Clinical Practice Procedures:
Cardiac/Pre-hospital cardiac reperfusion

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Date	September, 2024
Purpose	To ensure a consistent procedural approach to pre-hospital cardiac reperfusion.
Scope	Applies to Queensland Ambulance Service (QAS) clinical staff.
Health care setting	Pre-hospital assessment and treatment.
Population	Applies to all ages unless stated otherwise.
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Pre-hospital cardiac reperfusion

September, 2024

The identification of ST-segment elevation myocardial infarction (STEMI) by ambulance clinicians, followed by the prompt administration of a thrombolytic agent or rapid referral to for percutaneous coronary intervention (PCI) is a crucial component of out-of-hospital cardiac care.[1] These clinical interventions are effective in reducing myocardial damage and overall morbidity and mortality.[2,3]

Indications

- Symptoms suggestive of a myocardial infarction (e.g. ongoing ischaemic chest pain)
- 12-Lead ECG consistent with STEMI:
  - Persistent ST-elevation equal to or greater than 1 mm in at least 2 contiguous limb leads **AND/OR**
  - Persistent ST-elevation equal to or greater than 2 mm in at least 2 contiguous chest leads (V1-V6): **AND**
  - Normal QRS width (less than 0.12 seconds); **OR** right bundle branch block (RBBB) identified

For ACP2:

- *Corpuls3* identifies acute [xx] myocardial infarction*

*If STEMI identification is not supported by the *corpuls3*, ACP2's must email the 12-lead ECG to QAS.STEMIgroup@ambulance.qld.gov.au and contact the *QAS Clinical Consultation and Advice Line* (1300 315 280) for decision support.

Contraindications

Absolute contraindications for pre-hospital thrombolysis

- Patient aged less than 18 years
- Modified Rankin Scale equal to or greater than 4
- Ischaemic chest pain greater than 12 hours
- History of terminal illness, or under the management of a palliative care service
- Symptoms suggestive of an acute aortic dissection
- Located **within 60 minutes** to a PCI capable hospital from time of STEMI identification*
- Active bleeding (excluding menstruation) or history of bleeding/clotting disorders
- Significant closed head injury, or facial trauma within the past 3 months
- Prior intracranial haemorrhage
- Ischaemic stroke within the past 3 months
- Known cerebral vascular lesion, shunt or malformation
- Known malignant intracranial neoplasm (e.g. brain tumour)
- Known allergy to tenecteplase

Relative contraindications for QAS pre-hospital thrombolysis

- Ischaemic chest pain greater than 6 hours
- Currently on anticoagulants (e.g. apixaban, dabigatran, rivaroxaban, warfarin)
- Non-compressible vascular puncture (e.g. liver biopsy, lumbar puncture)

Contraindications *(cont.)*

- Major surgery within the past 3 weeks (e.g. surgery requiring general anaesthesia)
- CPR for greater than 10 minutes
- Internal bleeding within the past 4 weeks, or active peptic ulcer
- Suspected pericarditis
- Advanced liver disease
- Hypertension identified at any stage during care (systolic > 180 mmHg or diastolic > 100 mmHg)
- Previous ischaemic stroke, or known intracranial abnormality
- Currently pregnant, or within 1 week postpartum
- Patients aged 75 years, or older
- Known allergy to enoxaparin or clopidogrel
- Acute myocardial infarction in the setting of trauma

Absolute contraindications for PCI

- Patient aged less than 18 years
- Modified Rankin Scale equal to or greater than 4
- Ischaemic chest pain greater than 12 hours
- History of terminal illness, or under the management of a palliative care service
- Symptoms suggestive of an acute aortic dissection

Relative contraindications for PCI

- Nil

*In some instances, the interventional cardiologist may provide case specific advice for ambulance clinicians to administer pre-hospital thrombolysis.

PROCEDURE

1. Confirm the patient is indicated for pre-hospital cardiac reperfusion, specifically:

   a) Symptoms suggestive of a myocardial infarction (e.g. ongoing ischaemic chest pain)

   b) 12-Lead ECG consistent with STEMI:

   - Persistent ST-elevation equal to or greater than 1 mm in at least 2 contiguous limb leads; **AND/OR**
   - Persistent ST-elevation equal to or greater than 2 mm in at least 2 contiguous chest leads (V1-V6); **AND**
   - Normal QRS width (less than 0.12 seconds); **OR** right bundle branch block (RBBB) identified

For ACP2:

- *Corpuls3* identifies acute [xx] myocardial infarction*

* If STEMI identification is not supported by the corpuls3, ACP2's must email the 12-lead ECG to QAS.STEMIgroup@ambulance.qld.gov.au and contact the *QAS Clinical Consultation and Advice Line* (1300 315 280) for decision support.

2. If not already present on scene, request 'code 1' CCP attendance where available. **Requesting a CCP must not delay the commencement of treatment and/or transport**.
3. Complete the *Pre-hospital Cardiac Reperfusion Checklist (July 2024)* to determine if the patient should be managed under the PCI or pre-hospital thrombolysis pathway.

4a PCI Pathway

Patient within 60 minutes to a PCI capable hospital from time of STEMI identification

Y

Patient is indicated for pPCI Referral

To enact this, immediately contact the appropriate hospital using the *QAS pPCI Referral Line* (1300 313 952). The following narrative is suggested when speaking with the interventional cardiologist:

Can I confirm I have contacted [hospital]. My name is [insert name] and I am a [advanced care or critical care] paramedic with the QAS. I have a [xx] your old [sex] that presents with a 12-lead ECG consistent with a [xx] STEMI. The patient has an onset of pain at [time]. The patient has the following absolute contraindications for pre-hospital thrombolysis [list contraindications] and the following allergies [if any]. The patient is currently [taking/not taking] anticoagulants, and/or clopidogrel and/or ticagrelor. The patient's last set of vital signs are [GCS, HR, BP]. The patient weights approximately [weight, kg]. The estimated time at your hospital is [HH:MM]. How would you like me to proceed?

If accepted for pPCI, record and confirm the medication regime requested by the interventional cardiologist. This will typically comprise of heparin AND EITHER ticagrelor OR clopidogrel.

Transport the patient 'code 1' to hospital and pre-notify the hospital's emergency department.

N

Patient is indicated for delayed PCI

To enact this, transport the patient 'code 2' to the closest hospital and pre-notify the receiving hospital's emergency department.

If not already performed, contact the *QAS Consultation & Advice Line* (1300 315 280) who will notify Retrieval Services Queensland.

4b Pre-hospital thrombolysis

If the patient is indicated for pre-hospital thrombolysis, read the statement contained within the Pre-hospital Cardiac Reperfusion Checklist (July, 2024) to the patient and obtain verbal consent›

ACP2

If not already performed, email a photo of the 12-lead ECG annotated with the patient's name, date of birth and weight to QAS.STEMIgroup@ambulance.qld.gov.au. The subject of the email must include your current location and your best contact phone number.

Call the QAS Clinical Consultation and Advice Line (1300 315 280). The following narrative is suggested when speaking with the QAS Consult Line clinician.

"Can I confirm I have contacted the QAS Clinical Consultation and Advice Line? My name is [name] and I am an ACP2. I am currently located in [suburb] which is in [QAS region]. I am phoning for decision-supported thrombolysis. I have a [xx] year old [sex] that presents with a 12-lead ECG consistent with a [xx] STEMI.

I have completed the Pre-hospital Cardiac Reperfusion Checklist, and the patient has no contraindications to pre-hospital thrombolysis. The patient weights [weight, kg]. I have emailed the patients 12-lead ECG to the STEMI group email address; can you please review this and direct me on how to proceed?"

Follow all directions provided by the QAS Consult Line clinician.

CCP

If the patient has no contraindications for pre-hospital thrombolysis, perform appropriate drug checks and administer to the patient the following medications in accordance with the relevant QAS DTP:

(i) Tenecteplase; AND
(ii) Enoxaparin; AND
(iii) Clopidogrel

Transport the patient 'code 2' to hospital, unless altered vital signs are present.

If in rural or remote area, call the *QAS Consultation and Advice Line* (1300 315 280) who will notify Retrieval Services Queensland.

QAS Approved Autonomous pPCI Hospitals

REGION	PUBLIC HOSPITAL	PRIVATE HOSPITAL
Far Northern	**Cairns Hospital**[a] *(24/7)*	
Northern	**The Townsville University Hospital**[a] *(24/7)*	**Mater Private Pilmico Hospital**[a] *(Mon–Fri 0800–1600 hrs)*
Central	**Mackay Hospital**[a] *(24/7)*	
Darling Downs & South West		**St Andrew's Toowoomba Hospital**[a,b] *(24/7)*
Sunshine Coast & Wide Bay	**Sunshine Coast University Hospital**[a] *(24/7)*	**Buderim Private Hospital**[a] *(24/7)* **Sunshine Coast University Private Hospital (Birtinya)**[a] *(24/7)*
Metro North	**The Prince Charles Hospital**[a] *(24/7)* **The Royal Brisbane & Women's Hospital**[a] *(24/7)*	**St Vincent's Private Hospital Northside** *(24/7)* **The Wesley Hospital**[a] *(24/7)*
Metro South	**Princess Alexandra Hospital**[a] *(24/7)*	**Greenslopes Private Hospital**[a] *(24/7)* **Mater Private Hospital Brisbane**[a] *(24/7)*
Gold Coast	**Gold Coast University Hospital**[a] *(24/7)*	**Gold Coast Private Hospital**[a] *(24/7)* **John Flynn Private Hospital**[a] *(24/7)* **Pindara Private Hospital**[a] *(24/7)*

Note: [a] *Identifies hospitals facilitating direct interventional cardiologist referral.*

[b] *Will also be accepting PUBLIC patients until further notice.*

Additional information

- This CPP assumes that all standard acute coronary cares have been provided by the QAS ambulance clinician.
- The *QAS Consultation and Advice Line* **must** be contacted in any of following circumstances prior to initiating interventions detailed in this CPP:
  - Ambulance clinicians require support with 12-lead ECG interpretation or assistance with STEMI identification;
  - Ambulance clinicians are unsure, or doubt exists regarding the eligibility of the patient for pre-hospital cardiac reperfusion;
  - Ambulance clinicians are experiencing difficulties completing the *Pre-hospital Cardiac Reperfusion Checklist (July 2024)*
- Where clinically appropriate, ambulance clinicians should avoid IV cannulation of the right wrist, as this anatomical site is often used by interventional cardiologists for clinical procedures.
- All patients must be regularly reassessed during transport to hospital, with continuous comprehensive monitoring. Ambulance clinicians should have a low threshold for applying defibrillation pads and preparing resuscitation equipment.
- In instances that the interventional cardiologist cannot be reached using the *QAS pPCI Referral Line*, ambulance clinicians must notify the relevant emergency department and advise of a potential STEMI.
- All issues associated with the *QAS pPCI Referral Line* must be reported using the electronic form available on the QAS Portal.
- In instances that clinical interventions requested by the interventional cardiologist are outside the documented QAS Scope of Practice, ambulance clinicians must call the *QAS Consultation and Advice Line* to discuss case specific details.
- Where clinically appropriate, patients with private healthcare insurance should be transported to the private hospital of their choice that has 24/7 pPCI capability. These hospitals do not have fixed geographical boundaries, however, 'time to reperfusion' must be prioritised.

Audit

- All cases involving pre-hospital cardiac reperfusion are subject to clinical audit and review. In instances where there are complications or concerns following the administration of reperfusion medications, clinicians must immediately contact the *QAS Clinical Consultation and Advice Line*.

Data collection and research

- All incidents where a STEMI has been identified by an ambulance clinician are subject to mandatory digital data collection. The submission of this data is the responsibility of the primary patient care officer.
- When completing the patients eARF, ambulance clinicians must do the following:
  - Record the primary diagnosis as 'AMI – STEMI'.
  - Complete all fields within the 'STEMI' tab which is contained within the 'Care' tab in the eARF application.
  - Capture as a clinical image the first 12-lead ECG that was performed. If this doesn't not show a STEMI pattern, an additional image of the first 12-lead ECG where a STEMI pattern is present must also be captured.

Pre-hospital Cardiac Reperfusion Checklist

This form must be printed in colour

Confirm eligibility of patient for pre-hospital cardiac reperfusion

(answer EVERY question)

☐	Myocardial infarction likely from patient history (ongoing ischaemic chest pain)?
☐	Persistent ST-elevation equal to or greater than 1mm in at least 2 contiguous limb leads **AND/OR** Persistent ST-elevation equal to or greater than 2mm in at least 2 contiguous chest leads (V1-V6)?
☐	Normal QRS width (less than 0.12 seconds) or right bundle branch block?
☐	*corpuls*^{3} identifies acute [xx] myocardial infarction on 12-lead ECG*? (ACP 2 only)

If STEMI identification is not supported by corpuls3, ACP 2 clinicians **must email the 12-lead ECG to QAS.STEMIgroup@ambulance.qld.gov.au and contact QAS Clinical Consultation & Advice Line (1300 315 280)*

CONTINUE THROUGH CHECKLIST

MODIFIED RANKIN SCALE	DESCRIPTION
0	No symptoms at all
1	Able to carry out all usual duties and activities
2	Unable to carry out all previous activities, but able to walk without assistance
3	Requiring some help, but able to walk without assistance
4	Unable to walk without assistance and unable to attend own bodily needs without assistance
5	Bedridden, incontinent, and requiring constant nursing care and attention

Identify *absolute* contraindications for both QAS cardiac reperfusion pathways

(answer EVERY question)

☐ Y	☐ N	Patient aged less than 18 years?
☐ Y	☐ N	Modified Rankin Scale equal to or greater than 4? *(refer to table on right)*
☐ Y	☐ N	Ischaemic chest pain greater than 12 hours?
☐ Y	☐ N	History of terminal illness, or under the management of a palliative care service?
☐ Y	☐ N	Symptoms suggestive of an acute aortic dissection?

YES TO ANY → **Transport to hospital, provide prenotification**

NO TO ALL

Identify *absolute* contraindications for pre-hospital thrombolysis

(answer EVERY question)

☐ Y	☐ N	Active bleeding (excluding menstruation) or history of bleeding/clotting disorders?
☐ Y	☐ N	Significant closed head injury, or facial trauma within the past 3 months?
☐ Y	☐ N	Prior intracranial haemorrhage?
☐ Y	☐ N	Ischaemic stroke within the past 3 months?
☐ Y	☐ N	Known cerebral vascular lesion, shunt or malformation?
☐ Y	☐ N	Known malignant intracranial neoplasm (e.g. brain tumour)?
☐ Y	☐ N	Known allergy to tenecteplase
☐ Y	☐ N	Located **within 6o minutes** of a PCI capable hospital from time of STEMI identification?*

If unsure to any question, call the *QAS Clinical Consultation & Advice Line* (1300 315 280)

**In some instances, the interventional cardiologist may provide case specific advice for ambulance clinicians to administer pre-hospital thrombolysis.*

YES TO ANY → **PCI PATHWAY**

CONTINUE TO PAGE 2

NO TO ALL

Identify *relative* contraindications for QAS pre-hospital thrombolysis

(answer EVERY question)

☐ Y	☐ N	Ischaemic chest pain greater than 6 hours?
☐ Y	☐ N	Currently on anticoagulants (e.g. apixaban, rivaroxaban, warfarin), **OR** ticagrelor **OR** clopidogrel?
☐ Y	☐ N	Non-compressible vascular puncture (e.g. liver biopsy, lumbar puncture)?
☐ Y	☐ N	Major surgery within the past 3 weeks? (e.g. surgery requiring general anaesthesia)
☐ Y	☐ N	CPR for greater than 10 minutes?
☐ Y	☐ N	Internal bleeding within the past 4 weeks, or active peptic ulcer?
☐ Y	☐ N	Suspected pericarditis?
☐ Y	☐ N	Advanced liver disease?
☐ Y	☐ N	Hypertension identified at any stage during care (systolic > 180 mmHg or diastolic > 110 mmHg)?
☐ Y	☐ N	Previous ischaemic stroke, or known intracranial abnormality?
☐ Y	☐ N	Currently pregnant, or within 1 week postpartum?
☐ Y	☐ N	Patients aged 75 years, or older?
☐ Y	☐ N	Known allergy to enoxaparin or clopidogrel?
☐ Y	☐ N	Acute myocardial infarction in the setting of trauma?

YES OR **UNSURE** TO ANY → **Contact the *QAS Clinical Consultation & Advice Line* (1300 315 280)**

NO TO ALL

PRE-HOSPITAL THROMBOLYSIS PATHWAY

CONTINUE TO PAGE 2

Pre-hospital Cardiac Reperfusion Checklist

PCI PATHWAY

Is the patient located **within 60 minutes** to a PCI capable hospital from time of STEMI identification?

NO → Patient indicated for delayed PCI

- Transport to closest and most appropriate hospital **AND**
- Call *QAS Consultation & Advice Line* (1300 315 280) who will notify Retrieval Services Queensland

YES → Patient indicated for pPCI referral

Gather the following information to provide to the interventional cardiologist

☐
- Patient demographics
- 12-lead ECG findings
- Duration of pain [HH:MM]
- Any absolute contraindications for pre-hospital thrombolysis *(refer to page 1)*
- If patient is currently on or allergic to anticoagulants, ticagrelor or clopidogrel
- Any known allergies
- Most recent vital signs
- Patient weight
- Estimated time of arrival at hospital

Proceed with pPCI referral

☐	Call the *QAS pPCI Referral Line* (1300 313 952) and contact the relevant interventional cardiologist
☐	Provide the interventional cardiologist the information above
☐	Record and confirm the medication regime requested: ____ units of heparin (IV); ____ mg of ticagrelor (oral); **OR** ____ mg of clopidogrel (oral)
☐	Determine patient trajectory: 1. Direct to cath-lab; **OR** 2. Emergency department
☐	Perform drug checks and administer medications as directed
☐	Transport code 1 to hospital

PRE-HOSPITAL THROMBOLYSIS PATHWAY

Read to the patient the following statement

- *"It is likely that you are having a heart attack. With your consent, I would like to administer you a drug called tenecteplase that will assist in restoring blood flow to your heart.*
- *Before I administer this medication, I need to let you know the potential serious side effects that can occur in a small number of patients:*
  - *The most serious risk is a stroke which affects approximately 1% of patients.*
  - *There is also a small risk of major bleeding which occurs in approximately 4% of patients.*
- *Administering this medication is supported by national and international cardiology guidelines and the sooner you receive this medication, the lower your risk is of having long-term heart damage. Receiving this medication can significantly improve your chance of survival.*
- *Do you consent to this medication?"*

Verbal patient consent obtained?

NO
- If unable to consent, call *QAS Clinical Consultation & Advice Line* (1300 315 280)
- Transport to hospital and provide pre-notification

YES

Proceed with pre-hospital thrombolysis

ACP 2		CCP	
☐	If not already performed, email the 12-lead ECG with the patient's name, date of birth and weight to qas.stemigroup@ambulance.qld.gov.au	☐	Perform drug checks and administer the patient the following medication: • Weight base dose of tenecteplase (IV) • 30 mg of enoxaparin (IV) • 300 mg of clopidogrel (oral) • 1 mg/kg (up to max 100 mg) of enoxaparin subcutaneously 15 minutes after IV enoxaparin dose
☐	Contact *QAS Clinical Consultation & Advice Line* (1300 315 280)	☐	Transport code 2 to hospital unless altered vital signs
☐	Below, record the medication regime requested by the consult line clinician: ____ mg of tenecteplase (IV); ____ mg of enoxaparin (IV); ____ mg of clopidogrel (oral); ____ mg of enoxaparin subcutaneously 15 minutes after IV enoxaparin dose	☐	If in rural or remote locations, call *QAS Consultation & Advice Line* (1300 315 280) who will notify Retrieval Services Queensland
☐	Perform drug checks and administer medications as directed		
☐	Transport code 2 to hospital unless altered vital signs		