Out-of-Hospital Cardiac Arrest Register

OHCAR Ireland

At the heart of evidence

Annual Report 2017

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Pre-Hospital Emergency Care Council

NUI Galway
OÉ Gaillimh

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Executive Summary

2,333 cases of out-of-hospital cardiac arrest where resuscitation was attempted

***80%** had bystander CPR performed

67% Male, 33% Female
Median age – 68 years

20% of all cases were initially shockable

21% defibrillation attempts pre EMS arrival

45% transported

28% ROSC pre-hospital

20% ROSC on arrival at hospital

6.5% were discharged alive

*Excludes EMS witnessed cases

OHCAR Key Messages 2017

Patient and Event Characteristics

- 2,333 out-of-hospital cardiac arrest (OHCA) incidents recorded on OHCAR (49 per 100,000 population in 2017)
  - 71% occurred in a settlement[a] [10.]
  - 67% were Male
  - Median age – 68 years
  - 87% presumed medical aetiology
  - 69% of cases happened in the home
  - 80% received bystander CPR (B-CPR)
  - 50% were bystander witnessed

Defibrillation

- 20% had an initial shockable rhythm
- 20% had defibrillator pads applied prior to arrival of the EMS
- 31% had defibrillation attempted
  - 21% had defibrillation attempted before arrival of the EMS
- 28% had Return of Spontaneous Circulation (ROSC) pre-hospital
- 20% had ROSC on arrival at hospital
- 6.5% of cases were discharged alive (152 patients)
  - 95% had good to moderate neurological function on discharge

Utstein Group[a] [4]

- 13% of patients were in the Utstein Group
  - 58% had ROSC pre-hospital
  - 46% had ROSC on arrival at hospital
  - 51% of surviving patients collapsed in a public location
- 41% of surviving patients had defibrillation attempted pre-EMS arrival
- 30% of patients were discharged alive

[a] A settlement is defined as having a minimum of 50 occupied dwellings, with a maximum distance between any dwelling and the building closest to it of 100 metres, and where there is evidence of an urban centre.
[b] The Utstein subgroup consists of those patients that are >17 years, medical aetiology, bystander witnessed and initially shockable.

Annual Trends

- One minute decrease in the call response interval from 2015 – 2017 (all non-EMS witnessed cases)
- 20% increase in bystander CPR from 2012 – 2017
- 8% increase in bystander defibrillation from 2012 – 2017
- 5% increase in ROSC at any stage from 2012 – 2017
- 4% increase in ROSC at hospital arrival from 2012 – 2017

Abbreviations

B-CPR	Bystander Cardiopulmonary Resuscitation
BLS	Basic Life Supporter
CFR	Community First Responder
CPC	Cerebral Performance Category
CPR	Cardiopulmonary Resuscitation
CRI	Call Response Interval
CSO	Central Statistics Office
DAA	Dublin Airport Authority
DFB	Dublin Fire Brigade
ED	Emergency Department
EMS	Emergency Medical Services
ePCR	Electronic Patient Care Record
ERC	European Resuscitation Council
EuReCa	European Registry of Cardiac Arrest
GP	General Practitioner
HRB	Health Research Board
HSE	Health Service Executive
IQR	Interquartile Range
NAS	National Ambulance Service
OHCAR	Out-of-Hospital Cardiac Arrest Register
PCR	Patient Care Records
PEA	Pulseless Electrical Activity
PHECC	Pre-Hospital Emergency Care Council
PVT	Pulseless Ventricular Tachycardia
ROSC	Return of Spontaneous Circulation

Chapter 1

1.0 Introduction

1.1 The National Out-of-Hospital Cardiac Arrest Register (OHCAR)

The OHCAR project was established in June 2007 in response to a recommendation in the "*Report of the Task Force on Sudden Cardiac Death*"[1]. The need for OHCAR was also emphasised in the policy document "*Changing Cardiovascular Health*"[2] and the "*Emergency Medicine Programme Strategy*"[3]. Since 2012, OHCAR has been one of a small number of OHCA registries in Europe with full national coverage.

1.2 The OHCAR Steering Group and Governance

OHCAR is hosted by the Department of Public Health Medicine in the Health Service Executive (HSE) North West region, and is jointly funded by the Pre-Hospital Emergency Care Council (PHECC) and the National Ambulance Service (NAS). It is administered and supported by the Discipline of General Practice, National University of Ireland Galway, and is guided by the OHCAR Steering Group (Appendix 1).

1.3 The Aim of OHCAR

The aim of OHCAR is to facilitate improved outcomes from OHCA in Ireland by:

- Collecting information on the population who suffer OHCA and the circumstances of the arrest
- Collecting information on the pre-hospital treatment of OHCA patients
- Registering the survival of OHCA patients
- Establishing a sufficiently large patient database to enable identification of the best treatment methods for OHCA and organisation of services
- Providing regular feedback to service providers
- Facilitating research nationally and internationally using OHCAR data

Chapter 2

2.0 Methods

2.1 Inclusion / Exclusion criteria

OHCAR registers "all patients who suffer a witnessed or un-witnessed out-of-hospital cardiac arrest in Ireland which is confirmed and attended by Emergency Medical Services (EMS) and resuscitation attempted". A resuscitation attempt is defined as performance of cardiopulmonary resuscitation (CPR) and/or attempted defibrillation where there is evidence of a cardiac arrest rhythm. Incidents attended by the EMS where resuscitation is not attempted due to obvious signs of death, injuries incompatible with life, or a 'do not resuscitate' order are *not* included in OHCAR.

The current scope does not include patients who suffer an OHCA and who are not attended at any stage by statutory EMS. This means that a sub-group of patients are excluded from OHCAR, most notably cases attended by a General Practitioner (GP) where resuscitation is attempted but death is confirmed, and the ambulance is stood down by the GP.

2.2 Source of OHCAR data

The primary source of OHCAR data are Patient Care Records (PCRs) and ambulance dispatch data from the two statutory ambulance services, the National Ambulance Service (NAS) and the Dublin Fire Brigade (DFB).

OHCAR has data sharing agreements with other organisations including the Dublin Airport Authority (DAA), Red Cross, Civil Defence and Irish Coastguard and Order of Malta, but presently almost all data is provided from statutory services.

At present, the work undertaken by Community First Responder (CFR) groups is not fully reflected in OHCAR data. These groups are usually community based and voluntary. OHCAR is working to find ways of capturing and recording this information for future analysis.

2.3 Data collection

OHCAR collects data using the internationally agreed Utstein dataset[4].

NAS: PCRs are collected from ambulance stations on a monthly basis, digitised and stored on a central database by IMSCAN (Ireland) Ltd. PCRs for OHCA incidents are prioritised by NAS staff and fast-tracked in order to facilitate OHCAR. IMSCAN enter OHCAR data variables onto a preliminary database and forward this and digitised copies of PCRs to OHCAR.

Following validation, OHCAR staff uploads the data onto the OHCAR database. OHCAR receives NAS dispatch data monthly from the National Emergency Operations Centre (NEOC) in Tallaght and this data is added to each record in the OHCAR database. NAS are currently phasing the introduction of electronic PCRs (ePCR), and an increasing number of cases are received directly to OHCAR office by the electronic PCR system.

DFB: PCRs are sourced by DFB's EMS Support Unit and data is provided to OHCAR on a quarterly basis in a summarised electronic format. These records are integrated with data from the DFB East Region Command Centre in Townsend Street. Electronic copies of DFB PCRs are also sent to OHCAR to enable validation to be carried out.

Hospitals: OHCAR has a data sharing agreement with all hospitals who receive OHCA patients except Our Lady's Children's Hospital, Crumlin. Collection of data from hospitals is facilitated by a range of hospital staff, including administrators, resuscitation officers, clinical nurse managers and consultants.

Acute hospitals in Ireland provide information on survival status and Cerebral Performance Category (CPC) score[c] [5].

2.4 Aetiology

All cases where there is no evidence of another cause, e.g. trauma, asphyxiation, drug overdose, are deemed or 'presumed' to be of medical aetiology.

[c]Cerebral Performance Category (CPC) score is an assessment score developed to assess both traumatic and anoxic cerebral injuries.

2.5 Data completeness and quality control

The Utstein guidelines state that, "organisers of OHCA registries should implement monitoring and remediation for completeness of case capture"[4]. OHCAR operates a 'missing case search' system, which is performed on a monthly basis and repeated annually in order to identify cases that were not processed through the OHCAR data collection system[6].

The accuracy and completeness of data variables for each OHCAR case is vital to the usefulness of the register. Responsibility for accurate and comprehensive data recording lies with the emergency practitioners who attend the OHCA scene. OHCAR works with NAS and DFB to enhance completeness by providing quarterly reports which include a summary of the availability of some core data elements. NAS then devises and circulates OHCAR summary reports to ambulance stations on a quarterly basis. DFB also provide each practitioner access to their quarterly reports.

The following data quality checks are also undertaken:

- Case duplicate searches
- Checking for inconsistent and/or conflicting data values
- Validation of initial data entries and against OHCAR inclusion criteria
- Clinical expertise is provided on a case-by-case basis by the OHCAR Steering Group when required

2.6 Statistical analysis

Data analysis was performed using IBM SPSS version 24. In all cases $p<0.05$ was used as the level of statistical significance. Relationships between categorical values were expressed in percentages and examined by Chi square test for significance[7]. As some data variables had missing values, the analysis involved the use of available data.

Chapter 3

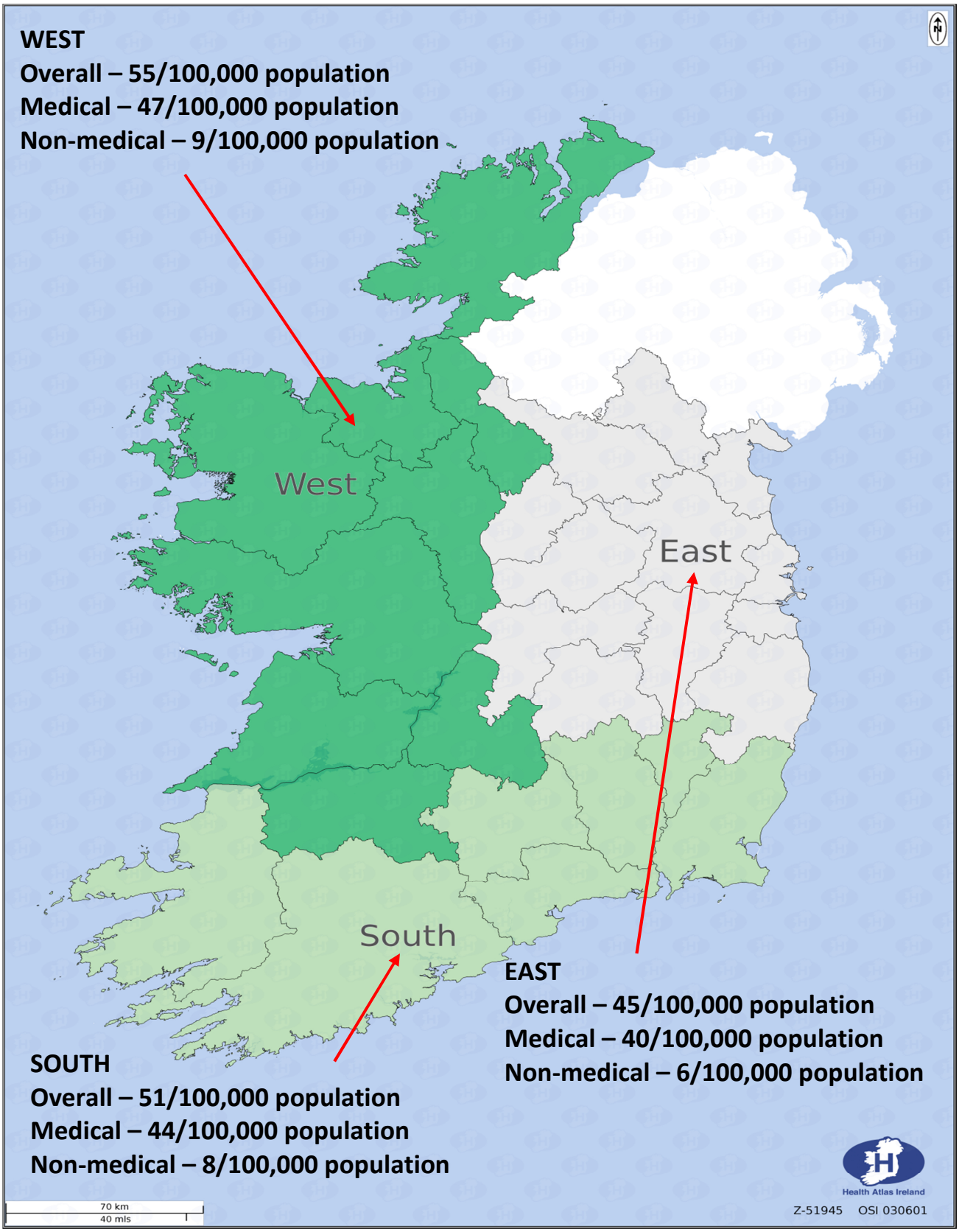
3.0 Results

3.1 Incidence

In 2017, a total of **2,333** OHCA were attended where resuscitation was attempted by NAS, DFB and DAA. Of these, 88% were reported directly to OHCAR and 12% were identified during missing case searches. This equates to 49 OHCA resuscitation attempts per 100,000 in 2017[10]. In Europe, the incidence of OHCA ranges between 38 and 86 per 100,000 per year[8, 9].

The majority of OHCA incidents were presumed to be of medical aetiology (43/100,000 persons/year) compared to a small proportion of cases of non-medical aetiology (trauma, asphyxial, drug overdose or submersion) (7/100,000 persons/year). The West area reported the highest incidence at 55/100,000 persons/year (Map 1). (Population data from Census of Population 2016[10]).

Map1: Incidence of OHCA with resuscitation attempts in 2017

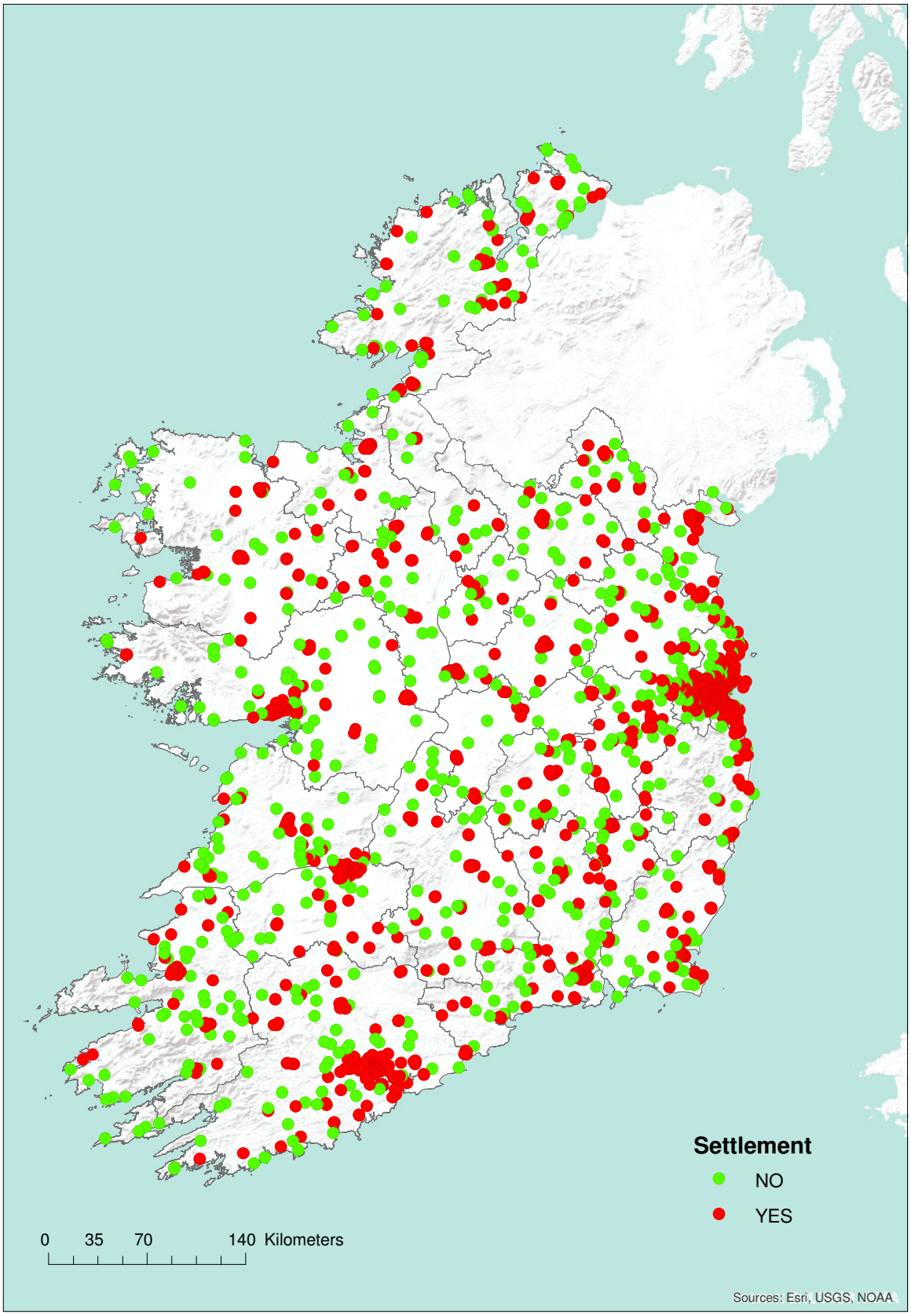


3.2 Geographical distribution of incidents

The geographical coordinates of incidence locations were identified using the HSE application 'Health Atlas' (https://www.healthatlasireland.ie/). Map 2 highlights that the majority of cases occurred in the most populated areas. The classification of a 'settlement / non-settlement' has been defined in line with United Nations criteria by the Central Statistics Office (CSO) under the Local Government Reform Act 2014[10], a settlement being described as having a minimum of 50 occupied dwellings, with a maximum distance between any dwelling and the building closest to it of 100 metres, and where there is evidence of an urban centre (shop, school, place of worship or a community centre). The term 'settlement' has replaced the term 'urban', and the term 'non-settlement' has replaced the term 'rural', which were used in previous years.

- 71% of cases occurred in a settlement (n=1,658/2,258), 75 cases could not be geocoded due to insufficient data, or the event having occurred during ambulance transport
- Case incidence was 55/100,000 per year in settlement areas and 34 per 100,000 population / year in non-settlement areas.

Map 2: Geographical distribution of OHCAR Incidents with settlement/non-settlement classification



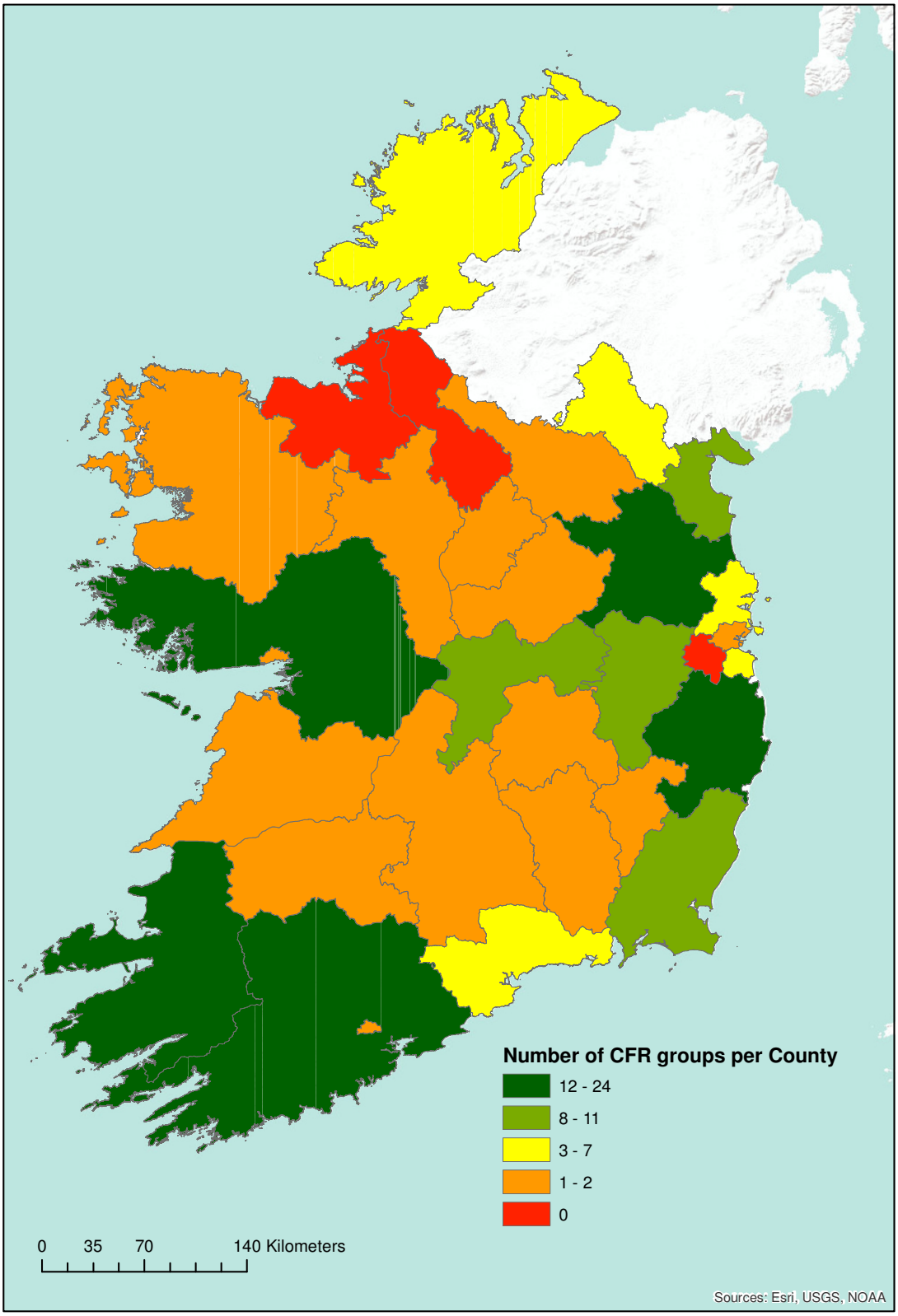
3.3 Demographics

- 1,563 patients were male (67%). Gender was not specified for four patients
- Patients ranged in age from <1 to 103 years old (median age 68 years, IQR 53 – 79). Age was missing for six patients
- Females were more likely to collapse in a private setting (homes or residential institutions) than males (n=678/766, 89% v 1,165/1,563, 75%) ($p<0.001$)
- The median age for females was 72 years (IQR 58 – 83) and 68 years for males (IQR 53 – 79).

3.4 Community First Responders

As of December 2017 there were 168 CFR groups linked with NAS, additionally there was approximately 900 AEDs identified to NEOC (Map 3). The CFR groups operate on a voluntary basis, having been trained in basic life support and the use of defibrillators. The CFR groups are co-ordinated locally by volunteers, yet dispatched by ambulance control. The CFR group members are predominantly made up of lay people with an interest in providing life-saving support in their communities, and receive training prior to activation from the NAS National Emergency Operations Centre.

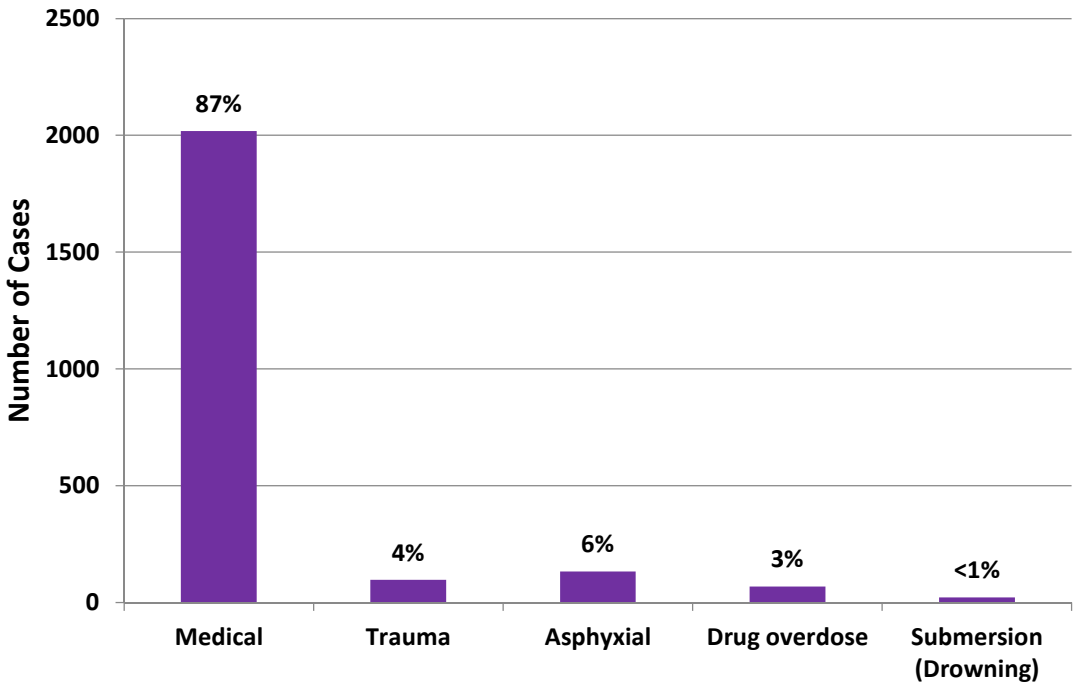
Map3: Geographical distribution of CFR groups linked to the EMS in 2017



3.5 Presumed aetiology

- 87% of incidents were presumed to be of medical aetiology (n=2,022/2,333). This category includes cardiac aetiologies, other medical aetiologies and unknown aetiologies (Figure 1)
- Non-medical aetiologies included:
  - 4% trauma (n=97)
  - 6% asphyxial (n=133)
  - 3% drug overdose (n=62)
  - <1% submersion (n=19)
- 85% of male patients had a presumed medical aetiology (n=1,327/1,563) compared to 90% of female patients (n=692/766) (p≤0.001)
- The median age of patients with a presumed medical aetiology was **70 years** and **41 years** for all other aetiologies.

Figure 1: Presumed aetiology (n=2,333)



3.6 Call response interval

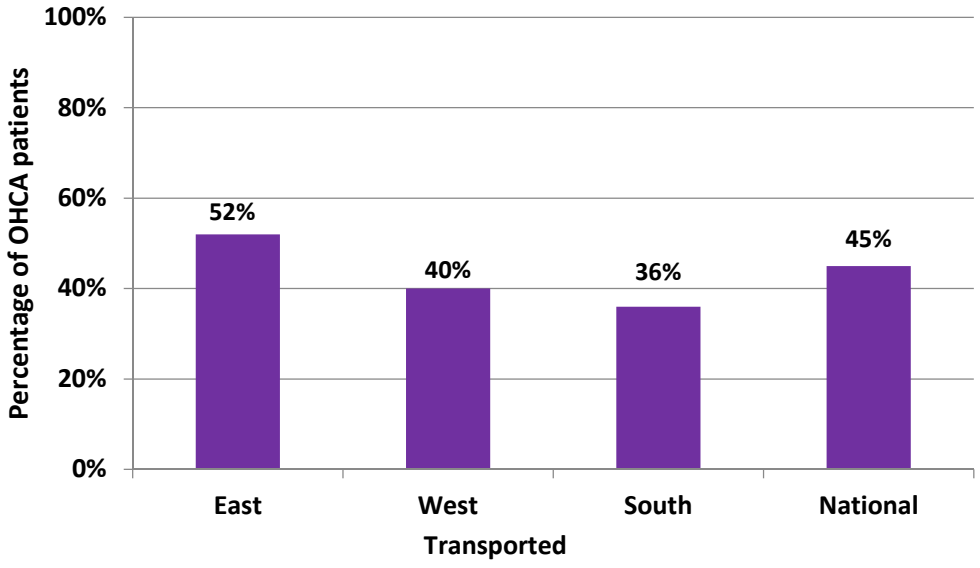
As per the Utstein definition[4], the call response interval (CRI) is the interval from the call received at the dispatch centre to arrival of EMS at the scene. Only the CRI for non-EMS witnessed cases are included in this analysis (n=2,081/2,256). As call response interval is not normally distributed, the median value for each category is given:

• All non EMS witnessed cases	12 minutes (IQR 8-19 minutes)
• Non-settlement non EMS witnessed cases	18 minutes (IQR 13-24 minutes)
• Settlement non EMS witnessed cases	10 minutes (IQR 7-16 minutes)
• Utstein comparator group	11 minutes (IQR 7-18 minutes)

3.7 Transported to hospital

- 45% of patients were transported to either an Emergency Department or a cardiac catheterisation laboratory (n=1,045/2,333), 2% were transported to a mortuary (n=40/2,333) and 53% of patients remained at scene (n=1,248/2,333)
- The percentage of patients who were transported to hospital was 52% in the East, 40% in the West, and 36% in the South (Figure 2)
- Patients in settlement areas were more likely to be transported than in non-settlement areas (48% vs. 33%, p<0.001).

Figure 2: Proportion of patients transported to hospital by EMS area and nationally



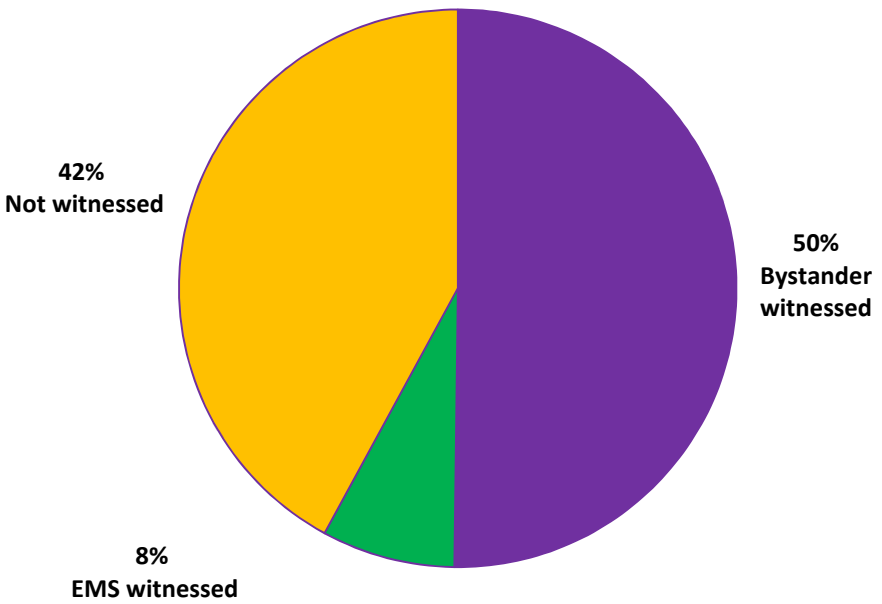
3.8 Event location

- 69% of incidents occurred at home (n=1,610/2,333)
- 79% of incidents occurred in a private setting (home, farm or residential institution (n=1,846/2,332)
- 21% of cases occurred in a public setting (industrial place, public building, GP surgery, recreational or sports place, street or road, in the ambulance, and other places such as rivers, lakes or piers (n=486/2,332)
- In settlement areas, a similar proportion of patients collapsed in a public place compared to non-settlement areas (19% vs. 20%).

3.9 Witness status

- 50% of cases were bystander witnessed (n=1,133/2,256), (Figure 3)
- 47% of settlement cases were bystander witnessed (n=782/1,597)
- 53% of non-settlement cases were bystander witnessed (n=321/587).

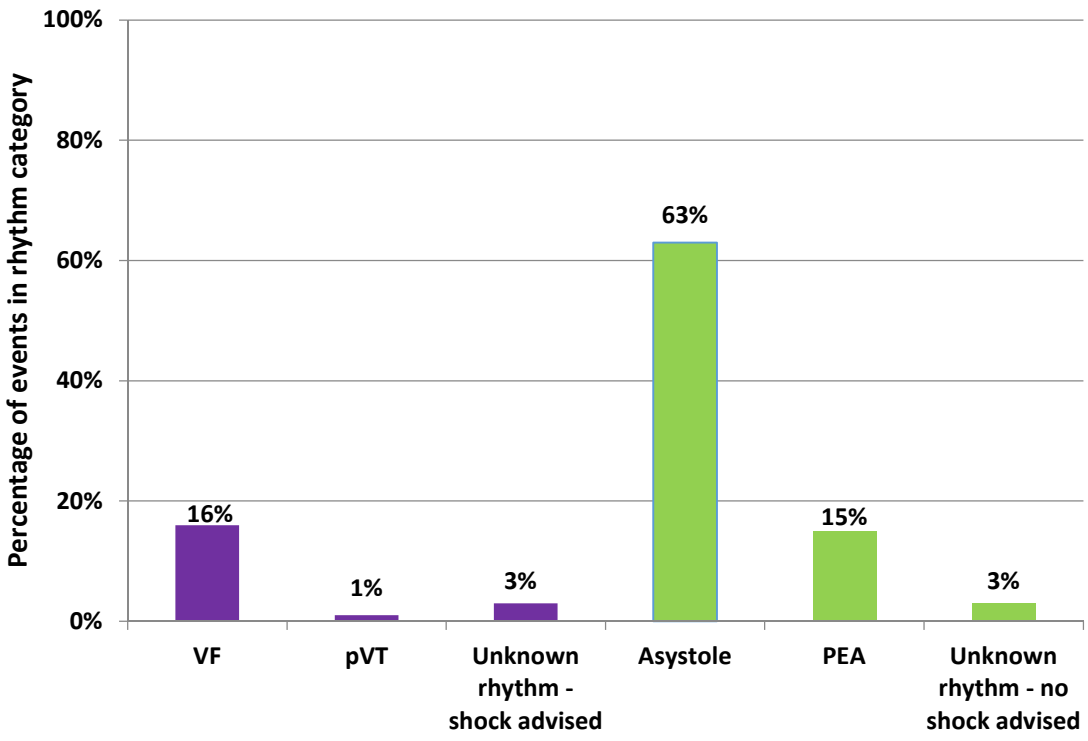
Figure 3: Witnessed status (n= 2,256)



3.10 First monitored rhythm

- 20% of cases were in a shockable rhythm at time of first rhythm analysis (n=454/2,303), (Figure 4)
    - 96% of all cases that were initially shockable had a presumed medical aetiology (n=434/454)
- 63% of all presenting rhythms were asystole (n=1,399/2,230).

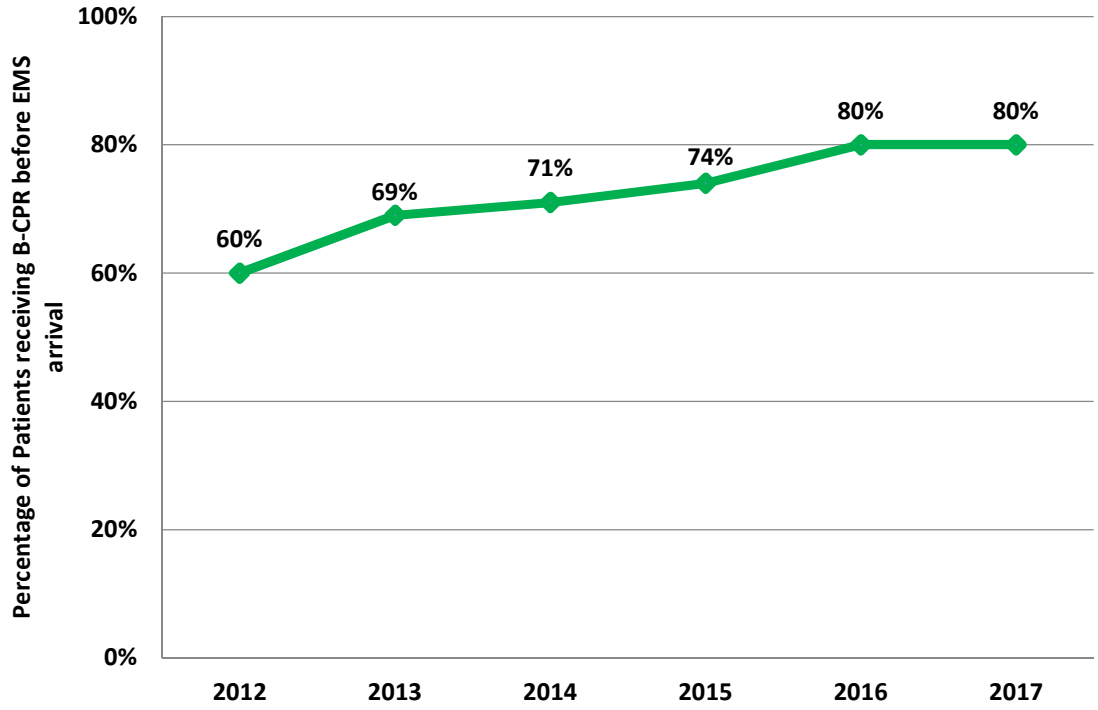
Figure 4: First monitored rhythm (n=2,230)



3.11 Bystander CPR

- Of the 2,081 cases that were not EMS-witnessed, data on B-CPR was available for 2,045 cases (figure 5). B-CPR was attempted in 80% of these cases (n=1,629/2,045).

Figure 5: Percentage of patients receiving B-CPR before EMS arrival, years 2012 – 2017

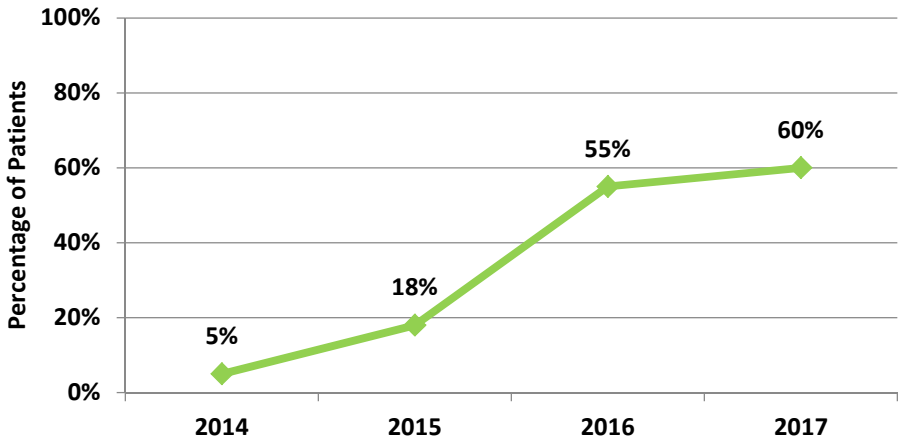


- In the subgroup of patients that had a bystander witnessed collapse (n=1,118) 82% (n=918) of patients had bystander CPR (B-CPR) attempted.
- A higher proportion of cases in a non-settlement received B-CPR (n=475/543) compared to a settlement area (n=1118/1,459) (87% vs. 76%; p<0.001).

3.12 Mechanical CPR

- 60% of cases involved the use of mechanical CPR (n=1,228/2,042) (Figure 6), compared to 55% in 2016, 18% in 2015, and 5% in 2014.

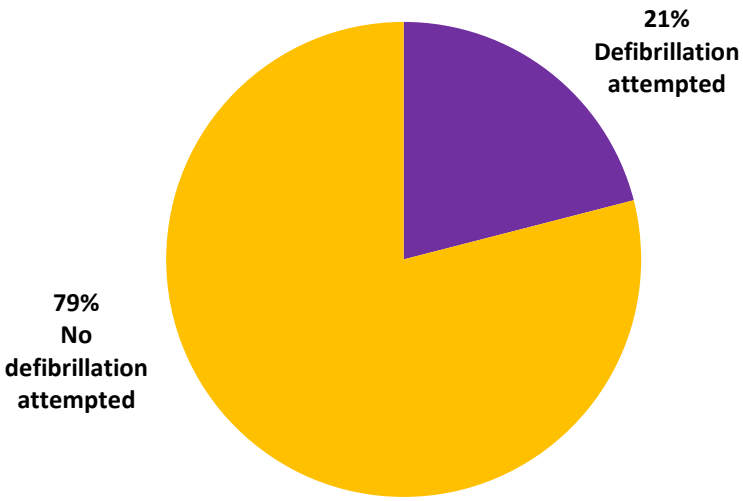
Figure 6 Percentage of patients receiving Mechanical CPR, years 2014 – 2017



3.13 Defibrillation

- 31% of cases had defibrillation attempted (n=719/2,300)
    - 25% had the pads applied pre-EMS arrival (n=180/715)
    - 21% had the first shock delivered pre-EMS arrived (n=147/712) (Figure 7).

Figure 7: Defibrillation attempted pre-EMS arrival (n=147/712)



In the 147 cases where first shock was delivered before EMS arrival, the identity of the person who delivered the first shock was as follows:

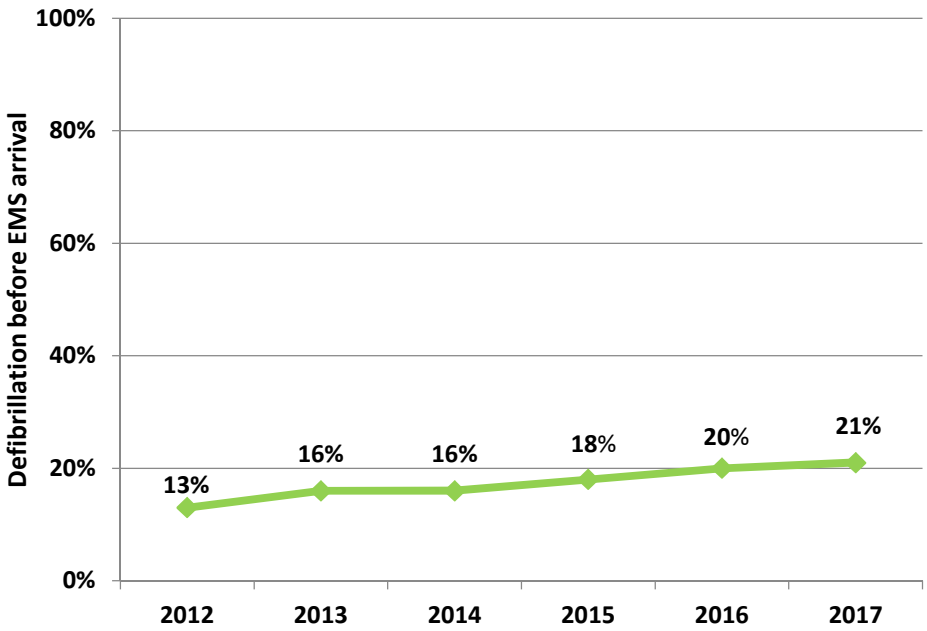
- Doctors (22%, n=33/147)
- Nurse (15%, n=29/147)
- Basic Life Supporter (BLS) / Cardiac First Responder (CFR) trained (22%, n=33/147)
- Local Fire services (9%, n=14/147)
- Voluntary Services (5%, n=8/147)
- Members of the general public (18%, n=27/147).

The remaining cases being made up of Occupational First Aiders and members of An Garda Síochána.

A total of 273 patients converted to a shockable rhythm during resuscitation. Of these:

- 63% were initially in asystole (n=171/273)
- 28% were initially in PEA (n=76/273, rhythm type not specified for the remainder.

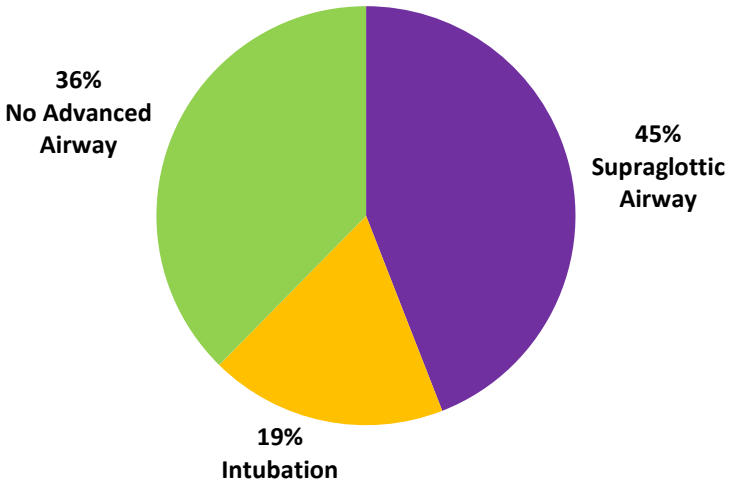
Figure 8: Defibrillation attempted before Ambulance service arrival 2012 – 2017



3.14 Advanced airway adjuncts

- In 64% of cases, advanced airway adjuncts were used, i.e. supraglottic airway device or intubation (n=1,450/2,254), (Figure 9).

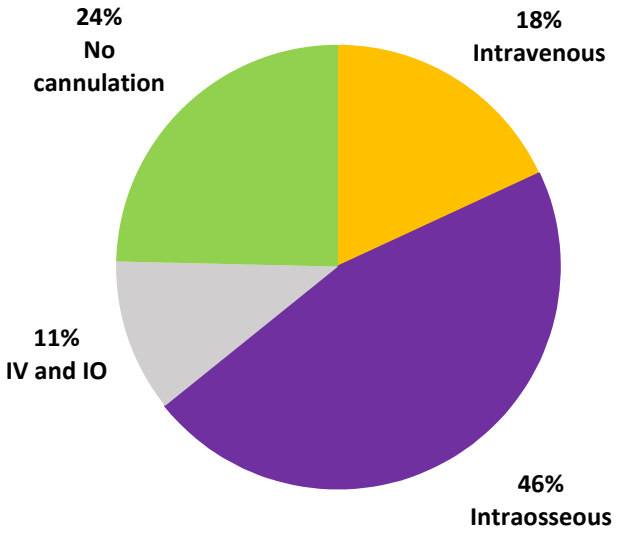
Figure 9: Adjunct airway management (n=2,254)



3.15 Cannulation

- 76% of cases had cannulation performed (n=1,760/2,327)
  - 46% of cases had intraosseous cannulation (n=1064/2,303)
  - 18% had intravenous only cannulation (n=413/2,303)
  - 11% had a combination of both techniques (n=259/2,303)
  - 24% of cases were not cannulated (n=567/2,327) (Figure 10).

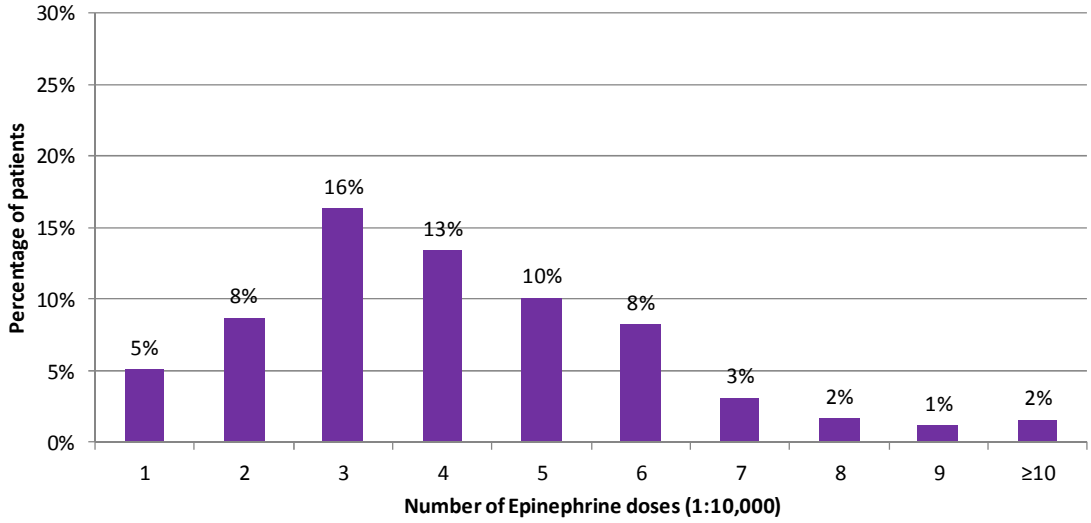
Figure 10: Cannulation method (n=2,311)



3.16 Cardiac arrest medication

- 70% of cases had epinephrine administered (n=1,622/2,328), the number of doses given ranged from 1 to 21 (Figure 11).

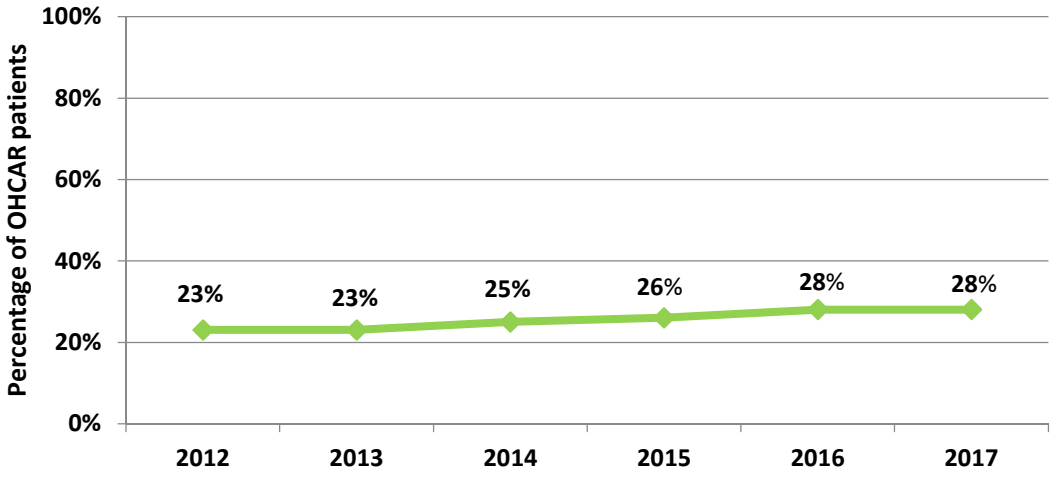
Figure 11: Percentage of Epinephrine doses (1:10,000) (n=1,622)



3.17 ROSC at any stage

- 28% of cases had ROSC before hospital arrival (n=655/2,316) (Figure 12). Data on ROSC was missing for 17 patients
- 30% of cases that occurred in a settlement achieved ROSC, compared with 23% in a non-settlement area (n=490/1,645 vs. n=135/596, p<0.001).

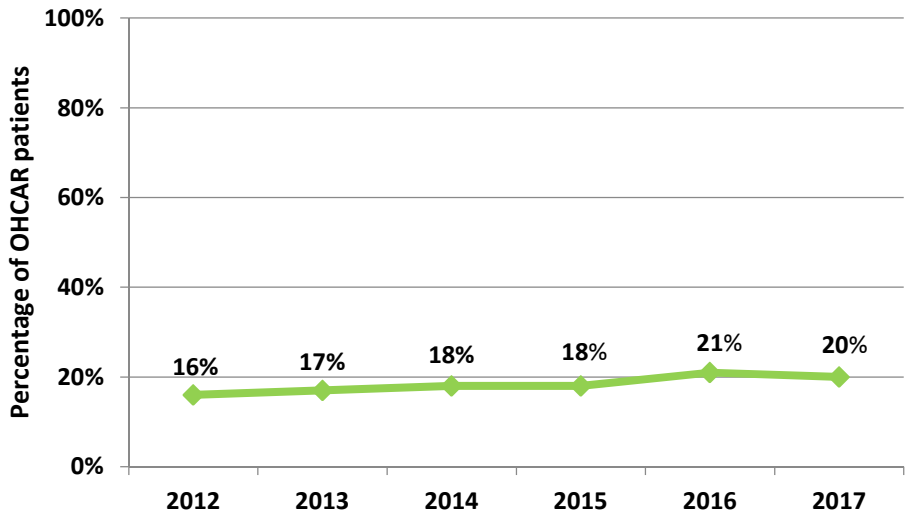
Figure 12: ROSC at any stage pre-hospital, all patients. Years 2012 – 2017 (n=3,821)



3.18 ROSC on arrival at the Emergency Department (ED)

- 20% of cases had ROSC on arrival at the ED (n=454/2,298). Data was missing for 35 patients (Figure 13)
- ROSC at the ED was more likely to occur in a settlement compared to a non-settlement case (20% vs. 16%; p<0.003).

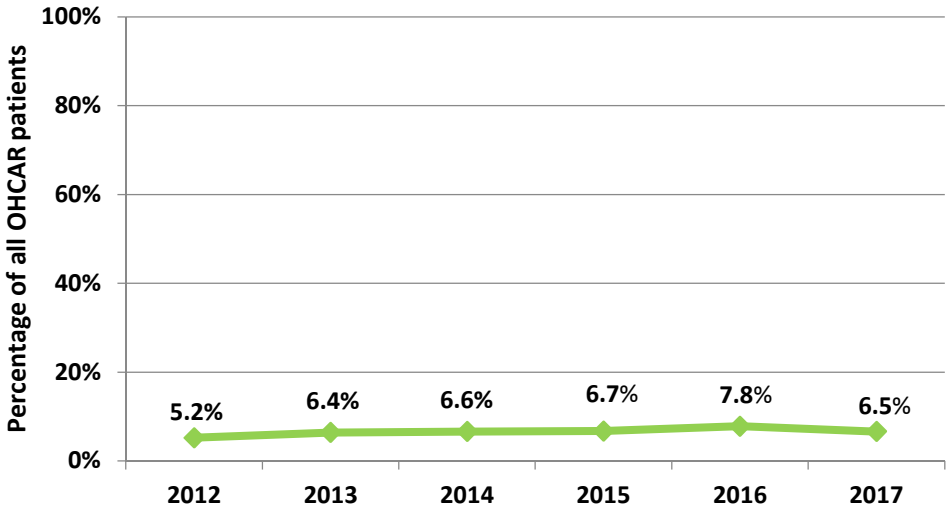
Figure 13: ROSC at ED, all patients. Years 2012 – 2017 (n=3,254)



3.19 Discharged alive from hospital

- 6.5% of patients were discharged alive from hospital (n=152/2,325) (Figure 14). Data on eight patients who were transported to hospital could not be obtained.

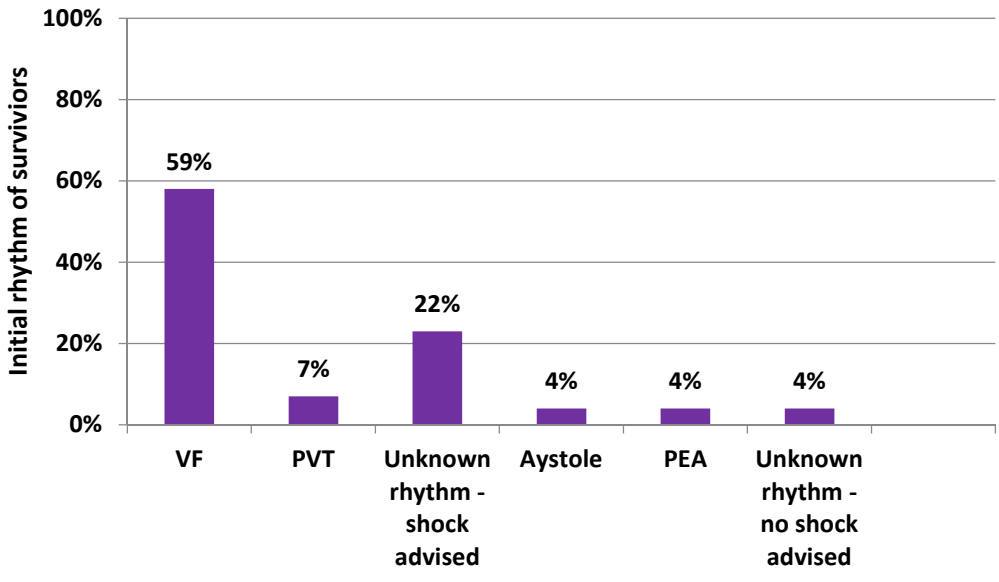
Figure 14: Percentage survival to discharge, all patients. Years 2012 – 2017 (n=827/12,626)



There is no statistically significant difference in percentage survival between 2016 and 2017. However, 2017 is the first year in which the absolute number of patients who survived has reduced. No inference can be drawn from this single year occurrence. Trends in absolute survival will be closely monitored in subsequent years.

- Surviving patients were younger (median age 59 years, IQR 49 – 69) than non-surviving patients (median age 69 years, IQR 54 – 79 years, (p≤0.001))
- The presumed aetiology was medical for 93% of survivors
- Survival in the presumed medical aetiology group was 7% (n=141/2,015) compared with 3% (n=11/310) in the non-medical group (p=0.021)
- 16% of patients who collapsed in a public location survived (n=77/481), compared to 4% of patients that collapsed in a private location (n=75/1,843), (p≤0.001)
- Survival of patients who collapsed in a settlement vs. non-settlement area was similar at 6.4% (n=106/1,652) vs. 6.3% (n=38/599)
- 87% of survivors had their first monitored rhythm recorded as shockable (n=132/152), (Figure 15)
    - 4% of survivors were initially in asystole
    - 4% were initially in PEA
    - 4% had an unknown, unshockable rhythm.

Figure 15: Percentage of survivors categorised by first analysed rhythm



- In the non-EMS witnessed group of survivors (n=121)
    - 87% had a witnessed arrest
    - 86% received bystander CPR
    - 38% (n=46), had defibrillator pads applied prior to EMS arrival
    - 35% (n=42) were shocked before EMS arrival
- In the overall EMS-witnessed group, 16% of patients survived (n=28/175)
- In the subgroup of EMS-witnessed patients that were adults, with presumed medical aetiology, with an initial shockable rhythm, 47% of patients survived (n=26/55).

3.20 Neurological function at discharge

The CPC[5] Score is an instrument developed to assess both traumatic and anoxic cerebral injuries. It is classified as a core Utstein data element for recording of cardiac arrest patients. The CPC score has five categories:

(1). Good cerebral performance

(2). Moderate disability: conscious, sufficient cerebral function for independent living

(3). Severe disability: dependent on others for daily support

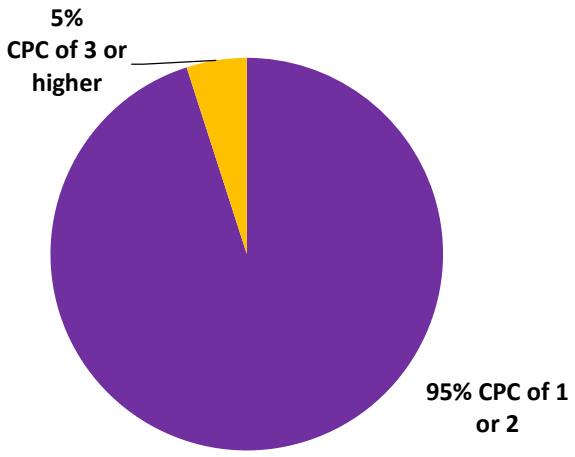
(4). Coma or vegetative state

(5). Brain death.

CPC score data was available for 101 surviving patients (Figure 16):

- 95% (n=96) had a score of 1 or 2
- 5% (n= 5) had a score of 3 or higher

Figure 16: CPC score at discharge



3.21 OHCA in the under 35 age group

- 8% of cases were recorded as <35 years of age (n=195/2,327)
    - 47% were of a presumed medical aetiology (n=92/195)
    - 14% were caused by trauma (road traffic accident, gunshot, stabbing, crush injuries or fall) (n=28/195)
    - 12% of cases resulted from a drug overdose (n=24/195)
    - 65% of cases were unwitnessed (n=126/195)
    - 8% were initially shockable (n=15/191)
    - 5% survived to discharge (n=10/192)

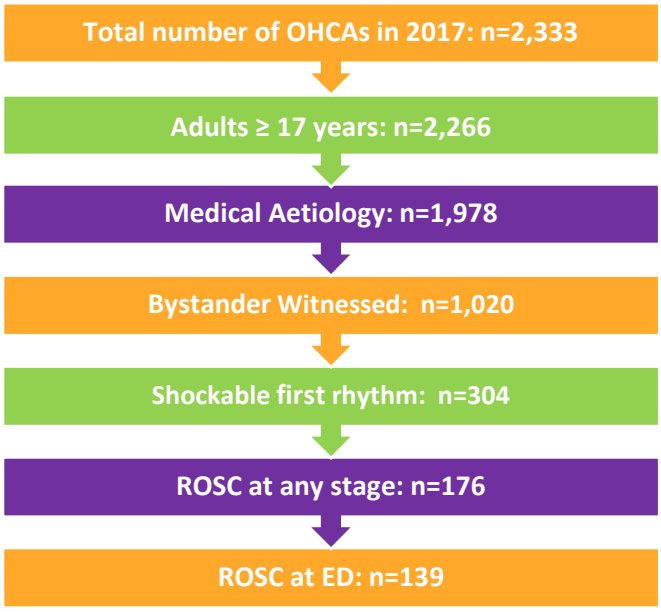
3.22 Utstein comparator subset

The Utstein comparator subset includes the following subgroup of patients

- Adult (i.e. older than seventeen years)
- Presumed medical aetiology
- Bystander witnessed
- First monitored rhythm shockable.

There is wide variation of circumstances around a cardiac arrest and patient characteristics. Using the Utstein comparator subset allows for a more standardised comparison of patients outcomes between systems and time periods (Figure 17).

Figure 17: Flowchart of the 2017 Utstein comparator subset and ROSC outcomes

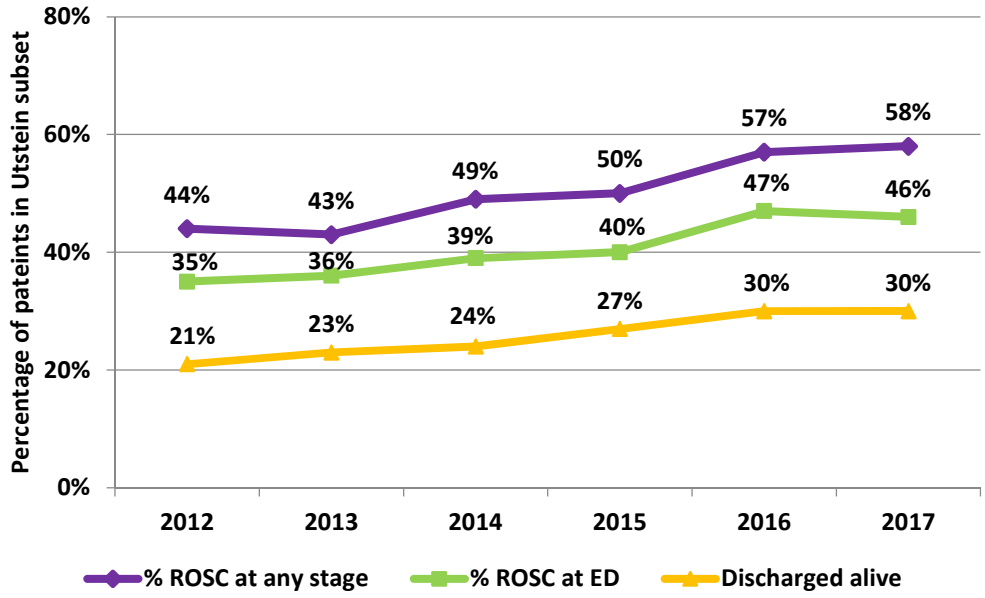


In 2017, the Utstein comparator subset included 304 patients and accounted for 13% of all OHCAs (304/2,333).

3.23 Utstein comparator subset outcomes

- **58%** of patients (n=176/303) achieved ROSC at some stage before hospital arrival
- **46%** of patients (n=139/299) had ROSC on arrival at the ED
- **30%** of patients (n=90/303) were discharged alive from hospital (Figure 18)
- Of the survivors for whom CPC was available, 95% had a CPC score of one or two (n=60/63).

Figure 18: Outcomes in the Utstein comparator subset, years 2012 – 2017



Case Characteristics

- Of those patients who collapsed in a public location, 37% survived (n=46/123) compared to 24% in a private location (n=44/180) (p=0.015)
- 92% of cases were recognised as cardiac arrest at the time of ambulance dispatch (n=279/304)
- Bystander CPR was performed on 88% of survivors
- 41% of the patients who survived had defibrillation attempted before ambulance service arrival (n=36/88). The estimated median time from 'time of collapse' to 'time of first shock administered' was 4 minutes (n=20/36, IQR 1 – 5).

Chapter 4

4.0 Discussion

4.1 OHCAR reporting to service providers

OHCAR data is used to measure the primary monthly clinical Key Performance Indicators for NAS, and also provides detailed regional quarterly reports to NAS. These include descriptive data elements and outcome variables at regional level and constitute the data source for reports circulated by NAS to stations via the ONELIFE initiative, which is a NAS run quality improvement programme. A quarterly report is provided to DFB with outcome data and descriptive information. OHCAR Annual reporting is undertaken on the geographical regions of West, South and combines the DFB with the Eastern NAS region.

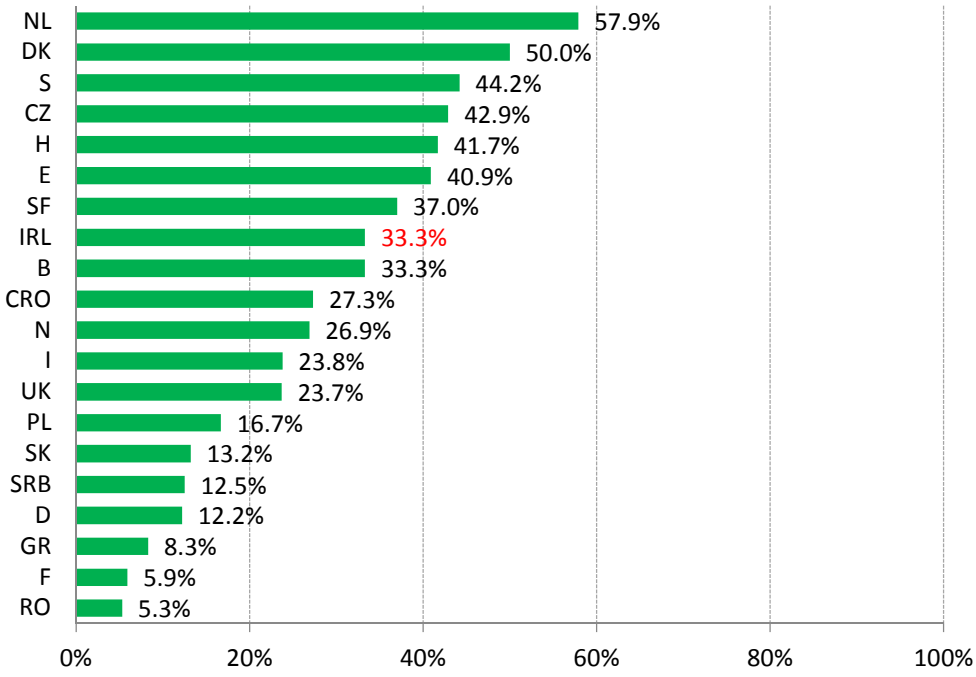
4.2 Ireland and the EuReCa studies

In October 2014, Ireland participated in the EuReCa ONE study – a one month survey of OHCA cases in 27 countries across Europe[11, 12]. Ireland was one of only seven countries that contributed data for the entire country for the study period. The estimated rate of OHCA where resuscitation was attempted per 100,000 population per year in EuReCa countries was 44 (Ireland 49). ROSC was achieved before hospital arrival in 29% of all EuReCa ONE cases (Ireland 26%, figure 19). The overall EuReCa ONE proportion of ROSC at arrival to hospital was 25% (Ireland 16%) and discharged alive was 10.3% (Ireland 5.9%, figure 21). (For participating Country names see appendix 4).

Utstein Subgroup

ROSC in the EuReCa ONE Utstein subgroup was 57% (Ireland 58%). Average survival to discharge in Utstein patients in collaborating countries was 30% (Ireland 33%, figure 19).

Figure 19: EuReCa ONE study survival rate in the Utstein comparator group



4.3 Research awards

European Registry of Cardiac Arrest Study ONE (EuReCa ONE)

The study received the Ian G. Jacobs Award for International Group Collaboration to Advanced Resuscitation Science, by the American Heart Association and the Resuscitation Science Symposium Planning Committee for best international collaboration. The award was presented in November 2017.

Following on from the success of EuReCa ONE[6], EuReCa TWO was launched in Reykjavik, Iceland in September 2016. EuReCa TWO is a study of the ERC. OHCAR has provided National OHCA data for incidents in Ireland to the EuReCa TWO study, which now covers 29 European countries with a population of over 175 million people. Data collection commenced on the 1st of October 2017 until the 31st of December 2017. We look forward to the data from the EuReCa TWO study when it is published in early 2019.

Dr. Peter Wright is the EuReCa Two National Coordinator for Ireland and Ms Siobhán Masterson is part of the EuReCa TWO Study Management Team. OHCAR representatives have regularly attended EuReCa meetings with the other National Coordinators and the Study Management Team.

4.4 OHCAR and the Health Research Board

Ms Siobhán Masterson commenced a three year Health Research Board (HRB) Research Training Fellowship in January 2015 entitled '*A geographic model for improving out-of-hospital cardiac arrest survival in Ireland'.*

Research Consortium

The OHCAR Research Consortium is a forum established by the OHCAR Steering Group. The aim of the consortium is to foster and support researchers and research in OHCA. The group has met twice since its inception, and has made two funding applications to the HRB.

4.5 Future developments in OHCAR

OHCAR is working closely with NAS, in implementing an electronic PCR system. Once operational, this will facilitate more efficient transfer data relating to an OHCA. OHCAR is in the process of updating its database which will be aligned with the electronic PCR system.

Chapter 5

5.0 Conclusion

Since the last OHCAR Annual Report was published in 2016, there has been a 2% decrease of cases reported to OHCAR. Bystander attempts at CPR has stabilised at 80% of cases. The use of mechanical CPR has increased from 55% of cases in 2016 to 60% of all OHCAR cases.

Attempted defibrillation before EMS arrival has increased from 20% to 21%. ROSC before hospital arrival has stabilised at 28%. ROSC on arrival at hospital has decreased from 21% to 20%. Discharge alive from hospital has decreased by 1.3% to 6.5%.

In the Utstein group the ROSC prior to hospital arrival has increased from 57% to 58%, and ROSC at Hospital arrival has decreased from 47% to 46%. Discharge alive has stabilised at 30%. In line with previous years, surviving patients were more likely to be younger, have a presumed medical aetiology, have collapsed in a public, urban location, have a witnessed arrest, present in a shockable rhythm, and received bystander CPR.

5.1 OHCAR research

Research projects approved by OHCAR Steering Group December 2017 – July 2018:

Principal Investigator	Title
Prof. Gerard Bury	Medical Emergency Responder Integration and Training Three (MERIT3). Utilisation of a novel Ambulance Service alerting system to prompt GP first responders to nearby cardiac arrests

Chapter 6

Acknowledgements

The author wishes to acknowledge the contribution made to the report from the following sources:

NAS - Emergency Medical Technicians, Paramedics, Advanced Paramedics, Aero-Medical Crews, National Emergency Operations Centre, NAS Clinical Information Manager, NAS Clinical Development Manager, NAS National Director, NAS Medical Director

DFB - Emergency First Responders, Emergency Medical Technicians, Paramedics, Advanced Paramedics, East Region Communications Centre, District Officer EMS Support, Assistant Chief Fire Officer EMS Operations, DFB Medical Director

First Responders - All CFR Group Members, First Aid Responders, Irish Coast Guard, Members of An Garda Síochána, Order of Malta, St. John Ambulance, Red Cross, Private Ambulance Crews, Voluntary First Responders, Bystanders, Doctors, Nurses, Local Fire Services, and Civil Defence

Hospitals - Resuscitation Training Officers, Emergency Department Consultants / Registrars, Clinical Nurse Managers, Emergency Department Staff / Secretaries, Audit Nurses

DAA - Information Officer, Responders

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Appendix 1

OHCAR Steering Group

The OHCAR Steering Group is responsible for ensuring that the aims of OHCAR are fulfilled and for advising on its organisation and direction. The Steering Group includes representatives from all four supporting organisations, and met three from December 2017 to July 2018.

The membership at November 2018 is:

- Professor Gerard Bury, UCD Centre for Emergency Medical Science
- A/Professor Conor Deasy, Consultant in Emergency Medicine, Cork University Hospital
- Dr. John Dowling, North West Immediate Care Programme
- Ms. Jacqueline Egan, Programme Development Officer, PHECC
- Mr. Joe Fahy, Resuscitation Officer, Portiuncula University Hospital
- Dr. Joseph Galvin, Consultant Cardiologist, Mater Hospital
- Mr. David Hennelly, Clinical Development Manager, National Ambulance Service, HSE
- Ms. Siobhán Masterson, National Project Manager, Out-of-Hospital Cardiac Arrest Strategy, National Ambulance Service & HRB Research Fellow, Discipline of General Practice, NUI Galway
- Dr. David Menzies, CFR Ireland & Consultant in Emergency Medicine, St Vincent's University Hospital & Clinical Lead, Emergency Medical Science, UCD, Centre for Emergency Medical Science
- Professor Andrew Murphy, Discipline of General Practice, NUI Galway
- Professor Cathal O'Donnell, Medical Director, National Ambulance Service
- Mr. Martin O'Reilly, District Officer, EMS Support Officer, DFB
- Mr. Martin Quinn, OHCAR Manager, Discipline of General Practice, NUI Galway
- Dr. Peter Wright, Director of Public Health Medicine, HSE West (North West area) (Director)

Appendix 2

OHCAR meetings and representations

- RESPOND "The Importance of CFRs in OHCAR", National Cardiac First Responder Conference, Mullingar, March 2017
- EuReCa Two Meetings: Warwickshire, March 2017 and Freiburg September 2017
- European Resuscitation Council (ERC) congress: Freiburg, September 2017
- European Resuscitation Academy Conference, Kildare, November 2017
- Irish Heart 6th Sudden Cardiac Death Conference, Dublin, November 2017.

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Appendix 3

OHCAR Utstein comparator subset 2017 – Regional results

Figure 1: Number of OHCAR patients in the Utstein group by region (n=304)

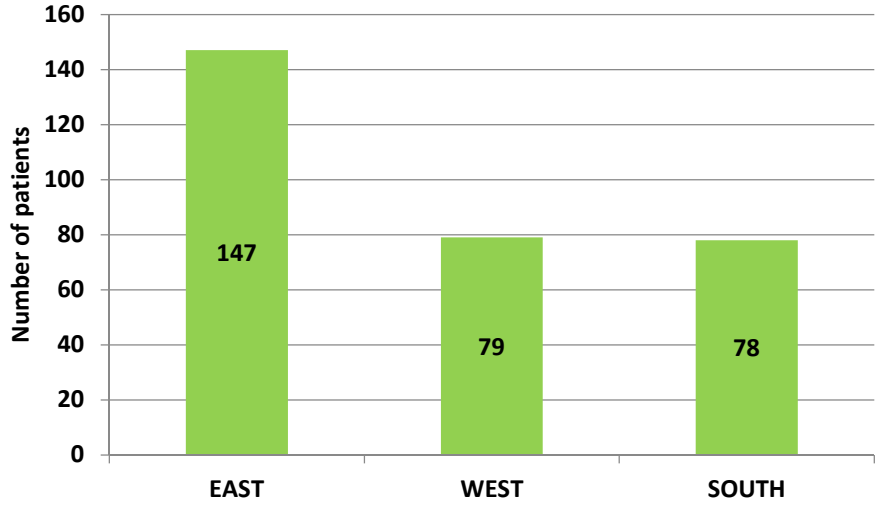


Figure 2: Dispatcher recognition of cardiac arrest at time of ambulance dispatch (Utstein), (n=304):

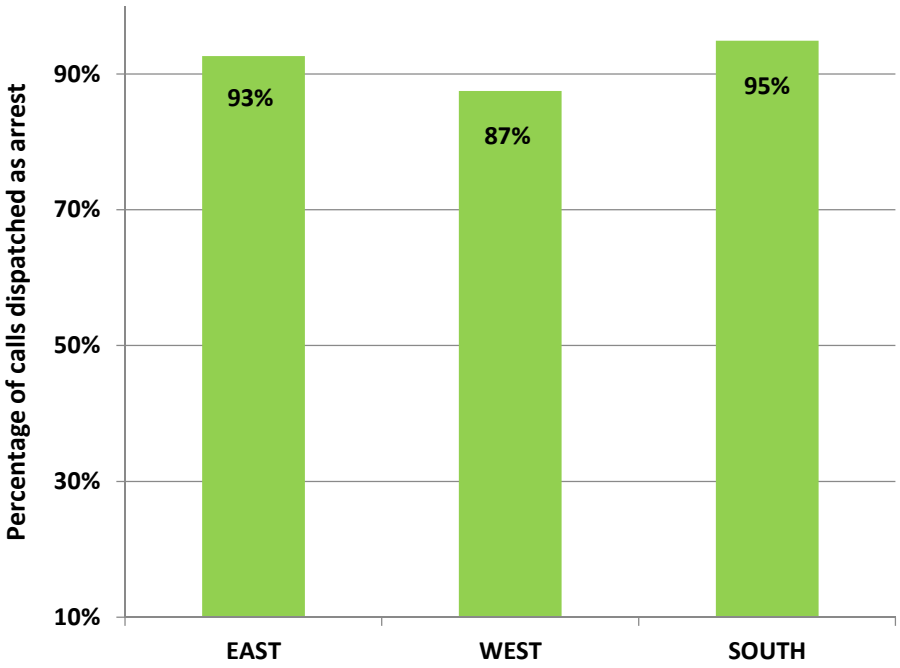
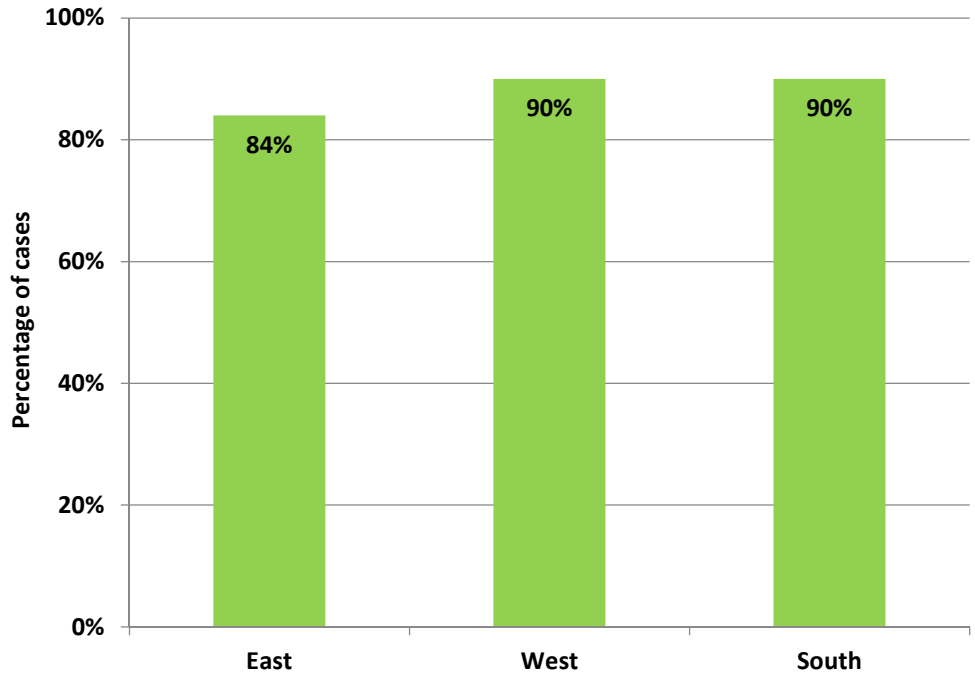


Figure 3: Percentage of Utstein cases with bystander CPR:



Appendix 4

EuReCa ONE participating Country's abbreviations;

CZ	Czech Republic
B	Belgium
H	Hungary
SK	Slovakia
P	Portugal
DK	Denmark
UK	United Kingdom
PL	Poland
D	Germany
I	Italy
SRB	Serbia
SF	Finland
LUX	Luxembourg
F	France
N	Norway
RO	Romania
CH	Switzerland
S	Sweden
NL	The Netherlands
SLO	Slovenia
ICE	Iceland
A	Austria
CRO	Croatia
IRL	Ireland
GR	Greece
CYP	Cyprus
E	Spain