



Out-of-Hospital Cardiac Arrest Report

2023



Acknowledgement of country

St John WA acknowledges the First Nations people of the many Traditional lands and language groups across Western Australia, as the Traditional Custodians of the Country. We pay our respects to their Ancestors and Elders, past and present.

SJWA is committed to honouring the unique cultural and spiritual relationships to the land, sea and waterways and the rich continuing contribution Aboriginal and Torres Strait Islander peoples make to our society.

Survivor Stories

Beating the odds, twice

The odds of surviving out-of-hospital cardiac arrest are one in 10. Joe Jeffries beat the odds. Twice. In seven months.

The 64-year-old touch rugby referee collapsed during halftime at separate games, one held at his Southern Stars Touch Football club in Karawara on January 22 and the second at Northern District's Bennett Park in Doubleview on July 3, 2023.

Thanks to the quick actions of team mates, the Kardinya man regained a pulse from shocks delivered by automated external defibrillators (AEDs) installed at both clubs and Cardiopulmonary Resuscitation (CPR) from trained medics before an ambulance arrived.

"When I was in hospital, the doctors, surgeons and medical staff all said after looking deeper into what

they've done for me, I am really lucky to be alive," Joe said.

Joe was delivered his first of four AED shocks in under three minutes of his first collapse and managed to get a pulse just as paramedics arrived 10 minutes later.

Similar occurred at Bennett Park, where together with the arrival of a Clinical Support Paramedic and an ambulance crew, Mr Jeffries again achieved a pulse.

Years ago, touch football clubs around the Perth metropolitan area mandated the need to have defibrillators at club houses, helped along by Lotterywest Heart Grants in partnership with SJWA.



Joe Jeffries

Still kicking footy with his kids

Fit and healthy Wade 'Freddy' Hunter had pulled on his Northam Federals guernsey and jogged onto Henry Street Oval in Northam for what he thought would be just another home game in July 2023, when everything came crashing down.

Wade said he had been feeling a bit more fatigued than usual, but with more than 400 games under his belt over his stellar 32-year career, he pushed through.

"In the second quarter of the game I collapsed, and that is all I remember until I woke up the next morning," he said.

Bystanders launched into action to save his life by phoning Triple Zero (000) before the umpire, also one of the small town's police officers, began CPR.

An off-duty nurse who'd been barracking from the sidelines then stepped in while Wade's mates ran to the clubrooms to retrieve an AED which shocked his heart back to life.

A SJWA crew were just around the corner from the oval and were on the scene within five minutes to take over.

Wade survived thanks to bystander CPR and use of an AED purchased by the local shire.

He has gone on to learn first aid so he can help someone else the way his community helped him.

Returning to the oval to kick his 450th game, Wade continues to enjoy kicking the footy with his young son.

Pictured below: Wade Hunter, centre right, with St John WA ambulance team members, from left, Dylan Campbell, Charlotte Powell, Greg Martin and Brooke Lincoln with Ross at a free community first aid training day in Northam.



Wade Hunter

Watch Wade's story →



About St John WA and our response to cardiac arrest

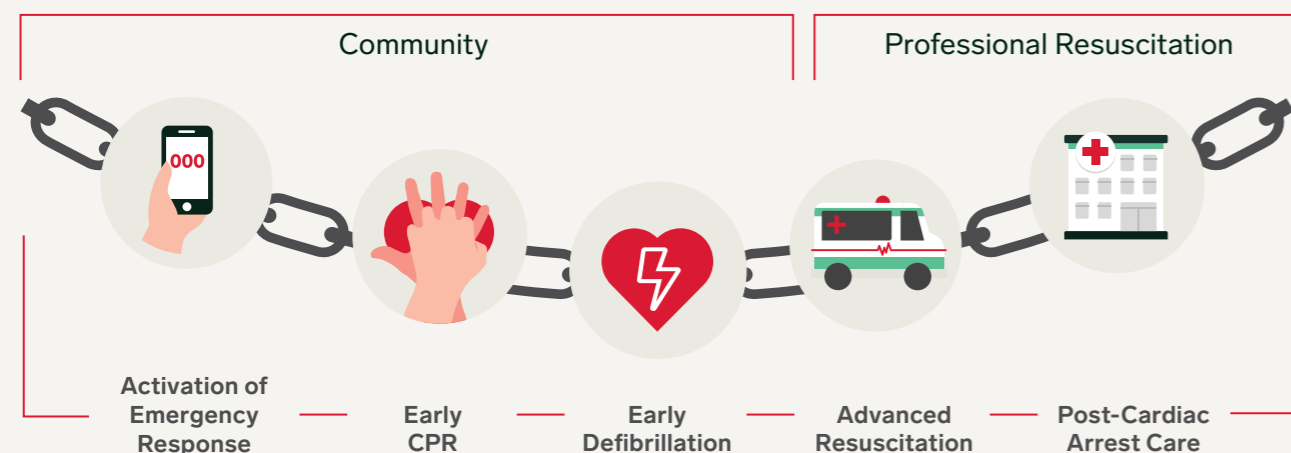
SJWA provides ambulance services across a vast land mass approximately 2.5 million km² in area, the largest area in the world covered by a single jurisdictional ambulance service. Western Australia (WA) has a population of approximately 2.88 million, the majority of whom reside within the Perth metropolitan and south-west areas of the state.⁽¹⁾

SJWA also provides first aid training and AED services to communities across the state, which supports ambulance in the event of sudden out-of-hospital cardiac arrest (OHCA). Research has shown that a patient's OHCA survivability decreases by about 10% with every minute that passes without lifesaving Cardio-Pulmonary Resuscitation (CPR) and delivery of an AED shock,⁽²⁾ making bystander assistance vital in those first critical minutes until an ambulance arrives.

The Chain of Survival is an internationally accepted series of steps that bystanders and community members at the scene of a cardiac arrest, along with professional Emergency Medical Services (EMS) can take to maximise survival from OHCA. The first three steps – activating

an emergency response via a call to Triple Zero (000), initiating CPR, and providing defibrillation with a community AED - can be performed by bystanders prior to ambulance arrival and are associated with the largest benefit for survival⁽³⁾.

SJWA, like other jurisdictional ambulance services, attempt to optimise the chain of survival to give OHCA patients the best possible chance of survival. Upon recognition of cardiac arrest on a Triple Zero (000) call, SJWA Emergency Medical Dispatchers (EMDs) will provide the caller with instructions in performing CPR and using a defibrillator if one is available. To strengthen WA's response to OHCA events, members of the community may also be alerted via SJWA's Community First Responder program.



Community First Responder Program

SJWA operates a Community First Responder (CFR) program with two key pillars that empower community members to act as spontaneous first responders during an OHCA. The goal is for responders to provide CPR and, where available, use a community AED before an ambulance arrives.

The **State Defibrillator Network** encourages AED owners to register their devices with SJWA. Once registered, these individuals/businesses/organisations may be contacted during a nearby OHCA to bring their AED to the scene and assist with lifesaving efforts.

In addition, AEDs stored in external locked cabinets can be accessed by bystanders via a code provided by SJWA's State Operations Centre (SOC) when they call Triple Zero (000). This increases the chances of defibrillation being administered in the critical first minutes following an OHCA.

SJWA strongly advocates for the widespread installation and ownership of AEDs, investing in this program for over a decade to improve survival rates following OHCA.

The **First Responder App** invites health professionals and members of the public with a First Aid certification to make themselves available to be notified when an OHCA occurs within 500 metres of their location. This means bystanders can offer crucial care, such as CPR, and relay vital information to the SOC while the ambulance crew is enroute.

The app also provides users with access to nearby AED locations, further enhancing the chances of timely defibrillation through the State Defibrillator Network.



← See the chain of survival and CFR program in action



← Register your AED or sign up as a CFR – download the First Responder App

Ambulance Response

Triple Zero (000) calls for cardiac arrest generate a multiple-asset response, typically comprising of two ambulances, each with two clinicians. Where possible a Clinical Support Paramedic will be tasked in metropolitan areas to provide overview, leadership and additional decision-making support. An operational manager may be deployed as an alternative. These responders also carry mechanical CPR devices to be used if transport to an Emergency Department (ED) is undertaken.

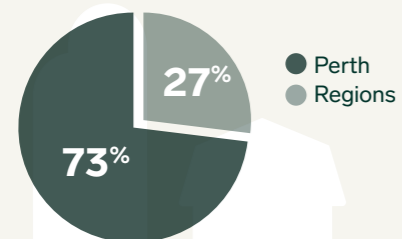
In larger regional centres where the organisation is funded to provide a career paramedic response, a multiple-asset response of two ambulances will routinely be dispatched to cases of cardiac arrest. In other rural areas, a Community Paramedic may be deployed where practical to provide paramedic support to volunteer Emergency Medical Technician or Emergency Medical Assistant crews. Alternatively, the response may be volunteer ambulance officers only.

SJWA clinicians provide cardiac arrest care in accordance with the Australian and New Zealand Committee on Resuscitation (ANZCOR), Basic Life Support (BLS) and Advanced Life Support (ALS) algorithms and are trained in a team approach to high-performance CPR.



2023 OHCA Key Statistics

1271 patients treated (3.5 per day)
 41 were children
 148 already being treated by ambulance crew (EMS-witnessed)



68% of cardiac arrests occur in private residences
 23% occur in public places
 9% other locations

94% of OHCA recognised on Triple Zero (000) call



82% of patients received bystander CPR

11% of patients survived when they received bystander CPR
 5% survived with no bystander CPR



48,562 registered Community First Responders on St John First Responder app



142 people survived

21% of patients had a pulse on arrival at hospital

11% survived

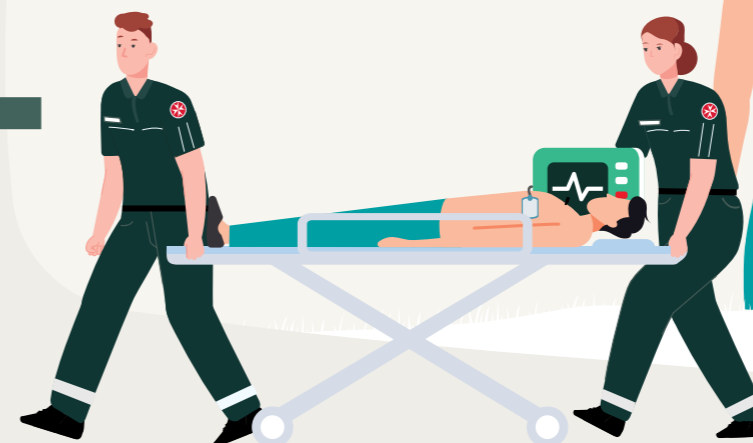
40% of patients in the Utstein comparator group survived*

Median ambulance response times:
 9.2 minutes in Perth metropolitan area
 12.2 minutes in regions



78 patients had a shock from a community AED prior to ambulance arrival

49% survived when first shocked by community AED
 19% survived when first shocked by an ambulance crew



9737 community AEDs registered on State Defibrillator Network
 2747 of these are available 24/7

16% of patients had a community AED applied
 43% in public places



Notes: All data for cases where SJWA attempted resuscitation.
 Data for type of location, recognition, bystander CPR, AED use, community response and response times exclude EMS-witnessed arrests.
 Survival refers to 30-day survival.

Registration data for First Responder app and State Defibrillator Network as at 31 December 2023.
 *Utstein Comparator Group refers to patients who experience OHCA witnessed by a bystander, present in a shockable rhythm, and EMS attempted resuscitation.
 See page 29 for more information on the Utstein comparator group.

SJWA's work with community to support response to out-of-hospital cardiac arrest

SJWA's dedication to strengthening the chain of survival is made possible by the support of corporate partners and generous donors. Our collaboration with local government councils continues to influence businesses across WA, highlighting the vital role of community defibrillators in saving lives.

Thanks to these contributions and advocates, the Community First Responder network continues to grow, with almost 10,000 defibrillators and more than 48,000 first responders across WA. This enables us to stay true to our purpose of building resilient communities and serving humanity.



Leading by example – South Perth

In July, Member for South Perth Geoff Baker MLA attended defibrillator training for the South Perth Learning Centre having funded the SJWA training following support to local bowling, footy and recreational clubs receiving five AEDs in 2021.

Dr Baker also committed to promoting the need for more defibrillators accessible outside buildings and sponsoring two organisations in his electorate wishing to convert their AED to an outdoor unit that is accessible outside of business hours, up to the value of \$800.

Ahead of Restart a Heart Day (October 16), SJWA's Paramedic and Resuscitation Improvement Specialist Jason Belcher addressed the City of South Perth's Emerging Artist Award Business Networking event on October 11 about the importance of AEDs in saving lives, and the need to be able to access them 24/7 in the community.

Subsequently, six more 24/7 community AEDs were installed in the area, with SJWA Social Sustainability Manager Angel Robins' commitment to working with all Local Government Areas to expand the City of South Perth's example and grow the State Defibrillator Network.

Ripple effect – Denmark

The State Defibrillator Network, which has operated since 2011, is a service which aims to get defibrillators to cardiac arrest victims in the vital minutes before an ambulance arrives.

It grew along regional coastlines thanks to an inspired fundraising initiative by small business owner Kirsten Lopez wishing to honour the late Fremantle father of two Andy Rutherford.

Andy, 48, died of a sudden cardiac arrest after collapsing on a beach at Elephant Rocks, near Denmark, in April 2023 despite the best efforts of first aid-trained friends, use of community defibrillator and speedy response of volunteer crews from Denmark sub centre.

In tribute to Andy, South Beach Boardies' owner Kirsten created specially designed 'Djiti-djitis for Defibrillators' ('Willy Wagtails' in Noongar) boardshorts in collaboration with his widow Renae and two sons Maxton and Fraser, and donated profits from the sales in December to increase publicly accessible defibrillators in the area.

Six defibrillators are to be installed thanks to Kirsten's initiative and broader community donations to SJWA's charitable arm, with the initiative still ongoing.

It aligns with SJWA's goal of increasing registered 24/7 publicly accessible defibrillators to the West Australian community, no matter how remote the location. More than 300 of these are on the State Defibrillator Network in the Great Southern.

Thank you

Thanks to corporate partners such as CBH, which has donated 160 AEDs to the network across the grain growing region through its Harvest Mass Management Scheme, and new partners Beach Energy, which came on board in 2023, regional defibrillators per head of population is a leading example of SJWA's statewide aim for community cardiac arrest response.

Introduction

St John WA presents its out-of-hospital cardiac arrest (OHCA) report for the calendar year 2023 which is made possible by the close collaboration and partnership with the researchers at the Pre-hospital, Resuscitation and Emergency Care Research Unit (PRECRU) based at Curtin University, Perth. The Western Australian cardiac arrest database is managed and maintained at PRECRU and continues to inform and influence practice.

New records have been set in 2023, with SJWA's highest survival result historically in the Utstein comparator group, which is an international benchmark for cardiac arrest performance, of 39.6%. In addition, 94% of cardiac arrests were recognised by SJWA State Operations Centre Triple Zero (000) call-takers and escalated appropriately with CPR instructions delivered over the phone, while those with a community AED applied prior to ambulance arrival increased to its highest number ever. It is also the first time 30-day survival in rural/regional WA exceed survival in metropolitan Perth, since OHCA annual reporting began in 2016. Ultimately, 142 patients survived their cardiac arrest.

This was also a year where SJWA welcomed new senior leadership and continued to build on improvements in the system of care for OHCA.

We recognise the foundation for OHCA survival has firmly been established internationally as largely resting with the community⁽³⁾ and that in the words of the Resuscitation Academy "it takes a system to save a victim"⁽⁴⁾. Early response to cardiac arrest from bystanders making a Triple Zero (000) call, providing CPR and applying a community defibrillator in the first few minutes of a cardiac arrest makes the most significant impact on survival, so we continue to work to develop systems for resilient communities who can provide that early response.

In WA, SJWA continues to develop world-leading rates of bystander CPR (in more than 80% of patients where SJWA ambulance crews attempted resuscitation) and the number of patients with a community AED applied prior to the ambulance crew rose to 16%, with 43% of patients having

an AED applied in public places. It is incredibly encouraging to see these rates increase each year.

We thank the Western Australian community for their efforts in helping save lives by stepping forward when somebody has a sudden cardiac arrest and making that critical decision to help. We thank businesses, community organisations and individuals for registering their AED on our State Defibrillator Network so it can be mobilised in an emergency, and the business and corporate funders who put AEDs street-side so they are available to the community 24/7.

We also thank our dedicated EMDs in the State Operations Centre at the heart of this system, who not only organise an ambulance response to cardiac arrest, but direct callers to perform CPR, and provide directions to public access defibrillators on the State Defibrillator Network or organise a community responder from a defibrillator location to bring the defibrillator to the patient. And of course, we thank our dedicated ambulance crews and other frontline clinicians, who provide excellent care to patients through their commitment to high-performance CPR and providing a high standard of advanced care and clinical decision-making for patients in cardiac arrest. We also acknowledge and thank our clinical educators, Clinical Support Paramedics and Community Paramedics who continue to advocate for excellence in OHCA care in WA.

We further recognise the work that happens in the background by the SJWA Community First Responder team maintaining the State Defibrillator Network in readiness for a defibrillator to be activated.



We particularly acknowledge Sally Simmonds who retired in 2023 after a 32-year career with SJWA; and who was the first manager of the State Defibrillator Network since it began in 2011, and oversaw its growth over the subsequent 12 years. A significant number of lives have been saved, and will continue to be into the future, thanks to her work.

We acknowledge that we stand on the shoulders of multiple St John visionaries who helped develop our OHCA response system over time, since the late Prof. Ian

Jacobs, who was a giant in the international resuscitation research community.

Everyone at St John celebrates the patients who can return to their families after a cardiac arrest. However, we are mindful of the many cardiac arrest sufferers who do not survive, and we offer our respects to them, their families and communities. We re-affirm our commitment to continually improve our systems of care and clinical practice, to shift the dial on cardiac arrest survivability in WA.

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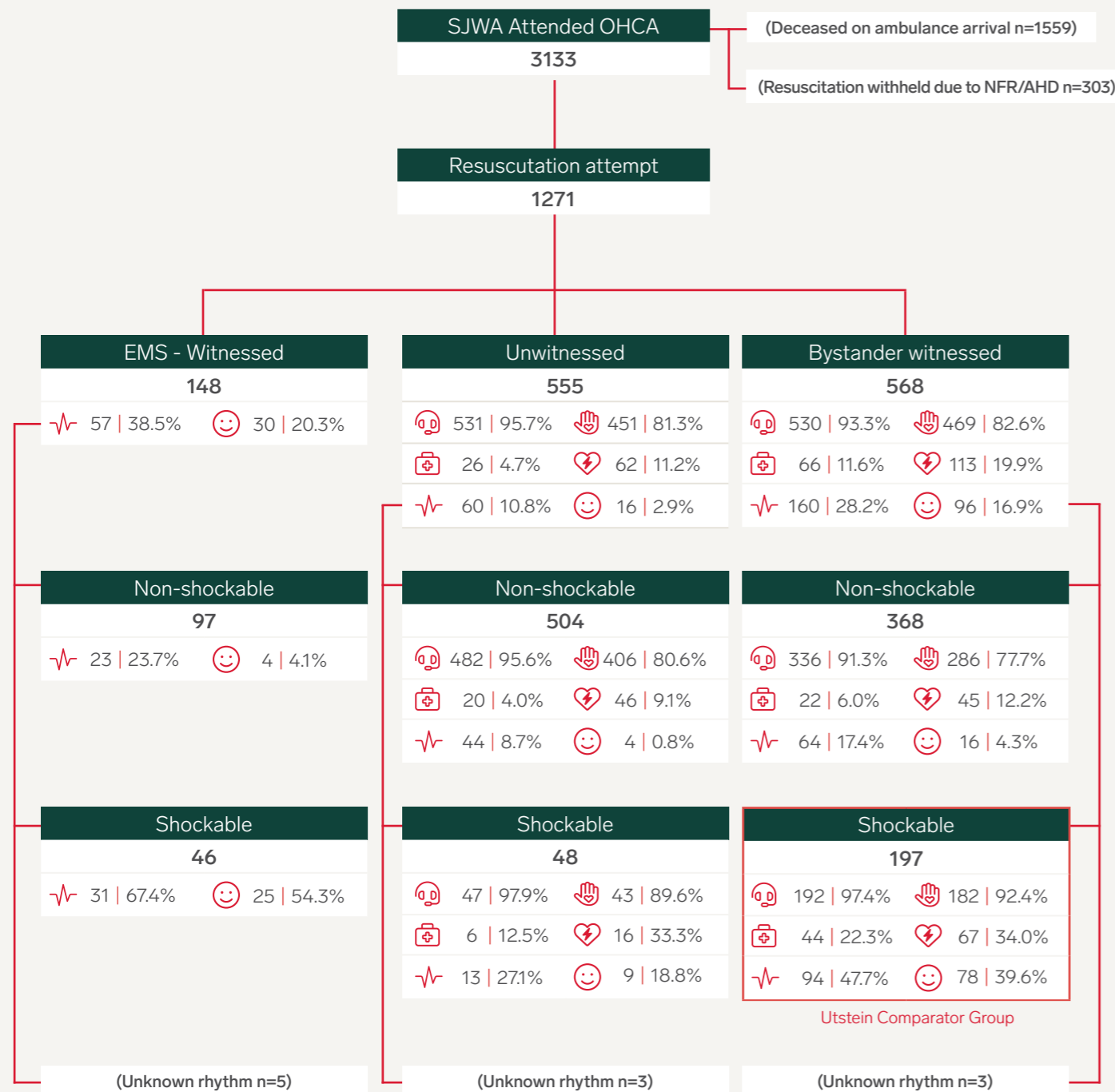
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Summary and Benchmarking

Figure 1: Breakdown of all OHCA attended in 2023



- Legend:**
- Recognition on emergency call
 - Community First Responder activation
 - Return of Spontaneous Circulation (ROSC) at ED
 - Bystander CPR
 - Community AED applied
 - Survived to 30 days

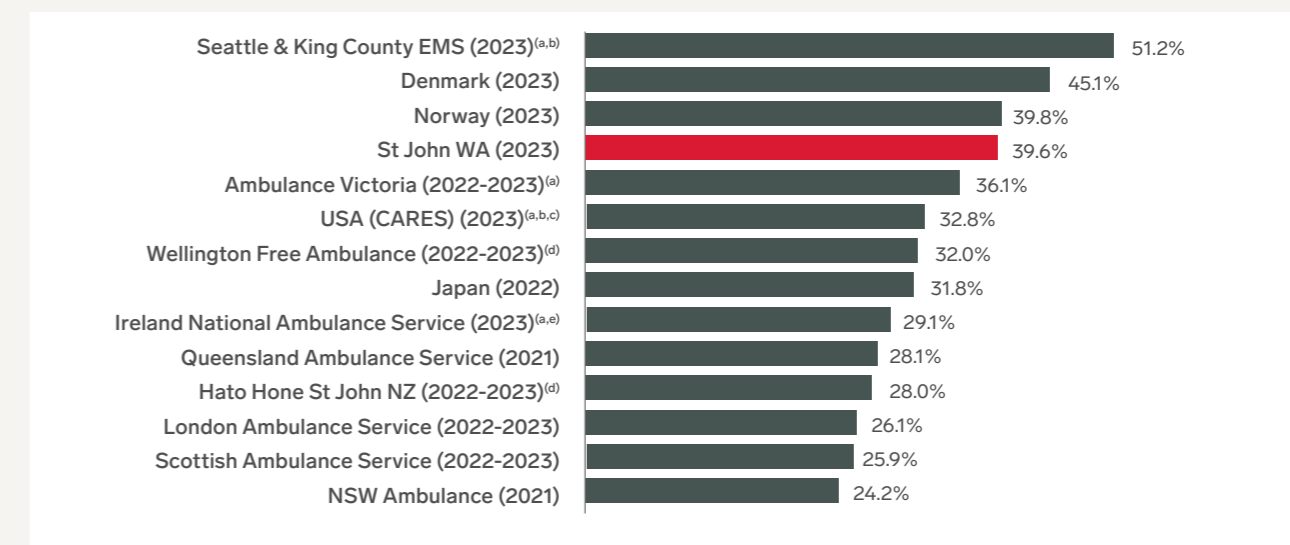
Table 1: Key figures for all-cause events where EMS attempted resuscitation

Year	Number of cases	Bystander CPR% ¹	Bystander AED use % (pads applied) ^(a)	Median metro response time (mins) ^(a)	Median rural response time (mins) ^(a)	% ROSC at ED	% 30-day survival	Utstein % ROSC at ED ²	Utstein % 30-day survival ²
2019	1112	79.0	11.8	8.9	13.1	21.1	12.3	44.3	34.5
2020	1088	79.6	13.8	9.1	13.1	20.8	11.6	44.3	35.7
2021	1116	81.6	15.8	9.4	12.4	20.6	10.5	47.7	33.5
2022	1182	81.5	14.5	9.6	15.0	19.7	10.8	43.0	33.0
2023	1271	81.9	15.6	9.2	12.2	21.8	11.2	47.7	39.6

^(a) Excludes EMS-witnessed arrests.

The Utstein Comparator group is an international standard used for benchmarking. It refers to survival among patients who experience OHCA witnessed by a bystander, present in a shockable rhythm, and receive EMS attempted resuscitation. See page 29 for more information on the Utstein comparator group.

Figure 2: Benchmarking survival rates nationally and internationally (Utstein comparator group)



Notes:

See references 5-17 (page 38) for original registry reports

(a) Seattle & King County EMS, Ambulance Victoria, CARES and Ireland National Ambulance Service report Survival to Hospital Discharge. All others report 30-day survival. The measures are considered equivalent.⁽¹⁾⁽⁸⁾

(b) Seattle & King County EMS and CARES exclude arrests with traumatic aetiology.

(c) The Cardiac Arrest Registry to Enhance Survival (CARES) collects data from participating emergency medical services and hospitals covering 54% of the population of the United States.

(d) Hato Hone St John NZ and Wellington Free Ambulance report on patients aged ≥15 years.

(e) Ireland National Ambulance Service reports on patients aged ≥17 years.

Incidence and case characteristics

SJWA attended 3133 OHCA cases in the calendar year 2023 (1 January – 31 December), a 1% increase on 2022 (n=3115). The majority of cases (n=3079) were classified as adults (16 years and above) compared to those aged under 16 years of age (n=54).

Of all OHCA cases, 68.0% were recorded as male and 32.0% as female by SJWA clinicians.

The crude incidence of OHCA decreased slightly from 2022 to 2023. In 2023 for adults, crude incidence was 133.5 per 100,000 population, and for children was 9.4 per 100,000. By comparison, in 2022 OHCA incidence for adults was 137.2 per 100,000, and for children was 9.5 per 100,000.

In 2023, SJWA attempted resuscitation on 40.6% (n=1271) of OHCA patients.

Table 2: Overview of OHCA cases attended by St John WA

	No of Cases	% of all cases	Incidence rate ^(a)	No. of resuscitation attempted	% resuscitation attempted
Adult	3079	98.3%	133.5	1230	39.9%
Children	54	1.7%	9.4	41	75.9%
TOTAL	3133	100%	108.7	1271	40.6%

^(a)per 100,000 population

All ambulance-attended OHCA cases in WA are recorded in the SJWA OHCA registry maintained by PRECRU. Detail about the registry is included at page 32. The utility of the SJWA OHCA registry relies on completeness of data capture. Missing data are relatively rare for all core variables (see Table 3).

Table 3: Missing Data

Variable	No of Cases
Sex	0
Age	2
Aetiology	0
Witness Status	0
Location Type	0
Response Time	3
Initial Arrest Rhythm	19
Bystander CPR	0
Bystander shock given	0
30-day survival	0

Number of records with missing data for select SJWA OHCA database variables in 2023 (from total of 3133 cases)

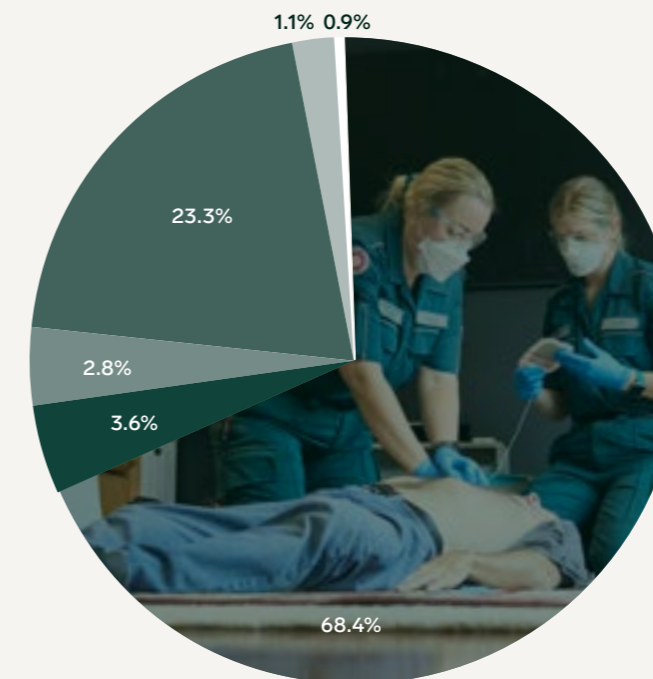
Location of Arrest

Similar to previous years, the majority of patients (68.4%) suffered a cardiac arrest at a private residential address, which is similarly observed in other systems.

If the cardiac arrest occurs in a public place, the likelihood of a bystander witnessing the collapse is greater and is associated with improved outcomes as the chain of survival is activated sooner. In 2023, 23.3% of patients suffered a cardiac arrest in a public place, compared to 20.3% in 2022.

These figures exclude cases where the cardiac arrest occurred whilst the patient was already in the care of SJWA ambulance personnel (EMS-witnessed arrests) as well as cases where resuscitation was not attempted.

Figure 3: Location of arrest



Legend

- Private residence (768)
- Residential aged care (40)
- Other accommodation (e.g. hotel, caravan park) (31)
- Public place (262)
- Medical centre (12)
- Other (e.g. prison, farmland, mine site) (10)

Total = 1123

Criteria: Excludes EMS-witnessed arrests, and cases where resuscitation not attempted.

Precipitating causes – adults (16+ yrs)

Of adult OHCA cases in 2023 where SJWA attempted resuscitation, 76.8% had a presumed cardiac cause (n=945), with the next most common causes being hanging (6.9%, n=85), trauma (6.7%, n=85), drug overdose (5.1%, n=63), respiratory pathology (2.0%, n=25) and drowning (1.8%, n=22).

Table 4: Aetiology – adults

	2019	2020	2021	2022	2023	TOTAL
Presumed cardiac	822	811	851	898	945	4327
Respiratory	33	23	19	34	25	134
Drowning	16	21	17	16	22	92
Trauma	75	67	73	78	83	376
Hanging	69	68	74	56	85	352
Drug overdose	52	58	43	53	63	269
Electrocution	2	2	2	1	1	8
Malignancy/Palliative	10	9	10	11	6	46
TOTAL	1079	1059	1089	1147	1230	5604

Criteria: Excludes cases where resuscitation was not attempted.

Precipitating causes – children (<16 yrs)

Among the 41 paediatric OHCA cases where SJWA attempted resuscitation in 2023, a presumed cardiac aetiology was recorded in 17 cases, with other causes including drowning (n=5), respiratory pathology (n=4) and Sudden Unexpected Death in Infancy (SUDI) (n=12).

Table 5: Aetiology – children

	2019	2020	2021	2022	2023	TOTAL
Presumed cardiac	10	10	10	8	17	55
Respiratory	2	3	-	2	4	11
Drowning	2	3	1	5	5	16
Trauma	6	5	6	4	1	22
Drug overdose	-	-	1	-	-	1
Hanging	4	1	5	4	2	16
SUDI	9	6	4	11	12	42
Malignancy/Palliative	-	1	-	1	-	2
TOTAL	33	29	27	35	41	165

Criteria: Excludes cases where resuscitation was not attempted.

Presenting rhythms

Of the 1230 adult OHCA 289 (23.5%) presented in a shockable rhythm – Ventricular Fibrillation (VF) or Ventricular Tachycardia (VT).

A total of 931 cases presented in non-shockable rhythms, the most common was asystole, which recorded 666 cases (54.1%). Pulseless electrical activity (PEA) featured in 173 cases (14.1%). Of note, 92 cases (7.5%) had an unspecified non-shockable rhythm, where a community AED or SJWA cardiac monitor-defibrillator in AED mode has performed a rhythm analysis with no shock advised. Data on presenting rhythm was missing for 10 cases.

Figure 4: Frequency of adult initial arrest rhythms 2023

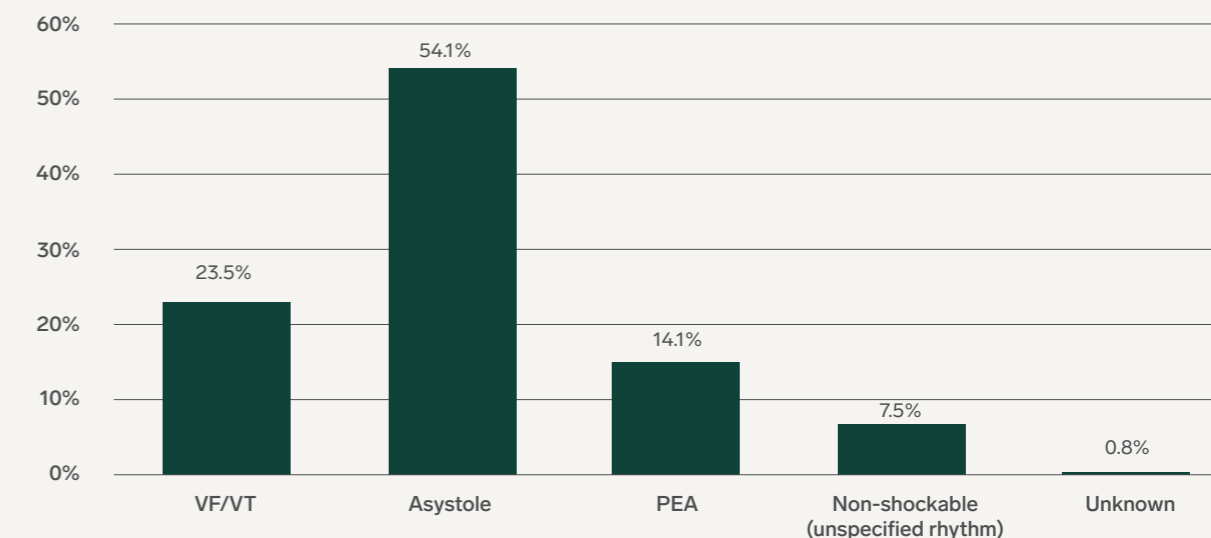


Table 6: Initial arrest rhythm for adults 2019-2023

Rhythm	2019	2020	2021	2022	2023
Shockable	282	281	258	285	289
Non-shockable	788	760	818	855	931
Bradycardia	-	-	1	-	-
Unknown	9	18	12	7	10
TOTAL	1079	1059	1089	1147	1230



Recognition of OHCA during Triple Zero (000) call

All incoming Triple Zero (000) emergency calls to SJWA are handled and triaged through the Medical Priority Dispatch System (MPDS) by specialist EMDs. More than 1100 calls for assistance are received by the State Operations Centre (SOC) per day.

Calls for suspected cardiac arrest are treated as the highest priority response above other Priority 1 cases. These cases generate a multiple asset response. Other community responses may also be activated to cardiac arrest cases if available through the Community First Responder program.

Recognition of cardiac arrest during the Triple Zero (000) call is vitally important to ensure that an appropriate ambulance dispatch is allocated to maximise a fast response. Early recognition of OHCA during the emergency call also allows the EMD to initiate telephone CPR instructions and activate Community First Responders or give directions to the nearest publicly accessible defibrillator if another bystander can retrieve it.

In 2023, 94.5% of cardiac arrest cases (excluding EMS-witnessed arrests) were recognised as such during the Triple Zero (000) call-taking process and dispatched accordingly.

Table 7: Recognition of OHCA on a Triple Zero (000) call

	2022	2023
OHCA recognised on emergency call	956	1057
OHCA not recognised	81	62
% recognised	92.2%	94.5%

Criteria: Excludes EMS-witnessed arrests, cases where resuscitation was not attempted, and cases where the ambulance response was activated by a method other than a Triple Zero (000) call (such as an ambulance being flagged down).

Pre-ambulance community response (Bystander CPR and AED activity)

Bystander CPR

The percentage of all OHCA patients in 2023 (regardless of resuscitation attempt by SJWA) who received bystander CPR prior to the arrival of SJWA was 69.0% among bystander-witnessed arrests, and 32.1% among unwitnessed arrests.

Table 8: Bystander CPR witnessed/unwitnessed

	2019	2020	2021	2022	2023
Among bystander-witnessed arrests	69.0%	66.8%	69.8%	71.0%	69.0%
Among unwitnessed arrests	30.0%	31.4%	27.4%	29.5%	32.1%

Amongst cases where SJWA attempted resuscitation, the percentage of OHCA patients receiving bystander CPR prior to the arrival of SJWA was 81.9%.

Table 9: Bystander CPR among cases with an EMS resuscitation attempt

	2019	2020	2021	2022	2023
CPR provided	754	747	785	850	920
No evidence of bystander CPR	200	191	177	193	203
TOTAL	954	938	962	1043	1123
% where CPR provided	79.0%	79.6%	81.6%	81.5%	81.9%

Criteria: Excludes EMS-witnessed arrests, and cases where resuscitation was not attempted.

Patients who received bystander CPR were more than twice as likely to be 30-day survivors than those who did not.

Table 10: 30-day survival in relation to bystander CPR

	% 30-day Survival
For all non-EMS witnessed arrests	
Bystander CPR	11.1%
No bystander CPR	4.9%
For bystander-witnessed arrests only	
Bystander CPR	18.8%
No bystander CPR	8.1%

Excludes EMS-witnessed arrests, and cases where resuscitation was not attempted.

Community AEDs

Community AEDs are strongly associated with improved chances of survival.⁽¹⁹⁾ AEDs were used by bystanders (i.e. AED pads applied) on 175 OHCA patients in 2023, with a defibrillation shock being delivered in 78 cases. Of those 78 patients, 43 (55.1%) had a pulse on arrival at ED and 38 (48.7%) survived to 30 days.

Table 11: Bystander use of AED and number of survivors (all of WA)

	2019	2020	2021	2022	2023
AED pads applied by bystander	113	114	131	151	175
AED shock delivered by bystander	59	55	56	75	78
ROSC at ED after bystander AED shock	35	25	30	34	43
30-day survivors after bystander AED shock	30	22	26	29	38
% ROSC at ED after bystander AED shock	59.3%	45.5%	53.6%	45.3%	55.1%
% 30-day survival after bystander AED shock	50.8%	40.0%	46.4%	38.7%	48.7%

Criteria: Excludes EMS-witnessed arrests, and cases where resuscitation was not attempted.

For patients in an initial shockable rhythm, when the first defibrillation shock is delivered by a community AED as compared to an EMS (ambulance) response, the patient is 2.6 times more likely to be a 30-day survivor (5-year average).

Table 12: Survival statistics based on who delivered first defibrillation shock

	2019	2020	2021	2022	2023	TOTAL
% ROSC at ED						
Community AED	59.3%	45.5%	53.6%	45.3%	55.1%	51.7%
EMS	26.7%	27.1%	28.3%	28.4%	31.4%	28.3%
% 30-day survival						
Community AED	50.8%	40.0%	46.4%	38.7%	48.7%	44.9%
EMS	15.8%	18.9%	15.5%	17.6%	18.8%	17.4%

Criteria: Excludes EMS-witnessed arrests and cases where resuscitation was not attempted.

Community Response by Location

Patients who had an OHCA in a public place were significantly more likely to receive bystander CPR and community AED application. Survival was also higher amongst OHCA in public places.

Table 13: Community response and outcomes based on location of arrest

Location type	% Bystander witnessed	% Bystander CPR	% Community AED applied	% ROSC to ED	% Survived to 30 days
For all non-EMS witnessed arrests					
Private residence	46.7%	79.2%	3.1%	16.3%	6.5%
Public place	63.4%	87.0%	42.7%	29.0%	19.8%
Other	46.2%	90.3%	41.9%	20.4%	10.8%
Total	50.6%	81.9%	15.6%	19.6%	10.0%
For bystander-witnessed arrests only					
Private residence		78.6%	1.9%	22.8%	10.9%
Public place		89.8%	50.6%	38.6%	28.9%
Other		88.4%	51.2%	32.6%	20.9%
Total		82.6%	19.9%	28.2%	16.9%

Community First Responder Program

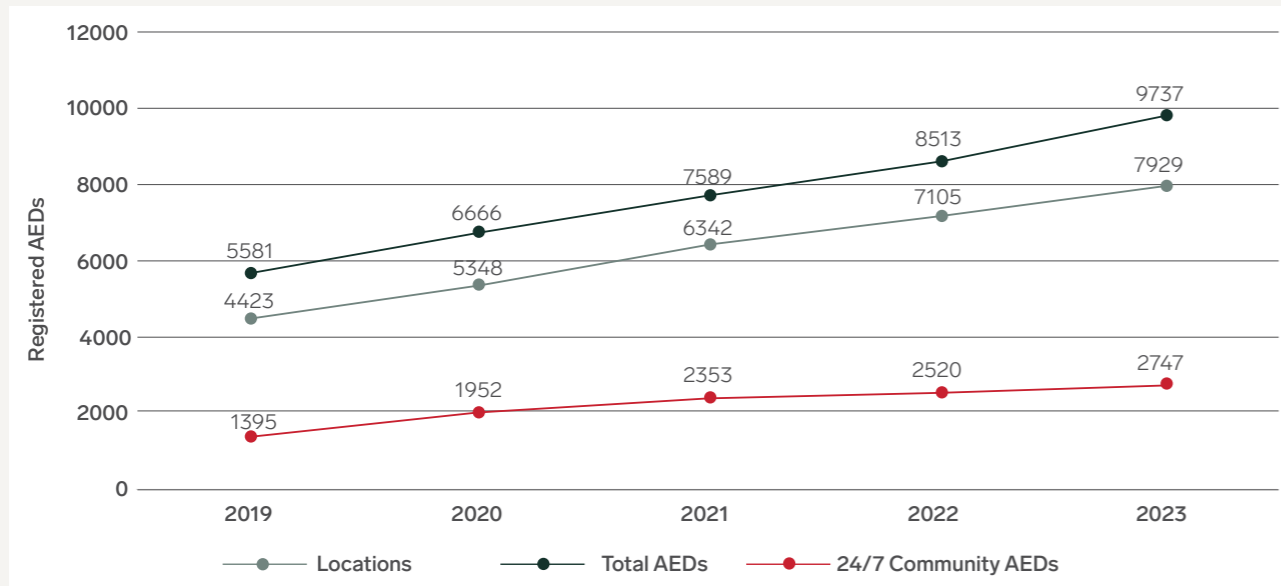
SJWA's Community First Responder (CFR) program, consisting of the State Defibrillator Network and First Responder App, enables members of the community to be spontaneous first responders and help in the vital first minutes in a sudden cardiac arrest. See Page 7 for a description of this program.

As of 31 December 2023, the State Defibrillator Network had 7929 locations across WA where a total of 9737 AEDs are registered, making it one of the biggest networks per capita of AEDs registered with an ambulance service in the country. Of these, 2747 AEDs are available 24/7 to the community.

Table 14: Growth of the State Defibrillator Network

	2019	2020	2021	2022	2023	Δ 5yr
Locations	4423	5348	6342	7105	7929	79.2%
Total AEDs	5581	6666	7589	8513	9737	74.4%
24/7 Community AEDs	1395	1952	2353	2520	2747	96.9%

Figure 6: Growth of the State Defibrillator Network



During 2023, there were 92 State Defibrillator Network activations to a patient in cardiac arrest. Of those 92 activations, an AED shock was delivered in 49 cases. In relation to the total of 78 OHCA cases to receive a community AED shock, 62% of those cases received their shock from a defibrillator network activation.

Out of 1123 non-EMS witnessed OHCA cases that had a resuscitation attempt, 27.2% of patients survived to 30 days where there was a defibrillator network activation, compared to 8.4% of patients where there was no activation.

Table 15: State Defibrillator Network activations

	2022	2023
Total Defibrillator Network activations	79	92
(% of all OHCA)	7.6%	8.4%
Activations where AED shock delivered	39	49
Outcomes associated with Defibrillator Network activation		
% 30-day survival where activated	22.8%	27.2%
% 30-day survival where not activated	7.9%	8.4%

Criteria: Excludes EMS-witnessed arrests, and cases where resuscitation was not attempted.

Registered community first responders on St John's First Responder app grew to 48,562 by 31 December 2023, a 12.8% increase from 43,065 12 months prior.



SJWA response times

In cases where resuscitation was attempted, the median response time in 2023 in metropolitan Perth was 9.2 minutes, compared to 9.6 minutes in 2022. In regional and remote WA, the median response time in 2023 was 12.2 minutes, compared to 15.0 minutes in 2022.

Table 16: Metropolitan response times (in minutes)

	2019	2020	2021	2022	2023
Median	8.9	9.1	9.4	9.6	9.2
10th centile	5.4	5.3	5.6	5.6	5.1
25th centile	6.8	6.9	7.2	7.4	6.8
75th centile	11.6	11.4	12.2	12.4	11.8
90th centile	14.2	14.3	16.0	16.7	15.3

Criteria: Excludes EMS-witnessed arrests and cases where resuscitation was not attempted.

Table 17: Regional and remote response times (in minutes)

	2019	2020	2021	2022	2023
Median	13.1	13.1	12.4	15.0	12.2
10th centile	5.7	6.3	6.3	6.8	6.3
25th centile	9.1	7.8	8.2	9.3	8.1
75th centile	21.7	19.0	18.1	23.2	20.1
90th centile	31.8	27.8	29.2	33.2	29.7

Criteria: Excludes EMS-witnessed arrests and cases where resuscitation was not attempted.

Outcomes

The total number of patients who survived their OHCA at 30 days in 2023 was 142 (139 adults and 3 children). This represents 11.3% of the 1271 OHCA patients who had resuscitation attempted. Arriving at ED with a pulse (ROSC at ED) is a prognostically favourable indicator and arguably a barometer of pre-hospital performance. As highlighted in Table 18, of the 1271 resuscitation attempted cases, 277 patients had ROSC at ED (21.8%).

Excluding EMS-witnessed cases, survival among resuscitation-attempted cases in 2023 was 19.6% for ROSC at ED, and 10.0% for 30-day survival.

Table 18: Percentage survival (of resuscitation attempted cases)

	2019	2020	2021	2022	2023
% ROSC at ED	21.1	20.8	20.6	19.7	21.8
% 30 Day Survival	12.3	11.6	10.5	10.8	11.2

Adult outcomes according to initial presenting rhythm

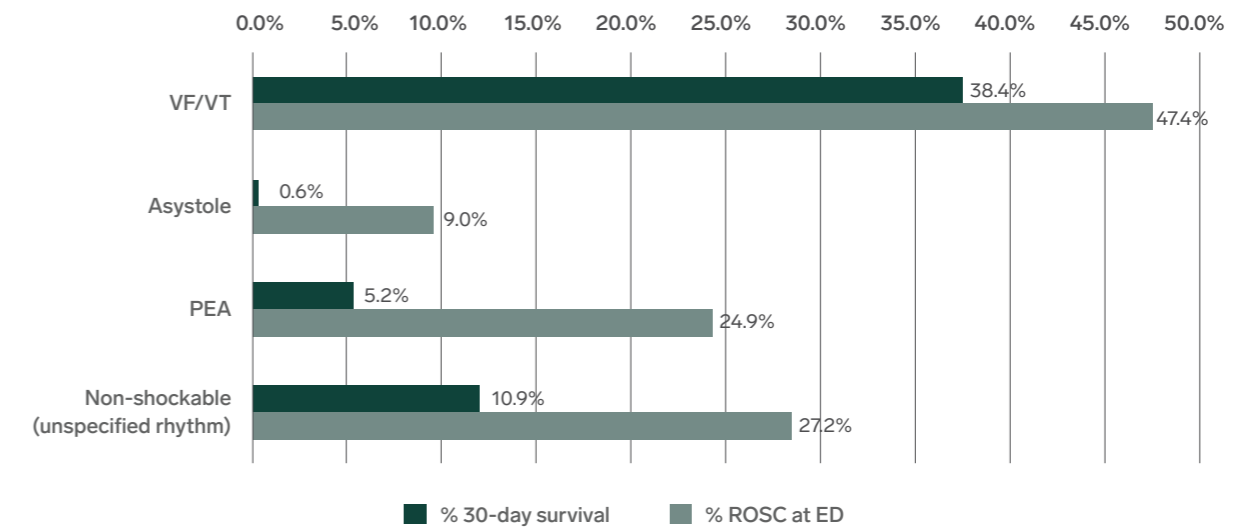
Those OHCA patients who presented in shockable rhythms were most likely to have a favourable outcome and comprised the majority of cases with ROSC at ED recorded in 2023. Of the adult patients who survived to 30-days, 79.9% were initially in a shockable rhythm (VF/VT) (n=111).

Asystole as a presenting rhythm is associated with poorer outcomes. A total of 60 patients in this cohort were recorded as ROSC at ED, with four survivors to 30 days. Other non-shockable rhythms had higher 30-day survival than asystole, however much lower than survival for shockable (VF/VT) patients. See Table 19 and Figure 6.

Table 19: Number of survivors by initial arrest rhythm, for adults

	Total number of patients	ROSC at ED	30-day survivors
VF/VT	289	137	111
Asystole	666	60	4
PEA	173	43	9
Non-shockable (unspecified rhythm)	92	25	10
Unknown	10	7	5
TOTAL	1230	272	139

Figure 7: Survival by initial arrest rhythm for adults



Utstein comparator group

The Utstein comparator group is defined as all-cause cardiac arrest in the community where the patient is witnessed to collapse by bystanders, presents with an initial shockable rhythm, and receives an EMS resuscitation attempt. It reflects a cohort who are regarded as most likely to have prognostically favourable survival outcomes. Importantly, the Utstein comparator group in having a defined set of patient characteristics facilitates more meaningful benchmarking against other systems. The Utstein comparator group is defined in the international Utstein reporting standard for OHCA as a measure of system efficacy.⁽²⁰⁾

Table 20: Utstein comparator group survival by year

	2019	2020	2021	2022	2023
% ROSC at ED	44.3%	44.3%	47.7%	43.0%	47.7%
% 30 Day Survival	34.5%	35.7%	33.5%	33.0%	39.6%

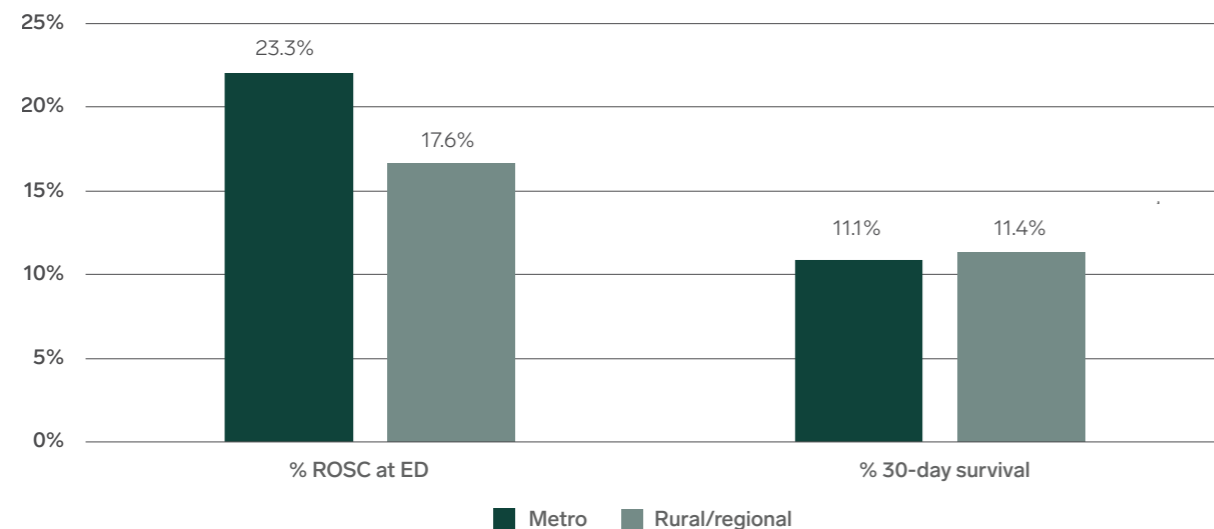
Resuscitation was commenced in 1271 patients, 568 (44.7%) of whom were witnessed (or heard) to collapse by a bystander. A shockable rhythm (VF/VT) was recorded in 197 (34.7%) of those cases. A large proportion of those cases received bystander CPR (97.4%). As shown in Figure 1, of the 197 patients who had a bystander witnessed arrest with an initial shockable rhythm, 94 (47.7%) were recorded as ROSC at ED and 78 survived to 30 days (39.6%).

While the Utstein comparator group represented only 15.5% (197/1271) of patients with an EMS resuscitation attempt, they comprised 54.9% of all 30-day survivors (78/142).

Outcomes according to rurality

As of mid-2023, the Australian Bureau of Statistics recorded approximately 2.88 million people living in WA, with 80.2% (2.31 million) in metropolitan Perth, and approximately 572,000 in regional WA. The majority of OHCA cases with attempted resuscitation occur in metropolitan Perth (930/1271 = 73.2%).

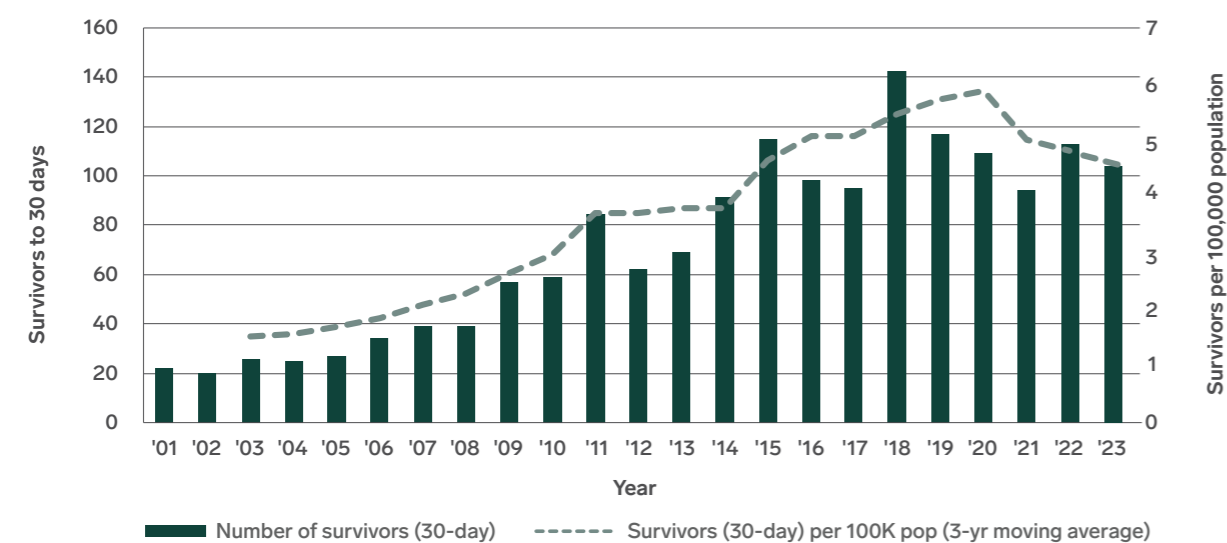
Figure 8: Comparative outcomes – metropolitan Perth vs regional WA



Survival per 100,000 population

From 2021 to 2023 in the Perth metropolitan area, there was an average of 4.61 OHCA survivors (30-day survival) per 100,000 population per year. This metric of the number of survivors per 100,000 population provides a useful measure for comparison with other EMSs, due to its independence from any differences between EMSs (or over time) in the propensity for attempting versus withholding resuscitation.

Figure 9: Number of survivors, and Survival per 100K population (metro Perth)



Outcomes at scene

Table 21: Outcomes at scene

	Cases	%
Transported from scene with ROSC	293	23.0%
Transported from scene without ROSC	287	22.6%
Resuscitation efforts ceased at scene	691	54.4%
TOTAL	1271	-

Criteria: Excludes cases where resuscitation was not attempted.

Among patients in 2023 with an EMS resuscitation attempt, 22.6% were transported from the scene without ROSC (i.e. CPR was in progress during scene departure), down from 40% in 2019. There are two factors that likely contributed to this change. Firstly, additional criteria for termination-of-resuscitation, introduced in July 2019 likely meant an increase in the number of patients declared deceased on scene, and a corresponding decrease in the number being transported from the scene without ROSC. In addition, since the introduction of high-performance CPR in late 2018, SJWA has continually encouraged clinicians to pursue (among patients not meeting termination-of-resuscitation criteria) more prolonged resuscitation efforts on scene to maintain quality of care and increase the chances of earlier ROSC. As a result of these initiatives, we expect that some patients who would have previously been transported from the scene without ROSC are likely to achieve and be transported with ROSC, due to sustained resuscitation efforts on scene.

Outcome by destination hospital

All of WA's large tertiary teaching hospitals are located in Perth. Given that a large proportion of OHCA cases have a presumed cardiac cause (see Tables 4 and 5), when patients are transported to a hospital that has an on-site 24-hour primary percutaneous coronary intervention (PCI) service, the odds of 30-day survival are much increased. In 2023, a total of 136 OHCA patients in Perth who had ROSC at the time of scene departure were transported directly to a PCI capable hospital, of which 54.4% survived to 30 days. This contrasts with 25.0% 30-day survival in the 36 OHCA patients in Perth who had ROSC at the time of scene departure and were transported to a non-PCI capable hospital.

Table 22: 30-day survival according to whether the patient had direct transport to a PCI hospital

	2019	2020	2021	2022	2023	Total
% Survival if PCI	64.5%	63.2%	50.0%	59.1%	54.4%	58.1%
% Survival if not PCI	35.6%	39.5%	36.4%	39.2%	25.0%	35.5%

Criteria: Includes adult OHCA cases of presumed cardiac aetiology in metropolitan Perth, where EMS resuscitation was attempted, and the patient had ROSC at the time of being transported from the scene to hospital.

The Registry

In 1996, the SJWA out-of-hospital cardiac arrest database was established. It is maintained by the PRECRU team, at Curtin University in Perth, WA, and includes all ambulance-attended OHCA cases in Western Australia.

The data is compiled from:

1. Computer aided dispatch data;
2. Pre-hospital clinical care and management data through ambulance patient records (electronic records became available from around mid-2011); and
3. Date of death, as well as hospital outcome data.

In 2014, a more comprehensive ability to capture state-wide data commenced, with research nurses manually reviewing hospital medical records to determine survival to hospital discharge. In addition, survival to 30 days is confirmed by checking the WA State Registry of Births, Deaths and Marriages.⁽²¹⁾

The database contains more than 49,000 OHCA records (as of 31 December 2023). De-identified data is shared with the Australasian Resuscitation Outcomes Consortium (AusROC) OHCA Epistry (Epidemiological Registry), which enables unique insights to be gained regarding OHCA patients across Australia and New Zealand.

All data is subject to ongoing quality improvement; with changes being incorporated and updated, including historical data, as needed.

Definition of OHCA

The database defines an OHCA patient as someone with no signs of circulation – specifically the absence of a carotid pulse, in combination with unconsciousness, and agonal or absent breathing; with the event occurring outside of hospital.

Eligibility

Table 23: SJWA OHCA database inclusion criteria

SJWA OHCA database inclusion criteria (all of the following):	
1	All patients, of any age who suffer a cardiac arrest in an out-of-hospital setting. This includes residential aged care facilities.
2	Occurred in the state of Western Australia and were attended by SJWA.
3	<p>a. All unconscious patients who are pulseless and not breathing (or have “agonal”, gasping breaths) on arrival of SJWA; OR</p> <p>b. All patients who become unconscious, pulseless and stop breathing (or have initial “agonal”, gasping breaths) in the presence of SJWA (i.e., EMS-witnessed arrests); OR</p> <p>c. Patients who have a pulse on arrival of SJWA having been successfully defibrillated by a bystander prior to the arrival of SJWA.</p>

Table 24: SJWA OHCA database exclusion criteria

SJWA OHCA database exclusion criteria (any of the following):	
1	Any patient who suffers a cardiac arrest in a hospital facility where SJWA may be in attendance but are not the primary care providers.
2	Any patient who suffers a cardiac arrest during an inter-hospital transfer where SJWA may be providing transport but are not the primary care providers.
3	Any patient where the bystander or lay person suspected a cardiac arrest, but the patient is not in cardiac arrest on arrival of SJWA, and no defibrillation has occurred.
4	Patients with brief episodes of pulselessness who DO NOT receive CPR or defibrillation from SJWA.

Data capture

The data fields in the SJWA OHCA database are based on the internationally agreed definitions that are outlined in the Utstein template from the International Liaison Committee on Resuscitation (ILCOR).⁽²⁰⁾

Several data sources are used to capture OHCA cases in WA:

1. Computer aided dispatch (CAD) system database

CAD is an organisational database with comprehensive geographical and operational information collected by the SJWA State Operations Centre. Specifically, the database includes date and incident location. The system timestamps key points such as the receipt time of the Triple Zero (000) emergency call, the dispatch time of the first ambulance, as well as the time of arrival at scene of the first ambulance. This data enables response time data to be accurately calculated.

2. Electronic patient care record (ePCR)

The ePCR records multiple data fields, including patient demographics, clinical assessment and management. Importantly, this includes identification of the cardiac arrest heart rhythms, defibrillation delivery (including bystander use of AED), as well as the administration of any cardiac arrest medicines. The ePCR was introduced in SJWA in 2011, with paper-based records used previously.

A sensitive but not specific electronic search strategy is conducted to identify potential cases from the CAD database to ensure the capture of all OHCA cases in WA attended by SJWA. A research nurse carefully scrutinises the results manually, and only those cases meeting the criteria for OHCA (Tables 23 and 24) are included in the SJWA OHCA database.

Presenting arrest rhythms and probable causes of OHCA are determined by manual review of the ePCR records.

Survival outcomes of ‘return of spontaneous circulation’ (ROSC) and ‘ROSC on arrival at hospital’ (i.e. event survival) are also obtained from the ePCR records.

3. Survival follow up

The 2020 OHCA report onwards reports the 30-day survival as the primary survival outcome, whereas previous reports outlined survival to hospital discharge. These two measures are almost 100 per cent equivalent in WA, with less than one in every 200 cases being discordant between the two measures among initial survivors to hospital.⁽¹⁸⁾

Ethics approval

SJWA has given approval for the SJWA OHCA database to be managed at PRECRU (Curtin University) – under strict data access and security protocols. The Human Research Ethics Committee (HREC) at Curtin University has given approval for the SJWA OHCA database to be used for specific research purposes.

PRECRU has standing ethics approval, granted by individual hospital HRECs, to access relevant hospital medical records for the purposes of determining OHCA patient outcomes. The Registrar of Births, Deaths and Marriages in WA has approved PRECRU researchers to access the WA Death Registry for HREC-approved studies.

All data relating to the SJWA OHCA database is securely stored by PRECRU at Curtin University as per the PRECRU Data Access and Security Policy.

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Aja Styles
External Affairs Specialist

Caitlyn Pavey-Smith
Community First Responder Lead

Prof Ian Jacobs (late)

PRECRU:

Prof Judith Finn
Director PRECRU

Dr Stephen Ball
Deputy Director PRECRU

Sheryl Gallant
Research Officer

Lyndall Finn
Senior Research Officer

Tanya Birnie
Research Officer

Dr David Majewski
Research Fellow

Research

SJWA and PRECRU are committed to research to understand and improve outcomes from OHCA. Along with our own internationally recognised research, we contribute data to the AusROC registry to enable wider epidemiological research.

The below OHCA-related research outputs by SJWA and/or PRECRU or using SJWA OHCA data were published during 2023:

Howell S, Smith K, Finn J, Cameron P, Ball S, Bosley E, Doan T, Dicker B, Faddy S, Nehme Z, Swain A, Thorrowgood M, Thomas A, Perillo S, McDermott M, Smith T, Bray J. The development of a risk-adjustment strategy to benchmark emergency medical service (EMS) performance in relation to out-of-hospital cardiac arrest in Australia and New Zealand. *Resuscitation*. 2023;188:109847.

Perera N, Birnie T, Whiteside A, Ball S, Finn J. "If you miss that first step in the chain of survival, there is no second step"-Emergency ambulance call-takers' experiences in managing out-of-hospital cardiac arrest calls. *PLoS One*. 2023;18(3):e0279521.

Smith A, Masters S, Ball S, Finn J. The incidence and outcomes of out-of-hospital cardiac arrest in metropolitan versus rural locations: A systematic review and meta-analysis. *Resuscitation*. 2023;185:109655.

Talikowska M, Ball S, Majewski D, Belcher J, Brits R, Gallant S, Finn L, Finn J. Out-of-hospital cardiac arrest in residential aged care facilities is independently associated with lower survival in Perth, Australia. *Resuscitation Plus*. 2023;16:100495.

Talikowska M, Ball S, Whiteside A, Belcher J, Finn J. Use of dispatch codes for obvious/expected deaths: Maintaining patient safety while reducing the number of lights-and-sirens responses. *Resuscitation*. 2023;185:109751.

Abbreviations

AED	Automated External Defibrillator	MPDS	Medical Priority Dispatch System
AHD	Advance Health Directive	NFR	Not for Resuscitation
ANZCOR	Australian and New Zealand Committee on Resuscitation	OHCA	Out of Hospital Cardiac Arrest
AusROC	Australasian Resuscitation Outcomes Consortium	PEA	Pulseless Electrical Activity
CAD	Computer Aided Dispatch	PCI	Percutaneous Coronary Intervention
CARES	Cardiac Arrest Registry to Enhance Survival	PRECRU	Pre-hospital, Resuscitation and Emergency Care Research Unit
CFR	Community First Responder	ROSC	Return of Spontaneous Circulation
CPR	Cardio-Pulmonary Resuscitation	SJWA	St John Western Australia
ED	Emergency Department	SOC	State Operations Centre
EMD	Emergency Medical Dispatcher	SUDI	Sudden Unexpected Death in Infancy
EMS	Emergency Medical Service	VF	Ventricular Fibrillation
ePCR	Electronic Patient Care Record	VT	Ventricular Tachycardia
HREC	Human Research Ethics Committee	WA	Western Australia
ILCOR	International Liaison Committee on Resuscitation		

Definitions

30-day Survival

Where a patient is recorded as being alive 30 days after their out-of-hospital cardiac arrest.

Adults

Patients aged 16 years or greater, or where the age is missing/unknown (in the absence of the patient being described as a child).

Aetiology

The precipitating cause of a cardiac arrest (e.g. trauma, overdose/poisoning, asphyxia, presumed cardiac)

All-cause

Referring to OHCA cases of all aetiologies.

Asystole

Absence of any cardiac electrical activity.

Bystander witnessed

An out-of-hospital cardiac arrest that is witnessed by a bystander (seen or heard).

Community AED

Any AED that is, or has the ability to be, used to defibrillate a patient outside of a hospital setting prior to ambulance arrival.

Defibrillation

Providing an electrical shock to a patient in a shockable heart rhythm.

EMS attempted resuscitation

Cases where trained ambulance clinicians attempted to revive a patient in cardiac arrest using CPR and/or defibrillation, as well as any patients who received a defibrillator shock from bystanders.

EMS attended

Cardiac arrest events attended by trained ambulance personnel regardless of whether treatment was provided.

EMS response time

The time from the start of the emergency call to arrival of an ambulance crew on scene.

EMS witnessed

An out-of-hospital cardiac arrest that occurs in the presence of on-duty Emergency Medical Service personnel (paramedics and/or volunteer ambulance officers)

Event survival

Patients who have ROSC (a palpable pulse) on arrival at hospital as documented on the ePCR.

Metropolitan/Metro

Denotes the Perth metropolitan area (based on the Australian Bureau of Statistics classification for Greater Capital City Statistical Areas, 2016).

Non-shockable rhythm

Cardiac electrical rhythms which are not appropriate to receive a defibrillation shock. These rhythms include asystole and PEA.

Out of Hospital Cardiac Arrest

Where the patient has no signs of circulation. Specifically, when there is an absence of a detectable carotid pulse, the patient is unconscious/unresponsive, and has agonal/ absent breathing; with the event occurring outside of hospital.

Paediatrics/Children

Patients aged less than 16 years.

Paramedic

A healthcare professional registered with the Paramedicine Board of Australia as per the Health Practitioner National Law Act (WA) 2010. In the Western Australian ambulance service context, career ambulance crews consist of registered paramedics who provide cardiac arrest care consistent with the ANZCOR Advanced Life Support algorithm.

Presumed cardiac

Cases where the cause of arrest is not due to a known precipitator (e.g., trauma, overdose/poisoning, asphyxial), as determined from the ePCR.

Priority 1

High priority emergency ambulance response, with immediate vehicle dispatch responding with lights-and-sirens to the scene.

Pulseless Electrical Activity

The absence of a palpable pulse, with organised electrical activity on an electrocardiogram (other than ventricular tachycardia).

Regional/Rural WA

Denotes areas outside the Perth metropolitan area.

Resuscitation attempted

See *EMS attempted resuscitation*.

State Defibrillator Network activation

An event where an AED registered on the State Defibrillator Network is applied to a patient prior to ambulance arrival.

Return of Spontaneous Circulation (ROSC)

Return of circulation to the body with a detectable pulse.

State Operations Centre (SOC)

St John WA call centre for emergency ambulance Triple Zero (000) and non-urgent calls.

Shockable Rhythm

Cardiac electrical rhythms which are appropriate to receive defibrillation by St John WA ambulance clinicians, or from a bystander with a public AED. These rhythms include ventricular fibrillation and pulseless ventricular tachycardia.

Survival

May refer to Event Survival (ROSC on arrival at hospital) or 30-day Survival.

Triple Zero (000)

The Australian emergency telephone number used by the public to activate EMS (or other emergency services). In Western Australia, Triple Zero (000) callers who request ambulance are connected to SJWA SOC.

Utstein comparator group

Patients who are witnessed to arrest by a bystander, present in a shockable rhythm, and receive EMS attempted resuscitation. This includes any patient who receives a bystander AED shock, as these patients are known to have a shockable initial rhythm.

Volunteer Ambulance Officer

Unpaid ambulance officer with relevant training and skill, volunteering ambulance services to their community. Volunteers provide cardiac arrest resuscitation consistent with the ANZCOR Basic Life Support standard.

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