National Ambulance Service

Out of Hospital Cardiac Arrest Register

16th Annual Report 2023

Out-of-Hospital Cardiac Arrest Register

OHCAR Ireland

At the heart of evidence

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OHCAR Key Facts 2023

Overall Patient and Event Characteristics

- 2,857 out-of-hospital cardiac arrest incidents attended by Emergency Medical Services (EMS) where resuscitation attempted or had Return of Spontaneous Circulation (ROSC) recorded on OHCAR
  (55 per 100,000 population in 2023)
  - 63% occurred in an urban area[a]
  - 66% Male
  - Median age 68 years (interquartile range 54 – 79)
  - 81% Presumed medical cause
  - 68% Happened in the home
  - 85% Bystander CPR attempted
  - 53% Bystander witnessed
  - 32% of patients had defibrillation attempted
  - 11% of patients had defibrillation attempted pre EMS arrival
  - 28% had ROSC pre-hospital arrival
  - 20% had sustained ROSC to Hospital arrival.

Survivors - Patient and Event Characteristics

240 patients survived

- 8.4% Discharged alive
  - 207 (98%) had good to moderate neurological function on discharge (data available for 211 patients).

Utstein Group

- 15% of patients were in the Utstein Group[b]
  - 52% ROSC pre-hospital
  - 41% ROSC on arrival at hospital
  - 29% 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 [15].
[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
D-CPR	Dispatch assisted Cardio-Pulmonary Resuscitation
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

Molua's Story

Sligo Man, Molua, was at home in Cartron, Sligo, in March 2023 training on his rowing machine when his daughter, Alannah, heard a loud noise.

Molua was mid exercise, while his daughter was studying for exams in another room. Prior to this he had run more than 50 marathons, had been an avid rower and a coach with Sligo Rowing Club. Overall he was generally in good health before the collapse.

Luckily his teenage daughter Alannah was in the house and immediately called 999 and started CPR while taking instructions on the phone from the National Ambulance Service Emergency Call taker

"Alannah learned a bit about CPR in transition year and gave the call-taker our eircode."

The Cartron Community First Responder group had went live with the ambulance service 3 weeks prior. Community First Responder Reece Cawley was after finishing an RNLI training evening nearby. There was a Public Access Defibrillator at the location so he immediately fetched it. Along with RNLI volunteer Daryl Ewing they were on scene about 6 minutes later having been automatically notified to the emergency by text message.

They took over CPR and used the defibrillator (AED) to give a shock. When the paramedics arrived minutes later Molua had a pulse and was breathing. The crew rapidly transported him to Sligo University Hospital. He was treated there and subsequently had two stents inserted in the Mater Hospital in Dublin.

He works as a lecturer in the Atlantic Technological University and has returned to work, been on

Molua with his wife Bernadette and daughters Alannah and Tara

holiday, and has resumed training on his bike and regular walking.

Molua is grateful to his daughters' school for having given Alannah CPR training and has since assisted with arranging CPR demos (by local CFR Groups) in the university campus. He is also encouraging the general public to know the location of automated external defibrillators (AED).

"It's important that as many people as possible are aware of CPR and know where defibrillators are located and how to use them. It should be like learning to ride a bike. CPR and a defibrillator saved my life."

"I would urge anyone to do a CPR course. They will tell you how to use a defibrillator and you could save someone's life. I didn't realise how important they are."

Molua was reunited with Reece and Daryl, along with the National Ambulance Service paramedics and the ambulance dispatcher who were involved in the call. He has also visited the National Ambulance

Service Control room in Ballyshannon and spoke at their awards ceremony.

Molua explained: "I can't thank them enough. I would definitely encourage people to start Community First Responder Groups where they are needed, especially in rural parts of the country.

"Time is of the essence when someone has a heart attack and CPR can keep you going until the ambulance crew get to you."

Commenting on the incident for Restart a Heart 2023, Robert Morton, Director of the HSE National Ambulance Service said: "Out of hospital cardiac arrest survival is dependent on early recognition of an emergency, alerting the Emergency Medical Services, good quality CPR and early defibrillation."

"As the actions of Alannah and Reece demonstrate, Community First Responders can make all the difference when an out of hospital cardiac arrest occurs. Through their swift actions, Molua is here with us today".

Molua with his daughter Alannah and some of the rescuers involved that night

Larry's Story

On the morning of 12th September 2023, Larry, a resident of Co. Meath, experienced a sudden cardiac arrest at his home near Trim. His wife, Ann, quickly called 999 and requested the ambulance service.

Recognizing the critical nature of the situation, the emergency call taker immediately categorized the incident as a cardiac arrest and began providing instructions for CPR.

Although Ann had considered attending a local first aid class the previous year, the course dates clashed with a family holiday and prevented it from happening. Nevertheless, the call taker's clear instructions enabled her to initiate effective chest compressions which provided the second link in the chain of survival.

The 999 call triggered a significant response with various community first response resources in the area. Automated text notifications were sent to the Community First Response (CFR) group in Trim, as well as to off-duty responders (ODRs) from the National Ambulance Service.

Responding to the call were Mark and Jane McSherry, a husband-and-wife team from the CFR group. Both had trained as CPR/AED instructors via the National Ambulance Service and are active members of the Trim branch of the Irish Red Cross. Along with their extensive training in CPR and AED use they had practiced many scenarios involving assisting higher clinical levels and as active CFRs had regularly worked alongside paramedics in the area.

John Nally, an off-duty National Ambulance Service Advanced Paramedic who lived nearby, also received the notification. He was getting his children ready for the day but abandoned his morning routine and proceeded to the scene.

Simultaneously, the ambulance dispatcher mobilised an advanced paramedic, Marc Tighe, from the Trim Ambulance base in a rapid response vehicle, along with an ambulance which was in Mullingar.

The four responders arrived almost simultaneously and found Ann performing effective CPR. Mark and Jane took over chest compressions, while John and Marc conducted further assessments and initiated advanced life support interventions. They had all met each other before and worked together at calls. They were joined by Gordon and Philip (a qualified paramedic), both of whom responded as volunteers with Trim CFR and are also members of the Irish Red Cross.

Larry along with his wife Ann and grandsons Lorcan and Killian

The team's familiarity with one another facilitated excellent coordination during the resuscitation effort.

An ambulance and paramedics arrived from Mullingar, and after a prolonged resuscitation, Larry began to show signs of life. He was subsequently transported to Mullingar General Hospital, with both John and Marc continuing care en route. Larry was admitted to the intensive care unit and has since made an excellent recovery.

Ann has since underscored the importance of learning CPR: "The emergency call taker guided me through the process and kept me calm and focused. It's crucial to know CPR—it can save a life."

Larry echos the sentiment saying "I think I'm very fortunate, I am one of the lucky ones. We can never thank everyone adequately for the service provided that morning. We are so lucky to live in an area with such a response and unfortunately we know that service is not everywhere. We are so grateful to everyone involved both at the scene and also a special thanks to the staff in Mullingar Hospital, particularly the ICU for their excellent care and kindness".

Chapter 1

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

The OHCAR Steering Group and Governance

The Aim of OHCAR

OHCAR reporting to Service Providers

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Chapter 1

1.0 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]. OHCAR is one of four OHCA registries in Europe with full national coverage.

1.1 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).

1.2 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.

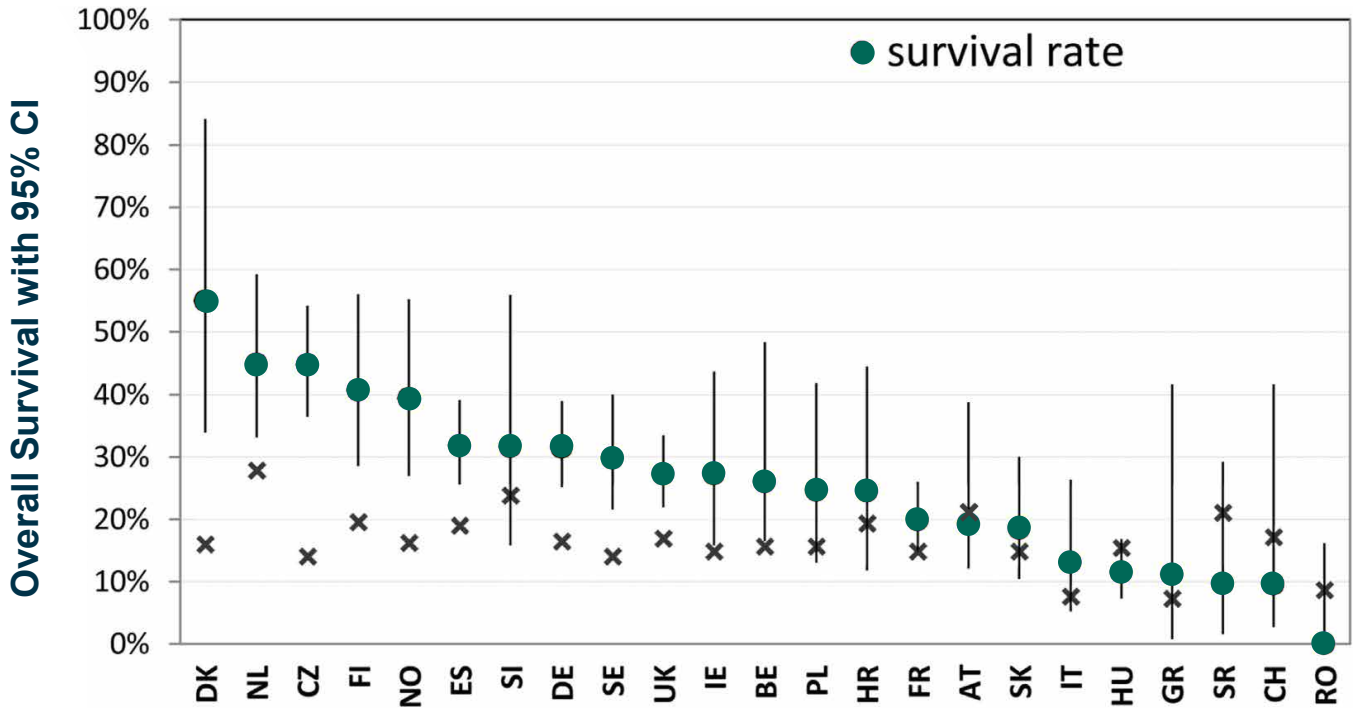
1.3 OHCAR reporting to Service Providers

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 according to the new HSE Health Regions.
(Map 1).

1.4 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, which was a three month study from October to December 2017, and was published in 2020 [4]. 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 5, 6 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 (Ireland = 'IE')



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) including patients who have achieved Return of Spontaneous Circulation (ROSC before EMS arrival (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= 4,895

Number that had a resuscitation attempt

n = 3,182

Number that had resuscitation continued on EMS arrival

n = 2,857

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.[7, 8]

National Ambulance Service: NAS uses electronic PCRs (ePCR), and during 2023 OHCAR identified all cases via the ePCR system. 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. Data from the Community First Responders is gathered electronically and is matched via incident numbers and added to NAS data. Cases are also matched with data from NAS defibrillators.

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 9, 10].

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

2.4 Aetiology

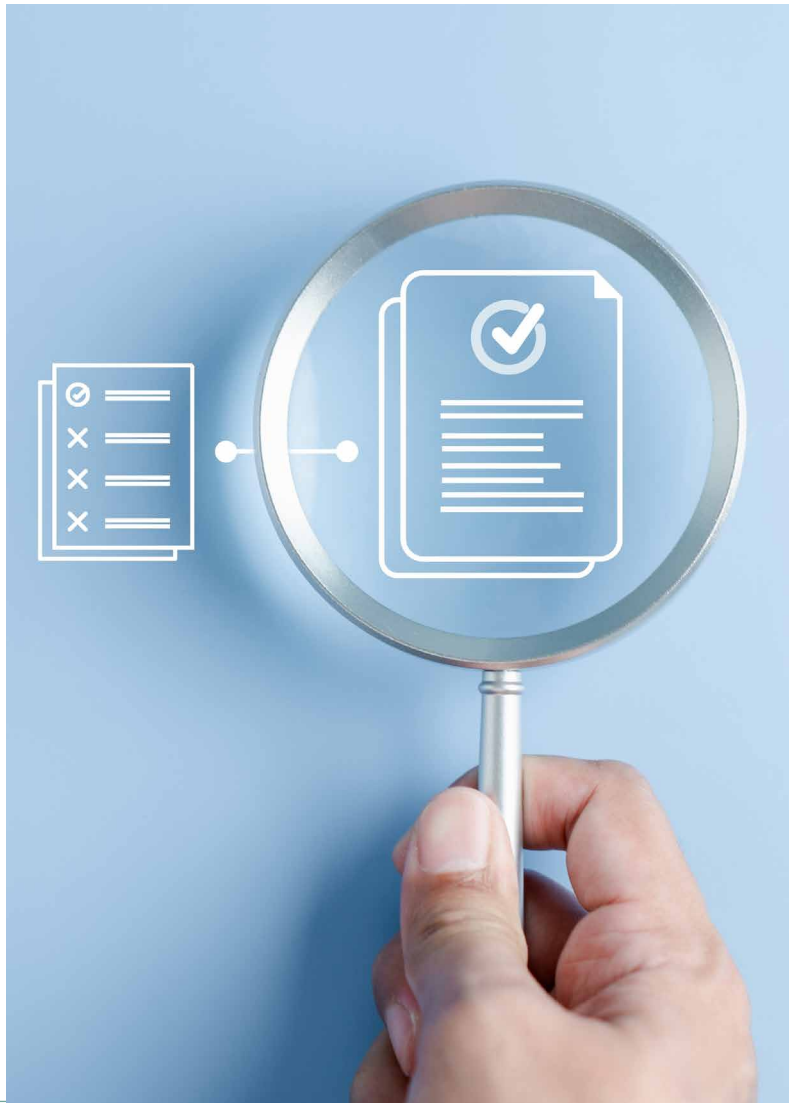
As per the Utstein definition, where there is no evidence of another cause, e.g. trauma, asphyxiation, drug overdose cases were presumed to be of medical aetiology.

2.5 Data Quality Management

The Utstein guidelines state that, “organisers of OHCA registries should implement monitoring and remediation for completeness of case capture [8‘’]. 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 Data Analysis

Data analysis was performed using IBM SPSS version 29. 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.[11]

Chapter 3

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Utstein Comparator Subset

Utstein Comparator Subset Outcomes

3.0 Results for 2023

3.1 Incidence

In 2023, a total of 2,857 OHCA were attended where resuscitation was reported to have been attempted by NAS, DFB, DAA or bystanders, and continued by the EMS or had achieved ROSC pre-EMS arrival. This equates to 55 OHCA resuscitation attempts per 100,000 in 2023 12. In Europe, the estimated incidence of OHCA ranges between 27 and 91 per 100,000 per year. [13]

In 2023, the majority of OHCA incidents were presumed to be of medical aetiology (45/100,000 persons) compared to a small proportion of cases of non-medical aetiology (trauma, asphyxia, drug overdose or submersion, 10/100,000 persons). (Map 1[d]).

[d] Population data from Census of Population 2022.[14]

Map1: Incidence of OHCA with resuscitation attempts in 2023

Map of six new Regional Health Areas

AREA A

Overall
50/100,000 population

Medical
41/100,000 population

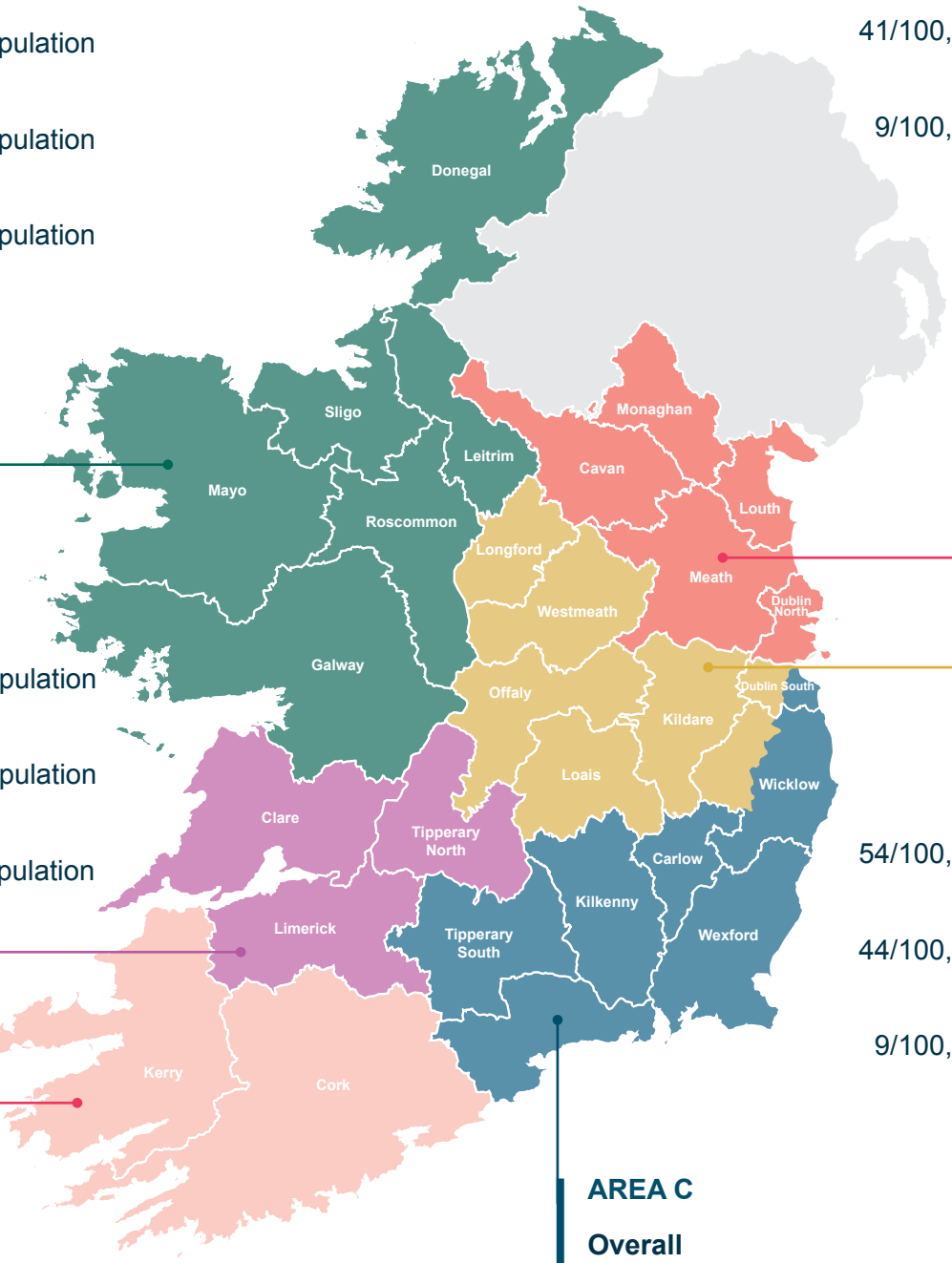
Non-medical
9/100,000 population

AREA F

Overall
59/100,000 population

Medical
47/100,000 population

Non-medical
12/100,000 population



AREA E

Overall
58/100,000 population

Medical
46/100,000 population

Non-medical
11/100,000 population

AREA B

Overall
54/100,000 population

Medical
44/100,000 population

Non-medical
9/100,000 population

AREA D

Overall
62/100,000 population

Medical
51/100,000 population

Non-medical
11/100,000 population

AREA C

Overall
55/100,000 population

Medical
45/100,000 population

Non-medical
10/100,000 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.[13]

- 63% of cases occurred in an urban area (n=1,745/2,763); 94 cases could not be geocoded due to insufficient data or the event having occurred during ambulance transport.

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

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

3.3 Demographics

- 1,877 patients were male (66%)
- Patients ranged in age from less than one to over 100 years old (median age 68 years, interquartile range (IQR) 54 – 79)
- Females were older than males, 72 years (IQR 58 – 82) vs. 66 years (IQR 52 – 77) respectively), ($p<0.001$)
- Females were more likely to collapse in a private setting (homes or residential institutions) than males (n=814/979, 83% v 1,343/1,877, 72%), ($p<0.001$).

3.4 Community First Responders

In December 2023 there were 259 Community First Responder (CFR) groups in 26 counties linked with NAS. 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.

- CPR was initiated by CFR's in 8% of cases (n=220/2,795)
- CFR's first applied defibrillators pads in 13% of cases (n=386/2,853)
- In those patients that were defibrillated, the first shock was delivered by CFR's in 14% of cases (n=131/910)
- 24% of cases that received their first shock by CFR's were discharged alive (n=31/131).

3.5 Dispatch assisted Cardio-pulmonary Resuscitation

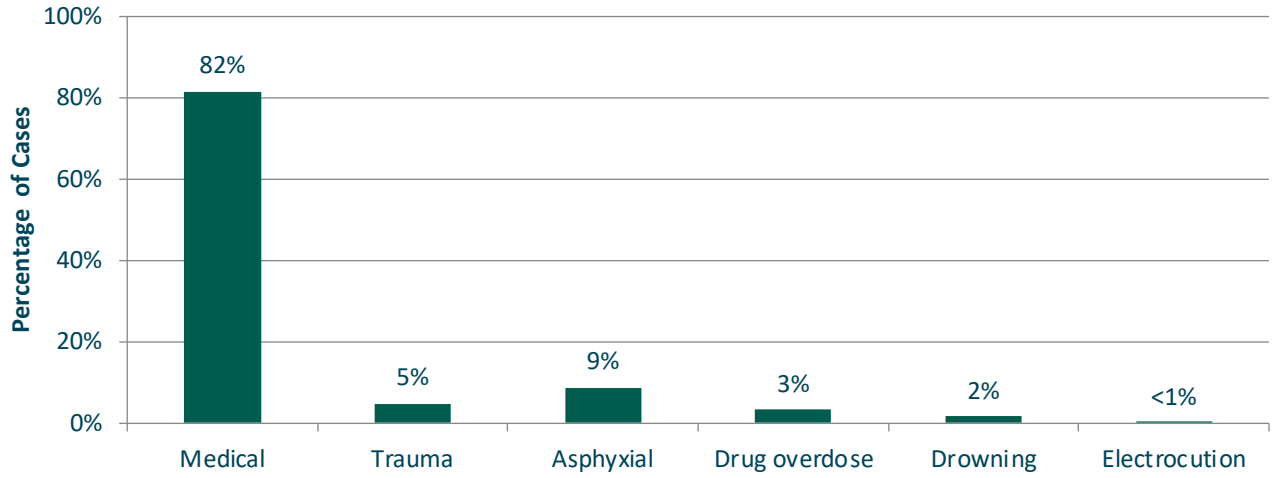
Since 2022, NAS has been recording the metric Dispatch-assisted CPR (D-CPR). When cardiac arrest is confirmed or suspected by the Emergency Call Taker, the caller is given instructions in performing CPR. The time taken to commence is measured in minutes and seconds from when the call is received by the EMS call taker to when D-CPR is offered. Only non-EMS witnessed cases are included here. It is important to note that D-CPR instructions are provided only if the call is categorised as cardiac arrest by the call taker and if the caller has not already commenced CPR.

- Of those cases that were NAS, and not EMS witnessed, had B-CPR performed, 57% required D-CPR (the other 43% had already commenced CPR. The median time in minutes was 2:25 (IQR 1:33 – 4:32) (n=942/1,657).

3.6 Presumed Aetiology

- 82% of incidents were presumed to be of medical aetiology (n=2,329/2,857)
- Non-medical aetiologies included (Figure 3):
  - 9% asphyxia (n=249)
  - 5% trauma (n=137)
  - 3% drug overdose (n=94)
  - 2% submersion (n=47)
  - <1% Electrocution (n=1)
- 80% of male patients had a presumed medical aetiology (n=1,500/1,877) compared to 85% of female patients (n=829/979), (p<0.004)
- 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)



3.7 Call Response Interval

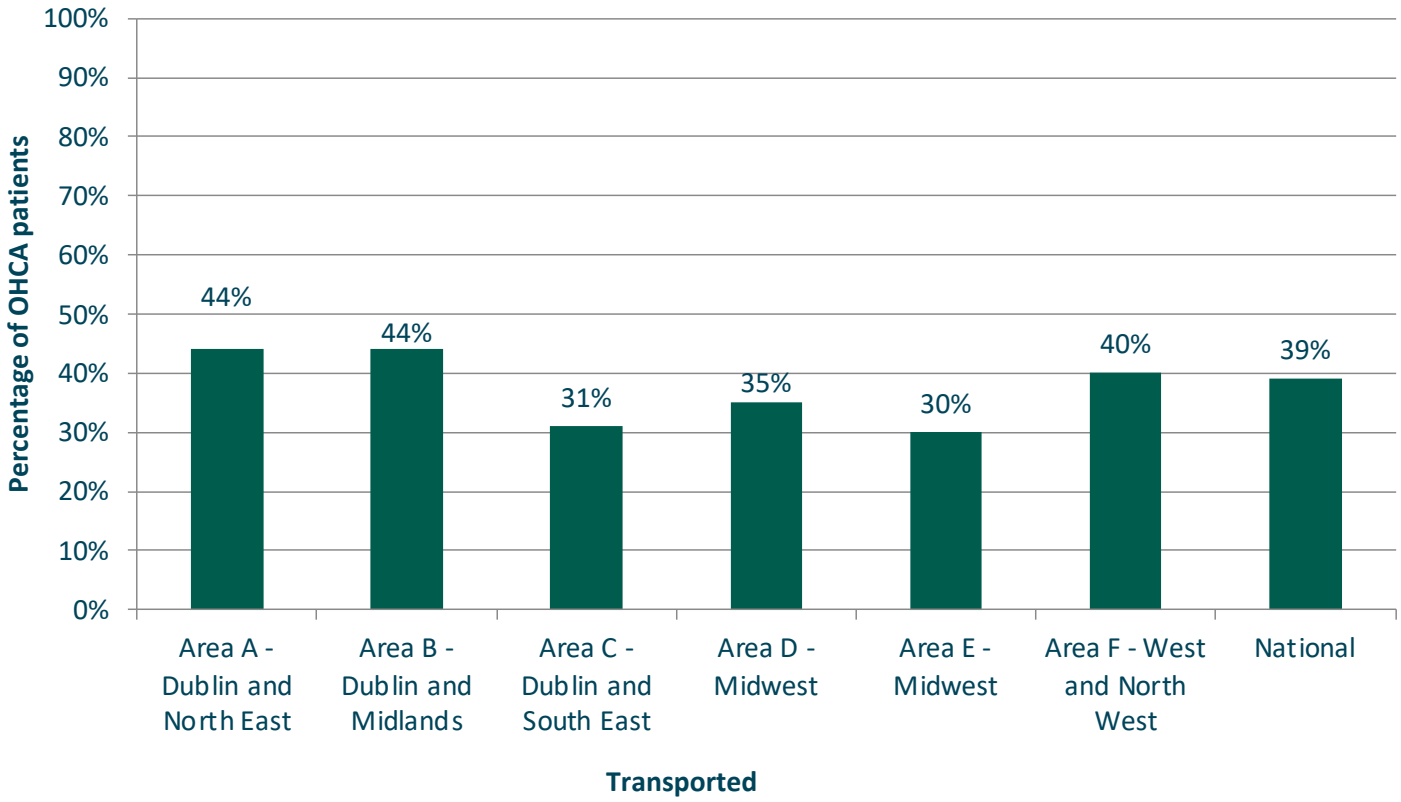
As per the Utstein definition [10], the call response interval (CRI) is the interval from the time the emergency call was received at the dispatch centre to arrival of EMS at the scene. Only the CRI for non-EMS witnessed cases are included in this analysis (n=2,514/2,856). As CRI is not normally distributed, the median value for each category is given:

All non EMS witnessed cases	13 minutes (IQR 9 – 20 minutes)
Rural non EMS witnessed cases	18 minutes (IQR 13 – 25 minutes)
Urban non EMS witnessed cases	11 minutes (IQR 8 – 16 minutes)
Utstein comparator group	13 minutes (IQR 8 – 19 minutes)

3.8 Transported to Hospital

- 39% of patients were transported to either an Emergency Department or a cardiac catheterisation laboratory (n=1,101/2,857)
- The percentage of patients who were transported to hospital was 44% in Regional Health Area (RHA) A – Dublin and North compared to 30% in Area E - Midwest, (Figure 4)
- More patients were transported in urban areas compared to rural areas (43% vs. 27%, p<0.001).

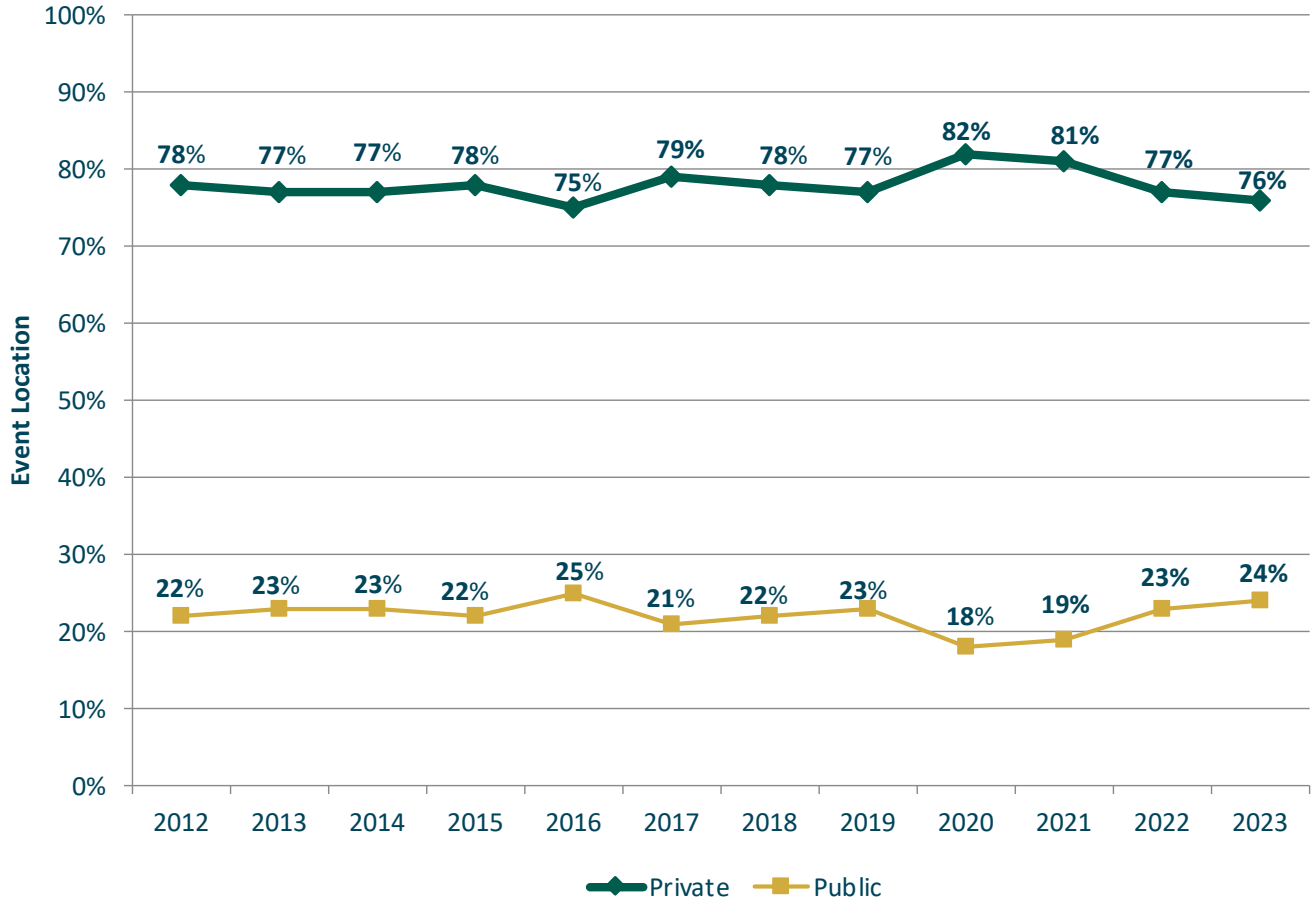
Figure 4: Proportion of patients transported to hospital by RHAs and nationally



3.9 Event Location

- 68% of incidents occurred in the home (n=1,947/2,857)
- 76% of incidents occurred in a private setting (home, farm or residential institution (n=2,158/2,857)
- 24% 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=699/2,857) (Figure 5)
- In urban areas, a higher proportion of patients collapsed in a public place compared to rural areas (23% vs. 20%), (p<0.051).

Figure 5: Event Location



3.10 First Monitored Rhythm

- 23% of cases were in a shockable rhythm at time of first rhythm analysis (n=649/2,855) (Figure 7)
- The initial rhythm was asystole in 41% of cases (n=1,138/2,803), (Figure 8).

Figure 7: Initial Rhythm shockable

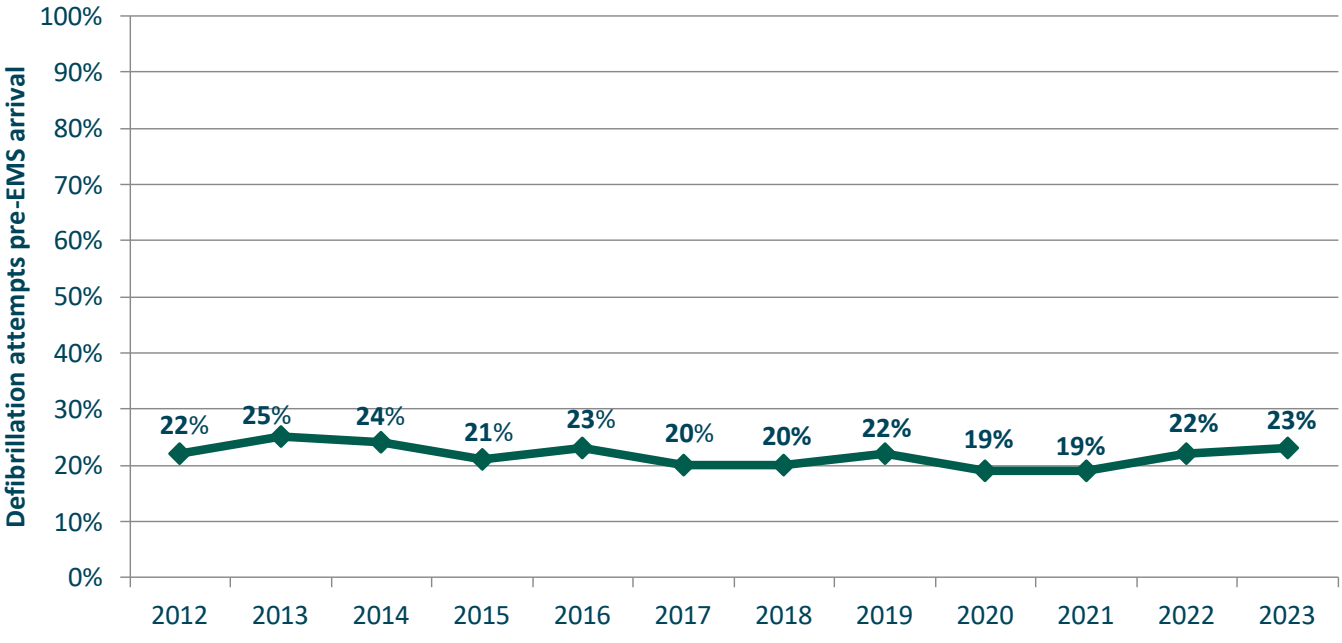
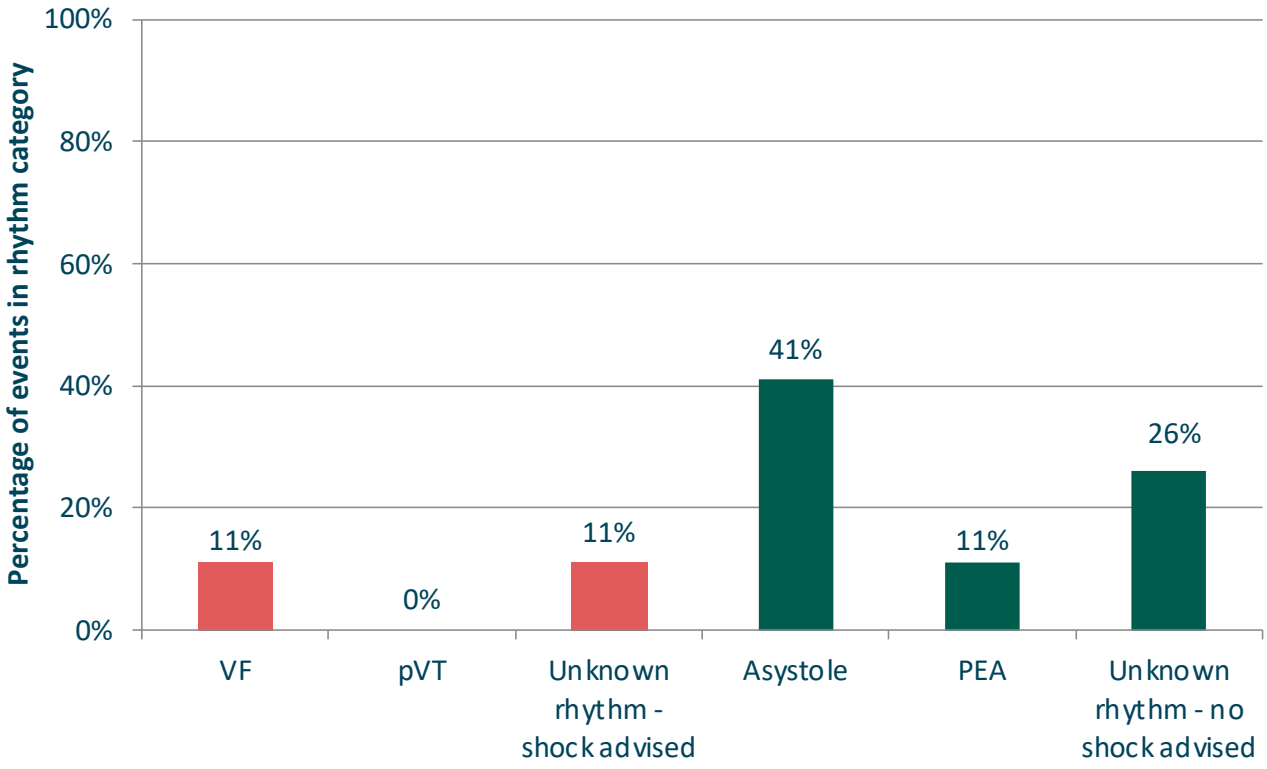


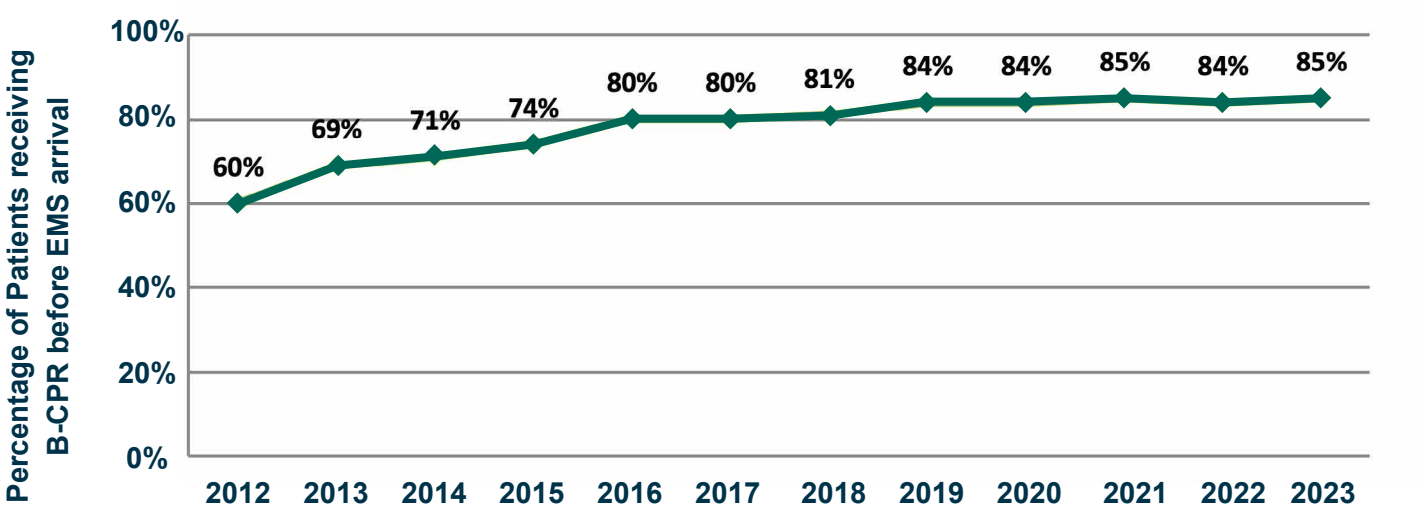
Figure 8: First monitored rhythm (n=2,803)



3.11 Bystander CPR

- Bystander CPR was attempted in 85% of non-EMS witnessed* cases (n=2,144/2,515) (Figure 9).

Figure 9: Percentage of patients receiving B-CPR before EMS arrival, years 2012 – 2023



*i.e. non-EMS witnessed cases

- In the subgroup of patients that had a bystander witnessed collapse (n=1,511) 88% (n=1,326) of patients had bystander CPR (B-CPR) attempted
- A higher proportion of cases in a rural area received B-CPR (n=860/1,018) compared to an urban area (n=1,281/1,745) (84% vs. 74%; p<0.001)
- A higher proportion of cases in a private location received B-CPR (n=1,667/2,158)compared to a public location (n=505/699) (77% vs. 72%; p<0.007).

3.12 Mechanical CPR

- 54% of cases had Mechanical CPR performed (n=1,442/2,686).

3.13 Defibrillation

- 32% of cases had defibrillation attempted (n=910/2,855)
- 11% of cases had defibrillation attempted pre-EMS arrival (n=304/2,850) (Figure 10)
- Of the 910 patients who had defibrillation attempted:
  - 394 had the pads applied pre-EMS arrival (43%)
  - 304 had the first shock delivered pre-EMS arrival (33%, Figure 11).

Figure 10: 11% of all cases had defibrillation attempted pre-EMS arrival (n=304/2,850)

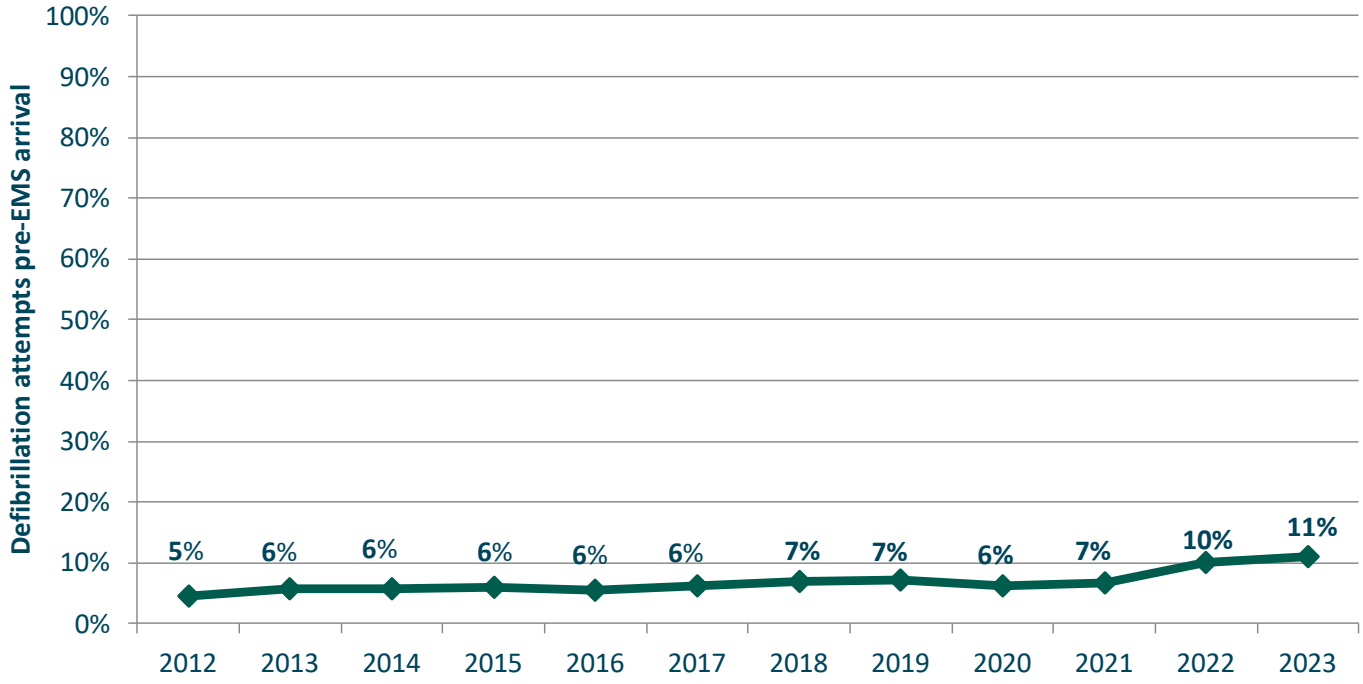
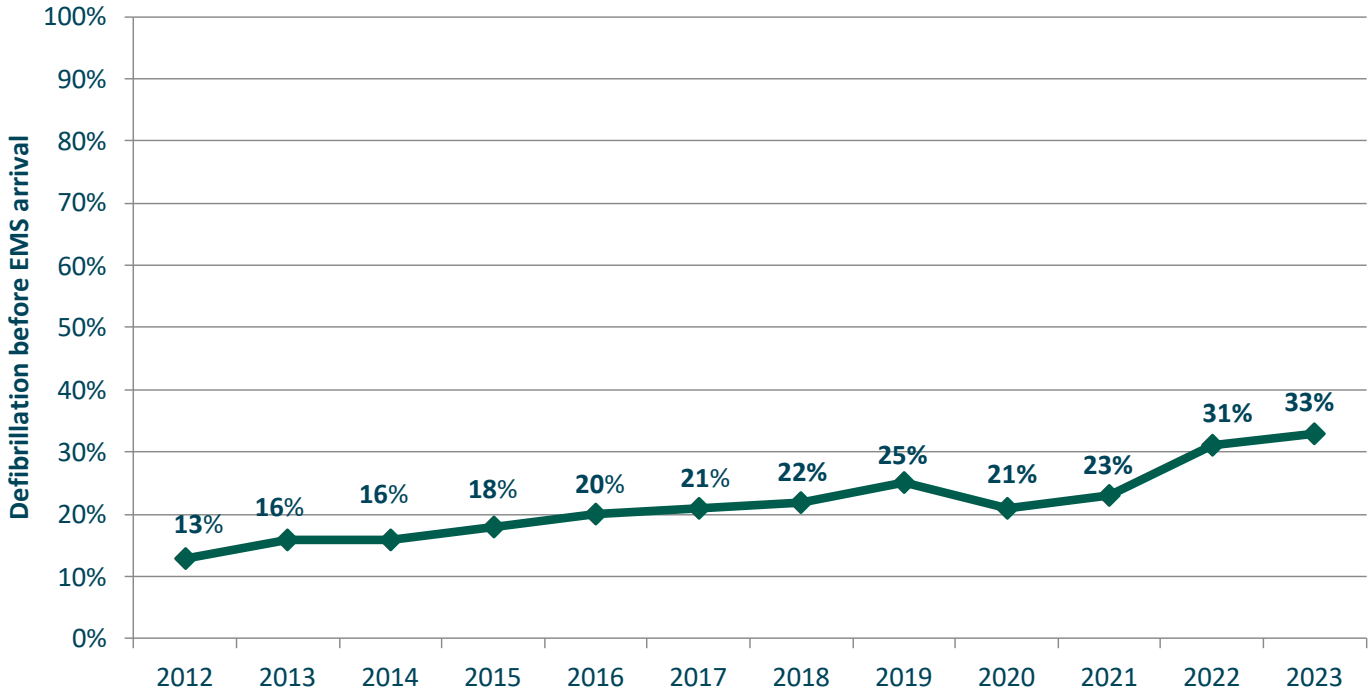


Figure 11: Defibrillation attempted pre-EMS arrival (of those with attempted defibrillation) (n=304/910)



First shock delivered before EMS arrival

In the 304 cases where first shock was delivered before EMS arrival, the identity of the person who delivered the first shock was as follows:

- Community First Responder (43%, n=131)
- Members of the general public (17%, n=53)
- Local Fire services (8%, n=25)
- Nurses (9%, n=28)
- Doctors (10%, n=29)
- Voluntary Services (10%, n=31)
- Members of An Garda Síochána (2%, n=7).

Conversion to shockable rhythm during resuscitation

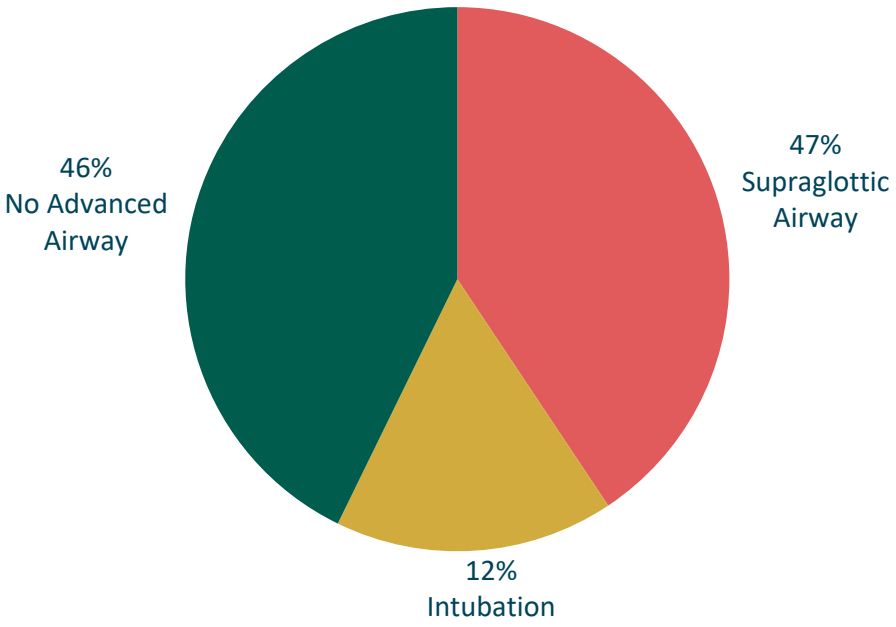
A total of 274 patients converted to a shockable rhythm during resuscitation. Of these:

- 49% were initially in asystole (n=134/274)
- 2% were initially in PEA (n=17/274), rhythm type not specified for the remainder.

3.14 Advanced Airway Adjuncts

- In 61% of cases, advanced airway adjuncts were used, i.e. supra-glottic airway device or intubation (n=1,707/2,790), (Figure 12).

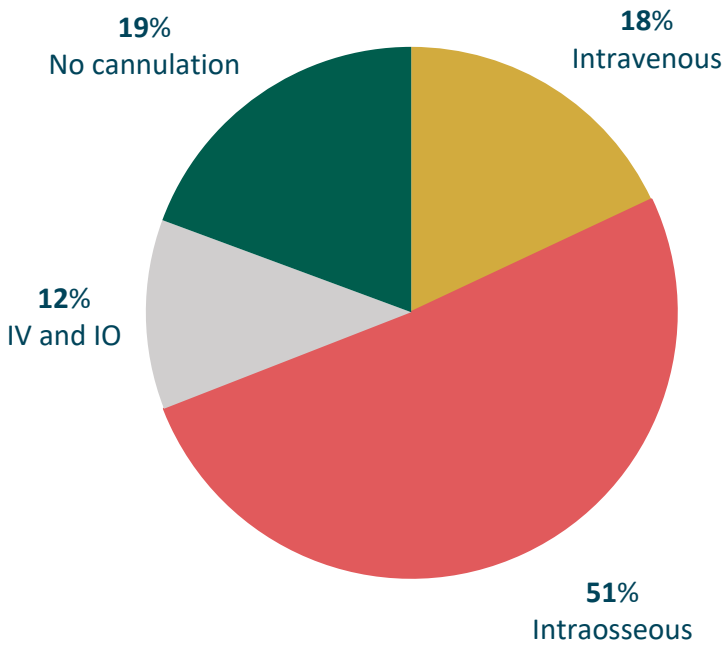
Figure 12: Adjunct airway management (n=2,790)



3.15 Cannulation

- 81% of cases had cannulation performed (n=2,308/2,857)
  - 51% of cases had intraosseous cannulation (n=1,448/2,837)
  - 18% had intravenous only cannulation (n=512/2,837)
  - 12% had a combination of both techniques (n=328/2,837)
  - 19% had no cannulation performed (n=549/2,837) (Figure 13).

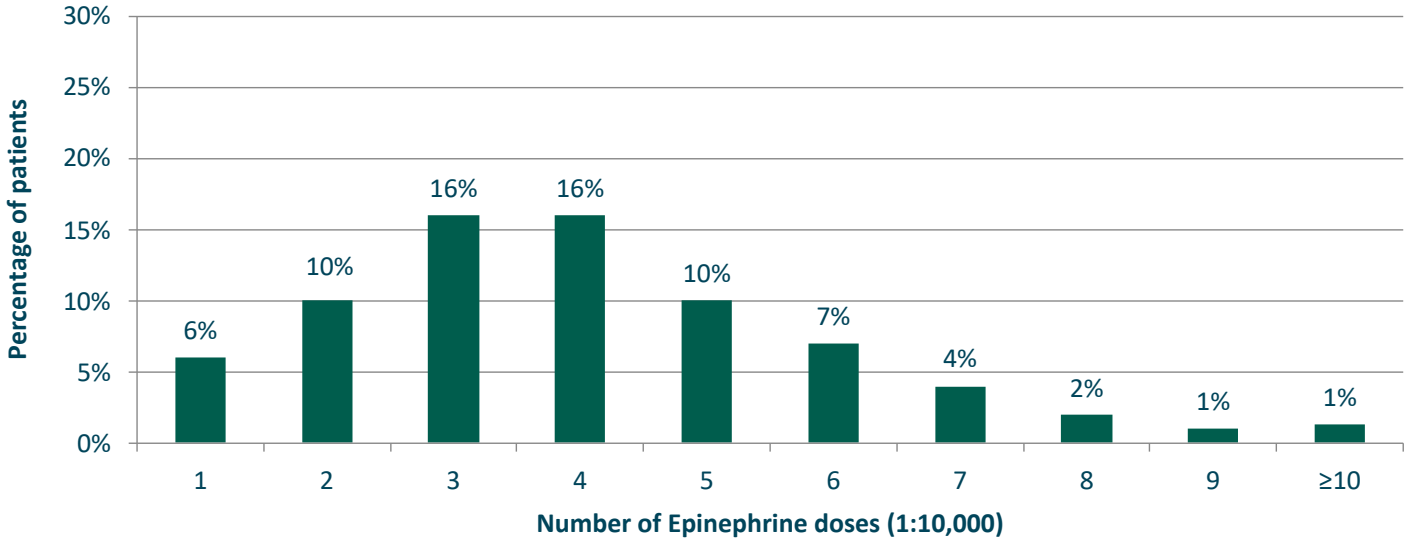
Figure 13: Cannulation (n=2,837)



3.16 Cardiac Arrest Medication

- 74% of cases had epinephrine administered (n=2,117/2,857); the number of doses given ranged from 1 to 18 (Figure 14).

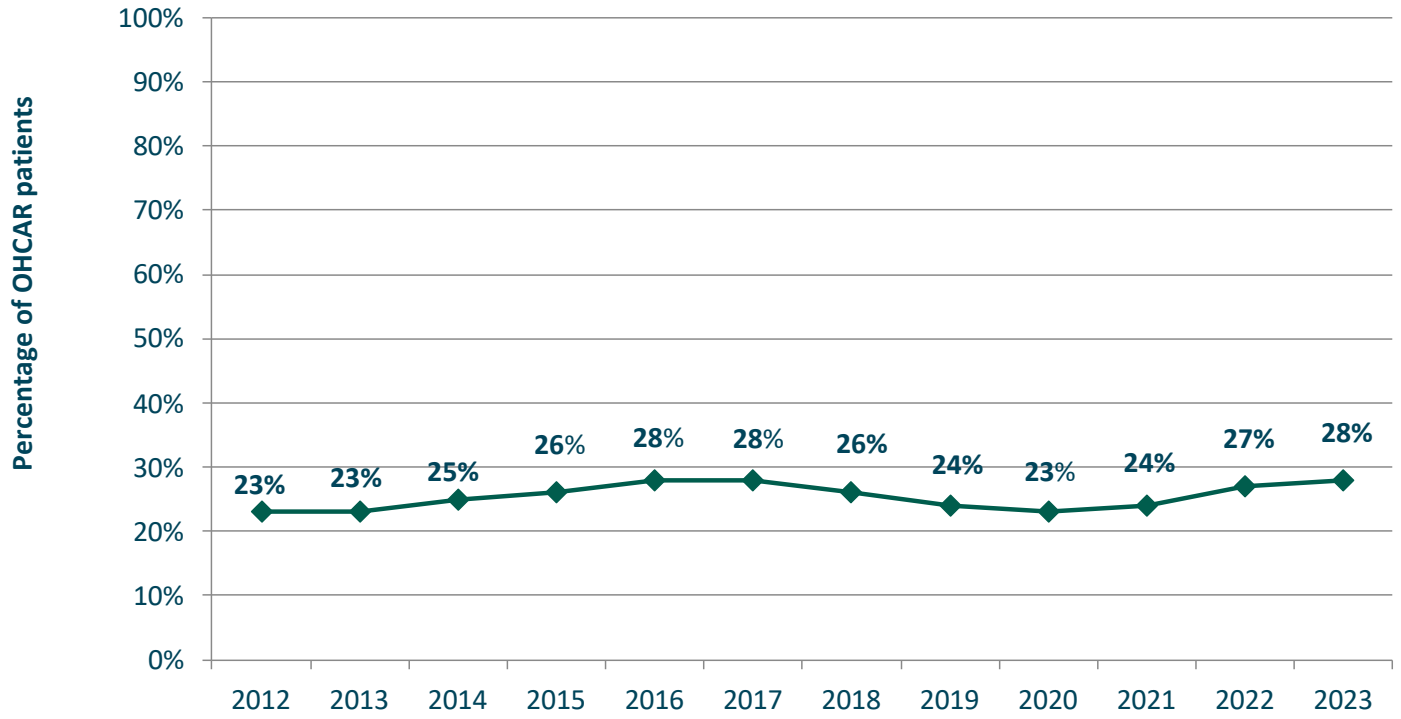
Figure 14: Percentage of Epinephrine doses (1:10,000)



3.17 ROSC at any stage

- 28% of cases had ROSC before Hospital arrival (n=796/2,852) (Figure 15)
- A higher number of patients achieved ROSC in urban compared to rural areas (29% vs. 25%) (n=502/1,740 vs. n=250/1,018), (p<0.016).

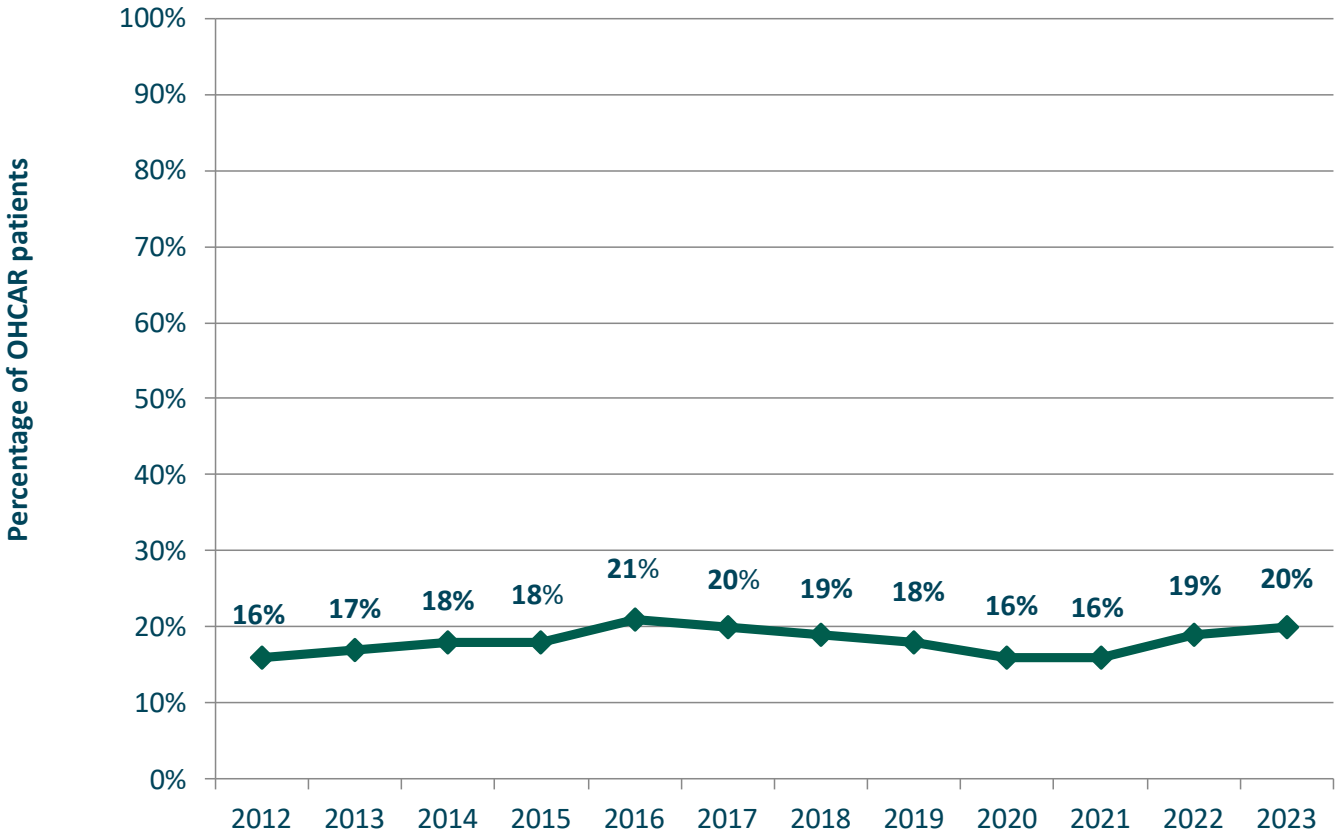
Figure 15: ROSC at any stage pre-hospital, all patients. Years 2012 – 2023



3.18 ROSC on Hospital arrival

- 20% of cases had ROSC on Hospital arrival (n=566/2,800) (Figure 16)
- ROSC on Hospital arrival was higher in urban than rural areas (21% vs. 16%), (p<0.004).

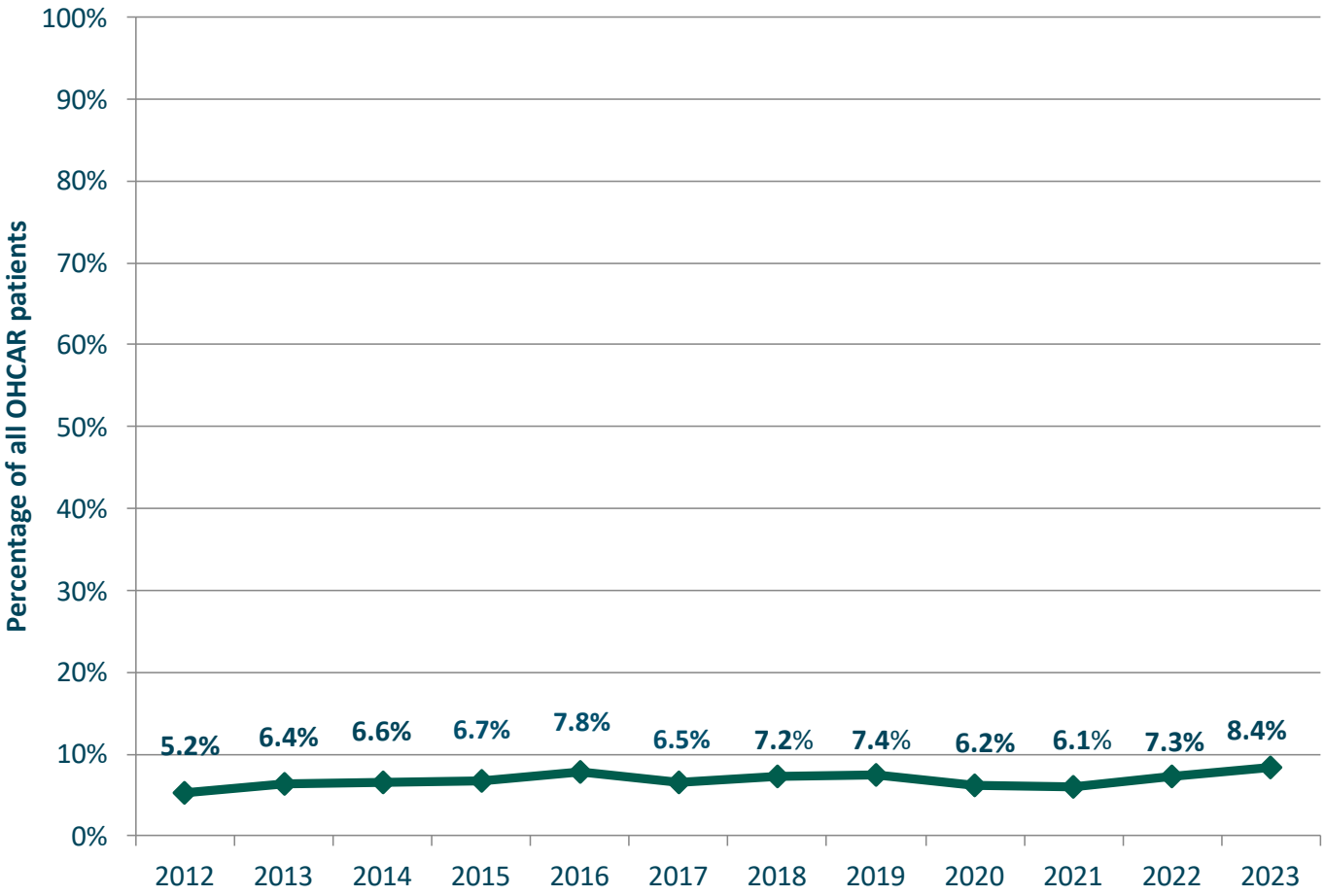
Figure 16: ROSC at Hospital arrival, all patients. Years 2012 – 2023



3.19 Discharged alive from Hospital

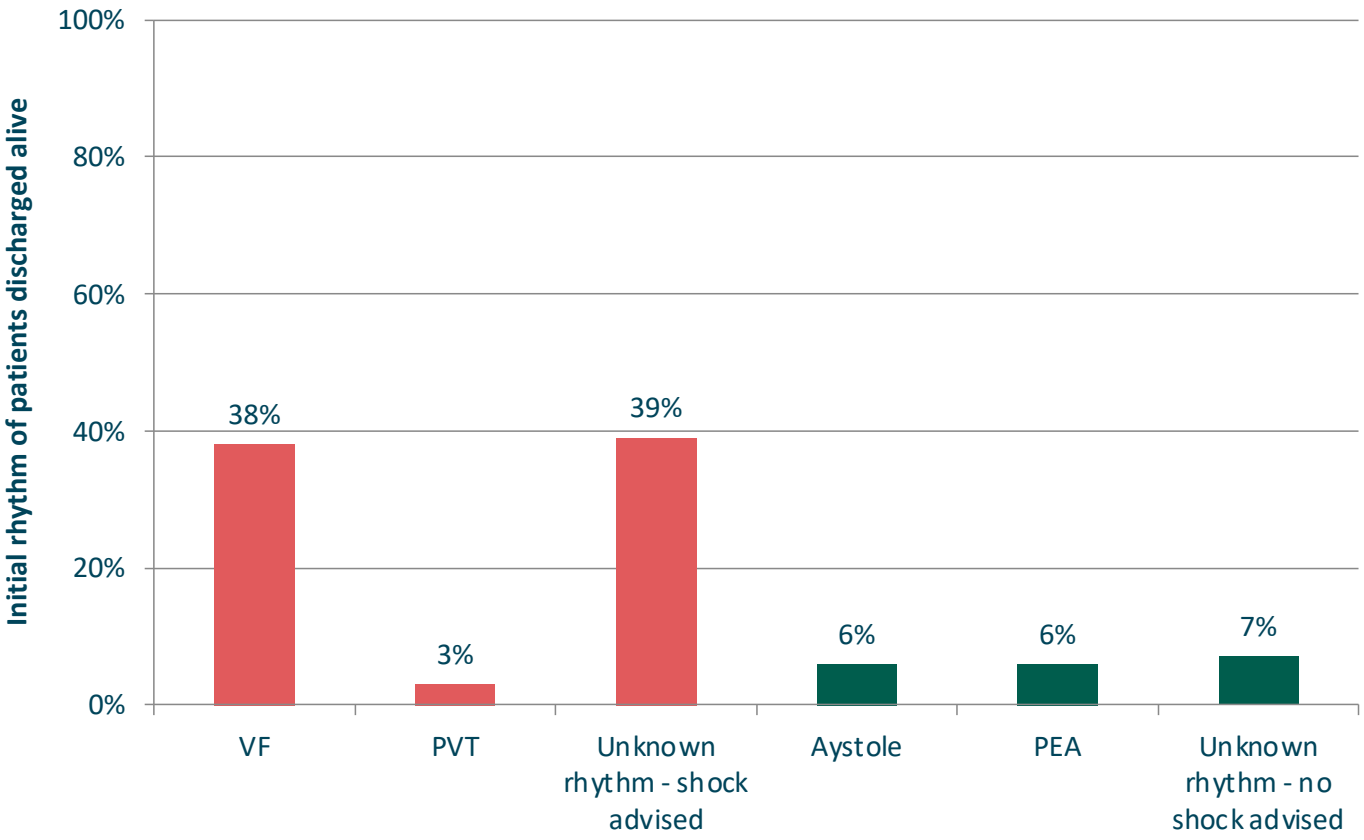
- A total of 240 patients were discharged alive from hospital (8.4%) (Figure 17). Data on 10 patients who were transported to hospital could not be obtained.

Figure 17: Percentage survival to discharge, all patients. Years 2012 – 2023 (n=1,981/28,834)



- Surviving patients were younger (median age 58 years, IQR 49 – 71) than non-surviving patients (median age 69 years, IQR 55 – 80 years, p≤0.001)
- The presumed aetiology was medical for 89% of survivors
- Survival in the presumed medical aetiology group was 9% (n=214/2,329) compared with 5% (n=26/528) in the non-medical group (p=0.007)
- 19% of patients who collapsed in a public location survived (n=133/699), compared to 5% of patients that collapsed in a private location (n=107/2,158), (p≤0.001)
- 8.8% of patients who collapsed in an urban area survived (n=154/1,745), compared to 6.7% of patients that collapsed in a rural area (n=68/1,018), (p≤0.007)
- 80% of survivors had an initial shockable rhythm (n=192/240, Figure 18)
- 20% of survivors had an initial non-shockable rhythm (n=47/239).

Figure 18: Percentage of survivors categorised by first analysed rhythm



- In the non-EMS witnessed group of survivors (n=180)
  - 91% had a witnessed arrest
  - 96% received bystander CPR
  - 59% (n=105), had defibrillator pads applied prior to EMS arrival
  - 49% (n=88) were shocked before EMS arrival
- In the EMS-witnessed group, 20% of patients survived (n=56/285)
- In the subgroup of EMS-witnessed patients that were adults, with presumed medical aetiology, with an initial shockable rhythm, 58% of patients survived (n=40/69).

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:

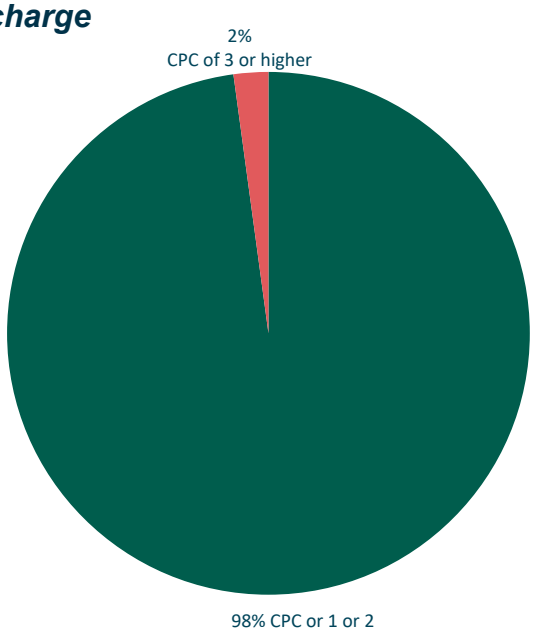
1. Good cerebral performance
2. Moderate disability: conscious, sufficient cerebral function for independent living
3. Severe disability: dependent on others for daily support
4. Coma or vegetative state
5. Brain death.

CPC score data was available for 211 surviving patients (Figure 19):

- 98% (n=207) 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 29 surviving patients.

Figure 19: CPC score at discharge



3.21 OHCA in the under 35 age group

- 9% of all cases were recorded as being <35 years of age (n=248/2,847)
  - 39% were of a presumed medical aetiology (n=97/248)
  - 15% were caused by trauma (road traffic accident, gunshot, stabbing, crush injuries or fall) (n=38/248)
  - 12% of cases resulted from a drug overdose (n=31/248)
  - 52% of cases were unwitnessed (n=129/245)
  - 14% were initially shockable (n=35/248)
  - 9.3% survived to Hospital discharge (n=23/248).

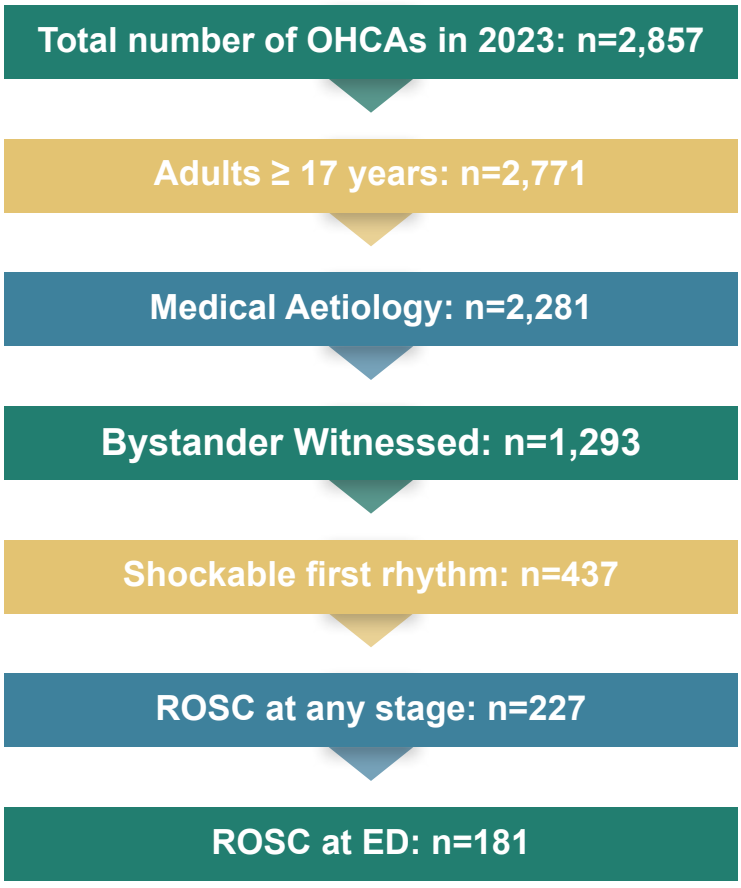
3.22 Utstein Comparator Subset

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.

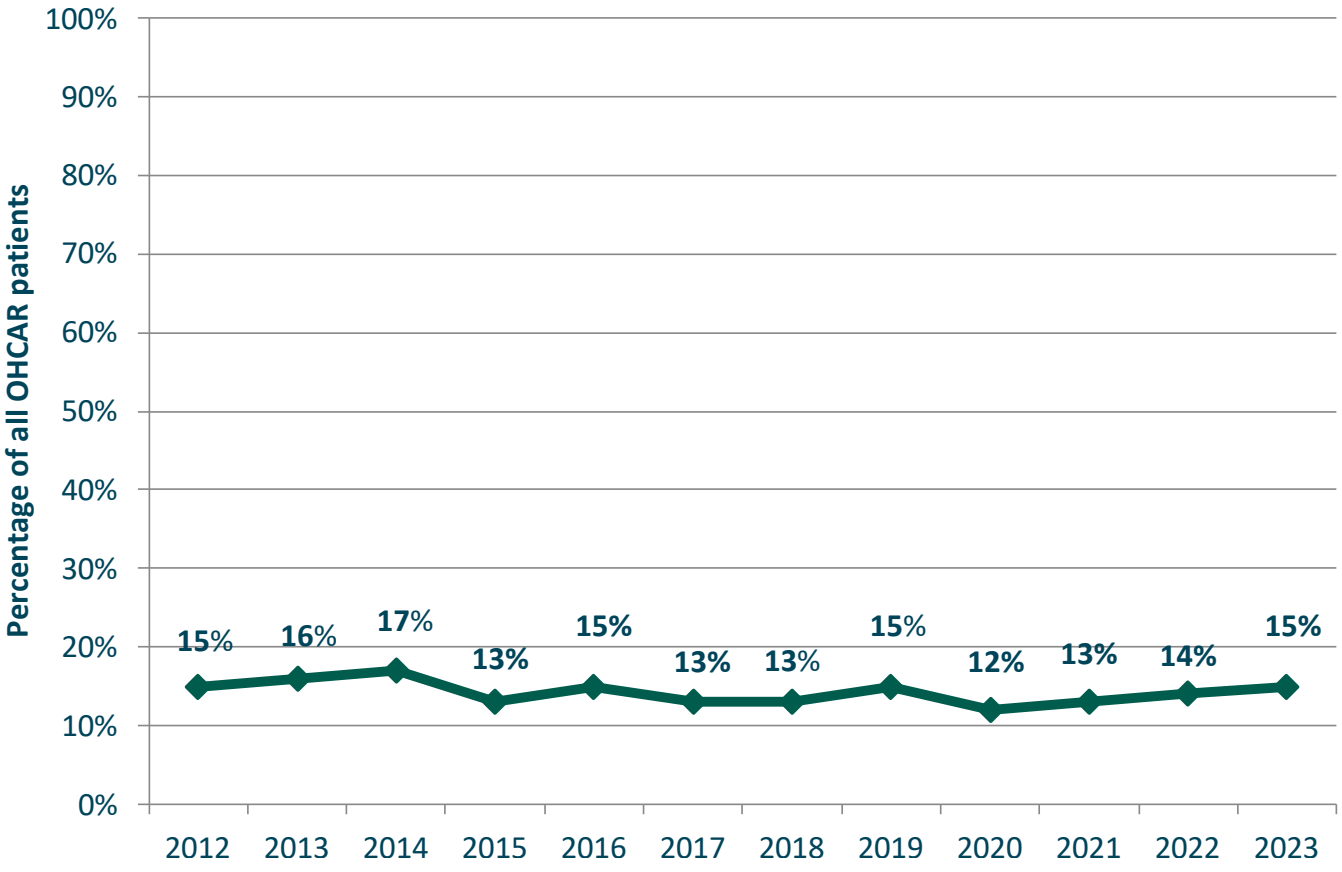
There is wide variation of circumstances around a cardiac arrest and patient characteristics. Using the Utstein comparator subset allows for a more standardised comparison of patient outcomes between systems and time periods (Figure 20).

Figure 20: Flowchart of the 2023 Utstein comparator subset and ROSC outcomes



In 2023, the Utstein comparator subset included 437 patients and accounted for 15% of all OHCAR cases (437/2,857, Figure 21).

Figure 21: Utstein comparator subset 2012 – 2023

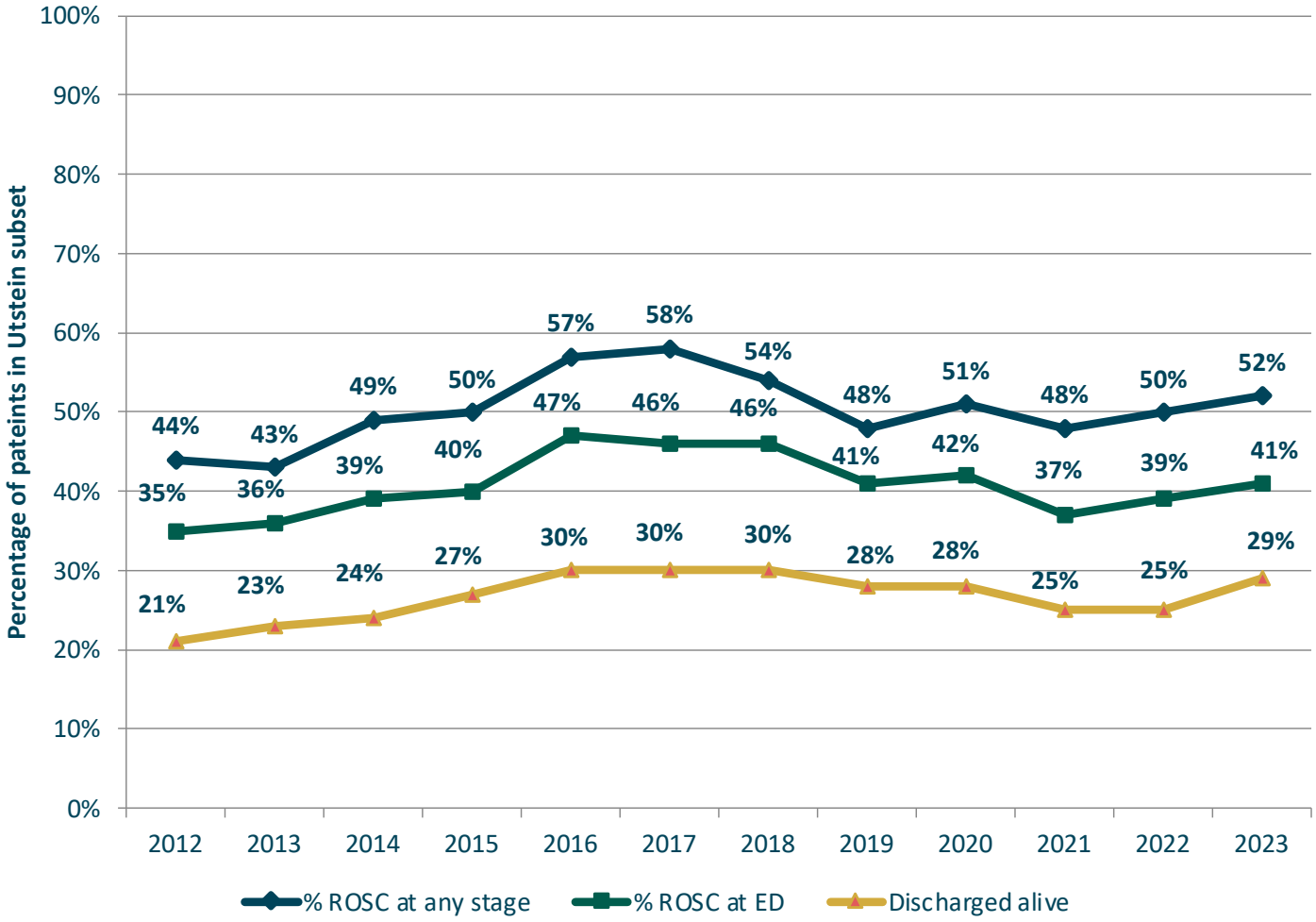


3.23 Utstein Comparator Subset Outcomes

- 52% of patients (n=227/437) achieved ROSC at some stage before hospital arrival
- 41% of patients (n=181/437 had ROSC on hospital arrival
- 29% of patients (n=127/437) were discharged alive from hospital (Figure 22)
- Of the survivors for whom CPC was available, 96% had a CPC score of one or two (n=112/117).

N.B. Data on CPC score was missing for five surviving Utstein patients.

Figure 22: Outcomes in the Utstein comparator subset, years 2012 – 2023



Case Characteristics

- Of those patients who collapsed in a public location, 40% survived (n=71/177) compared to 22% in a private location (n=56/260) (p=0.001)
- 89% of cases were recognised as cardiac arrest at the time of ambulance dispatch (n=381/427)
- Bystander CPR was performed on 98% of survivors
- 61% of the patients who survived had defibrillation attempted before ambulance service arrival (n=76/125). The estimated median time from 'time of collapse' to 'time of first shock administered' was 8 minutes (n=73/100, IQR 4 – 11).

Chapter 4

Conclusion

Future developments in OHCAR

4.0 Conclusion

Compared to the 2022 OHCAR Annual Report, Bystander CPR in 2023 has increased from 84% to 85%. Attempted defibrillation before EMS arrival has increased to 11% of all patients. In the subgroup of patients who had defibrillation attempted (n=910), there has been an increase in attempted defibrillation before EMS arrival, from 31% to 33%. ROSC before hospital arrival was 33%, ROSC on hospital arrival was 20% and the absolute number of patients discharged alive from hospital has increased from 206 in 2022 to 240.

In the Utstein group the ROSC prior to hospital arrival was 52%, ROSC at Hospital arrival was 41% and discharge alive was 29%. In line with previous years, and international data, 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.

An important milestone was the publication of an analysis of the trends in Irish national out of hospital cardiac arrest data from 2012-2020 inclusive (Barry, 2024) [15]. This longitudinal study of 18,117 cases confirmed that national survival from OHCA has significantly increased incrementally over time in Ireland. It also showed that the COVID-19 pandemic was associated with decreased survival even after accounting for potential disruption to key elements of bystander and EMS care. The OHCAR registry is very well placed to continue to provide high quality and timely data to support service improvement and increase patient survival.

4.1 Future developments in OHCAR

OHCAR is working closely with the HSE Data Protection Officer to ensure that data sharing agreements are aligned with the GDPR. OHCAR is collecting data on D-CPR from NAS only, but is working with the DFB to gain national coverage of the metric. OHCAR has commenced measuring Quality of Life (QoL) in OHCA survivors, using the internationally recognised EQ-5D-5L and Short Form 36 questionnaires. OHCAR is aligned with the Irish Heart Foundation in signposting supports to OHCA survivors that they may benefit from.

Chapter 5

Acknowledgements

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NAS, DFB, Community First Responders, First Aid Responders, Irish Coast Guard, An Garda Síochána, Order of Malta, St. John Ambulance, Red Cross, Voluntary First responders, bystanders, Doctors, Nurses, local Fire services, and Civil Defence. The HSE, including Hospital staff, Section 38 Voluntary Hospital staff.

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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 July 2023 to July 2024.

The membership at April 2024 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, University of 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

Publications using OHCAR data or supported by OHCAR

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Barry T, Kasemiire A, Quinn M et al. Resuscitation for out-of-hospital cardiac arrest in Ireland 2012-2020: Modelling national temporal developments and survival predictors. Resuscitation Plus (2024) https://doi.org/10.1016/j.resplu.2024.100641.

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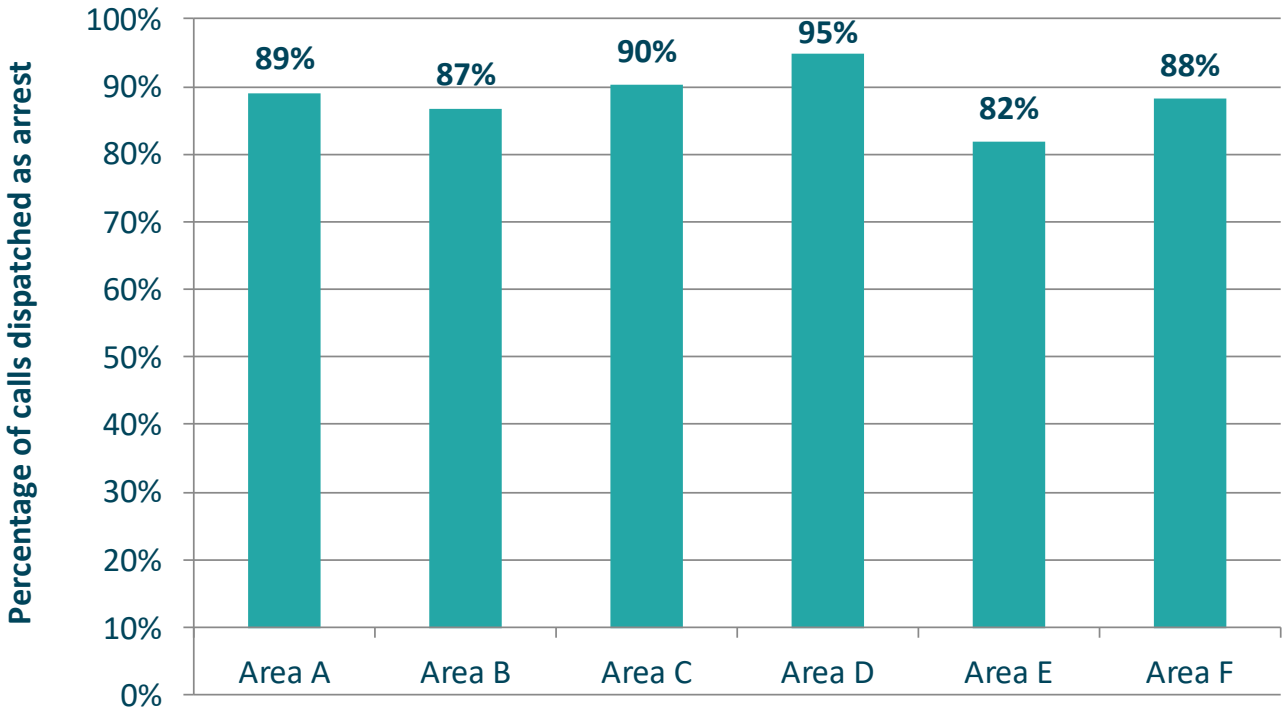
Appendix 3

OHCAR Utstein Comparator Subset 2023 – Results by Regional Health Area

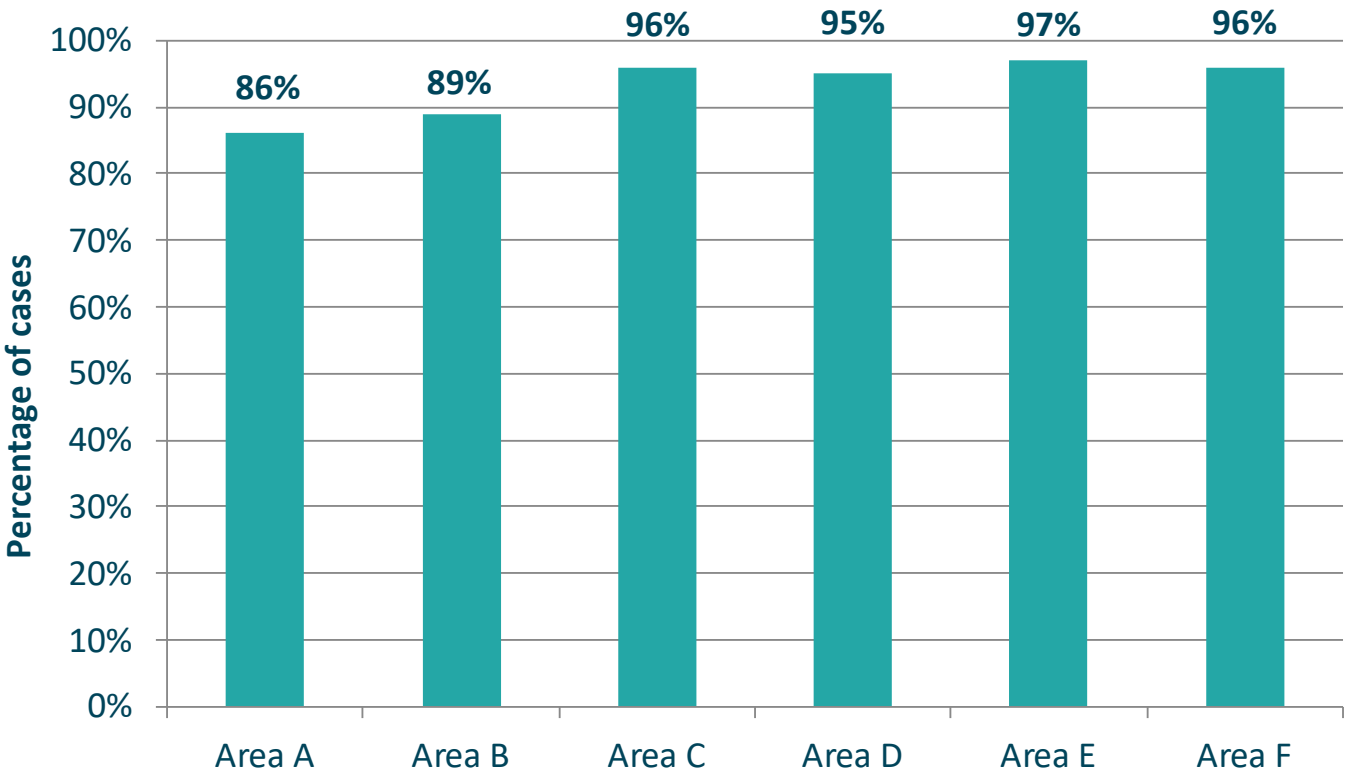
Figure 1: Number of OHCAR patients in the Utstein group by region (n=437)

Figure 2: Cardiac arrest recognition at time of ambulance dispatch (Utstein, n=427)



Appendix 3

Figure 3: Percentage of Utstein cases with bystander CPR by region



Out-of-Hospital Cardiac Arrest Register

OHCAR Ireland

At the heart of evidence