

ANNUAL REPORT

2024 / 25

**Victorian Ambulance
Cardiac Arrest Registry**



**Ambulance
Victoria®**



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With thanks

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Victorian hospitals for provision of survival outcomes.

The Victorian Ambulance Cardiac Arrest Registry Annual Report 2024/25 is a publication produced by the Centre for Research and Evaluation, Ambulance Victoria.

If you would like to receive this publication in an accessible format, please contact the VACAR team at: VACAR2@ambulance.vic.gov.au

Acknowledgement of country

Ambulance Victoria acknowledges the Traditional Owners of the lands in Victoria. We pay our respects to Aboriginal and Torres Strait Islander cultures and to Elders past and present and recognise Aboriginal self-determination is a human right.

At Ambulance Victoria, we recognise the diverse and unique cultures and histories of Aboriginal and Torres Strait Islander peoples and value the knowledge of countless generations of Custodians. We commit to working together to build a fair and just future. We will come together with Aboriginal and Torres Strait Islander communities to identify, understand, and develop opportunities to create and sustain a culturally aware organisation.

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A message from the Leadership Team



A/Prof Ziad Nehme ASM

Director, Centre for Research & Evaluation
Chair, Victorian Ambulance Cardiac Arrest Registry

Out-of-hospital cardiac arrest (OHCA) remains one of the most critical public health emergencies in developed nations. In Australia alone, more than 30,000 people experience an OHCA each year, yet only around one in 10 survives to hospital discharge. Survival improves markedly when cardiopulmonary resuscitation (CPR) and defibrillation are delivered rapidly within a coordinated system of care – an approach internationally recognised as the **Chain of Survival**.



Dr Tegwyn McManamny

Executive Director, Quality and Clinical Innovation

Since 1999, the Victorian Ambulance Cardiac Arrest Registry (VACAR) has tracked, evaluated and strengthened every link in this chain. Over more than two decades, this work has driven substantial and sustained improvements in OHCA care through advances in resuscitation practice, call-taking and dispatch, community participation, and digital innovation, including the introduction of the GoodSAM smartphone CPR crowd-sourcing application.

In parallel, Ambulance Victoria (AV) has built a globally recognised research and clinical trials capability that has directly informed international resuscitation evidence and practice.

Today, VACAR is among the most comprehensive cardiac arrest registries worldwide. It uniquely integrates 12-month quality-of-life outcomes for survivors and coronial and autopsy data from the National Coronial Information System for non-survivors, enabling an unparalleled understanding of patient outcomes across the full care continuum.

It is also one of few cardiac arrest registries in the world that provide data-driven insights and feedback to paramedics who attend a resuscitation. This data-driven debriefing model has resulted in exceptional improvements in resuscitation care and quality in Australia over the past five years.

The Heart Safe
Community program
engaged **3,902 Victorians**
across **12 communities**

Despite the ongoing challenges following the COVID-19 pandemic, AV recorded its highest ever internationally comparable (Utstein) survival outcomes in 2024/25, surpassing its previous year's record of 41 per cent. Survival reached 44 per cent for bystander-witnessed, initially shockable OHCA – one of the highest rates reported globally and the highest annual result in AV's history. These outcomes are the result of deliberate, evidence-driven action, guided by our Cardiac Arrest Improvement Strategy 2023–2028.

Over the past year, we have accelerated targeted improvements in system oversight, resuscitation practice and quality assurance. A major milestone was the introduction of the Fire Medical Response (FMR) program in December 2024, which for the first time in more than two decades addressed a critical gap in the regional cardiac arrest response.

Through this program, 50 fire-fighter brigades have been equipped with basic life support training and resources, enabling them to respond alongside AV to cardiac arrests in regional communities. Adapted from the world-leading Emergency Medical Response model operating across urban Melbourne, the FMR program has already contributed to life-saving resuscitation care for more than 50 patients.

We also transformed access to performance intelligence through the rollout of interactive, organisation-wide resuscitation dashboards. These dashboards provide AV leaders with real-time visibility of resuscitation quality metrics drawn directly from the VACAR.

They enable live benchmarking across regions and rapid identification of individual cases where CPR performance falls short of organisational standards, supporting focused debriefing and continuous improvement.

By making high-quality data accessible and actionable, these reforms strengthen transparency, accountability and a unified organisational focus on improving OHCA outcomes – outcomes reflected

in the consistently strong results presented in this year's Resuscitation Quality Snapshot.

Community action remains fundamental to improving survival. In the past year, the Heart Safe Community program engaged 3,902 Victorians across 12 communities and supported the installation of 35 new publicly registered automated external defibrillators (AEDs).

At the same time, more than 29,000 people participated in Call, Push, Shock education sessions, bringing us significantly closer to our ambition of training over 100,000 Victorians by 2028. These incremental improvements have helped to drive rates of community treatment for cardiac arrest.

In 2024/25, almost a quarter of all initially shockable cardiac arrests were shocked by bystanders using a public AED – our highest ever result.

Our research and innovation agenda also reached a new level of scale and impact. The First Responder Shock Trial (FIRST) successfully completed recruitment of more than 750 cardiac arrest patients. This cluster randomised controlled trial is evaluating the benefit of equipping smartphone-activated GoodSAM responders with ultraportable defibrillators.

In parallel, our Paramedic Randomised Trial of Noradrenaline versus Adrenaline in the Initial Management of Patients with Cardiogenic Shock (PANDA) enrolled over 350 patients to compare the effects of adrenaline and noradrenaline in the setting of cardiogenic shock. Together, these landmark trials will strengthen the scientific foundations of the Chain of Survival and open new pathways to further improve patient outcomes.

It is against this backdrop of sustained system improvement, innovation and collaboration that we present the 2024/25 VACAR Annual Report, highlighting the outstanding contributions of the community, paramedics and clinicians who continue to transform cardiac arrest care in Victoria.

Executive summary

2024/25 key highlights

Ambulance Victoria is committed to the care of cardiac arrest patients

7,550

Out-of-hospital cardiac arrest patients across Victoria



0.1% increase from the previous year
68% were male

77% of cardiac arrests occurred at home



More than ever before, the community is stepping in to help in cardiac arrest emergencies

80%

of EMS-treated witnessed cases received bystander CPR



152 cases

had a shock delivered from a public AED, the highest number on record

63% survived when first shocked by public AED

35% survived when first shocked by EMS



17%

survived when they received bystander CPR

7% survived with no bystander CPR

94%

of calls were correctly directed by bystanders to Triple Zero Victoria (000) ambulance



93%

of cardiac arrests were identified in the Triple Zero Victoria (000) call

The majority of cardiac arrest patients were attended within 10 minutes

Median response time **8.0 minutes**

Half of all patients were defibrillated within **9.9 minutes**



Cardiac arrest patients are returning home to their families

83%

of survivors were discharged from hospital directly home to their families



477 patients were discharged alive

44% of patients discharged alive (Utstein cohort)

88% of patients who survived to 1 year reported favourable neurological recovery



Victorian Ambulance Cardiac Arrest Registry

The VACAR was established in 1999 and incorporates prehospital clinical and operational data, communications centre dispatch records, and hospital follow-up data for all OHCA events in Victoria where AV was in attendance. The data is collated in the registry based on the internationally recognised Utstein template and definitions (Grasner 2024).

Hospital outcome data is supplemented by death records from the Victorian Registry of Births, Deaths and Marriages. Commencing January 2011, 12-month follow-up interviews have also been conducted with adult survivors. The VACAR maintains ethical approval from the Monash University Human Research Ethics Committee.

The VACAR is used to monitor key clinical indicators which measure the quality of ambulance care and allow for performance benchmarking. These clinical indicators include ambulance response times, event survival and survival to hospital discharge.

The registry is also used to measure the impact of ambulance programs such as the fire-fighter Emergency Medical Response Program, 'Call, Push, Shock' community CPR education program, Heart Safe Communities (in partnership with Heart Foundation) and public AED use.

In addition, VACAR has successfully established an internationally recognised research program, with the publication of scientific literature in

key medical journals. The results of the research program are used to provide an evidence base for AV treatment of cardiac arrest patients.

The VACAR proudly contributes data to the Australian Resuscitation Outcomes Consortium (Aus-ROC) Epistry (www.ausroc.org.au), an epistry which was established with the aim of understanding regional, ambulance service and treatment factors associated with improved OHCA outcomes in Australia and New Zealand.

In 2019, the VACAR also began contributing to the End Unexplained Cardiac Death (EndUCD) Registry which aims to collect data on all sudden cardiac arrests in patients aged one to 50 years.

Eligibility

The VACAR captures data on all OHCA patients where Emergency Medical Services (EMS) are in attendance. For the purposes of this report, EMS is defined as AV and participating first responder organisations, including Fire Rescue Victoria (FRV) (in selected areas) and GoodSAM responders.

The VACAR defines the state of cardiac arrest as the cessation of cardiac mechanical activity as confirmed by the absence of signs of circulation, including the absence of a detectable carotid pulse, unresponsiveness and apnoea or agonal breathing. Patients eligible for inclusion in the VACAR are described at right.

VACAR inclusion and exclusion criteria

Inclusion criteria (all of the following)

1. Patients of all ages who suffer a documented cardiac arrest.
2. Occurs in the state of Victoria where AV is the primary care giver. Cardiac arrests occurring in the neighbouring states of New South Wales and South Australia are considered for inclusion where AV is clearly documented as the primary care giver.
3. Patients who are pulseless on arrival of EMS;
OR
Patients who become pulseless in the presence of EMS (EMS-witnessed arrests);
OR
Patients who have a pulse on arrival of EMS, where a successful attempt at defibrillation was undertaken by a bystander prior to arrival of EMS.

Exclusion criteria (any of the following)

1. Patients who suffer a cardiac arrest in a hospital facility, where AV may be in attendance but are not the primary care giver.
2. Brief episodes of pulselessness which do not receive CPR or defibrillation by EMS.
3. Bystander-suspected cardiac arrest where the patient is not in cardiac arrest on arrival of EMS, no defibrillation was provided prior to arrival, and no other evidence verifying a cardiac arrest state is present.



How we respond to cardiac arrest in Victoria



The state of Victoria has an estimated population of 7 million spread over almost 227,000km². Over 5.5 million people live in the state's capital city of Melbourne. AV is the state-wide EMS provider and comprises ambulance paramedics who have advanced life support skills (e.g. laryngeal mask airway, intravenous epinephrine) and Mobile Intensive Care Ambulance (MICA) paramedics who are authorised to perform endotracheal intubation, rapid sequence induction, needle thoracostomy and administer a wider range of medications.

Paramedics in Victoria have the base qualification of a three-year bachelor's degree in Paramedicine. MICA paramedics are experienced paramedics who undergo a university-level post-graduate diploma in Intensive Care Paramedic Practice. Since December 2018, all paramedics are required to be registered with the Paramedicine Board of Australia via the Australian Health Practitioner Regulation Agency in order to practice.

Australia operates a single national telephone number for community access to emergency services (Triple Zero '000'). Telephone triage is performed using the Medical Priority Dispatch System. Unless circumstances suggest ventilations (as is the case for patients under the age of 18 years old), suspected cardiac arrest events identified in-call receive telephone CPR, recommending chest compressions until professional help can take over.

Advanced Life Support and MICA paramedics are dispatched concurrently to suspected cardiac arrest events in the community. A first responder program for early defibrillation by firefighters operates for patients in greater Melbourne and a number of large regional towns.

In addition, AV co-responds with 101 volunteer community teams in smaller, predominately rural communities across the state.

Approved community volunteer responders, called GoodSAM responders, are also dispatched to suspected cardiac arrest events. GoodSAM (Smartphone Activated Medic) is a free global smartphone application that is used to facilitate a rapid response to cardiac arrests across the globe by connecting nearby persons to patients experiencing a cardiac arrest in those critical minutes before emergency services arrive.

GoodSAM is activated at the same time as ambulance dispatch by Triple Zero (000) and alerts nearby registered users of the app of an event, as well as the location of the nearest AED.

Since the launch of the GoodSAM app on 28 January 2018, more than **18,639** volunteers have registered in the GoodSAM app. More than

Since 2018

18,639

volunteers have registered to the GoodSAM app



10,819 AEDs are currently active and registered to individuals and businesses in AV's AED registry, more than 8,243 of which are public AEDs.

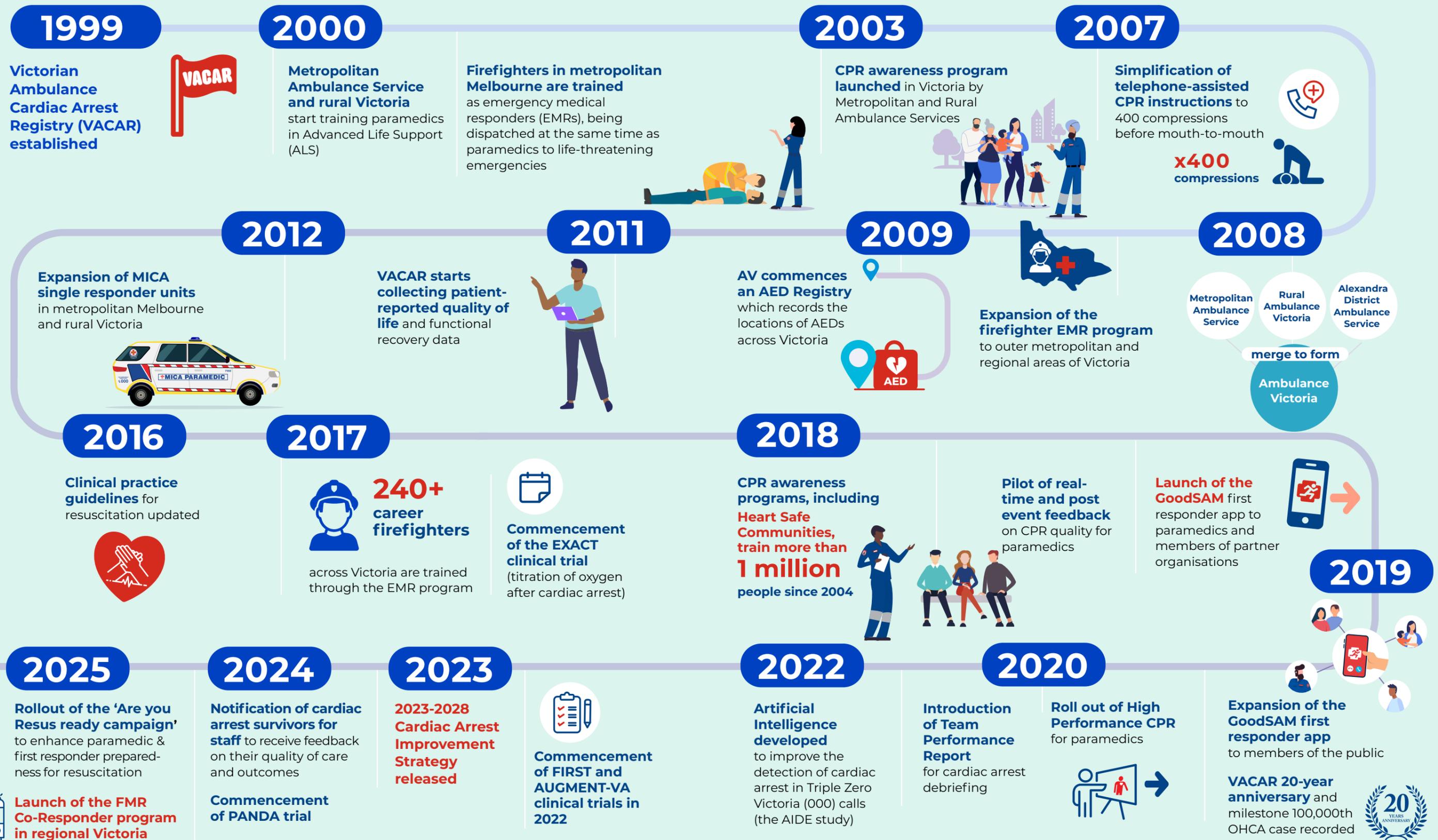
AV cardiac arrest protocols follow the recommendations of the Australian and New Zealand Committee on Resuscitation. Paramedics are not obliged to commence resuscitation when the clinical presentation is inconsistent with life. They may discontinue resuscitation if advanced life support has been performed for 30 to 45 minutes without sustained return of spontaneous circulation (ROSC), unless there are exceptional circumstances as described in clinical practice guidelines.

In 2019, a resuscitation quality improvement initiative was rolled out across the state, training all paramedics and first responders in high-performance CPR. The initiative was supported by team-based resuscitation training, real-time feedback on CPR performance, structured resuscitation choreography and scene leadership, and post-event debriefing. Paramedics in Victoria are also required to complete an annual high-performance CPR competency test.

Ongoing monitoring of resuscitation quality occurs after every resuscitation attempt and paramedics attending a resuscitation are provided with a data-driven post-resuscitation debriefing report.

These debriefing reports, called Team Performance Reports, consist of 20 metrics which align with international treatment recommendations and key actions within the Chain of Survival.

AV's key initiatives to improve cardiac arrest outcomes



Cardiac Arrest Improvement Strategy

In 2018/19, AV reported its highest ever survival rate from OHCA. This improvement was not due to luck, but rather, the implementation of a targeted and comprehensive resuscitation quality improvement bundle. However, the COVID-19 pandemic had a devastating impact on the OHCA system of care across Australia and internationally. As a result, survival outcomes in the years following the COVID-19 pandemic declined significantly.

To improve survival from OHCA, AV developed a Cardiac Arrest Improvement Strategy 2023-2028. Its ambitious goal is to improve survival to hospital discharge by 30 per cent in bystander witnessed, initially shockable OHCA (the Utstein comparator group), or from 34 per cent in 2021/22, to 44 per cent in 2027/28.

The Utstein survival result achieved this year (44 per cent) is a 10-percentage point improvement on what was achieved at the height of the COVID-19 pandemic and has achieved our target three years ahead of schedule.

See the Strategy here



Our target

To improve survival to hospital discharge by

30%



in bystander witnessed initially shockable OHCA



Cardiac Arrest Improvement Strategy highlights



A lifesaving partnership with the Country Fire Authority

The Country Fire Authority (CFA) FMR program is a co-responder healthcare initiative in partnership with AV to improve survival and health outcomes for people experiencing OHCA. Modelled off the world-leading Emergency Medical Response program in metropolitan and peripheral areas of Melbourne, the FMR program has equipped CFA brigades in regional areas of Victoria with basic life support resources, training and equipment.

In the event of a suspected OHCA identified by Triple Zero Victoria (000), FMR trained CFA volunteers from participating brigades are dispatched to the case concurrently with AV.

With more than a thousand strategically located brigades across regional and remote Victoria, CFA is uniquely positioned to significantly reduce the time to life-saving treatment following an OHCA in the community.

Thanks to the investment of the Victorian Government, 39 CFA brigades are now equipped to respond to these emergencies across regional areas of Victoria, with an additional 11 brigades becoming operational soon.

Since the program launched in December 2024, 54 patients with OHCA in regional Victoria have received treatment from an FMR trained brigade. This critical initiative provides regional communities with the best possible opportunity for resuscitation after OHCA.

Driving targeted education and awareness in resuscitation

In line with AV's goal to improve cardiac arrest survival rates by 30 per cent by 2028, we launched a grass-roots awareness campaign across Victoria to enhance paramedic and first responder preparedness for resuscitation.

The 'Are you Resus Ready?' campaign was the result of feedback from paramedics and patient safety reviews that identified the need for better preparedness and training in responding to resuscitation cases.

The campaign was delivered in line with AV's 2025 Continuing Education program which provides additional targeted education and awareness to paramedics in the areas of airway management, sedation safety and clinical deterioration.

Regional performance monitoring of CPR quality

A key objective of the Cardiac Arrest Improvement Strategy is to drive local accountability in CPR performance across Victoria, such that regional clinical governance committees could take action in response to local trends.

In 2025, we delivered new interactive dashboards using PowerBI, providing leadership staff with real-time access to resuscitation quality data directly from the VACAR. These dashboards not only report CPR quality metrics, but they also include patient outcome data and community intervention rates.

The dashboards provide real-time benchmarking of resuscitation quality across Victorian regions.

Providing accessible, real-time data in this way drives transparency and accountability, and a whole of organisation approach in delivering better patient care.



Novel trial of ultraportable AEDs finishes recruitment

In March 2025, The First Responder Shock Trial (FIRST), led by AV and Hato Hone St John New Zealand, reached a major milestone, closing enrolment with over 750 cardiac arrest patients recruited across Victoria and Aotearoa New Zealand.

The FIRST trial was a world first multicentre randomised controlled trial that aimed to test whether equipping GoodSAM responders with ultraportable AEDs reduces the time to first defibrillation and increase survival rates from OHCA.

With enrolment complete, data analysis and patient follow up are underway, and results will be published internationally. We thank all GoodSAM responders whose commitment has been vital in advancing research and improving survival from OHCA.

Our Heart Safe Communities reach new heights

The Heart Safe Community Program is a public health initiative aimed at improving survival from OHCA by empowering bystanders to step in and begin CPR and use an AED while emergency services are on their way.

Heart Safe Communities is a joint initiative between AV and the National Heart Foundation of Australia. In 2024/25, the Heart Safe Community project reached 3,902 Victorians within 12 communities, with 35 new 24/7 public AEDs registered.

As part of AV's Cardiac Arrest Improvement Strategy, AV will establish 40 new Heart Safe Communities in high-risk regions across Victoria.

Call Push Shock sessions were delivered to over **29,000 individuals**



Training the Victorian community in 'Call Push Shock'

The Call Push Shock Program is a community awareness program which aims to raise awareness of the actions required to save a life and address major barriers behind why bystanders fear taking action during OHCA.

The program highlights the desired actions to save a life – Call Triple Zero, Push on the patient's chest hard and fast and Shock the heart using an AED.

In 2024/25, 840 Call Push Shock sessions were delivered to over 29,000 individuals. As part of AV's Cardiac Arrest Improvement Strategy 2023-2028, AV aims to train more than 100,000 Victorians in the Call Push Shock Program by 2028.



Story of survival



For Fortunata, what began as her normal 6:15am pilates class quickly turned into a life-or-death emergency.

Participants in a Mildura pilates class have shown the incredible impact of bystander CPR, helping save the life of a fellow class member who experienced a cardiac arrest.

Fortunata 'Forch' Panetta, 65, was at her usual 6:15am reformer class in August when she suddenly collapsed.

"We were about 15 minutes into the class and it had all been normal, then completely out of the blue, she just fell back," class member Grace Weaving said.

At first, the group thought Forch had fainted but it quickly became apparent that it was a life-threatening emergency.

"Two women in the class immediately began CPR as we realised this was really serious," Grace said.

"I said I would call the ambulance – I'd never had to call Triple Zero (000) before.

"It was surreal. It's not something you expect to happen in that environment and to a woman who was so fit and healthy."

Forch was in cardiac arrest, where the heart stops pumping blood effectively around the body. It can happen to anyone, regardless of age, gender or fitness level, and often without symptoms.

Lisa Nystrom, an off-duty nurse, was in the pilates class and began CPR.

"When I'm at work, I've got monitors and a team behind me but on this occasion, I didn't have any of that and had to just rely on my own instincts and knowledge," she said.

"It absolutely highlighted the importance of knowing what to do in a cardiac arrest because there were no warning signs this was going to happen.

"It was unlucky it happened to Forch, but so lucky it happened where it did because we were there to help her."

The members of the class were in the process of applying the pilates studio's automated external defibrillator (AED) when Ambulance Victoria (AV) crews arrived.

Mobile intensive care ambulance (MICA) paramedic Craig Stack said the efforts of the bystanders made all the difference.

"Their knowing what to do in an emergency and knowing how to do CPR was invaluable to give Forch a chance at survival," he said.

"For every minute that CPR is delayed during a cardiac arrest, survival decreases by 10 per cent.

"The high-quality compressions meant her heart rate remained in a shockable rhythm, so as soon as we arrived, we applied our defibrillator and delivered three shocks, continuing compressions in between."

“For every minute that CPR is delayed during a cardiac arrest, survival decreases by 10 per cent.”

A Fire Rescue Victoria (FRV) crew helped with CPR, responding to the emergency as part of the Emergency Medical Response (EMR) partnership with AV which sees firefighters dispatched to the most critical medical emergencies.

About 10 minutes later, Forch's pulse returned, however she remained in a critical condition. MICA paramedics performed rapid sequence intubation, a highly skilled procedure where a patient is placed into medically induced unconsciousness so paramedics can manage their airway.

Forch was transported to Mildura Base Hospital then transferred to The Alfred. After intensive treatment and nearly three weeks in hospital, Forch was finally able to return home – a milestone her rescuers and family say still feels miraculous.

"It was a huge relief when I found out she survived," Lisa said. "I knew she had been in hospital a while so I was fearing the worst."

FRV acting commander Matthew Duda said Forch's case highlights the importance of early and effective CPR.

"If you don't know CPR, learn it now. It's as easy as Call, Push and Shock – and you never know when you may need to help save a life," he said.

Anyone can help save a life in three simple steps: Call (call Triple Zero 000), Push (perform CPR by pushing hard and fast on the middle of the chest) and Shock (use an AED).

Almost three months later, Forch is recovering and thankful the cardiac arrest occurred at the pilates studio.

"I was in the right place – if it had happened anywhere else, there might not have been anybody to begin CPR and I probably wouldn't have survived," she said.

"It happened without any warning at all. I considered myself reasonably fit, which many of the hospital staff indicated helped my survival and recovery.

"I'm slowly getting back into things, getting better and stronger every day."

Both Forch and her husband Frank said they couldn't be more grateful to the trainer and members of the class and all the first responders.

"I'm incredibly grateful. I thank God that it happened where it did and that all the emergency services were able to respond so quickly," Frank said.

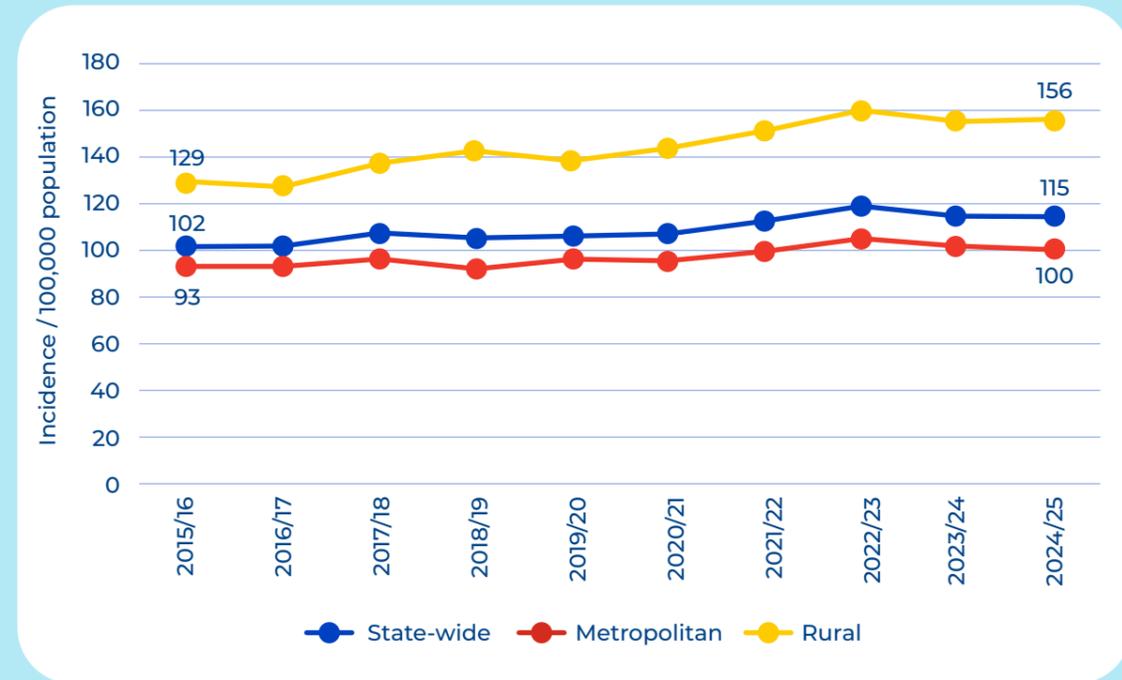
Every day, around 21 Victorians will suffer a cardiac arrest and only one in 10 survive.

Victoria has the best cardiac arrest survival rates in Australia and second best anywhere in the world, thanks to a high level of bystander intervention meaning early access to CPR and defibrillation.



Incidence

OHCA incidence per 100,000 population



In 2024/25, AV attended 7,550 OHCA events, a 0.1 per cent increase on 2023/24.

The state-wide incidence of OHCA was 115 per 100,000 population, which is an increase from 114 per 100,000 population in 2023/24 but a decrease from 120 per 100,000 population in 2022/23.

OHCA incidence in metropolitan and rural areas also increased in 2024/25.

The age-adjusted incidence was 96 OHCA per 100,000 population for 2024/25, a decrease from 99 OHCA per 100,000 in 2023/24.

Ambulance Victoria attended

7,550
OHCA events
0.1% increase

115 per
100,000 population

Demographics



Adult
(≥ 16 years) population demographics[^]

6,796
OHCAs



65%
were male
and the median age was 69 years



30%
were witnessed by a bystander



40%
received a resuscitation attempt by EMS

Paediatric
(< 16 years) population demographics[^]

82
OHCAs

52%
were male
and the median age was 3 years

33%
were witnessed by a bystander

77%
received a resuscitation attempt by EMS

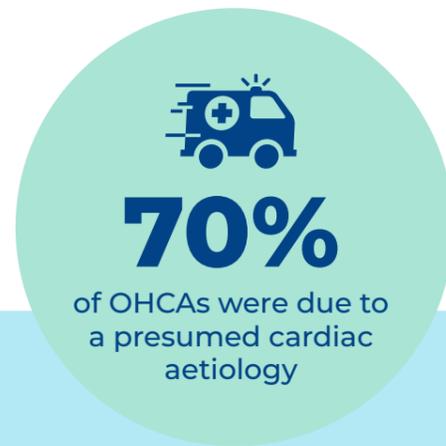
[^]Excludes EMS witnessed events.

Precipitating events

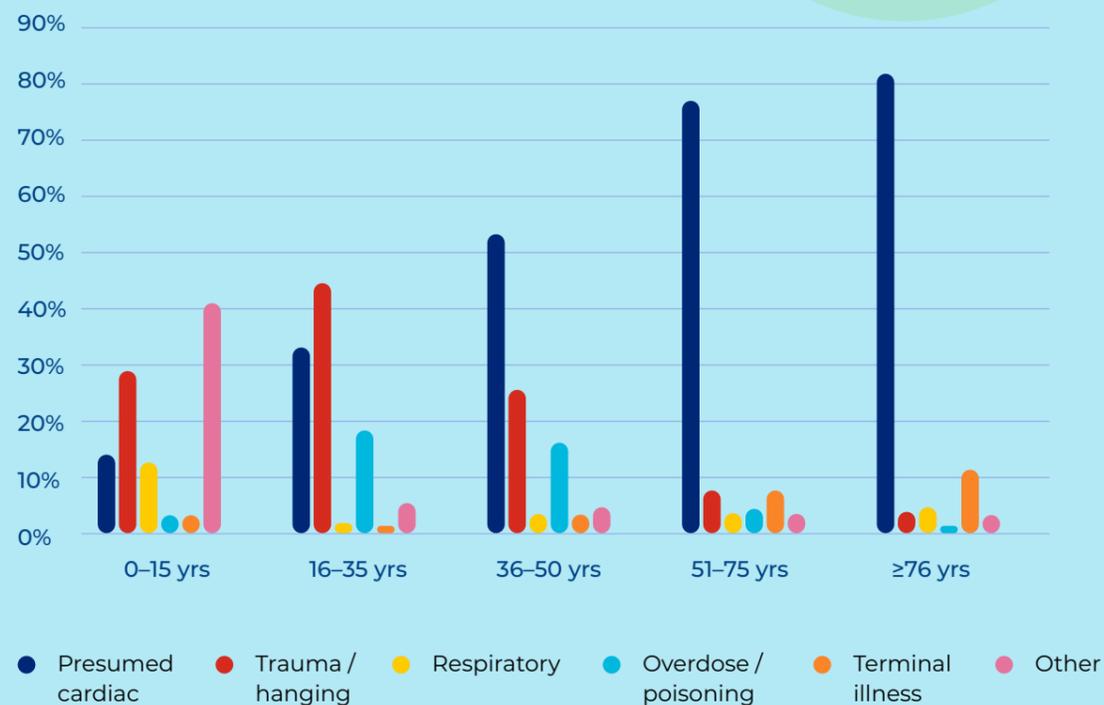
In 2024/25, 70 per cent of OHCA's were due to a presumed cardiac aetiology. In accordance with the Utstein recommendations (Grasner 2024), OHCA's are presumed to be of cardiac origin unless a clear precipitator is specified on the patient care record.

In adult patients, the proportion of presumed cardiac events increased with increasing age. Among patients aged between 16 and 35 years, the most common cause of OHCA was trauma / hanging (43 per cent).

In paediatric patients, most events were of 'Other' causes (41 per cent) which most commonly included cases of sudden unexpected death in infancy. This was followed by trauma/hanging (28 per cent).



Precipitating events by age group[^]



[^]Excludes EMS witnessed events.

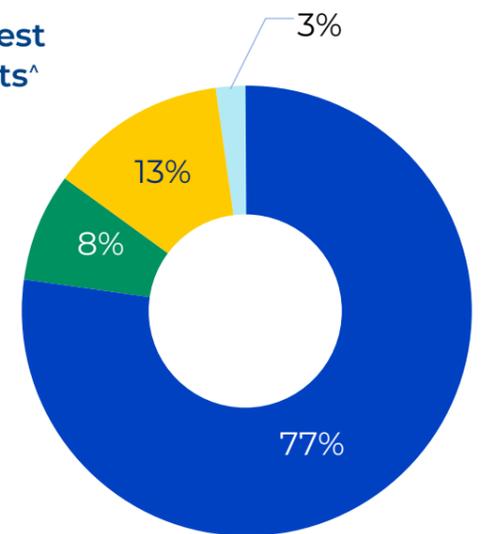
Location of arrest

In 2024/25, 77 per cent of OHCA's occurred in the home, while 13 per cent occurred in a public location.

Among patients who received a resuscitation attempt by EMS, 68 per cent of OHCA's occurred in the home, and 21 per cent occurred in a public location.

Location of arrest in adult patients[^]

- Private residence
- Aged care facility
- Public location
- Other



[^]Adult patient population. Excludes EMS witnessed events.



Story of survival

When 83-year-old Ray Riehm set out for his usual swim, he never imagined it would become a fight for his life. Thanks to quick thinking, community responders, and the power of early intervention, a routine day at the pool became a powerful reminder of how ordinary people can make an extraordinary difference.

Ray Riehm, 83, is a familiar face at his local swimming pool, where he regularly swims laps to stay active. But in early February 2025, his routine took a dramatic turn when he suffered a sudden cardiac arrest mid-swim.

Fortunately, help was close at hand.

Alex, a GoodSAM responder and pool service technician, was working onsite at the pool when he received an urgent GoodSAM alert on his phone. He had just stepped away for a drink of water when the notification came through, and he immediately rushed to the pool.

GoodSAM is a mobile app that connects patients in cardiac arrest with a nearby volunteer who is willing to start hands-only CPR while paramedics are on their way.

By the time Alex arrived at the poolside, lifeguards had pulled Ray from the water and begun CPR. Alex jumped in to assist, and together they used the pool's AED to deliver three life-saving shocks.

The combination of CPR and defibrillation helped Ray's heart begin beating on its own again.

MICA paramedic Tim Sedgwick said that the swift actions of the lifeguards, Alex and paramedics were instrumental in achieving ROSC – which meant that Ray's heart was beating on its own once again.

Alex, currently in his first year studying paramedicine at Victoria University, emphasised the importance of early intervention.

"It can be scary to respond to someone in cardiac arrest, but through the GoodSAM program you're supported every step of the way and the impact you can make far outweighs any nerves," he said.

"Everyone should download the GoodSAM app. You never know when you might be the one to give someone a second chance at life."

Inspired by his mum, a critical care nurse, Alex has worked as a service technician for four years and is now pursuing his dream of becoming a paramedic.

As for Ray, he's recovering well and looking forward to returning to the activities he loves – golfing, gardening and volunteering with his local Rotary club. He and his wife Nola are planning a holiday to Queensland later this year.

"It's a miracle I'm alive," Ray said. "I could've died then and there."

"The paramedics and lifeguards did a terrific job, and it feels wonderful to be able to say thank you."

Ray credits his physical fitness for helping him survive the ordeal and hopes his story encourages others to stay active and learn CPR.

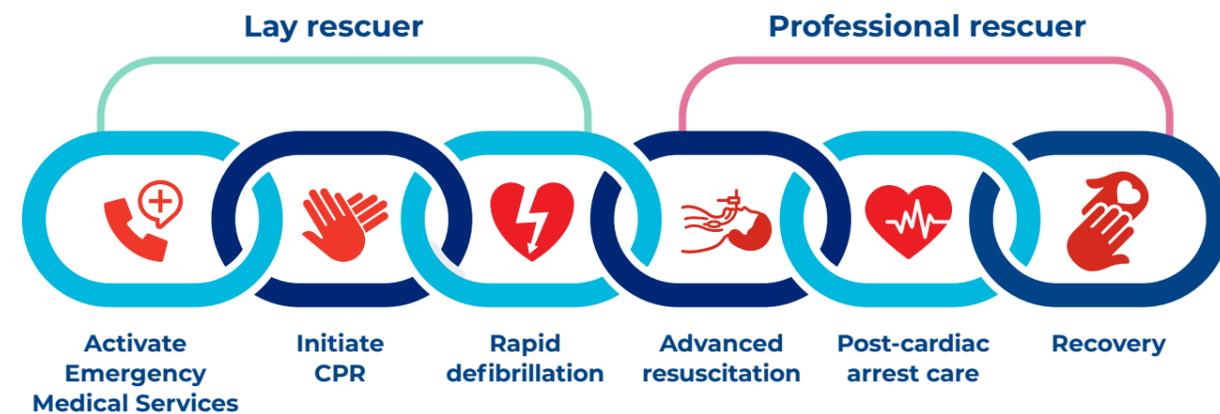


It can be scary to respond to someone in cardiac arrest, but through the GoodSAM program you're supported every step of the way and the impact you can make far outweighs any nerves."

The Chain of Survival



The chain of survival is an internationally recognised series of steps that bystanders and EMS can take in order to maximise survival from OHCA.



The first three links, which can be administered by bystanders, have been associated with the largest gains in survival (Marijon et al, 2023).

Interventions which aim to maximise bystander participation in resuscitation have the greatest impact on OHCA survival rates.



Link 1: Activate EMS



After collapse from OHCA, an early call for help is arguably the most important action taken by bystanders.

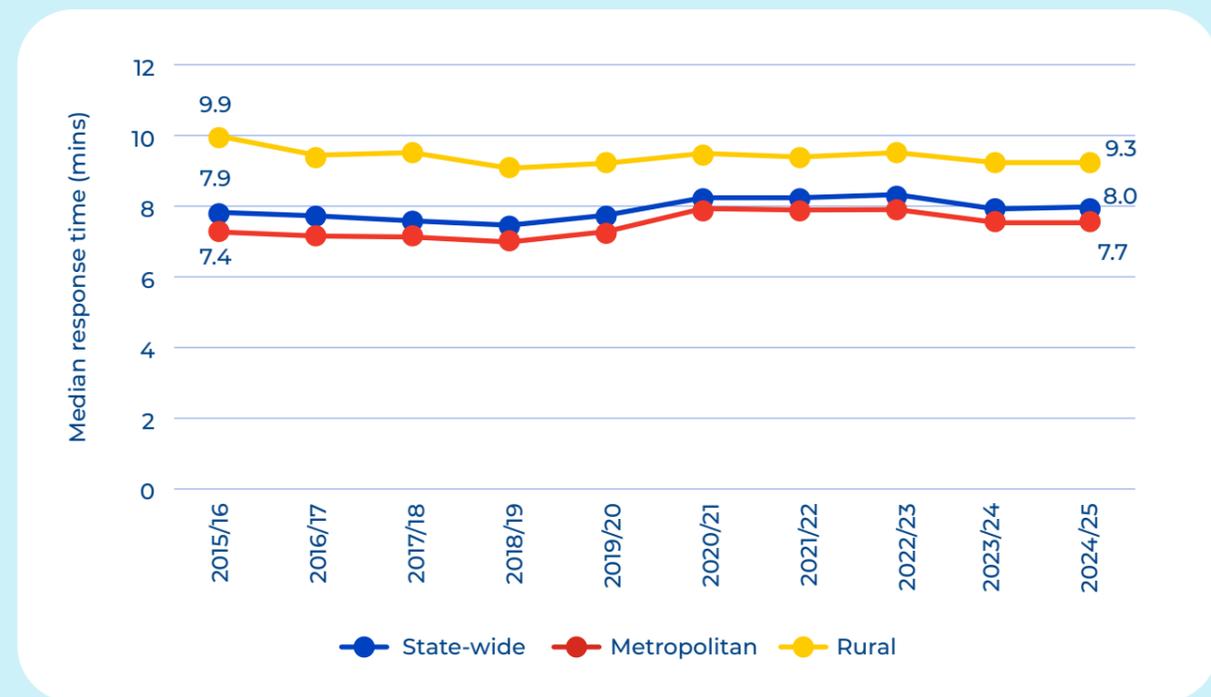
Early activation of EMS through Triple Zero (000) results in a whole of system response, including the dispatch of paramedics and professional and volunteer first responders, and the provision of life-saving CPR and AED instruction by Triple Zero (000) call-takers. EMS response time, or the time between

the Triple Zero (000) call and arrival of EMS at scene, is an international measure of quality for OHCA.

In 2024/25, 94 per cent of calls were initially directed by bystanders to Triple Zero (000) ambulance and 93 per cent of OHCA were correctly identified by Triple Zero (000) call-takers. The median EMS response time was 8.0 mins in 2024/25, which is the same as was reported in 2023/24.



EMS response times over the past 10 years^



*Excludes EMS witnessed events.

^Includes patients receiving a resuscitation attempt by EMS. Excludes EMS witnessed events.

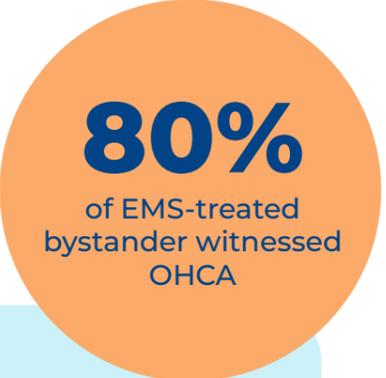
Link 2: Initiate CPR



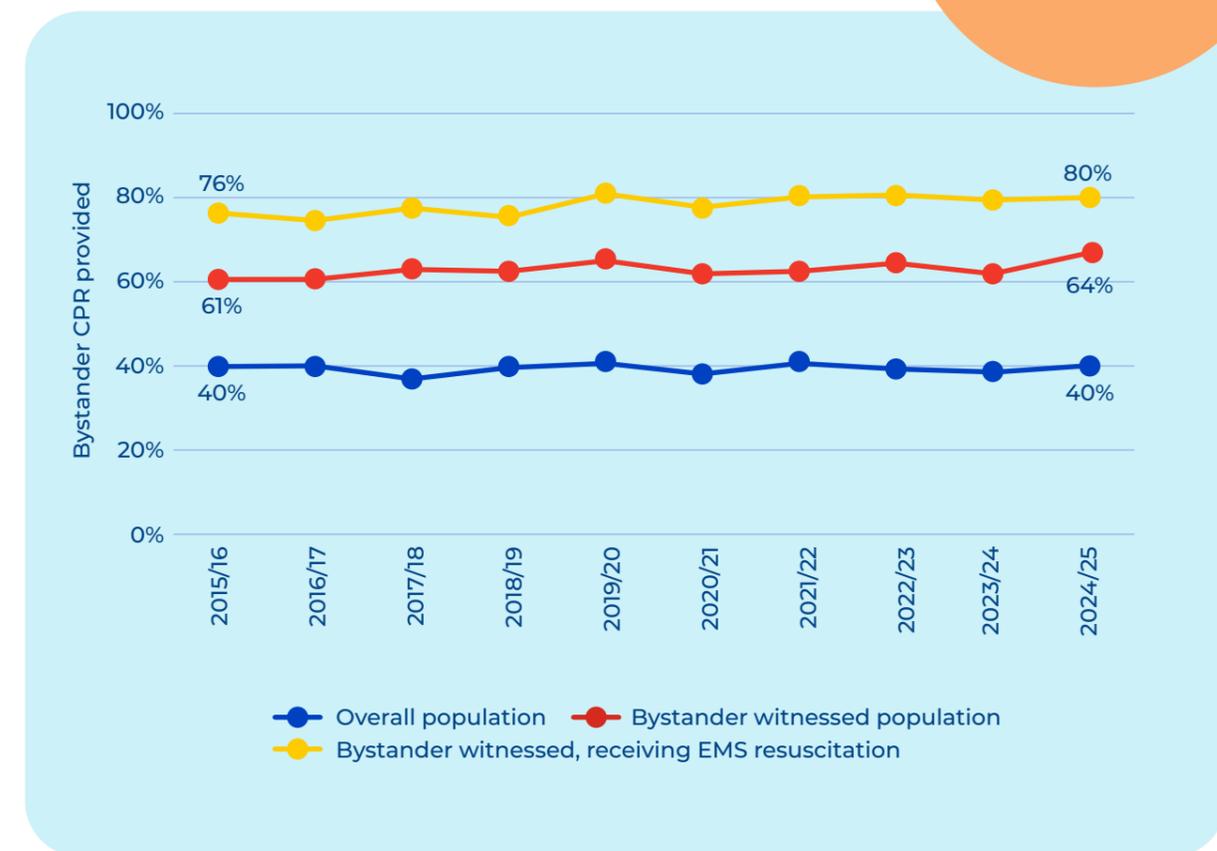
In 2024/25, 80 per cent of bystander witnessed OHCA patients who received a resuscitation attempt by EMS were administered bystander CPR.

Over the last decade, the rate of bystander CPR administration has plateaued. The implementation of the GoodSAM responder application in 2018 was associated with a small increase in bystander participation in resuscitation.

The AV 2023-2028 Cardiac Arrest Improvement Strategy aims to improve community-based participation in CPR and defibrillation by investing in community education programs (including education in schools) and Heart Safe Communities and encouraging the use of digital media applications, such as GoodSAM, to enhance the community response to OHCA.



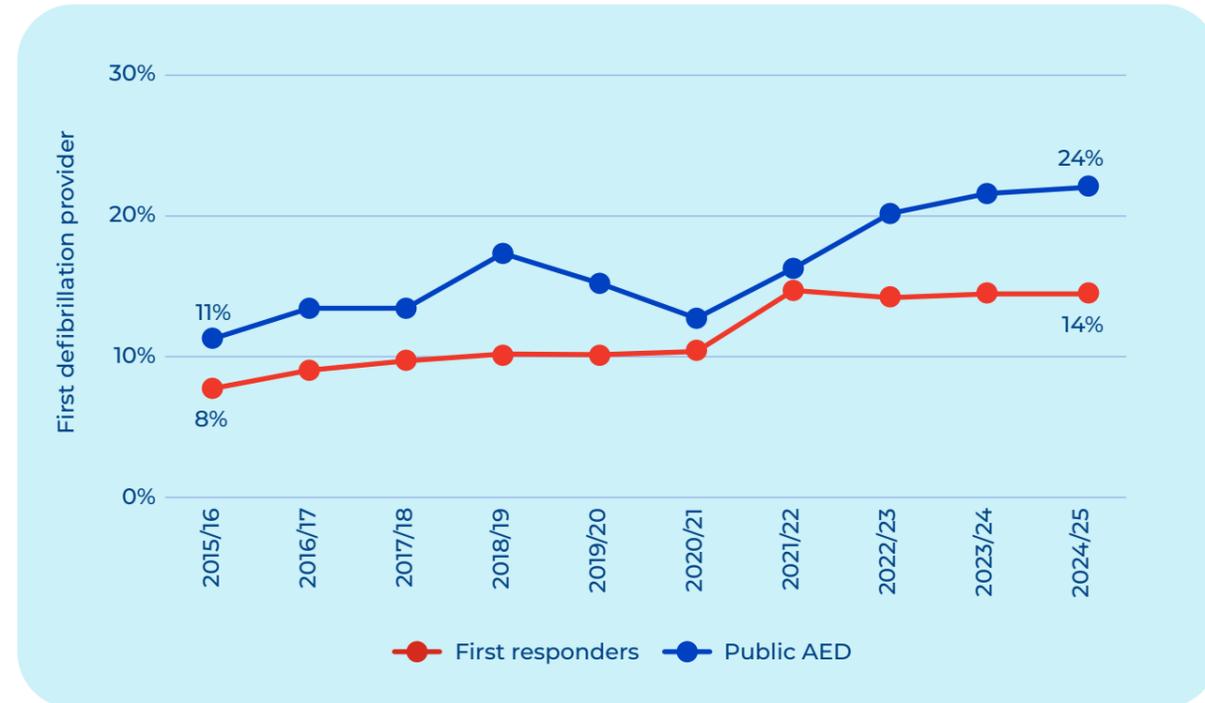
Bystander CPR rates over the past 10 years



Link 3: Rapid defibrillation



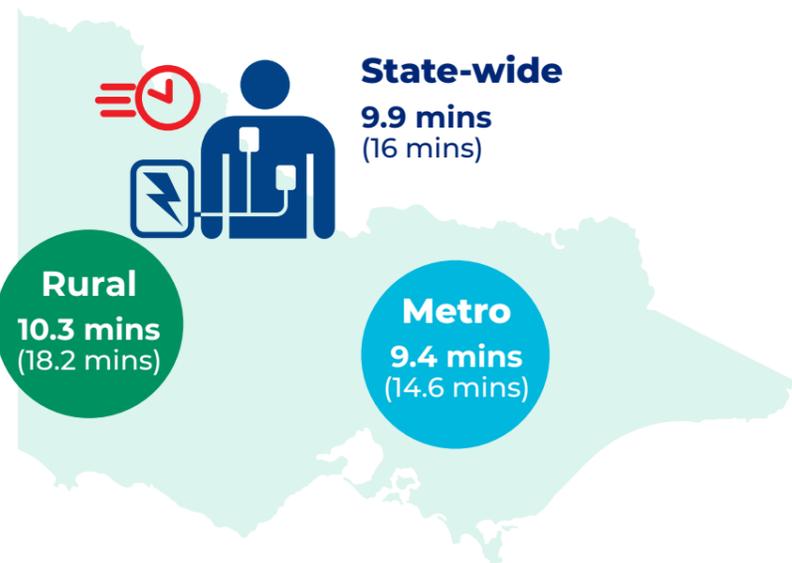
Initial defibrillation provider over the past 10 years[^]



In 2024/25, 24 per cent of patients who presented in a shockable rhythm received their initial defibrillation from a bystander with a public AED.

Although reduced rates of bystander defibrillation were observed during the COVID-19 pandemic, this year we saw the highest rate of bystander defibrillation on record.

Median (90th percentile) time to first defibrillation in 2024/25[^]



[^]Includes initially shockable patients who received a resuscitation attempt from EMS. Excludes EMS witnessed events.

Link 4: Advanced resuscitation



Advanced resuscitation refers to the phase of OHCA management during which paramedics step in and provide additional life-saving measures.

This includes the provision of high-quality CPR and defibrillation, amongst other clinical interventions designed to achieve ROSC.

CPR is of high quality if it meets internationally-defined standards and follows a well-practiced choreography (the 'pit-crew' approach) aimed at minimising interruptions to resuscitation.

The main components of high-performance CPR (HP-CPR) are:

- ✓ High chest compression fraction
- ✓ Targeted chest compression rate and depth
- ✓ Allowing full chest recoil
- ✓ Avoidance of over-ventilation

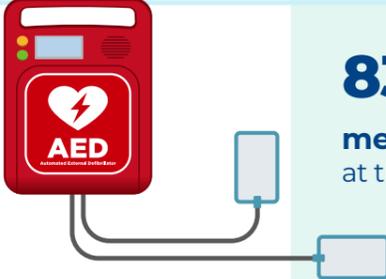
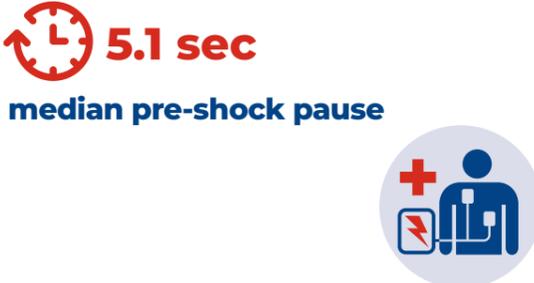
Recommendations for optimal chest compressions include a target depth of $\geq 5\text{cm}$ for adults and a rate of 100-120 compressions per minute. To maximise perfusion, guidelines for CPR and external cardiac compressions recommend minimising pauses in chest compressions. Lower chest compression fraction (i.e. lower proportion of time with CPR being performed) during resuscitation is associated with a decreased likelihood of ROSC and survival.

Recommendations for optimal chest compressions include a target depth of $\geq 5\text{cm}$ for adults and a rate of **100–120 compressions per minute.**



Resuscitation quality snapshot 2024/25



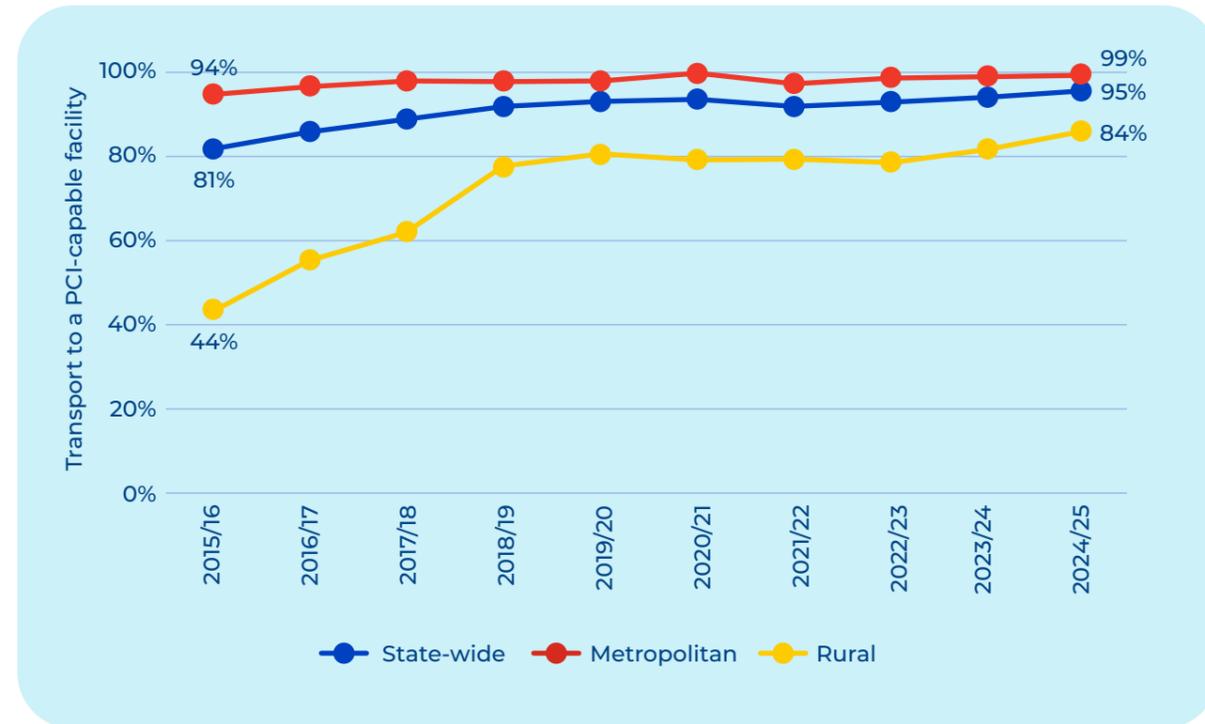
| Early recognition | High quality CPR | Early defibrillation | Advanced care |
|--|---|---|---|
| <p>92% of cases had placement of pads within 2 minutes of EMS arrival</p> | <p>92% median chest compression fraction</p>  | <p>74% of cases had the first defibrillation within 2 minutes of EMS arrival at patient</p> | <p>86% first pass intubation success</p>  |
| <p>95% of cases had compressions underway on pad placement</p>  | <p>83% median compressions at the target depth</p>  | <p>5.1 sec median pre-shock pause</p>  | <p>88% of transported cases had a systolic blood pressure > 100mmHg on hospital arrival</p>  |
| <p>94% of cases had the initial rhythm correctly identified</p>  | <p>73% median compressions at the target rate</p>  | <p>3.4 sec median post-shock pause</p>  | <p>74% of VF/VT patients who died on scene had an adequate duration (45 minutes) of resuscitation</p>  |

Note: Includes all EMS attempted resuscitations for 2024/25. Excludes patients aged <12 years and traumatic cardiac arrests.

Link 5: Post-cardiac arrest care

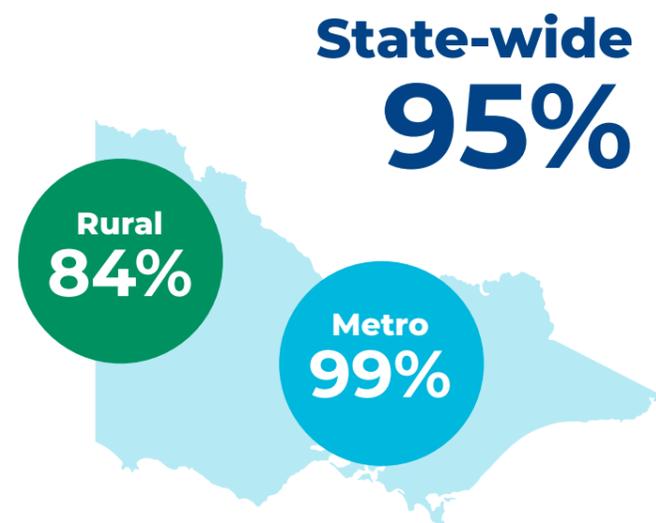


Transport to a PCI-capable facility in 2024/25[^]



In 2024/25, **95 per cent of presumed cardiac aetiology** OHCA patients were transported to a percutaneous coronary intervention (PCI)-capable hospital, in line with recent years.

PCI-capable hospitals have a process for receiving emergency patients via a pre-notification system and have full-time PCI capabilities.

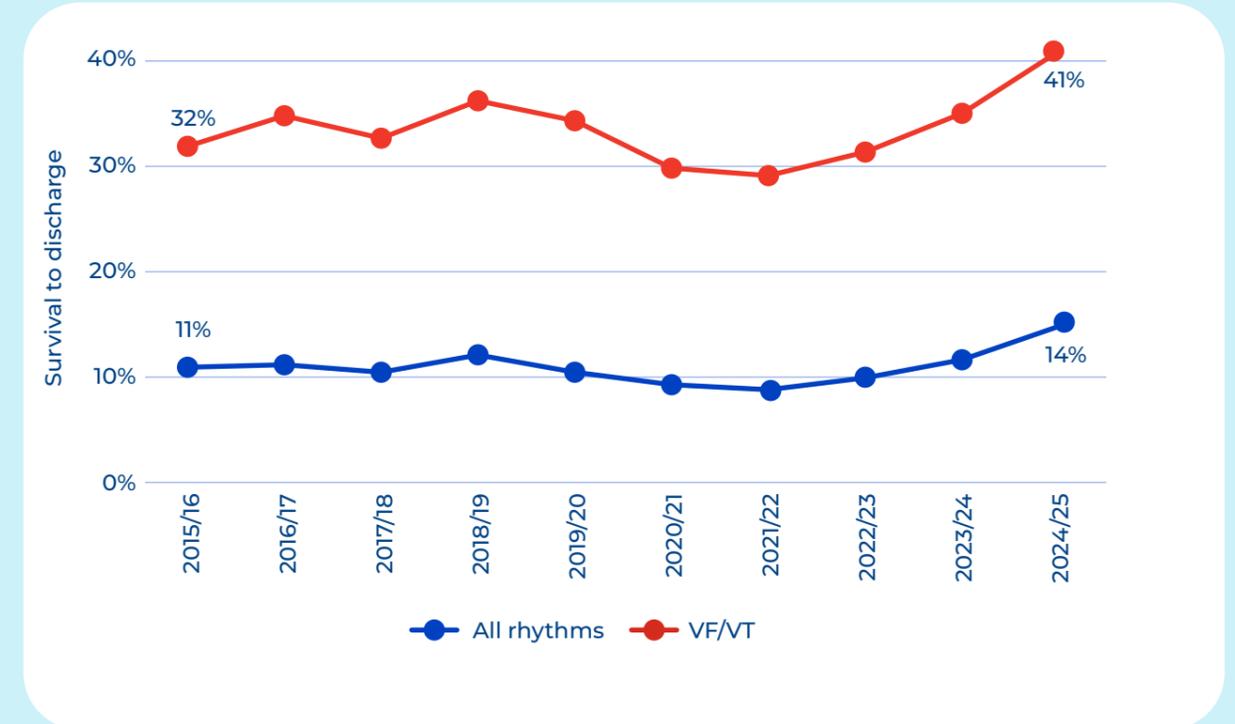


[^]Includes adult patients with a presumed cardiac aetiology who received a resuscitation attempt by EMS and transport to hospital. Excludes EMS witnessed events.

Link 6: Recovery



Survival to hospital discharge over the past 10 years[^]



In 2024/25, **14 per cent of adult patients who received a resuscitation attempt by EMS survived** to hospital discharge, an increase from 12 per cent in 2023/24.

In patients who presented with a shockable cardiac rhythm including ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT), 41 per cent of patients survived to hospital discharge, an increase on the 35 per cent observed in 2023/24.

Survival to hospital (event survival) in these patients was 61 per cent in 2024/25, an increase from 57 per cent in 2023/24.

In the population of patients who were witnessed to arrest by EMS and arrested into VF/VT, 75 per cent survived to hospital discharge in 2024/25, an increase from 66 per cent in 2023/24.

[^]Includes adult patients receiving a resuscitation attempt by EMS. Excludes EMS witnessed events.

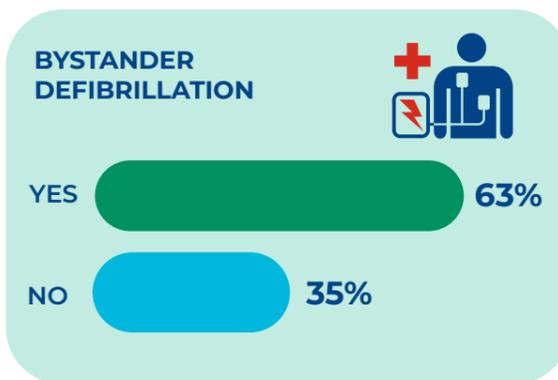
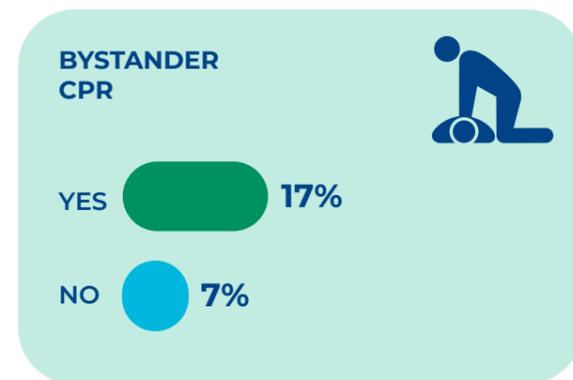
The importance of bystanders

In 2024/25, **17 per cent of patients who received bystander CPR survived to hospital discharge**, compared with seven per cent of patients who did not receive bystander CPR.

Further, **63 per cent of the patients who received bystander defibrillation survived to hospital discharge**, compared with 35 per cent of patients who received defibrillation from first responders or paramedics.

Patients who receive bystander CPR are also more likely to present to EMS in a shockable cardiac rhythm, and therefore have the greatest chance of survival.

These figures reiterate the importance of bystander interventions.



The chance of survival is highest when the initial cardiac rhythm is shockable.



Figures include adult patients who received a resuscitation attempt by EMS. Excludes EMS witnessed events.

Patient recovery

In 2024/25, **83 per cent of adult patients who were discharged from hospital alive** were discharged back to their home or usual place of residence.

For patients arresting in 2023/24, **400 patients were alive 12 months after their arrest**. Among these patients, 318 responded to 12-month follow-up interviews this year.

At 12 months, **88 per cent of responders were living at home without additional care**. In addition, 88 per cent reported favourable functional recovery according to the Glasgow Outcome Scale-Extended (i.e. good recovery or moderate disability), a widely used measure of functional outcome.

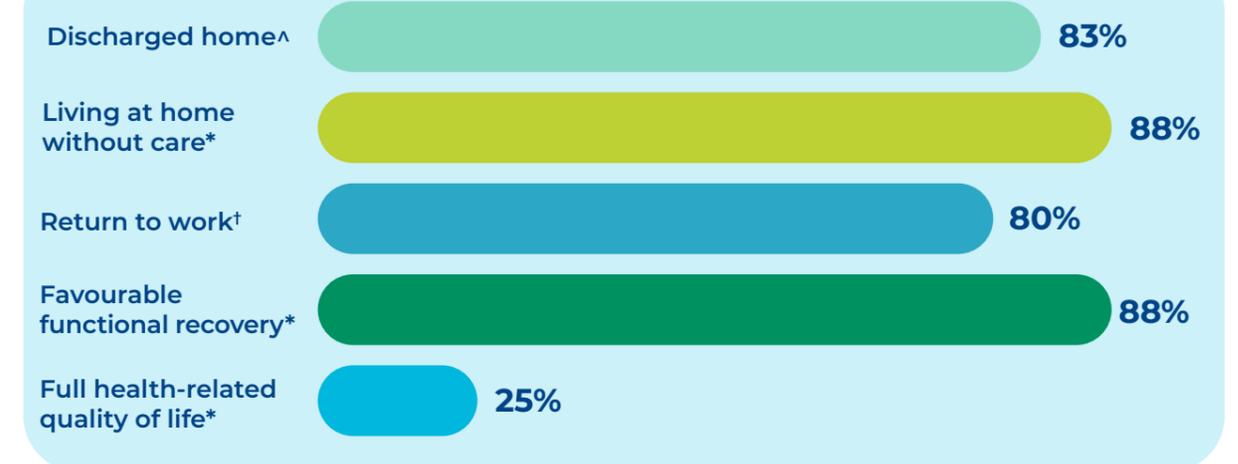
In total, **25 per cent of patients reported full health-related quality of life** (score = 1) at 12 months according to the ED-5D-5L. Among patients who were working prior to their arrest, **80 per cent had returned to work**.



83%
of adult patients

who were discharged from hospital alive were discharged back to their home.

Patient recovery



[^]Presented as a proportion of all survivors to hospital discharge in 2024/25

^{*}Presented as a proportion of 318 patients whose OHCA occurred in 2023/24 and responded to 12-month follow-up.

[†]Presented as a proportion of 185 patients whose OHCA occurred in 2023/24, responded to 12-month follow-up and were working prior to arrest.

Survival benchmarking

Utstein comparator group benchmarking

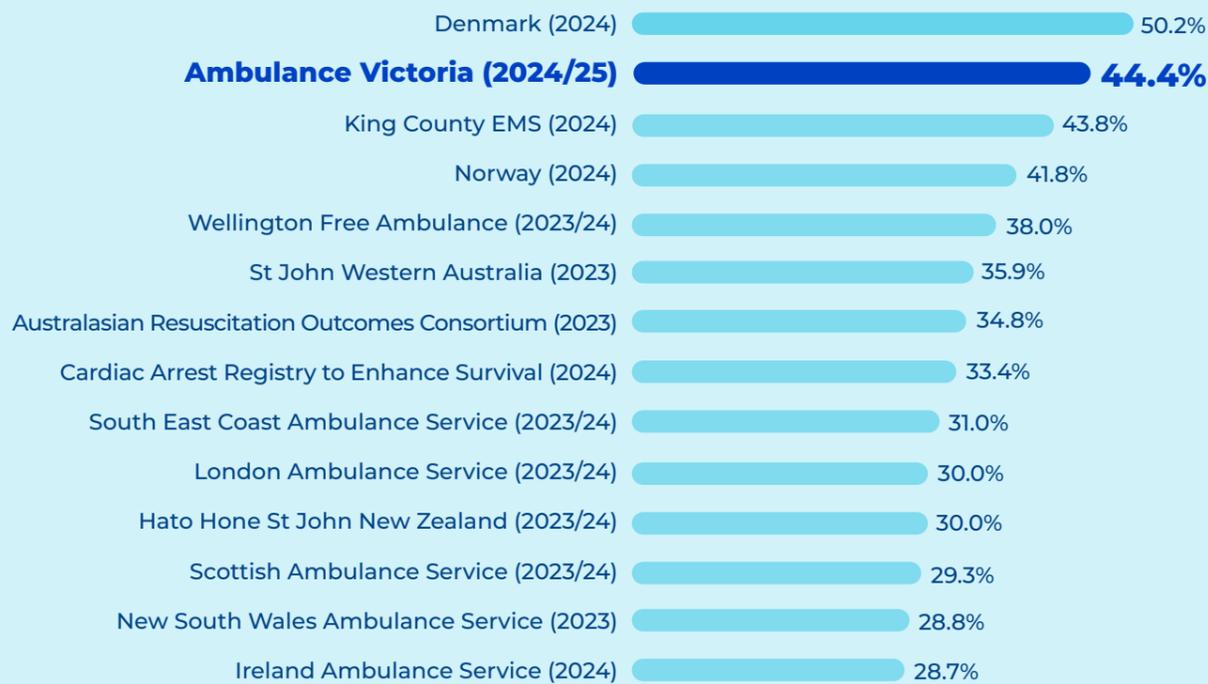
The Utstein template is a set of guidelines developed to promote uniform international reporting of OHCA data (Grasner 2024). The Utstein comparator group focusses on reporting survival within the cohort of patients who have a bystander witnessed OHCA, present in an initial shockable cardiac rhythm (VF/VT), and receive a resuscitation attempt by EMS.

The figure below displays survival rates reported nationally and internationally for the Utstein comparator group.

In 2024/25, **44 per cent of patients within the Utstein comparator group in Victoria survived to hospital discharge.** This is our highest ever Utstein survival rate and a modest improvement on the result achieved last year (41 per cent).

The result compares favourably to similar figures recently published by national and international ambulances services. This result also achieves the target set in AV's Cardiac Arrest Improvement Strategy of 44% survival by 2027/28.

Utstein comparator group survival rates nationally and internationally



Note:
Denmark, Norway, Wellington Free Ambulance, St John Western Australia, Australasian Resuscitation Outcomes Consortium, London Ambulance Service, Hato Hone St John New Zealand, Scottish Ambulance Service, New South Wales Ambulance Service and King County EMS and the Cardiac Arrest Registry to Enhance Survival report on non-traumatic OHCA's.
Hato Hone St John and Wellington Free Ambulance report on adult patients (≥15 years) only.
National Ambulance Service Ireland report on adult patients (>17 years) only.
South East Coast Ambulance Service report on 30-day survival.



Risk adjusted odds of survival[^]



Risk adjusted odds of survival to discharge in the Utstein comparator group

The risk-adjusted odds of survival to hospital discharge in 2024/25 was higher compared to 10 years ago. However, relative to 2015/16, 2023/24 and 2024/25 were associated with a significant increase in Utstein survival after adjustment for confounders.

Utstein comparator group survival over the past 10 years in Victoria



[^]Risk-adjusted model was adjusted for patient age, male gender, public location and year of arrest.

Priority locations

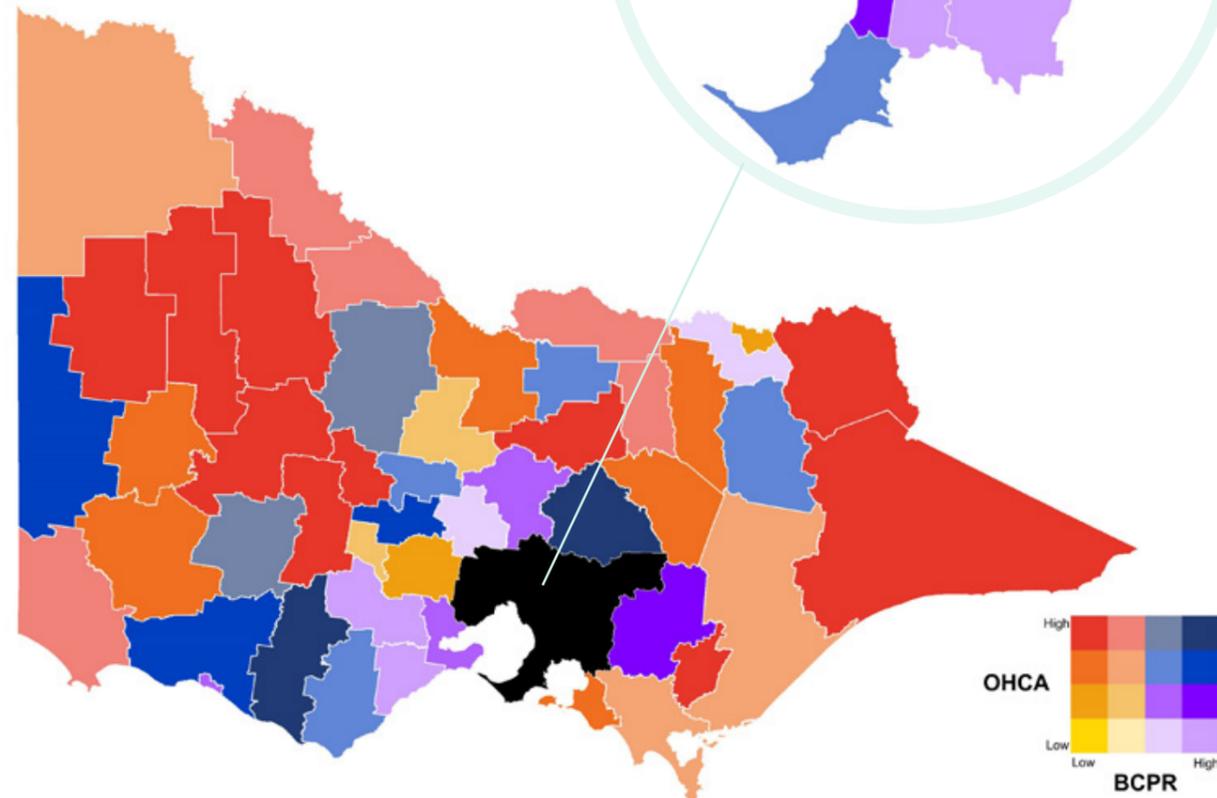
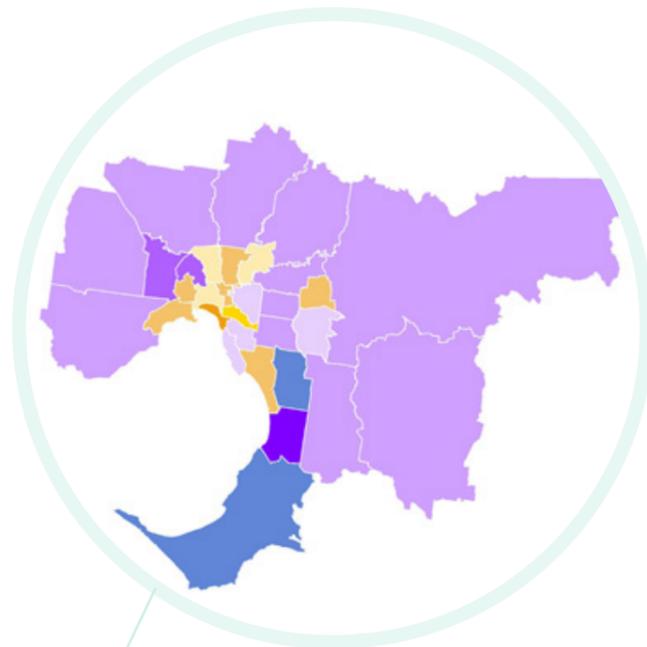


OHCA incidence relative to bystander CPR provision

The below map depicts the incidence of OHCA (per 100,000 population) within Local Government Areas of Victoria, relative to the proportion of patients who received bystander CPR within that Local Government Area. Red areas are those with high incidence of OHCA, but low rates of bystander CPR provision. These represent high priority areas for CPR education and awareness.

📍 CPR priority locations:

- Buloke
- Central Goldfields
- East Gippsland
- Hindmarsh
- Latrobe
- Northern Grampians
- Pyrenees
- Strathbogie
- Towong
- Yarriambiack



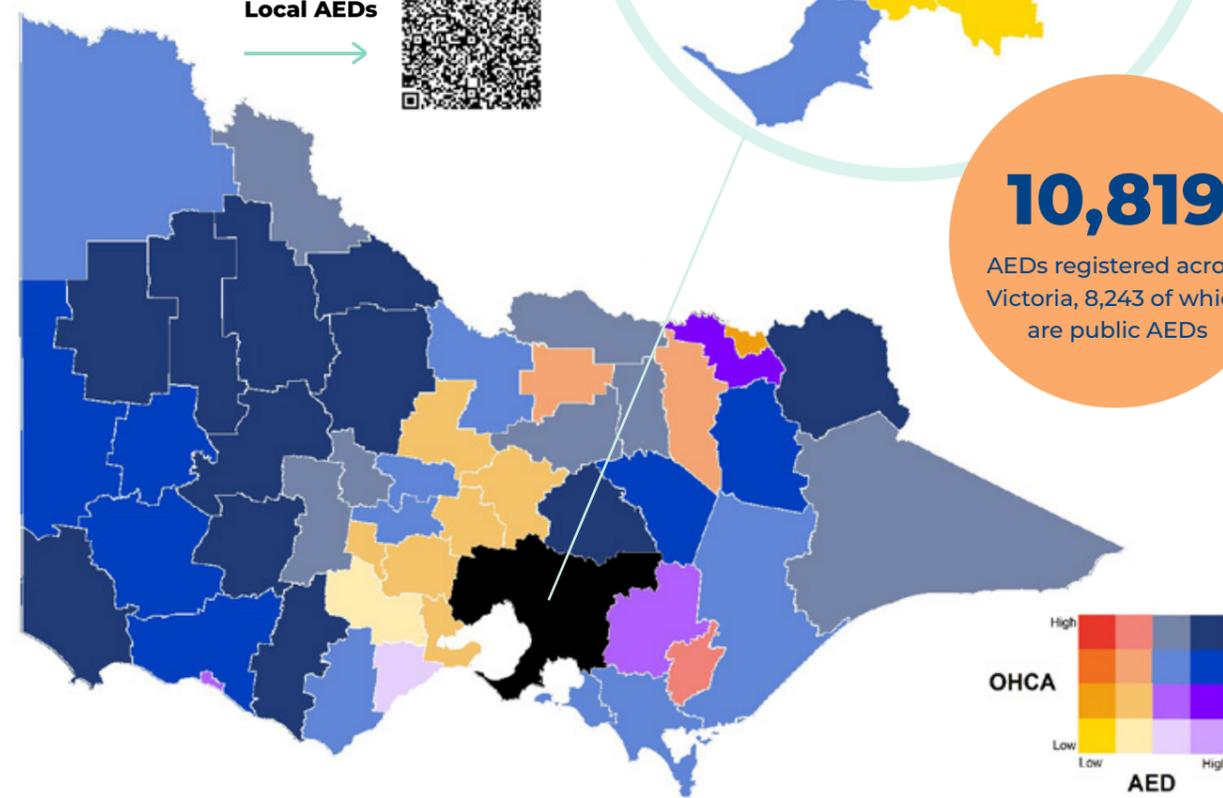
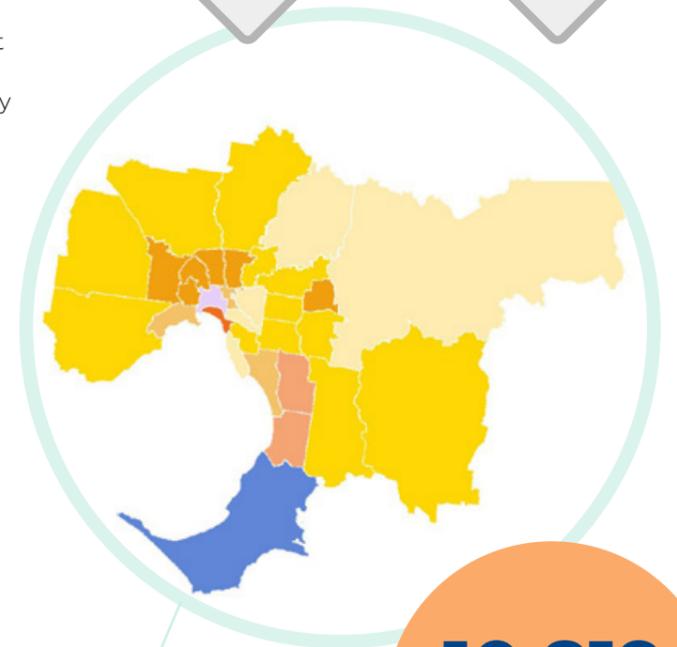
OHCA incidence relative to public AED availability

The below map depicts the incidence of OHCA (per 100,000 population) within Local Government Areas of Victoria, relative to the incidence of public AEDs (per 10,000 population) within that Local Government Area. Pink, dark orange and peach areas are those with high incidence of OHCA, but low incidence of public AEDs. These represent high priority areas in which public AED availability could be increased.

📍 Public AED priority locations:

- Frankston
- Greater Dandenong
- Greater Shepparton
- Latrobe
- Wangaratta
- Port Phillip

Locate Local AEDs



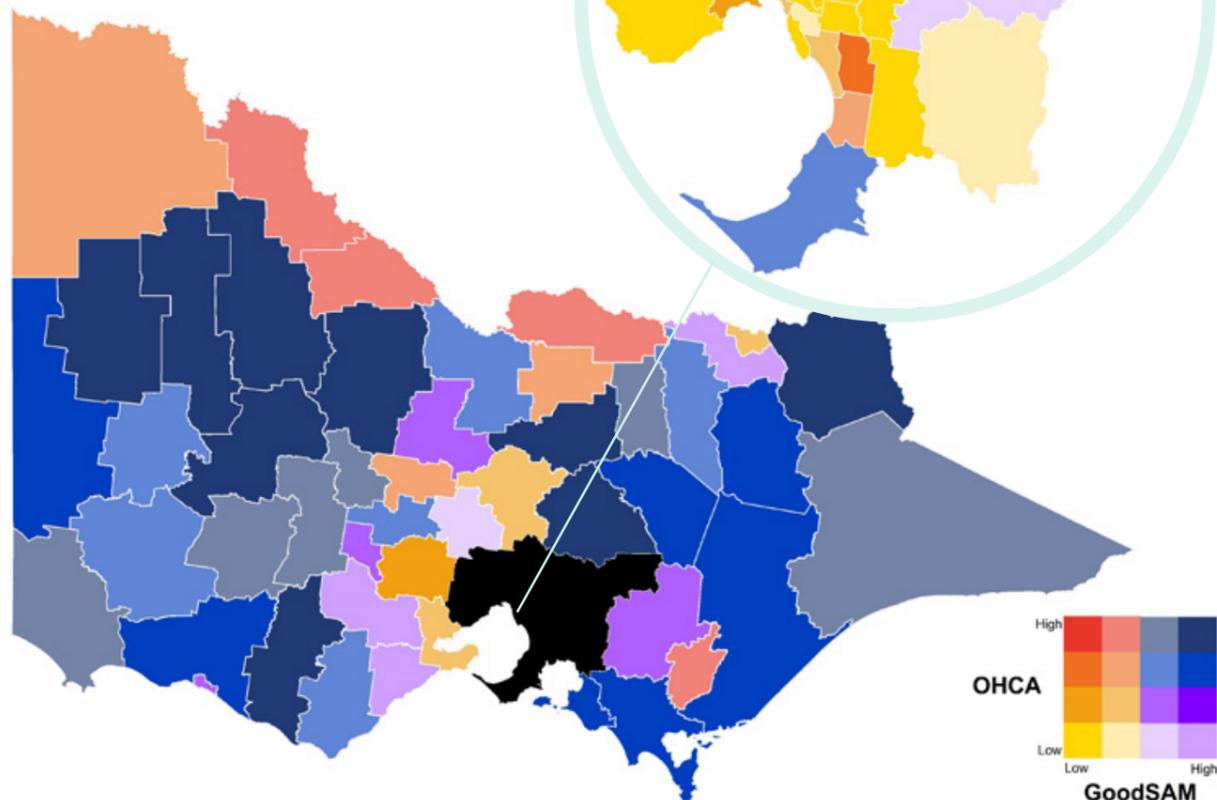
10,819
AEDs registered across Victoria, 8,243 of which are public AEDs

OHCA incidence relative to GoodSAM responder incidence

The below map depicts the incidence of OHCA (per 100,000 population) relative to the incidence of GoodSAM responders within Local Government Areas of Victoria. Pink, dark orange and peach coloured areas are those with high incidence of OHCA, but low incidence of GoodSAM responders. These represent the highest priority areas in which registered GoodSAM responders could be increased.

GoodSAM responder priority locations:

- Frankston
- Gannawarra
- Greater Dandenong
- Greater Shepparton
- Latrobe
- Mildura
- Moira
- Mount Alexander
- Swan Hill

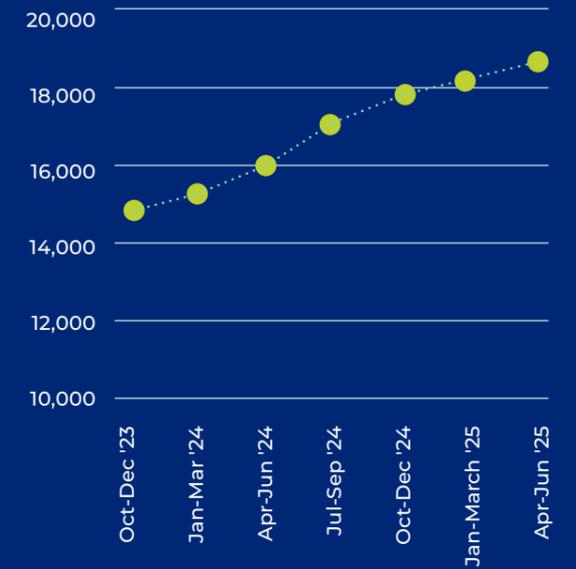


Become a GoodSAM responder

For every minute that a cardiac arrest patient goes without CPR and/or defibrillation, their likelihood of survival decreases by 10 per cent. Early intervention by bystanders can improve a patient's chances of survival.

GoodSAM is a free global smartphone app that is used to facilitate bystander response to cardiac arrest. A Triple Zero (000) call for suspected cardiac arrest triggers an alert to be sent to a nearby user of the app. The GoodSAM responder is notified of the patient's location, and the location of the nearest AED registered in AV's AED registry.

Registered GoodSAM responders



Become a GoodSAM responder



Register your AED in the AED registry



Research publications

- Villani M, Nehme E, Dantanarayana A, Ralph T, Anderson D, McManamny T, Nehme Z. Factors associated with CPR quality in out-of-hospital cardiac arrest. *Resuscitation*. 2025;217
- Okyere D, Nehme E, Mahony E, Stub D, Dawson LP, Ball J, Meadley B, Anderson D, McManamny T, Nehme Z. Incidence, Diagnoses, and Outcomes of Pediatric Nontraumatic Chest Pain Attended by Ambulance. *JAMA Network Open*. 2025;8(9):e2533962-e2533962
- Alhenaki A, Alqudah Z, Dantanarayana A, Williams B, Nehme E, Nehme Z. Impact of resuscitation duration on 12-month functional recovery following out-of-hospital cardiac arrest with initially shockable rhythms. *Resuscitation*. 2025;216
- Paratz ED, Hansen CJ, Gerche AL, Stub D, Nehme Z, Dantanarayana A, Freedman K, Pflaumer A, Ingles J, Winkel BG, Tfelt-Hansen J. Cardiac arrest while using the toilet: Not uncommon and associated with adverse resuscitation profile. *Resuscitation Plus*. 2025;25:101047
- Smith A, Mason R, Kilsby J, Dantanarayana A, Walker T, Nehme Z. Out-of-hospital cardiac arrest secondary to electrocution: Characteristics and outcomes. *Resuscitation*. 2025;214.
- Delardes B, Gregers MCT, Nehme E, Ray M, Hall D, Walker T, Anderson D, Okyere D, Dantanarayana A, Nehme Z. Smartphone-activated volunteer responders and survival to discharge after out-of-hospital cardiac arrests in Victoria, 2018–23: an observational cohort study. *Medical Journal of Australia*. 2025;222(10):504-509
- Alhenaki A, Alqudah Z, Williams B, Nehme E, Nehme Z. Clinical state transitions in shock-refractory ventricular fibrillation: an observational study. *Resuscitation*. 2025;211:110618
- Nanjayya VB, Fulcher B, Nehme E, Neto AS, Nichol A, Kaye DM, James Cooper D, Nehme Z, Bernard S, Pellegrino V, Higgins AM, Hodgson CL. Long-term health-related quality of life in survivors of extracorporeal cardiopulmonary resuscitation compared to conventional cardiopulmonary resuscitation- A cohort study using Australian and New Zealand extracorporeal membrane oxygenation registry and the Victorian Ambulance Cardiac Arrest Registry. *Resuscitation*. 2025;210:110601
- Paratz ED, Nehme E, Dantanarayana A, Freedman K, Coakley D, Fahy L, Rowe S, Wilkie B, Trytell A, Anderson D, Pflaumer A, Stub D, La Gerche A, Nehme Z. Cardiac arrest in the Australian Alps: A 20-year analysis. *Heart Rhythm O2*. 2025;6(6):835-842
- Howell S, Nehme Z, Ball S, Doan T, Finn J, Bosley E, Faddy S, Dicker B, Swain A, Cameron P, et al. The impact of the COVID-19 pandemic on resuscitation attempts, bystander CPR and survival outcomes in Australia and New Zealand: A binational population-based, Epistry study. *Resuscitation Plus*. 2025;22:100894.
- Humar M, Meadley B, Cresswell B, Nehme E, Groombridge C, Anderson D, Nehme Z. Cricothyroidotomy in out-of-hospital cardiac arrest: An observational study. *Resuscitation Plus*. 2024;20:100833.
- Nehme E, Anderson D, Salathiel R, Carlyon A, Stub D, Cameron PA, Wilson A, Smith S, McNeil JJ, Nehme Z. Out-of-hospital cardiac arrests in Victoria, 2003-2022: Retrospective analysis of Victorian Ambulance Cardiac Arrest Registry data. *Medical Journal of Australia*. 2024;221(11):603-611
- Kennedy C, Nehme E, Anderson D, Dantanarayana A, Delardes B, Nehme Z. Changes in out-of-hospital cardiac arrest resuscitation quality during and after the COVID-19 pandemic. *Resuscitation*. 2024;110419.
- Eliakundu AL, Bloom JE, Ball J, Nehme E, Okyere D, Heritier S, Voskoboinik A, Dawson L, Cox S, Anderson D, Burrell A, Pilcher D, Chew DP, Kaye D, Nehme Z, Stub D. Prehospital factors predicting mortality in patients with shock: state-wide linkage study. *Open Heart*. 2024;11(2):e002799.
- Delardes B, Schwarz J, Ralph T, Anderson D, Nehme E, Nehme Z. Sex Disparities in Resuscitation Quality Following Out of Hospital Cardiac Arrest. *Journal of the American Heart Association*. 2024;13(13):e033974.
- Villani M, Nehme E, Cox S, Anderson D, Reinders N, Nehme Z. Outcomes of adult patients discharged at scene by emergency medical services. *Emergency Medicine Journal*. 2024;41(8):459-46

Abbreviations

| | |
|----------------|--|
| AED | Automated External Defibrillator |
| Aus-ROC | Australian Resuscitation Outcomes Consortium |
| AV | Ambulance Victoria |
| CFA | Country Fire Authority |
| CPR | Cardiopulmonary Resuscitation |
| EMR | Emergency Medical Responders |
| EMS | Emergency Medical Services |
| End UCD | End Unexplained Cardiac Death Registry |
| FMR | Fire Medical Response |
| FRV | Fire Rescue Victoria |
| MICA | Mobile Intensive Care Ambulance |
| OHCA | Out-of-Hospital Cardiac Arrest |
| PCI | Percutaneous Coronary Intervention |
| PEA | Pulseless Electrical Activity |
| ROSC | Return of Spontaneous Circulation |
| VACAR | Victorian Ambulance Cardiac Arrest Registry |
| VF/VT | Ventricular Fibrillation / Ventricular Tachycardia |

References

Grasner JR, Bray JE, Nolan JP, et al. Cardiac arrest and cardiopulmonary resuscitation outcome reports: 2024 update of the Utstein Out-of-Hospital Cardiac Arrest Registry template. *Resuscitation*. 2024; 201: 110288

Marijon E, Narayanan K, Smith K, et al. The Lancet Commission to reduce the global burden of sudden cardiac death: a call for multidisciplinary action. *The Lancet*. 2023;402(10405):883-936

Public Health Seattle & King County Emergency Medical Services (EMS) Division. 2025 Annual Report

Danish Cardiac Arrest Registry 2024 (Dansk Hjertestopregister. Årsrapport for 2024)

Norsk (Norway) Cardiac Arrest Registry 2024 (Norsk Hjertestansregister. Årsrapport for 2024)

St John Western Australia. Out-of-Hospital Cardiac Arrest Report 2025.

Wellington Free Ambulance. Out-of-Hospital Cardiac Arrest Registry Summary Report 2023/24.

Aus-ROC Australasian Resuscitation Outcomes Consortium Epistry Annual Report 2024

Cardiac Arrest Registry to Enhance Survival. CARES 2024 Annual Report.

Hato Hone St John. Out-of-Hospital Cardiac Arrest Registry Summary Report 2023/24.

Ireland National Ambulance Service Out of Hospital Cardiac Arrest Register Annual Report (17th) 2024

NHS South East Coast Ambulance Service NHS Foundation Trust England Annual Report April 2023 – March 2024

London Ambulance Service. Cardiac Arrest Annual Report April 2023 – March 2024

Scotland's Out-of-Hospital Cardiac Arrest Report 2023-24.

NSW Ambulance. Out-of-Hospital Cardiac Arrest Registry 2023 Report.

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