Out-of-Hospital Cardiac Arrest Register

OHCAR Ireland

At the heart of evidence

Annual Report 2016

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Pre-Hospital Emergency Care Council

NUI Galway
OÉ Gaillimh

Contents

Executive Summary

2,389 cases of out-of-hospital cardiac arrest where resuscitation was attempted

***84%** had bystander CPR performed

66% Male, 34% Female
Median age – 67 years

20% of all defibrillation attempts were done pre EMS arrival

46% transported

28% had ROSC pre-hospital

21% had ROSC on arrival at hospital

7.8% were discharged alive

*Bystander witnessed only

OHCAR Key Messages 2016

Patient and Event Characteristics

- 2,389 out-of-hospital cardiac arrest (OHCA) incidences recorded on OHCAR (50 per 100,000 population per year)
  - 64% occurred in an Urban setting
  - 66% were Male
  - Median age – 67 years
  - 86% presumed medical aetiology
  - 67% of cases happened in the home
- 49% were bystander witnessed
  - 84% had bystander cardiopulmonary resuscitation (B-CPR)

Defibrillation

- 23% had an initial shockable rhythm
- 19% had defibrillator pads applied prior to arrival of the EMS
- 35% had defibrillation attempted
  - 20% had defibrillation attempted before arrival of the EMS
- 28% had Return of Spontaneous Circulation (ROSC) at any stage pre-hospital
- 21% had ROSC on arrival at hospital
- 7.8% of cases were discharged alive
  - 95% had good to moderate neurological function on discharge

Utstein Group

- 15% of patients were in the Utstein Group
  - 57% had ROSC at any stage pre-hospital
  - 47% had ROSC on arrival at hospital
  - 30% of patients were discharged alive
  - 66% of surviving patients collapsed in a public location
- **43%** of surviving patients had defibrillation attempted prior to ambulance arrival.

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
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
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 is likely to be 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, scanned electronically 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 copies of the electronic PCRs to OHCAR.

Following validation, OHCAR staff upload 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.

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[a] [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.

[a]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 23. 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

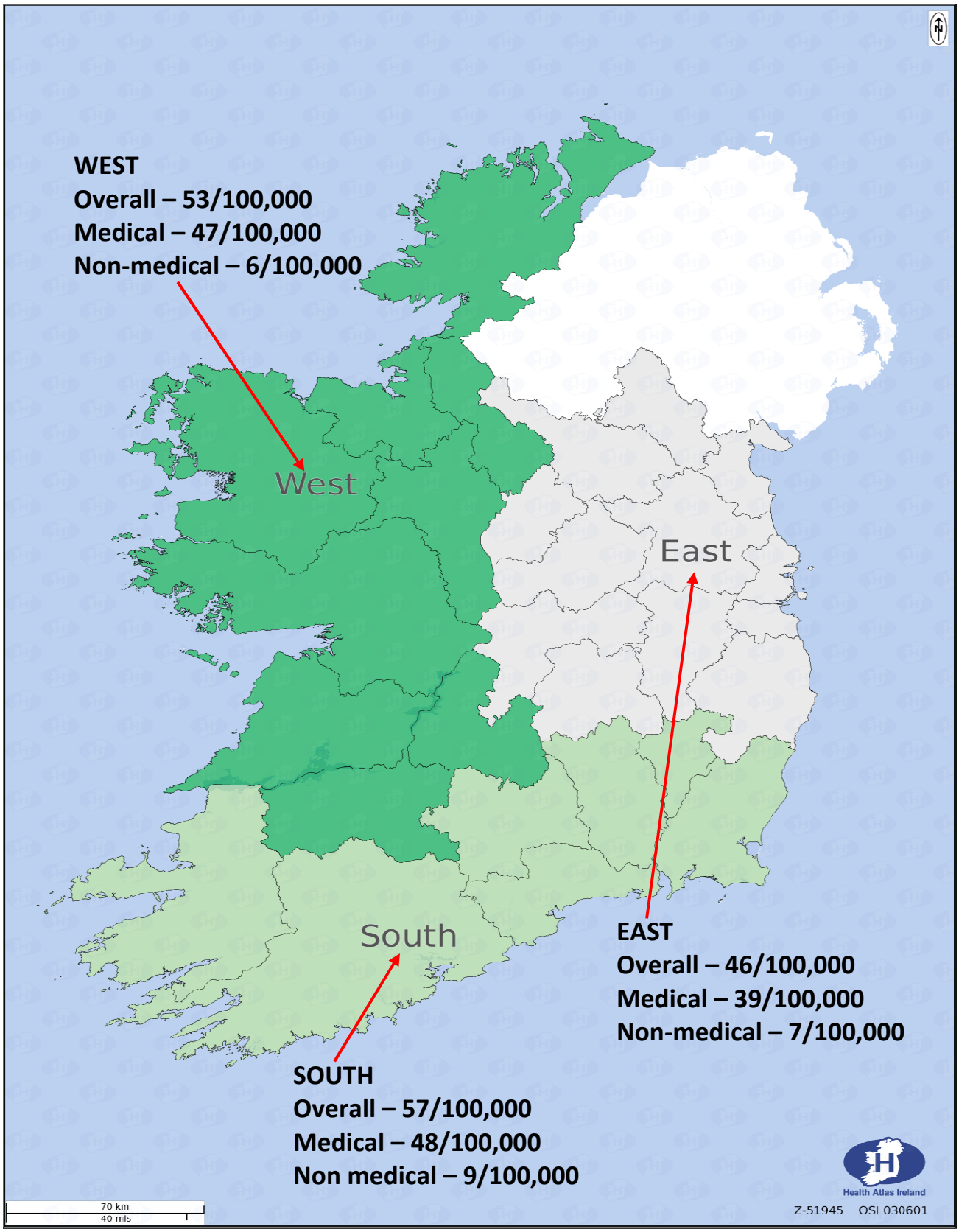
3.0 Results

3.1 Incidence

In 2016, a total of **2,389** OHCA where resuscitation was attempted were attended by NAS, DFB and DAA. Of these, 90% were reported directly to OHCAR and 10% were identified during missing case searches. This equates to 50 OHCA resuscitation attempts per 100,000 [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 (7/100,000 persons/year). The South area reported the highest incidence at 57/100,000 persons/year. (Figures from Census of Population 2016[10]).

Map1: Incidence of OHCA with resuscitation attempts

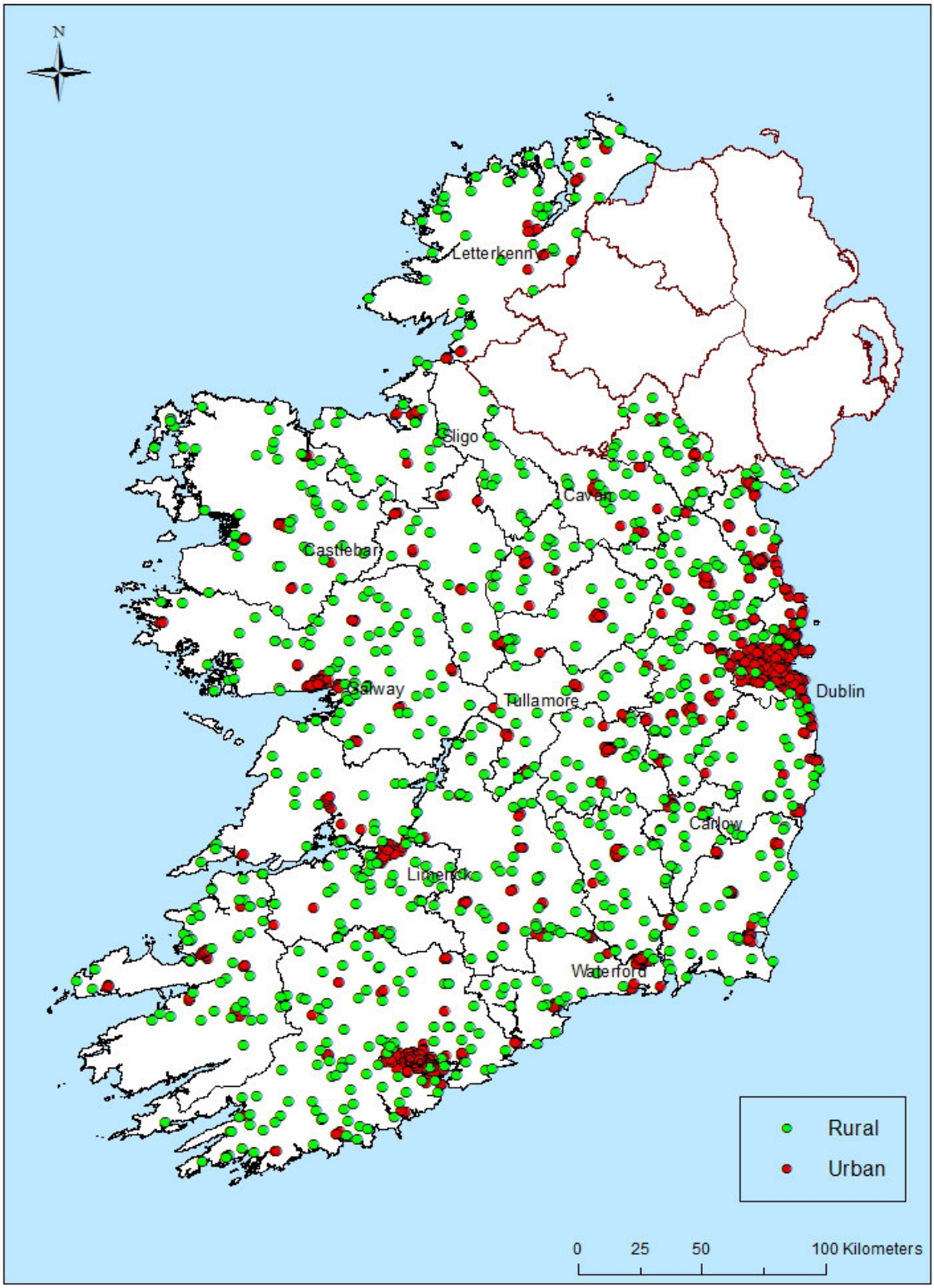


3.2 Geographical distribution of incidents

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 urban and rural has been defined by the Central Statistics Office (CSO) under the Local Government Reform Act 2014[10].

- 64% of cases occurred in an urban setting (n=1,438/2,264), 125 cases could not be geocoded due to insufficient data, or the event occurred during ambulance transport
- Case incidence was 48/100,000 per year in urban areas and 47 per 100,000 population / year in rural areas.

Map 2: Geographical distribution of OHCAR Incidents with urban/rural classification



Includes Ordnance Survey Ireland data reproduced under OSi Licence number 030601. Drawn by GIS Dept. CHO 1

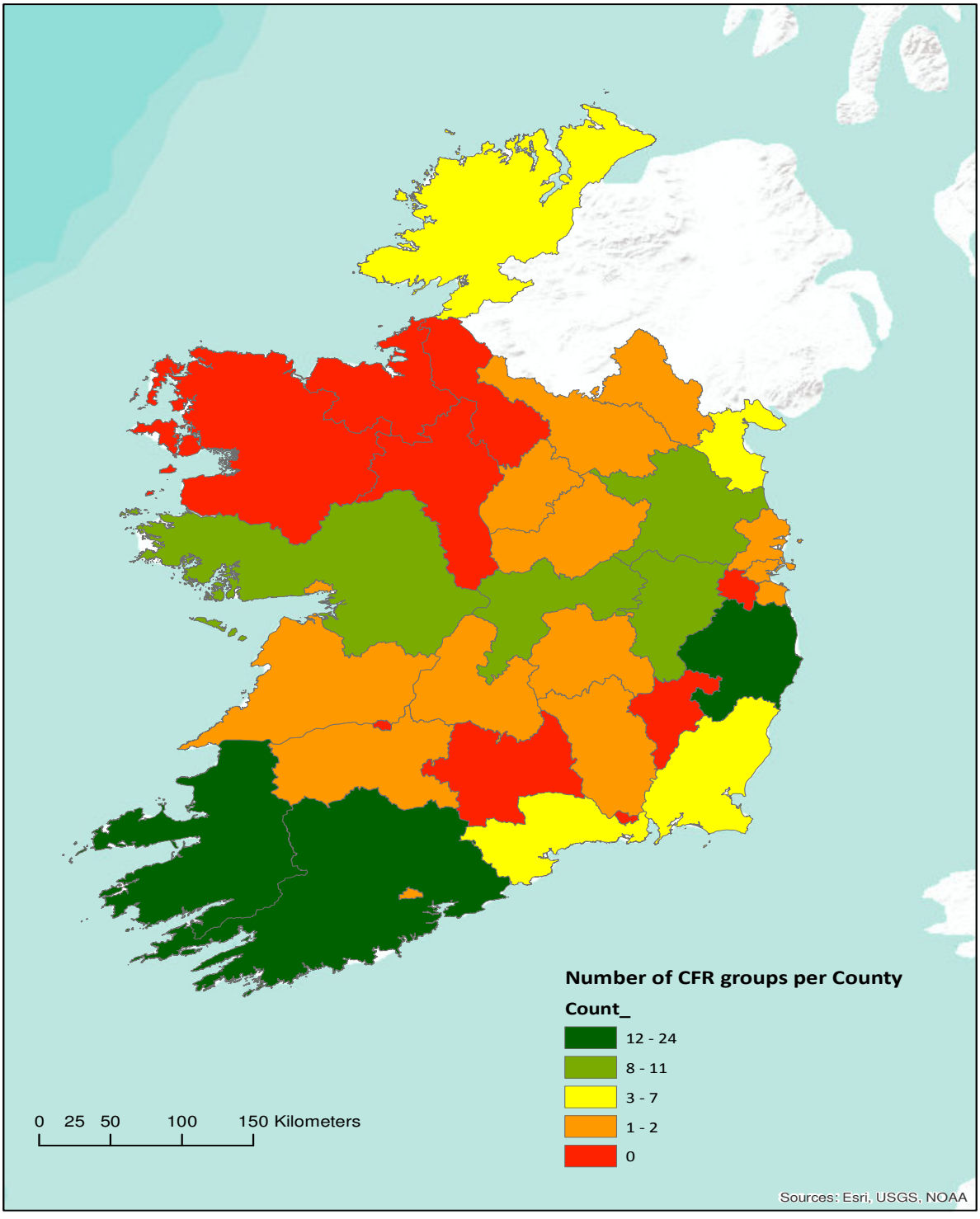
3.3 Demographics

- 1,581 patients were male (66%). Gender was not specified for four patients
- Patients ranged in age from <1 to 100 years old (median age 67 years, IQR 52 – 78). Age was missing for eight patients
- Females were more likely to collapse in a private setting (homes or residential institutions) than males (n=666/804, 83% v 1,118/1,581, 71%) ($p<0.001$)
- The median age for females was 70 years (IQR 56 – 81) and 65 years for males (IQR 51 – 76)

3.4 Community First Responders

As of December 2016 there were 147 CFR groups, with 495 AEDs registered directly with NAS. The CFR groups operate on a voluntary basis, have basic life support CPR training, 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. These CFR groups play an important role in the chain of survival of the OHCA patient.

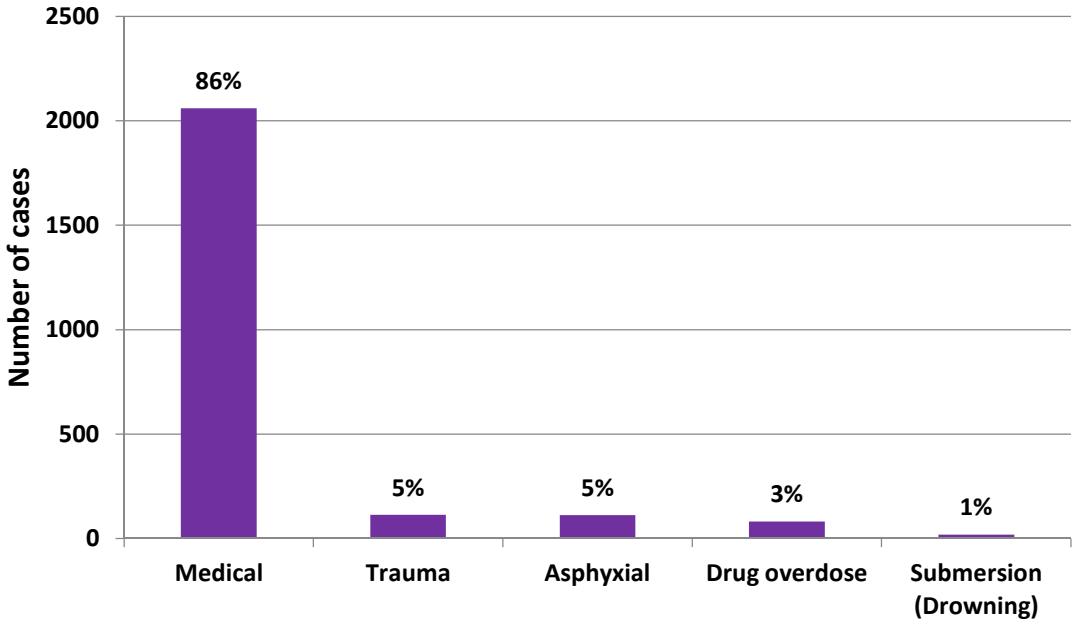
Map3: Geographical distribution of CFR groups linked to the EMS in 2016



3.5 Presumed aetiology

- 86% of incidents were presumed to be of medical aetiology (n=2,060/2,387). This category includes cardiac aetiologies, other medical aetiologies and unknown aetiologies
- Non-medical aetiologies included:
  - 5% trauma (n=114)
  - 5% asphyxial (112)
  - 1% submersion (n=19)
  - 3% drug overdose (n=82)
- 84% of male patients had a presumed medical aetiology (n=1,333/1581) compared to 90% of female patients (n=724/804) (p≤0.001)
- The median age of patients with a presumed medical aetiology was **69 years** and **37 years** for all other aetiologies

Figure 1: Presumed aetiology (n=2,387)



3.6 Call response interval

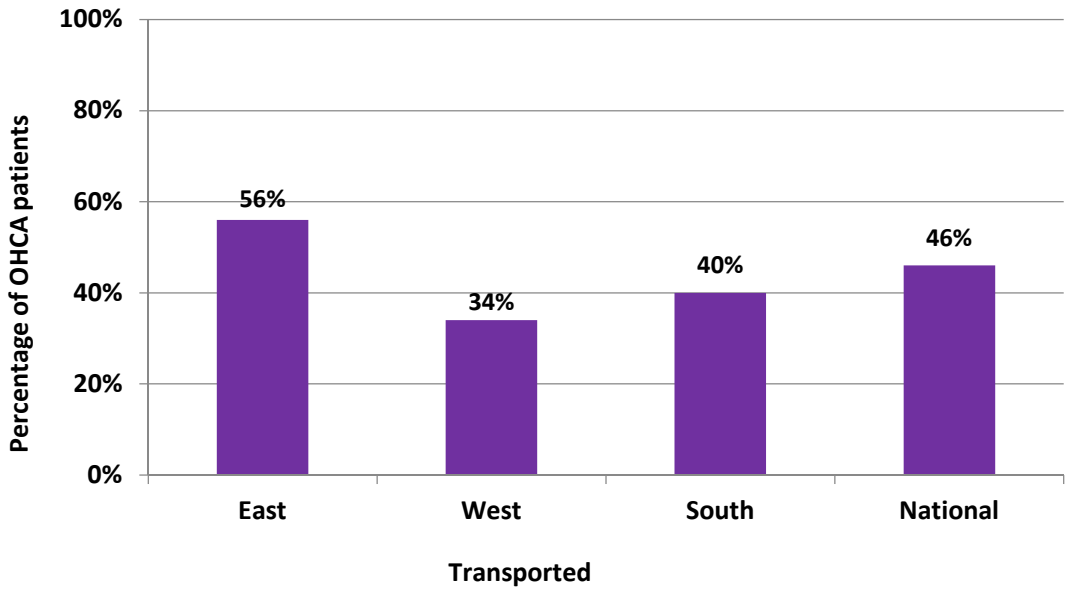
As per the Utstein definition[4], the call response interval (CRI) is the time from the call received at the dispatch centre to arrival of EMS at the scene. Only the CRI for non-EMS witnessed cases are included in this analysis (n=2,140/2,319). As call response interval is not normally distributed, the median value for each category is given:

• All non EMS witnessed cases	13 minutes (IQR 8-19 minutes)
• Rural non EMS witnessed cases	19 minutes (IQR 14-25 minutes)
• Urban non EMS witnessed cases	10 minutes (IQR 7-14 minutes)
• Utstein comparator group	12 minutes (IQR 8-19 minutes)

3.7 Transported to hospital

- 46% of patients were transported to either an Emergency Department or a cardiac catheterisation laboratory (n=1,099/2,389)
- The percentage of patients who were transported to hospital was 56% in the East, 34% in the West, and 40% in the South
- Patients in urban areas were more likely to be transported than in rural areas (53% vs. 30%, p<0.001)

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



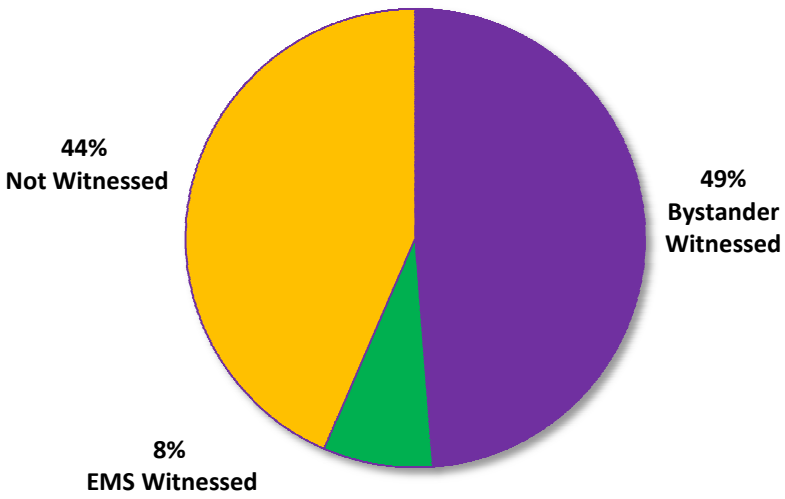
3.8 Event location

- 67% of incidents occurred at home (n=1,601/2,383)
- 75% of incidents occurred in a private setting (home, farm or residential institution (n=1,784/2,383)
- 25% 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=593/2,383)
- In urban settings, a higher proportion of patients collapsed in a public place compared to rural settings (31% vs. 24%; p=0.04)

3.9 Witness status

- 49% of cases were bystander witnessed (n=1,131/2,319)
- 52% of urban cases were witnessed (n=748/1,438)
- 56% of rural cases were witnessed (n=465/826)

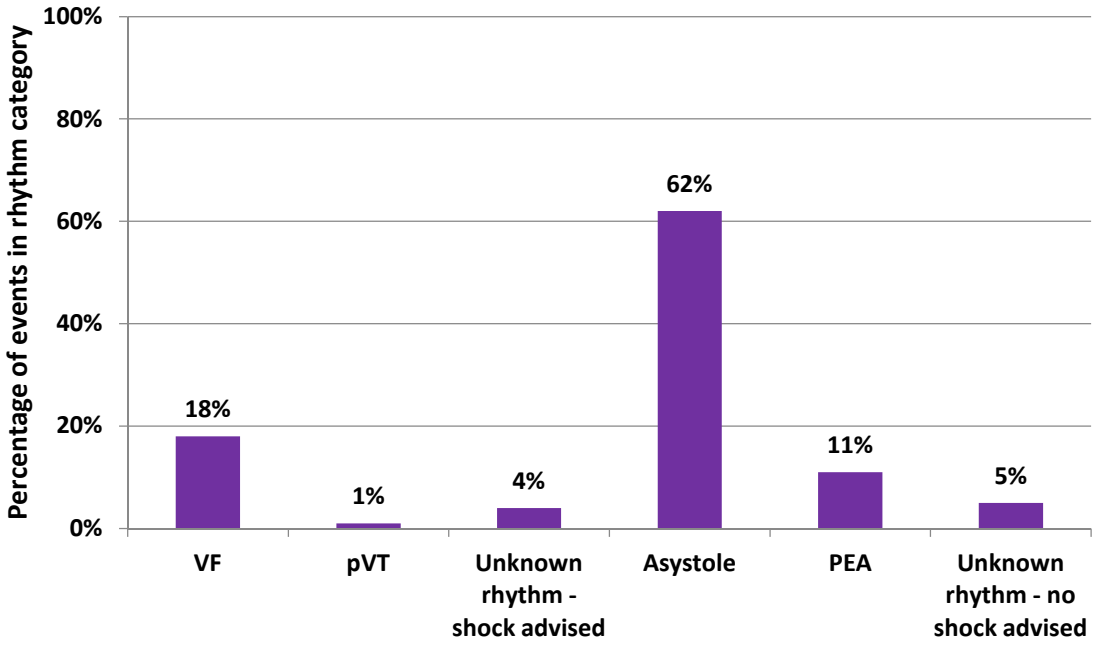
Figure 3: Witnessed status (n= 2,319)



3.10 First monitored rhythm

- 23% of the cases were in a shockable rhythm at time of first rhythm analysis (n=527/2,340)
    - 97% of all cases that were initially shockable had a presumed medical aetiology (n=509/527)
- 62% of all presenting rhythms were asystole (n=1,378/2,340)

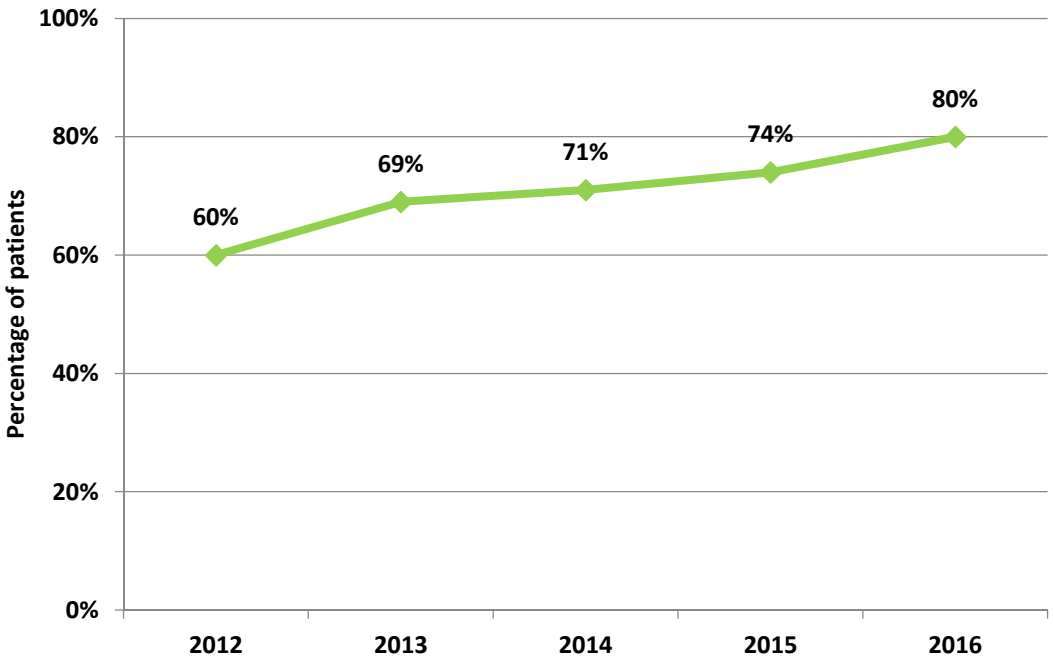
Figure 4: First monitored rhythm (n=2,226)



3.11 Bystander CPR

- Of the 2,140 cases that were not EMS-witnessed, data on B-CPR was available for 2,104 cases. B-CPR was attempted in 80% of these cases (n=1,684/2,104)

Figure 5: Percentage of patients receiving B-CPR before EMS arrival, years 2012 – 2016

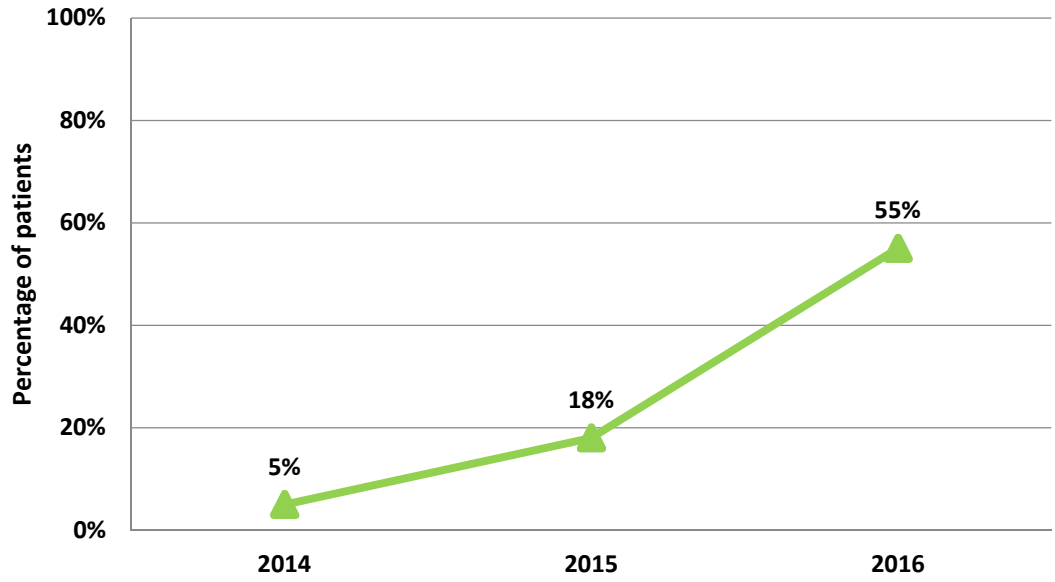


- Where the collapse was witnessed by a bystander, B-CPR was attempted in 84% (n=939/1,115) of cases
- A higher proportion of cases in a rural setting received B-CPR (n=659/826) compared to urban settings (n=989/1,438) (80% vs. 67%; p<0.001)

3.12 Mechanical CPR

- 55% of cases involved the use of mechanical CPR (n=1,185/2,166), **compared to 18% in 2015, and 5% in 2014**.

Figure 6 Percentage of patients receiving Mechanical CPR, years 2014 – 2016



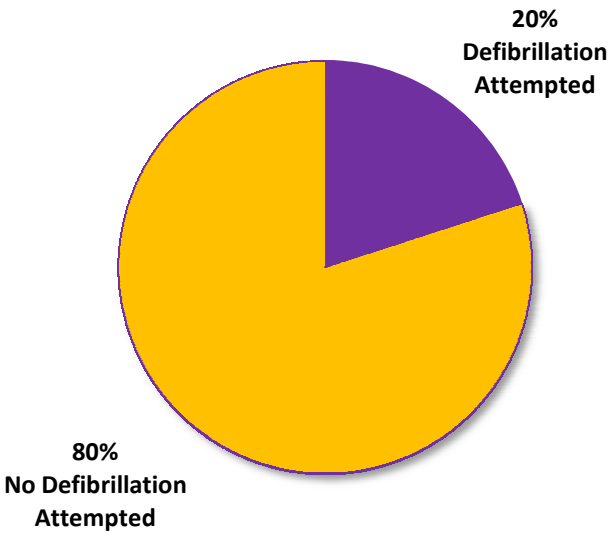
3.13 Defibrillation

- 35% of cases had defibrillation attempted (n=805/2,332)

Of the patients that had defibrillation attempted:

- 19% of cases had the pads applied before EMS arrival (n=433/2,306), **an increase of 1% since 2015** (n=359/2,121)
- 20% had the first shock delivered before ambulance services arrived (n=156/795), **an increase from 18% in 2015** (n=133/738)

Figure 7: Defibrillation attempted before Ambulance service arrival (n=156/795)



In the 156 cases where first shock was delivered before EMS arrival, the identity of the person who delivered the first shock was as follows:

- Doctors (23%, n=37/156)
- Basic Life Supporter (BLS) / Cardiac First Responder (CFR) trained (29%, n=46/156)
- Members of the general public (20%, n=31/156)

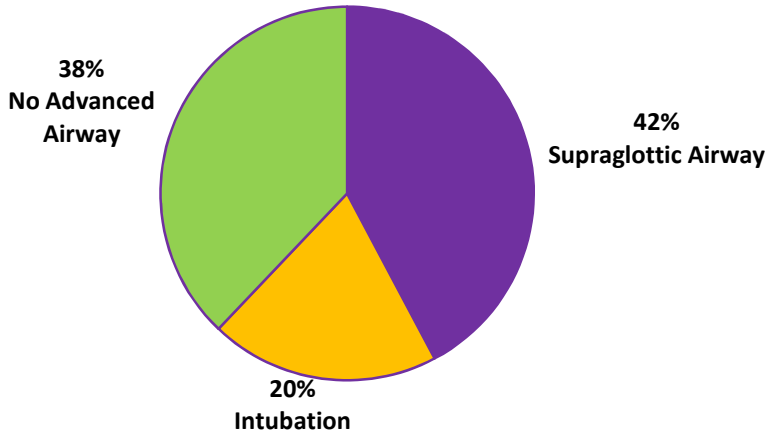
A total of 309 patients converted to a shockable rhythm during resuscitation. Of these:

- 60% were initially in asystole (n=184/309)
- 18% were initially in PEA (n=56/309) had PEA (rhythm type not specified for the remainder)

3.14 Advanced airway adjuncts

- 62% of cases had advanced airway techniques, i.e. supraglottic airway device or intubation (n=1,435/2,325)

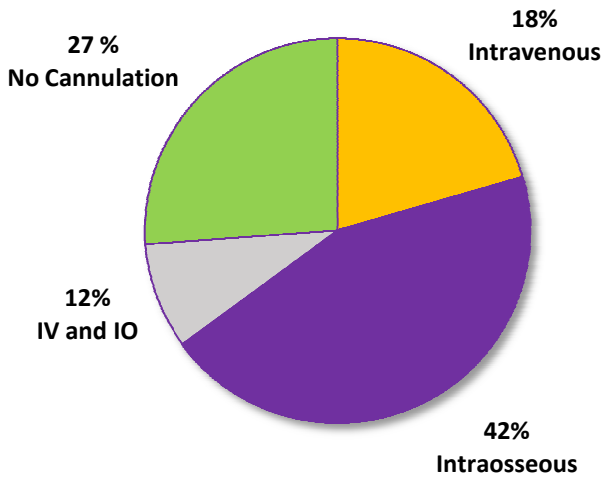
Figure 8: Adjunct airway management (n=2,311)



3.15 Cannulation

- 73% of cases had cannulation performed (n=1,724/2,376)
  - 42% of cases had intraosseous cannulation (n=995/2,364)
  - 18% had intravenous only cannulation (n=436/2,364)
  - 12% had a combination of both techniques (n=293/2,376)
  - 27% of cases were not cannulated (n=640/2,376)

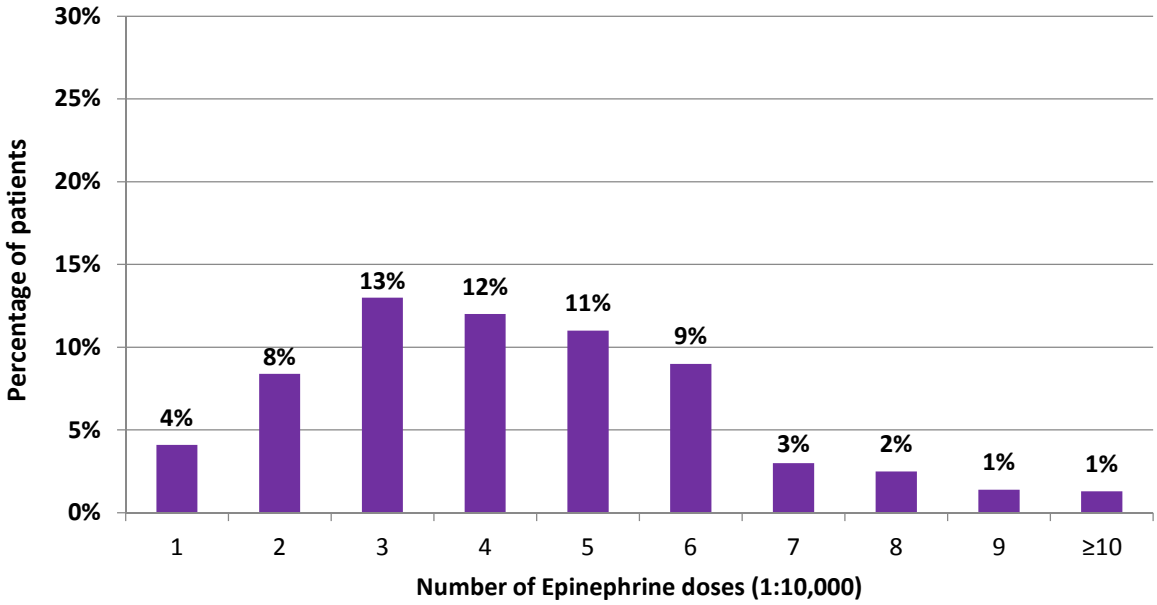
Figure 9: Cannulation method (n=2,364)



3.16 Cardiac arrest medication

- 67% of cases had epinephrine administered (n=1,580/2,373), the number of doses given ranged from 1 to 14

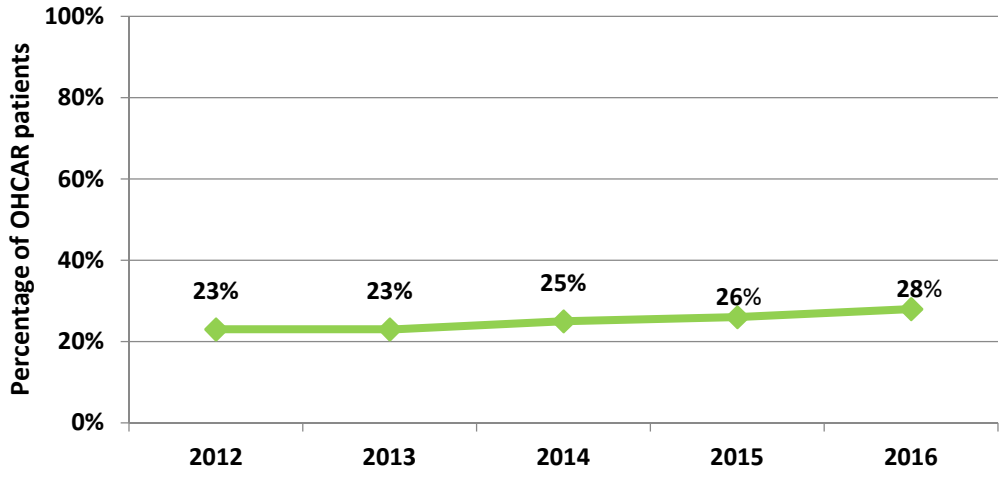
Figure 10: Percentage of Epinephrine doses (1:10,000) (n=1,578)



3.17 ROSC at any stage

- 28% of cases had ROSC before hospital arrival (n=660/2,326). This is **an increase of 2% since 2015**. Data on ROSC was missing for 63 patients
- Of the 2,206 cases available, 31% occurred in an urban setting (n=437/1,392) compared to 21% (n=173/814) in a rural setting (p<0.001)

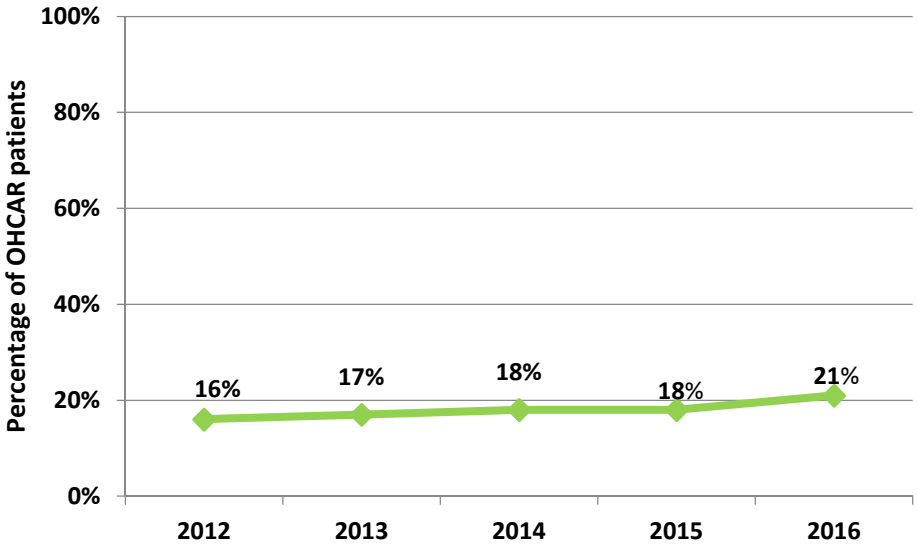
Figure 11: ROSC at any stage pre-hospital, all patients. Years 2012 – 2016 (n=3,172)



3.18 ROSC on arrival at the Emergency Department (ED)

- 21% of cases had ROSC on arrival at the ED (n=477/2,296). Data was missing for 93 patients
- ROSC at the ED was more likely to occur in an urban setting compared to a rural setting (23% vs. 15%; p<0.001)

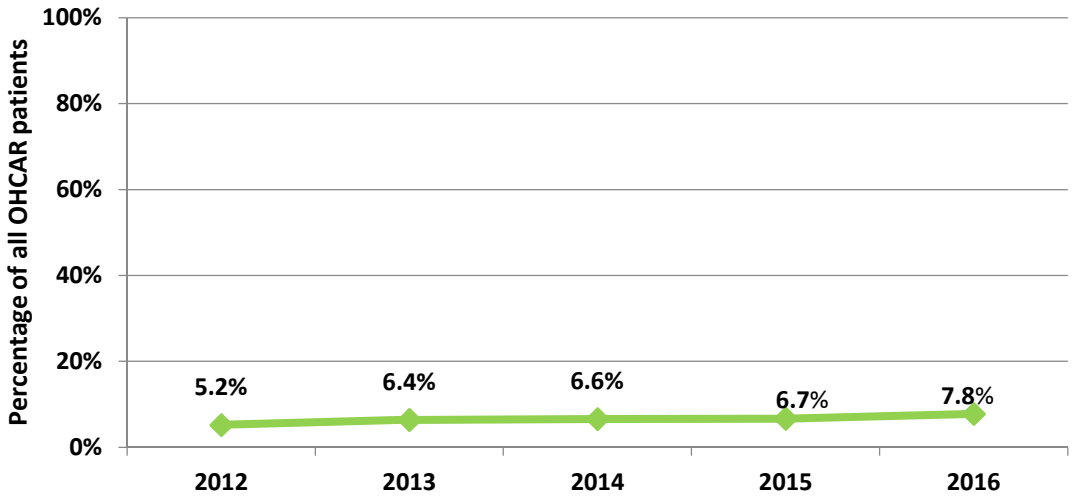
Figure 12: ROSC at ED, all patients. Years 2012 – 2016 (n=2,802)



3.19 Discharged alive from hospital

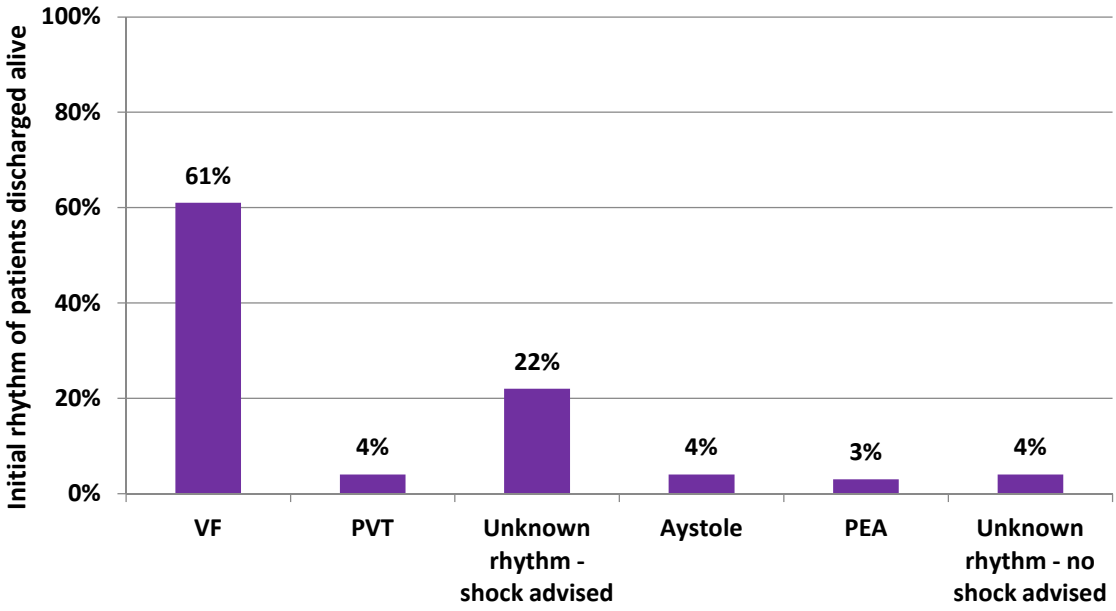
- 7.8% of patients were discharged alive from hospital (n=185/2,382). Data on seven patients who were transported to hospital could not be obtained

Figure 13: Percentage survival to discharge, all patients. Years 2012 – 2016 (n=675/10,293)



- Surviving patients were younger (median age 58 years, IQR 48 – 68) than non-surviving patients (median age 68 years, IQR 53 – 78 years, (p<0.001))
- The presumed aetiology was medical for 97% of survivors
- Survival in the presumed medical aetiology group was 9% (n=179/2,060) compared with 2% (n=6/329) in the non-medical group (p≤0.001)
- 20% of patients who collapsed in a public location survived (n=116/593), compared to 4% of patients that collapsed in a private location (n=68/1,785), (p≤0.001)
- Survival of patients who collapsed in an urban vs. rural setting was 8% (n=113/1,434) vs. 6% (n=48/825)
- 87% of survivors had their first monitored rhythm recorded as shockable (n=160/185)
    - 4% of survivors were initially in asystole
    - 3% were initially in PEA
    - 4% had an unknown, unshockable rhythm. Data missing for the remainder

Figure 14: Percentage of survivors categorised by first analysed rhythm



- In the non-EMS witnessed group of survivors (n=141)
    - 88% had a witnessed arrest
    - 88% received bystander CPR
    - 40% (n=57), had defibrillation attempted (defibrillator pads applied) prior to EMS arrival
    - 39% (n=55) were shocked before EMS arrival, **an increase of 5% from 2015**
- In the EMS witnessed group of patients, **all cases,** 25% survived (n=44/179)
- In the EMS witnessed group of patients that were **>17, medical aetiology, in an initially shockable rhythm,** 59% survived (n=37/63).

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 cerebral disability: conscious, sufficient cerebral function for independent activities of daily life

(3). Severe cerebral disability: dependent on others for daily support because of impaired brain function

(4). Coma or vegetative state

(5). Brain death

CPC score data was available for 122 surviving patients:

- 95% (n=116) had a score of 1 or 2
- 5% (n = 6) had a score of 3 or higher

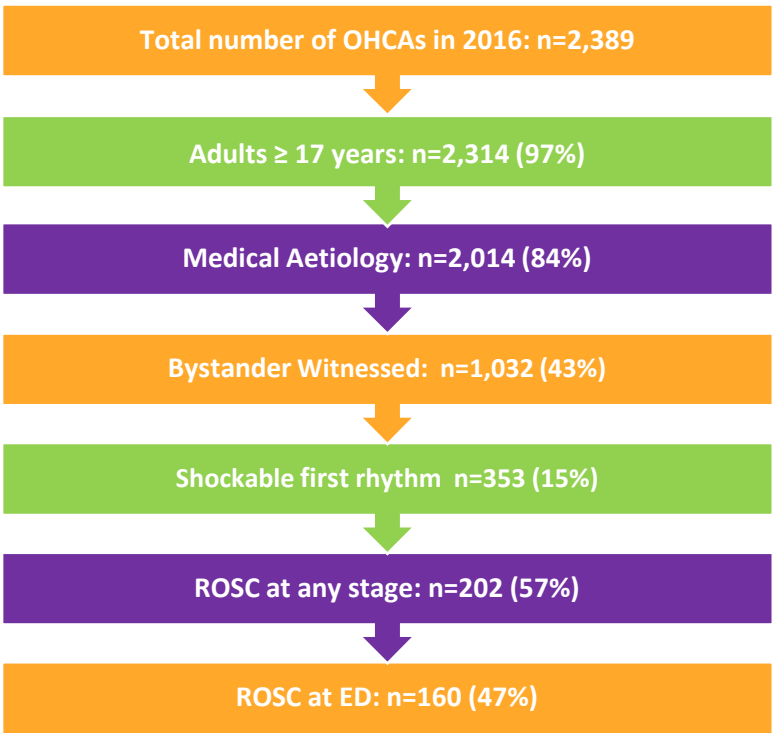
3.21 Utstein comparator subset

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 comparator subset allows for a more standardised comparison of patients outcomes between systems and time periods.

Figure 15: Flowchart of the 2016 comparator subset and ROSC outcomes

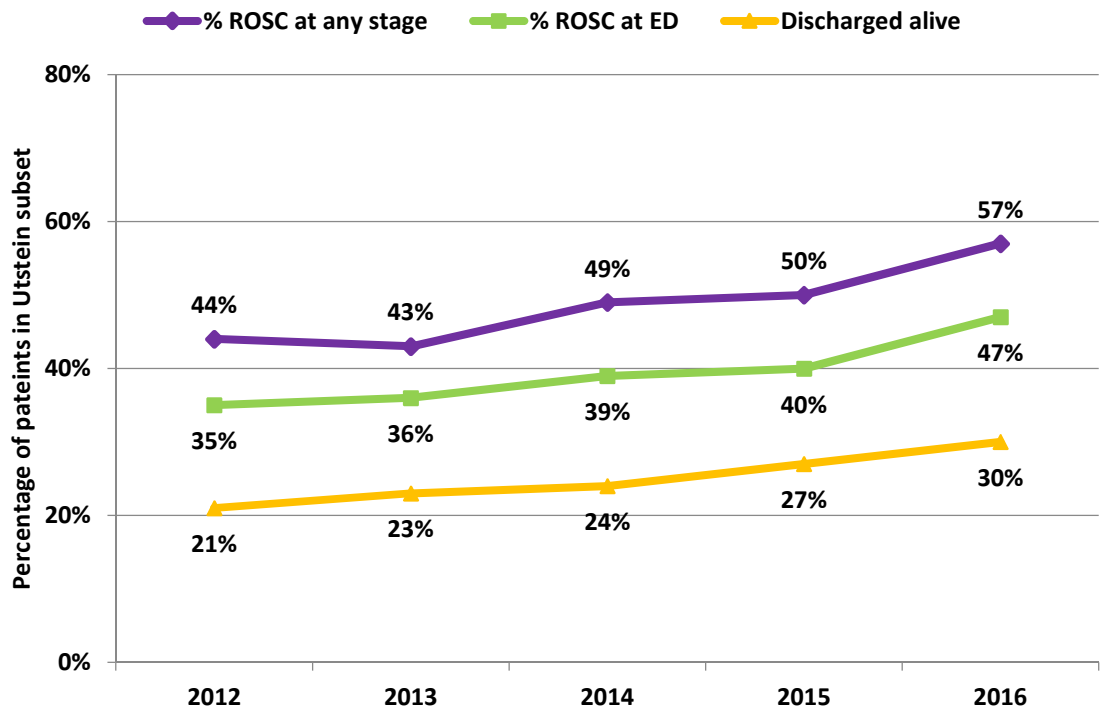


In 2016, the comparator subset included 353 patients and accounted for 15% of all OHCAs (353/2,389).

3.22 Outcomes

- **57%** of patients (n=202/351) achieved ROSC at some stage before hospital arrival
- **47%** of patients (n=160/339) had ROSC on arrival at the ED
- **30%** of patients (n=107/351) were discharged alive from hospital
- Of the 73 survivors for whom CPC was available, 70 patients had a CPC score of one or two (96%)

Figure 16: Outcomes in the Utstein comparator group years 2012 – 2016



Case Characteristics

- Of those patients who collapsed in a public location, 44% survived (n=71/161) compared to 19% in a private location (n=36/190)
- 74% of cases were recognised as cardiac arrest at the time of ambulance dispatch (n=260/353)
- Bystander CPR was performed on 90% of survivors
- 43% of the patients who survived had defibrillation attempted before ambulance service arrival (n=46/107)

Chapter 4

4.0 Discussion

4.1 OHCAR reporting to service providers

OHCAR 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 study

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%). The overall EuReCa ONE proportion of ROSC at arrival to hospital was 25% (Ireland 16%) and discharged alive was 10.3% (Ireland 5.9%).

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%).

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 will be 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. Data collection will begin in October 2017 for a three month period until 31st December 2017. OHCAR will provide OHCA data for incidents in Ireland to the EuReCa TWO study.

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 datahub -a centralised web enabled database is required to improve the data capture, efficiency of operating the register and data quality of OHCAR. NAS is implementing an electronic PCR and funding has been secured to develop an OHCAR database which will be aligned with the electronic PCR system.

Chapter 5

5.0 Conclusion

Since the last OHCAR Annual Report was published in 2015, there has been an increase of 9% more cases reported to OHCAR. Bystander attempts at CPR have risen by 6%, to 80% of cases. The use of mechanical CPR has increased from 18% of cases in 2015 to 55% of all OHCAR cases.

Attempted defibrillation before EMS arrival has increased from 18% to 20%. ROSC before hospital arrival has increased from 26% to 28%. ROSC on arrival at hospital has increased from 18% to 21%. Discharge alive from hospital has increased by 1% to 7.8%.

In the Utstein group the ROSC prior to hospital arrival has increased from 50% to 57%, and ROSC at Hospital arrival from 40% to 47%. Discharge alive has increased from 27% to 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 2016 – July 2017:

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.
Dr. Martine Dennekamp	Air Pollution, Temperature and Out of Hospital Cardiac Arrests in Ireland.
Mr. Peter Hendrick	An analysis of information contained on the Out of Hospital Cardiac Arrest Registry to establish if a change in protocols for the management of out of hospital cardiac arrest of PEA aetiology is required.

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, District Officer / EMS Support Officer

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

OHCA Strategy - Project Manager

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

HSE - Department of Public Health Medicine North West - Senior Surveillance Scientist, Administration, Business Manager, Geographical Information Officer

DAA - Information Officer

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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 four times from December 2016 to October 2017.

The membership at August 2017 is:

- Professor Gerard Bury, UCD Centre for Emergency Medical Science
- Mr. Gerry Clarke, Operational Support and Resilience Manager, NAS
- 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.

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Masterson S, Jensen M. Complying with Utstein guidelines: Comprehensive case identification in the Irish national out-of-hospital cardiac arrest register. Resuscitation. Jan 16 2016, doi:10.1016/j.resuscitation.2015.12.018.

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Nishiyama, C., S. P. Brown, S. May, T. Iwami, R. W. Koster, S. G. Beesems, M. Kuisma, A. Salo, I. Jacobs, J. Finn, F. Sterz, A. Nurnberger, K. Smith, L. Morrison, T. M. Olasveengen, C. W. Callaway, S. D. Shin, J. T. Grasner, M. Daya, M. H. Ma, J. Herlitz, A. Stromsoe, T. P. Aufderheide, S. Masterson, H. Wang, J. Christenson, I. Stiell, D. Davis, E. Huszti & G. Nichol (2014) Apples to apples or apples to oranges? International variation in reporting of process and outcome of care for out-of-hospital cardiac arrest. Resuscitation, 85, 1599-609.

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Appendix 3

OHCAR comparator subset 2016 – Regional results

Figure 1: Number of OHCAR patients in the Utstein group by region (n=353)

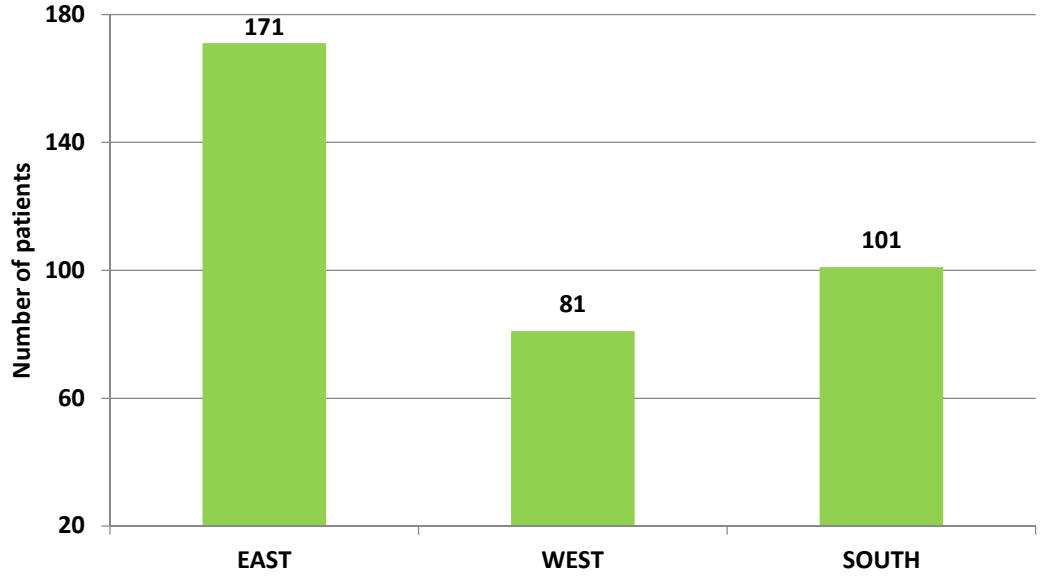

Figure 2: Dispatcher recognition of cardiac arrest at time of ambulance dispatch (n=260):

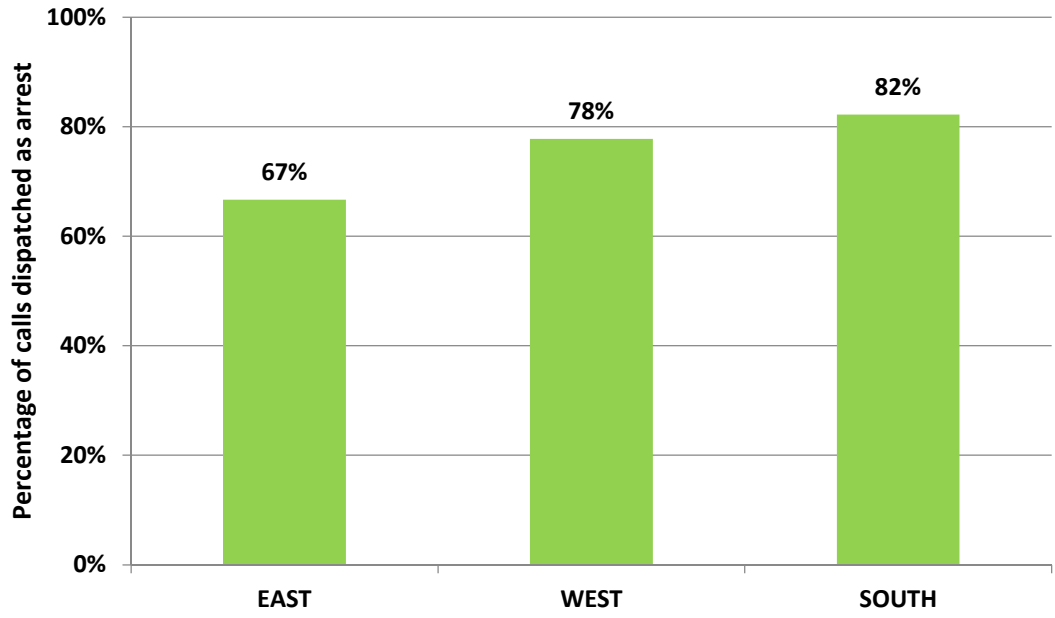

Figure 3: Percentage of cases with bystander CPR:

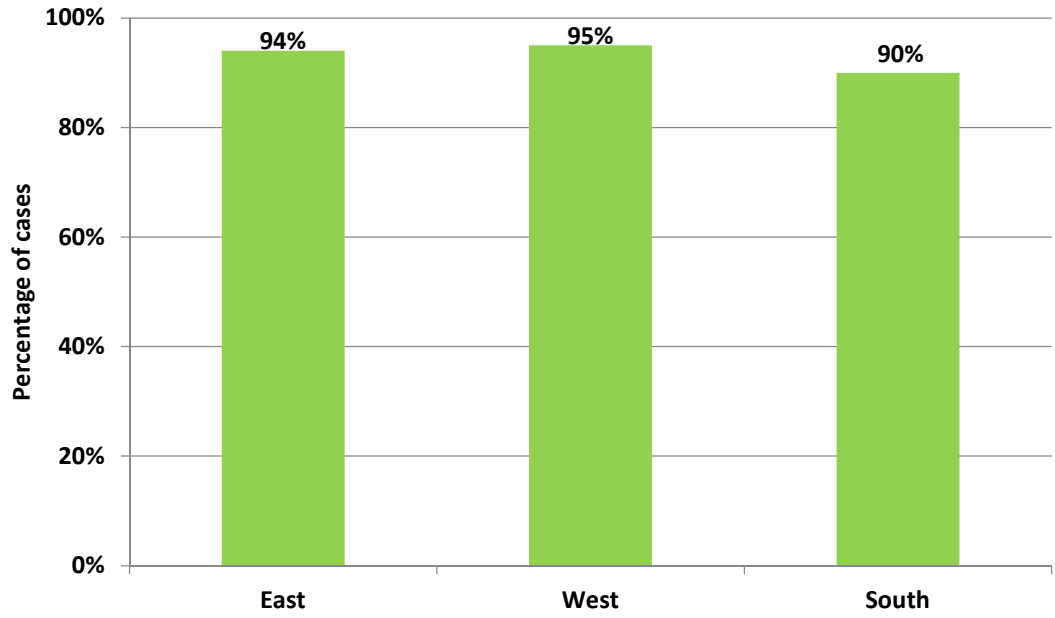

Figure 4: ROSC at any stage, ROSC at ED and discharge alive: