HTA Syd

Orienterande litteraturöversikt
med enkel analys

MOBILLARM TILL VOLONTÄRER VID HJÄRTSTOPP

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Denna litteraturöversikt är baserad på följande moment:

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☒ Sonderande litteratursökning
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Innehållsförteckning

1 Sammanfattning

Mobillarm till volontärer vid hjärtstopp, en orienterande litteraturöversikt med enkel analys*

Systemet med mobillarm till hjärtlungräddnings (HLR) utbildade volontärer vid hjärtstopp utanför sjukhus har tydligt visat sig vara praktiskt genomförbart, även i en svensk kontemporär kontext. Det har införts på ett flertal platser i landet.

Ett flertal studier har visat att surrogatutfallsmått, såsom tid från att larm till påbörjad HLR har kunnat förkortas samt antalet genomförda HLR-insatser, med eller utan automatiserad portabel defibrillator har stigit.

Dock är data avseende patientnära effektmått såsom långtidsöverlevnad (total och kardiovaskulär) och väldefinierade patientrelevanta neurologisk gradering samt livskvalitetsdata efter lyckad HLR endast är sparsamt rapporterade i befintlig vetenskaplig litteratur.
Detta innebär att evidens av hög kvalitet och med god vetenskaplig tillförlitlighet inte föreligger i dagsläget för relevanta patientnära effektmått.

Flera internationella professionsföreningar har de senaste åren publicerat rekommendationer i ämnet. Den nationella professionsföreningar Rådet för Hjärt-Lungräddnings rekommendationer ligger i linje med de internationella intresseföreningarnas och de är: ”HLR-rådet stöder införandet av ett nationellt livräddarsystem med frivilliga livräddare som larmas vid misstänkt hjärtstopp för att utföra HLR och vid behov defibrillera.”
I Socialstyrelsens senaste nationella kardiologiska riktlinjer (2018) är aktuell fråga inte behandlad. Riktlinjerna är under revision och frågan är planerad att tas upp i den nästkommande versionen av riktlinjerna.

En viktig och väldesignad svensk vetenskaplig studie är slutförd och är i publiceringsfas, dess resultat är ännu inte offentliga. Vidare finns det andra relevanta pågående randomiserade kontrollerade studier från övriga världen.

Det går inte att dra några slutsatser om eventuell kostnadseffektivitet utifrån de publicerade studierna.

Ett antal etiska och juridiska frågeställningar har identifierats som behöver fortsatt genomlysning.

*Aktuell litteraturöversikt gör inte anspråk på att vara heltäckande, refererad litteratur är inte relevansbedömd eller kvalitetsgranskad enligt vedertagen metod, ej heller är någon utvärdering av den vetenskapliga tillförlitligheten genomförd. I en fullständig HTA rapport utvärderas även den kliniska frågans etiska, organisatoriska och hälsoekonomiska aspekter grundligt. I föreliggande publikation berörs dessa ämnen översiktligt.
HTA Syd kan vid behov åta sig att tillsammans med professionen genomföra en verksamhetsnära och fullständig HTA-rapport.

2 Förkortningar

Tabell 1. förkortningar

Förkortning	Betydelse (förklaring)
AED	Automated External Defibrillator (automatiserad extern defibrillator) Hjärtstartare
AHA	American Heart Association
B-CPR	Bystander CPR
CAMTÖ	Centre for Assessment of Medical Technology in Örebro
CPR	Cardiopulmonary Resuscitation (HLR – hjärt-lungräddning)
DA-CPR	Dispatcher-Assisted CPR
EMS	Emergency Medical Services
GPS	Global Positioning System
GRADE	Grading of Recommendations, Assesment, Development and Evaluations
HTA	Health Technology Assessment
NNT	Numbers Needed to Treat
OHCA	Out-of-Hospital Cardiac Arrest (hjärtstillestånd/hjärtstopp utanför sjukhus)
QALY	Quality-Adjusted Life Year (Kvalitetsjusterat levnadsår)
PICO	Patient, Intervention, Comparator, Outcomes
RCT	Randomized Controlled Trial
ROSC	Return of Spontaneous Circulation
ROB	Risk Of Bias
SAMBA	The Scandinavian AED and Mobile Bystander Activation
TM	Text Message (sms)

3 Bakgrund

Mobillarm till volontärer vid hjärtstopp utanför sjukhuset innefattar i korthet följande moment: Volontärer genomgår en grundläggande utbildning i hjärtlungräddning (HLR). Den vuxne nödställde, eller någon som bevittnar situationen, kontaktar larmcentralen. Via GPS identifierar larmcentralen en volontär i den nödställdes närhet, personuppgifter och geografisk plats för den nödställde skickas till volontärens mobiltelefon. Volontärer kan välja att ta sig an uppgiften genom att kvittera på sin telefon och därefter skyndsamt ta sig till nödställde för HLR. Till sin hjälp kan volontären använda sig av en medhavd eller upplockad automatiserad extern defibrilator (AED, även kallat hjärtstartare). Volontären utför sitt arbete i enlighet med sin grundläggande utbildning tills den legitimerade ambulanspersonalen anländer till och övertar ansvaret.
Ett flertal studier har visat att systemet är tekniskt genomförbart. De fördelar som framhålls är (1) snabbheten med att starta HLR (2) att det är en HLR-utbildad person som genomför HLR, (3) att man kan starta innan räddningspersonal hinner fram och (4) att man i en del regioner kunnat ta med sig en AED till platsen och hunnit påbörja defibrillering innan ankomst av räddningspersonal. Det finns bred konsensus kring att framgångsrik defibrillering har stor effekt på överlevnad.

Incidensen av plötslig hjärtdöd i Europa beräknas vara mellan 70 och 170/100 000 invånare (Gräsner et al. 2016, Perkins et al. 2018, den genomsnittliga överlevanden i Europa är 8% vid hjärtstopp utanför sjukhuset, (OHCA, Södersved Källestedt et al. 2022). I Sverige rapporteras drygt 10% överleva (mätt som total 30 dagars mortalitet, www.hlr.nu) vid OHCA och om jämförelse kan anges att mer än var tredje patient som är inlagd på sjukhus och får ett hjärtstopp är vid liv 30 dagar senare. Det finns rapporterat att om HLR utförs av icke-legitimerad person i väntan på legitimerad personal skulle antalet överlevande kunna fördubblas (Rajan et al. 2016).

Vid flertalet* av landets sjukvårdsregioner har system med mobillarm till volontärer införts permanent.

4 Material och metoder

4.1 Frågeställning, PICO och avgränsningar

Aktuell fråga har inkommet från Hälso- och sjukvårdsnämnden, Region Skåne.
För att möjliggöra en litteratursökning har HTA Syd i samråd med sakkunniga tagit fram en kliniskt fokuserade fråga. Frågans delkomponenter har sedan specificerats enligt PICO-modellen. Vidare har studiernas avgränsningar definierats.

* Blekinge, Halland, Kronoberg, Jönköping, Kalmar, Sörmland, Västmanland, Västra Götaland, Östergötland, Stockholm och Norrbotten.

Tabell 2. Frågeställningar, PICO och avgränsningar.

Kliniskt fokuserade frågor	
Kan överlevnad med tillräckligt bevarad neurologi vid hjärtstopp i Skåne och Södra sjukvårdsregionen förbättras med hjälp av mobillarm till HLR-utbildade volontärer?	
PICO	
P, Patient	Patienter som drabbas av hjärtstillestånd utanför sjukhus.
I, Intervention	Utlarmning, via sms eller en mobil-app, av utbildade volontärer som befinner sig i närheten som komplement till sedvanlig utlarmning av räddningstjänst.
C, Comparator	Sedvanlig utlarmning av räddningstjänst.
O, Outcome	O1: Överlevnad till utskrivning från sjukhus eller 30 dagar O2: Överlevnad med acceptabel neurologisk status (odefinierat) O3: Antal genomförda bystander HLR O4: HLR genomfört m publik/egen AED
Avgränsningar	
Studiedesign	Randomiserade kontrollerade studier, ej randomiserade kontrollerade studier, systematiska översikter och metaanalyser. Studier om etik och hälsoekonomi. Professions- och intresseorganisationers riktlinjer.
Ålder	Vuxna.
Patienter	Ej trauma, drunkning eller självmordsförsök.
Bortfall	Ej definierat.
Publikationsdatum	190101 – 220601.
Språk	Engelska och skandinaviska språk.

För att belysa frågan har HTA Syd gjort en översiktlig litteratursökning med en enkel analys. Litteratursökningen gör inte anspråk på att vara heltäckande. Refererad litteratur är varken relevansbedömd eller kvalitetsgranskad, enligt den vedertagna metod som används i fullständiga HTA-rapporter. Inte heller är någon utvärdering av den vetenskapliga tillförlitligheten genomförd. Den kliniska frågans etiska, organisatoriska och hälseoekonomiska aspekter berörs endast översiktligt.

Eftersom frågan översiktligt undersökts tidigare av HTA Skåne (2019) har litteratursökningen avgränsats till artiklar publicerade de senaste fyra åren. HTA Skåne fann 2019 att frågan samma år hade belysts i två systematiska översikter: en svensk HTA-rapport från CAMTÖ (Lohse et al. 2019) och en Cochrane-översikt (Barry et al. 2019). Båda dessa översikter granskade ett stort antal artiklar i ämnet. I rapporten från CAMTÖ inkluderades en svensk randomiserad kontrollerad studie (Ringh et al. 2015) – fortfarande den enda RCT som publicerats i ämnet – samt en registerstudie från Nederländerna, rapporterad i två artiklar (Pijls et al. 2016, Pijls et al. 2018). Även Cochrane-översikten inkluderade artikeln av Ringh et al. (2015) samt en kluster-RCT från Nederländerna (van Alem et al. 2003). I den sistnämnda studien utgjordes gruppen ”Community First Responders” av brandmän i aktiv tjänst, vilket innebar att HTA Syd bedömde att det var svårt att överföra resultaten till svenska förhållanden. Utöver ovan nämnda studier tog HTA Syd upp ytterligare vid tillfället nypublicerade studier.

Varken CAMTÖ eller Cochrane fann 2019 att det gjorts några studier som med säkerhet visar att extralarm till volontärer vid hjärtstopp utanför sjukhus påverkar det patientnära effektmåttet överlevnad. Statens beredning för medicinsk och social utvärdering (SBU) har inte undersökt frågan.

4.2 Aktuell uppdaterad litteratursökning

Under mars och april 2022 har litteratursökningar gjorts i databaserna PubMed, Cochrane Library och Web of Science, i Google Scholar och på olika HTA-organisationers och expertorganisationers webbsajter (för detaljer se appendix 1).

5 Resultat

Vid litteratursökningen identifierades en ny systematisk översikt med metaanalys om mobil-larm till volontärer (Scquizzato et al. 2022). Förutom de tio studier som inkluderats i översikten har ytterligare en originalstudie med kontrollgrupp hittats i sökningarna (Oosterveer et al. 2022, se längst ner i tabell 3). Två artiklar som berör hälsoekonomiska aspekter diskuteras i avsnittet Hälsoekonomi. Vidare har ett antal artiklar med andra studiedesigner hittats, liksom artiklar som berör frågan ur ett etiskt perspektiv och även andra publikationstyper. Dessa artiklar återfinns i appendix 2. Aktuella internationella och nationella rekommendationer, riktlinjer och kunskapsluckor enligt James Lind Alliance samt pågående studier har identifierats och återfinns på s. 13-16.

5.1 Systematisk översikt med metaanalys, Scquizzato et al. 2022:

"Dispatching citizens as first responders to out-of-hospital cardiac arrests: a systematic review and meta-analysis."

Översikten inkluderar studier om hjärtstillestånd utanför sjukhus som jämför effekten av att skicka mobil-larm till volontärer med enbart sedvanlig utlarmning av räddningstjänst och prehospital akutsjukvård. Både randomiserade och icke randomiserade kontrollerade studier som publicerats i granskade vetenskapliga tidskrifter inkluderades. Bland dessa studier återfinns bara en studie som bedömts ha låg risk för bias/systematisk snedvridning och det är samma svenska RCT, (Ringh et al. 2015) som togs upp redan i översikterna från 2019 (Lohse et al 2019, Barry et al. 2019). Övriga studier är retrospektiva och har en jämförande kontrollgrupp. De befanns ha hög eller medelhög risk för snedvridning, se tabell 2. Abstrakt till samtliga ingående artiklar finns i appendix 2.

Tabell 3. Den identifierade systematiska översikten (Scquizzato et al., 2022) och dess inkluderade originalstudier med respektive artikelförfattares slutsatser, studiens härkomst, studiedesign, typ av larm samt bedömning av risk för snedvridning (Risk of Bias, ROB) samt en nytillkommen studie (Oosterveer et al., 2022) som inte var inkluderad i den systematiska översikten.

Systematisk översikt och metaanalys					
Studie	Artikelförfattarnas slutsatser	Land	Studiedesign[1]	Larmtyp[2]	Risk för bias[3]
Scquizzato et al. (2022)	Alerting citizen first responders to OHCA patients is associated with higher rates of bystander-initiated CPR, use of AED before ambulance arrival, and survival at hospital discharge or 30 days.	Italien	Systematisk översikt och metaanalys	Sms och app	Ej utförd av HTA Syd
Originalstudier inkluderade i den systematiska översikten av Scquizzato et al. (2022)					
Studie	Artikelförfattarnas slutsatser	Land	Studiedesign[1]	Larmtyp[2]	Risk för bias[3] (enl. Scquizzato)
Ringh et al. (2015)[4]	A mobile-phone positioning system to dispatch lay volunteers who were trained in CPR was associated with significantly increased rates of bystander-initiated CPR among persons with out-of-hospital cardiac arrest.	Sverige	RCT	Sms	Låg
Pijls et al. (2016)[4]	The textmessage-alert system is effective in increasing survival to hospital discharge in OHCA victims and the degree of disability or dependence after survival is low.	Neder-länderna	Retrospektiv kontrollerad observations-studie	Sms	Hög
Lee et al. (2019)[4]	The bundle intervention including textmessage alert service for OHCA was associated with better survival outcomes through an increase in bystander CPR.	Sydkorea	Retrospektiv longitudinell observations-studie	Sms	Hög
Andelius et al. (2020)	Arrival of app-dispatched citizen responders before EMS was associated with increased odds for bystander CPR and a more than 3-fold increase in odds for bystander defibrillation.	Danmark	Retrospektiv kontrollerad observations-studie	App	Medelhög
Derkenne et al (2020)	We report that mobile smartphone technology was associated with OHCA survival through accelerated initiation of efficient CPR by first responders in a large urban area.	Frankrike	Retrospektiv kontrollerad observations-studie	App	Medelhög
Stroop et al. (2020)	Simultaneous alerting of nearby CPR-trained volunteers complementary to professional emergency medical system teams can reduce both the response time and resuscitation-free interval and might improve hospital discharge rate and neurological outcomes after OHCA.	Tyskland	Retrospektiv kontrollerad observations-studie	App	Hög
Wong et al. (2021)	B-CPR rates in Singapore have been increasing alongside the implementation of community-level interventions such as DA-CPR and myResponder. DA-CPR was associated with improved odds of receiving B-CPR over time while the impact of myResponder was less clear.	Singa-pore	Retrospektiv longitudinell observations-studie	App	Medelhög

Smida et al. (2021)	A minority of PulsePoint dispatches in Pittsburgh were triggered by true OHCA. The majority of OHCA during the study period occurred within private residences where PulsePoint responders are not currently dispatched. PulsePoint dispatches were associated with prognostically favorable OHCA characteristics and increased bystander CPR performance.	USA	Retrospektiv kontrollerad observations-studie	App	Medelhög
Smith et al. (2021)	Alert acceptance was associated with improved survival in both ambulance services. Alert acceptance rates were low, and challenges remain to maximize the potential benefit of GoodSAM.	Stor-britannien	Retrospektiv kontrollerad observations-studie	App	Medelhög
Stieglis et al. (2021)	Introducing volunteer responders directed to AEDs, dispatched by text-message was associated with significantly reduced time to first defibrillation, increased bystander CPR and increased overall survival for OHCA patients in residences found with VF.	Neder-länderna	Retrospektiv longitudinell observations-studie	Sms	Hög
Studie som tillkommit efter den systematiska översikten av Scquizzato et al.					
Författare	Artikelförfattarnas slutsatser	Land	Studiedesign[1]	Larmtyp[2]	Risk för bias[3]
Oosterveer et al. (2022)	A TM alert system seems to improve the chain of survival; because textmessage responders reached patients early, AEDs were attached more often and more OHCA patients achieved Return of Spontaneus Circulalation. However, the introduction of a textmessage alert system was not associated with improved 3-month or 1-year survival in a region with above-average survival rates.	Neder-länderna	Retrospektiv kontrollerad observations-studie	Sms	Ej utförd av HTA Syd

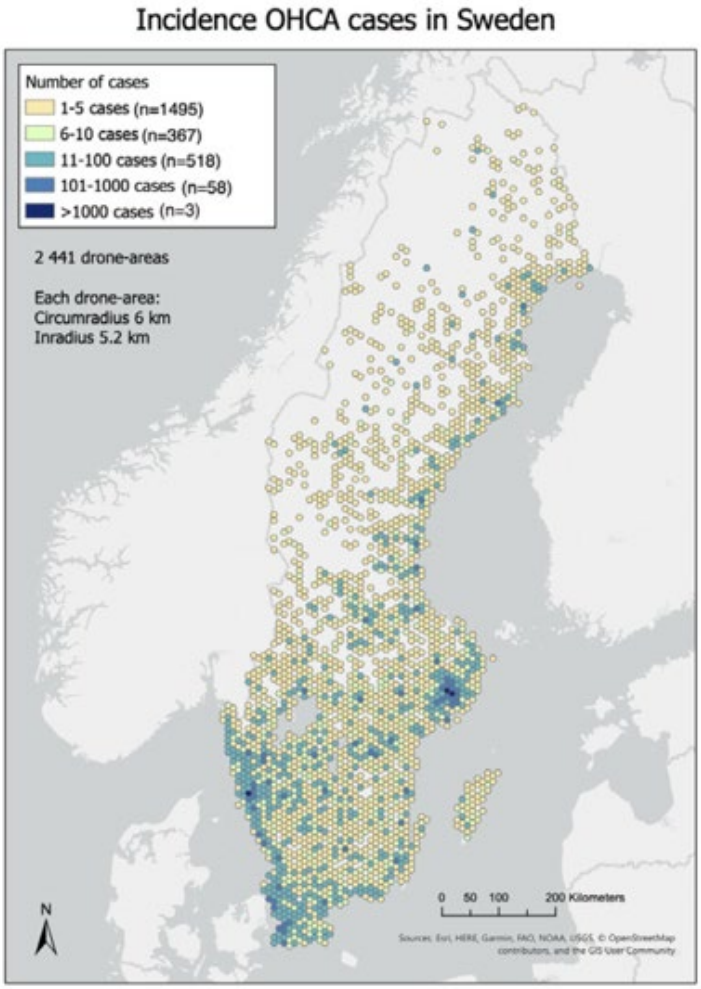
[1] Alla studier hade kontrollgrupp, [2] för jämförelse av olika system för mobil-larm, se Valeriano et al. 2021, [3] Bedömning av Scquizzato et al. Tregradig skala för bedömning av risk för bias (low/låg, moderate/medelhög och serious/hög), ROB, användes, [4] dessa tre artiklar togs upp i HTA Skånes litteraturöversikt från 2019.

Tabell 4. Summary of main findings från Scquizzato et al. 2022

Outcomes	No. of studies	Citizens first responders activated	Conventional emergency response	Odds ratio (95% CI)	*P*-value	I^2 (%)
Primary outcome						
Survival to hospital discharge or 30 days, *n* (%)	9	903/9978 (9.1%)	1104/13 247 (8.3%)	1.45 (1.21–1.74)	<0.001	52
Secondary outcomes						
Survival with good neurological outcome, *n* (%)	3	316/2685 (12%)	276/2972 (9.3%)	1.37 (0.81–2.33)	0.24	84
Return of spontaneous circulation, *n* (%)	9	2575/9169 (28%)	3445/12 607 (27%)	1.40 (1.07–1.81)	0.01	83
Bystander-initiated CPR, *n* (%)	8	5876/9074 (65%)	6384/11 970 (53%)	1.75 (1.43–2.15)	<0.001	75
Bystander-operated AED, *n* (%)	8	654/9132 (7.2%)	624/14 848 (4.2%)	1.82 (1.31–2.53)	<0.001	69

AED, automated external defibrillator; CI, confidence interval; CPR, cardiopulmonary resuscitation; EMS, emergency medical services.

5.2 Incidens i Sverige av OHCA



Hämtad från Shierbeck et al (2021).

5.3 Aktuell situation i Region Skåne

Under 2021 registrerades 608 OHCA i Skåne (Svenska HLR-registret*). Av dessa räddades totalt 72 personer till livet (11,8%). Knappt 60% (334 st) av det totala antalet OHCA-patienter erhöll HLR av lekmän, anhöriga, legitimerad personal som inte är i tjänst, så kallade bystanders i detta sammanhang. Mediantiden från larmtid till ankomst för ambulanspersonal var 9 minuter för män och 10 min för kvinnor. För hela Skåne har ambulansens responstid legat mellan 15:30 och 16:35 (min:sek) under perioden 2012-2020. Det föreligger lokala skillnader i Skåne, uppmätt på kommunivå, för närmare specifikation var god se appendix 3. Den kliniska signifikansen för dessa lokala skillnader är inte definierad.

* Data från HLR-registret, såväl som andra register av motsvarande slag, tillåter analys på gruppnivå men inte på individnivå. För att en analys på individnivå skall kunna genomföras förutsätts etiskt godkänd forskningsansökan.

5.4 Hypotetisk klinisk situation i Region Skåne vid ett ev. införande av mobillarm till volontärer

Sakkunnig bedömningen (HW) är att ytterligare omkring 5-10 personer skulle årligen kunna räddas till livet vid införandet av systemet med utbildade volontärer och mobillarm.

Om man antar att 8 personer till skulle överleva, och givet att det totala antalet OHCA är konstant, kan man att beräkna ett hypotetiskt Numbers Needed to Treat (NNT, den inverterade absoluta riskskillnaden). Man får då ett NNT-värde på 76,5, dvs det krävs 76,5 st genomförda mobillarms-initierade HLR vid OHCA för att en av dessa personer skall överleva i 30 dagar. För uträkningen och vidare kommentar vg se appendix 4.

5.5 Organisatoriska aspekter

Ett införande av mobillarm till utbildade volontärer kräver en tydlig och klar planering och konsekvensbeskrivning samt en diskussion kring horisontella prioriteringar då ett införande kan betraktas som omfattande projekt som behöver resurssättas.

Det är bortom denna översiktliga publikations format att kommentera och utvärdera organisatoriska aspekter av ett eventuellt införande. Men det är rimligt att tro att Region Skåne kan dra lärdom från de regioner i landet som har genomfört ett införande.

5.6 Hälsoekonomiska aspekter

Två artiklar (sammanfattade nedan) från de senaste tre åren som tar upp hälsoekonomiska aspekter har identifierats, båda modellbaserade analyser. Den första är gjord vid Centrum för forskning inom respons- och räddningssystem vid Linköpings universitet och tar upp svenska förhållanden. Den andra artikeln redovisar resultat för en analys som presenteras tillsammans med en pilotstudie i Belgien. Modellbaserad analys av kostnadseffektivitet är relevant för att fånga potentiell nytta av mobillarm där en ökad överlevnad också kan knytas till patientnytta på längre sikt. Därtill kan modellbaserade analyser väga in fler kostnader och aspekter på patientnytta av mobillarm vid hjärtstopp utifrån bredare genomgång av litteraturen liksom att pröva hur känsliga resultaten är för de antaganden som modellanalysen vilar på.

5.6.1 Ennab Vogel & Levin (2020):

”Sms-livräddare vid akut omhändertagande av patient med hjärtstopp utanför sjukhus – en kostnadseffektivitetsanalys”.

Studien gör en modellbaserad analys av kostnaden per vunnet kvalitetsjusterat levnadsår utifrån aggregerade data för var och en av Sveriges regioner. Beräkningarna utgår från registrerat antal hjärtstopp utanför sjukhus och förväntad påverkan på överlevnad till följd av tidigare defibrillering med AED av SMS-livräddaren. Studien räknar med att SMS-livräddningssystemet kostar 800 000 kronor per år per region. Kostnaden för andra vårdinsatser eller SMS-livräddarnas insatser ingår inte. Rapporten innehåller också en känslighetsanalys där kostnaden för interventionen istället antas vara 1,6 miljoner kronor (+100%). Författarnas slutsats är att kostnaden per vunnet kvalitetsjusterat levnadsår i huvudanalysen för alla regioner ligger under 10 000 kronor och kan betraktas som låg. Det finns dock betydande skillnader mellan regioner som drivs av de epidemiologiska data som skiljer sig mellan regionerna inklusive förekomst av hjärtstopp, typ av hjärtstopp och demografi (ålder och kön). Även känslighetsanalysen redovisar förhållandevis låg kostnad per effekt även om

några regioner då har en kostnad över 100 000 kronor per vunnet kvalitetsjusterat levnadsår. Det är också oklart om det går att säkerställa att systemet fungerar med enbart frivilligarbetare från civilsamhället.

5.6.2 Vercammen & Moens (2020):

”Cost-effectiveness of a novel smartphone application to mobilize first responders after witnessed OHCA in Belgium.”
Artikeln redovisar en modellbaserad analys av kostnader, patientnytta och kostnadseffektivitet för implementering av ett system med mobillarm, EVapp, där upp till fem volontärer inom 500 meters radie eller upp till 1500 meters radie kan kallas till en person med hjärtstopp i syfte att kunna initiera behandling före ambulanspersonal kommer fram. Modellanalysen beräknade förväntade kostnader och patientnytta för scenerier med olika antaganden om hur stor påverkan på överlevnad och hälsoutfall som EVapp kunde ha. Detta eftersom publicerade studier och registerdata innehöll betydande osäkerhet. Författarna beräknade att kostnaden per vunnet kvalitetsjusterat levnadsår (QALY, Quality-Adjusted Life Year) var omkring 18 000 euro. De noterade också att den viktigast kostnadsfaktorn var sjukhusbehandling av personer som överlever hjärtstopp. Detta innebar att scenariot med störst dödlighet (minst påverkan av EVapp) också hade lägst kostnad per kvalitetsjusterat levnadsår (13 000 euro per QALY) medan scenariot med störst effekt på överlevnaden också innebar högst kostnad per effekt (25 000 euro per QALY). Artikeln innehåller också en beskrivning av erfarenheter från implementering av systemet EVapp i ett av Belgiens mer glesbefolkade områden där EVapp förväntades kunna göra stor skillnad om volontärer larmas och tidigt kan sätta in behandling och göra defrillering i väntan på att ambulanspersonal når fram. Artikeln lyfter flera utmaningar för praktisk implementering såsom rekrytering av volontärer, tillräcklig tillgång på defibrillatorer och observerade att ambulansen anlände före volontärerna i 80% av fallen. Återkoppling från volontärerna lyfte oklar anvisning om plats och att larmen inte gick igenom om mobiltelefonen var på ljudlöst.

5.7 Etiska och juridiska aspekter

De etiska aspekterna av sjukvårdsinsatser gjorda av icke-sjuvårdslegitimerade volontärer rör bland annat följande frågor: Sjukvårdens ansvar för genomförda HLR med fatal/icke neurologiskt tillfredställande utfall, eventuella negativa reaktioner hos volontärerna till följd av misslyckad återupplivning eller vid ett negligerat mobillarm. Vidare hur utlarmningen bör hanteras vid hjärtstopp i samband med trauma, självmordsförsök eller drunkning samt hjärtstopp hos barn. Ytterligare aspekter är risker för fysisk skada för volontären och/eller smittrisk vid hjärt- och lungräddning.

Till de juridiska aspekterna hör bland annat ansvarsfördelningen mellan volontären kontra sjukvården. Volontärens legala möjligheter att utföra HLR på icke-offentlig plats behöver genomlysas. En icke-offentlig plats kan vara en privatbostad, vilket är en vanligaste plats för HLR i samband med OHCA.

5.8 Rekommendationer och riktlinjer

5.8.1 Ilcor (International Liaison Committee on Resuscitation), Consensus on Science with Treatment Recommendations (CoSTR)

First responder engaged by technology (EIT #878): Systematic Review (Semeraro 2019)
Utdrag:
Treatment recommendations
"We recommend that citizen/individuals who are in close proximity to a suspected Out-Of-Hospital Cardiac Arrest (OHCA) event and willing to be engaged/notified by a smartphone app with mobile positioning system (MPS) or Text Message (TM)-alert system should be notified (strong recommendation, very low-certainty evidence)."
https://costr.ilcor.org/document/first-responder-engaged-by-technology-systematic-review

5.8.2 ERC (European Resuscitation Council)

"European Resuscitation Council Guidelines 2021: Systems saving lives" (Semeraro 2021)
Utdrag, avsnittet om mobil-larm:
Social media and smartphones apps for engaging the community

- First responders (trained and untrained laypersons, firefighters, police officers, and off-duty healthcare professionals) who are near a suspected OHCA should be notified by the dispatch centre through an alerting system implemented with a smartphone app or a text message.
- Every European country is highly encouraged to implement such technologies in order to:
    - Improve the rate of bystander-initiated cardiopulmonary resuscitation (CPR).
    - Reduce the time to first compression and shock delivery.
    - Improve survival with good neurological recovery.

https://www.resuscitationjournal.com/article/S0300-9572(21)00061-7/fulltext

5.8.3 AHA (American Heart Association)

2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care
Utdrag, avsnitt 7.3 "Mobile Phone Technologies to alert Bystanders of Events Requiring CPR"
The use of mobile phone technology by emergency dispatch systems to alert willing bystanders to nearby events that may require CPR or AED use is reasonable. (COR 2a, LOE B-NR, se appendix 5 för AHA definitioner)
https://cpr.heart.org/en/resuscitation-science/cpr-and-ecc-guidelines/systems-of-care

5.8.4 Socialstyrelsens Nationella Riktlinjer

I de senaste kardiologiska riktlinjerna (2018) tas frågan kring mobillarm till volontärer vid OHCA inte upp. Riktlinjerna är under revision och frågan är planerad att tas i den nästkommande versionen av de kardiologiska riktlinjerna.

5.8.5 Svenska rådet för hjärt-lungräddning

"Tillsammans räddar vi liv"
Utdrag, avsnittet om livräddarsystem:
HLR-rådet rekommenderar:
HLR-rådet stöder införandet av ett nationellt livräddarsystem med frivilliga livräddare som larmas vid misstänkt hjärtstopp för att utföra HLR och vid behov defibrillera.
https://www.hlr.nu/wp-content/uploads/2019/11/10-steg-till-%C3%B6kad-%C3%B6verlevnad.pdf

5.9 Pågående studier

5.9.1 The Scandinavian AED and Mobile Bystander Activation Trial, Sweden

"The Scandinavian AED and Mobile Bystander Activation Trial - a Randomized Controlled Trial"
Enrollment: 815 participants
Allocation: Randomized. Intervention Model: Parallel Assignment. Masking: Double (Care Provider, Investigator)
Expected completion, year: 2020 (Har skickats in för publicering, data ännu inte offentlig)
The aim of "The Scandinavian AED and Mobile Bystander Activation" (SAMBA) trial is to evaluate if a Mobile Phone Positioning system and a smartphone application will increase the proportions of patients with an attached Automated External Defibrillator (AED) before arrival of the Emergence Medical System (EMS). Mobile phone technology and a smartphone application will be used identify and recruit nearby CPR-trained lay people and

automated external defibrillators (AEDs) to patients suffering out-of-hospital cardiac arrest (OHCA). The system is currently running in Stockholm Sweden and in the Gothenburg region.
https://clinicaltrials.gov/ct2/show/NCT02992873

5.9.2 The HeartRunner Trial, Denmark

"Public Access Defibrillation by Activated Citizen First-responders - The HeartRunner Trial"
Estimated enrollment: 1 600
Estimated completion year: 2026
Allocation: Randomized. Intervention Model: Parallel Assignment. Masking: Double (Investigator, Outcomes Assessor.
The study will assess 30-day survival for cases where volunteer citizen responders ('heart runners') were activated through a smartphone app to retrieve an AED in case of suspected out-of-hospital cardiac arrest (OHCA) versus standard emergency medical services care. The study will randomize emergency medical dispatch center incoming calls which are suspected out-of-hospital cardiac arrest, such that half will be randomized to activation of heart runners and half to no activation of heart runners (standard care). The study will also assess physical or psychological risks involved for the activated heart runners.
https://clinicaltrials.gov/ct2/show/NCT03835403

5.9.3 The PulsePoint Study, USA

"Evaluating the PulsePoint Mobile Device Application to Increase Bystander Resuscitation for Victims of Sudden Cardiac Arrest"
Estimated enrollment: 522 participants
Estimated completion year: 2023
Allocation: Randomized. Intervention Model: Parallel Assignment. Masking: Triple (Participant, Care Provider, Outcomes Assessor).
This randomized controlled trial will evaluate whether use of the PulsePoint system increases bystander CPR or defibrillator use compared to standard dispatch procedures in patients who suffer non-traumatic, out-of-hospital cardiac arrest in a public location. Half of all suspected cardiac arrest 9-1-1 calls in a public location will receive PulsePoint alerts (treatment arm). The other half of this eligible patient cohort will receive standard dispatch procedures (control arm).
https://clinicaltrials.gov/ct2/show/NCT04806958

5.9.4 Cardiac Arrest in Residential Areas With Mobile First-responder Activation (CARAMBA), Danmark

"A Cluster Randomized Clinical Trial of Strategic AED Deployment in High-risk Residential Areas Combined With Activation of Local Residents"
Estimated enrollment: 260 patients
Estimated completion year: 2025
A Cluster Randomized Clinical Trial of Strategic AED Deployment in High-risk Residential Areas Combined With Activation of Local Residents
Allocation: Randomized. Intervention Model: Parallel Assignment. Masking: Single (Outcomes Assessor).
The study aims to increase proportions of bystander defibrillation during out-of-hospital cardiac arrest (hereof referred to as cardiac arrest) in residential areas with a high density of cardiac arrests. The intervention consists of Automated External Defibrillators (AEDs) and residents' involvement in resuscitation through training and enrollment as citizen responders.
https://clinicaltrials.gov/show/NCT04446585

5.9.5 DISPATCH, Frankrike

"Multifaceted Intervention for Increasing Performance of Cardiopulmonary Resuscitation by Laypersons in Out-of-hospital Cardiac Arrest. A Stepped Wedge Cluster Randomized Controlled Trial"
Enrollment: 2481
Estimated completion: September 2022
Allocation: Randomized. Intervention Model: Sequential Assignment. Intervention Model Description:, A Stepped Wedge Cluster Randomized Controlled Trial. Single (Outcomes Assessor).
Multifaceted intervention including 3 components including Dispatcher training to improve cardiac phone recognition, mobile application to send bystanders on cardiac arrest location before first professionals rescuers and motivational support for volunteer bystanders
https://clinicaltrials.gov/ct2/show/NCT03633370

5.10 Kunskapsluckor från James Lind Alliance

Dainty et al. 2021:
”Partnering with survivors & families to determine research priorities for adult out-of-hospital cardiac arrest: A James Lind Alliance Priority Setting Partnership.”
Utdrag: “The top ranked question in the final top ten list related to understanding the most effective mechanisms for improving the rate of lay responder/bystander CPR; the group discussed how this was most important because “without this, the rest doesn’t matter … ”

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Appendix 1 – Medverkande och använda sökstrategier

Medverkande till föreliggande publikation;

Sakkunniga:

Henrik Wagner, kardiolog, med dr, överläkare, Helsingborg, HLR-ansvarig Region Skåne

Jesper Petersson, neurolog, professor, FoU-chef Region Skåne

HTA Syd:

Jan Holst, överläkare, HTA-handledare, docent, HTA-handledare

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Katarina Steen-Carlsson, hälsoekonom, docent

Karin Sandqvist, informationsspecialist

Kristina Arnebrant, informationsspecialist, fil dr (delar av projektet)

Använda söktermer:

“text message" OR TM OR "mobile app" OR smartphone OR app OR phone-based AND alert* OR dispatch* OR activat*

OR

volunteer* OR bystander* OR “first responder*” OR “lay person*” OR lay-responder* OR citizen*

AND

“cardic arrest* at home” OR “out-of-hospital cardiac arrest*” OR OHCA OR “sudden cardiac arrest*”

Följande HTA-organisationers webbplatser genomsöktes:

- SBU – Statens beredning för medicinsk och social utvärdering
- Kunnskapssenteret (FHI), Norge
- CRD – Centre for Reviews and Dissemination, University of York, UK
- CADTH – Canadian Agency for Drugs and Technologies in Health, Canada
- NICE – National Institute for Health and Care Excellence, UK
- INAHTA – The International Network of Agencies for Health Technology Assessment
- Epistemonikos

Vidare gjordes en sökning efter pågående studier i Clinicaltrials.gov.

Appendix 2 – Abstrakt för inkluderade studier

Abstrakt till den systematiska översikten

Scquizzato et al. 2022

OBJECTIVES: Mobile phone technologies to alert citizen first responders to out-of-hospital cardiac arrests (OHCAs) were implemented in numerous countries. This systematic review and meta-analysis aim to investigate whether activating citizen first responders increases bystanders' interventions and improves outcomes.

METHODS: We searched PubMed, EMBASE, and the Cochrane Central Register of Controlled Trials from inception to 24 November 2021, for studies comparing citizen first responders' activation versus standard emergency response in the case of OHCA. The primary outcome was survival at hospital discharge or 30 days. Secondary outcomes were discharge with favourable neurological outcome, bystander-initiated cardiopulmonary resuscitation (CPR), and the use of automated external defibrillators (AEDs) before ambulance arrival. Evidence certainty was evaluated with GRADE.

RESULTS: Our search strategy yielded 1215 articles. After screening, we included 10 studies for a total of 23 351 patients. OHCAs for which citizen first responders were activated had higher rates of survival at hospital discharge or 30 days compared with standard emergency response [nine studies; 903/9978 (9.1%) vs. 1104/13 247 (8.3%); odds ratio (OR), 1.45; 95% confidence interval (CI), 1.21-1.74; P < 0.001], return of spontaneous circulation [nine studies; 2575/9169 (28%) vs. 3445/12 607 (27%); OR, 1.40; 95% CI, 1.07-1.81; P = 0.01], bystander-initiated CPR [eight studies; 5876/9074 (65%) vs. 6384/11 970 (53%); OR, 1.75; 95% CI, 1.43-2.15; P < 0.001], and AED use [eight studies; 654/9132 (7.2%) vs. 624/14 848 (4.2%); OR, 1.82; 95% CI, 1.31-2.53; P < 0.001], but similar rates of neurological intact discharge [three studies; 316/2685 (12%) vs. 276/2972 (9.3%); OR, 1.37; 95% CI, 0.81-2.33; P = 0.24].

CONCLUSIONS: Alerting citizen first responders to OHCA patients is associated with higher rates of bystander-initiated CPR, use of AED before ambulance arrival, and survival at hospital discharge or 30 days.

Abstrakt till de 11 originalstudier som jämför sms-larm med standardutryckning
(I förekommande fall även kommentarer och svar)

Ringh et al. 2015 (RUMBA, Sverige)

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

OBJECTIVES: We investigated whether rates of bystander-initiated CPR could be increased with the use of a mobile-phone positioning system that could instantly locate mobile-phone users and dispatch lay volunteers who were trained in CPR to a patient nearby with out-of-hospital cardiac arrest.

METHODS: We conducted a blinded, randomized, controlled trial in Stockholm from April 2012 through December 2013. A mobile-phone positioning system that was activated when ambulance, fire, and police services were dispatched was used to locate trained volunteers who were within 500 m of patients with out-of-hospital cardiac arrest; volunteers were then dispatched to the patients (the intervention group) or not dispatched to them (the control group). The primary outcome was bystander-initiated CPR before the arrival of ambulance, fire, and police services.

RESULTS: A total of 5989 lay volunteers who were trained in CPR were recruited initially, and overall 9828 were recruited during the study. The mobile-phone positioning system was activated in 667 out-of-hospital cardiac arrests: 46% (306 patients) in the intervention group and 54% (361 patients) in the control group. The rate of bystander-initiated CPR was 62% (188 of 305 patients) in the intervention

group and 48% (172 of 360 patients) in the control group (absolute difference for intervention vs. control, 14 percentage points; 95% confidence interval, 6 to 21; P<0.001).

CONCLUSIONS: A mobile-phone positioning system to dispatch lay volunteers who were trained in CPR was associated with significantly increased rates of bystander-initiated CPR among persons with out-of-hospital cardiac arrest.

Pijls et al. 2016 (Nederländerna)

“A text message alert system for trained volunteers improves out-of-hospital cardiac arrest survival”

OBJECTIVES: The survival rate of sudden out-of-hospital cardiac arrests (OHCAs) increases by early notification of Emergency Medical Systems (EMS) and early application of basic life support (BLS) techniques and defibrillation. A Text Message (TM) alert system for trained volunteers in the community was implemented in the Netherlands to reduce response times. The aim of this study was to assess if this system improves survival after OHCA.

METHODS: Dutch province of Limburg were collected according to the Utstein template. On site resuscitation attempts for presumed cardiac arrest were made in 833 cases, of which the TM-alert system was activated in 422 cases. Two cardiopulmonary resuscitation (CPR) scenarios were compared: 1. TM-alert system was activated but no responders attended (n=131), and 2. TM-alert system was activated with attendance of ≥1 responder(s) (n=291).

RESULTS: Survival to hospital discharge was 16.0% in scenario 1 and 27.1% in scenario 2 corresponding with OR=1.95 (95% CI 1.15-3.33; P=.014). After adjustment for potential confounders the odds ratio increased (OR=2.82; 95% CI 1.52-5.24; P=.001). Of the 100 survivors, 92% were discharged from the hospital to their home with no or limited neurological sequelae.

CONCLUSIONS: The TM-alert system is effective in increasing survival to hospital discharge in OHCA victims and the degree of disability or dependence after survival is low.

Comment

Mendelson & Berg 2016
“Getting the right bystander to the right place at the right time”

Lee et al. 2019 (Sydkorea)

“Text message alert system and resuscitation outcomes after out-of-hospital cardiac arrest: A before-and-after population-based study”

OBJECTIVES: This study aimed to investigate the association of a resuscitation bundle intervention including text message (TM) alert system and bystander cardiopulmonary resuscitation (CPR) and outcomes of out-of-hospital cardiac arrest (OHCA).

METHODS: A population intervention study was conducted for resuscitation-attempted OHCAs from 2013 to 2017 in selected districts in Seoul, Korea. A bundle intervention consisting of three components was implemented in May 2015: 1) community CPR training and organizing volunteer network, 2) installation of public access defibrillators (PAD) and 3) text message (TM) sent to registered volunteers to inform them about the OHCA event and nearest PAD. The study outcomes (bystander CPR, survival to discharge and good neurological outcome at hospital discharge) were compared between intervention period (after-intervention: May 2015 to December 2017) and control period (before-intervention: January 2013 to April 2015). A multivariable logistic regression analysis was performed to determine the effect of the intervention. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated, adjusting for potential confounders. As a sensitivity analysis, propensity score matching (PSM) method was used for cases of the before period to the TM sent cases in the after period to balance covariate in the before and after groups. the same logistic regression model was evaluated with this PSM population.

RESULTS: A total of 3194 eligible OHCA cases (1498 in before- and 1696 in after-intervention) were evaluated. The bystander CPR rate increased during the study periods (from 54.9% to 59.8%) ($p < 0.01$). OHCA outcomes improved from 9.0% to 12.7% for survival to discharge and from 4.5% to 8.3% for good neurological outcome (all $p < 0.01$). Compared with control periods, the AORs (95% CIs) for bystander CPR, survival to discharge and good neurological outcome of the intervention period were 1.25 (1.08-1.44), 1.84 (1.29-2.63) and 2.31 (1.44-3.70), respectively. Similar results were observed in the PSM population.

CONCLUSIONS: The bundle intervention including TM alert service for OHCA was associated with better survival outcomes through an increase in bystander CPR. Clinical trials registration; NCT02010151.

Andelius et al. 2020 (The HeartRunner System, Danmark)

“Smartphone Activation of Citizen Responders to Facilitate Defibrillation in Out-of-Hospital Cardiac Arrest”

OBJECTIVES: This study investigated arrival at the OHCA location of app-dispatched citizen responders before the Emergency Medical Services (EMS) and the association with bystander CPR and bystander defibrillation.

METHODS: Suspected OHCAs with alerted citizen responders from September 1, 2017, to August 31, 2018, were included. Citizen responders located 1.8 km (1.1 miles) from the OHCA were dispatched to start CPR or retrieve an automated external defibrillator. OHCAs where at least 1 citizen responder arrived before EMS were compared with OHCAs where EMS arrived first. In both groups, random bystanders could be present before the arrival of citizen responders and the EMS. Primary outcomes were bystander CPR and bystander defibrillation, which included CPR and defibrillation by citizen responders and random bystanders.

RESULTS: Citizen responders were alerted in 819 suspected OHCAs, of which 438 (53.5%) were confirmed cardiac arrests eligible for inclusion. At least 1 citizen responder arrived before EMS in 42.0% (n = 184) of all included OHCAs. When citizen responders arrived before EMS, the odds for bystander CPR increased (odds ratio: 1.76; 95% confidence interval: 1.07 to 2.91; $p = 0.027$) and the odds for bystander defibrillation more than tripled (odds ratio: 3.73; 95% confidence interval: 2.04 to 6.84; $p < 0.001$) compared with OHCAs in which citizen responders arrived after EMS.

CONCLUSIONS: Arrival of app-dispatched citizen responders before EMS was associated with increased odds for bystander CPR and a more than 3-fold increase in odds for bystander defibrillation. (The HeartRunner Trial; NCT03835403)

Derkenne et al. 2020 (Frankrike)

“Mobile Smartphone Technology Is Associated With Out-of-hospital Cardiac Arrest Survival Improvement: The First Year "Greater Paris Fire Brigade" Experience”

OBJECTIVE: The main goal was to determine whether identification and activation of nearby first responders through a smartphone application named Staying Alive (SA) can improve survival following OHCA in a large urban area (Paris).

METHODS: We conducted a nonrandomized cohort study of all adults with OHCA managed by the Greater Paris Fire Brigade during 2018, irrespective of mobile application usage. We compared survival data in cases where SA did or did not lead to the activation of nearby first responders. During dispatch, calls for OHCA were managed with or without SA. The intervention group included all cases where nearby first responders were successfully identified by SA and actively contributed to CPR. The control group included all other cases. We compared survival at hospital discharge between the intervention and control groups. We analyzed patient data, CPR metrics, and first responders' characteristics.

RESULTS: Approximately 4,107 OHCA cases were recorded in 2018. Among those, 320 patients were in the control group, whereas 46 patients, in the intervention group, received first responder-initiated CPR. After adjustment for confounders, survival at hospital discharge was significantly improved for patients in the intervention group (35% vs. 16%, adjusted odds ratio = 5.9, 95% confidence interval = 2.1 to 16.5, $p < 0.001$). All CPR metrics were improved in the intervention group.

CONCLUSIONS: We report that mobile smartphone technology was associated with OHCA survival through accelerated initiation of efficient CPR by first responders in a large urban area.

Comment

Morgenstern et al. 2002
"Hot Off the Press: Mobile Smartphone Technology Is Associated With Out-ofhospital Cardiac Arrest Survival Improvement"

Stroop et al. 2020 (Mobile rescuer, Tyskland)

"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"

OBJECTIVES: To test the hypothesis that simultaneous mobile phone-based alerting of CPR-trained volunteers (Mobile-Rescuers) with Emergency Medical Service (EMS) teams leads to better outcomes in out-of-hospital cardiac arrest (OHCA) victims than EMS alerting alone.

METHODS: The outcomes of 730 OHCA patients were retrospectively analysed, depending on who initiated CPR: Mobile-Rescuer-initiated-CPR (n = 94), EMS-initiated-CPR (n = 359), lay bystander-initiated-CPR (n = 277). An adjusted analysis of the intervention and their main outcomes (emergency response time, return of spontaneous circulation, hospital discharge rate, neurological outcomes) was performed (Propensity Score Method with patient matching).

RESULTS: Recruited and trained Mobile-Rescuers (n = 740) arrived at the scene in 46% of all triggered alarms. There was a significant difference in response time between Mobile-Rescuers (4 min) and EMS teams (7 min), ($p < 0.001$). Compared to EMS-initiated-CPR, Mobile-Rescuer-initiated-CPR patients more frequently showed a return of spontaneous circulation, but statistical significance was narrowly missed ($p = 0.056$). The hospital discharge rate was significantly higher with the Mobile-Rescuer (18%) vs. EMS (7%), ($p = 0.049$). Good neurological outcomes (Cerebral Performance Categories Score 1 and 2) were seen in 11% of Mobile-Rescuer patients and 4% of EMS patients ($p = 0.165$). There were no significant differences compared with lay bystander-initiated-CPR.

CONCLUSION: Simultaneous alerting of nearby CPR-trained volunteers complementary to professional EMS teams can reduce both the response time and resuscitation-free interval and might improve hospital discharge rate and neurological outcomes after OHCA.

Comments

Calle et al. 2020
"How (not) to prove that a mobile phone-based alerting system has a positive effect on outcome after out-of-hospital cardiac arrest?"

Hensel et al. 2020
"Reply to: How (Not) to prove that a mobile phone-based alerting system has a positive effect on outcome after out-of-hospital cardiac arrest?"

Müller et al. 2021Hen
"Comment on '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'"

Hensel et al. 2021
"Reply to letter by Müller et al"

Wong et al. 2021 (My Responder, Singapore)

“Impact of dispatcher-assisted cardiopulmonary resuscitation and myResponder mobile app on bystander resuscitation”

OBJECTIVE: Community-level interventions including dispatcher-assisted CPR (DA-CPR) and myResponder were implemented to increase B-CPR. We sought to assess whether these interventions increased B-CPR.

METHODS: The Singapore out-of-hospital cardiac arrest registry captured cases that occurred between 2010 and 2017. Outcomes occurring in 3 time periods (Baseline, DA-CPR, and DA-CPR plus myResponder) were compared. Segmented regression of time-series data was conducted to investigate our intervention impact on the temporal changes in B-CPR.

RESULTS: A total of 13,829 out-of-hospital cardiac arrest cases were included from April 2010 to December 2017. Higher B-CPR rates (24.8% versus 50.8% vs 64.4%) were observed across the 3 time periods. B-CPR rates showed an increasing but plateauing trend. DA-CPR implementation was significantly associated with an increased B-CPR (level odds ratio [OR] 2.26, 95% confidence interval [CI] 1.79-2.88; trend OR 1.03, 95% CI 1.01-1.04), while no positive change was detected with myResponder (level OR 0.95, 95% CI 0.82-1.11; trend OR 0.99, 95% CI 0.98-1.00).

CONCLUSION: B-CPR rates in Singapore have been increasing alongside the implementation of community-level interventions such as DA-CPR and myResponder. DA-CPR was associated with improved odds of receiving B-CPR over time while the impact of myResponder was less clear.

Smida et al. 2022 (PulsePoint Respond, USA)

“PulsePoint dispatch associated patient characteristics and prehospital outcomes in a mid-sized metropolitan area”

OBJECTIVES: Examine prehospital case characteristics and outcomes from a multi-year deployment of PulsePoint Respond in Pittsburgh, Pennsylvania.

METHODS: PulsePoint event timing, location, and associated prehospital electronic health records (ePCRs) were obtained for EMS-encountered OHCA cases that did and did not generate PulsePoint alerts within the service area of Pittsburgh EMS from July 2016 to October 2020. ePCRs were reviewed and OHCA case characteristics were extracted according to the Utstein template. PulsePoint-associated OHCA and non-PulsePoint-associated OHCA were compared.

RESULTS: Of 840 total PulsePoint dispatches, 64 (7.6%) were for OHCA associated with a resuscitation attempt. Forty-one (64.1%) were witnessed, 38 (59.4%) received bystander CPR, and 13 (20.0%) of these patients had an AED applied prior to EMS arrival. Twenty-seven (39.7%) had an initial shockable rhythm, and 31 (48.4%) patients achieved ROSC in the field. In the city of Pittsburgh, there were 1229 total OHCA during the study period, with an estimated 29.6% occurring in public. When PulsePoint-associated and publicly occurring non-PulsePoint-associated OHCA were compared, baseline characteristics (age, sex, witnessed status) were similar, but PulsePoint-associated OHCA received more bystander CPR ($p = 0.008$).

CONCLUSIONS: A minority of PulsePoint dispatches in Pittsburgh were triggered by true OHCA. The majority of OHCA during the study period occurred within private residences where PulsePoint responders are not currently dispatched. PulsePoint dispatches were associated with prognostically favorable OHCA characteristics and increased bystander CPR performance.

Smith et al. 2022 (GoodSAM, Storbritannien)

“The effect of the GoodSAM volunteer first-responder app on survival to hospital discharge following out-of-hospital cardiac arrest”

OBJECTIVES: The aim of this study was to determine GoodSAM's effect on survival to hospital discharge following out-of-hospital cardiac arrest.

METHODS: We collected data from the Out-of-Hospital Cardiac Arrest Outcomes Registry (University of Warwick, UK) submitted by the London Ambulance Service (1 April 2016 to 31 March 2017) and East Midlands Ambulance Service (1 January 2018 to 17 June 2018) and matched out-of-hospital cardiac arrests to GoodSAM alerts. We constructed logistic regression models to determine if there was an association between a GoodSAM first-responder accepting an alert and survival to hospital discharge, adjusting for location type, presenting rhythm, age, gender, ambulance service response time, cardiac arrest witnessed status, and bystander actions.

RESULTS: Survival to hospital discharge was 9.6% (393/4196) in London and 7.2% (72/1001) in East Midlands. A GoodSAM first-responder accepted an alert for out-of-hospital cardiac arrest in 1.3% (53/4196) cases in London and 5.4% (51/1001) cases in East Midlands. When a responder accepted an alert, the adjusted odds ratio for survival to hospital discharge was 3.15 (95% CI: 1.19-8.36, P = 0.021) in London and 3.19 (95% CI: 1.17-8.73, P = 0.024) in East Midlands.

CONCLUSION: Alert acceptance was associated with improved survival in both ambulance services. Alert acceptance rates were low, and challenges remain to maximize the potential benefit of GoodSAM.

Comment

Folke et al. 2021
Volunteer first-responder activation in out-of-hospital cardiac arrest-a lot of potential and a lot of unknowns

Stieglis et al.

“Alert system-supported lay defibrillation and basic life-support for cardiac arrest at home.”

OBJECTIVE: Automated external defibrillators (AEDs) are placed in public, but the majority of out-of-hospital cardiac arrests (OHCA) occur at home.

METHODS: In residential areas, 785 AEDs were placed and 5735 volunteer responders were recruited. For suspected OHCA, dispatchers activated nearby volunteer responders with text messages, directing two-thirds to an AED first and one-third directly to the patient. We analysed survival (primary outcome) and neurologically favourable survival to discharge, time to first defibrillation shock, and cardiopulmonary resuscitation (CPR) before Emergency Medical Service (EMS) arrival of patients in residences found with ventricular fibrillation (VF), before and after introduction of this text-message alert system.

RESULTS: Survival from OHCAs in residences increased from 26% to 39% {adjusted relative risk (RR) 1.5 [95% confidence interval (CI): 1.03-2.0]}. RR for neurologically favourable survival was 1.4 (95% CI: 0.99-2.0). No CPR before ambulance arrival decreased from 22% to 9% (RR: 0.5, 95% CI: 0.3-0.7). Text-message-responders with AED administered shocks to 16% of all patients in VF in residences, while defibrillation by EMS decreased from 73% to 39% in residences (P < 0.001). Defibrillation by first responders in residences increased from 22 to 40% (P < 0.001). Use of public AEDs in residences remained unchanged (6% and 5%) (P = 0.81). Time from emergency call to defibrillation decreased from median 11.7 to 9.3 min; mean difference -2.6 (95% CI: -3.5 to -1.6).

CONCLUSION: Introducing volunteer responders directed to AEDs, dispatched by text-message was associated with significantly reduced time to first defibrillation, increased bystander CPR and increased overall survival for OHCA patients in residences found with VF.

Oosterveer et al. 2022 (HartslagNu, Nederländerna)

“Improved ROSC rates in out-of-hospital cardiac arrest patients after introduction of a text message alert system for trained volunteers”

OBJECTIVE: To evaluate whether a text message (TM) alert system for trained volunteers contributed to early cardiopulmonary resuscitation, the use of automated external defibrillators (AEDs), return of spontaneous circulation (ROSC) and survival in out-of-hospital cardiac arrest (OHCA) patients in a region with above-average survival rates.

METHODS: Data on all OHCA patients in 2012 (non-TM group) were compared with those of all OHCA patients in 2018 (TM group). The association of the presence of a TM alert system with ROSC and survival was assessed with multivariate regression analyses.

RESULTS: TM responders reached 42 OHCA patients (15.9%) earlier than the first responders or ambulance. They connected 31 of these 42 OHCA patients (73.8%) to an AED before the ambulance arrived, leading to a higher percentage of AEDs being attached in 2018 compared to the 2012 non-TM group (55% vs 46%, p = 0.03). ROSC was achieved more often in the TM group (61.0% vs 29.4%, p < 0.01). Three-month and 1-year survival did not differ significantly between the two groups (29.3% vs 24.3%, p = 0.19, and 25.9% vs 23.5%, p = 0.51). Multivariate regression analyses confirmed the positive association of ROSC with the TM alert system (odds ratio 1.49, 95% confidence interval 1.02-2.19, p = 0.04).

CONCLUSION: A TM alert system seems to improve the chain of survival; because TM responders reached patients early, AEDs were attached more often and more OHCA patients achieved ROSC. However, the introduction of a TM alert system was not associated with improved 3-month or 1-year survival in a region with above-average survival rates.

Hälsoekonomi

Vogel & Levin (2020)

“Sms-livräddare vid akut omhändertagande av patient med hjärtstopp utanför sjukhus – en kostnadseffektivitetsanalys”

”Mot bakgrund av tillgängliga data från Hjärtstoppscentrum vid Karolinska Institutet (KI), Heartrunner Sweden AB och Svenska Hjärtlungräddningsregistret har en förenklad kostnadseffektivitetsanalys av Sms-livräddare som tilläggsintervention till prehospitalt, akut omhändertagande av patient vid misstanke om hjärtstopp utanför sjukhus kunnat genomföras. En kortfattad epidemiologisk översikt av hjärtstopp utanför sjukhus, i riket och på regionnivå ges tillsammans med beskrivning av data på tilldelade uppdrag i Sms-livräddare som tjänat underlag för estimering av hälsoeffektmått och de kostnader som införts analysen.”

Vercammen & Moens (2020)

“Cost-effectiveness of a novel smartphone application to mobilize first responders after witnessed OHCA in Belgium”

METHODS: An accessible model was developed, using literature data, to simulate survival and cost-effectiveness of nation-wide Evapp implementation. Initial validation was performed using field data from a first pilot study of Evapp implementation in a city in Flanders, covering 2.5 years of implementation.

RESULTS: Simulation of nation-wide Evapp implementation resulted in an additional yearly 910 QALY gained over the current baseline case scenario (worst case 632; best case 3204). The cost per QALY associated with Evapp implementation was comparable to the baseline scenario, i.e., 17 vs 18 k€ QALY−1.

CONCLUSIONS: Evapp implementation was associated with a positive balance on amount of QALY gained and cost of QALY. This was a consequence of both the lower healthcare costs for patients with good neurological outcome and the more efficient use of yet available resources, which did not outweigh the costs of operation

Urval av artiklar och andra publikationstyper som tar upp fler aspekter av mobil-larm

Södersved Källestedt et al. (2022)

“Smartphone activated community first responders' experiences of out-of-hospital cardiac arrests alerts, a qualitative study”

Andelius et al. (2021):

“Risk of Physical Injury for Dispatched Citizen Responders to Out-of-Hospital Cardiac Arrest”

Berglund et al. (2022):

“Wellbeing, emotional response and stress among lay responders dispatched to suspected out-of-hospital cardiac arrests”

Haskins et al. (2021):

“A binational survey of smartphone activated volunteer responders for out-of-hospital cardiac arrest: Availability, interventions, and post-traumatic stress”

Kragh et al. (2021):

“Immediate psychological impact on citizen responders dispatched through a mobile application to out-of-hospital cardiac arrests”

Nabecker et al. (2020):

“Out-of-hospital cardiac arrest: comparing organised groups to individual first responders A qualitative focus group study”

Valeriano et al. 2021:

“Crowdsourcing to save lives: A scoping review of bystander alert technologies for out-of-hospital cardiac arrest”

Sarkisian et al. (2020):

“Global positioning system alerted volunteer first responders arrive before emergency medical services in more than four out of five emergency calls”

Folke et al. (2021):

“Activation of citizen responders to out-of-hospital cardiac arrest”

Svensk avhandling

Berglund (2020):

“Dispatch of lay responders to out-of-hospital cardiac arrests”

List of papers:

I. Berglund E, Claesson A, Nordberg P, Djärv T, Lundgren P, Folke F, Forsberg S, Riva G, Ringh M. A smartphone application for dispatch of lay responders to out-of-hospital cardiac arrests. Resuscitation. 2018 May;126:160-165.

II. Jonsson M, Berglund E, Djärv T, Nordberg P, Claesson A, Forsberg S, Nord A, Tan HL, Ringh M. A brisk walk – Real-life travelling speed of lay responders in out-of-hospital cardiac arrest. Resuscitation. 2020 Jun;151:197-204. doi: 10.1016/j.resuscitation.2020.01.043.

III. Berglund E, Olsson E, Jonsson M, Svensson L, Hollenberg J, Claesson A, Nordberg P, Lundgren P, Högstedt Å, Ringh M. Wellbeing, Emotional response and stress among lay responders dispatched to suspected out-of-hospital cardiac arrests. [Manuscript]

IV. Berglund E, Hollenberg J, Jonsson M, Svensson L, Claesson A, Nord A, Nordberg P, Forsberg S, Rosenqvist M, Lundgren P, Högstedt Å, Riva G, Ringh M. Use of automated external defibrillators by smartphone dispatched lay responders in out-of-hospital cardiac arrest. [Manuscript]

Konferensabstracts

Jonsson et al. (2021):

“Dispatch of lay-responders is associated with bystander cardiopulmonary resuscitation, bystander defibrillation and 30-day survival following an out-of-hospital cardiac arrest”

Berglund et al. (2021)

“Who arrives first: EMS, fire-fighter or lay responder? The rally to the suspected out-of-hospital cardiac arrest”

Appendix 3 – Responstider för ambulans i Region Skåne uppdelat kommunsvis (2012-2020).

Responstid amulans på plats (min)			
Bjuv	2012	2016	2020
Bromölla	20	18,6	18,9
Bromölla	20,5	19,1	16,2
Burlöv	15,4	15	16,4
Båstad	21,6	19,3	21,1
Eslöv	13,2	14,2	15,7
Helsingborg	10,6	11,4	12,9
Hässleholm	13,8	15	16,2
Hörby	14,7	16	16,6
Höör	16,8	18	20,4
Klippan	16,3	17,1	18,1
Kristianstad	12,9	13	14,5
Kävlinge	18,2	15,9	17,4
Lansdkrona	10,8	11,3	12,5
Lomma	16,3	15,9	17,5
Lund	12	11,6	13,4
Malmö	9,8	11,2	12,1
Osby	17,3	17,4	19
Perstorp	11,5	12,4	14,7
Simrishamn	13,7	15,2	15,7
Sjöbo	16,6	16,5	17,8
Skurup	19,1	16,7	18,2
Staffanstorp	14,4	14,2	15,8
Svalöv	19,1	18,1	18,8
Svedala	14,7	13,9	14,9
Tomelilla	17,6	17,2	18,4
Trelleborg	9,9	13,6	14,6
Vellinge	15,4	15	17,1
Ystad	10,1	10,3	11,7
Åstorp	16,1	15,1	16,1
Ängelholm	11	11,2	12,9
Örkelljunga	21,9	22	22,3
Östra Göinge	15,2	15,4	15,4
Antal	32	32	32
Medel	15,20	15,21	16,35
Median	15,3	15,15	16,2

Källa: HW,

Appendix 4 – Beräkning och kommentar till hypotetiskt NNT vid införande av mobillarm för HLR vid OHCA

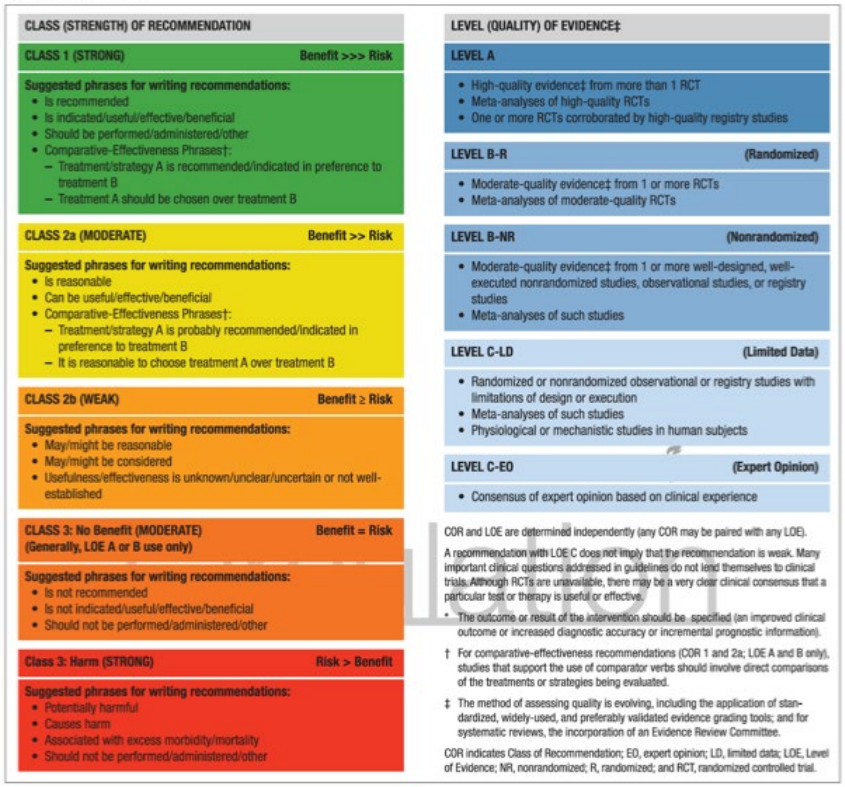
NNT: 1/((A/A+B)-(C/C+D)); baserat på hypotetiska data vid införande av sms/hlr				***Hypotetiskt NNT***
	Händelse (överlevnad)	Inte händelse (död)	Tot antal pat	
intervention	A	B	A+B	
SMS/HLR-grupp	80	528	608	1/((80/608)-(72/608))=76,5
Komparator, beh som idag	C	D	C+D	
ej SMS/HLR	72	536	608	

Sakkunnigs kommentar till hypotetiskt NNT;

Inom professionenen används ofta begreppet ”treatment of futility (enkelt översatt ”meningslös behandling”).
I korthet innebär detta: om man, mellan tummen och pekfingret, måste göra en insats 100 gånger för att lyckas med en (1), dvs att NNT är 100, brukar det sägas att man inte rutinmässigt bör syssla med det.
Som en jämförelse till ovan hypotetiska beräkning så är NNT 112 för användandet av adrenalininjektion intravenöst vid plötslig hjärtdöd (Perkins et al. 2018). Enligt ”treatment of futility” dogmen bör man således inte regelmässigt använda adrenalininjektion. Och ändå är internationella rekommendationer att fortsätta med just denna behandling (Soar et al. 2021).

Appendix 5 – Nomenklatur använd av AHA

Table 2. Applying Class of Recommendation and Level of Evidence to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care (Updated May 2019)*



CLASS (STRENGTH) OF RECOMMENDATION	LEVEL (QUALITY) OF EVIDENCE‡
CLASS 1 (STRONG) — **Benefit >>> Risk** **Suggested phrases for writing recommendations:** • Is recommended • Is indicated/useful/effective/beneficial • Should be performed/administered/other • Comparative-Effectiveness Phrases†: – Treatment/strategy A is recommended/indicated in preference to treatment B – Treatment A should be chosen over treatment B	**LEVEL A** • High-quality evidence‡ from more than 1 RCT • Meta-analyses of high-quality RCTs • One or more RCTs corroborated by high-quality registry studies
CLASS 2a (MODERATE) — **Benefit >> Risk** **Suggested phrases for writing recommendations:** • Is reasonable • Can be useful/effective/beneficial • Comparative-Effectiveness Phrases†: – Treatment/strategy A is probably recommended/indicated in preference to treatment B – It is reasonable to choose treatment A over treatment B	**LEVEL B-R** (Randomized) • Moderate-quality evidence‡ from 1 or more RCTs • Meta-analyses of moderate-quality RCTs
CLASS 2b (WEAK) — **Benefit ≥ Risk** **Suggested phrases for writing recommendations:** • May/might be reasonable • May/might be considered • Usefulness/effectiveness is unknown/unclear/uncertain or not well-established	**LEVEL B-NR** (Nonrandomized) • Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies • Meta-analyses of such studies
CLASS 3: No Benefit (MODERATE) (Generally, LOE A or B use only) — **Benefit = Risk** **Suggested phrases for writing recommendations:** • Is not recommended • Is not indicated/useful/effective/beneficial • Should not be performed/administered/other	**LEVEL C-LD** (Limited Data) • Randomized or nonrandomized observational or registry studies with limitations of design or execution • Meta-analyses of such studies • Physiological or mechanistic studies in human subjects
Class 3: Harm (STRONG) — **Risk > Benefit** **Suggested phrases for writing recommendations:** • Potentially harmful • Causes harm • Associated with excess morbidity/mortality • Should not be performed/administered/other	**LEVEL C-EO** (Expert Opinion) • Consensus of expert opinion based on clinical experience

COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

* The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

† For comparative-effectiveness recommendations (COR 1 and 2a; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

‡ The method of assessing quality is evolving, including the application of standardized, widely-used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.