Clinical paper

Epidemiology and outcomes from out-of-hospital cardiac arrests in England☆

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ABSTRACT

Introduction: This study reports the epidemiology and outcomes from out-of-hospital cardiac arrest (OHCA) in England during 2014.

Methods: Prospective observational study from the national OHCA registry. The incidence, demographic and outcomes of patients who were treated for a OHCA between 1st January, 2014 and 31st December 2014 in 10 English ambulance service (EMS) regions, serving a population of almost 54 million, are reported in accordance with Utstein recommendations.

Results: 28,729 OHCA cases of EMS treated cardiac arrests were reported (53 per 100,000 of resident population). The mean age was 68.6 (SD = 19.6) years and 41.3% were female. Most (83%) occurred in a place of residence, 52.7% were witnessed by either the EMS or a bystander. In non-EMS witnessed cases, 55.2% received bystander CPR whilst public access defibrillation was used rarely (2.3%). Cardiac aetiology was the leading cause of cardiac arrest (60.9%). The initial rhythm was asystole in 42.4% of all cases and was shockable (VF or pVT) in 20.6%. Return of spontaneous circulation at hospital transfer was evident in 25.8% (n = 6302) and survival to hospital discharge was 7.9%.

Conclusion: Cardiac arrest is an important cause of death in England. With less than one in ten patients surviving, there is scope to improve outcomes. Survival rates were highest amongst those who received bystander CPR and public access defibrillation.

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Introduction

Each year 60,000 people sustain an out-of-hospital cardiac arrest (OHCA) in England,[1,2] for whom resuscitation is attempted in less than half.[3] Internationally, cardiac arrest survival rates vary widely from 0.6% to 25%,[4,5] and in the United Kingdom (UK) rates are much worse than in the best performing Emergency Medical Services (EMS) systems. Doubling the reported UK survival rates to a level comparable with the best performing systems could save 1000 lives a year.[6]

Improving links in the cardiac arrest chain of survival can improve outcomes,[7] particularly the early links in this chain. Interventions known to improve survival include, improving early recognition and calling for help from EMS (link 1), bystander cardiopulmonary resuscitation (CPR) (link 2) and the use of public access defibrillation (PAD) (link 3).[8] By definition, these interventions mean increasing the proportion of the population with skills to provide them. The impact of such interventions with regional, or even national populations occurs incrementally over time and can occur in different locations at different times, depending on who is organising and delivering improvement strategies e.g. voluntary sector or public sector organisations, and the level of national or local policy support. Demonstrating the scale and rate of improvement warrants baseline measurement as well as measurement over time of both the proportions of OHCA patients experiencing process outcomes (such as bystander CPR) and clinical outcomes (such as survival). Comprehensive measurement nationally, using clearly defined outcome measures enables evaluation of the impact of both national and local initiatives. Comparison with systems outside the UK is also possible.

Other regional and national OHCA registries have successfully provided such measurement data.[9] They have been used to evaluate national initiatives (e.g. Denmark,[10] Sweden[11] and USA[12]) demonstrating the value of regional and national interventions to improve outcome from cardiac arrest (e.g. mandating CPR training in schools and for people taking a driving test).

Beyond OHCA survival outcomes in England,[13] little is known about patient demographics, event characteristics, process variables and treatments administered. The out-of-hospital cardiac arrest outcomes (OHCAO) project aimed to establish a national registry including detailed process and clinical outcomes relevant to all links in the chain of survival, to facilitate research and quality improvement in OHCA.[14]

This study reports the 2014 data from England as a baseline for future reference, summarising patient characteristics, processes and outcomes for OHCA.

Methods

Setting and population

This analysis is based on OHCA events that occurred between 1st January, 2014 and 31st December 2014 in 10 English ambulance service (EMS) regions, which together serve a population of approximately 54 million in England. One small service providing emergency care for an island (Isle of Wight, population 139,105 inhabitants) did not submit data. The registry covered 99.74% of the 2014 population of England and 83.87% of the UK population.[15] OHCA patients of all ages with resuscitation commenced or continued by EMS personnel were included. Patients who had a 'Do Not Attempt Resuscitation' (DNAR) decision in place, or achieved return of spontaneous circulation (ROSC) before the arrival of EMS, were excluded.

Ethical approval

The University of Warwick hosts the OHCAO project. The registry is structured and maintained in accordance with the Utstein guideline for resuscitation registries.[16] Details of the registry have been summarised previously.[14] The National Research Ethics Service granted ethics approval, reference number 13/SC/036. The Confidential Advisory Group (CAG), reference number ECC8-04(C)/2013, granted approval to use identifiable patient information where it is not practical to obtain consent.

Description of EMS

EMS are provided by the National Health Service (NHS). Emergency dispatch centres are alerted through a national emergency services number (999 or 112). Dispatchers use the protocolised Medical Priority Dispatch system or NHS pathways to triage calls. Cases identified as a cardiac arrest are assigned the highest priority response. EMS are commissioned to reach 75% of these cases with a defibrillator capable response within 8 min and to have an ambulance on scene within 19 min in 95% of cases. The nearest available resource(s) which may be a community responder, car, ambulance, motorbike or helicopter is dispatched to the scene.

Paramedics or emergency medical technicians, either or both of which may be assigned to a cardiac arrest case, staff ambulance vehicles. Paramedics can deliver advanced life support (ALS) interventions (including advanced airway management and intravenous drugs). Technicians, and many community responders dispatched by the NHS ambulance service, can deliver CPR and defibrillation, and some use supraglottic airways.

Upon arrival at a cardiac arrest, EMS personnel assess the viability of a full resuscitation attempt. Resuscitation may be withheld if there is unequivocal evidence of death (major traumatic injuries, putrefaction, rigor mortis, post mortem staining etc.), a DNAR decision is documented or if there is asystole, no bystander CPR and more than 15 min has elapsed from the time of collapse. When resuscitation is attempted, EMS follow National Resuscitation Council (UK) guidelines or regional clinical guidelines derived from these national guidelines, which in turn, are derived from the European Resuscitation Council guidelines.[17] Resuscitation is continued until ROSC is achieved or further resuscitation is considered futile. Recognition of life extinct (ROLE) guidelines permit qualified EMS personnel to terminate resuscitation in the field if the patient remains in asystole despite 20 min of full resuscitation measures.[18]

Data collection

Participating EMS routinely collect source data from the 999 call to hospital transportation via Patient Report Forms (PRFs), as well as data related to survival status at hospital discharge. Each EMS region has their own methods for case ascertainment e.g. screening paper or electronic PRF databases for cardiac arrest case records, dispatch codes, or related clinical or treatment terms. Identified cases are entered into a cardiac arrest database, cleaned and verified by trained members of the EMS clinical audit team. If the patient is conveyed to hospital the EMS collect data on survival at hospital discharge status directly from hospital emergency departments if data sharing protocols are in place. The data are uploaded by each service to the OHCAO server, transformed using service-specific rules and securely stored in the OHCAO registry at the University of Warwick.

Definitions

Age at date of OHCA was calculated from the patient's date of birth. If age was missing or out of a reasonable range (0–110 years),