National Ambulance Service

Out of Hospital Cardiac Arrest Register

Annual Report 2022

October 2023

Out-of-Hospital Cardiac Arrest Register

OHCAR Ireland

At the heart of evidence

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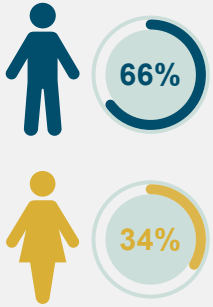
OUT OF HOSPITAL CARDIAC ARREST REGISTER KEY FINDINGS 2022

DEMOGRAPHICS

2,802

out of hospital arrest incidents were recorded as attended by the EMS



Private Setting*
*Includes home, farm or residential institution

Occurred in the home

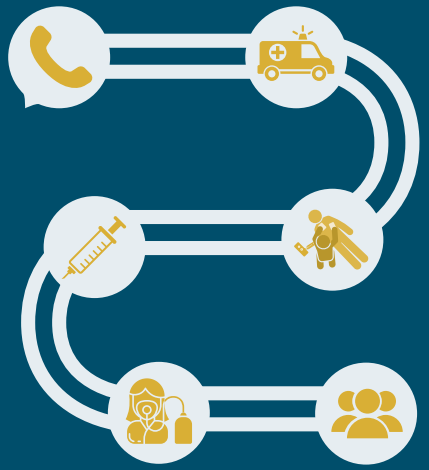
Public Setting

EMERGENCY MEDICAL SERVICES

82% cardiac arrest recognition by emergency call takers

72% epinephrine administered

59% advanced airway use

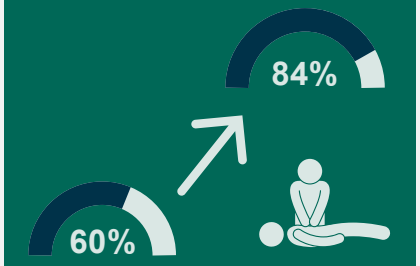


36% transported to hospital

32% defibrillation performed

18% EMS witnessed cases survived

COMMUNITY INVOLVEMENT



Since 2012, Bystander CPR has **increased from 60% to 84%**

10%
defibrillated before EMS arrival **(n=282/2,802)**

31% of cases defibrillated **before** EMS arrival survived **(n=87/282)**

POST CARDIAC ARREST OUTCOME

206 PEOPLE

Returned to their communities

98%

98% of survivors were recorded as having a good neurological outcome

25%

25% of patients in the Utstein comparator group survived to hospital discharge

EMS - Emergency Medical Services CPR - Cardio Pulmonary Resuscitation CFR - Community First Responder

OHCAR Key Messages 2022

Overall Patient and Event Characteristics

- 2,802 out-of-hospital cardiac arrest incidents recorded on OHCAR (55 per 100,000 population in 2022)
  - 59% occurred in an urban area [a]
  - 66% Male
  - Median age 69 years (interquartile range 54 – 79)
  - 84% presumed medical cause
  - 69% happened in the home
  - 84% Bystander CPR attempted
  - 53% Bystander witnessed
  - 10% of patients had defibrillation attempted pre EMS arrival
  - 19% had sustained ROSC to Hospital arrival
  - 31% had ROSC pre-hospital arrival
  - 19% had sustained ROSC to Hospital arrival

Survivors - Patient and Event Characteristics

206 patients survived

- 7.3% Discharged alive
  - 183 had good to moderate neurological function on discharge

Utstein Group

- 14% of patients were in the Utstein Group [b]
  - 50% ROSC pre-hospital
  - 39% ROSC on arrival at hospital
  - 25% were discharged alive

[a] Definition of urban is matched with the CSO definition of a settlement i.e. 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 includes patients who are >17 years, with presumed medical aetiology, bystander witnessed event and an initial shockable rhythm.

Abbreviations

Acronym	Term
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
DAFR	Dublin Airport Fire and Rescue
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

Jonathan's Story

Meath man Jonathan Doherty was in his early 40s and a regular runner. He was not a likely candidate for a cardiac arrest. But all that changed one sunny summer's day in 2022.

The father of two had just returned from a routine 5k run when he began experiencing pains in his arm.

"I had jumped in the shower and started getting pains in my left arm, I thought it was muscular from the run so just started doing some light stretches. It wasn't getting any better so I had to lie down and that's when I knew something was up. I was getting heart palpitations and was sweating quite a lot. I called my wife Claire upstairs to tell her. She was very calm – or in total shock – and rang the ambulance," Jonathan explained.

She was transferred to a paramedic and the call taker quickly realised that I was in cardiac arrest and dispatched the local first responders to assist until the ambulance arrived on the scene.

As luck would have it, a husband and wife team of first responders were Jonathan's neighbours.

"Jonathan and Deirdre [Roughneen] are two kilometres down the road and they got up to help straightaway. They always go on calls together. Jonathan delivered CPR and worked on me until the ambulance came. I really owe them my life," he said.

Luck was certainly on Jonathan's side as the husband and wife duo were just about to take advantage of the lovely June weather to go on a bike ride. Five more minutes and they wouldn't have been able to take the call. The nearest other first responder was also unavailable at the time.

"We live in a very rural part of Meath and we had always wondered what would happen if we needed an ambulance quickly, like if the children had a choking incident. As it happens, the ambulance wasn't able to get here for 45 minutes so I wouldn't be here without the first responders and their CPR," said Jonathan.

Jonathan is now back at work full-time. He explained that the recovery from the CPR was among the hardest things for him to recover from physically.

"It was a full two months until I fully recovered. The CPR can be very hard on the chest and it took so much out of me. I was in hospital for eight days and then I slowly got stronger. I went back to work very slowly too, making sure I didn't overdo it."

Although he can no longer run, he has switched his love to walking.

"I get a lot of walking in as I can't run anymore with the ICD device that I have fitted. But I am used to it now and really enjoying it. I really can't complain," he said.

Jonathan, dad to Darragh and Grace, is currently training to become a first responder having benefited from it first-hand.

"It is something everyone should do," he said. "We train in teams and work on three or four scenarios, like a child choking or an adult experiencing chest pains. The situations obviously aren't real but it helps to get you familiar with the procedures you need to go through and what a scene might look like. It is such a worthwhile thing to do."

Nada's story

Out enjoying a New Year's Day, Nada Kanj and her husband Finn passed some of the defibrillators that Nada and her fellow Community First Responders in Shankill Ballybrack, Co Dublin were responsible for maintaining.

Little did either of them know that less than 24 hours later, one of those same defibrillators would end up saving Finn's life.

"Finn reminded me that I hadn't done my checks on the defibrillators that week as it was my turn. He wouldn't normally even mention them. But despite the fact that I was feeling a bit lazy, I opened each one up and made sure everything was in working order and we continued on our walk," she explained.

"The next day, 2 January 2023, I went back to work in Sandyford, and Finn was returning to Denmark for work. He had been commuting between our Dublin home and Denmark for six years at this point. He said he would text me once he got on the bus to the airport that morning. By lunchtime, I hadn't heard from him and thought it was very unusual. I just felt something was wrong and dumped my lunch without eating it and returned to my desk," she said.

While she was at her desk and after a number of unanswered texts, her phone rang – it was Finn's number.

"It was a garda calling on his phone. He explained that Finn had collapsed on the street with a cardiac arrest and that they were giving him CPR and would be taking him to St James' Hospital. I raced out of the office and got in my car. I don't know how I got there but I arrived at the scene seven minutes later and saw the ambulance there – I just screamed," said Nada.

She phoned two of her friends from the Community First Responders – Dave McCormack and Catherine Malone – but they were already on the scene helping Norwegian-born Finn.

Nada said that without a huge amount of lucky coincidences, Finn would not have made it.

"It was the day after New Year's Day so there was hardly anyone around. The only two people on the street at the time were a doctor and a nurse. Liz, a nurse, had just moved to Shankill and was on her way for coffee. Hannah Marshall, the doctor, was only in Ireland for her sister's wedding and was on her way to the airport at the time. It was as if they were supposed to be there to help Finn and I couldn't be more grateful," she said.

Nada said that Finn had effectively died for two minutes before he was revived by the efforts of the pair and highlighted the need for as many people in the community to get the Community First Responder training as possible.

"Finn was lucky that the two people that came along had training in CPR. Others won't be as lucky. In situations like this, every second counts. That's why I would encourage people to become a Community First Responder. I am originally from Lebanon and have been living here 18 years. I became one because I felt like I wanted to give something back to the community," she said.

Finn's life has completely changed since his cardiac arrest. He spent a time in intensive care and then had to undergo a long and slow rehab. Nada noted that he did not have any of the warning signs of a cardiac arrest and believes it was his stressful job that was the main factor.

"Finn is in his mid-50s and was otherwise fit and healthy. He did have a very stressful job in Denmark and he has decided not to go back to it. We were very lucky – it was a miracle. Not many people get this lucky. We will take time finding him something less stressful," Nada said, adding that he is well on the road to recovery and they climbed the Sugar Loaf Mountain together that weekend.

"Money comes and goes but you only get one life."

Chapter 1

Introduction – OHCAR and COVID-19

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

The OHCAR Steering Group and Governance

The Aim of OHCAR

OHCAR reporting to Service Providers

Ireland and the EuReCa Studies

Chapter 1

1.0 Introduction – OHCAR and COVID-19

The Coronavirus (COVID-19) first emerged during December 2019, and by December 2021, this contagious virus had been confirmed in over 767 million people, and has been linked to over 6.9 million deaths globally (WHO, 2023).[1]

In 2022 the HSE advice on dealing with a suspected COVID positive patient included the mandatory use of personal protective equipment (gloves, facemask, gown and eye protection). Due to the risk of spreading the virus during aerosol generating procedures, which includes cardiopulmonary resuscitation, the International Liaison Committee on Resuscitation (ILCOR)[2] advised against these procedures. OHCAR contributed data to HSE guidance regarding CPR and do-not-attempt resuscitation decision making during the COVID pandemic.[3] Throughout 2022, COVID prevalence continued to have an impact on EMS services.

> ***"In 2022 the HSE advice on dealing with a suspected COVID positive patient included the mandatory use of personal protective equipment (gloves, facemask, gown and eye protection)"***

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".[4] The need for OHCAR was also emphasised in the policy document "Changing Cardiovascular Health" [5] and the "Emergency Medicine Programme Strategy".[6] OHCAR is one of six OHCA registries in Europe with full national coverage.

1.2 The OHCAR Steering Group and Governance

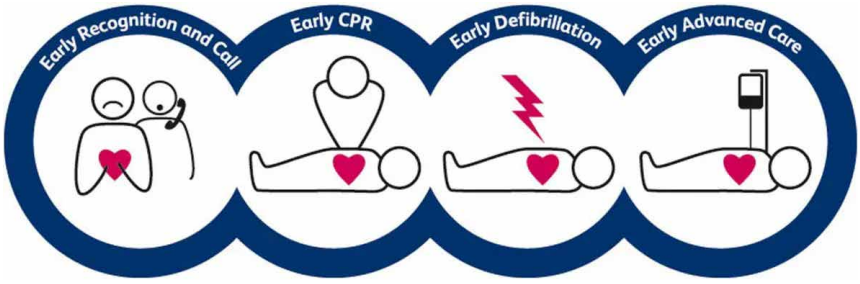
OHCAR is an integral part of the Clinical Directorate of the National Ambulance Service (NAS), Health Service Executive (HSE) and is guided by the OHCAR Steering Group (Appendix 1).

1.3 The Aim of OHCAR

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

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

> ***"The Chain of Survival has 4 steps and can be implemented by any member of the public, supported over the phone by the HSE National Ambulance Service (NAS) 112/999 team."***



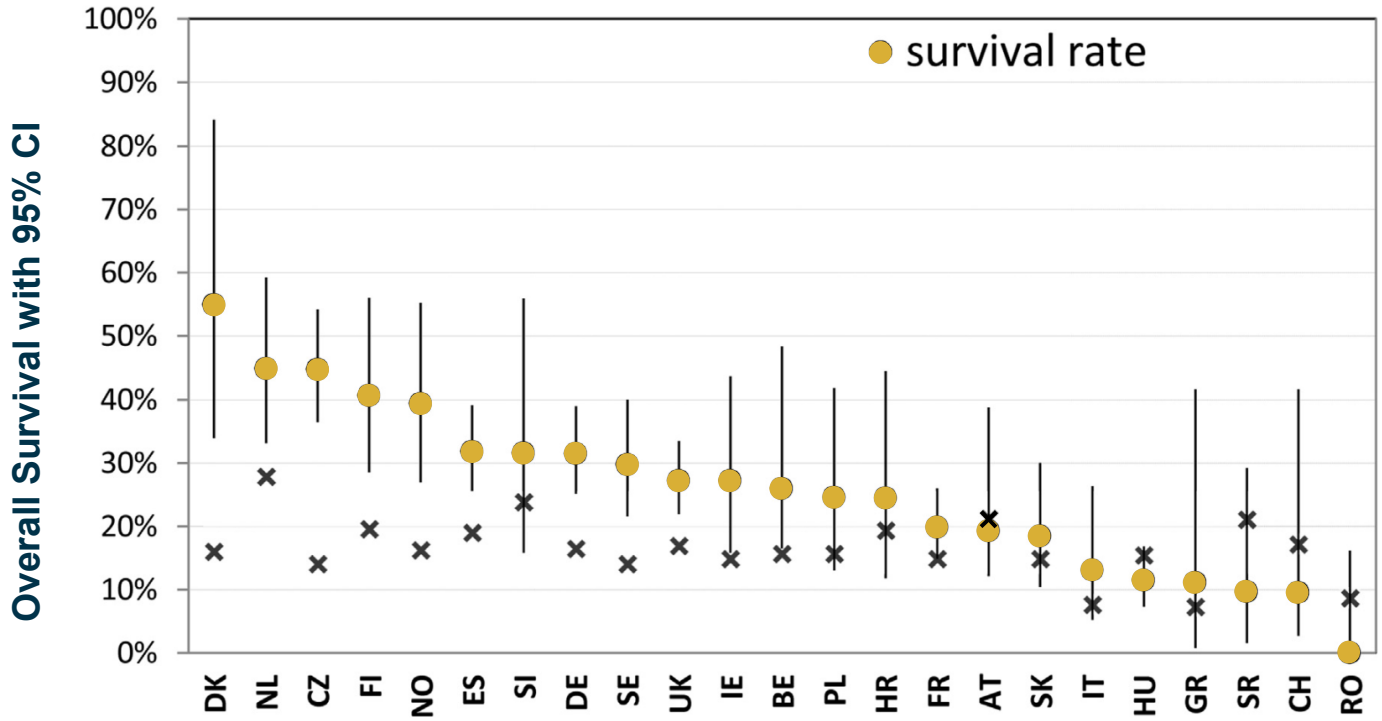
1.4 OHCAR reporting to Service Providers

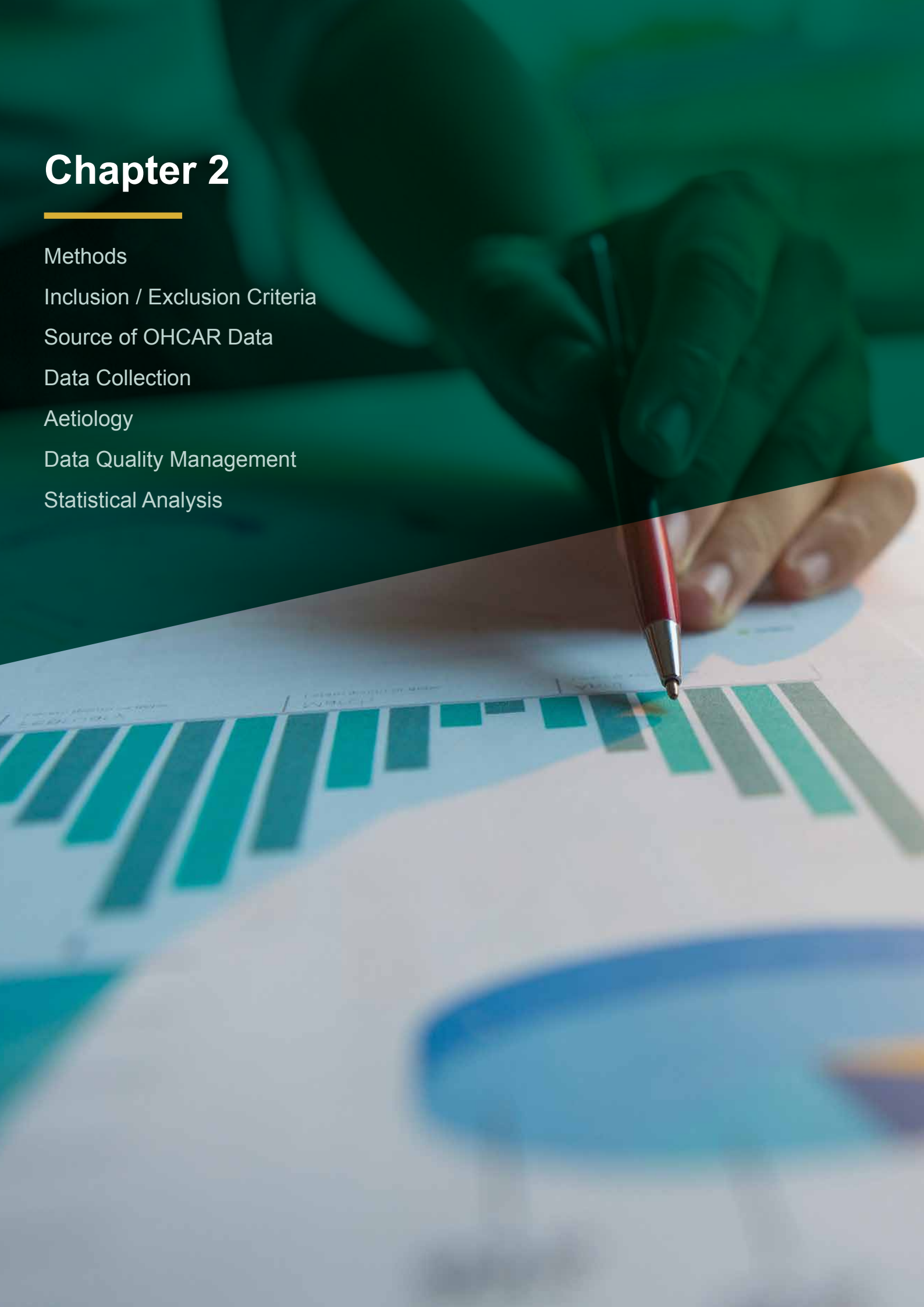
OHCAR is used to provide data for the 'ROSC at Hospital' monthly clinical Key Performance Indicator for NAS, and also to provide detailed regional quarterly reports. These include descriptive data elements and outcome variables at regional level and constitute the data source for reports circulated by NAS to stations for the ONELIFE initiative, which is a NAS run quality improvement programme. A quarterly report is provided to Dublin Fire Brigade (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.

1.5 Ireland and the EuReCa Studies

EuReCa THREE was launched in June 2022. OHCAR has provided National OHCA data for incidents in Ireland to the EuReCa THREE study, which covered the time period from 1st September to November 30th 2022. In 2017 Ireland participated in the EuReCa TWO study (Figure 1), which was a three month study from October to December 2017, and was published in 2020.[7] Ireland was one of only four countries that contributed data for the entire country for the study period. In October 2014, Ireland participated in the EuReCa ONE [8,9] study – a one-month survey of OHCA cases in 27 countries across Europe. Ireland was one of only seven countries that contributed data for the entire country for the study period.

Figure 1: EuReCa TWO overall survival rates in Utstein group





Chapter 2

Methods

Inclusion / Exclusion Criteria

Source of OHCAR Data

Data Collection

Aetiology

Data Quality Management

Statistical Analysis

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 by the EMS, unless Return of Spontaneous Circulation (ROSC) is present" (Figure 2). A resuscitation attempt is defined as performance of cardiopulmonary resuscitation (CPR) and/or attempted defibrillation where there is evidence of a cardiac arrest rhythm.

Figure 2: Inclusion criteria

Total number of OHCAR cases

n = 4,563

Number that a resuscitation attempt

n = 3,177

Number that had resuscitation continued on EMS arrival

n = 2,802

2.2 Source of OHCAR Data

The primary sources of OHCAR data are Patient Care Records (PCRs) and 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 Fire and Rescue (DAFR), Red Cross, Civil Defence, Irish Coastguard and Order of Malta, but almost all data is provided from statutory services.

2.3 Data Collection

OHCAR collects data in the format of the internationally agreed Utstein dataset.[10,11]

National Ambulance Service: NAS uses electronic PCRs (ePCR), and during 2022 OHCAR identified all cases via the ePCR system. 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.

Dublin Fire Brigade: PCRs are sourced by DFB's EMS Support Unit and data are 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 case validation.

Hospitals: OHCAR has a data sharing agreement with all hospitals who receive OHCA patients except Our Lady's Children's Hospital, Crumlin. Data collection from hospitals is facilitated by various hospital staff, including administrators, resuscitation officers, clinical nurse managers and consultants. Acute hospitals provide information on survival status and Cerebral Performance Category (CPC) score.[c 12,13]

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

2.4 Aetiology

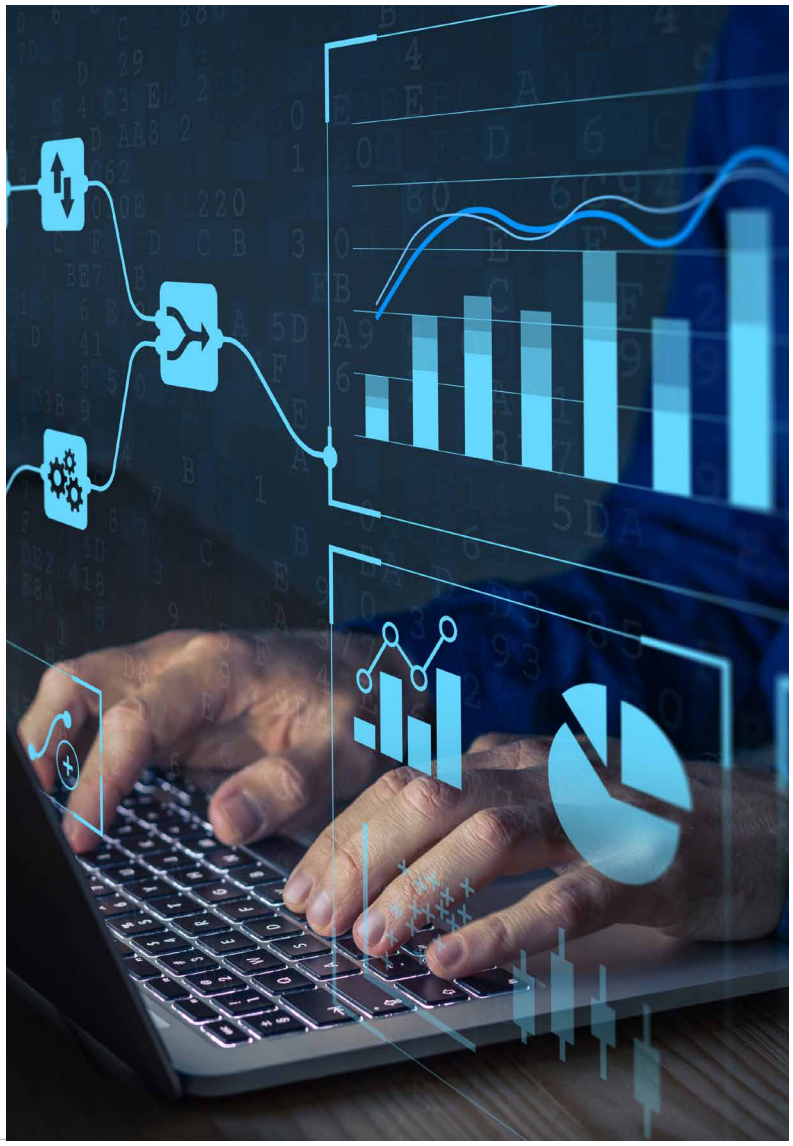
As per the Utstein definition, where there is no evidence of another cause, e.g. trauma, asphyxiation, drug overdose cases were presumed to be of medical aetiology.

2.5 Data Quality Management

The Utstein guidelines state that, “organisers of OHCA registries should implement monitoring and remediation for completeness of case capture.[11] ‘’ The quality 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 data quality by providing quarterly reports which include a summary of the availability of some core data elements. NAS then produces 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 duplication searches
- Checking for inconsistent and/or conflicting data values
- Validation of initial data entries and against OHCAR inclusion criteria
- Clinical expertise is provided by the OHCAR Steering Group when required.



2.6 Statistical Analysis

Data analysis was performed using IBM SPSS version 27. In all cases $p<0.05$ was used as the level of statistical significance. Where appropriate, relationships between categorical values were expressed in percentages and examined by the Chi square test for significance.[14]

Chapter 3

Results for 2022
Incidence
Geographical Distribution of Incidents
Demographics
Community First Responders
Presumed Aetiology
Call Response Interval
Transported to Hospital
Event Location
Witness Status
First Monitored Rhythm
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Utstein Comparator Subset Outcomes

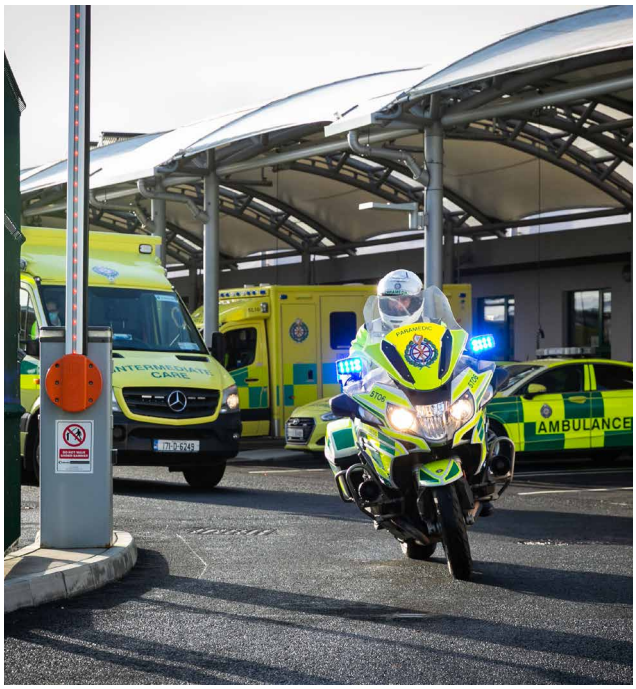
Chapter 3

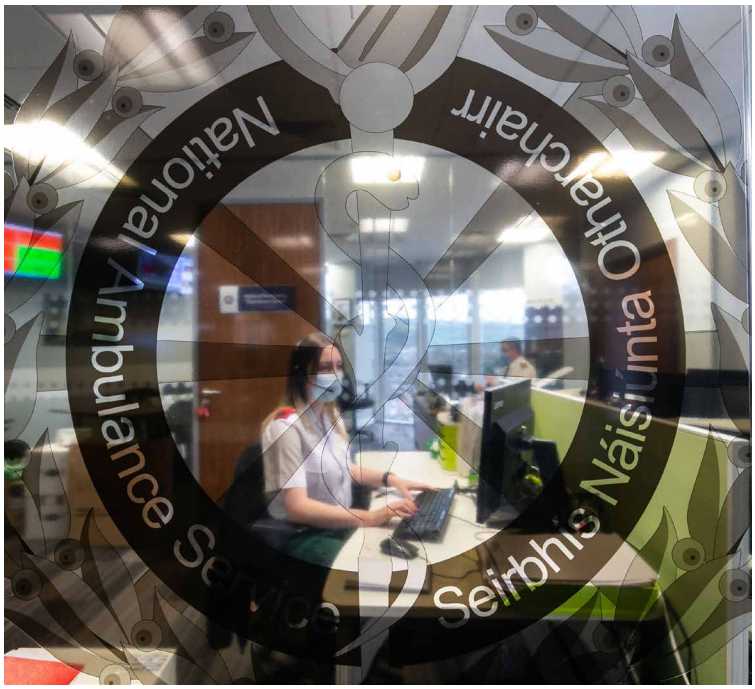
3.0 Results for 2022

3.1 Incidence

In 2022, a total of **2,802** OHCA were attended where resuscitation was reported to have been attempted by NAS, DFB, DAA or bystanders, and continued by the EMS. This equates to 55 OHCA resuscitation attempts per 100,000 in 2022 [15], (50/100,000 East, 57/100,000 in the South and 62/100,000 in the West. In Europe, the estimated incidence of OHCA ranges between 27 and 91 per 100,000 per year.[16]

In 2022, the majority of OHCA incidents were presumed to be of medical aetiology (46/100,000 persons) compared to a small proportion of cases of non-medical aetiology (trauma, asphyxia, drug overdose or submersion, 9/100,000 persons). The HSE West Area reported the highest incidence at 51/100,000 persons (Map 1[d]).





[d] Population data from Census of Population 2022 [15].

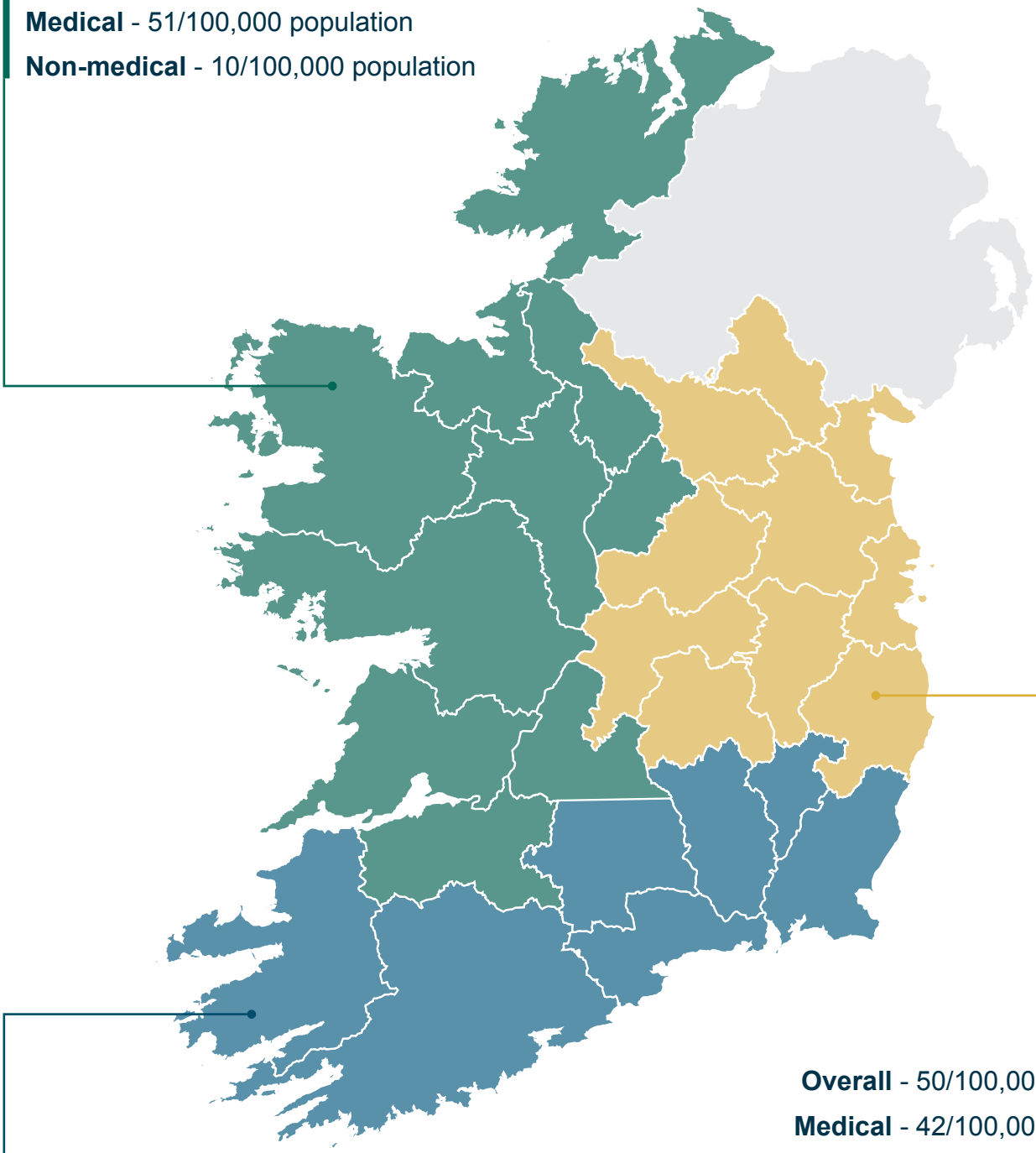
Map1: Incidence of OHCA with resuscitation attempts in 2022

WEST

Overall - 62/100,000 population

Medical - 51/100,000 population

Non-medical - 10/100,000 population



EAST

Overall - 50/100,000 population

Medical - 42/100,000 population

Non-medical - 8/100,000 population

SOUTH

Overall - 57/100,000 population

Medical - 48/100,000 population

Non-medical - 9/100,000 population

Health Atlas Ireland

3.2 Geographical Distribution of Incidents

The geographical coordinates of incident locations were mapped 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 an urban area matches with the Central Statistics Office (CSO) definition of a settlement i.e. urban settlements are towns with a population of 1,500 or more, while settlements with a population of less than 1,500 are classified as rural.[17]

- 59% of cases occurred in an urban area (n=1,643/2,650); 152 cases could not be geocoded due to insufficient data or the event having occurred during ambulance transport (146 and 6 respectively)

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

- **Rural**
- **Urban**

3.3 Demographics

- 1,862 patients were male (66%)
- Patients ranged in age from less than one to 101 years old (median age 69 years, interquartile range (IQR) 54 – 79)
- Females were older than males (69 years (IQR 54 – 79) vs. 67 years (IQR 53 – 77) respectively), (p<0.001)
- Females were more likely to collapse in a private setting (homes or residential institutions) than males (n=815/938, 87% v 1,345/1,862, 72%), (p<0.001).

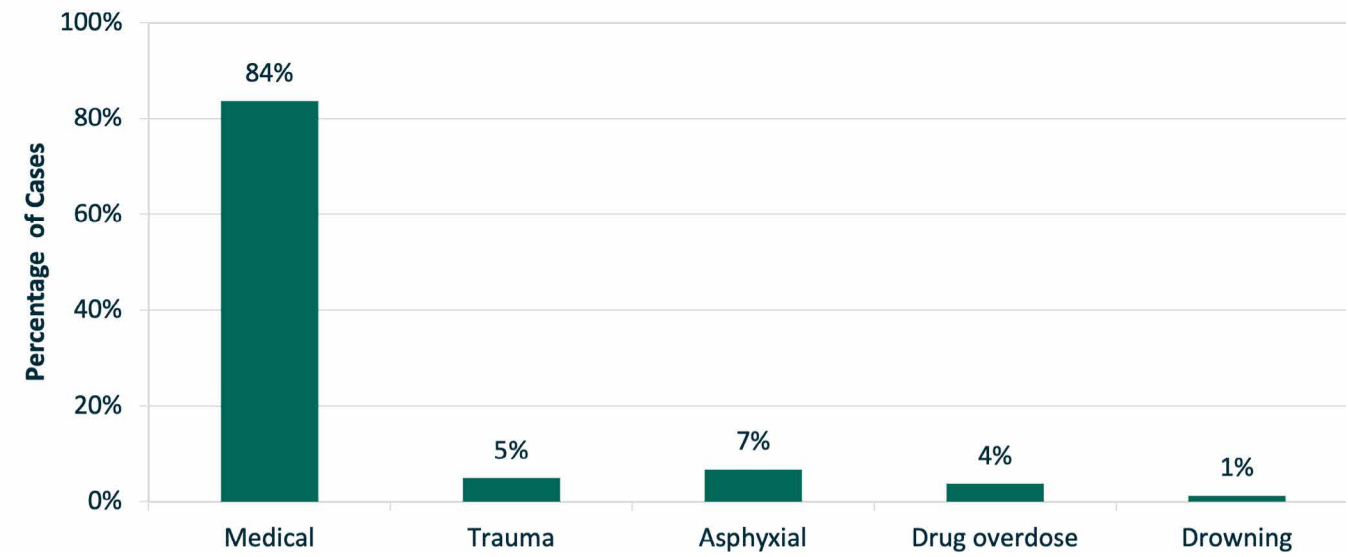
3.4 Community First Responders

In December 2022 there were 275 Community First Responder (CFR) groups in 26 counties linked with NAS; however there were only 209 active CFR resources. 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. The CFR groups operate on a voluntary basis and are trained in basic life support and the use of defibrillators. They are co-ordinated locally by volunteers, work under the auspices of the National Ambulance Service policy, and are dispatched by ambulance control.

3.5 Presumed Aetiology

- 84% of incidents were presumed to be of medical aetiology (n=2,342/2,802)
- Non-medical aetiologies included (Figure 2):
  - 7% asphyxia (n=187)
  - 5% trauma (n=136)
  - 4% drug overdose (n=103)
  - 1% submersion (n=34)
- 82% of male patients had a presumed medical aetiology (n=1,534/1,862) compared to 86% of female patients (n=806/938), (p<0.047).
- Patients with a presumed medical aetiology were significantly older than all other aetiologies (71 years vs. 47 median years respectively), (p<0.001).

Figure 3: Presumed aetiology (n=2,342)



3.6 Call Response Interval

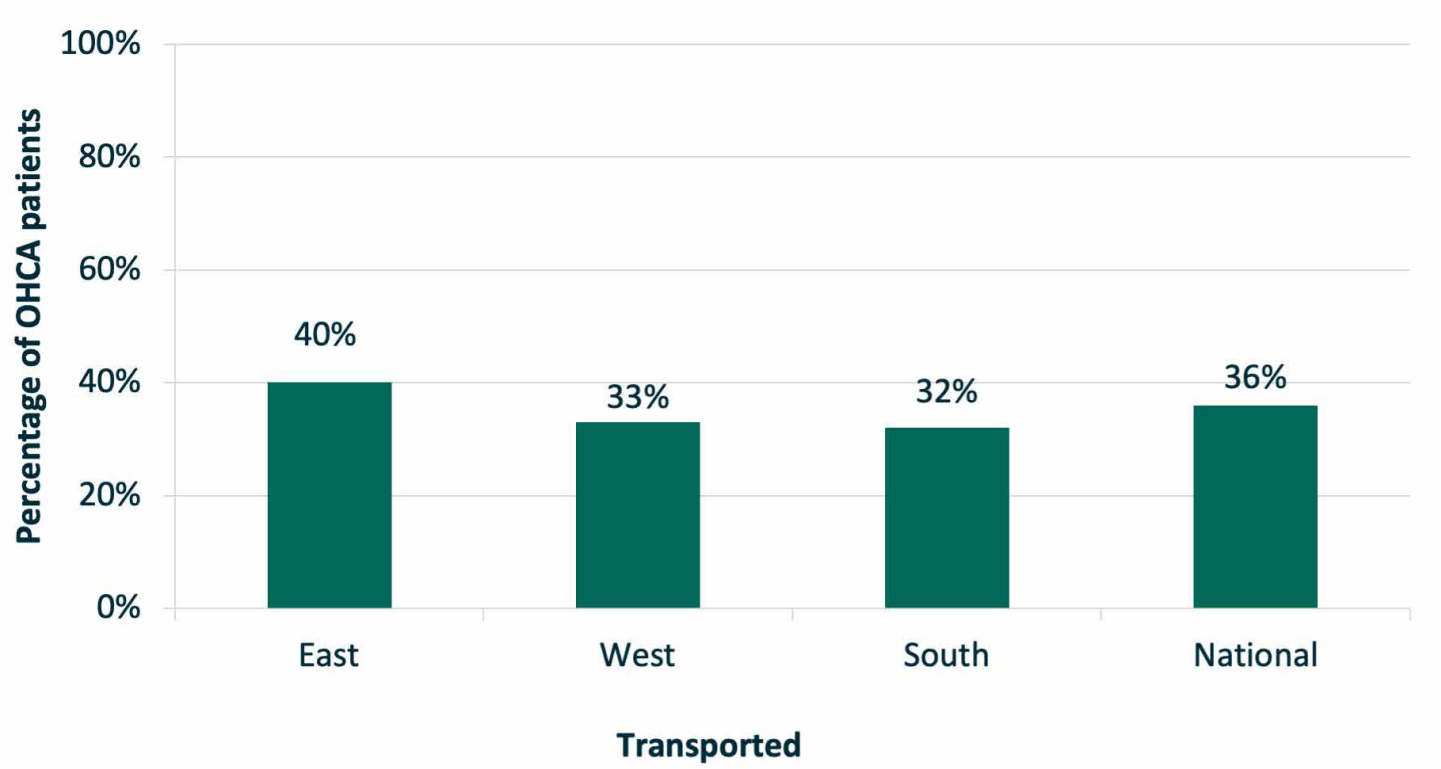
As per the Utstein definition[10], the call response interval (CRI) is the interval from the time the emergency call was received at the dispatch centre to arrival of EMS at the scene. Only the CRI for non-EMS witnessed cases are included in this analysis (n=2,453/2,802). As CRI is not normally distributed, the median value for each category is given:

All non EMS witnessed cases	13 minutes (IQR 9 – 22 minutes)
Rural non EMS witnessed cases	15 minutes (IQR 10 – 23 minutes)
Urban non EMS witnessed cases	13 minutes (IQR 8 – 21 minutes)
Utstein comparator group	13 minutes (IQR 9 – 20 minutes)

3.7 Transported to Hospital

- 36% of patients were transported to either an Emergency Department or a cardiac catheterisation laboratory (n=1,020/2,802)
- The percentage of patients who were transported to hospital was 40% in the East, 33% in the West, and 32% in the South, (Figure 4)
- Patients in urban areas were as likely to be transported as in rural areas (37% vs. 37%, p<0.001).

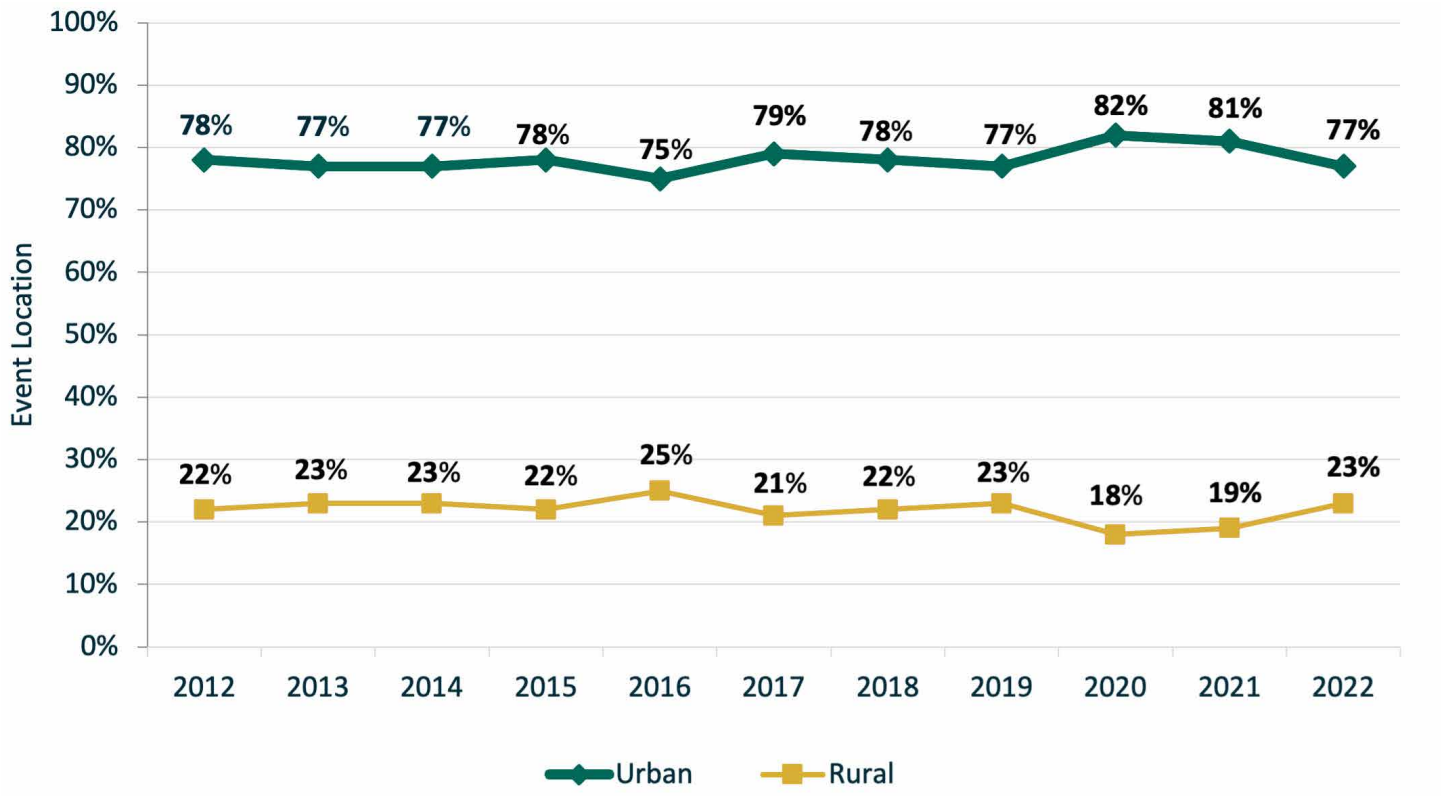
Figure 4: Proportion of patients transported to hospital by EMS area and nationally



3.8 Event Location

- 69% of incidents occurred in the home (n=1,933/2,802)
- 77% of incidents occurred in a private setting (home, farm or residential institution (n=2,157/2,802) (Figure 3)
- 23% 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=645/2,802) (Figure 5)
- In urban areas, a similar proportion of patients collapsed in a public place compared to rural areas (23% vs. 22%), (p<0.374).

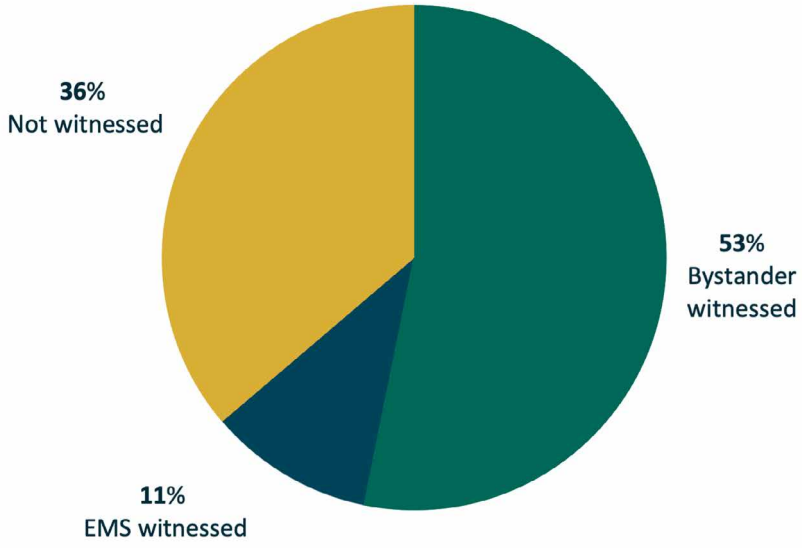
Figure 5: Event Location



3.9 Witness Status

- 53% of cases were bystander witnessed (n=1,465/2,755), (Figure 6)
- 52% of urban cases were bystander witnessed (n=853/1,643) and 54% of rural cases were bystander witnessed (n=544/1,007).

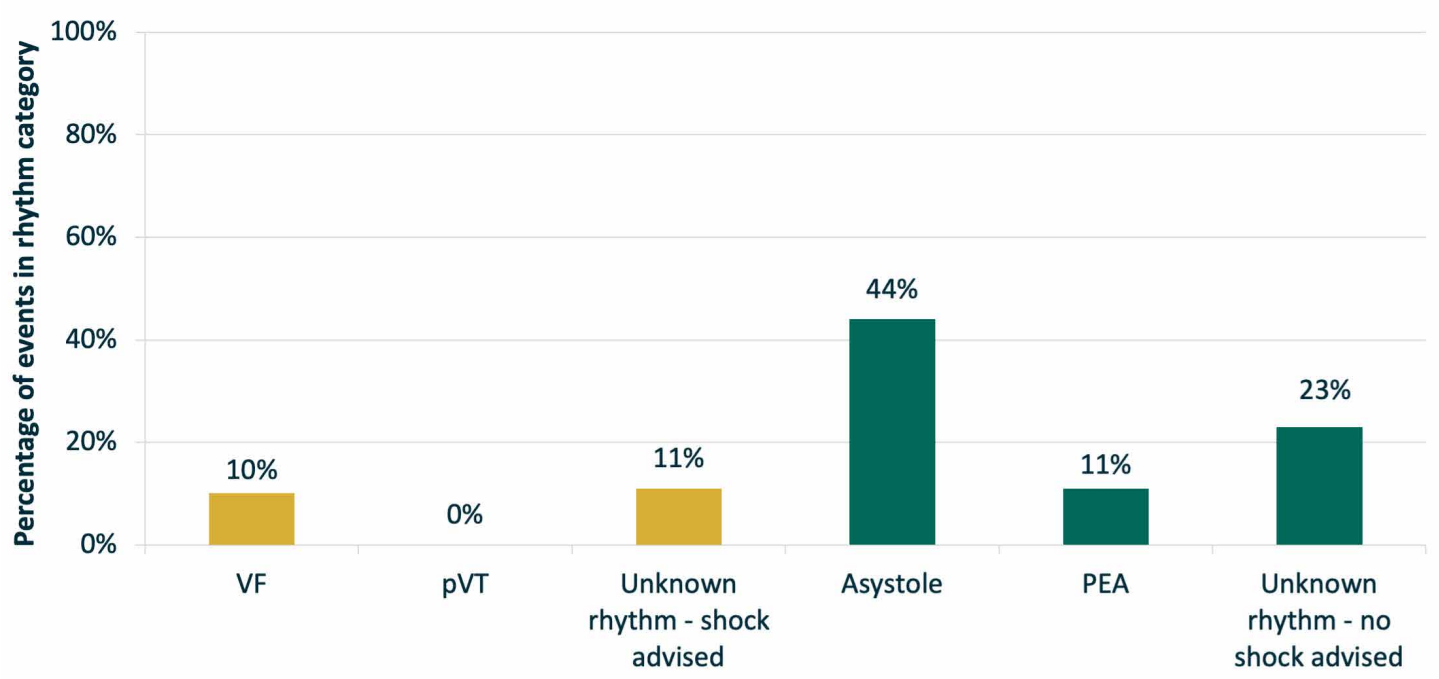
Figure 6: Witnessed status (n= 2,755)



3.10 First Monitored Rhythm

- 22% of cases were in a shockable rhythm at time of first rhythm analysis (n=608/2,802), (Figure 7)
- The initial rhythm was asystole in 44% of cases (n=1,200/2,750).

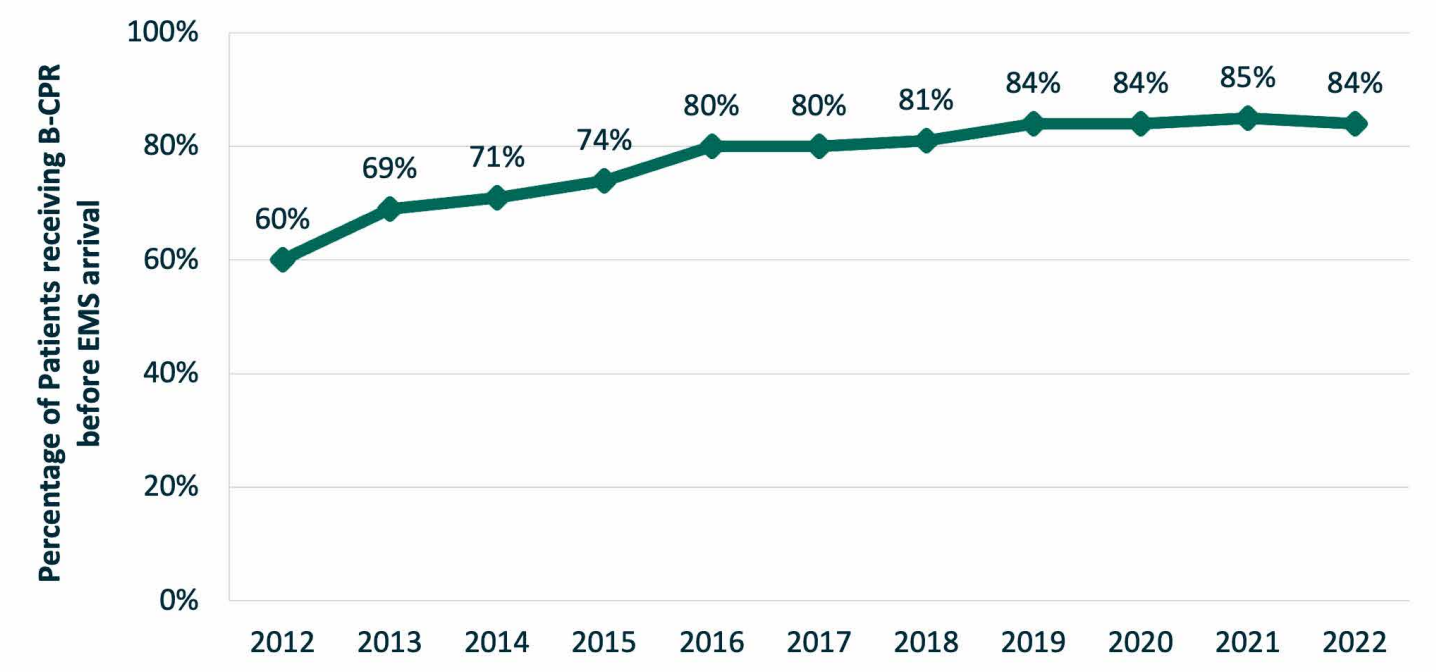
Figure 7: First monitored rhythm (n=2,750)



3.11 Bystander CPR

- Bystander CPR was attempted in 84% of non-EMS witnessed* cases (n=2,082/2,463). (Figure 8)

Figure 8: Percentage of patients receiving B-CPR before EMS arrival, years 2012 – 2022



*i.e. non-EMS witnessed cases

- In the subgroup of patients that had a bystander witnessed collapse (n=1,465) 87% (n=1,275) of patients had bystander CPR (B-CPR) attempted.
- A higher proportion of cases in a rural area received B-CPR (n=782/885) compared to an urban area (n=1,196/1,444) (88% vs. 83%; p<0.001)
- A lower proportion of cases in a private location received B-CPR (n=1,626/1,960) compared to a public location (n=456/503) (83% vs. 91%; p<0.001).

The proportion of cases that received public B-CPR increased from 67% in 2020 to 72% in 2022. The proportion of patients that received B-CPR has remained stable throughout the COVID-19 pandemic.

3.12 Mechanical CPR

- 53% of cases had Mechanical CPR performed (n=1,411/2,640).

3.13 Defibrillation

- 32% of cases had defibrillation attempted (n=896/2,802)
- 10% of defibrillation attempts were made pre-EMS arrival (n=282/2,802) (Figure 9)
- Of the 896 patients who had defibrillation attempted:
  - 364 had the pads applied pre-EMS arrival (41%)
  - 282 had the first shock delivered pre-EMS arrival (31%, Figure 10).

Figure 9: Defibrillation attempts pre-EMS arrival – all cases

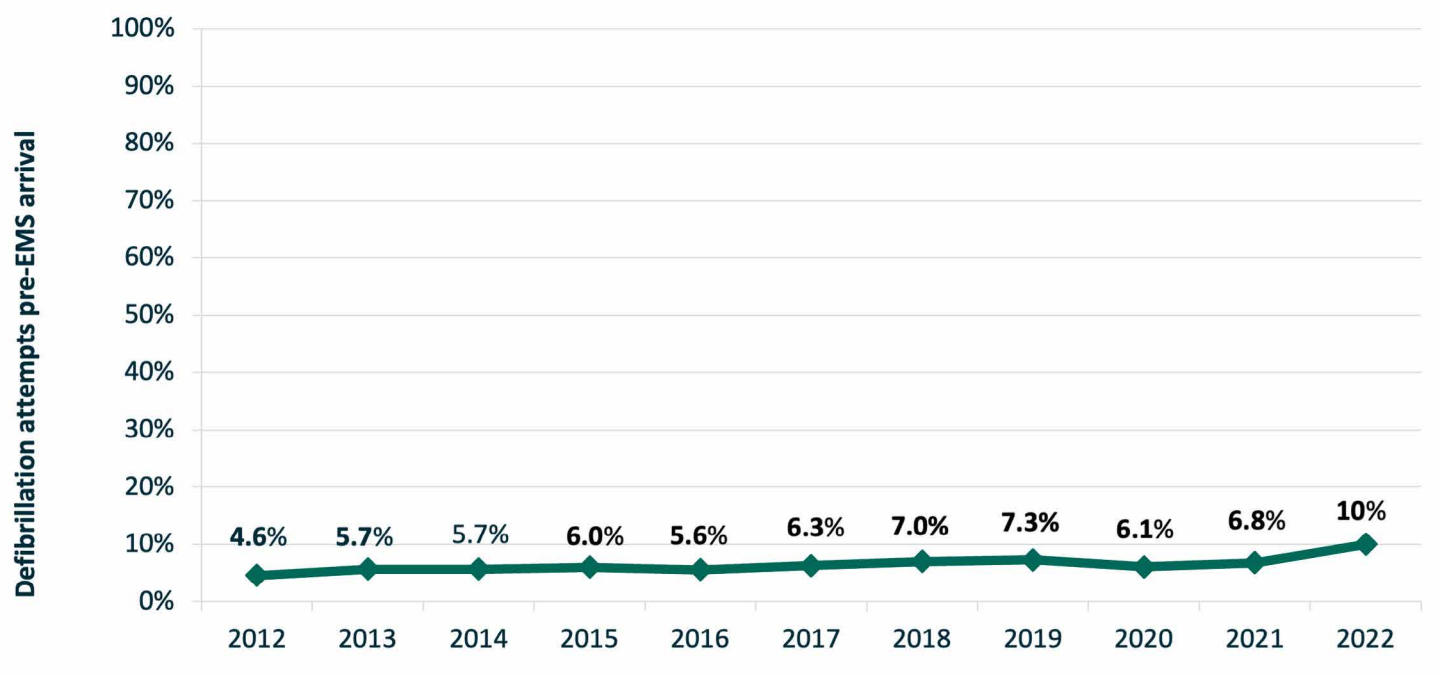
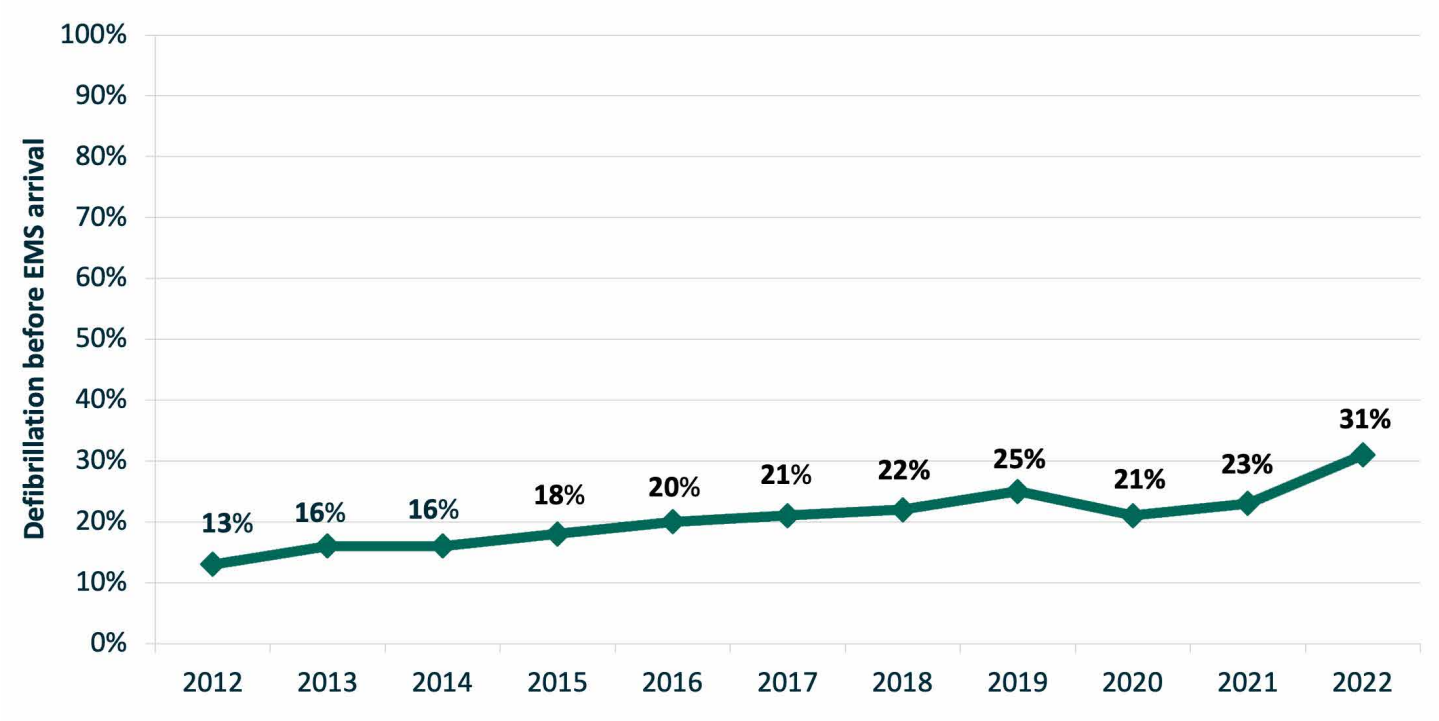


Figure 10: Defibrillation attempts pre-EMS arrival – of those with attempted defibrillation



First shock delivered before EMS arrival

In the 282 cases where first shock was delivered before EMS arrival, the identity of the person who delivered the first shock was as follows:

- Cardiac First Responder (31%, n=88)
- Members of the general public (22%, n=62)
- Local Fire services (11%, n=31)
- Nurses (11%, n=31)
- Doctors (10%, n=27)
- Voluntary Services (9%, n=25)
- Members of An Garda Síochána (5%, n=14).

Conversion to shockable rhythm during resuscitation

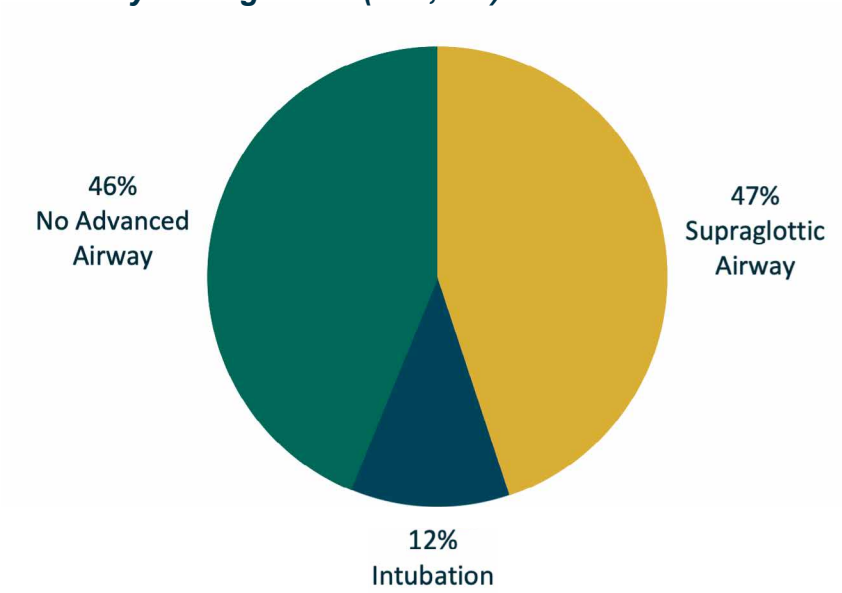
A total of 300 patients converted to a shockable rhythm during resuscitation. Of these:

- 50% were initially in asystole (n=149/300)
- 22% were initially in PEA (n=66/300, rhythm type not specified for the remainder.

3.14 Advanced Airway Adjuncts

- In 59% of cases, advanced airway adjuncts were used, i.e. supraglottic airway device or intubation (n=1,635/2,771), (Figure 10).

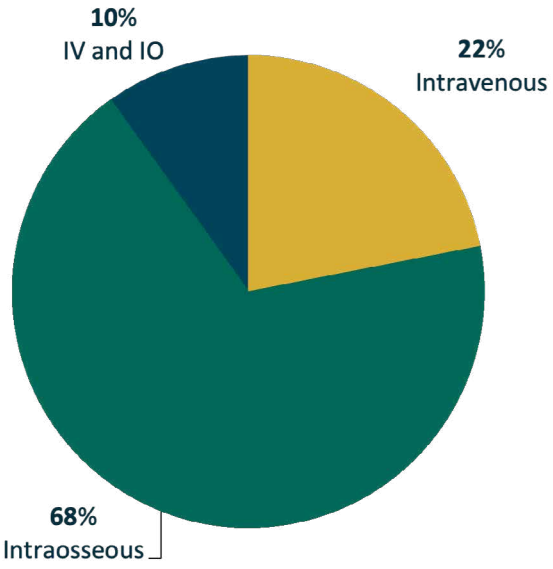
Figure 11: Adjunct airway management (n=2,771)



3.15 Cannulation

- 79% of cases had cannulation performed (n=2,214/2,802)
  - 68% of cases had intraosseous cannulation (n=1,495/2,194)
  - 22% had intravenous only cannulation (n=481/2,194)
  - 1% had a combination of both techniques (n=218/2,194) (Figure 12).

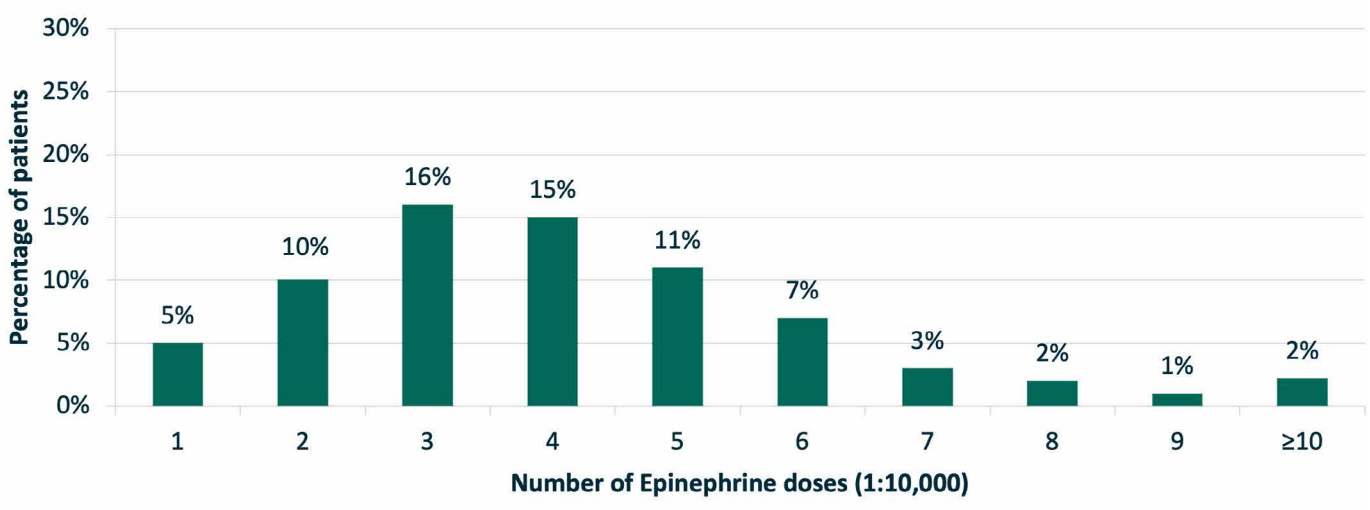
Figure 12: Cannulation method (n=2,194)



3.16 Cardiac Arrest Medication

- 72% of cases had epinephrine administered (n=2,026/2,802); the number of doses given ranged from 1 to 33 (Figure 13).

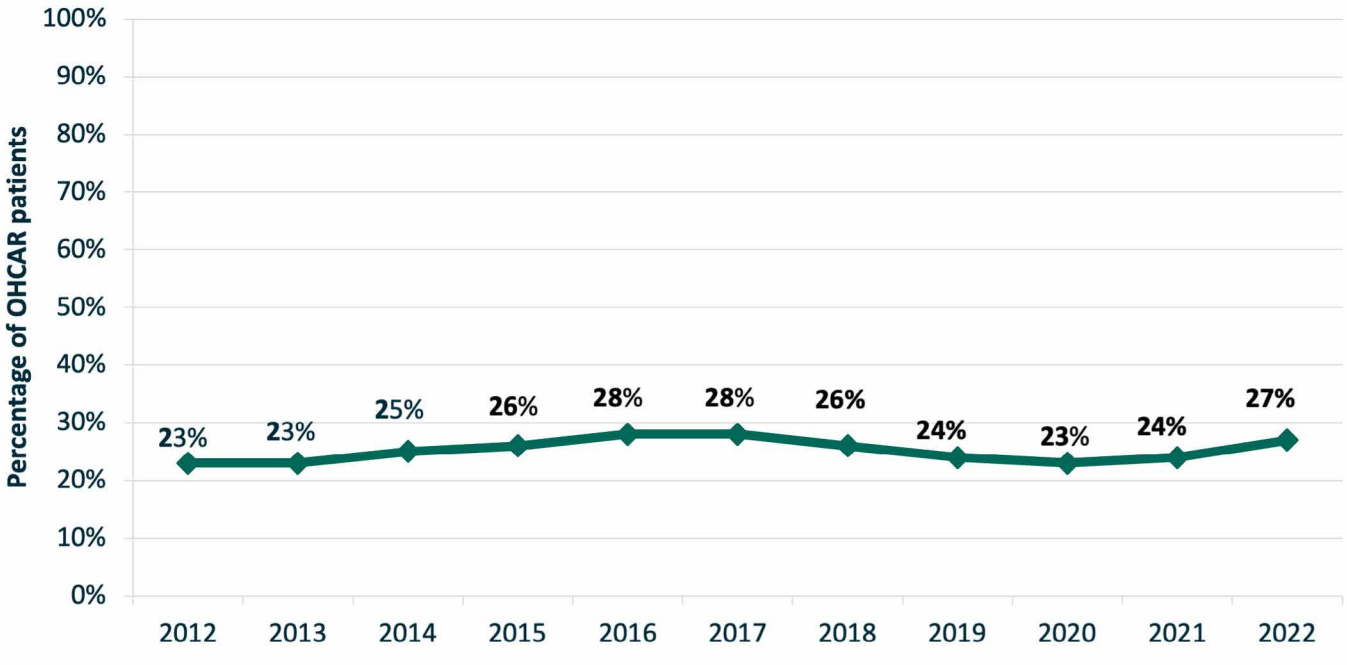
Figure 13: Percentage of Epinephrine doses (1:10,000)



3.17 ROSC at any stage

- 27% of cases had ROSC before Hospital arrival (n=751/2,797) (Figure 14)
- A similar number of patients achieved ROSC in an urban area, compared (Both 27%) (n=446/1,642 vs. n=268/1,004).

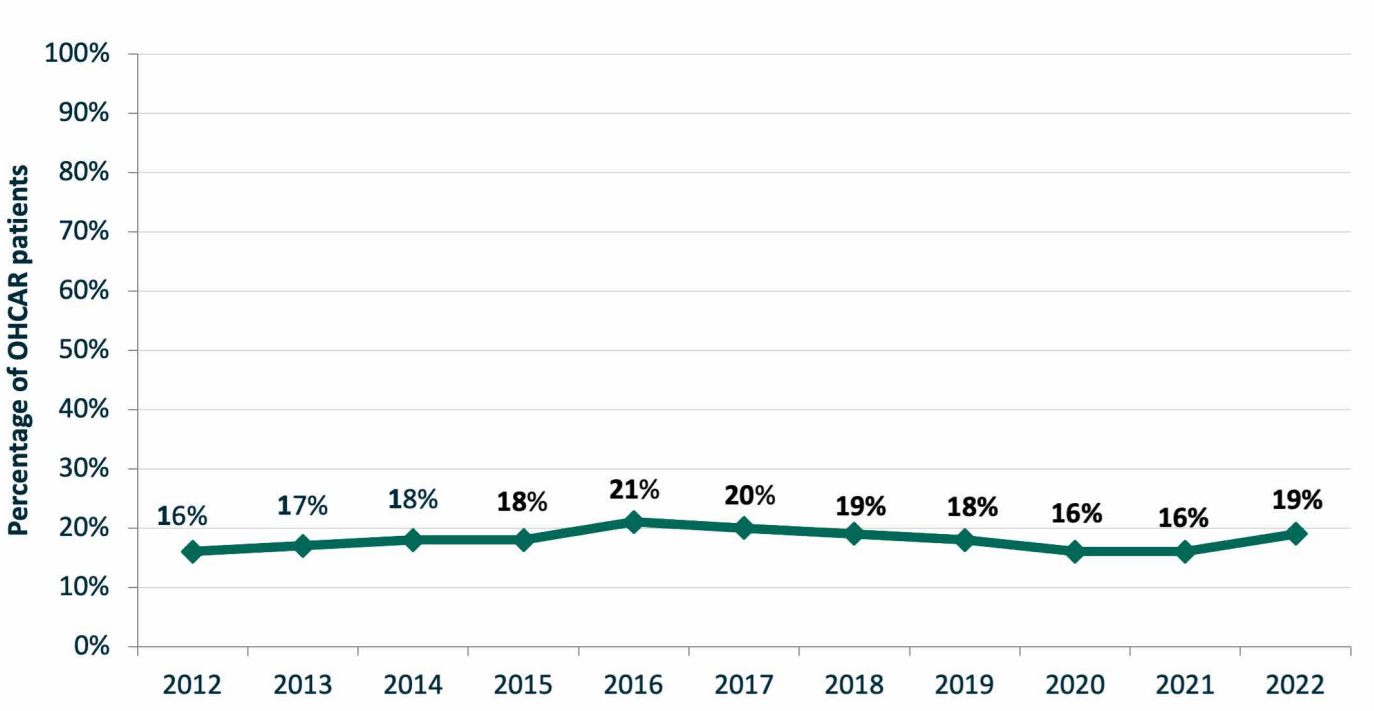
Figure 14: ROSC at any stage pre-hospital, all patients. Years 2012 – 2022



3.18 ROSC on Hospital arrival

- 19% of cases had ROSC on Hospital arrival (n=520/2,802) (Figure 15)
- ROSC on Hospital arrival was similar in both urban and rural areas (18% vs. 19%).

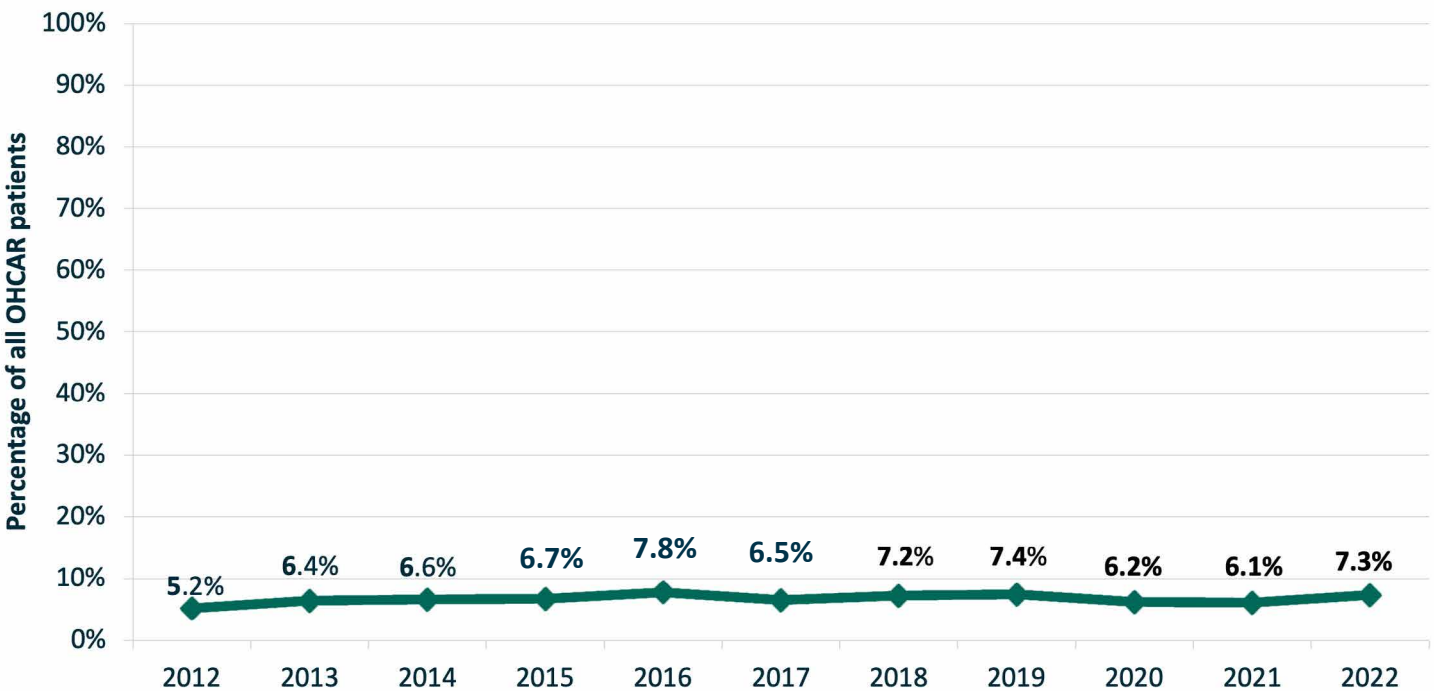
Figure 15: ROSC at Hospital arrival, all patients. Years 2012 – 2022



3.19 Discharged alive from Hospital

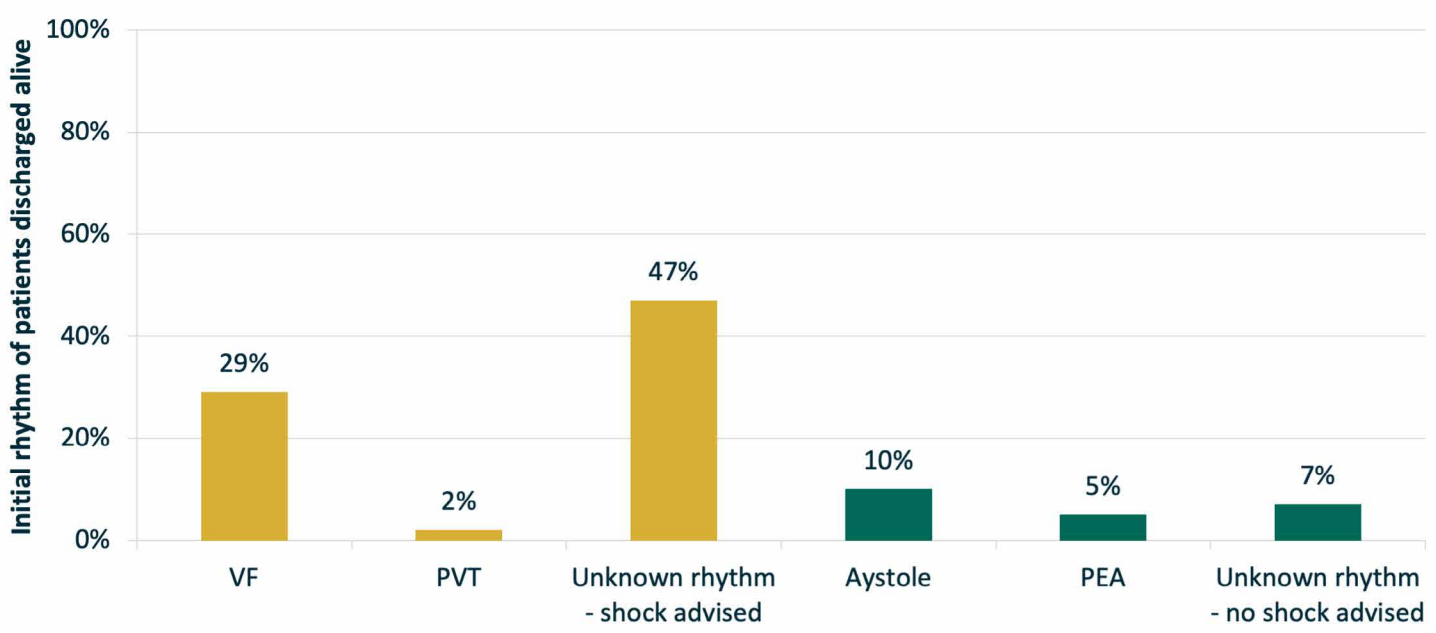
- A total of 206 patients were discharged alive from hospital (7.3%) (Figure 16). Data on 11 patients who were transported to hospital could not be obtained.

Figure 16: Percentage survival to discharge, all patients. Years 2012 – 2022 (n=1,741/25,978)



- Surviving patients were younger (median age 62 years, IQR 50 – 71) than non-surviving patients (median age 70 years, IQR 54 – 79 years, p≤0.001)
- The presumed aetiology was medical for 92% of survivors
- Survival in the presumed medical aetiology group was 8% (n=189/2,342) compared with 4% (n=17/460) in the non-medical group (p=0.005)
- 17% of patients who collapsed in a public location survived (n=109/645), compared to 4% of patients that collapsed in a private location (n=97/2,157), (p≤0.001)
- 7.5% of patients who collapsed in an urban area survived (n=123/1,643), compared to 7.2% of patients that collapsed in a rural area (n=73/1,007)
- 77% of survivors had an initial shockable rhythm (n=158/206, Figure 16)
- 23% of survivors had an initial non-shockable rhythm (n=48/206).

Figure 17: Percentage of survivors categorised by first analysed rhythm



- In the non-EMS witnessed group of survivors (n=152)
  - 89% had a witnessed arrest
  - 94% received bystander CPR
  - 66% (n=100), had defibrillator pads applied prior to EMS arrival
  - 57% (n=87) were shocked before EMS arrival
- In the EMS-witnessed group, 18% of patients survived (n=52/292)
- In the subgroup of EMS-witnessed patients that were adults, with presumed medical aetiology, with an initial shockable rhythm, 49% of patients survived (n=32/65).

3.20 Neurological function at discharge

The CPC [12] 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:

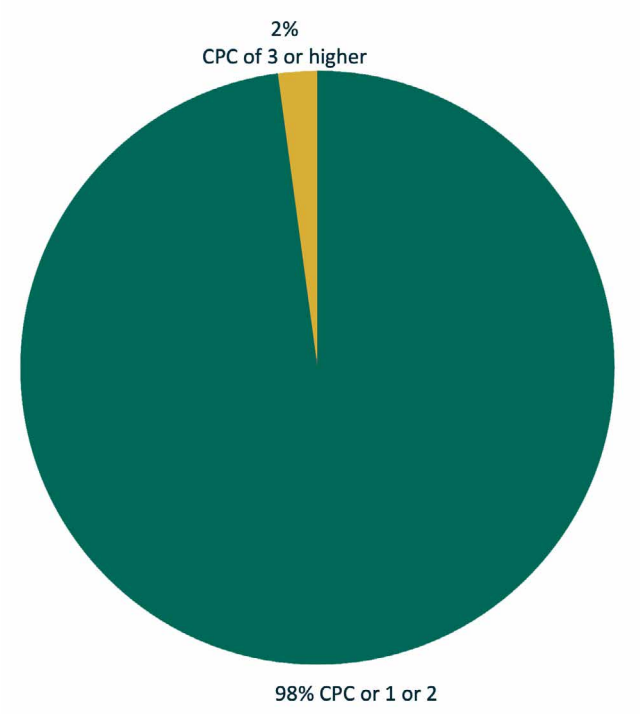
1. Good cerebral performance
2. Moderate disability: conscious, sufficient cerebral function for independent living
3. Severe disability: dependent on others for daily support
4. Coma or vegetative state
5. Brain death.

CPC score data was available for 187 surviving patients (Figure 18):

- 98% (n=183) had a score of 1 or 2
- 2% (n=4) had a score of 3 or higher

N.B. Data on CPC score was missing for 9% of surviving patients.

Figure 18: CPC score at discharge



3.21 OHCA in the under 35 age group

- 7% of cases were recorded as being <35 years of age (n=211/2,802)
  - 44% were of a presumed medical aetiology (n=94/211)
  - 16% were caused by trauma (road traffic accident, gunshot, stabbing, crush injuries or fall) (n=33/211)
  - 15% of cases resulted from a drug overdose (n=31/211)
  - 53% of cases were unwitnessed (n=108/204)
  - 13% were initially shockable (n=27/211)
  - 7.1% survived to Hospital discharge (n=15/211)

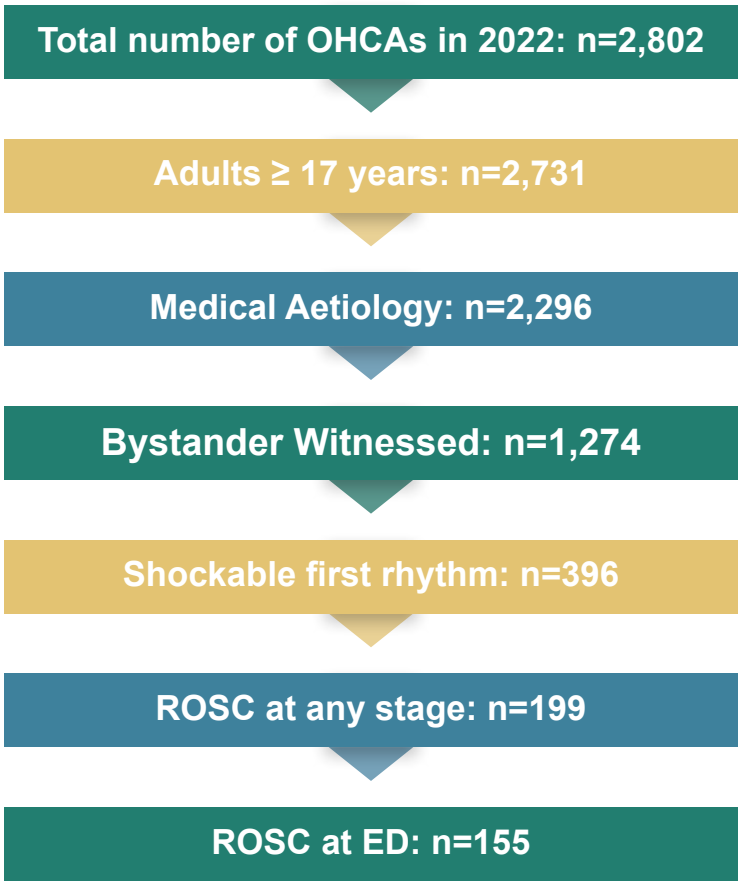
3.22 Utstein Comparator Subset

The Utstein comparator subset includes the following subgroup of patients

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

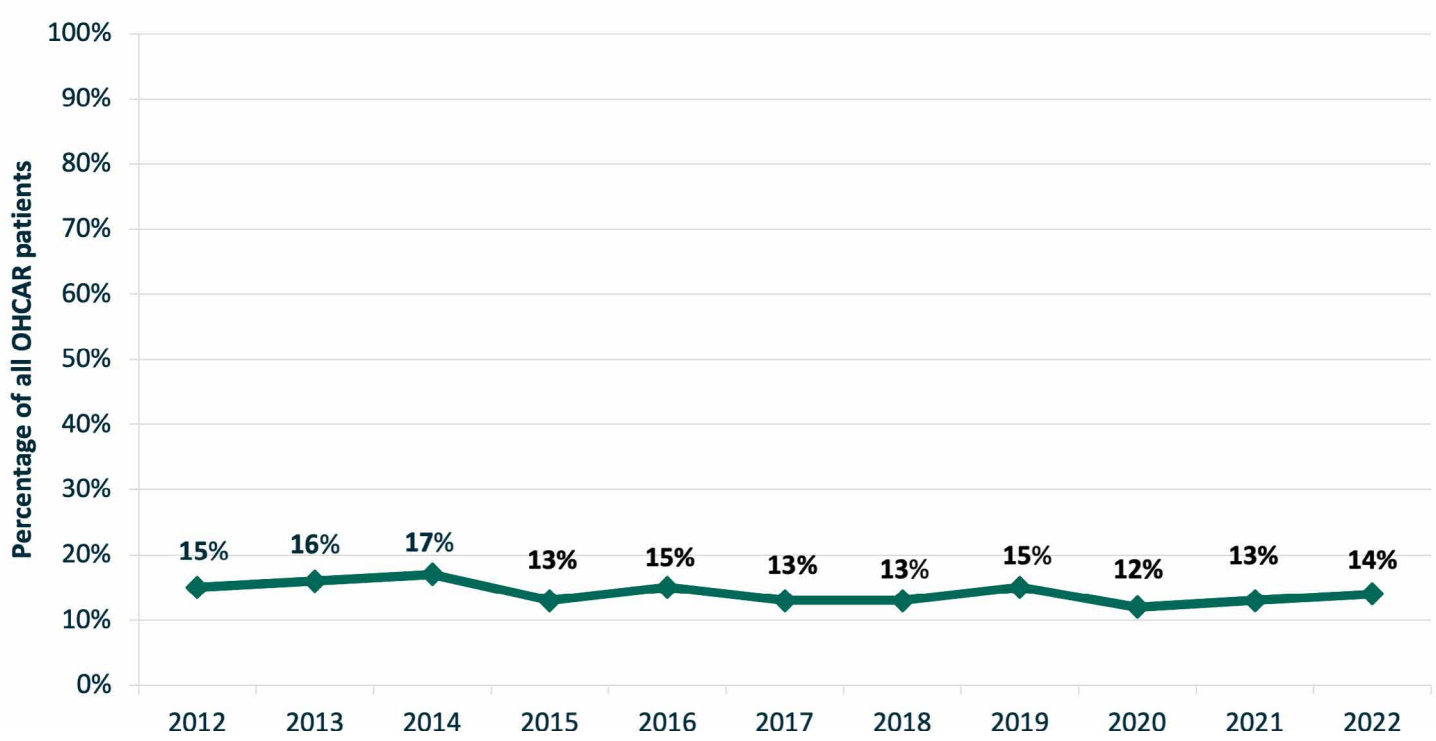
There is wide variation of circumstances around a cardiac arrest and patient characteristics. Using the Utstein comparator subset allows for a more standardised comparison of patient outcomes between systems and time periods (Figure 19).

Figure 19: Flowchart of the 2022 Utstein comparator subset and ROSC outcomes



In 2022, the Utstein comparator subset included 396 patients and accounted for 14% of all OHCAR cases (396/2,802, Figure 20).

Figure 20: Utstein comparator subset 2012 – 2022

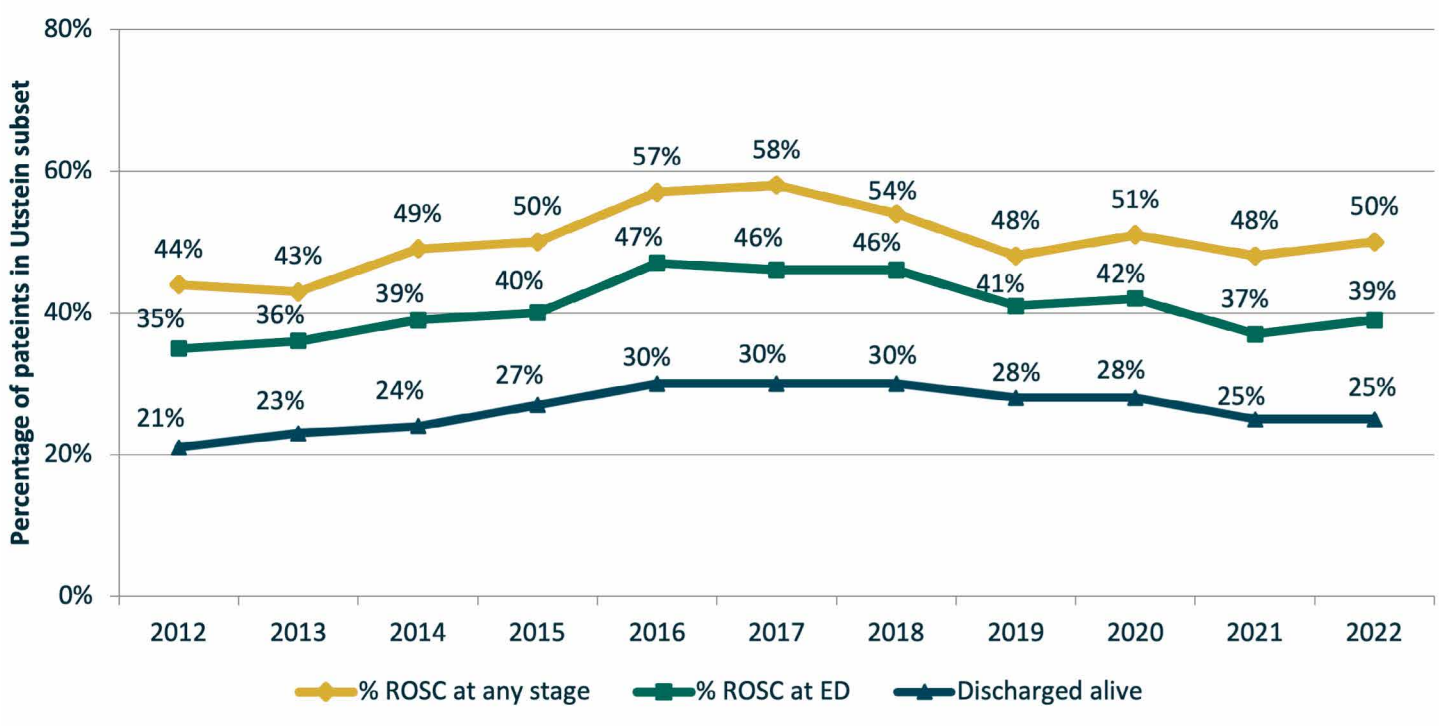


3.23 Utstein Comparator Subset Outcomes

- 50% of patients (n=199/396) achieved ROSC at some stage before hospital arrival
- 39% of patients (n=155/396 had ROSC on hospital arrival
- 25% of patients (n=101/396) were discharged alive from hospital (Figure 21)
- Of the survivors for whom CPC was available, 100% had a CPC score of one or two (n=93/93).

N.B. Data on CPC score was missing for 8% of surviving Utstein patients.

Figure 21: Outcomes in the Utstein comparator subset, years 2012 – 2022



Case Characteristics

- Of those patients who collapsed in a public location, 44% survived (n=61/138) compared to 15% in a private location (n=40/258) (p=0.001)
- 89% of cases were recognised as cardiac arrest at the time of ambulance dispatch (n=348/392)
- Bystander CPR was performed on 98% of survivors
- 72% of the patients who survived had defibrillation attempted before ambulance service arrival (n=73/101). The estimated median time from 'time of collapse' to 'time of first shock administered' was 6 minutes (n=73/100, IQR 3 – 11).

Chapter 4

Conclusion

OHCAR Research

Future developments in OHCAR

Chapter 4

4.0 Conclusion

Since the last OHCAR Annual Report, the Bystander CPR has remained high at 84%. Attempted defibrillation before EMS arrival has increased to 10% of all patients. In the subgroup pf patients who had defibrillation attempted (n=896), there has been an increase in attempted defibrillation before EMS arrival, from 23% to 31%. ROSC before hospital arrival was 31%, ROSC on hospital arrival was 19% and the absolute number of patients discharged alive from hospital increased to 206.

In the Utstein group the ROSC prior to hospital arrival was 50%, ROSC at Hospital arrival was 39% and discharge alive was 25%. 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.

4.1 OHCAR Research

Research projects approved by OHCAR Steering Group July 2022 – July 2023:

Principal Investigator	Title
Ingvild Tjelmeland	Cohort study of the impact of the COVID-19 pandemic on the rate and incidence of bystander cardiopulmonary resuscitation (CPR) after out-of-hospital cardiac arrest

4.2 Future developments in OHCAR

OHCAR has worked closely with NAS in implementing an electronic PCR system. This is fully operational and has facilitated a more efficient and streamlined transfer of data relating to an OHCA. Information is available to OHCAR immediately, aiding data processing and the generation of reports to service users in a short timeframe. OHCAR is in the process of updating its database which will be aligned with the electronic PCR system. OHCAR is working closely with the HSE Data Protection Officer to ensure that data sharing agreements are aligned with the GDPR.

Chapter 5

Acknowledgements

References

Appendix 1

Appendix 2

Appendix 3

Acknowledgements

The OHCAR Steering Group wishes to acknowledge the contribution made to the report from the following sources:

NAS - Emergency Medical Technicians, Paramedics, Advanced Paramedics, John Garvey - Aero-Medical, National Emergency Operations Centre, David Willis; Clinical Information Manager, Siobhan Masterson; General Manager, Rory Quinn; Data Analyst, Robert Morton; National Director, Professor Cathal O'Donnell; Clinical Director.

DFB - Emergency First Responders, Emergency Medical Technicians, Paramedics, Advanced Paramedics, East Region Communications Centre, Martin O'Reilly; District Officer EMS Support, Michael O'Reilly; Assistant Chief Fire Officer EMS Operations, DFB Clinical Director.

First Responders - All CFR Group Members, First Aid Responders, Irish Coast Guard, An Garda Síochána, Order of Malta, St. John Ambulance, Red Cross, Voluntary First responders, Bbystanders, Doctors, Nurses, local Fire services, and Civil Defence.

Hospitals;

- Bantry General Hospital – Joan Mulgrew, Chair Registration Officer
- Beaumont - Dr Peader Gilligan; ED consultant, Dr Khalid Khan SpR., Dr Bassey Ndoma-Egba SpR. In Emergency Medicine
- Cork University – Linda Drummond; Coronary Heart Attack Ireland Register (CHAIR)
- Our Lady of Lourdes, Drogheda – Rosemarie Faulkner and Claire Jordan, RTOs
- Galway University – Siobhain Trowell, Applications Section Officer
- Connolly Hospital Blanchardstown - Anne Regan, RTO
- University Hospital Kerry - James Hanlon, RTO
- Letterkenny University - the Death Registration Office
- Limerick University - Marie O'Hora, Anne McNulty & Ciara Cahill, RTOs
- Mater Misericordiae University - Bernie Morgan and Orla Gaynor, RTOs
- Mayo University - Liz Casey, R & EWS RTO
- Midland Regional Hospital, Mullingar - Patricia Geraghty, ED secretary
- Midland Regional Hospital, Portlaoise – Lloyd McGree, ED CNM3
- Naas General – Siobhan Buckley
- Navan, Our Lady's – Grace Crehan, Scheduled Care Manager
- Portiuncula University - Joe Fahy, RTO

- Public Health Area F – Carmel Costello, OHCAR Administration
- Tipperary University – Liz Ryan & Aoife Walsh, RTOs
- St. James's - Brendan O'Hagan
- St. Vincent's University - Statistics Department
- South Tipperary General – Aoife Walsh
- Tallaght University - Catherine Markham, Cardiology Audit Nurse
- Temple Street – Claire Ahern, RTO
- Midland Regional Hospital, Tullamore - Ann Calvert, ED CNM
- University Hospital Waterford – Tracey Slattery, RTO
- Wexford General - Frances Hore, ED secretary.

References

1. World Health Organisation; https://covid19.who.int/ (accessed 19.06.2023).

2. International Liaison Committee on Resuscitaion; https://costr.ilcor.org/document/covid-19-infection-risk-to-rescuers-from-patients-in-cardiac-arrest

3. HSE Guidance on DNR decision making during COVID; https://www.hse.ie/eng/about/who/national-office-human-rights-equality-policy/assisted-decision-making-capacity-act/hse-guidance-regarding-cardiopulmonary-resus-dnar-decision-making-dur-covid-19-pand-v-1-2.pdf

4. Department of Health and Children. Reducing the Risk: A Strategic Approach. The Report of the Task Force on Sudden Cardiac Death. 2006.

5. Department of Health and Children. Changing Cardiovascular Health: National Cardiovascular Health Policy 2010-2019.

6. Irish Association for Emergency Medicine, College of Emergency Medicine. The National Emergency Medicine Programme: A Strategy to improve Safety, Quality Access and Value in Emergency Medicine Ireland.2012.

7. Gräsner J-T, Wnent J, et al. Survival after out-of-hospital cardiac arrest in Europe – Results of the EuReCa TWO study. Resuscitation 2020; 148: p. 218-226.

8. Wnent J, Masterson S, Gräsner J-T, et al. EuReCa ONE–27 Nations, ONE Europe, ONE Registry: a prospective observational analysis over one month in 27 resuscitation registries in Europe–the EuReCa ONE study protocol. Scandinavian journal of trauma, resuscitation & emergency medicine 2015;23:1-6.

9. Gräsner J-T, Lefering R, Koster RW, et al. EuReCa ONE - 27 Nations, ONE Europe, ONE Registry. A prospective one month analysis of out-of-hospital cardiac arrest outcomes in 27 countries in Europe. Resuscitation 2016; 105: 188-95.

10. Perkins GD, Jacobs IG, Nadkarni VM, et al. Cardiac arrest and cardiopulmonary resuscitation outcome reports: update of the Utstein Resuscitation Registry Templates for Out-of-Hospital Cardiac Arrest: a statement for healthcare professionals from a task force of the International Liaison Committee on Resuscitation (American Heart Association, European Resuscitation Council, Australian and New Zealand Council on Resuscitation, Heart and Stroke Foundation of Canada, InterAmerican Heart Foundation, Resuscitation Council of Southern Africa, Resuscitation Council of Asia); and the American Heart Association Emergency Cardiovascular

Care Committee and the Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation. Circulation 2015;132:1286-300.

11. 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.

12. Rittenberger JC, Raina K, Holm MB, Kim YJ, Callaway CW. Association between Cerebral Performance Category, Modified Rankin Scale, and Discharge Disposition after Cardiac Arrest. Resuscitation. 2011;82(8):1036-1040. doi:10.1016/j.resuscitation.2011.03.034.

13. Berdowski J, Berg RA, Tijssen JG, Koster RW. Global incidences of out-of-hospital cardiac arrest and survival rates: systematic review of 67 prospective studies. Resuscitation 2010;81:1479-87.

14. Pallant, J. (2007). SPSS – Survival Manual. 3rd Edition, Mc Graw Hill.

15. Census 2022 Summary Results - Part 1, retrieved from; https://www.cso.ie/en/csolatestnews/presspages/2022/censusofpopulation2022-preliminaryresults/

16. Atwood C, Eisenberg MS, Herlitz J, Rea TD. Incidence of EMS-treated out-of-hospital cardiac arrest in Europe. Resuscitation 2005;67:75-80.

17. National Mapping Open Data Portal; Settlements Ungeneralised - National Statistical Boundaries - 2015 | Open Data Portal (arcgis.com)

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 July 2022 to July 2023.

The membership at April 2023 is:

- Professor Conor Deasy, Professor of Emergency Medicine, University College Cork and Consultant in Emergency Medicine, Cork University Hospital (OHCAR Chair)
- Professor Gerard Bury, Director, UCD Centre for Emergency Medical Science
- 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
- Siobhán Masterson PhD, General Manager, Clinical Strategy and Evaluation, National Ambulance Service & Adjunct Senior Lecturer, University College Cork
- Dr David Menzies, Chair, 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, Foundation Professor, Discipline of General Practice, NUI Galway
- Professor Cathal O'Donnell, Clinical Director, National Ambulance Service
- Mr. Michael O'Reilly, Assistant Chief Fire Officer, Dublin Fire Brigade
- Mr. Martin O'Reilly, District Officer, EMS Support Officer, Dublin Fire Brigade
- Mr. Martin Quinn, OHCAR Manager, National Ambulance Service.

Appendix 2

OHCAR Meetings, Representations and Publications

- The OHCA Strategy Goverance Implemenation Steering Group Meeting, “OHCAR and the OHCAR Strategy”, Ashbourne 29th November 2022

Publications using OHCAR data or supported by OHCAR

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, https://www.researchgate.net/publication/290788897_Complying_with_Utstein_Guidelines_Comprehensive_Case_Identification_in_the_Irish_National_Out-of-Hospital_Cardiac_Arrest_Register

Moran PS, Teljeur C, Masterson S, O’Neill M, Harrington P, Ryan M. Cost-effectiveness of a national public access defibrillation programme. Resuscitation 2015; 91: 48-55.

Masterson, S., P. Wright, C. O’Donnell, A. Vellinga, A. W. Murphy, D. Hennelly, B. Sinnott, J. Egan, M. O’Reilly, J. Keaney, G. Bury & C. Deasy (2015) Urban and rural differences in out-of-hospital cardiac arrest in Ireland. Resuscitation, 91, 42-7.

Grasner, J. T. & S. Masterson (2015) EuReCa and international resuscitation registries. Current Opinion in Critical Care, 21, 215-9.

Wnent J*, Masterson S*, Gräsner JT, Böttiger BW, Herlitz J, Koster RW, Rosell Ortiz F, Tjelmeland I, Maurer H, Bossaert L. EuReCa ONE - 27 Nations, ONE Europe, ONE Registry: a prospective observational analysis over one month in 27 resuscitation registries in Europe - the EuReCa ONE study protocol. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(1), p.1. *Joint lead authors

Masterson, S., A. Vellinga, P. Wright, J. Dowling, G. Bury & A. W. Murphy (2015a) General practitioner contribution to out-of-hospital cardiac arrest outcome: A national registry study. European Journal of General Practice, 21, 131-7.
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.

Gräsner, JT., Böttiger, BW and Bossaert, I. “EuReCa ONE–ONE month–ONE Europe–ONE goal.” Resuscitation 10.85 (2014): 1307-1308.

Masterson, S., P. Wright, J. Dowling, D. Swann, G. Bury & A. Murphy (2011) Out-of-hospital cardiac arrest (OHCA) survival in rural Northwest Ireland: 17 years' experience. Emergency Medicine Journal, 28, 437-8.

Masterson, S., J. Cullinan, B. McNally, C. Deasy, A. Murphy, P. Wright, M. O'Reilly & A. Vellinga (2016) Out-of-hospital cardiac arrest attended by ambulance services in Ireland: first 2 years' results from a nationwide registry. Emergency Medicine Journal, 33, 776-781.

Masterson S, Cullinan J, Teljeur C, and Vellinga A. (2016) The Spatial Distribution of Out-of-Hospital Cardiac Arrest and the Chain of Survival in Ireland: A Multi-Class Urban-Rural Analysis'. Irish Geography, 49(2), 1-27, https://irishgeography.ie/index.php/irishgeography/article/download/1232/1089

Tanner, R., S. Masterson, M. Jensen, P. Wright, D. Hennelly, M. O'Reilly, A. W. Murphy, G. Bury, C. O'Donnell & C. Deasy (2017) Out-of-hospital cardiac arrests in the older population in Ireland. Emergency Medicine Journal. https://pubmed.ncbi.nlm.nih.gov/28655755/

Masterson S, Teljeur C, Cullinan J, Murphy AW, Deasy C, Vellinga A (2017). The Effect of Rurality on Out-of-Hospital Cardiac Arrest Resuscitation Incidence: An Exploratory Study of a National Registry Utilizing a Categorical Approach. The Journal of Rural Health; epub.

Wnent, Jan; Masterson, Siobhan; Gräsner, Jan-Thorsten; Böttiger, Bernd W.; Eggeling, Johanna; Herlitz, Johan; Koster, Rudolph W.; Lefering, Rolf; Maurer, Holger; Rosell Ortiz, Fernando; Perkins, Gavin D.; Tjelmeland, Ingvild; Bossaert, Leo.EuReCa TWO – A prospective observational analysis over three month in 29 cardiac arrest and resuscitation registries in 29 European countries – The EuReCa TWO study protocol. Anästh Intensivmed 2017;85:506-511. https://wrap.warwick.ac.uk/106047/

Masterson, Siobhán; Teljeur, Conor; Cullinan, John; Murphy, Andrew; Deasy, Conor; Vellinga, Akke; Out-of-hospital cardiac arrest in the home: Can area characteristics identify at-risk communities in the Republic of Ireland? International Journal of Health Geographics (2018) 17:6 https://ij-healthgeographics.biomedcentral.com/articles/10.1186/s12942-018-0126-z

T. Barry, N. Conroy, M. Headon, M. Egan, M. Quinn, C. Deasy, G. Bury; The MERIT 3 project: Alerting general practitioners to cardiac arrest in the community. Resuscitation 121 (2017) 141–146

Siobhán Masterson, Bryan McNally, John Cullinan, Kimberly Vellano, Joséphine Escutnaire, David Fitzpatrick, Gavin D. Perkins, Rudolph W. Koster, Yuko Nakajima, Katherine Pemberton, Martin

Quinn, Karen Smith, Bergþór Steinn Jónsson, Anneli Strömsöe, Meera Tandan, Akke Vellinga; Out-of-hospital cardiac arrest survival in international airports. Resuscitation 127 (2018) 58–62

Siobhán Masterson, Anneli Strömsöe, John Cullinan, Conor Deasy, Akke Vellinga; Apples to apples: can differences in out-of-hospital cardiac arrest incidence and outcomes between Sweden and Ireland be explained by core Utstein variables? Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine (2018) 26:37

H. Maurer, S. Masterson, I. Tjelmeland, J. Gräsner, R. Lefering, B. Böttiger, L. Bossaert, J. Herlitz, R. Koster, F. Rosell-Ortiz, G. Perkins, J. Wnent; When is a bystander not a bystander anymore? A European Survey. Resuscitation (2018), https://doi.org/10.1016/j.resuscitation.2018.12.009

Kylie Dyson, Siobhan P. Brown, Susanne May, Karen Smith, Rudolph W. Koster, Stefanie G. Beesems, Markku Kuisma, Ari Salo, Judith Finn, Fritz Sterz, Alexander Nürnberger, Laurie J. Morrison, Theresa M. Olasveengen, Clifton W. Callaway, Sang Do Shin, Jan-Thorsten Gräsner, Mohamud Daya, Matthew Huei-Ming Ma, Johan Herlitz, Anneli Strömsöe, Tom P. Aufderheide, Siobhán Masterson, Henry Wang, Jim Christenson, Ian Stiell, Gary M. Vilke, Ahamed Idris, Chika Nishiyama, Taku Iwami, Graham Nichol; International variation in survival after out-of-hospital cardiac arrest: A validation study of the Utstein template. Resuscitation (2019), https://doi.org/10.1016/j.resuscitation.2019.03.018

Kieran Henry, Jeffrey Mulcaire, Alice Kirby, Aine Cotter, Siobhan Masterson, Cathal O'Donnell, Conor Deasy; Out-of-hospital cardiac attest quality of life follow-up study of survivors in Munster, Ireland. Irish Journal of Medical Science (2020) https://doi.org/10.1007/s11845-020-02189-4

Iris Oving, Corina de Graaf, Siobhan Masterson, Rudolph Koster, Aeilko Zwinderman, Remy Stieglis, Hajriz AliHodzic, Enrico Baldi, Susanne Betz, Diana Cimpoesu, Fredrik Folke, Dennis Rupp, Frederico Semeraro, Anatolij Truhlar, Hanno Tan, Marieke Blom; European first responder systems and differences in return of spontaneous circulation and survival after out-of-hospital cardiac arrest: A study of registry cohorts, The Lancet Regional Health – Europe (2020), https://doi.org/10.1016/j.lanepe.2020.100004

Tomas Barry, Mary Headon, Martin Quinn, Siobhan Masterson, Conor Deasy, Gerard Bury; General practice and cardiac arrest community first response in Ireland, Resuscitation Plus (2021), https://dx.doi.org/10.1016/j.resplu.2021.100127

E. Baldi, N.B. Grieco, G. Ristagno, H. Alihodžic´, V. Canon, A. Birkun, R. Cresta, D. Cimpoesu, C. Clarens, J. Ganter, A. Markota, P. Mols, O. Nikolaidou, M. Quinn, V. Raffay, F. Ortiz, A. Salo, R. Stieglis, A. Strömsöe, I. Tjelmeland, S. Trenkler, J. Wnent, J. Grasner, B. Böttiger, S. Savastano; The

Automated External Defibrillator: Heterogeneity of Legislation, Mapping and Use across Europe. New Insights from the ENSURE Study. J. Clin. Med. 2021, 10, 5018. https://doi.org/10.3390/jcm10215018

Health Service Executive; Guidance Regarding Cardiopulmonary Resuscitation and DNAR Decision-Making during the COVID-19 Pandemic (2020) https://www.hse.ie/eng/about/who/national-office-human-rights-equality-policy/assisted-decision-making-capacity-act/hse-guidance-regarding-cardiopulmonary-resus-dnar-decision-making-dur-covid-19-pand-v-1-2.pdf

C. Nishiyama, T. Kiguchi, M. Okubo et al., Three-year trends in out-of-hospital cardiac arrest across the world: Second report from the International Liaison Committee on Resuscitation (ILCOR), Resuscitation (2023) https://doi.org/10.1016/j.resuscitation.2023.109757

Barry T, Kasemiire A, Quinn M et al. Outcomes of out-of-hospital cardiac arrest in Ireland 2012-2020: Protocol for an observational study, HRB Open Research (2023), 6:17 https://doi.org/10.12688/hrbopenres.13699.1

Appendix 3

OHCAR Utstein Comparator Subset 2022 – Regional Results

Figure 1: Number of OHCAR patients in the Utstein group by region (n=396)

Figure 2: Dispatcher recognition of cardiac arrest at time of ambulance dispatch (Utstein, n=392)

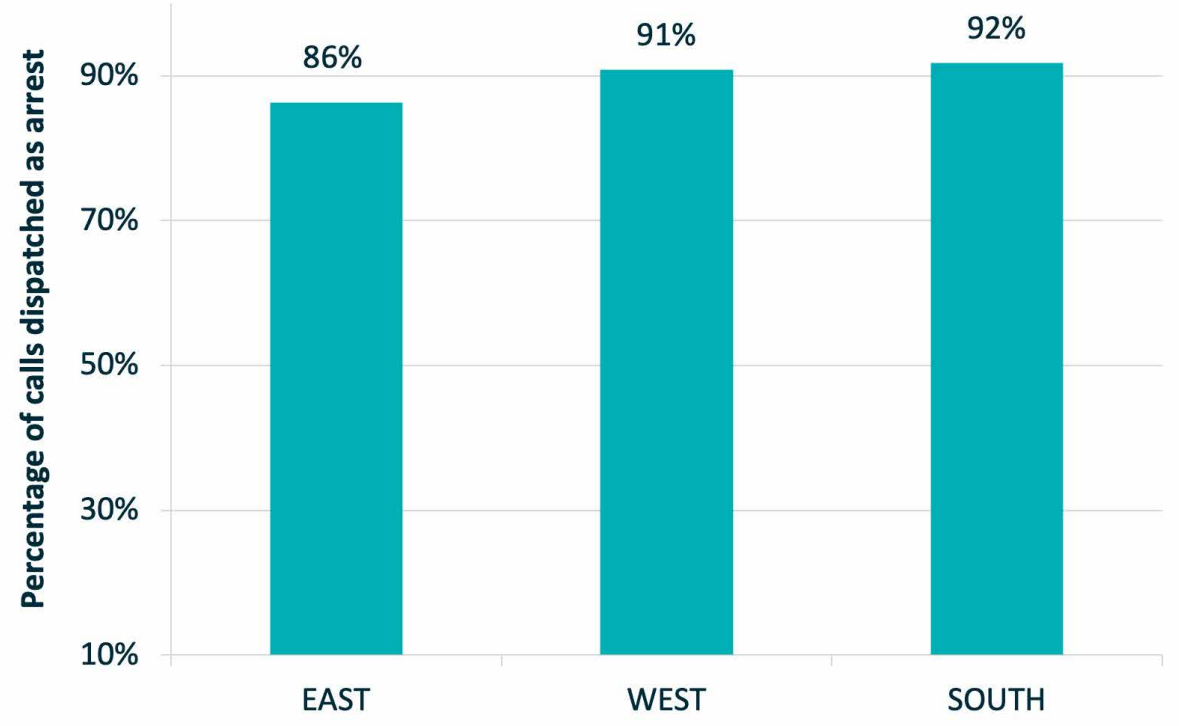
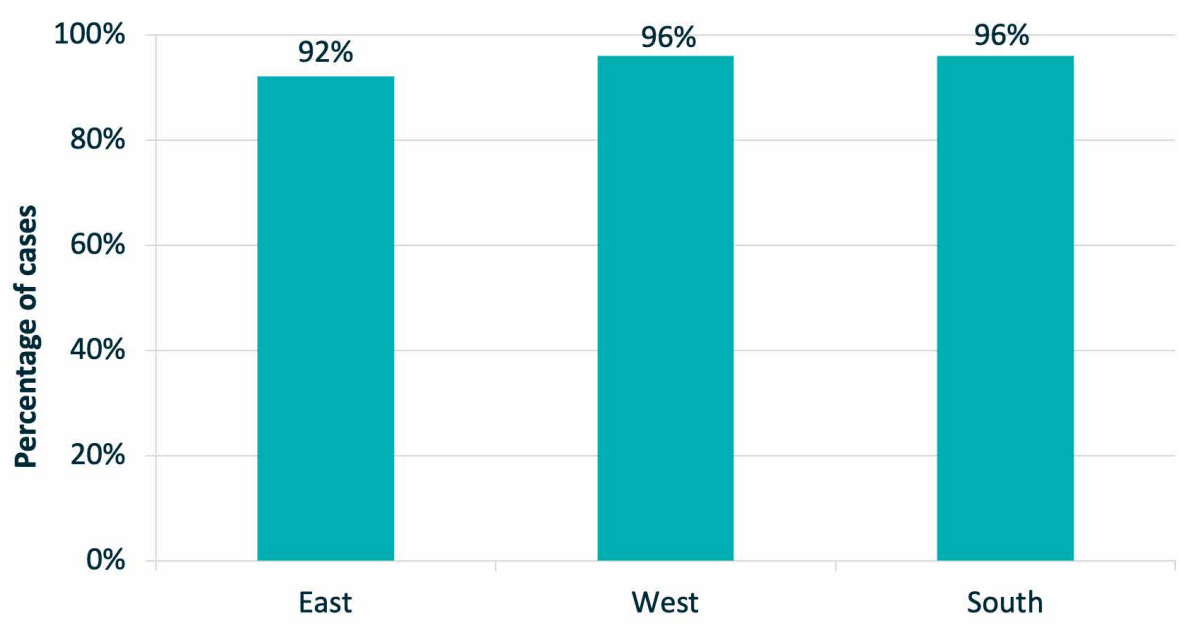


Figure 3: Percentage of Utstein cases with bystander CPR



Out-of-Hospital Cardiac Arrest Register

OHCAR Ireland

At the heart of evidence