

Summary Report 2023/24



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**Quality Improvement and Innovation** 

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## MEET DANIEL AND GRAINGER -Why Early CPR is so important



Grainger was helping his uncle Daniel move a pallet-load of wood to the backyard when the unthinkable happened: Daniel had a sudden cardiac arrest [the sudden loss of all heart activity]. Thanks to Grainger recognising what was happening and immediately starting CPR and Daniel's wife Sarah calling 111 to get Wellington Free Ambulance on the way, Daniel is able to share his story today.

It was a Monday in mid-July. Daniel and wife Sarah had had a large pallet of wood delivered to their home as Daniel was building a shed. Access issues, so common in Wellington, meant that the wood was dropped at the roadside and needed moving to the backyard.

To make the job easier and quicker, Daniel asked nephew Grainger to help him move the wood, which he happily agreed to do.

To begin with, everything was fine. Grainger recalls that they were "just getting on with it, chipping away at the pile, occasionally chatting but just trying to get through it for the most part".

There were no signs that Daniel was feeling unwell or any indication of what was about to happen. Then, suddenly, everything changed in an instant.

Grainger remembers dropping off another load of wood in the backyard. As he turned around to head back to the roadside pile, he saw Daniel "go down. He never really fell, he kind of just crumpled to the ground. He ended up lying on his back".

Grainger wasn't sure what was going on, as he explains: "I thought he was making a joke that he was tired from the work, so he was having a nap or something – Daniel jokes around a lot."

Grainger started to move towards Daniel, as he called for Sarah.

"When I got to Daniel, it just looked like he was asleep, like he'd fallen asleep right then and there. It sounded like he was snoring."

Sarah rushed over and "took one look at Daniel's face and saw he wasn't responding. I called 111 immediately. I started shouting at him to try to get him to come around."

Daniel suddenly jolted upright, gasping for air, before slumping unconscious against the wall.

Grainger believes it was at this moment that he realised what was going on – Daniel was experiencing a sudden cardiac arrest [the sudden loss of all heart activity].



Sarah who had immediately called 111 recalls telling the call taker – Carmen, a Wellington Free Ambulance Emergency Medical Dispatcher – that Daniel "had collapsed and they needed to come straight away. I could see that his face was changing colour and turning blue, and I was shouting that I thought we were losing him".

Carmen started providing instructions, saying that they needed to get Daniel on his back.

Grainger reflects "Even though Daniel is about the same size as me, he felt so heavy. It took all my strength to get him onto his back". Once on his back, Grainger remembers "looking at Daniel. It sounded like he was breathing, but I recognised it as agonal breathing [the gasping that people do when they're struggling to breathe, which is usually a sign that the heart is no longer circulating oxygenated blood].

That's when I knew for certain what was going on."

Just three weeks earlier, Grainger had learnt CPR which was a mandatory requirement for his job.

Although he'd never performed CPR [cardiopulmonary resuscitation – a vital life-saving action anyone can perform on a person experiencing a sudden cardiac arrest that gives them the best chance of survival] before, he remembered his training.

Grainger recalls Sarah starting CPR on Daniel but then "I kind of snapped and realised I knew what I was doing" so he took over CPR.

"I remember the call taker counting for me - 1,2,3,4 - like a metronome. I was counting with the call taker to ensure I kept a constant rhythm with the compressions."

Grainger continued CPR as Sarah stood on the roadside, waiting for Wellington Free, to make sure they could see where to come.

Grainger remembers the first paramedic coming down the passageway: "I've never felt that sort of relief before. I was already exhausted and wasn't sure whether what I was doing had done any good."

As Wellington Free Ambulance paramedics began attending to Daniel, Grainger went out to the road to direct the other emergency services.

Grainger recalls that "the response was so quick. I have no idea how long I was actually doing CPR, but very shortly after I began, the first paramedic showed up in a car [Intensive Care Paramedic Serah in a fully equipped quick response vehicle]. Then a fire engine and an ambulance arrived.

There were about five paramedics there in the blink of an eye, plus four firefighters. They were brilliant, they were all so assured and calm."

Grainger cleared some of the wood to allow the paramedics more space to treat Daniel. He remembers that the paramedics were "so professional, fast-acting and effective. I can only imagine how stressful and demanding the work they do is, but you wouldn't know it with how calm and assured their actions were on the day."

"I know very little about how these things work, but the fact that Daniel can speak to me today is a testament to the quality of the work the paramedics do is. One of them came out to me shortly before they took him away in the ambulance and told me, very calmly, that they had got his heart beating again."

Grainger "doubts Daniel would still be alive today had I not learnt CPR. I had no idea how to do CPR before that, or even how to recognise a sudden cardiac arrest. Because of the CPR training I was able to follow the necessary procedures and give him the CPR he needed while waiting for the ambulance to arrive."

Once at Wellington Hospital Emergency Department, Daniel underwent an emergency angiogram [an x-ray of the arteries in the heart] to identify the cause of the cardiac arrest. As Sarah explains, "the team was able to identify where the blockage in Daniel's heart was. Immediately after this, Daniel was taken to ICU [Intensive Care Unit] for surgery, during which he had two stents [short, wire mesh tubes that are fitted into arteries to keep them open in the future] put in."

- "After about three-four hours, he was out of surgery and in recovery in ICU where he spent the night."
- "The next morning, he was transferred to the Cardiology ward and was discharged two days after that."

Daniel describes his recovery as "surprisingly swift":

"I noticed the benefits of the stents almost immediately. Key to my recovery has been the medication and my participation in a programme run by the folks at HeartWorks on Thorndon Quay. They run monitored exercise sessions where I've been able to work on strength and fitness in a safe environment."

Daniel's story highlights the importance of the chain of survival – the chain of events that must happen quickly to maximise the chances of survival from sudden cardiac arrest.

It begins with recognising what's happening and calling 111. It includes prompt CPR, use of an AED [automated external defibrillator – a device that analyses the heart's rhythm and, if necessary, delivers an electric shock to help the heart get back to its natural rhythm], and professional medical care.

Daniel is here today to share his story because the chain of survival was unbroken.

Anyone can learn life-saving CPR and how to use an AED, for free, through the Wellington Free Ambulance Heartbeat CPR training programme. This training is able to be provided free of charge to anyone in Greater Wellington and Wairarapa thanks to the generosity of Cornerstone Partner Julie Nevett and The Lloyd Morrison Foundation.

For now, Grainger says "I cannot thank everyone at Wellington Free enough. I know not all stories end as well as this one has, but I doubt any would have happy endings if it weren't for the work Wellington Free Ambulance does."

"It was one of those nightmare situations", Sarah says.

"Everything happened very quickly, and the overwhelming feeling was shock. We'll be forever grateful Grainger was with us that day and that he'd done CPR training. We know that's the reason Daniel is still with us.

As for the teams from Wellington Free Ambulance and Fire and Emergency NZ, we couldn't have wished for a better group of people to come to the rescue. They were extremely efficient but also very compassionate."



# **ABOUT THIS REPORT**

Cardiac arrest remains a considerable public health issue, with ischaemic heart disease being the second most prevalent cause of death in New Zealand.

Internationally, survival rates following out-of-hospital cardiac arrest (OHCA) are highly variable and can range from less than 6% to greater than 50%. Benchmarking survival from OHCA is a key measure of the clinical quality of an Emergency Ambulance Service (EAS) and is fundamental to making improvements in OHCA survival. Knowledge of New Zealand OHCA outcomes is a key driver to help identify and address areas for improvement in clinical care.

The data presented in this report is for all OHCA attended by Wellington Free Ambulance EAS in the period from 1 July 2023 to 30 June 2024. The data presented in this report primarily relates to events that were either 'attended' or where there was a 'resuscitation attempted' by EAS personnel. 'Attended' refers to all OHCA where EAS personnel arrived at the scene regardless of whether or not a resuscitation attempt was made. 'Resuscitation attempted' refers only to those events where an attempt at resuscitation was made by EAS personnel or successful defibrillation occurred prior to EAS arrival.

Unless otherwise stated, all analyses exclude cardiac arrests witnessed by EAS personnel.

Unless otherwise stated, survival refers to survival to 30 days post cardiac arrest.



survival in the Utstein comparator group)

# **EXECUTIVE SUMMARY**



All events, adult, resuscitation attempted: includes adults ( $\geq$  15 years old), all-cause, and EAS personnel witnessed events.

# BENCHMARKING EXECUTIVE SUMMARY

#### Key figures for all-cause events

Table 1: Key figures for all-cause events<sup>A</sup>

Year	Total number events	% Bystander CPR	% Community Responder AED use	Urban median response time	Rural & remote median response time	% Attended by Fire & Emergency New Zealand	ROSC on handover	م الم % Survival
2018/19	204	76	6	8	14	93	32	19
2019/20	209	77	6	9	14	94	32	16
2020/21	217	71	4	8	14	97	28	10
2021/22	234	77	7	8	10	97	26	10
2022/23	258	78	7	9	10	93	27	14
2023/24	242	77	10	9	9	95	26	14

#### Benchmarking (all-cause events)

The outcomes of OHCA for international benchmarking compare rates of ROSC sustained to hospital handover and survival. This group requires that the following criteria be met: includes adults ( $\geq$  15 years old), all-cause, resuscitation attempted. Excludes children, and EAS personnel witnessed events.

#### Table 2: Benchmarking survival outcomes for all-cause events<sup>A</sup>

Ambulance Service	Collection period	Total number events	% ROSC on handover	% Survival <sup>®</sup>
King County EMS <sup>E</sup>	1 July 2023 to 30 June 2024	1,010	40%	15%
Wellington Free Ambulance	1 July 2023 to 30 June 2024	242	26%	14%
Hato Hone St John New Zealand	1 July 2023 to 30 June 2024	2,305	24%	11%
Ambulance Victoria	1 July 2023 to 30 June 2024	2,318	30%	12%
St John Western Australia	1 July 2023 to 30 June 2024	1,049	21%	10%
Ireland National Ambulance Service <sup>c,D</sup>	1 January 2023 to 31 December 2023	2,857	20%	8%



A All events, adult, resuscitation attempted: includes adults (≥ 15 years old), all-cause, resuscitation attempted. Excludes children, and EAS personnel witnessed events.

**B** Wellington Free Ambulance, Hato Hone St John New Zealand, and St John Western Australia report on survival to 30-days, all other services report survival to hospital discharge.

**C** Ireland National Ambulance Service report on all ages.

**D** Ireland National Ambulance Service data includes EAS witnessed events.

E King County EMS exclude cardiac arrests with penetrating or blunt trauma mechanisms.

#### Utstein Comparator Group<sup>A</sup>

One important international comparison uses a carefully standardised subgroup of patients known as the 'Utstein Comparator Group'. This subgroup requires that the following criteria be met: includes adults ( $\geq$ 15 years old), all-cause, resuscitation attempted, shockable presenting rhythm and bystander witnessed. Excludes children, EAS witnessed and no resuscitation attempt.



The chart below compares the Wellington Free Ambulance Utstein comparator group survival rate with that of other ambulance services.



**D** King County EMS exclude cardiac arrests with penetrating or blunt trauma mechanisms.

A Utstein Comparator Group: includes adults ( ≥ 15 years old), all-cause, resuscitation attempted, shockable presenting rhythm and bystander witnessed. Excludes children, EAS witnessed and no resuscitation attempt.
B Wellington Free Ambulance, Hato Hone St John New Zealand, English Ambulance Services, and St John Western

Australia report on survival to 30-days, all other services report survival to hospital discharge.

C Ireland National Ambulance Service reports patients ≥17 years old. English Ambulance Services report on all ages.

# **APPENDICES**

## THE OUT-OF-HOSPITAL CARDIAC ARREST REGISTRY

In 2019, the Hato Hone St John and Wellington Free OHCA Registries were merged to create a National OHCA Registry. In 2022, the national OHCA Registry was further integrated into the Aotearoa New Zealand Paramedic Care Collection (ANZPaCC) database. ANZPaCC includes all routinely collected clinical data from the electronic Patient Report Form (ePRF) for patients attended by road emergency medical services. It is co-governed by Hato Hone St John and Wellington Free Ambulance.

Analysis is conducted in collaboration with Wellington Free Ambulance by Hato Hone St John Clinical Evaluation, Research, and Insights investigators Heather Hutchinson and Sarah Maessen, along with Auckland University of Technology's ANZPaCC Principal Investigator Bridget Dicker.

#### Eligibility

Wellington Free Ambulance captures data on all OHCA events attended by the EAS. A cardiac arrest is defined as a patient who is unconscious and pulseless with either agonal breathing or no breathing.

Inclusion and exclusion criteria are described in Table A1 and Table A2.

### Table A1: Inclusion criteria (all of the following).

defibrillation.

Patients of all ages who suffer a documented cardiac arrest Occurs in New Zealand where Wellington Free Ambulance or one of its participating co-2 responders is the primary treatment provider • Patients of all ages who on arrival of the EAS are unconscious and pulseless with either agonal breathing or no breathing or • Patients of all ages who become unconscious and pulseless with either agonal breathing 3 or no breathing in the presence of EAS personnel or Patients who have a pulse on arrival of EAS personnel following successful bystander

#### Data capture

The data is collated in the registry using a reporting template based on international definitions outlined in the Utstein style of reporting and the variables developed by the Australasian Resuscitation Outcomes Consortium (Aus-ROC).

In the data collection process there are three separate points where data is acquired:

- Computer Aided Dispatch (CAD) and supporting systems.
- On scene by the EAS personnel in attendance.
- Mortality data from the New Zealand National Health Index (NHI) records.

#### **Computer aided dispatch**

Patient and event details are collected by the Ambulance Communications Centre when a 111 call is received and an ambulance is dispatched, with data being entered into the CAD system. Data specifically related to cardiac arrest is obtained from the CAD system and transferred into the OHCA Registry.

### Table A2: Exclusion criteria (any of the following).

Patients who suffer a cardiac arrest in a hospital facility where EAS may be in attendance but are 1 not the primary treatment providers Patients who suffer a cardiac arrest during an inter-hospital transfer where EAS may be 2 providing transport but are not the primary treatment providers Bystander suspected cardiac arrest where the patient is not in cardiac arrest on arrival of the EAS personnel, and where defibrillation did not 3 occur prior to ambulance arrival or no other evidence verifying a cardiac arrest state is present Patients who suffer a cardiac arrest where Hato Hone St John is the primary treatment provider

#### On scene collection

Ambulance officers on scene attending a patient in cardiac arrest are required to record specific data. This is recorded on an electronic Patient Report Form (ePRF) and submitted electronically to a secure server.

#### NHI patient outcome data

The patient's NHI is collected by EAS personnel on scene or at hospital handover. If the NHI was not available at the time of the event then the NHI is determined by cross-reference of the patient's date of birth and name to the NHI database.

The date of death is updated by the Manatū Hauora Ministry of Health identity data management team after matching NHI identity with the official death registrations on a monthly basis.

#### Data quality

The registry is subject to quality improvement processes which involve continual auditing of existing data and updating of the registry entries as appropriate.

Registry reports are generated on a monthly and quarterly basis and these are analysed for variances in the numbers of cases and patient outcomes. These results are compared with international data from EAS that are similar to Wellington Free Ambulance.

#### **Ethical review**

The OHCA Registry has been approved by the New Zealand Health and Disability Ethics Committee (Aotearoa New Zealand. Paramedic Care Collection (ANZPaCC), 13415).

The registry is also subject to EAS internal research governance processes that include a locality review and locality authorisation as per the Standard Operating Procedures for Health and Disability Ethics Committees.

The OHCA Registry is held on a secure server which requires active directory permissions. At no stage is data that could identify individual patients or individual hospitals publicly released from this registry.

#### OHCA flowchart for system effectiveness (attempted resuscitation, all ages, includes EAS witnessed)<sup>A</sup>

Population served		
546,300		
↓		
Cardiac arrest attended 🗕	Cardiac a	rrest not treated
630	DNAR	53
<b>↓</b>	Futile	274
Cardiac arrest treated		
303		
+		
Patient characteristics		
Male sex	188 (19 u	nknown)
Initial shockable rhythm	117 (6 un	known)
Medical aetiology	283	
Witnessed by bystander	135	
Witnessed by EAS	52	
Bystander CPR	191	
Public location	67	
+		
Patient outcomes		
Any ROSC	128	
Survived event	94	
Survival to 30 days	52 (7 un	known)

### OHCA flowchart for system effectiveness (Utstein comparator, includes all ages)<sup>A</sup>

Population served		
546,300		
↓		
Cardiac arrest attended	Cardiac arrest no	t treated
630	DNAR	53
<b>↓</b>	Futile	274
Cardiac arrest treated		
303		
<b>↓</b>		
Bystander witnessed	Other witness	
135	Not witnessed	116
	EAS witnessed	52
<b>↓</b>		
Initial shockable rhythm	Initial non-shockab	e rhythms
75	Asystole	33
	PEA	20
	Non shockable	5
	Unknown	2
<u> </u>		
Patient outcomes		
Any ROSC	44	
Survived event	38	

27 (3 unknown)

Survival to 30 days

## **ABBREVIATIONS**

AED	Automated external defibrillator	EMS	Emergency medical services
CAD	Computer aided dispatch	FENZ	Fire and Emergency New Zealand
CPR	Cardiopulmonary resuscitation	GoodSAM	Good Smartphone Activated Medics
DNAR	Do not attempt resuscitation order	ОНСА	Out-of-hospital cardiac arrest
EAS	Emergency ambulance service	ROSC	Return of spontaneous circulation

### **GLOSSARY OF TERMS**

Adult	Patients aged 15 years or older.
Children	Patients aged less than 15 years.
Community responder	A member of the community who is not part of the EAS service who provides assistance at an OHCA event. For example, a member of the public, or an off duty ambulance officer or an off duty doctor or nurse.
EAS attended	This is the population of all patients following cardiac arrest where EAS personnel attended regardless of whether emergency treatment was provided.
EAS personnel	Emergency ambulance crews dispatched to a medical emergency.
Presumed cardiac aetiology	An OHCA is presumed to be of cardiac aetiology, unless it is known or likely to have been caused by trauma, drowning, poisoning or any other non-cardiac cause.
Resuscitation attempted	Performance of chest compressions (or other emergency care for cardiac arrests secondary to trauma) by responding EAS personnel, or the delivery of a shock at any time (including before ambulance arrival).
Return of spontaneous circulation	The patient shows clear signs of life in the absence of chest compressions for more than 30 seconds. Signs of life include any of the following: normal breathing, palpable pulse, increasing end tidal CO <sub>2</sub> or active movement.
Rural and remote service area	Assigned according to the Geographic Classification for Health. Rural includes: R1, R2 and R3.
Shockable rhythm	Ventricular fibrillation, ventricular tachycardia or unknown shockable (AED).

Specific rates	Rates for specific segments/groups of the population (e.g. sex, age, ethnicity).
Survival to 30- days	The patient is alive at 30-days post-OHCA event.
Survived event	The patient has sustained ROSC to handover at hospital.
Urban area	Assigned according to the Geographic Classification for Health. Urban includes: U1 and U2.
Witnessed event	A witnessed cardiac arrest is one that is seen or heard by another person

### SOURCES

Ball, S. et al, St John Western Australia: OHCA statistics 1 July 2023 to 30 June 2024. 2025: Personal Communication. Email 16 January 2025.

Dantanarayana, A. et al, *Ambulance Victoria:* OHCA statistics 1 July 2023 to 30 June 2024. 2025: Personal Communication. Email 29 January 2025.

Grasner, J–T., Bray, J.E., Nolan, J.P. et al., *Cardiac arrest and cardiopulmonary resuscitation outcome reports*: 2024 update of the Utstein Out–of–Hospital Cardiac Arrest Registry template, Resuscitation, https://doi.org/10.1016/j.resuscitation.2024.110288

National Ambulance Service. *Out-of-Hospital Cardiac Arrest Register 16th Annual Report 2023*. 2024; Available from: https://www.hse.ie/eng/services/news/newsfeatures/out-of-hospital-cardiac-arrest-register-ohcar-/ohcar-annual-report-2023.pdf

The University of Warwick. *Out-of-Hospital Cardiac Arrest Overview: English Ambulance Services* 2023. Accessed 2024; Available from https://warwick.ac.uk/fac/sci/med/research/ctu/trials/ohcao/publications/epidemiologyreports/ohcao\_epidemiological\_report\_2023\_-\_england\_ overview.pdf

Whitehead, J., Davie, G., de Graaf, B., Crengle, S., Fearnley, D., Smith, M., Lawrenson, R., Nixon, G. *Defining rural in Aotearoa New Zealand: a novel geographic classification for health purposes*. N Z Med J. 2022 Aug 5;135(1559):24–40.

Young, R., Public Health-Seattle & King County, Division of Emergency Medical Services, King County, Washington, USA: OHCA statistics 1 July 2023 to 30 June 2024. 2025: Personal Communication. Email 23 January 2025.




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