Pathway for Acute Coronary Syndrome Assessment (PACSA)

**Summary** PACSA outlines how to assess and manage patients with suspected acute coronary syndrome (ACS).

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**Branch contact** (02) 9464 4711

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**Audience** All Clinical Staff; Emergency Department Staff; Cardiology Services
PATHWAY FOR ACUTE CORONARY SYNDROME ASSESSMENT (PACSA)

PURPOSE
The Pathway for Acute Coronary Syndrome Assessment (PACSA) outlines how to assess and manage patients with suspected acute coronary syndrome (ACS).

It has been designed to standardise practice throughout the variety of health services operating in NSW. PACSA will be utilised in rural, remote and metropolitan clinical environments.

PACSA was developed to replace the 2011 NSW Health Policy Directive PD2011_037 Chest Pain Evaluation (NSW Chest Pain Pathway).

KEY PRINCIPLES
The first step in PACSA is to identify patients with ST- elevation myocardial infarction (STEMI) who require reperfusion.

If no STEMI is identified, a sequence of risk assessments is undertaken to determine a patient’s overall risk and direct their care. This sequence comprises:

- Clinical Risk Assessment
- Troponin Risk Assessment
- Electrocardiogram (ECG) Risk Assessment
- Summative Risk Assessment – an integration of the findings of the above assessments which also allows for further expert clinical judgement.

These steps are described in detail in the Pathway for Acute Coronary Syndrome Assessment (PACSA) Clinical Practice Guide in the section entitled: How to use PACSA.

USE OF THE GUIDELINE
PACSA consists of four documents:

- PACSA Flowchart (NH700422)
- PACSA Checklist (NH700420)
- PACSA STEMI Reperfusion Flowchart (NH700423)
- PACSA STEMI Reperfusion Checklist (NH700421)

The PACSA Flowchart and PACSA STEMI Reperfusion Flowchart outline each step of management. Each Flowchart has a corresponding Checklist which will be digitized for use within the Electronic Medical Record.
The PACSA Flowchart, the PACSA STEMI Reperfusion Flowchart and corresponding Checklists are available from State Health Forms.

**REVISION HISTORY**

<table>
<thead>
<tr>
<th>Version</th>
<th>Approved by</th>
<th>Amendment notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>September-2019</td>
<td>Susan Pearce, Deputy Secretary, Patient Experience</td>
<td>This Guideline replaces PD2011_037 Chest Pain Evaluation (NSW Chest Pain Pathway)</td>
</tr>
<tr>
<td>(GL2019_014)</td>
<td>and System Performance</td>
<td></td>
</tr>
</tbody>
</table>

**ATTACHMENTS**

1. Pathway for Acute Coronary Syndrome Assessment (PACSA) Clinical Practice Guide
Pathway for Acute Coronary Syndrome Assessment (PACSA)
The Agency for Clinical Innovation (ACI) is the lead agency for innovation in clinical care.

We bring consumers, clinicians and healthcare managers together to support the design, assessment and implementation of clinical innovations across the NSW public health system to change the way that care is delivered.

The ACI’s clinical networks, institutes and taskforces are chaired by senior clinicians and consumers who have a keen interest and track record in innovative clinical care.

We also work closely with the Ministry of Health and the four other pillars of NSW Health to pilot, scale and spread solutions to healthcare system-wide challenges. We seek to improve the care and outcomes for patients by re-designing and transforming the NSW public health system.

Our innovations are:
- person-centred
- clinically-led
- evidence-based
- value-driven.

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## Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS</td>
<td>Acute coronary syndrome</td>
</tr>
<tr>
<td>AMI</td>
<td>Acute myocardial infarction</td>
</tr>
<tr>
<td>AV</td>
<td>Atrioventricular</td>
</tr>
<tr>
<td>CABG</td>
<td>Coronary artery bypass graft</td>
</tr>
<tr>
<td>CAD</td>
<td>Coronary artery disease</td>
</tr>
<tr>
<td>DOAC</td>
<td>Direct oral anticoagulant</td>
</tr>
<tr>
<td>ECG</td>
<td>Electrocardiogram</td>
</tr>
<tr>
<td>ED</td>
<td>Emergency department</td>
</tr>
<tr>
<td>EDACS</td>
<td>Emergency Department Assessment of Chest Pain Score</td>
</tr>
<tr>
<td>HS</td>
<td>High sensitivity</td>
</tr>
<tr>
<td>IV</td>
<td>Intravenous</td>
</tr>
<tr>
<td>LBBB</td>
<td>Left bundle branch block</td>
</tr>
<tr>
<td>LHD</td>
<td>Local health district</td>
</tr>
<tr>
<td>NSTEMI</td>
<td>Non ST-elevation myocardial infarct</td>
</tr>
<tr>
<td>PACSA</td>
<td>Pathway for Acute Coronary Syndrome Assessment</td>
</tr>
<tr>
<td>PCI</td>
<td>Percutaneous coronary intervention</td>
</tr>
<tr>
<td>PE</td>
<td>Pulmonary embolus</td>
</tr>
<tr>
<td>POCT</td>
<td>Point of care testing</td>
</tr>
<tr>
<td>SBP</td>
<td>Systolic blood pressure</td>
</tr>
<tr>
<td>SC</td>
<td>Subcutaneous</td>
</tr>
<tr>
<td>SCRS</td>
<td>State Cardiac Reperfusion Strategy</td>
</tr>
<tr>
<td>SpO₂</td>
<td>Peripheral capillary oxygen saturation</td>
</tr>
<tr>
<td>STEMI</td>
<td>ST-elevation myocardial infarction</td>
</tr>
<tr>
<td>VT</td>
<td>Ventricular tachycardia</td>
</tr>
</tbody>
</table>
What is PACSA?
The Pathway for Acute Coronary Syndrome Assessment (PACSA) set of documents outline how to assess and manage patients with suspected acute coronary syndrome (ACS). It has been designed to standardise practice throughout the variety of health services operating in NSW. PACSA will be utilised in rural, remote and tertiary clinical environments.

It is not designed to be a comprehensive review of the assessment and management of ischaemic heart disease and should be used in conjunction with other clinical resources.

PACSA consists of four documents:

- **PACSA Flowchart (NH700422)**
- **PACSA Checklist (NH700420)**
- **PACSA STEMI Reperfusion Flowchart (NH700423)**
- **PACSA STEMI Reperfusion Checklist (NH700421)**.

The PACSA Flowchart and PACSA STEMI Reperfusion Flowchart outline each step of management with corresponding colour-coded details on the right hand side. Each Flowchart has a corresponding Checklist which will be digitised for use within the electronic medical record.

The PACSA Flowchart, the PACSA STEMI Reperfusion Flowchart and corresponding Checklists are available from State Health Forms.

How was PACSA developed?
PACSA was developed to replace the 2011 *NSW Health Policy Directive PD2011_037 Chest Pain Evaluation (NSW Chest Pain Pathway)*.

The Clinical Excellence Commission reviews adverse events associated with acute coronary syndrome.1 Between July 2015 and June 2017 there were 23 serious incidents, including 13 rated severity assessment code 1 (SAC 1). These were characterised into themes to inform development of a new Pathway.

More than 300 papers relating to cardiac biomarkers and their use in rapid assessment pathways were examined. Australasian and International Chest pain pathways were reviewed.2,3

NSW Pathology was engaged to derive the PACSA troponin values. There were three rounds of consultation with clinicians across NSW. PACSA was tested in rural, regional and metropolitan facilities.

The evidence regarding assessment and management of suspected ACS is rapidly evolving. PACSA will require revision and updating as new information becomes available.
How to use PACSA

The first step in PACSA is to identify patients with ST-elevation myocardial infarction (STEMI) who require reperfusion. If no STEMI is identified, sequential risk stratification is performed using clinical features, troponin testing and electrocardiogram (ECG) findings. The integration of these results provides a summative risk assessment that directs clinical management.

Clinical risk assessment

The definition of high risk is derived from the National Heart Foundation of Australia (NHFA) and the Cardiac Society of Australia and New Zealand (CSANZ).

If a patient does not meet high risk criteria, he/she is assessed for low risk. The Emergency Department Assessment of Chest Pain Score (EDACS) is recommended although there are other low risk tools available. If a patient is not high or low risk, he/she is intermediate risk.

In high risk populations, ACS can present at a younger age. This includes people with diabetes, renal disease, autoimmune disorders, HIV and those with a strong family history of cardiovascular disease. Aboriginal and Torres Strait Islander ethnicity is not an independent risk but is associated with multiple cardiac risk factors. Psychiatric illness is not an independent risk factor for ACS but is also associated with multiple risk factors for ischaemic heart disease and poorer outcomes.

Atypical symptoms of ACS occur more commonly in women, the elderly and people with diabetes. Atypical symptoms include unusual patterns of pain, fatigue and shortness of breath.

Troponin risk assessment

The predictive value of clinical risk scores is increased when used in conjunction with troponin tests and serial ECGs.

An initial elevated troponin result does not necessarily indicate acute myocardial infarction (AMI), however it does indicate that the patient is not low risk. This group has higher all-cause mortality as well as greater risk of ACS.

A repeat troponin is recommended if a patient has had symptoms within the previous six hours or if the patient is high or intermediate risk. For low risk patients, a single troponin may be sufficient if performed more than six hours after cessation of symptoms.

Troponin assays are positive above a defined threshold. High sensitivity troponins also allow for a positive result via a change (delta) either up or down, between repeated troponin tests. This is known as a positive delta troponin and is associated with ischaemic causes of chest pain and high risk. A troponin is positive by delta even if both troponin results are in the normal range.

All laboratory-based troponin tests in NSW use high sensitivity (HS) assays. These should be repeated after two hours to obtain a delta. Absolute delta values are more reliable than relative (or percentage) delta values.

All point of care troponin tests (POCT) in NSW are standard sensitivity assays. POCT results are positive above a defined threshold. They are not currently reproducible enough to allow the use of delta troponin. POCT troponin can be repeated at any time and is useful if positive. A patient should not be discharged unless they have had a negative six hour POCT troponin.
HS and POCT (standard sensitivity) troponin results are not interchangeable.

The threshold and delta levels for all HS troponins used in NSW are listed in PACSA.

**ECG risk assessment**

The initial ECG is performed to identify a STEMI. The criteria for STEMI and STEMI equivalents are shown in PACSA. STEMI equivalents include left bundle branch block (LBBB) in an unstable patient, LBBB with modified Sgarbossa criteria, posterior infarction and de Winter T waves.

STEMI mimics include Wellens and Brugada syndromes. These are both high risk conditions and require cardiology referral, however they are not indications for thrombolysis.\(^\text{18}\)

A minimum of two ECGs are required: one on arrival and another at two hours. ECGs should also be performed when repeating troponin(s) and every 30 minutes if there are ongoing symptoms. Dynamic ECG changes are a marker of high risk.

**Summative risk assessment**

The integration of clinical risk, troponin results and serial ECGs determines a summative risk that directs further management.

Summative risk assessment provides an opportunity for senior decision-makers to modify the risk category determined by PACSA. There continues to be an important role for clinical judgement, as negative troponin results do not exclude coronary artery disease as a cause of symptoms and positive troponin results are not always due to cardiac ischemia.

Shared decision-making and establishing goals of treatment with each patient is the expected standard of care.

**STEMI transfer**

Each local health district (LHD) should facilitate transfer of patients with STEMI in line with the State Cardiac Reperfusion Strategy (SCRS).\(^\text{19}\)
### Pathway for Acute Coronary Syndrome Assessment (PACSA) Checklist

#### Initial Assessment
- Triage category (Australasian Triage Scale), Vital signs and resuscitate
- Aspirin 300mg (soluble) already given
- ECGs at 0 and two hours, when repeating troponin and every 30 minutes if ongoing symptoms
- Bloods (and troponin), IV, monitoring, CXR, analgesia, +/- GTN, O2 (if Sats <93%)

#### Identify STEMI
- Perform and review initial ECG within 10 minutes of clinical contact
- ECG meets STEMI Criteria

#### Clinical Risk Assessment
- High
- Intermediate
- Low

If Non-Ischaemic cause of Chest Pain EXIT Flowchart and Senior Review

#### Troponin Risk Assessment
- Initial: Positive, becomes either High or Intermediate Risk
- Negative, Low Risk
- Repeat: Positive, High Risk
- Negative, Intermediate Risk
- Negative, Low Risk

#### ECG Risk Assessment
- Dynamic ECG
- ECG unchanged

#### Summative Risk Assessment
- High Risk
- Intermediate Risk
- Low Risk

#### Management
- Admit
  - Cardiac monitoring
  - Admitting team advises: Anticoagulation, Antiplalet therapy, Beta blockers, Statins
  - No cardiac monitoring OR Discharge
  - After Senior Review Follow-up with Physician, GP or Cardiologist within one week
- Reassess
  - Treat other diagnoses
- Discharge
  - Followup by GP, Exercise Stress Testing, Echo, Cardiac Perfusion and CT Angiogram are usually NOT indicated

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**Use this Checklist in conjunction with the PACSA Flowchart NH700422**

**If you think the patient is High Risk for any reason then treat as High Risk**
# Pathway for Acute Coronary Syndrome Assessment (PACSA)

## Emergency Department Assessment of Chest Pain Score (EDACS)

Use this form to identify Low Clinical Risk patients (EDACS less than 16)

If you think the patient is High Risk for any reason then treat as High Risk

Choose column (below) based on patient age

<table>
<thead>
<tr>
<th>Use this table for patients aged 18 to 50 years</th>
<th>Use this table for patients aged 51 years and above</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td><strong>Sex</strong></td>
</tr>
<tr>
<td>Male</td>
<td>+8</td>
</tr>
<tr>
<td>Female</td>
<td>+0</td>
</tr>
<tr>
<td><strong>Diaphoresis (sweating)</strong></td>
<td><strong>Diaphoresis (sweating)</strong></td>
</tr>
<tr>
<td>+3</td>
<td></td>
</tr>
<tr>
<td><strong>Pain radiates to arm, shoulder, neck or jaw</strong></td>
<td><strong>Pain radiates to arm, shoulder, neck or jaw</strong></td>
</tr>
<tr>
<td>+5</td>
<td></td>
</tr>
<tr>
<td><strong>Pain is reproduced by palpation</strong></td>
<td><strong>Pain is reproduced by palpation</strong></td>
</tr>
<tr>
<td>-6</td>
<td></td>
</tr>
<tr>
<td><strong>Pain occurs or worsened with inspiration</strong></td>
<td><strong>Pain occurs or worsened with inspiration</strong></td>
</tr>
<tr>
<td>-4</td>
<td></td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td><strong>Age (years)</strong></td>
</tr>
<tr>
<td>46-50</td>
<td>+4</td>
</tr>
<tr>
<td>18-45</td>
<td>+2</td>
</tr>
<tr>
<td><strong>History</strong></td>
<td><strong>History</strong></td>
</tr>
<tr>
<td>Only able to score 4 points for this section</td>
<td>Cardiac risk factors are outweighed by age when over 50 years. NO SCORE FOR THIS SECTION</td>
</tr>
<tr>
<td>Any one of:</td>
<td></td>
</tr>
<tr>
<td>Previous AMI, CABG or PCI</td>
<td></td>
</tr>
<tr>
<td><strong>OR</strong></td>
<td></td>
</tr>
<tr>
<td>3 or more:</td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>+4</td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
</tr>
<tr>
<td>Hyperlipidaemia</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
</tr>
<tr>
<td>Family history of early onset IHD</td>
<td></td>
</tr>
</tbody>
</table>

**Total Score (Low risk is < 16)**

**Total Score (Low risk is < 16)**
PACSA STEMI Reperfusion Flowchart

**STEMI for Reperfusion**

- PCI Less than 60 minutes to cath lab?
  - No: Thrombolysis or Anticoagulation before PCI
  - Yes: URGENT transfer for PCI

**Contraindications to Thrombolysis**

- Relative Contraindications to Thrombolysis
  - Age > 75 years
  - Hypertension
  - Hypokalemia

**Anticoagulation before PCI**

- Heparin 5000 units IV OR subcutaneous
  - Agent: 18 – 75 years
  - 75 years and over
  - PLUS: TPA 50mg OR 100mg
    - OR: Clopidogrel 300 – 600mg OR 75mg
    - OR: Prasugrel 60mg OR No dose

**Antithrombotic loading before Thrombolysis**

- ASA (300mg) unless already given or contraindicated
  - Agent: 18 – 75 years
  - 75 years and over
  - PLUS: Clopidogrel 300mg OR 75mg

**Thrombolysis**

- Thrombolysis: t-PA 5mg/L (IV bolus over 10 min)
  - Weight
    - 18 – 75 years: 50mg/m²
    - 75 years and over: 15mg/m²
  - 50 – 60kg
    - 50mg/m² + 7.5mg
    - 15mg/m² + 3.5mg
  - 70 – 80kg
    - 50mg/m² + 8mg
    - 25mg/m² + 4mg
  - 90kg and above
    - 50mg/m² + 10mg
    - 25mg/m² + 5mg

**Anticoagulation after Thrombolysis**

- Heparin: 15 units/kg over 1 hour, followed by 1 unit/kg/hour
  - OR: Enoxaparin: 18 – 75 years: 30 units/kg OR 75 years and over: 100 units/kg
  - IV at 15 minutes
    - 30 mg IV bolus
    - 75mg IV push

**ECG STEMI Equivalents: for Reperfusion**

- Diagnosis of STEMI in either lead: V1-V2 or V1-V3
- OR: Any lead with ST elevation > 0.1 mV
- OR: Any lead with ST elevation > 5 mm in leads V1-V2
- OR: Any lead with ST elevation > 0.2 mV in leads V1-V3

**ECG STEMI Mimics: NOT for Reperfusion**

- Benign mimics (NOT for reperfusion)
  - Inferior or Anterior STEMI
  - Right bundle branch block (RBBB)
  - Posterolateral
  - Posteroseptal
  - Deep T waves

**ECG STEMI Equivalents: for Reperfusion**

- Diagnosis of STEMI in Left bundle branch block (LBBB) using modified ECG criteria:
  - Any lead with ST elevation > 5 mm
  - OR: Any lead with ST elevation > 1 mm
  - OR: Any lead with ST elevation > 0.1 mV
**PACSA STEMI Reperfusion Checklist**

<table>
<thead>
<tr>
<th>Reperfusion method</th>
<th>Access to Cath lab within 60 minutes?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

### Assess Contraindications to Thrombolysis

- Symptoms present more than 12 hours
- BP more than 180/110mmHg, treat BP and reassess
- Major trauma OR surgery OR internal bleeding within one month
- Ischaemic stroke within 3 months OR Intracerebral bleed at any time
- Allergy to tenecteplase

**If any Contraindications transfer for URGENT PCI**

- Senior Review if any Relative Contraindication: Ischaemic stroke >3 months OR INR >1.8 OR anticoagulation OR bleeding disorder

### Antiplatelet loading before Thrombolysis

- Aspirin 300mg (soluble):
  - already given:
  - contraindicated:
- Clopidogrel:
  - 18-74 years:
  - 75 years and over:

### Thrombolysis tenecteplase 5mg/mL IV (IV bolus over 10 sec)

<table>
<thead>
<tr>
<th>Weight</th>
<th>Time Given</th>
<th>18-74 years</th>
<th>75 years and over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 60kg</td>
<td></td>
<td>30mg = 6mL</td>
<td>15mg = 3mL</td>
</tr>
<tr>
<td>60 – 65kg</td>
<td></td>
<td>35mg = 7mL</td>
<td>17.5mg = 3.5mL</td>
</tr>
<tr>
<td>70 – 79kg</td>
<td></td>
<td>40mg = 8mL</td>
<td>20mg = 4mL</td>
</tr>
<tr>
<td>80 – 89kg</td>
<td></td>
<td>45mg = 9mL</td>
<td>22.5mg = 4.5mL</td>
</tr>
<tr>
<td>Above 90kg</td>
<td></td>
<td>50mg = 10mL</td>
<td>25mg = 5mL</td>
</tr>
</tbody>
</table>

### Anticoagulation after Thrombolysis

- Either
  - Heparin
    - 15 minutes after Thrombolysis use weight based infusion (no loading dose) OR Use local protocol
  - Enoxaparin
    - 18-74 years:
    - 75 years and over:
    - IV at 15 minutes:
      - 30mg IV bolus:
        - No IV dose
    - SC at 30 minutes:
      - 1mg/kg SC (max: 100mg):
      - 0.75mg/kg SC (max: 75mg)

### Thrombolysis successful?

- □≥50% reduction in ST segment
- □Symptoms largely resolved
- □Haemodynamically stable

**Thrombolysis successful if ALL three positive at 60 minutes**

- Thrombolysis NOT successful: URGENT PCI

**Name:**

**Designation:**

**Signature:**

**Date:**

**Time:**
References


5. Vachiat A1, McCutcheon K1, Tsabelde N1, Zachariah D1, Manga P. HIV and Ischemic Heart Disease J Am Coll Cardiol. 2017 Jan;69(1):73-8


