VICTORIAN AMBULANCE STEMI QUALITY INITIATIVE (VASQI)

ANNUAL REPORT
2024/25

Ambulance Victoria®

Pictured left to right:
Eden Bartlett, Karen Murdoch, Ashanti Dantanarayana and Georgia Rosin

ACKNOWLEDGEMENT OF COUNTRY

Ambulance Victoria (AV) 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 an emerging human right.

At AV, 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.

We gratefully acknowledge the following people for their assistance in the collection of registry data and production of this report:

Karen Murdoch, Georgia Rosin, Jonathan Ong, Eden Bartlett, Jesslyn Wijaya, Holly Azzopardi, Jessie Collins, Louise Cornell, Molly Hoyne, Reva Jeboo, Tamika Larkin, Amy Lingard, Bernadette Miller, Vanessa Powter, Lauren Ring, Michaela Ryan, Mikayla Studley, Sahra Brown, Delaney Biglin, Claire Leatherbarrow, Kimberley Magain, Kathryn Wilson, Alyce Drum, Belinda Delardes, Tara Ralph, Jenna Schwarz, Brett Whibley, Devika Damodarasamy, Danny Pham, Emily Nehme, Ashanti Dantanarayana and Ziad Nehme.

AV's spatial services team:
Jason Muller.

VASQI steering committee members:
A/Prof Ziad Nehme ASM (Chair), Prof Dion Stub, A/Prof David Anderson, Prof John McNeil AO, Prof Derek Chew, Ross Salathiel, A/Prof Mark Horrigan, Prof Jeff Leftovits, Dr Diem Dinh, Haroula Vaniotis (former member) and Angela Brennan (former member).

Victorian hospitals for provision of survival outcomes includes:
Alfred Health, Monash Health, Peninsula Health, Eastern Health, Melbourne Health, Western Health, Northern Health, St Vincent's, Ballarat Health Services and Bendigo Health.

VASQI would not be possible without the efforts of paramedics, doctors, nurses, data processors and other relevant AV people who manage VASQI data related activities.

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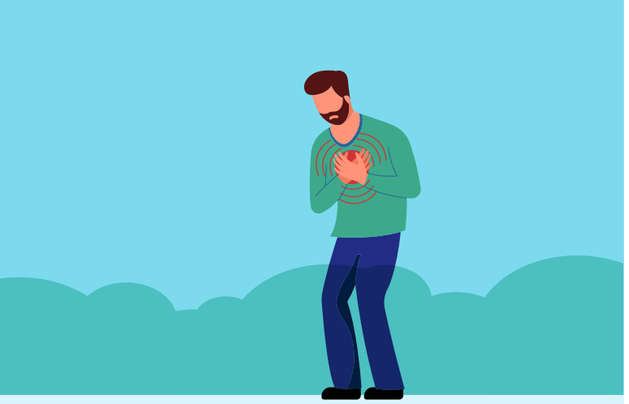


ST-Elevation Myocardial Infarction (STEMI) is a serious type of heart attack that places a substantial burden on the community.

They are associated with a high risk of death and long-term disability, create urgent pressure on emergency and hospital services, lead to significant healthcare costs, and have a lasting impact on patients' quality of life and ability to work.

This burden is especially pronounced in rural and remote areas, where access to specialist cardiac care is often limited.

In Victoria, the combination of advanced pre-hospital diagnostics, early intervention, and streamlined coordination with hospital care has resulted in faster treatment and better clinical outcomes.

Prompt and effective prehospital management of STEMI cases play a crucial role in lowering mortality rates and reducing the risk of long-term complications.

A message from the **leadership team**

Cardiovascular diseases remain a leading cause of morbidity and mortality worldwide, with myocardial infarction (MI), or 'heart attack', representing one of the most life-threatening conditions within this spectrum.

STEMI accounts for approximately one quarter of all MI and warrants particular attention due to its acute nature, rapid progression, and significant impact on the community.

Any delay in diagnosis or treatment can result in extensive myocardial damage and life-threatening complications, including heart failure and cardiac arrest.

Paramedics serve as the first point of contact in the chain of survival for individuals experiencing STEMI. They are uniquely positioned to perform early assessment, initiate prehospital management, and ensure rapid transport to facilities capable of delivering definitive care. Since 2018, the Victorian Ambulance STEMI Quality Initiative (VASQI) has been instrumental in monitoring and improving the STEMI patient journey across this system of care.

Over this time, VASQI has informed numerous enhancements to care at AV, including the expansion of prehospital fibrinolysis in regional areas, consider the administration of pre-hospital heparin and the optimisation of hospital pre-notification processes.

The VASQI also supports a crucial quality-improvement feedback loop that ensures AV continues to deliver world-leading care to patients experiencing STEMI.

This report aims to illuminate the significant burden of STEMI within our communities and highlight the critical importance of timely recognition and early intervention by ambulance first responders and paramedics. Between 1 July 2024 and 30 June 2025, paramedics diagnosed 2,874 patients with STEMI.

More than 205 received definitive prehospital fibrinolysis prior to hospital arrival, while the remaining patients were transported directly to specialist cardiac facilities for primary percutaneous coronary intervention (pPCI).

Paramedics play a crucial role in this system-of-care acting as the gatekeepers to emergency heart attack care in Victoria.

The quality of AV's care is demonstrated through these results. A 12-lead electrocardiogram (ECG) was acquired within 10 minutes for 87 per cent of patients, and 80 per cent received an optimal bundle of care – comprising timely ECG acquisition, aspirin administration when appropriate, hospital pre-notification, and transport to a PCI-capable facility. Importantly, more than 91 per cent of patients experiencing severe pain achieved meaningful pain relief before arriving at hospital.

As a research-focused organisation, we are equally driven by the promise of cutting-edge science and emerging innovations in STEMI care.

Our paramedics are internationally recognised for their leadership in prehospital research, contributing to landmark randomised controlled trials such as AVOID (oxygen titration in STEMI) and AVOID-2 (lidocaine as an alternative to opioids for pain management). In 2024, we launched the PANDA trial, a major study comparing two commonly used vasoactive agents in the treatment of cardiogenic shock. Enrolling nearly 1,200 patients, the trial will assess whether noradrenaline is superior to adrenaline in the prehospital management of cardiogenic shock.

The VASQI acts as a critical backbone for all our trials, providing the robust data infrastructure required to advance science efficiently and cost-effectively.

To that end, we are pleased to present the findings of the 2024/25 VASQI Annual Report, showcasing the exceptional achievements of first responders and paramedics in the delivery of acute cardiac care in Victoria. These results reflect not only the expertise of our clinicians, but also the collective determination of an organisation committed to saving lives and continually elevating the standard of prehospital cardiac care.

A/Professor Ziad Nehme ASM

Director, Centre for Research & Evaluation

Chair, VASQI

A/Professor Tegwyn McManamny

Executive Director, Quality and Clinical Innovation

Professor Dion Stub

Cardiology Medical Advisor and VASQI Steering Committee Member

Executive summary:
2024/25 key highlights

AV is committed to the care of STEMI patients

2,874
STEMI cases attended by AV in 2024/25

30%
occurred in rural and regional areas of Victoria

75%
had one or more risk factors for heart disease

71%
were male

the median age was **68 years**

Recognition and prehospital care

12.1 mins
The median AV response time to STEMI statewide

80%
of patients received an optimal bundle of care*

92%
of STEMI cases were dispatched as Code 1 lights and sirens

33%
of patients experienced warning symptoms for > 60 mins before calling Triple Zero (000)

91%
of patients achieved effective pain relief

87%
of patients had their first 12-lead ECG within 10 minutes of AV arrival

** Bundle of care consists of four key performance targets, a 12-lead ECG within 10 minutes of arrival, aspirin administration unless contraindicated, hospital pre-notification and transport to a PCI-capable hospital.*

Reperfusion strategy

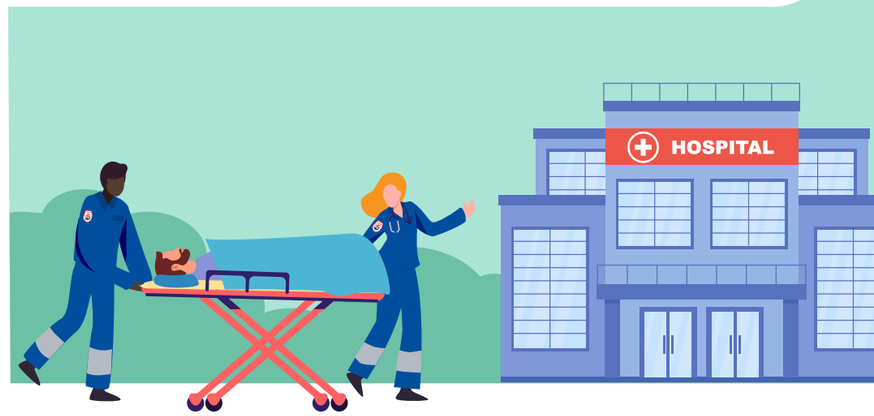
205
patients received prehospital thrombolysis (PHT) by paramedics

87%
of cases received PHT within 45 minutes of STEMI diagnosis

91%
of cases achieved hospital pre-notification

29.0 mins
Median time from STEMI diagnosis to prehospital thrombolysis

97%
of patients were transported to Primary Percutaneous Coronary Intervention (pPCI) capable hospitals



Unless otherwise stated all analyses exclude patients experiencing a cardiac arrest and Advanced Care Directive (ACD).

How we respond to **STEMIs in Victoria**

The state of Victoria has an estimated population of seven million spread over almost 227,000km^2, of which six and a half million are people aged 18 years or over and live in the state's capital city of Melbourne. AV is the state-wide Emergency Medical Service (EMS) provider who responds to emergency incidents using a two-tiered model consisting of Advanced Life Support (ALS) and Mobile Intensive Care Ambulance (MICA) paramedics. The care of STEMI patients is informed by evidence-based treatment protocols detailed in AV's Clinical Practice Guidelines (CPGs).

Both ALS and MICA crews are trained to assess, recognise, and promptly manage patients experiencing STEMI. Early recognition is initiated with the rapid acquisition and interpretation of a 12-lead ECG. Once identified, additional clinical support from a MICA paramedic is promptly requested, especially in haemodynamically compromised patients or where PHT may be required due to distance from a PCI-capable hospital.

As a precaution, defibrillation pads are applied early to prepare for potential life-threatening arrhythmias. AV paramedics also initiate pharmacological management, including the administration of aspirin, nitrates and opioids for the treatment of anginal symptoms.

Paramedics play a critical role in the triage of STEMI patients to definitive care. For patients within 60 minutes of primary PCI facilities, patients are transferred directly by road or air with wireless ECG transmission and hospital pre-notification. There are 17 hospitals throughout Victoria where AV transports STEMI patients that perform primary PCI (thirteen public and four private). If transport to a PCI-facility is not feasible within 60 minutes, PHT is considered for patients with STEMI where not otherwise contraindicated to therapy. ALS paramedics administer PHT following consultation with a senior AV paramedic or an on-call cardiologist, whereas MICA paramedics can administer PHT without consultation.

The PHT pathway consists of intravenous tenecteplase administration, followed by transfer to a PCI-capable hospital, including aeromedical retrieval if the transport time is prolonged.

STEMI

Identify acute infarct

Action
- Transmit ECG
- Request MICA (ALS)
- Treat as per CPG A0401 **Acute coronary syndromes**

Assess
- Time to PCI
- Inclusion/exclusion criteria for PHT
- Contraindications

Urgent transport to PCI facility
- Time to PCI < 1 hour ***OR*** Does not meet inclusion criteria
- Meet one or more exclusion criteria

Action
- Transport with hospital notification and ECG transmission
- Heparin IV bolus 4000 IU
- Repeat heparin IV bolus 1000 IU at one hour intervals

Prehospital thrombolysis
- Time to PCI > 1 hour ***AND*** All inclusion criteria met
- No exclusion criteria met

Action
- Consult for relative contraindications e.g. low weight, age with MICA or clinician
- Intravenous access x 2, normal saline to keep vein open
- Complete checklist and read information to patient
- Tenecteplase intravenous bolus
- Heparin intravenous bolus 4000 units
- Repeat heparin intravenous bolus 1000 units at one hour intervals
- Transport with hospital notification
- Transmit subsequent 12-lead ECG

Victorian Ambulance STEMI Quality Initiative **Registry**

VASQI was established by AV in 2018 following the successful implementation of the PHT initiative across regional Victoria. The VASQI incorporates prehospital clinical and operational data, communications centre dispatch records, and hospital follow-up data for STEMI events in Victoria where AV is in attendance.

Death records from the Victorian Registry of Births, Deaths and Marriages are also collected. The purpose of VASQI is to monitor and improve the quality-of-care provided to STEMI patients, including those who receive PHT by paramedics in regional Victoria.

The VASQI 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, the care provided by paramedics (including compliance with evidence-based guidelines), adverse events, and patient outcomes. In addition, VASQI provides a quality feedback loop to stakeholders, including paramedics, educators, and team managers.

Cases included in the VASQI undergo routine audit by team managers to identify performance opportunities. Similarly, the VASQI registry provides senior leaders across Victoria with details of performance exceptions every month.

This report and the VASQI registry are administered by the Centre for Research and Evaluation at AV.

Eligibility

The VASQI captures data on all adult paramedic-suspected STEMI patients where AV is in attendance.

STEMI identification at AV is based on clinical features of acute myocardial infarction and the presence of 12-lead ECG criteria in two or more anatomically contiguous leads, including:

1. ≥2.5 mm ST elevation in leads V2-3 in men <40 years of age or ≥2 mm for men ≥ 40 years of age
2. ≤1.5 mm ST elevation in leads V2-3 in women
3. ≥1 mm ST elevation in any other, or
4. new-onset left bundle branch block.

Paramedics are supported by the computerised interpretation of the 12-lead ECG when diagnostic uncertainty exists.

VASQI inclusion and exclusion criteria

Inclusion criteria (any of the following)

- Patients aged ≥18 years where STEMI is suspected by paramedics
- Occurs in the state of Victoria where AV is the primary care giver. STEMIs occurring in the neighbouring states of New South Wales and South Australia are considered for inclusion where AV is documented as the primary care giver and the patient is transported to a hospital in Victoria.

Exclusion criteria (any of the following)

- ST-elevation on the ECG occurs after arrival at hospital
- Secondary transfers from a hospital facility (except where AV paramedics administer Tenecteplase).

Data quality

The VASQI implements a data quality control process to ensure the accuracy, completeness and consistency of the information collected. Monthly quality control audits assess data accuracy and identify discrepancies that are reviewed and corrected.

Protected Industrial Action occurring between March and September 2024 impacted the completion of electronic patient care records across Victoria. During this time, patient treatment data was collected on paper records, and this impacted both the frequency and quality of data capture for cases during this period. We therefore suggest caution in the interpretation of data during this period.

A story of **survival**

Debbie McCann was grateful to reunite with the paramedics who saved her life.

Debbie McCann, 57, is grateful for every day after a severe heart attack in November 2024 almost took the mother-of-four's life.

It started off as a normal Saturday night with Debbie sitting on the couch, when suddenly pain began radiating throughout her chest and her arms went weak.

A former registered nurse, Debbie immediately knew her life was in danger and asked her husband, Peter, to call Triple Zero (000).

Within 10 minutes the first AV ALS paramedic crew had arrived on scene, and after diagnosing Debbie with a STEMI they requested backup.

After the MICA paramedics arrived, Debbie's condition deteriorated, and she went into cardiac arrest.

Paramedics immediately moved Debbie to the floor where they started cardiopulmonary resuscitation (CPR) and used a defibrillator to provide six shocks.

Crews were able to achieve return of spontaneous circulation and transported Debbie to the Victorian Heart Hospital for specialist care.

Seven months on, Debbie has made a full recovery and is thankful for everyone who helped give her a second chance.

AV ALS paramedic Sarah Braham said Debbie's recovery is remarkable considering the severity of the case.

"A patient who is diagnosed with a STEMI is a time critical emergency as there is a high degree of risk that the patient deteriorates into cardiac arrest – which was the case for Debbie," she said.

"As a team, we knew we needed to act immediately as Debbie's life was at risk.

"When she deteriorated into cardiac arrest, we were able to provide defibrillation, chest compressions, manual ventilation and administer adrenaline and anti-arrhythmic medication to restart Debbie's heart and give her the best chance of survival.

"It was an all hands on deck situation, with every paramedic on scene performing a vital role."

Symptoms of a heart attack can include pain in your chest, arm, shoulder, back, neck or jaw, as well as shortness of breath, dizziness, sweating, nausea or extreme fatigue.

Debbie said she'd never had any heart issues before and was shocked to hear how close she was to losing her life.

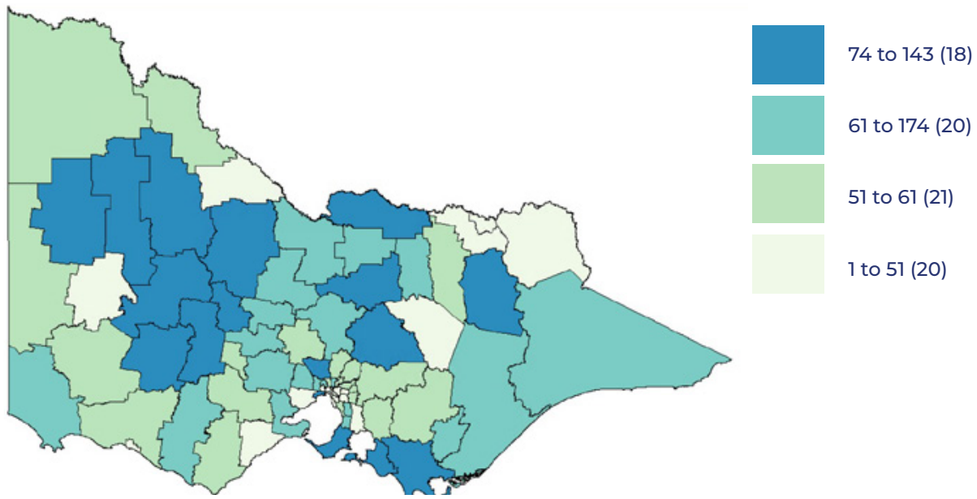
"I thought I was healthy, eating a good diet and getting my health checked regularly," she said.

"You never think anything like this will happen to you and just assume you're in good health. That's why it's so important to get your heart checked and also to listen to your body."

"I'm now feeling really strong and confident and am grateful for the second chance they gave me."

Incidence and demographics

VASQI incidence by local government area



The map depicts the incidence of STEMI per 100,000 population within Local Government Areas (LGAs) of Victoria between July 2018 and June 2025.

The blue LGAs represent those with the highest incidence of STEMIs (≥80 cases per 100,000 population).

Demographics by reperfusion strategy

In 2024/25, 70 per cent of STEMI cases occurred in metropolitan areas of Victoria and 30 per cent of cases occurred in rural and regional areas of Victoria.

30%

of cases occurred in rural and regional areas of Victoria

	PHT	Non PHT
	205 cases	**2,669** cases
	76% male	**70%** male
	median age **65** years	median age **68** years
	1% had limited English proficiency	**4%** had limited English proficiency

STEMI incidence per 100,000 population

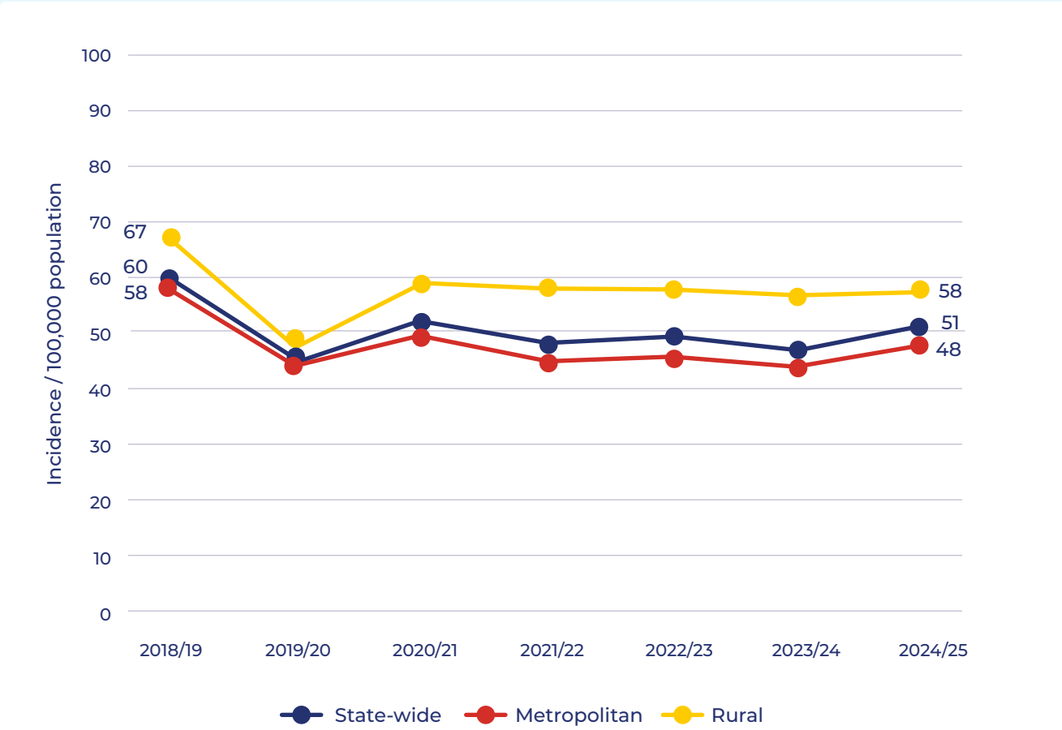
In 2024/25, AV attended 2,874 STEMI cases, a 2.6 per cent decrease on 2023/24. Despite this, there was a modest increase in the state-wide incidence of STEMI cases from 47 cases per 100,000 population in 2023/24 to 51 cases per 100,000 population in 2024/25. STEMI incidence in metropolitan and rural areas also increased in 2024/25.

The age-adjusted incidence was 61 per 100,000 population for 2024/25, an increase from 57 per 100,000 population in 2023/24.

AV attended

2,874 STEMI cases

2.6% decrease on 2023/24



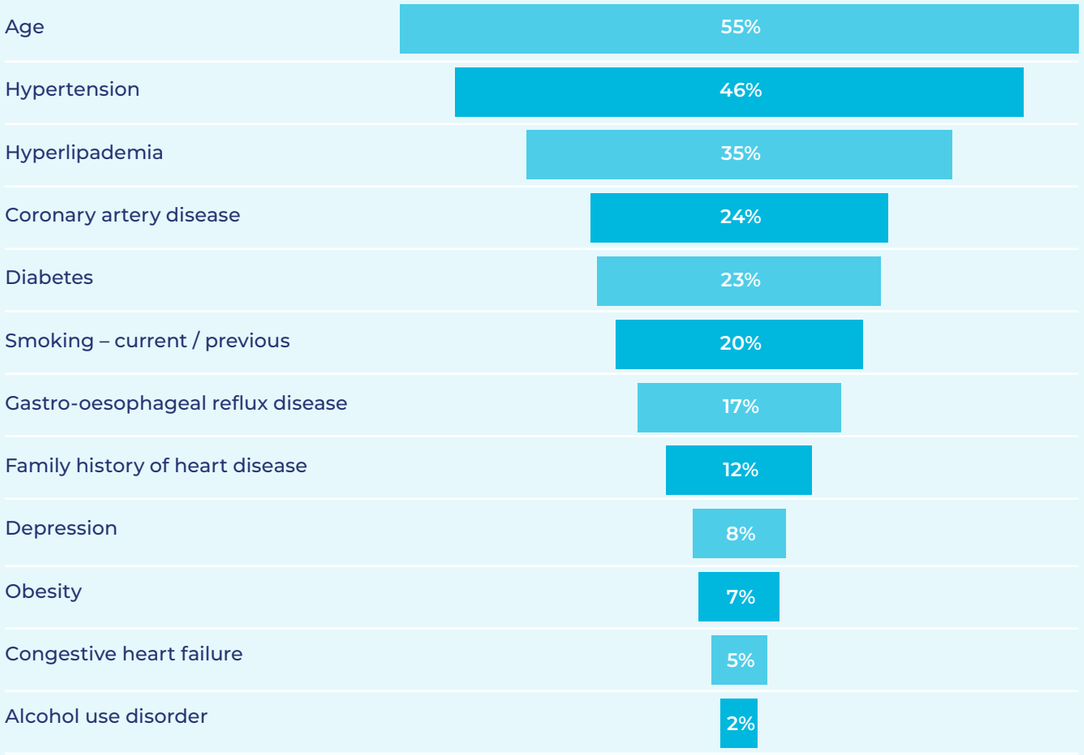
Incidence and demographics

Risk factors

Risk factors increase the risk of STEMI by damaging the coronary arteries. Risk factors such as increased age, obesity and smoking can cause the weakening of artery walls that create an environment that makes a STEMI more likely to occur.

In 2024/25, 75 per cent of STEMI cases had one or more risk factors associated with heart disease including increased age, hypertension, hyperlipidemia and prior coronary artery disease.

	PHT	Non PHT
	74% had ≥1 risk factors for heart disease	**76%** had ≥1 risk factors for heart disease
	15% were haemodynamically compromised on AV arrival systolic blood pressure < 100	**15%** were haemodynamically compromised on AV arrival Systolic Blood pressure < 100
	14% experienced a cardiac arrest at any time	**11%** experienced a cardiac arrest at any time



Recognition and prehospital care

STEMI recognition^

Early activation of AV through Triple Zero (000) results in the dispatch of paramedics who rapidly assess, recognise and manage patients with STEMI. Longer delays to accessing help are associated with poorer outcomes for patients with STEMI.

In 2024/25, the median time between symptom onset and the Triple Zero (000) call was 44 mins (interquartile range, 16, 136). 33 per cent of patients delayed contacting Triple Zero (000) for more than one hour.

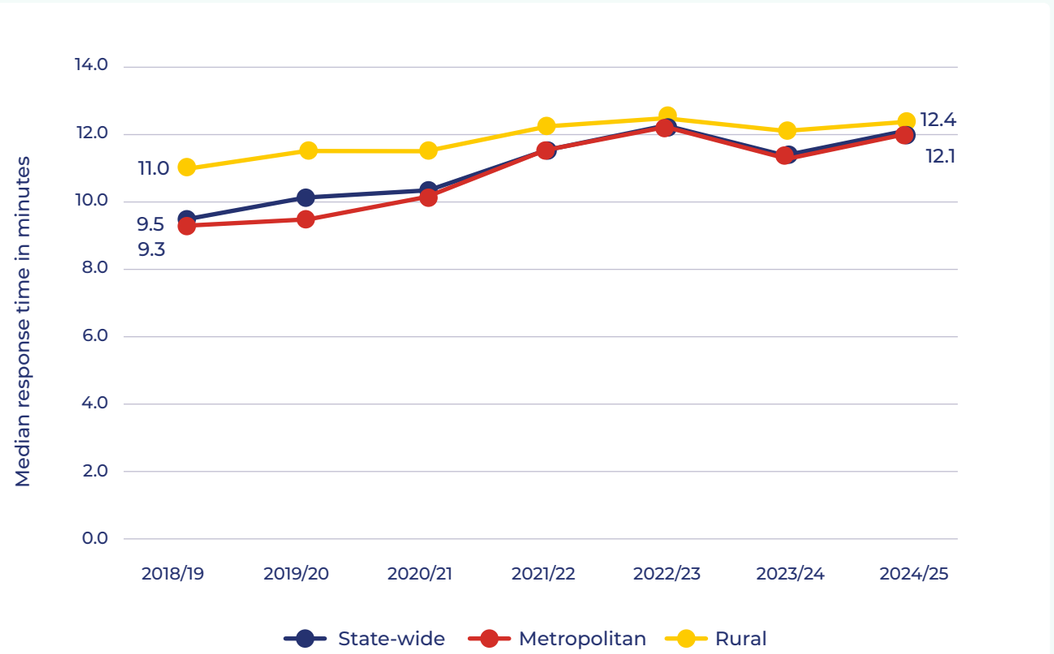
In 2024/25, 92 per cent of STEMI cases were dispatched Code 1 or lights and sirens by emergency dispatchers, which ensures the fastest possible response and treatment. 70 per cent of STEMI cases were responded to within 15 minutes statewide.

92%
of calls were dispatched as Code 1 lights and sirens

12.1mins
the median AV response time to STEMI statewide

70%
were attended by AV within 15 minutes statewide

AV response times to STEMI over the past seven years^



^ Excludes patients experiencing cardiac arrest or those who have an advanced care directive.

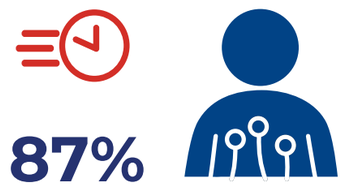
Recognition and prehospital care

Time to first 12-lead ECG

First Medical Contact (FMC) refers to the arrival of the first AV crew at the patient. This time point marks the start of a time-critical cascade of events in the care of STEMI patients, including the acquisition of the 12-lead ECG and treatment with pharmacological therapy.

Internationally, the time between FMC and 12-lead ECG acquisition is recognised as a measure of quality for health systems.

In 2024/25, 87 per cent of patients received a 12-lead ECG within 10 minutes of arrival at the patient. This is a similar result from the previous year and an increase from 78 per cent since 2018/19.



87%

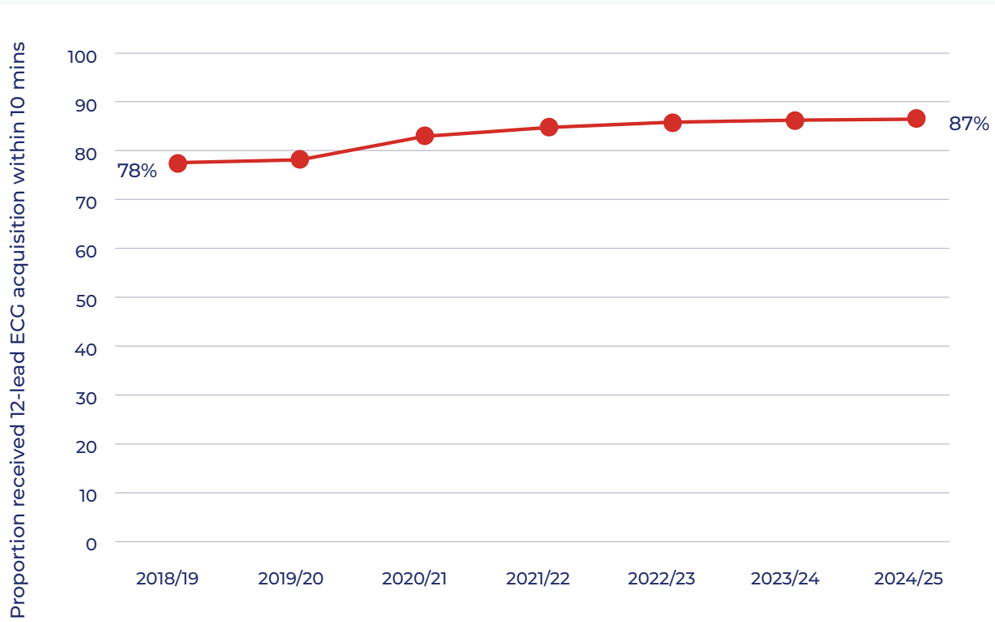
of patients received a 12-lead ECG within 10 minutes of arrival

Pain relief

Until definitive care can be achieved, the treatment of pain and symptoms associated with STEMI is a key focus for paramedics and enhances patient experience and outcomes.

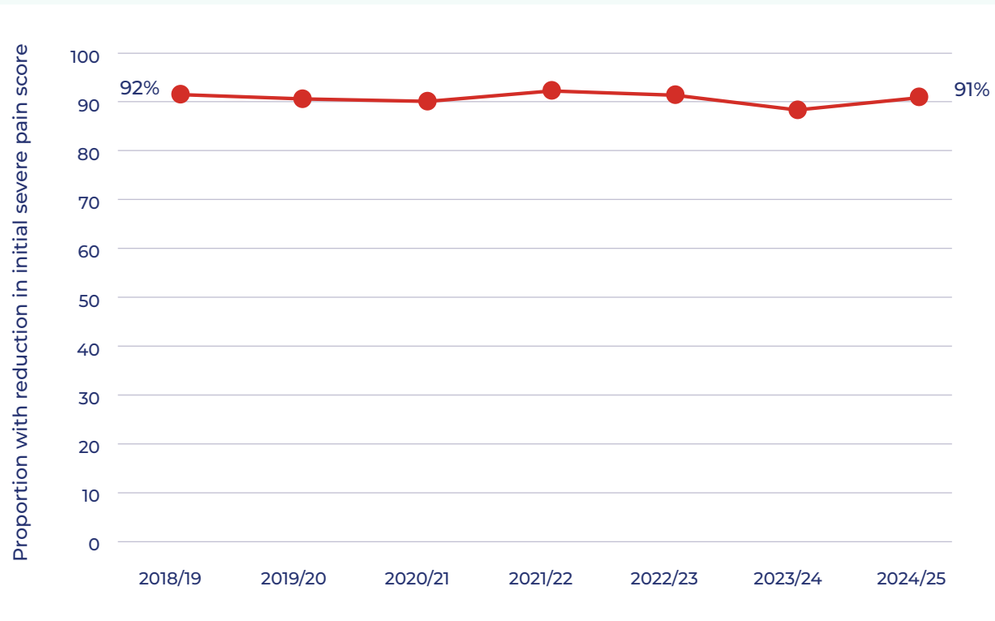
In 2024/25, 91 per cent of patients with an initial severe pain score (>7/10) reported a clinically meaningful reduction of at least two points. This is a small increase from the previous year (89 per cent).

FMC and 12-lead ECG acquisition within 10 minutes of arrival^



^ Excludes patients experiencing cardiac arrest or those who have an advanced care directive.

Reduction in severe pain for STEMI patients^



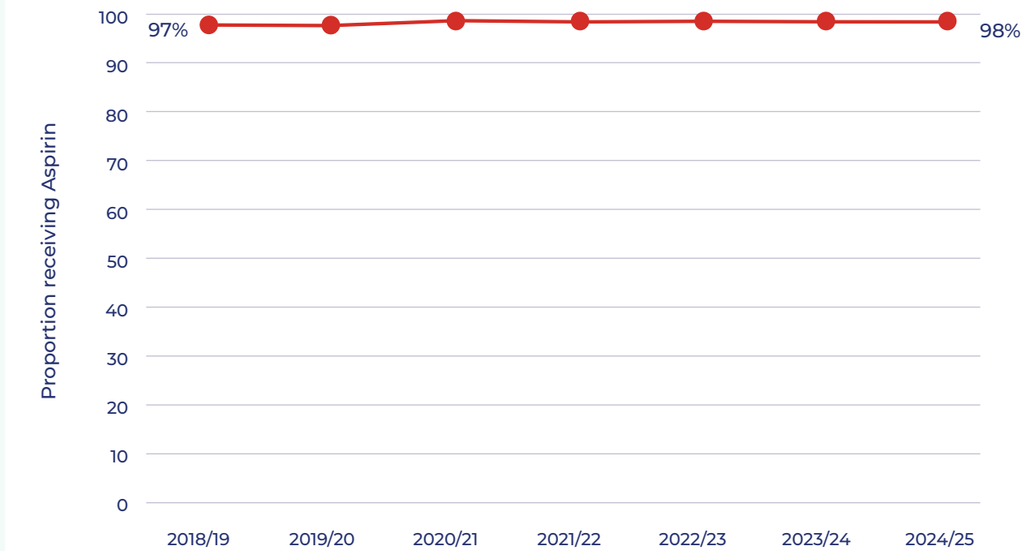
^ Excludes patients experiencing cardiac arrest or those who have an advanced care directive.

Recognition and prehospital care

Aspirin and heparin administration^

In patients with STEMI, both aspirin and heparin play crucial roles in preventing further clot formation and reducing the risk of death.

In 2024/25, 98 per cent of STEMI cases received Aspirin from paramedics or were advised to self-administer aspirin prior to AV arrival during the Triple Zero (000) call.



^ Excludes patients experiencing cardiac arrest and contradictions or those who have an advanced care directive.

In 2024/25,

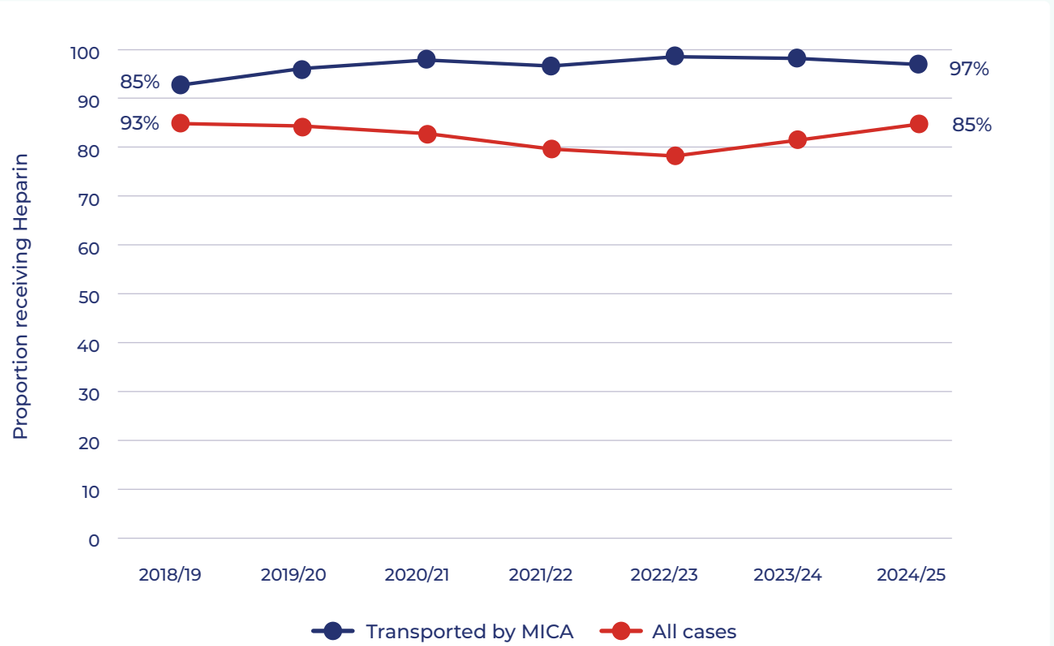
98%

of STEMI cases received aspirin or were advised to administer aspirin

97%

of cases transported by MICA were administered heparin

In 2024/25, 97 per cent of cases transported by MICA were administered heparin, a small decrease from the previous year of 98 per cent. In metropolitan Melbourne, the use of heparin is limited to MICA paramedics.



^ Excludes patients experiencing cardiac arrest and contradictions or those who have an advanced care directive.

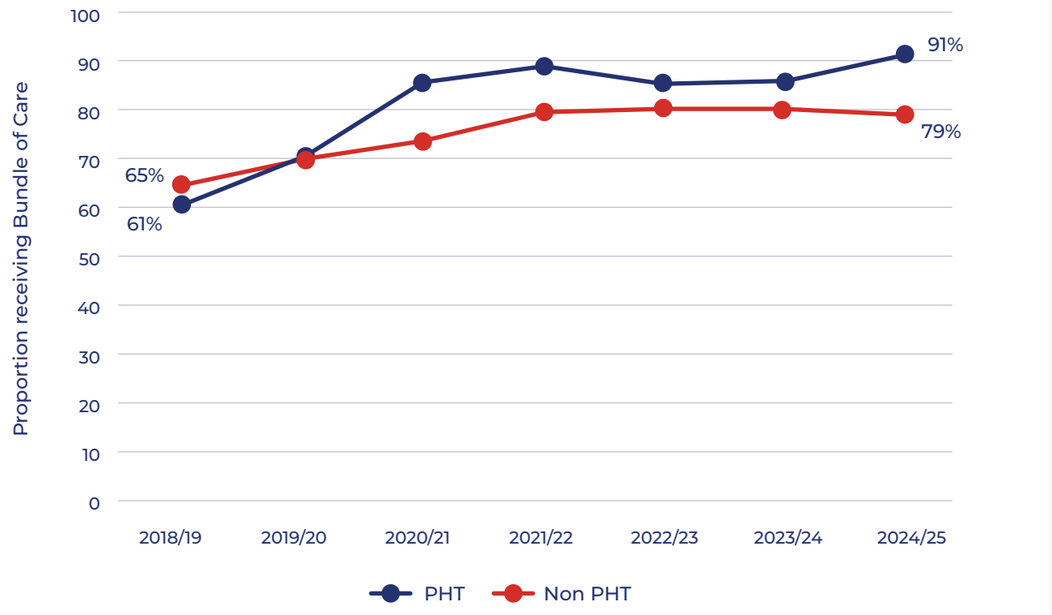
Recognition and prehospital care

Bundle of care performance^

Scientific evidence suggests that elements of prehospital care, including aspirin administration (unless contraindicated), rapid 12-lead ECG acquisition, hospital pre-notification and transport to a PCI facility are associated with improved patient outcomes. Collectively, these four actions, known as the STEMI bundle of care, are monitored by ambulance services internationally as a key measure of quality for patients with STEMI.

In 2024/25, 91 per cent of PHT cases and 79 per cent of non-PHT cases received the STEMI bundle of care. Overall, 80 per cent of patients received STEMI bundle of care. These results were similar to the previous year, but markedly higher than results seen in 2018/19.

Bundle of care by reperfusion strategy^



^ Excludes patients experiencing cardiac arrest and contradictions or those who have an advanced care directive.

	PHT	Non PHT
	91% cases achieved the STEMI bundle of care	**79%** cases achieved the STEMI bundle of care

Reperfusion and outcomes

Management of STEMI centres on restoring blood flow (reperfusion), which can be achieved through pPCI or PHT.

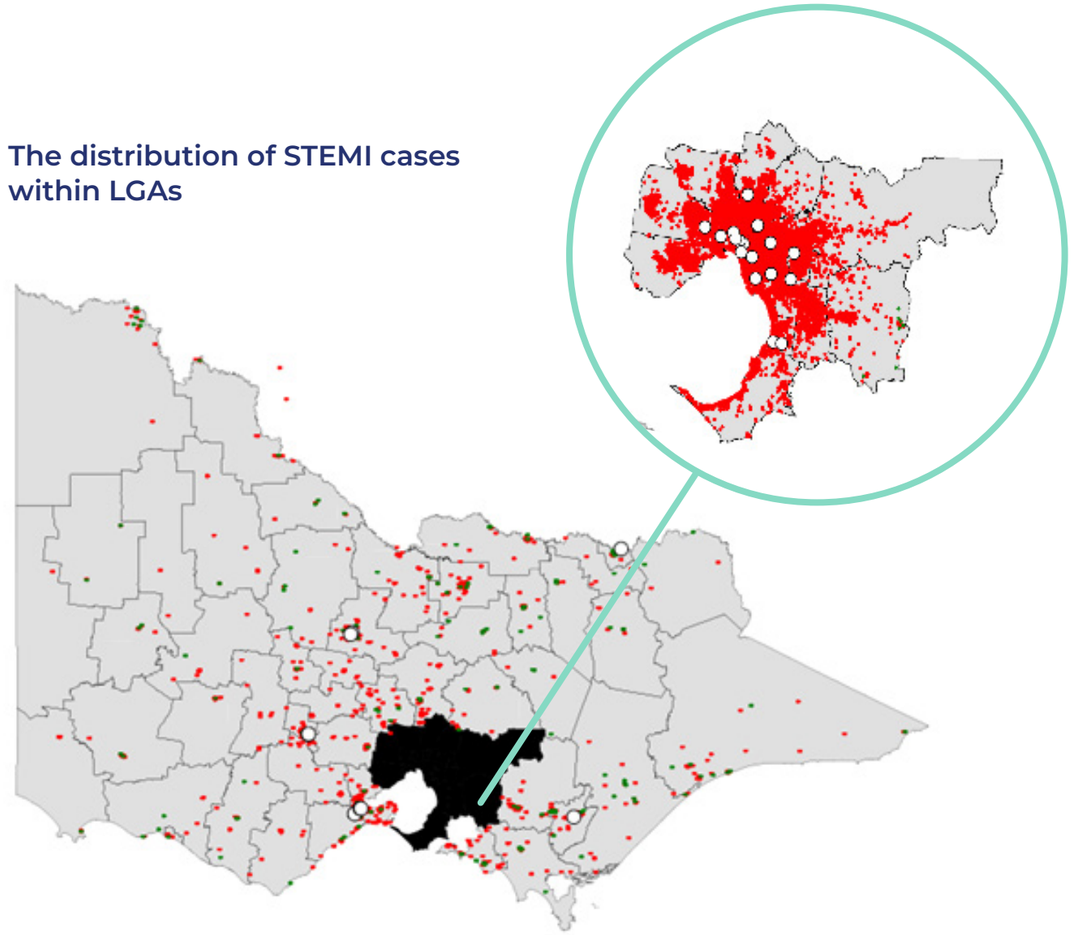
Rapid reperfusion is critical and is associated with reduced heart tissue damage and risk of death. Although pPCI is the preferred treatment because of its higher effectiveness and lower risk profile, intravenous fibrinolysis is administered by paramedics when pPCI cannot be achieved within 60 minutes of arrival. In 2014, AV introduced PHT to minimise treatment delays for regional STEMI patients who lack timely access to pPCI services.

The below map depicts the distribution of STEMI cases within LGAs of Victoria between 2018 to 2025. Red dots represent cases that were transferred for pPCI, and the green dots represent cases that were administered PHT. White dots represent the nearest pPCI capable facility.

Median time from STEMI diagnosis to PHT^

^ Excludes patients experiencing cardiac arrest or those who have an advanced care directive.

The distribution of STEMI cases within LGAs

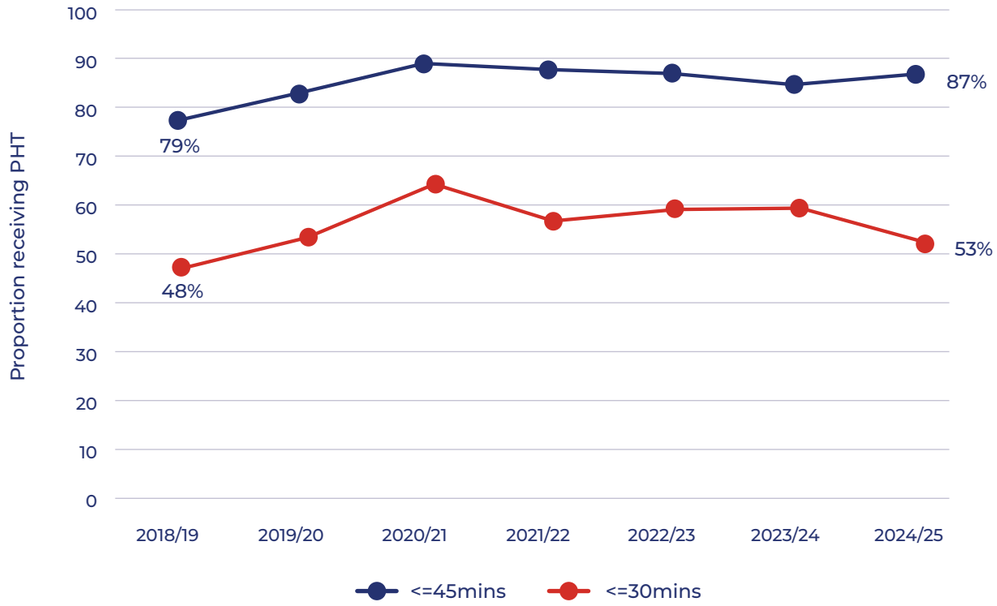


Reperfusion and outcomes

STEMI diagnosis to PHT^

When a patient cannot reasonably be transported directly to a pPCI in under an hour following STEMI diagnosis, PHT may be administered.

In 2024/25, 205 STEMI cases received PHT. Of these, 87 per cent of patients received PHT within 45 minutes of STEMI diagnosis, an increase from the previous year of 84 per cent.



^ Excludes patients experiencing cardiac arrest or those who have an advanced care directive.

Hospital Pre-Notification (PHN)^

AV recommends that paramedics notify the receiving hospital in advance to allow emergency departments to prepare for immediate care upon the patient's arrival.

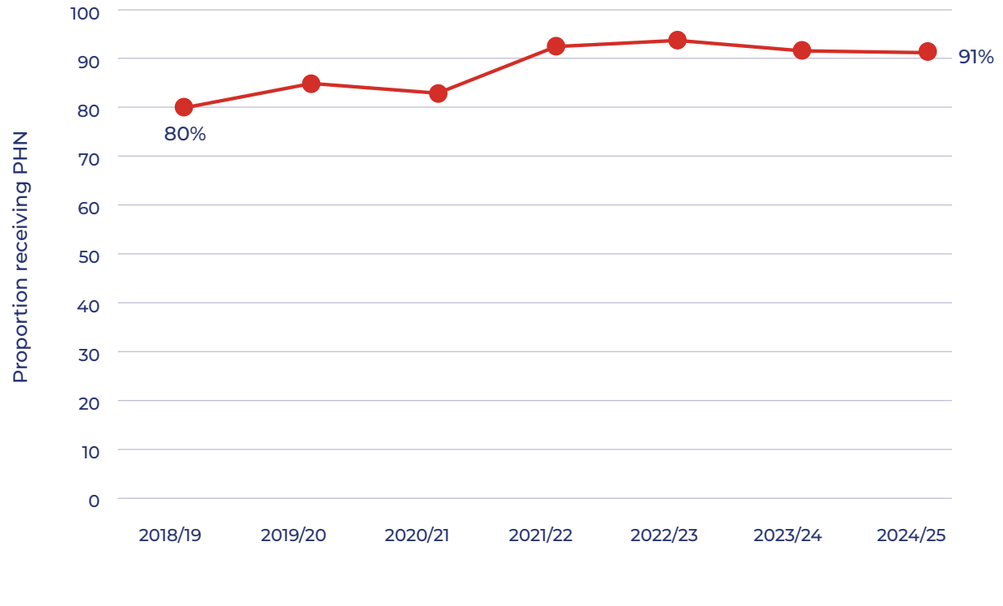
PHN by paramedics has been shown to reduce time to definitive care, including pPCI.

In 2024/25, 91 per cent of STEMI patients were pre-notified prior to hospital arrival. This result was a decrease from the previous year of 92 per cent.

In 2024/25,

91%

of STEMI patients were pre-notified prior to hospital arrival



^ Excludes patients experiencing cardiac arrest or those who have an advanced care directive.

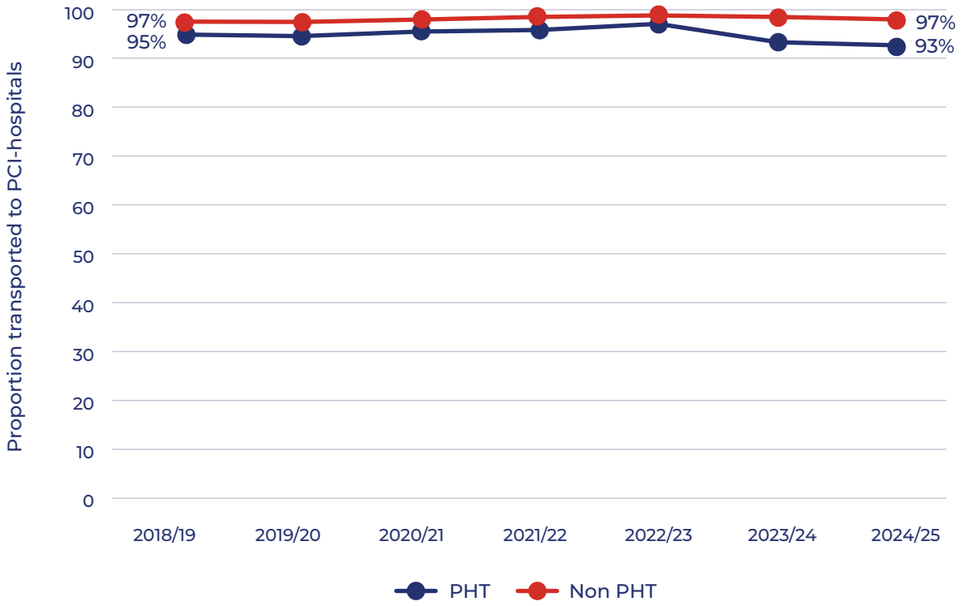
Reperfusion and outcomes

Transport to PCI capable hospital^

In 2024/25, 97 per cent of STEMI cases were transported to PCI-capable hospitals statewide. For patients receiving PHT, 93 per cent were transported directly to a PCI capable hospital. The median time from STEMI diagnosis to arrival at a PCI-capable hospital statewide was 40.3 mins.

The proportion of patients transferred to a PCI-capable hospital within 90 mins of STEMI diagnosis was 12 per cent for patients receiving PHT and 95 per cent for patients transferred for pPCI.

Transport to PCI-capable hospital by reperfusion strategy^



^ Excludes patients experiencing cardiac arrest or those who have an advanced care directive.

Abbreviations

MI	Myocardial Infarction
STEMI	ST-Elevation Myocardial Infarction
EMS	Emergency Medical Services
VASQI	Victorian Ambulance STEMI Quality Initiative
ALS	Advanced Life Support
MICA	Mobile Intensive Care Ambulance
CPGs	Clinical Practice Guidelines
PCI	Percutaneous Coronary Intervention
pPCI	Primary Percutaneous Coronary Intervention
PHT	Pre-Hospital Thrombolysis
ECG	Echocardiogram
ACD	Advanced Care Directive
FMC	First Medical Contact

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