



Clinical paper

Recognition of out-of-hospital cardiac arrest by medical dispatchers in emergency medical dispatch centres in two countries[☆]



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ABSTRACT

Introduction: Survival after out-of-hospital cardiac arrest (OHCA) remains low. Early recognition by emergency medical dispatchers is essential for an effective chain of actions, leading to early cardiopulmonary resuscitation, use of an automated external defibrillator and rapid dispatching of the emergency medical services.

Aim: To analyse and compare the accuracy of OHCA recognition by medical dispatchers in two countries.

Method: An observational register-based study collecting data from national cardiac arrest registers in Denmark and Sweden during a six-month period in 2013. Data were analysed in two steps; registry data were merged with electronically registered emergency call data from the emergency medical dispatch centres in the two regions. Cases with missing or non-OHCA dispatch codes were analysed further by auditing emergency call recordings using a uniform data collection template.

Results: The sensitivity for recognition of OHCA was 40.9% (95% CI: 37.1–44.7%) in the Capital Region of Denmark and 78.4% (95% CI: 73.2–83.0%) in the Skåne Region in Sweden ($p < 0.001$). With additional data from the emergency call recordings, the sensitivity was 80.7% (95% CI: 77.7–84.3%) and 86.0% (95% CI: 81.3–89.8%) for the two regions ($p = 0.06$). The majority of the non-recognised OHCA were dispatched with the highest priority.

Conclusion: The accuracy of OHCA recognition was high and comparable. We identified large differences in data registration practices despite the use of similar dispatch tools. This raises a discussion of definitions and transparency in general in scientific reporting of OHCA recognition, which is essential if used as quality indicator in emergency medical services

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Introduction

Survival from out-of-hospital cardiac arrest (OHCA) is strongly associated with early initiation of bystander cardiopulmonary resuscitation (CPR) and use of an automated external defibrillator (AED).^{1–3} Emergency medical dispatchers play an essential role in this process by recognising the cardiac arrest during the emergency call, performing dispatcher assisted CPR (DA-CPR) instructions to the caller, referring to the nearest AED and providing an accurate

and timely response.^{4,5} Medical emergency calls are thus a vital point in the pre-hospital patient trajectory. Research concerning the first link in the chain of survival – activation of the emergency response system – has identified an association between dispatchers' recognition of cardiac arrest and increased survival.⁶

Recognition of OHCA is a quality indicator in the medical dispatch process, and might serve as metric for benchmarking of systems. Few Emergency Medical Services (EMS) have published data on proportions of OHCA recognition, with a variation from 20 to 97%.^{7–10} This variation could illustrate differences in methodology, or in medical dispatchers' education, competence or tools available or differences in the organization of the EMS. In the Capital Region of Denmark and the Skåne Region in Sweden, the dispatch workflow is based on the same criteria-based dispatch tool, originally developed in Seattle, in the United States,¹¹ and further

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Table 1
Basic characteristics of region, emergency medical dispatch centre and emergency medical services.

Main characteristics	Item	Capital Region of Denmark	Skåne Region in Sweden
Region demography ^a	Population	1.7 million	1.3 million
	Area	2,568 km ²	11,035 km ²
	Population density	662/km ²	118/km ²
Emergency medical dispatch centre	Number for emergency (single/multiple)	Single	Single
	Call number	1-1-2	1-1-2
	Call volume in 2013 (incidence/1000 inhabitants/year)	105,153 (58)	114,034 (88)
	Proportion of calls resulting in an ambulance ^b	Emergency priority A 32% Emergency priority B 38% Non-emergency priority 4% Medical advice 26%	Emergency priority 1: 42% Emergency priority 2: 45% Non-emergency priority including medical advice: 13%
	Index/dispatch priority tool	Danish Index for Emergency Care (based on Norwegian Index for Emergency Care)	Swedish Index for Emergency Care (based on Norwegian Index for Emergency Care)
	Manual/electronic use of Index	Electronic	Electronic
	Mandatory/optional use of Index Dispatcher certification and education	Mandatory Nurses and paramedics (70/30%). 6 week communication module supplied with a simulation course with telephone assisted CPR.	Mandatory Paramedics (47%) and others (53%), with no former medical education. All dispatchers receive a 20-week training program (including telephone assisted CPR) providing certification, to be re-evaluated annually.
Ambulance services (2013 numbers)	Approximate number of calls/dispatcher/shift ^c	23	33
	Activity, all EMS-assignments (number/1000 inhabitants/year)	248,765 missions (147)	150,002 missions = (115)
	Highest priority assignments ^d (number/1000 inhabitants/year)	128,430 missions (75)	63,312 (37)
	Response time ^e highest priority (median)	6 min 15 s	11 min 28 s
	First responder (describe)	No first responder system	1200 firefighters educated to perform CPR and use AED
	PAD program (describe)	Danish PAD network www.hjertestarter.dk >10,000 AEDs in the register	Swedish AED registry (not automatically combined with Emergency Medical Dispatch Centre) www.hjartstartarregistret.se >10,000 AEDs in the register
	Inhabitant/AED	603 inhabitants/AED (2815 AED in 2013)	1286 inhabitants/AED (1011 AED in 2013)
Competence of ambulance providers	Paramedics = 150 (25%) Emergency medical technicians (EMT) = 450 (75%)	Paramedics = 141 (25%) Registered nurse = 77 (14%) Registered nurse with specialist qualifications = 344 (61%)	

AED = automated external defibrillator, PAD = public access defibrillation.

^a Numbers regarding the region demography are obtained from Statistics Denmark¹³ and Statistics Sweden¹⁹.

^b Capital Region: emergency priority A = life-threatening symptoms, emergency priority B = urgent but not life-threatening symptoms. Skåne Region: priority 1 = life-threatening symptoms or accident, priority 2 = urgent but not life-threatening symptoms.

^c Total number of calls/shifts in study period/number of dispatchers at work.

^d Includes missions activated by dispatch centre through emergency calls and other missions.

^e response time is defined as from dispatcher answers the incoming emergency call to arrival of the ambulance.

developed in Norway.¹² This facilitates comparison of EMS organizational structures and performance between the two regions. The aim of this study was to evaluate and compare the accuracy in recognising OHCA by medical dispatchers using the same dispatch tool in two different regions in two countries.

Materials and methods

A description of the two EMS Systems related to the OHCA chain of survival is presented below. Demographic and EMS characteristics are presented in Table 1.

EMS system in the Capital Region of Denmark

The Capital Region of Denmark covers an area of 2568 km² with a population of 1.7 million citizens¹³ (population density 701/km²). The EMS is publicly funded and ambulance services partly contracted to external providers. The Emergency Medical

Dispatch Centre (EMDC) is controlled by the public healthcare region. Denmark is covered by 5 EMDC. The emergency phone number 1-1-2 connects to a switchboard that locates the address and categorises the need for police, fire department or medical assistance. If medical assistance is needed, the call is forwarded to an EMDC that answers the call, reconfirms the address and responds by activating the appropriate EMS response. The medical dispatchers are specially trained registered nurses (70%) or paramedics (30%) with 6 weeks of training in communication and prioritization of emergency calls. The decision-making process is supported by a dispatch tool which is a validated standardised criteria-based, nationwide Emergency Medical Dispatch System (Danish Index for Emergency Care^{14,15}), developed from the Norwegian Index for Emergency Care.¹² The electronically based system was implemented in Denmark in 2011 and is mandatory to use by the medical dispatchers.

In case of suspected OHCA, the medical dispatchers guide the bystanders in performing CPR (DA-CPR) and to localise and use

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