ergebnisse



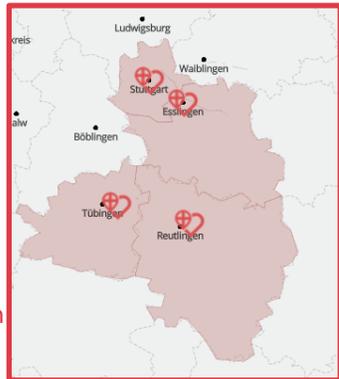


Göttingen, n=182
 mind. 1 CFR: 76%
 S4 vor RD: 61%
 S4 (median): 3:42 min
 AED vor RD: 15%



Oberpfalz Nord, n=551
 mind. 1 CFR: 41%
 S4 vor RD: 34%
 S4 (median) 3:19 min
 AED vor RD: 12%

Tübingen, n=323
 mind. 1 CFR: 79%
 S4 vor RD: 65%
 S4 (median) 3:53 min
 AED vor RD: 28%



Stuttgart, n=844
 mind. 1 CFR: 71%
 S4 vor RD: 45%
 S4 (median) 5:15 min
 AED vor RD: 14%

Reutlingen, n=172
 mind. 1 CFR: 77%
 S4 vor RD: 68%
 S4 (median) 5:08 min
 AED vor RD: 51%

Esslingen, n=198
 mind. 1 CFR: 74%
 S4 vor RD: 49%
 S4 (median) 3:06 min
 AED vor RD: 26%

Dresden, n=626
 mind. 1 CFR: 76%
 S4 vor RD: 50%
 S4 (median) 3:09 min
 AED vor RD: 9%



3.793 Alarmierungen

2.578 Fälle mit mind. 1 CFR

68%

1.880 Fälle mit Eintreffen vor RD

50%

671 Fälle mit AED vor RD

18%

Main-Taunus, n=121
 mind. 1 CFR: 88%
 S4 vor RD: 65%
 S4 (median) 4:09 min
 AED vor RD: 36%



Rottweil, n=90
 mind. 1 CFR: 72%
 S4 vor RD: 53%
 S4 (median) 5:24 min
 AED vor RD: 27%



Trier, n=581
 mind. 1 CFR: 60%
 S4 vor RD: 46%
 S4 (median) 3:14 min
 AED vor RD: 13%



Konstanz, n=105
 mind. 1 CFR: 85%
 S4 vor RD: 67%
 S4 (median) 2:42 min
 AED vor RD: 28%



HEROES: Ergebnisse

- Studienziel erreicht? -> Noch nicht alle Entlassbriefe in Datenbank
- Messbare Effekte nach sehr kurzer Zeit (!)
- Erhebliche Reduktion no-flow Zeit, relevante Anzahl AED-Einsatz vor RD
- Performance nach 4 (12) Monaten noch nicht am Maximum
- Weitere Beobachtungsphase 2026?
- Wir müssen die weißen Flecken reduzieren!!

Lassen Sie uns gemeinsam
Leben retten.

