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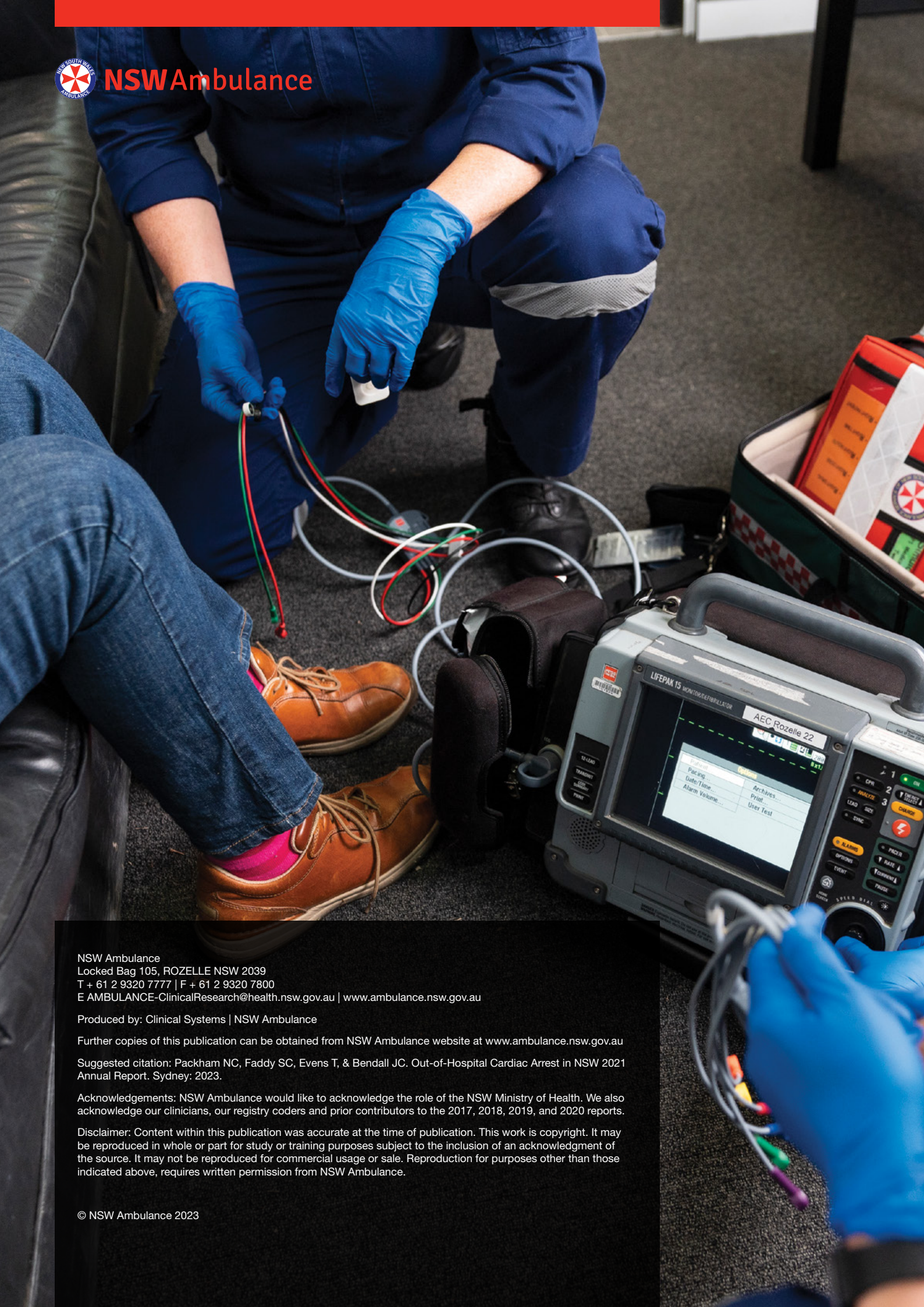
# Out-of-Hospital Cardiac Arrest Registry

## 2021 REPORT

NSW Ambulance

NSW GOVERNMENT

NSW Ambulance

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*This report from the NSW Ambulance Cardiac Arrest Registry is a quality assurance activity designed to assist NSW Ambulance in improving clinical outcomes for an important group of acutely ill patients.*

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# Characteristics and outcomes for 2021

## DEMOGRAPHICS

**9,273**

**Cardiac arrest patients attended across NSW** (highest number of all Australian States and Territories)


**3,284**

**Resuscitations attempted**

**↑ 2.9%**

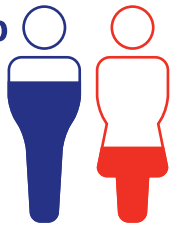
**More cardiac arrests** (compared to 2020) and the highest number ever attended

**79%**

**Private residence**
11% in a public place
8% in aged care facilities
2% other locations

**65%**

**Male**
average age 69 years



**35%**

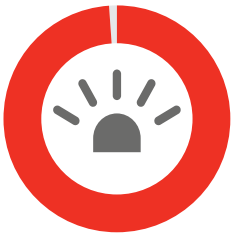
**Female**
average age 74 years

## RESPONSE


**was our median response time**

**86%**

**of attended cardiac arrests** correctly received the highest response category (1A)



**99%**

**received a lights and sirens response**

**AED** = Automated external defibrillator

**CPR** = Cardiopulmonary resuscitation.

**EMS** = Emergency Medical Services including NSW Ambulance paramedics, doctors, community first responders and volunteer ambulance officers.

**ROSC** = Return of Spontaneous Circulation.

**Survival rates** are as a percentage of patients on whom resuscitation was attempted by NSW Ambulance.

The **Utstein subgroup** is a comparator group used to compare cardiac arrest survival rates internationally. This group represents the subgroup with the highest potential for successful resuscitation.

## BYSTANDER INVOLVEMENT

**58%**

of bystander witnessed cardiac arrests received **bystander CPR**

**81%**

of EMS treated arrests received **bystander CPR** (excl. paramedic witnessed)


**46**

cardiac arrest patients were **successfully resuscitated by bystanders** prior to paramedic arrival

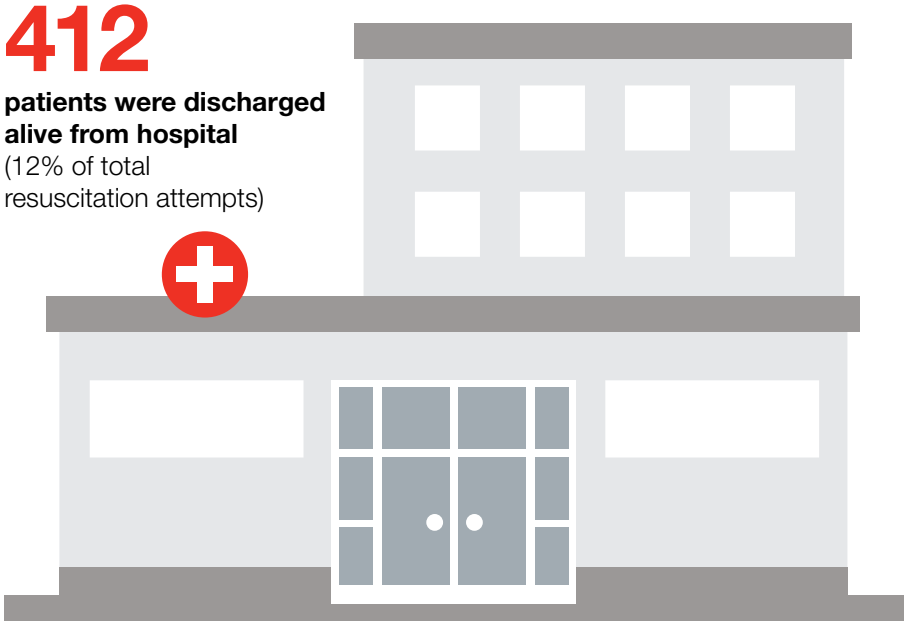

Patients who received **bystander CPR** had a **higher survival rate** (10%) compared to those with no bystander CPR (7%)


**132** patients were **defibrillated by a bystander using an AED**. Survival was significantly higher when shocked by an AED prior to paramedic arrival

## CARDIAC ARREST SURVIVAL OUTCOMES

**412**

**patients were discharged alive from hospital** (12% of total resuscitation attempts)



**24%**

**Survived to hospital discharge** in the *Utstein patient subgroup

***Utstein subgroup** EMS-attempted resuscitation, bystander-witnessed arrest, shockable rhythm.

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# Introduction

**Adjunct Professor Dominic Morgan ASM**

***Chief Executive, NSW Ambulance***

**OUT-OF-HOSPITAL** cardiac arrest (OHCA) is a global public health challenge[1]. Across Australia and New Zealand there are over 30,000 OHCAs annually. OHCA across Australia and NZ has varied incidence, characteristics and survival. Understanding the variation in survival and modifiable predictors is key to informing strategies to improve outcomes[2]. Overall, survival from OHCA across Australia and New Zealand is low with only 1 in every 8 persons surviving (13%).

Outcomes from OHCA can be improved with an earnest and sustained focus on strengthening the four most critical elements of the chain of survival, namely early access, early cardiopulmonary resuscitation (CPR), early defibrillation and early advanced care[3]. NSW Ambulance, like other peer ambulance jurisdictions, is committed to implementing the Ten Programs described by the Global Resuscitation Alliance to continue to improve cardiac arrest survival in NSW communities[4]. During this reporting period NSW Ambulance continued to strengthen Program 2 (telephone-CPR) and Program 4 (rapid dispatch).

For NSW Ambulance, 2021 was about COVID-19. January 2021 was the 12 month anniversary of the first COVID-19 case in NSW. At the commencement of 2021 NSW Ambulance was optimistic that we could continue with the progress made in 2020 but the pandemic had other plans for us with our focus on keeping our paramedics and the community safe. The impact of the Delta variant (June 2021) and Omicron variant (November 2021) placed unprecedented pressures on NSW Ambulance with the highest number of Triple Zero (000) calls on record. NSW Ambulance was able to pivot rapidly to establish new models of care to ensure that we could maintain our response capability to OHCA patients. These included the continuation of the COVID-19 Incident Management Team, the opening of the COVID-19 Virtual Clinical Care Centre (VCCC) and rapid translation of evidence into clinical practice.

By June 2021 NSW Ambulance had uplifted our entire Intensive Care Paramedic Specialists by attending a bespoke 5-day COVID-19 update course which included the education on mechanical CPR (mCPR), use of video laryngoscopy, high performance CPR, human factors and clinical leadership. By the end of 2021 our fleet of Intensive Care Paramedic vehicles were equipped with mCPR devices.

Unfortunately the Delta and Omicron outbreak did have a negative impact on the entire NSW Health System. NSW Ambulance was faced with an increase in demand for our highest triage category (1A), an almost 3% increase in OHCA and a slight weakening of our median response time to 9 minutes, despite the implementation of a comprehensive 'whole-of-system' demand management plan.

We are very much looking forward to making further progress implementing the Ten

## 2021 timeline

**JANUARY**

12 month anniversary of first COVID-19 cases in NSW.

Scheduled (cyclic) clinical training remains suspended

**FEBRUARY**

Paramedic vaccination for COVID-19 commenced

**MARCH**

Respirator fit testing commenced

**JUNE**

Outbreak of COVID-19 Delta variant.

ICP COVID-19 update course finishes training almost 600 ICPs

Programs described by the Resuscitation Academy to continue to improve cardiac arrest survival in NSW throughout the 2022 reporting period.

I am proud that we continue to be accountable to the NSW community by publishing our 5th annual cardiac arrest registry report made possible through the establishment of our Cardiac Arrest Registry which has collected OHCA data since 1 January 2017. The NSW Ambulance Cardiac Arrest Registry identifies opportunities for NSW Ambulance to improve, drive change and review our cardiac arrest strategy. NSW Ambulance is committed to improving the chain of survival for OHCA patients. NSW Ambulance remains a collaborative organisation contributing data to the Australasian Resuscitation Outcomes Consortium Epistry to increase outcome oriented OHCA research[5].

As we continue to work towards a culture of excellence against the Ten Programs, we look forward to reporting on initiatives relating to OHCA, and the measurable contributions that NSW Ambulance is making in the global effort to improve OHCA survival rates.

On behalf of NSW Ambulance, I am very pleased to present the Out-of-Hospital Cardiac Arrest in NSW 2021 Annual Report.

## 10 steps to improve Cardiac Arrest Survival

1. Establish a cardiac arrest registry
2. Begin telephone CPR with ongoing training and QI
3. Begin high-performance EMS CPR (HP-CPR) with ongoing training and QI
4. Begin rapid dispatch
5. Measure professional resuscitation using the defibrillator recording (and voice if possible)
6. Begin an AFD program for first responders, including police officers, guards and other security personnel
7. Use smart technologies to extend CPR and public access defibrillation programs
8. Make CPR and AED training mandatory in schools and the community
9. Work towards accountability – submit annual reports to the community
10. Work towards a culture of excellence



**JULY**

Updated Pandemic Management Protocol

**AUGUST**

Rapid antigen testing commences

COVID-19 Delta variant causing significant (unprecedented) increases in triple zero (000) demand

**SEPTEMBER**

Ongoing unprecedented demand pressures.

COVID Virtual Clinical Care Centre opens.

Workforce surge plans enacted.

**NOVEMBER**

Outbreak of COVID-19 Omicron variant.

Ongoing upward demand pressures

**DECEMBER**

Highest demand ever with 7-day average of 4,500 triple zero (000) calls.

95% COVID-19 vaccination 16+ NSW population

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# List of figures and tables

## Figures



## Tables



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# Cardiac arrest in the community

## Call – Push - Shock. David's Story of Survival

It started out as a normal outing to the Campbelltown Wests League Club, but turned into a day that David is unlikely to forget.

The 71-year-old collapsed as he was leaving, suffering a cardiac arrest.

Moments later, three staff jumped into action, immediately recognising the unfolding emergency.

One called Triple Zero (000), one commenced CPR, and another raced to get the publicly accessible automatic external defibrillator (AED).

Employee Emily Carter said: "One of the patrons saw him fall, and said he was foaming at the mouth. I knew straight away that meant he was unconscious."

When NSW Ambulance paramedics arrived, David was alert and conscious.

Now David describes the staff as his guardian angels. "They were amazing."


The early intervention undoubtedly saved his life and highlights the importance of CPR and public access to defibrillators.

The actions of calling Triple Zero (000), starting CPR and waving down the ambulance, gave David a fighting chance of survival.

## CPR saves lives

Laura Myers was asleep in bed next to her son when she went into cardiac arrest.

Her husband Corey heard strange noises and went in to check on her. He was trained in CPR and quickly recognised that something was seriously wrong.

"She wasn't breathing so I dragged her onto the floor and started CPR. The paramedics were there within a few minutes."

Laura, who was 37 at the time, says there were no warning signs.

"I was at work that day, came home, got the kids something to eat and then went to bed. And then I woke up after they shocked me twice.

"There's nothing wrong with my heart muscle. It was more of an electrical thing so they don't actually know what happened. That's probably the hardest part, not knowing why."

Laura now has an Implantable Cardioverter Defibrillator (ICD) and takes medication.

Corey's quick actions in calling Triple Zero (000) and starting CPR undoubtedly saved her life.

"If I'd not been trained or not been there or not heard her, one of the kids would have woken up next to her the next morning and she would have been dead."

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# Executive summary

NSW Ambulance attended 9,273 OHCA events in the period between 1 January 2021 and 31 December 2021 with 99% involving adults. Our mobile health service commenced treatment in 35% of patients. The crude incidence of OHCA was lower in "Greater Sydney and Central Coast" region when compared to the rest of NSW (89 vs 134 per 100,000 population). The age-adjusted statewide incidence of OHCA was 87 events per 100,000 population.

The demographics in 2021 were similar to previous years with males accounting for 65% of OHCA cases, male patients were younger than female patients (69 vs 74). The majority of OHCA was at home (79%). OHCA due to a presumed medical cause accounted for 85% of all adult EMS-attended patients. In paediatrics (< 16 years) OHCA was presumed from a medical cause in 65% of patients.

The median state-wide response to EMS-treated events in 2020 was 9 minutes, 90th percentile 20 minutes. The median EMS response time to EMS-treated patients in Greater Sydney & Central Coast was 9 minutes, 90th percentile 17 minutes. For the rest of NSW the median response time was 9 minutes, 90th percentile 23 minutes.

The rate of bystander CPR for bystander witnessed OHCA events in 2021 was 58%. The rate of bystander CPR for bystander witnessed OHCA patients receiving EMS-attempted resuscitation was 81%. A public automated external defibrillator (AED) was used in 3% of all OHCA patients excluding those arrests witnessed by a paramedic.

When an arrest was witnessed by a bystander, the proportion of patients who survived the event was higher than that observed for all OHCA combined (27% vs 14%).

The state-wide return of spontaneous circulation (ROSC) in adult EMS-treated patients during 2021 was 34%. The event rate of survival for all-cause adult OHCA in the EMS-treated population was 25%, while 12% survived to hospital discharge.


*When an arrest was witnessed by a bystander, the proportion of patients who survived the event was higher than that observed for all OHCA combined (27% vs 14%).*

The event rate of survival for EMS-treated patients presenting in a shockable rhythm was 46% with 33% surviving to hospital discharge. For EMS-treated patients presenting in a shockable rhythm and witnessed to arrest by EMS, event survival was 76% and survival to 30 days was 67%. Patients presenting in asystole or pulseless electrical activity experienced the poorest survival outcomes with 2% and 7% surviving to hospital discharge respectively.

For the Utstein patient subgroup, the survival to hospital discharge rate in 2021 was 24%, down 1% from that observed in 2020.

# Out-of-hospital cardiac arrest emergency response

Nearly a third of all Australians live in New South Wales (NSW), with most living in the state capital of Sydney. NSW has the highest population of any state in Australia, with 8,189,300 residents as of 30 June 2021. Roughly 65% of the state's population live in Greater Sydney.

In 2021-2022 NSW Ambulance received 1,201,210 Triple Zero (000) calls which resulted in over 1.3 million ambulance responses. NSW Ambulance has over 5,200 paramedics working across 231 operational ambulance stations and 9 paramedic response points*. NSW Ambulance also operates several clinical volunteer responder models across metropolitan, regional and remote NSW across approximately 60 locations. These programs are an important part of building the resilience of small communities and minimising the time between calling for help, and receiving initial care from clinically skilled responders, until paramedics arrive.

Australia operates a primary national emergency number (Triple Zero (000)) for community access to emergency service organisations which send Police, Fire and/or Ambulance to emergencies. Triple Zero (000) calls to NSW Ambulance are answered by an Emergency Medical Dispatcher (EMD) at one of five Control Centres. Emergency Medical Dispatchers perform telephone triage using Medical Priority Dispatch System (MPDS) software. When an out-of-hospital cardiac arrest is recognised (or suspected) EMDs provide telephone CPR advice commencing with 600 chest compressions then two mouth-to-mouth breaths unless there is information to suggest that mouth-to mouth breaths should be performed prior to chest compressions (e.g. drowning). A subsequent ratio of 100 compressions to two breaths is advised until help arrives.

Advanced life support (ALS) is a standard element of NSW Ambulance paramedic scope of practice, inclusive of manual defibrillation, supraglottic airway device and intravenous adrenaline administration (in adults).

Specialist intensive care paramedics are also credentialed in intubation, intra-osseous access and to administer additional ALS medications (e.g. amiodarone). NSW Ambulance cardiac arrest management is consistent with Australian New Zealand Committee on Resuscitation (ANZCOR) guidelines and the recommendations of the Australian Resuscitation Council.

The closest ambulance resource is assigned to all OHCA with a minimum of three (usually 4) paramedics. If closer, clinical volunteers are responded who are trained in basic life support including semi-automatic defibrillation. Once on scene, paramedics may decide not to continue or commence resuscitation if the patient is clearly deceased or has injuries incompatible with life, no CPR was performed for at least 20 minutes prior to paramedic arrival, or there is a treatment directive in place. If resuscitation is commenced and the patient remains in asystole or pulseless electrical activity (PEA) for over 20 minutes without return of spontaneous circulation (ROSC), paramedics may discontinue resuscitation.

**231**

**Operational Ambulance Stations** plus 9 Paramedic Response Points

**7**

**Helicopter bases:** Bankstown, Wollongong, Orange, Tamworth, Lismore, Newcastle and ACT Ambulance Service

**3**

**Fixed wing bases:** Sydney Airport, Royal Flying Doctors Service Dubbo, Royal Flying Doctors Service Broken Hill

**1,606**

**On road operational vehicles:** with an additional 50 frontline emergency ambulances to support the COVID-10 surge workforce requirements

**6,536**

**People work at NSW Ambulance:**

**5,269 Paramedics**

**544 Control centre staff**

**558 Corporate and support staff**

**115 Doctors**

**50 Nurses**

**370 Clinical volunteers**

**2 Therapy dogs**

*Data obtainbed from 2021-2022 Year In Review

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# Out-of-hospital cardiac arrest registry

Clinical quality registries provide a powerful tool with which to understand variation in treatments and outcomes, identify prognostic factors, examine standard of care patterns, evaluate effectiveness, monitor safety, and influence clinician behaviour through feedback. Clinical research has consistently demonstrated that instituting clinical quality registries improves outcomes and reduces health care costs.

In 2017 the NSW Ambulance Out-of-Hospital Cardiac Arrest (OHCA) clinical quality registry (the registry) was created that includes all patients who experience a cardiac arrest outside of a hospital setting and who are attended by NSW Ambulance.

The registry adheres to the widely accepted Utstein dataset and definitions, with inclusion of minor additions to accommodate local conditions. The registry includes information on the arrest event, prehospital treatment and prehospital outcome. Longer term survival outcomes are obtained via data linkage, conducted by the Centre for Health Record Linkage (CHeReL), and overseen by the NSW Ministry of Health.

The registry is housed in the REDCap (Research Electronic Data Capture) platform, a secure, Health Records and Information Privacy Act (HRIPA) compliant, web-based, data collection application. Advantages to REDCap include secure multi-site access from anywhere with an internet connection, inbuilt data quality control tools, and multiple safeguards that protect health information and preserve privacy.

Analyses in this report are based on two main patient populations. The 'OHCA attended' population represent all out-of-hospital cardiac arrest patients attended by NSW Ambulance, including those who are deemed to be unsuitable for intervention. This group is used primarily for demographic description of the cardiac arrest population. The 'Resuscitation attempted' group are those where paramedics undertake CPR with the aim of reversing cardiac arrest. Measures of the effectiveness of bystander and paramedic interventions are based on this group of patients.

Effectiveness of treatment are reported as 'event survival' which are patients arriving at the Emergency Department with sustained return of spontaneous circulation; and 'survival to 30-days'.

### Case ascertainment and missing data

Maintaining a consistent approach to case identification in OHCA is of central importance when comparing survival between ambulance services and contributing data to resuscitation trials. The case ascertainment process used by NSW Ambulance has been informed by the processes used by the more established Queensland and Victorian OHCA registries and begins with the identification of cases from electronic and paper-based patient health care records.

Since 2010, the details of patient encounters at NSW Ambulance have been electronically recorded using mobile computer tablets synchronised daily to a clinical data warehouse. A highly sensitive search algorithm is applied to these warehoused data to identify potential cardiac arrest cases. Registry data fields are initially populated through extraction of standardised data, eliminating the need for intermediary case report forms and minimising transcription errors and the level of missing data. The dataset is then completed through the abstraction of data of prognostic importance, by specifically trained data coders.

Quality control is facilitated by data range and validity checks using embedded electronic algorithms. Incomplete or erroneous data fields, for example, negative time intervals, are remedied manually using information from patient health care records or computer aided dispatch data. Where patient identifiers are sufficient and death has occurred, linkage of the registry to the NSW Register of Births Deaths and Marriages (RBDM) is used to obtain the date of death.

### Out of hospital cardiac arrest as a reportable condition in NSW

The NSW Public Health Act 2010 allows for the Minister for Health to establish public health or disease registers to follow up the care and treatment of patients. The Centre for Epidemiology and Evidence establishes and manages a range of ad hoc and ongoing registers, based on linked administrative data. One such register is the Population Health and Risks Outcome Register (PHROR). NSW Ambulance is required to report all instances of OHCA, annually, to the PHROR. Survival to discharge and survival to 30 days outcomes for OHCA are then obtained through linkage of the PHROR to NSW Health Emergency Department Data Collection (EDDC) and the Admitted Patient Data Collection (APDC) to overcome RBDM linkage limitations due to missing patient identifiers.

This report comprises line level incidence, prognostic and treatment data from the NSW Ambulance Out-of-Hospital Cardiac Arrest Clinical Quality Registry and aggregated survival to discharge and 30-day survival data.

# Incidence and demographics

In 2021, NSW Ambulance clinicians attended 9,227 patients in cardiac arrest and 46 patients who regained ROSC prior to NSW Ambulance arrival, a total of 9273 OHCAs (Table 1).

Most patients were male (64.2%). The median age was 71 (IQR: 57-82) years. Female patients had a higher median age at arrest than males (74 versus 69 years). Case distribution by age and gender was similar to previous years (Figure 2). Adults (16 years or older) accounted for 98.8% of cases.

Arrests occurred most frequently in residential homes (79.4%), followed by public places (11.3%) and nursing homes (8.2%) (Figure 3).

NSW Ambulance clinicians attempted to resuscitate 3,284 (35.4%) patients. An initial shockable rhythm (ventricular fibrillation or ventricular tachycardia, VF/VT) was observed in 24.8% of these patients and bystander CPR was performed on 68.1%. Of cardiac arrests occurring before paramedic arrival, 23.4% of patients were found in a shockable rhythm. Of these patients (n=2,747), an initial shockable rhythm was more likely in patients who had received bystander CPR (26.1%) than those who did not receive bystander CPR (12.4%).

**Table 1: Patient Characteristics**

| Variable | All OHCA attended | | Resuscitation attempted | | ROSC prior to arrival | |
|---|---|---|---|---|---|---|
| **Age (years)** | | | | | | |
| Median (Q1-Q3)^ | 71 | (57-82) | 67 | (52-78) | 63 | (54-71.5) |
| **Gender** | | | | | | |
| Female | 3269 | 35.4% | 1081 | 32.9% | 14 | 30.4% |
| Male | 5956 | 64.6% | 2201 | 67.0% | 32 | 69.6% |
| Not specified/unknown | 48 | | 2 | | 0 | |
| **Location of arrest** | | | | | | |
| Public place | 1049 | 11.3% | 581 | 17.7% | 31 | 67.4% |
| Residential home | 7364 | 79.4% | 2428 | 73.9% | 6 | 13.0% |
| Nursing home | 760 | 8.2% | 195 | 5.9% | 1 | 2.2% |
| Medical facility | 100 | 1.1% | 80 | 2.4% | 8 | 17.4% |
| **Initial rhythm** | | | | | | |
| Shockable | 862 | 9.3% | 813 | 24.8% | 30 | 65.2% |
| Non-shockable | 8300 | 89.5% | 2405 | 73.2% | 10 | 21.7% |
| Unknown | 111 | 1.2% | 66 | 2.0% | 6 | 13.0% |
| **Bystander CPR** | | | | | | |
| Yes | 3449 | 37.2% | 2236 | 68.1% | 46 | 100.0% |
| No | 5775 | 62.3% | 1016 | 30.9% | 0 | 0.0% |
| Unknown | 49 | 0.5% | 32 | 1.0% | 0 | 0.0% |
| **Bystander witnessed** | | | | | | |
| Bystander witnessed | 2842 | 30.6% | 1618 | 49.3% | 44 | 95.7% |
| Not witnessed | 5595 | 60.3% | 1103 | 33.6% | 1 | 2.2% |
| Paramedic witnessed | 720 | 7.8% | 537 | 16.4% | 1 | 2.2% |
| Unknown | 116 | 1.3% | 26 | 0.8% | 0 | 0.0% |
| **Presumed aetiology** | | | | | | |
| Medical | 7883 | 85.0% | 2775 | 84.5% | 40 | 87.0% |
| Non-medical (incl trauma) | 1390 | 15.0% | 509 | 15.5% | 6 | 13.0% |
| **Survival** | | | | | | |
| Survived event | 884 | 9.5% | 833 | 25.4% | 46 | 100% |
| Survived to discharge# | 416 | 4.5% | 376 | 11.8% | 37 | 90.2% |
| Survived 30 days# | 415 | 4.5% | 376 | 11.8% | 36 | 87.8% |
| **Total** | **9273** | | **3284** | | **46** | |

^ Q1 = quartile 1 (25th percentile) ; Q3 = quartile 3 (75th percentile) | All denominators adjusted to account for missing data

Figure 2: NSW Ambulance attended OHCAs by age and gender

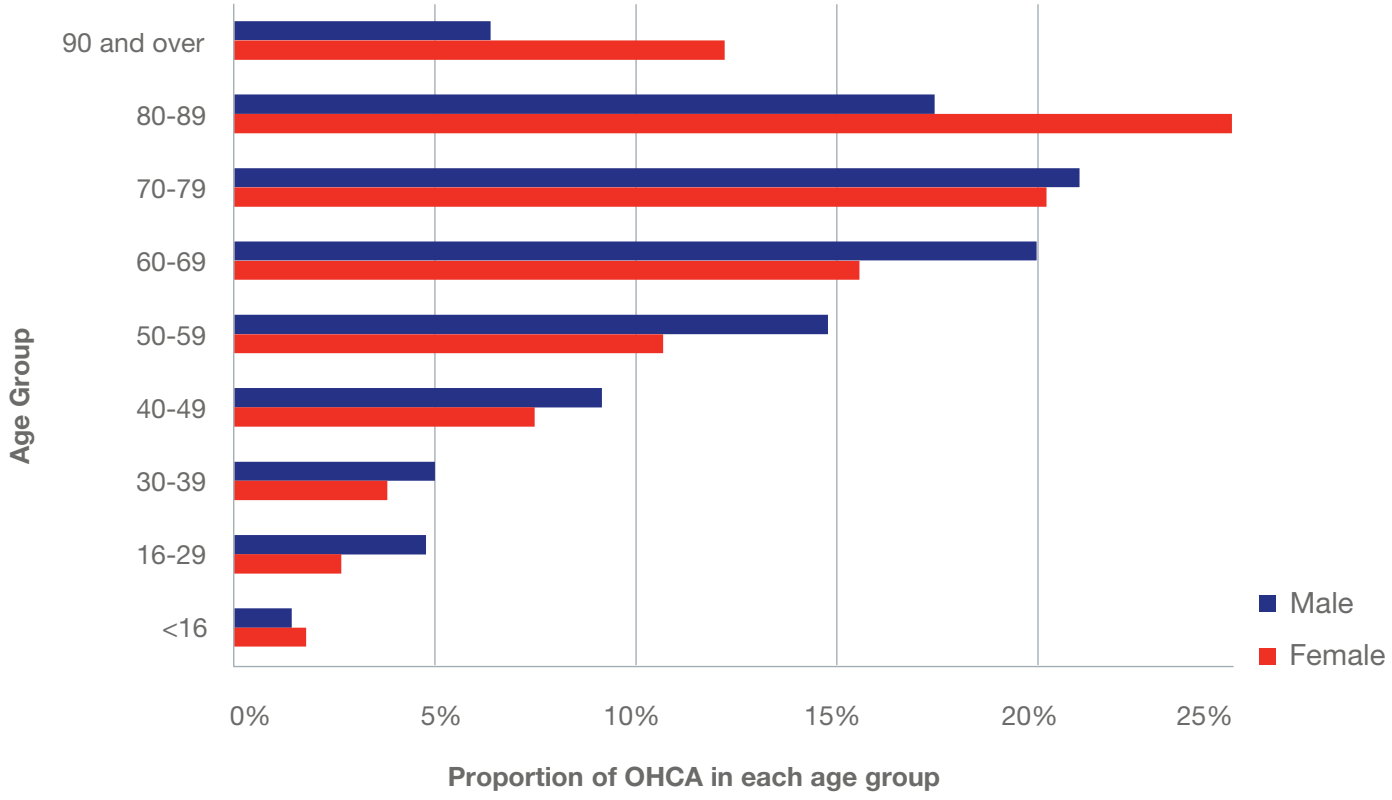
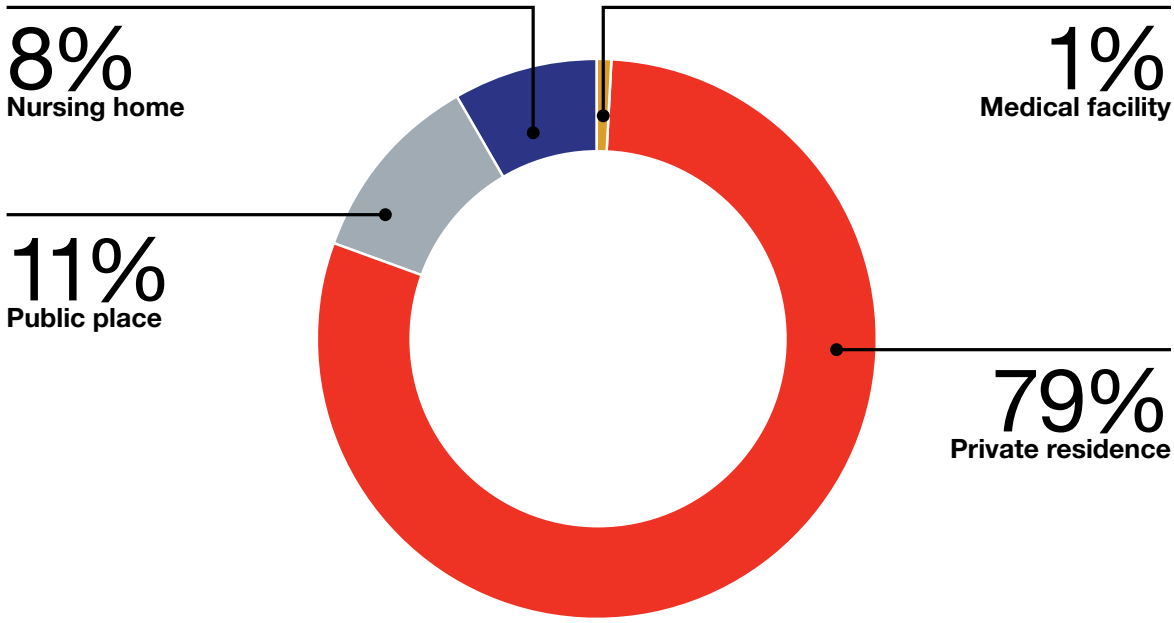



Figure 3: Location of NSW Ambulance attended OHCA



The crude and age-standardised (adjusted) incidence of OHCA across NSW were 105 and 87 (95% CI 85-89) per 100,000 person-years respectively. OHCA incidence was considerably higher in Non-metropolitan NSW compared to Greater Sydney and Central Coast (Table 2). Incidence of OHCA varied markedly across NSW. Both crude and age standardised rates were lowest in Baulkham Hills and Hawkesbury (61 and 43 per 100,000 person-years, respectively) and highest in Far West and Orana (166 and 138 per 100,000 person-years, respectively) (Table 2). OHCA incidence and OHCA events are shown in Figure 4 (a & b) and Figure 5 (a & b) respectively.

**Table 2: Crude and age-standardised incidence of all NSW Ambulance attended OHCA by geographical area[1,2]**

| | Incidence per 100,000 person-years | | | |
|---|---|---|---|---|
| **Area** | **Crude** | **Adjusted** | **Lower 95% CI** | **Upper 95% CI** |
| Capital Region | 156 | 123 | 110 | 136 |
| Central West | 166 | 132 | 118 | 147 |
| Coffs Harbour – Grafton | 123 | 101 | 86 | 119 |
| Far West and Orana | 166 | 138 | 119 | 161 |
| Hunter Valley exc Newcastle | 118 | 92 | 83 | 103 |
| Illawarra | 102 | 80 | 71 | 90 |
| Mid North Coast | 167 | 131 | 118 | 146 |
| Murray | 118 | 94 | 79 | 112 |
| New England and North West | 160 | 125 | 111 | 141 |
| Newcastle and Lake Macquarie | 118 | 102 | 93 | 112 |
| Richmond – Tweed | 121 | 98 | 87 | 110 |
| Riverina | 126 | 100 | 87 | 116 |
| Southern Highlands and Shoalhaven | 144 | 110 | 96 | 127 |
| Central Coast | 160 | 134 | 123 | 146 |
| Baulkham Hills and Hawkesbury | 61 | 43 | 36 | 51 |
| Blacktown | 88 | 73 | 65 | 81 |
| City and Inner South | 85 | 84 | 75 | 95 |
| Eastern Suburbs | 80 | 72 | 63 | 83 |
| Inner South West | 96 | 84 | 78 | 92 |
| Inner West | 81 | 74 | 65 | 84 |
| North Sydney and Hornsby | 72 | 61 | 55 | 69 |
| Northern Beaches | 69 | 59 | 50 | 68 |
| Outer South West | 88 | 64 | 56 | 73 |
| Outer West and Blue Mountains | 110 | 80 | 72 | 90 |
| Parramatta | 89 | 87 | 79 | 95 |
| Ryde | 67 | 61 | 51 | 73 |
| South West | 90 | 64 | 58 | 71 |
| Sutherland | 68 | 49 | 42 | 59 |
| **Greater Sydney and Central Coast** | **89** | **76** | **74** | **78** |
| **Non-metropolitan NSW (Rest of NSW)** | **134** | **107** | **104** | **111** |
| **All NSW** | **105** | **87** | **85** | **89** |

[1] Geographical area was statistical area level 4 (SA4) as defined by Australian Bureau of Statistics (ABS).

[2] SA4 Area was unknown (n=6) or outside NSW (n=14) for 20 cases.

Figure 4a: OHCA incidence for non-metropolitan NSW (per 100,000 person-years)

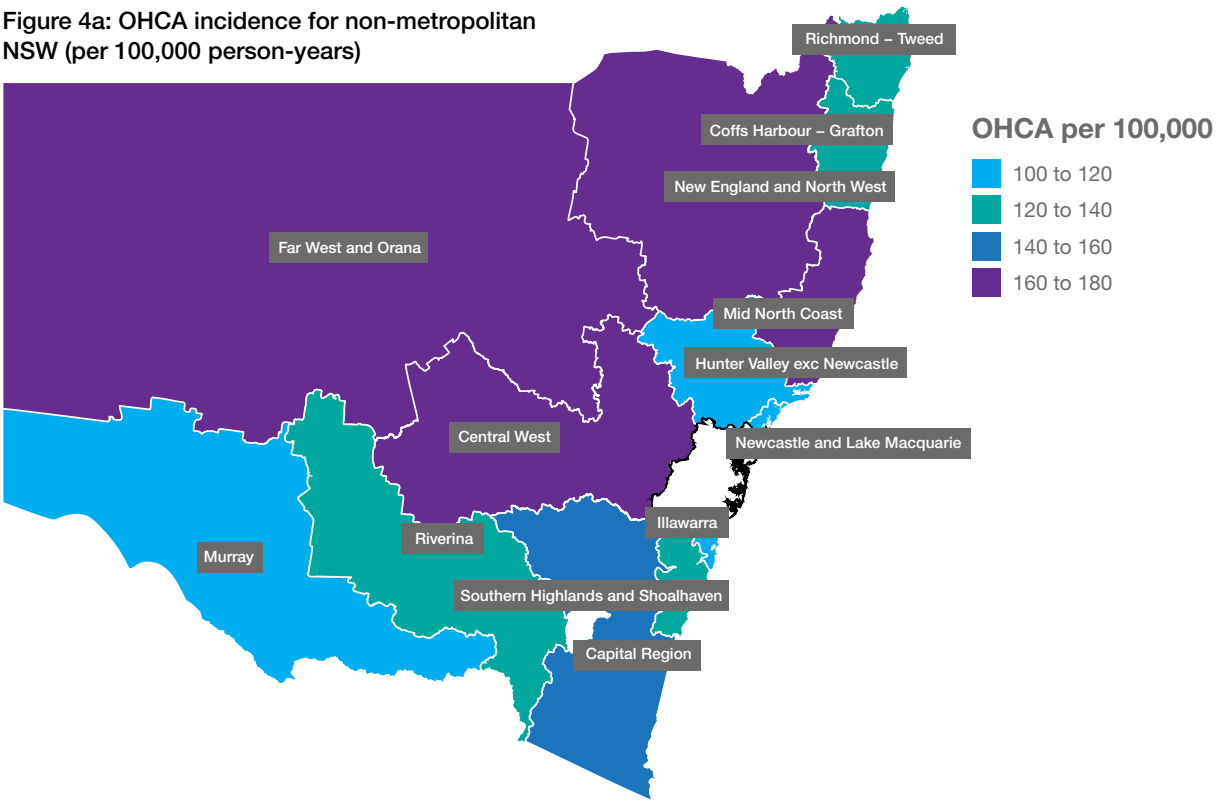



Figure 4b: OHCA incidence for Greater Sydney and the Central Coast (per 100,000 person-years)

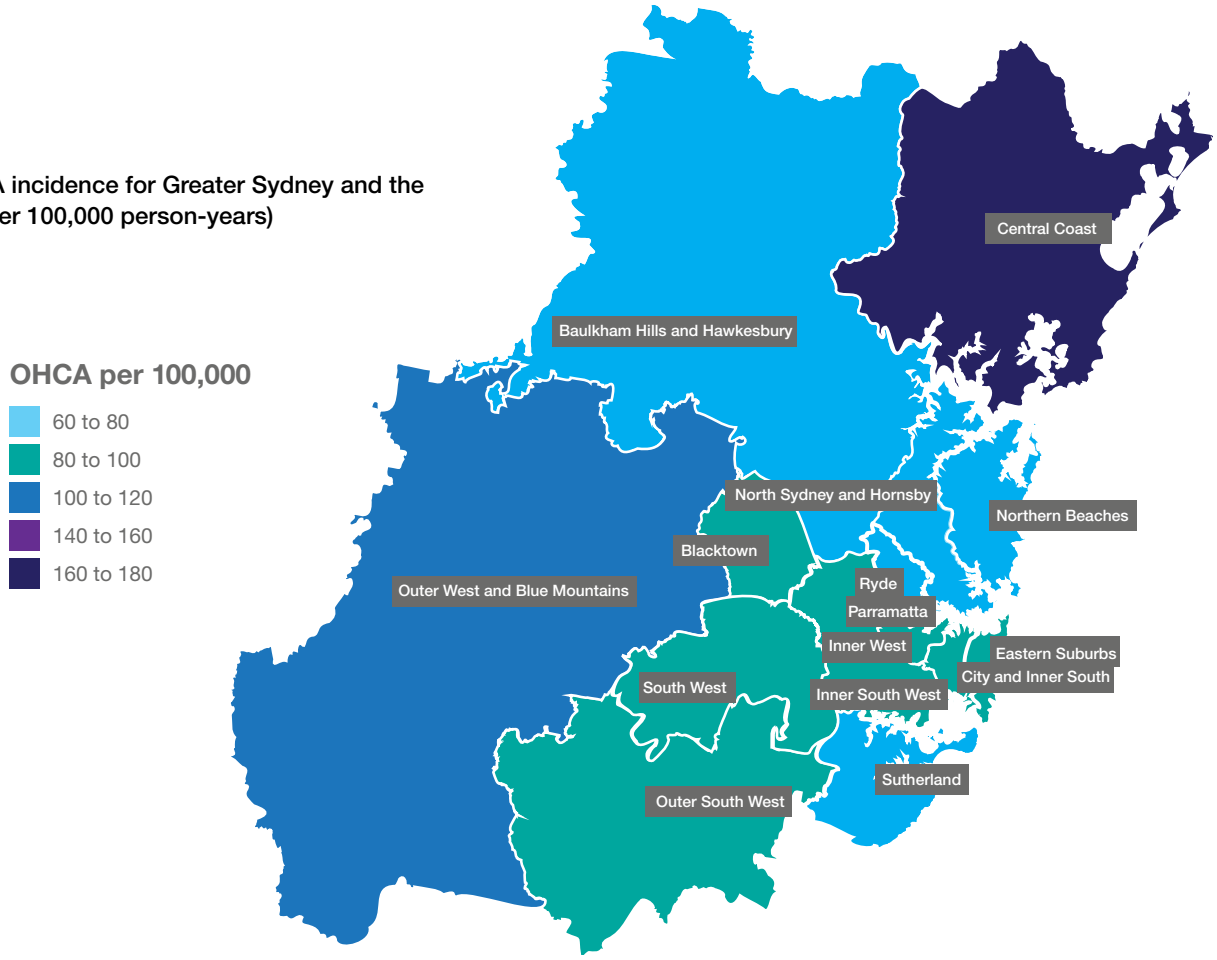


Figure 5a: OHCA events for non-metropolitan NSW

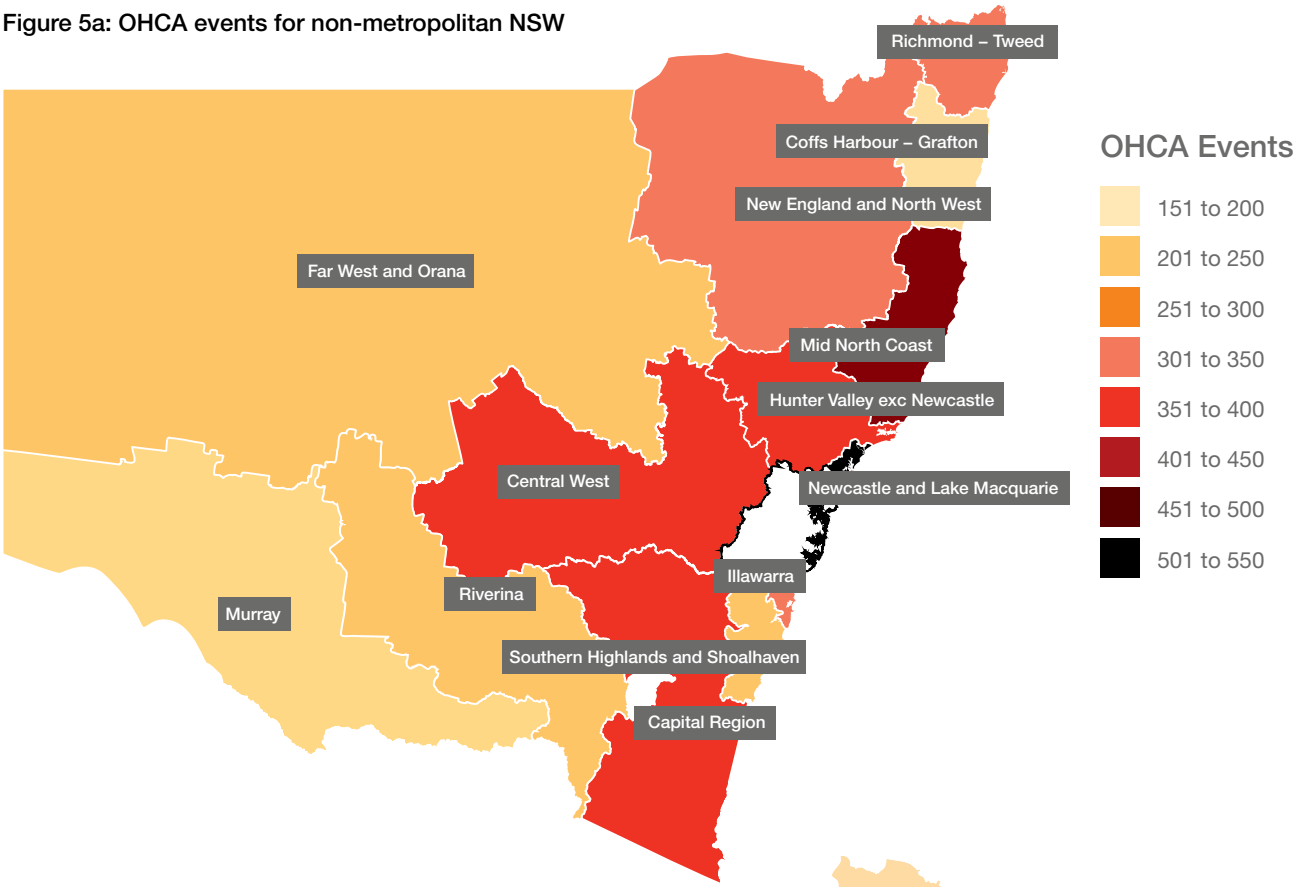
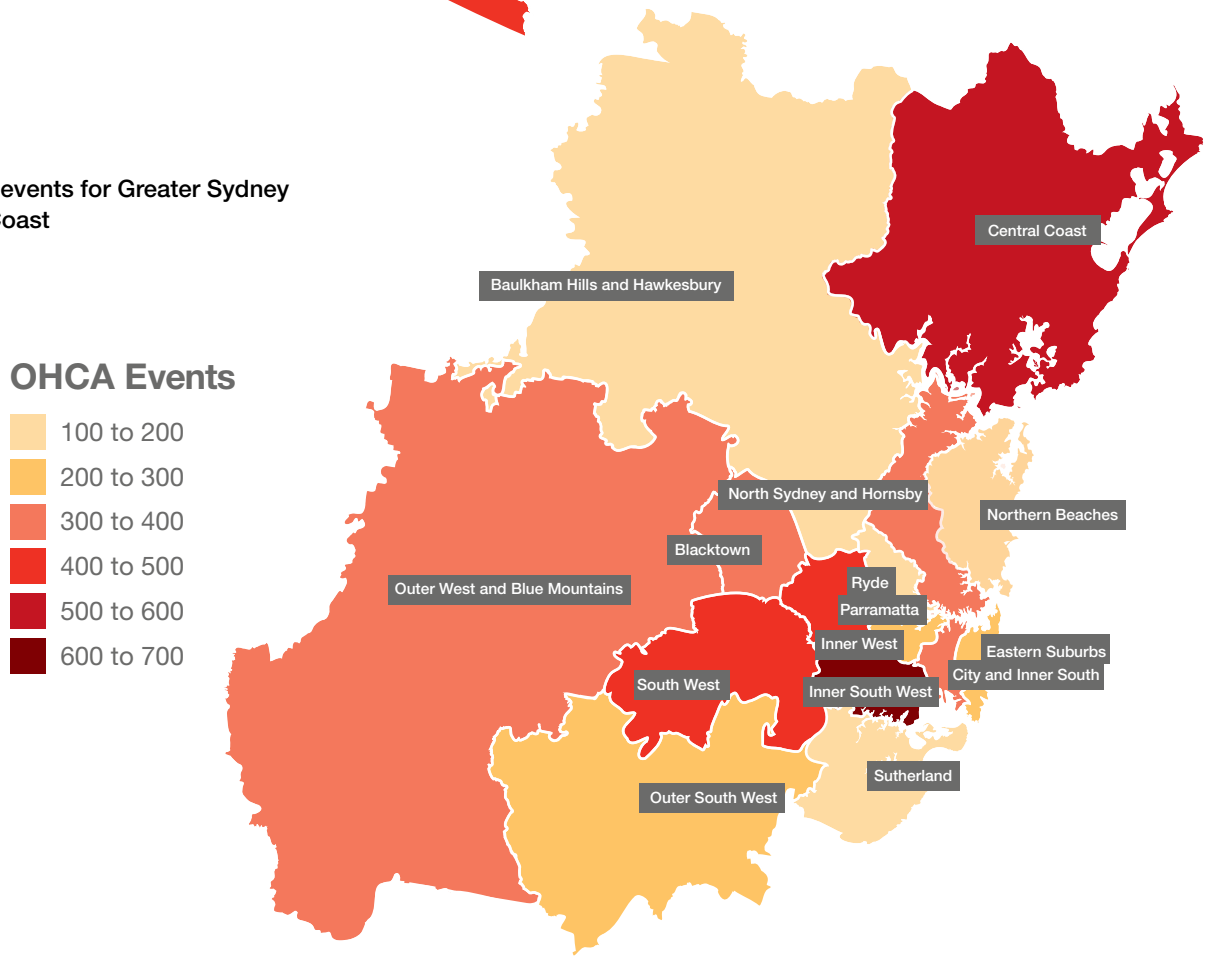



Figure 5b: OHCA events for Greater Sydney and the Central Coast



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# Witnessed status and bystander interventions

Of the 3,284 arrests where a NSW Ambulance clinician attempted resuscitation, 1618 (49.3%) arrests were witnessed by bystanders, and 537 (16.4%) were witnessed by paramedics (Table 1). Compared to paramedic and unwitnessed-arrests, bystander-witnessed arrests occurred more often in residential homes. Compared to unwitnessed arrests, bystander-witnessed arrests occurred more often in residential homes (46.7% versus 35.6%), more often had an initially shockable rhythm (63.0% versus 15.7%), and more often received bystander CPR (58.9% versus 39.4%) (Table 3).

**Table 3: Patient characteristics and witnessed status (n=3,284)**

| Characteristic | n | Paramedic witnessed | | Bystander witnessed* | | Not witnessed | | Unknown (n=96) | |
|---|---|---|---|---|---|---|---|---|---|
| **Age (years)** | | | | | | | | | |
| Median (Q1-Q3) | | 68 | 57-79 | 69 | 56-80 | 62 | 44-76 | 68 | 57-75 |
| **Gender** | | | | | | | | | |
| Female | 1,081 | 186 | 17.2% | 507 | 46.9% | 379 | 35.1% | 9 | 0.8% |
| Male | 2,201 | 350 | 15.9% | 1,111 | 50.5% | 723 | 32.8% | 17 | 0.8% |
| **Location of arrest** | | | | | | | | | |
| Public place | 581 | 50 | 8.6% | 361 | 62.1% | 169 | 29.1% | 1 | 0.2% |
| Residential home | 2,428 | 408 | 16.8% | 1,134 | 46.7% | 865 | 35.6% | 21 | 0.9% |
| Nursing home | 195 | 36 | 18.5% | 94 | 48.2% | 62 | 31.8% | 3 | 1.5% |
| Medical facility | 80 | 43 | 53.8% | 29 | 36.3% | 7 | 8.8% | 1 | 1.3% |
| **Initial rhythm** | | | | | | | | | |
| Shockable | 813 | 169 | 20.8% | 512 | 63.0% | 128 | 15.7% | 4 | 0.5% |
| Non-shockable | 2,405 | 353 | 14.7% | 1,075 | 44.7% | 958 | 39.8% | 19 | 0.8% |
| Unknown | 66 | 15 | 22.7% | 31 | 47.0% | 17 | 25.8% | 3 | 4.5% |
| **Bystander CPR** | | | | | | | | | |
| Yes (n=2236) | | - | - | 1,318 | 58.9% | 882 | 39.4% | 22 | 1.0% |
| No (n=1016) | | - | - | 277 | 27.3% | 213 | 21.0% | 3 | 0.3% |
| Unknown (n=31) | | - | - | 23 | 74.2% | 7 | 22.6% | 1 | 3.2% |

*Witnessed status was unknown for 26 cases; Gender was unknown for 2 cases.

Survival was highest in patients found in a shockable rhythm or where their arrest was witnessed, particularly by a paramedic

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# Survival and factors associated with survival

Of the 3,284 arrests where a NSW Ambulance clinician attempted resuscitation, event survival and 30-day survival were 25.4% and 11.8% respectively (Table 1). Males had higher survival rates when compared to females (13.2% versus 9.0%; survival to discharge and 30-day survival). Patients suffering a cardiac arrest of medical aetiology had higher rates of survival when compared to non-medical aetiologies (12.1% versus 10.0%; survival to discharge and 30-day survival) (Table 4). Survival was highest where patients presented in a shockable rhythm, or where their arrest had been witnessed, particularly by a paramedic.

**Table 4: Survival by patient characteristics**

| Characteristic | Survived Event (n=833) | | Survived to discharge* (n=376) | | Survived 30 days* (n=376) | |
|---|---|---|---|---|---|---|
| **Age^ (years)** | 66 (52-77) | | 60 (48-71) | | 60 (48-71) | |
| **Gender** | | | | | | |
| Female | 274 | 25.3% | 95 | 9.0% | 95 | 9.0% |
| Male | 559 | 25.4% | 281 | 13.2% | 281 | 13.2% |
| **Location of arrest** | | | | | | |
| Public place | 147 | 25.3% | 89 | 16.9% | 90 | 17.0% |
| Residential home | 606 | 25.0% | 250 | 10.5% | 250 | 10.5% |
| Nursing home | 43 | 22.1% | 7 | 3.6% | 7 | 3.6% |
| Medical facility | 37 | 46.3% | 30 | 39.5% | 29 | 38.2% |
| **Initial rhythm** | | | | | | |
| Shockable | 372 | 45.8% | 252 | 32.6% | 251 | 32.5% |
| Non-shockable | 428 | 17.8% | 107 | 4.6% | 108 | 4.6% |
| **Witnessed status** | | | | | | |
| Bystander witnessed | 430 | 26.6% | 174 | 11.1% | 173 | 11.0% |
| Not witnessed | 151 | 13.7% | 49 | 4.6% | 51 | 4.7% |
| Paramedic witnessed | 246 | 45.8% | 152 | 29.5% | 151 | 29.3% |
| **Aetiology** | | | | | | |
| Medical | 706 | 25.4% | 328 | 12.1% | 328 | 12.1% |
| Non-medical (incl trauma) | 127 | 25.0% | 48 | 10.0% | 48 | 10.0% |
| **Response time^ (min)** | **9 (6-14)** | | **9 (6-14)** | | **9 (6-14)** | |

*Survival to discharge or 30 days was unknown for 101 cases where ambulance records indicated the patient was transported but there was no corresponding linked EDDC or APDC record, all denominators were adjusted accordingly.

^Median (25th-75th percentile). Age was unknown for 12 cases; Witnessed status was unknown for 1 case.

Similarly to 2020, survival was greatest where both features (shockable rhythm and paramedic witnessed) were present (76.3% survived the event; 67.1% 30-day survival). Significant increases were observed in this cohort when compared to 2020 (67.8% survived the event; 58.9% 30-day survival). Survival was poorest where patients presented in a non-shockable rhythm and where their arrest had not been witnessed, and was minimal when both were present (11.2% survived the event; 2.6% 30-day survival) (Table 5).

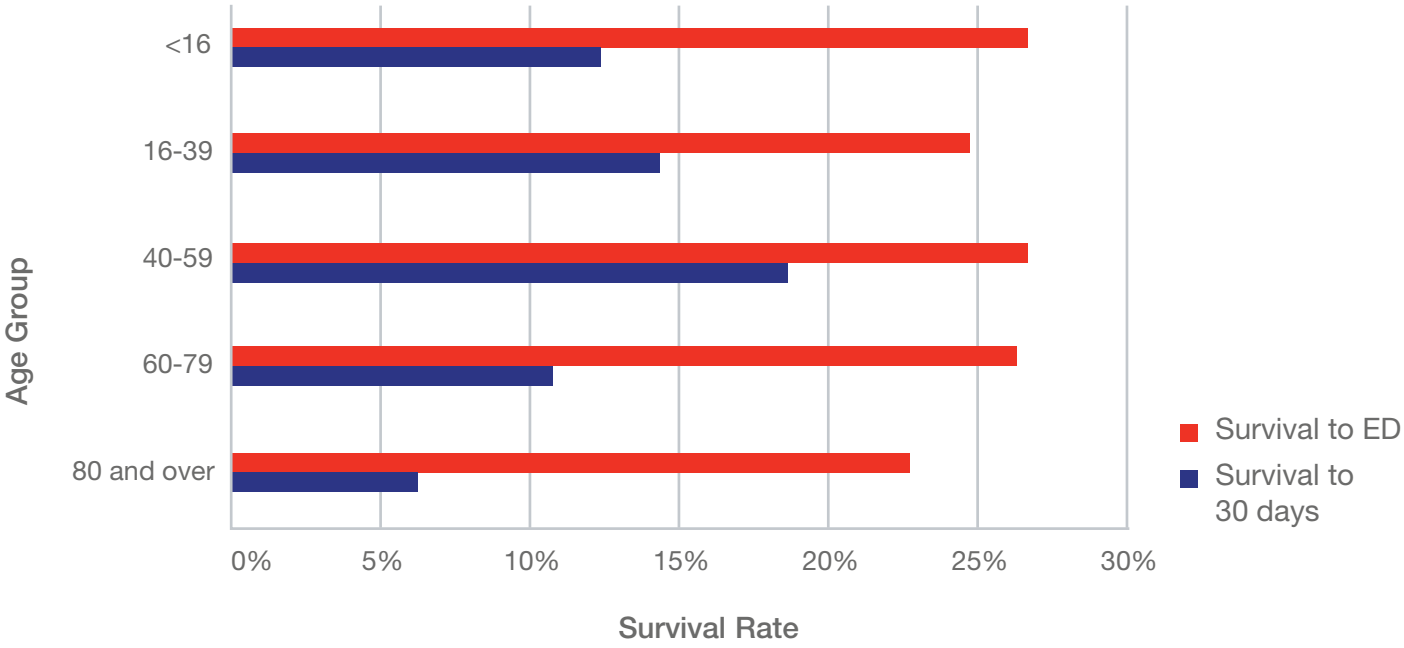
**Table 5: Survival by witnessed status and initial rhythm, EMS-treated OHCAs^**

| Indicator | Witnessed status | Initial rhythm | Number | Denominator | % |
|---|---|---|---|---|---|
| **Survived event** | Paramedic-witnessed | Shockable | 129 | 169 | 76.3% |
| | | Not shockable/ not documented | 117 | 368 | 31.8% |
| | | **Total - all rhythms** | **246** | **537** | **45.8%** |
| | Bystander-witnessed | Shockable | 198 | 512 | 38.7% |
| | | Not shockable/ not documented | 232 | 1,106 | 21.0% |
| | | **Total - all rhythms** | **430** | **1,618** | **26.6%** |
| | Not witnessed / Unknown | Shockable | 45 | 132 | 34.1% |
| | | Not shockable/ not documented | 112 | 997 | 11.2% |
| | | **Total - all rhythms** | **157** | **1,129** | **13.9%** |
| | All witnessed statuses | Shockable | 372 | 813 | 45.8% |
| | | Not shockable/ not documented | 461 | 2,471 | 18.7% |
| | | **Total - all rhythms** | **833** | **3,284** | **25.4%** |
| **Survived 30 days^** | Paramedic-witnessed | Shockable | 108 | 161 | 67.1% |
| | | Not shockable/not documented | 43 | 354 | 12.1% |
| | | **Total - all rhythms** | **151** | **515** | **29.3%** |
| | Bystander-witnessed | Shockable | 116 | 486 | 23.9% |
| | | Not shockable/not documented | 57 | 1,080 | 5.3% |
| | | **Total - all rhythms** | **173** | **1,566** | **11.0%** |
| | Not witnessed / Unknown | Shockable | 27 | 125 | 21.6% |
| | | Not shockable/not documented | 25 | 977 | 2.6% |
| | | **Total - all rhythms** | **52** | **1,102** | **4.7%** |
| | All witnessed statuses | Shockable | 251 | 772 | 32.5% |
| | | Not shockable/not documented | 125 | 2,411 | 5.2% |
| | | **Total - all rhythms** | **376** | **3,183** | **11.8%** |

^Survived 30 days was unknown for 101 cases.

The highest event survival rates were observed in <16 years (26.7%), 40-59 year age group (26.7%) and 60-79 year age group (26.4%). The highest 30-day survival rate was observed in the 40-59 year age group (18.7%). The lowest survival rates were observed in the 80 and over age group (22.7% survived event; 6.3% 30-day survival) (Figure 6). Across all age groups, the 30-day survival rate was 11.8%.

**Figure 6: Survival by age group, EMS-treated OHCA**




# Survival rates by bystander CPR and witnessed status

Early interventions initiated by bystanders during the first moments after the patient collapses in OHCA are crucial for survival. In 2021, of all the non-paramedic witnessed OHCA where the patient subsequently received resuscitation by paramedics, 81% had received bystander CPR. The survival benefit of bystander CPR was more substantial in the subset of patients whose arrest was witnessed by a bystander and had an initial shockable rhythm on EMS arrival (Table A3).

Of the patients with bystander-witnessed OHCA and initial shockable rhythm, 39.9% survived the event when they received bystander CPR, compared to 25.6% without bystander CPR. Survival to 30 days was higher for patients receiving bystander CPR (25.2%) compared to patients who did not receive bystander CPR (14.3%).

Across all witnessed statuses, the survival rate was highest for patients who received bystander CPR (23.2% survived event; 10.2% 30-day survival), compared to patients who did not receive bystander CPR (20.2% survived event; 7.2% 30-day survival). The survived event rate and 30-day survival was highest for patients who had a bystander witnessed OHCA and received bystander CPR (29.7% survived event; 13.8% 30-day survival) (Table 6).

In assessing the impact of bystander CPR, patients with ROSC prior to NSW Ambulance arrival have not been included and paramedic-witnessed OHCAs have been excluded.

**Table 6: Survival outcomes by witnessed status and bystander CPR, EMS-treated or ROSC prior to EMS arrival OHCA, all ages, in NSW for 2021 ^**

| Indicator | Witnessed status | Bystander CPR | Number | Denominator | % |
|---|---|---|---|---|---|
| **Survived event** | Bystander-witnessed | Bystander CPR | 404 | 1,362 | 29.7% |
| | | No/ unknown bystander CPR | 70 | 300 | 23.3% |
| | | **Total – all CPR** | **474** | **1,662** | **28.5%** |
| | Not witnessed / Unknown | Bystander CPR | 122 | 905 | 13.5% |
| | | No/ unknown bystander CPR | 36 | 225 | 16.0% |
| | | **Total – all CPR** | **158** | **1,130** | **14.0%** |
| | All witnessed statuses (excl para-witness) | Bystander CPR | 526 | 2,267 | 23.2% |
| | | No/ unknown bystander CPR | 106 | 525 | 20.2% |
| | | **Total – all CPR** | **632** | **2,792** | **22.6%** |
| **Survived 30 days^** | Bystander-witnessed | Bystander CPR | 181 | 1,314 | 13.8% |
| | | No/ unknown bystander CPR | 27 | 291 | 9.3% |
| | | **Total – all CPR** | **208** | **1,605** | **13.0%** |
| | Not witnessed / Unknown | Bystander CPR | 42 | 883 | 4.8% |
| | | No/ unknown bystander CPR | 10 | 220 | 4.5% |
| | | **Total – all CPR** | **52** | **1,103** | **4.7%** |
| | All witnessed statuses (excl para-witness) | Bystander CPR | 223 | 2,197 | 10.2% |
| | | No/ unknown bystander CPR | 37 | 511 | 7.2% |
| | | **Total – all CPR** | **260** | **2,708** | **9.6%** |

^Excludes OHCA where ambulance records indicated the patient was transported but no corresponding linked EDDC or APDC record.

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# Survival rates by AED use and witnessed status

Bystander defibrillation, when the patient is in VF/VT, is another bystander intervention that has proven survival benefit. In 2021, an AED was applied by a bystander to 281 patients in cardiac arrest, with 132 of these patients receiving a shock prior to paramedic arrival.

Across all witnessed statuses, the survival rate was highest for patients on whom an AED was used (35.4% survived event; 26.5% 30-day survival), compared to patients who did not have an AED used (21.4% survived event; 8.1% 30-day survival). The event survival rate and 30-day survival rate was highest for patients who had a bystander witnessed OHCA and had an AED used (42.0% and 32.1% respectively) (Table 7).

**Table 7: Survival outcomes by witnessed status and AED use, EMS-treated or ROSC prior to EMS arrival OHCA, all ages**

| Indicator | Witnessed status | Bystander CPR | Number | Denominator | % |
|---|---|---|---|---|---|
| **Survived event** | Bystander-witnessed | AED used | 71 | 169 | 42.0% |
| | | AED not used | 403 | 1,493 | 27.0% |
| | | **Total – all AED use** | **474** | **1,662** | **28.5%** |
| | Not witnessed / Unknown | AED used | 13 | 68 | 19.1% |
| | | AED not used | 145 | 1,062 | 13.7% |
| | | **Total – all AED use** | **158** | **1,130** | **14.0%** |
| | All witnessed statuses (excl para-witness) | AED used | 84 | 237 | 35.4% |
| | | AED not used | 548 | 2,555 | 21.4% |
| | | **Total – all AED use** | **632** | **2,792** | **22.6%** |
| **Survived 30 days^** | Bystander-witnessed | AED used | 50 | 156 | 32.1% |
| | | AED not used | 158 | 1,449 | 11.0% |
| | | **Total – all AED use** | **208** | **1,605** | **13.0%** |
| | Not witnessed / Unknown | AED used | 8 | 63 | 12.7% |
| | | AED not used | 44 | 1,040 | 4.1% |
| | | **Total – all AED use** | **52** | **1,103** | **4.6%** |
| | All witnessed statuses (excl para-witness) | AED used | 58 | 219 | 26.5% |
| | | AED not used | 202 | 2,489 | 8.1% |
| | | **Total – all AED use** | **260** | **2,708** | **9.6%** |

^Excludes OHCA where ambulance records indicated the patient was transported with no corresponding linked EDDC or APDC record.

# Ambulance response times

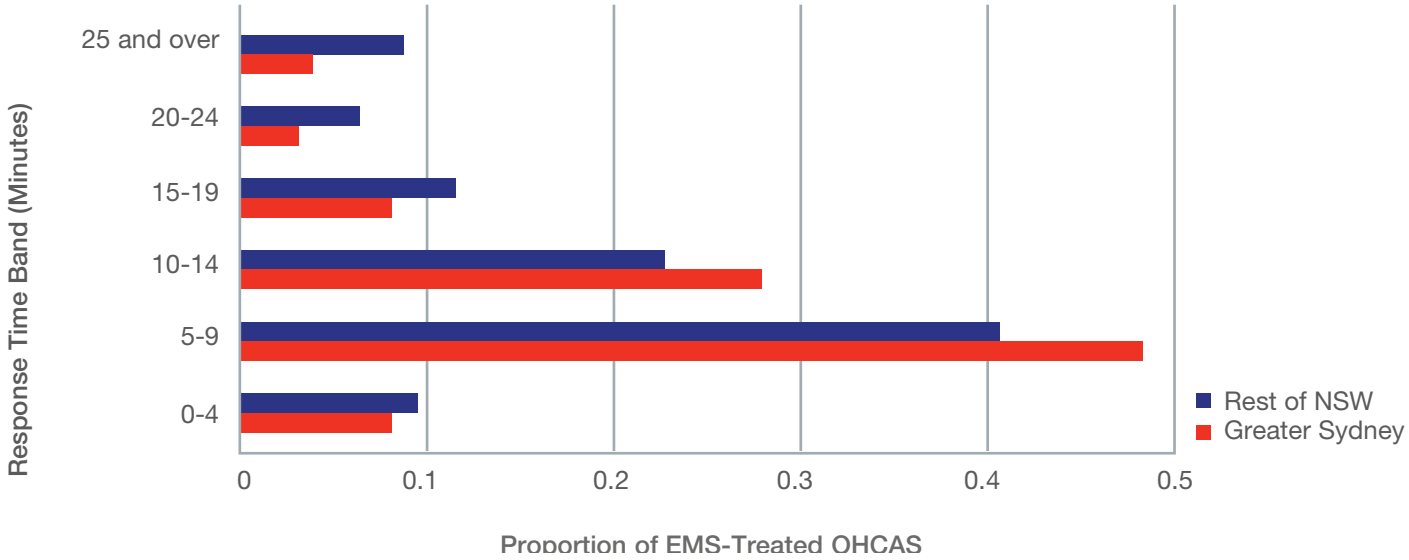

**Overall:** Median (IQR) response time = 9 (7-13) mins
**Greater Sydney:** Median (IQR) response time = 9 (7-12) mins
**Rest of NSW:** Median (IQR) response time = 9 (6-15) mins

Ambulance response time, defined as the period of time that elapses between receipt of the Triple Zero (000) call and the arrival of EMS at the scene, is a key prognostic factor for OHCA.

Numerous studies have shown that shorter response times are associated with higher probability of survival to 30 days or hospital discharge, and favourable neurological outcome.

The median response time to OHCA where a resuscitation attempt was made (excluding paramedic-witnessed arrests) was 9 minutes in both metropolitan areas (Greater Sydney and the Central Coast) and Rest of NSW (Figure 7). This represents an increase of 1 minute over the 2020 median response time.

**Figure 7: Distribution of response times, EMS treated OHCA (excluding paramedic witnessed), by region**




^Excludes OHCA where ambulance records indicated the patient was transported with no corresponding linked EDDC or APDC record.

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# Comparisons with other jurisdictions

The latest available figures from a number of ambulance services on survival rates for patients meeting Utstein criteria can be found in Table 8.

**Table 8: Benchmark OHCA survival rates across jurisdictions, Utstein subgroup**

| Organisation | Time period | Survived event (%) | Survived to hospital discharge or 30 days (%) |
|---|---|---|---|
| NSW Ambulance | 1 Jan 20 – 31 Dec 20 | - | 24% |
| Ambulance Victoria[6] | 1 Jul 21 – 30 Jun 22 | - | 34% |
| Queensland Ambulance Service[7] | 1 Jan 21 - 31 Dec 21 | 49% | 28% |
| St John Ambulance WA[8] | 1 Jan 21 – 31 Dec 21 | 48% | 34% |
| London Ambulance Service[9] | 1 Jan 21 – 31 Dec 21 | 44% | 27% |
| Seattle & King County EMS[10] | 1 Jan 21 – 31 Dec 21 | - | 46% |
| St John New Zealand[11] | 1 Jul 21 – 30 Jun 22 | 43% | 29% |
| Wellington Free Ambulance[12] | 1 Jul 21 – 30 Jun 22 | 50% | 32% |

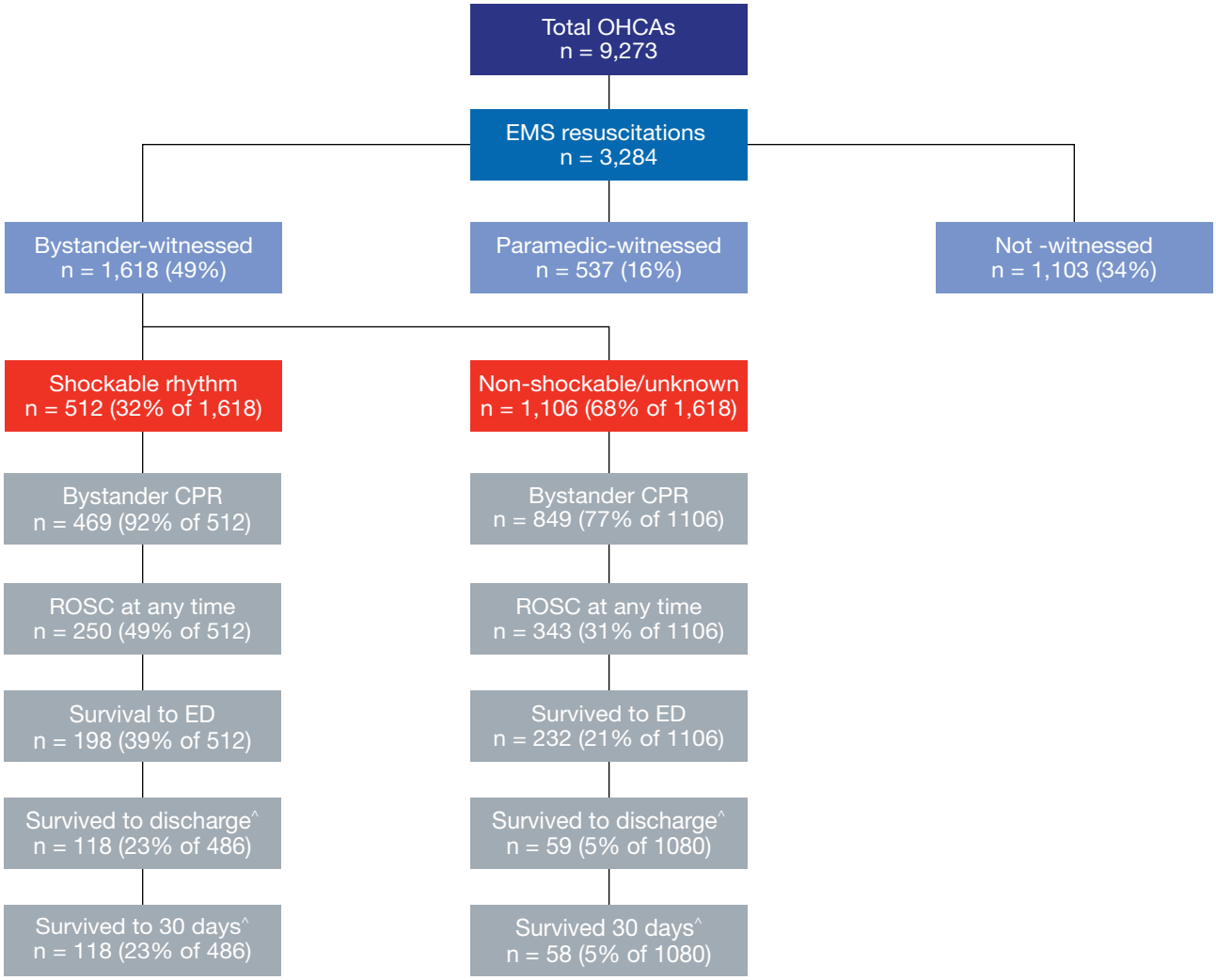
# Survival outcomes for patients meeting Utstein criteria

The ability to compare performance across jurisdictions depends on consistency of presentation and definitions. The Utstein measure is intended to allow comparison of survival rates for the same patient subgroup (bystander-witnessed EMS resuscitations with an initial shockable rhythm). However, even with this measure, inconsistent definitions of resuscitation, and variations in jurisdictional population size and density complicates like-for-like comparisons. The Utstein patient subgroup is defined as:

- Arrest witnessed by a bystander (not paramedic-witnessed) and
- EMS-attempted resuscitation and
- Initial rhythm shockable

There were 512 (16%) of 3,284 resuscitations attempted that met these criteria (Figure 8).

**Figure 8: Utstein patient subgroup measures**



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# Appendix

Table A1: Age in 5 year groupings at time of arrest – Signs of Life prior to EMS arrival

| Age Group (years) | All EMS attended OHCA | Signs of life (ROSC) prior to EMS arrival | Any ROSC | Survived event | Survival to Hospital discharge |
|---|---|---|---|---|---|
| 0-4 | 71 | 1 | 1 | 1 | 1 |
| 5-9 | 10 | 0 | 0 | 0 | 0 |
| 10-14 | 25 | 1 | 1 | 1 | 1 |
| 15-19 | 67 | 0 | 0 | 0 | 0 |
| 20-24 | 99 | 0 | 0 | 0 | 0 |
| 25-29 | 146 | 3 | 3 | 3 | 2 |
| 30-34 | 167 | 0 | 0 | 0 | 0 |
| 35-39 | 191 | 1 | 1 | 1 | 1 |
| 40-44 | 269 | 2 | 2 | 2 | 2 |
| 45-49 | 379 | 1 | 1 | 1 | 1 |
| 50-54 | 497 | 2 | 2 | 2 | 2 |
| 55-59 | 636 | 4 | 4 | 4 | 4 |
| 60-64 | 723 | 8 | 8 | 8 | 8 |
| 65-69 | 784 | 5 | 5 | 5 | 4 |
| 70-74 | 940 | 8 | 8 | 8 | 6 |
| 75-79 | 956 | 2 | 2 | 2 | 1 |
| 80-84 | 965 | 2 | 2 | 2 | 2 |
| 85+ | 1631 | 3 | 3 | 3 | 2 |
| Unknown | 717 | 0 | 3 | 3 | 0 |
| **Totals** | **9273** | **46** | **46** | **46** | **37^ (90%)** |

^ Survival to hospital discharge could not be confirmed for 5 patients.

Table A2: Resuscitation outcomes for OHCA where EMS-attempted resuscitation by age group

| Age Group (years) | OHCA attended by EMS | Resuscitation attempted by EMS | Any ROSC | Survived event | Survival to Hospital discharge |
|---|---|---|---|---|---|
| 0-4 | 71 | 51 | 13 | 12 | 6 |
| 5-9 | 10 | 6 | 1 | 1 | 0 |
| 10-14 | 25 | 14 | 7 | 5 | 2 |
| 15-19 | 67 | 31 | 13 | 12 | 5 |
| 20-24 | 99 | 46 | 20 | 17 | 9 |
| 25-29 | 146 | 69 | 18 | 13 | 7 |
| 30-34 | 167 | 88 | 20 | 20 | 13 |
| 35-39 | 191 | 85 | 22 | 18 | 11 |
| 40-44 | 269 | 116 | 41 | 37 | 26 |
| 45-49 | 379 | 154 | 49 | 35 | 25 |
| 50-54 | 497 | 193 | 74 | 55 | 41 |
| 55-59 | 636 | 259 | 94 | 66 | 42 |
| 60-64 | 723 | 278 | 108 | 76 | 36 |
| 65-69 | 784 | 289 | 103 | 78 | 43 |
| 70-74 | 940 | 338 | 122 | 95 | 32 |
| 75-79 | 956 | 324 | 102 | 75 | 21 |
| 80-84 | 965 | 311 | 100 | 70 | 22 |
| 85+ | 1631 | 388 | 124 | 89 | 23 |
| Unknown | 717 | 244 | 85 | 59 | 12 |
| **Totals** | **9273** | **3284** | **1116** | **833** | **376^ (11%)** |

^ Survival to hospital discharge could not be confirmed for 101 patients.

**Table A3: Utstein standardised template for reporting outcomes from out-of-hospital cardiac arrest**

| Population served | 8,093,815 residents as of 30 June 2021 |
|---|---|
| Out-of-Hospital Cardiac Arrests attended | 9,273 |

| Resuscitation attempted | Resuscitation not attempted | | | |
|---|---|---|---|---|
| 3,284 | All cases | DNAR | Obviously dead | Signs of life |
| | N=5,943 | 393 | 5,504 | 46 |

| | EMD (Call taker) ID CA | | | EMD (Call taker) CPR | | |
|---|---|---|---|---|---|---|
| **Emergency Medical Dispatch** | Yes | No | Unknown | Yes | No | Unknown |
| | 7,880 | 1,387 | 16 | 3,218 | 5,803 | 257 |

| | | All Locations | Greater Sydney & Central Coast | Rest of NSW |
|---|---|---|---|---|
| **Response time (All) N=9,273** | Median (IQR): 90th percentile | 10 (7-15): 24 | 9 (7-13) : 21 | 10 (7-17): 27 |
| **Response time (EMS-resuscitation only) N=3,248** | Median (IQR): 90th percentile | 9 (7-13): 20 | 9 (7-12) : 17 | 9 (6-15): 23 |

| **Location** | Home | Public | Nursing | Medical facility | Other | Unknown |
|---|---|---|---|---|---|---|
| | 7,364 | 1,013 | 760 | 100 | 36 | 0 |

| **Patient** | Age (years) | | Gender | | |
|---|---|---|---|---|---|
| | Median (IQR) | Unknown | Male | Female | Unknown/Not recorded |
| | 63 (50-76) | 10 | 5,956 | 3,269 | 48 |

| **Witnessed** | Bystander | EMS | Unwitnessed or unknown |
|---|---|---|---|
| | 2,842 | 720 | 5,711 |

| **Bystander response** | Bystander CPR | | Bystander AED | | |
|---|---|---|---|---|---|
| | No bCPR / unknown | bCPR | Available | Shock | Unknown |
| | 5,824 | 3,449 | 281 | 132 | 0 |

| **Aetiology** | Medical | Trauma | Overdose | Drowning | Electrocution | Asphyxial* |
|---|---|---|---|---|---|---|
| | 7,883 | 485 | 229 | 78 | 16 | 582 |

| **Patient outcomes reporting population** | | n | Any ROSC | | Survived event | | Survival 30 days | |
|---|---|---|---|---|---|---|---|---|
| | | | Yes | Unknown | Yes | Unknown | Yes | Unknown |
| **EMS witnessed included** | All EMS treated OHCA | 3,284 | 1,116 | 0 | 833 | 0 | 345 (10.4%) | 61 |
| **EMS witnessed excluded** | Shockable bystander** | 512 | 250 | 0 | 198 | 0 | 125 (23.8%) | 26 |
| | Shockable bystander CPR | 579 | 287 | 0 | 226 | 0 | 136 (24.9%) | 32 |
| | Non-shockable witnessed | 1,106 | 343 | 0 | 232 | 0 | 57 (5.2%) | 26 |

AED indicates automated external defibrillator; bCPR, bystander cardiopulmonary resuscitation; CA, cardiac arrest; CC, chest compressions; CPR, cardiopulmonary resuscitation; Defib, defibrillation; DNAR; do not attempt resuscitation; EMS; emergency medical services; ID, identified; ROSC, return of spontaneous circulation; Vent, ventilations; *Asphyxial includes asphyxia, strangulation, foreign body obstruction and hanging. **Utstein comparator group (system efficacy).

**Table A4: Missing or unknown data for selected registry variables (2021)**

| Variable | n | % |
|---|---|---|
| Patient age | | % |
| Patient gender | 2 | <1% |
| Arrest location | 0 | 0% |
| Witnessed status | 26 | 1% |
| Bystander CPR | 32 | 1% |
| Rhythm on arrival | 66 | 2% |

| Variable | n | % |
|---|---|---|
| EMS response time | 0 | 0% |
| Outcome at scene | 0 | 0% |
| Event survival | 0 | 0% |
| Survival to hospital discharge | 101 | 3% |
| Survival – 30 days | 101 | 3% |

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# Glossary of terms, abbreviations and acronyms

| | |
|---|---|
| **AED** | Automated external defibrillator |
| **APDC** | Admitted patient data collection |
| **ARC** | Australian Resuscitation Council |
| **CFR** | Community first responder |
| **CHeReL** | Centre for health record linkage |
| **CPR** | Cardiopulmonary resuscitation |
| **EDDC** | Emergency department data collection |
| **EMS** | Emergency medical service |
| **ETT** | Endotracheal tube |
| **GRA** | Global Resuscitation Alliance |
| **HRIPA** | Health records and information privacy Act |
| **IHD** | Ischaemic Heart Disease |
| **IQR** | Interquartile Range |
| **MPDS** | Medical priority dispatch system |
| **NSW** | New South Wales |
| **OHCA** | Out-of-hospital cardiac arrest |
| **PEA** | Pulseless electrical activity |
| **PHROR** | Population health risks and outcomes register |
| **RBDM** | Registry of births deaths and marriages |
| **REDCap** | Research electronic data capture |
| **RFS** | Rural Fire Service |
| **ROSC** | Return of spontaneous circulation |
| **SA4** | Statistical area 4 |
| **SES** | State Emergency Service |
| **VAO** | Volunteer ambulance officer |
| **VF** | Ventricular fibrillation |
| **VT** | Ventricular tachycardia |
| **WA** | Western Australia |

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