Chest Pain Assessment in the Emergency Department

Dr Yusuf Nagree
Emergency Physician (FACEM)
Chest Pain Assessment in the Emergency Department

- Chest pain accounts ~10% of all presentations
- 10-15% are serious conditions
  - About 10-12% cardiac
  - About 2-3% other serious causes (PE, dissection)
- Need safe ways to accurately identify serious causes
Chest Pain Assessment in the Emergency Department

- Many doctors (especially juniors) only think of ACS (acute coronary syndrome)
- However, up to 30% of serious chest pain outcomes are non cardiac
Chest Pain Assessment in the Emergency Department

- In WACHS, we designed a new chest pain form:
  - To recognise the non-cardiac causes of chest pain
  - To move risk stratification to TIMI in line with international best practice
Chest Pain Assessment in the Emergency Department

- Serious causes of chest pain (non traumatic)
  - Acute coronary syndrome
  - Pulmonary embolus
  - Myocarditis / Pericarditis
  - Spontaneous Pneumothorax
  - Aortic Dissection
Acute Coronary Syndromes (ACS)

- **Ischaemia**
  - Reduced blood flow due to spasm or blockages
  - Reversible
  - ECG changes: ST depression, T-wave inversion or nil ECG changes
  - Usually no troponin rise

- **Infarct**
  - Complete blood flow occlusion leads to tissue necrosis
  - Irreversible
  - Associated with troponin rises +/- ST elevation
ECG complex

Healthier country communities through partnerships and innovation

Values  Community | Compassion | Quality | Integrity | Justice
Infarct ECG – ST elevation MI
Ischaemic ECG – ST depression
Ischaemic ECG – T wave inversion
Acute Coronary Syndromes (ACS)

- Not all chest pain = ACS
- Chest pain of ACS
  - Crushing / Squeezing / Pressure
  - Central +/- radiation to jaw or arm
  - May resolve / decrease with rest
- However, can get “atypical” chest pain
Acute Coronary Syndromes (ACS)

- If you decide the pain may be from an ACS, you need to determine how likely the patient is of having an adverse outcome from their pain

- Basically, risk stratification

- Old NHF/CSANZ used low, intermediate, high
Acute Coronary Syndromes (ACS)

- A number of risk stratification tools out there now:
  - HEART score – simple but degree of subjectivity
  - EDACS – relatively complex to calculate but good specificity
  - TIMI – simple. Not designed for ED use but has been validated in ED use)
Acute Coronary Syndromes (ACS)

- The National Heart Foundation 2016 ACS guidelines recommend use of a tool but don’t recommend a particular one
  - https://www.heartfoundation.org.au(for-professionals/clinical-information/acute-coronary-syndromes
- Most places selected TIMI due to simplicity
Acute Coronary Syndromes (ACS)

- **TIMI risk stratification**

  **Calculate TIMI score**

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt; 65 (&gt; 45 for ATSI)</td>
<td>1 point</td>
</tr>
<tr>
<td>Aspirin use in last 7 days (excluding analgesic use)</td>
<td>1 point</td>
</tr>
<tr>
<td>&gt; 2 episodes pain in last 24 hours</td>
<td>1 point</td>
</tr>
<tr>
<td>ST changes ≥ 0.5mm</td>
<td>1 point</td>
</tr>
<tr>
<td>Known stenosis ≥ 50%</td>
<td>1 point</td>
</tr>
<tr>
<td>≥ 3 coronary artery disease risk factors</td>
<td>1 point</td>
</tr>
</tbody>
</table>

**Risk factors:**
- Sedentary occupation
- Hypertension
- Diabetes
- Current Smoker
- Hypercholesterolaemia
- High risk ethnic group

- TIMI 0,1,2 – low risk of adverse outcome in 30 days
- TIMI 3 – moderate risk of adverse outcome in 30 days
- TIMI 4 – high risk of adverse outcome in 30 days
Acute Coronary Syndromes (ACS)

- Need to look for risk factors as well – High risk features

<table>
<thead>
<tr>
<th>ECG changes - ST↓ or T↓</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitated at rest or by minimal exertion</td>
</tr>
<tr>
<td>Recurrent pain</td>
</tr>
<tr>
<td>Hypotension (BP&lt;90) not associated with GTN</td>
</tr>
<tr>
<td>Shock</td>
</tr>
<tr>
<td>Congestive Cardiac Failure</td>
</tr>
<tr>
<td>Diaphoresis</td>
</tr>
<tr>
<td>Angioplasty or CABG within last 6 months</td>
</tr>
<tr>
<td>Ventricular fibrillation or ventricular tachycardia</td>
</tr>
<tr>
<td>Syncope</td>
</tr>
</tbody>
</table>
Acute Coronary Syndromes (ACS)

- Cardiac troponins
  - Enzyme released by dying / ischaemic heart muscle
  - Highly specific
  - Basically three types of troponin testing now:
    - Point of care
    - Standard laboratory analyser
    - Highly sensitive
  - WACS only has the first two which are termed “standard sensitivity”
Acute Coronary Syndromes (ACS)

Highly Sensitive Troponins

- Have now been available for a few years and can detect minute traces of troponin
- Problem is that small increases in troponin can be seen with many non cardiac conditions:
  - Acute and chronic heart failure
  - Myocarditis
  - Cardiac contusion from trauma
  - Cardioversion
  - Endomyocardial biopsy
  - Aortic dissection
  - Hypertrophic cardiomyopathy
  - Aortic valve disease (aortic stenosis or regurgitation)
  - Cardiotoxic drugs
  - Tachyarrhythmia (SVT, V-tach, atrial fibrillation)
  - Bradyarrhythmia or heart block
  - Cardiac surgery
  - Cardioversion
  - Tako-tsubo cardiomyopathy
  - Rhabdomyolysis
  - Stenting or angioplasty (percutaneous coronary intervention/PCI)
  - Irukandji syndrome
  - Renal failure
  - Pulmonary embolism
  - Severe pulmonary hypertension
  - Sepsis
  - Severe critical illness
  - Burns
  - Extreme exertion
  - Amyloidosis or other infiltrative diseases
  - Stroke
  - Subarachnoid hemorrhage
Acute Coronary Syndromes (ACS)

**Troponin Timing**

Complex question – depends on risk stratification, duration of pain and type of assay  (table 9, NHF guidelines)

<table>
<thead>
<tr>
<th>Timing of sampling</th>
<th>Strategy*</th>
<th>Assays</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 hour (single sample)</td>
<td>Patients whose pain and symptoms resolved 12 hours prior to testing (cut points are the assay-specific 99th percentile)</td>
<td>Both sensitive and highly sensitive assays</td>
</tr>
<tr>
<td>0 hour (single sample)</td>
<td>Patients with value &lt;LoD of the specific assay (not &gt;99th percentile cut point) and symptom onset &gt;3 hours(^)</td>
<td>Highly sensitive assays</td>
</tr>
<tr>
<td>0 and 1 hours after presentation</td>
<td>Rule-in and rule-out AMI algorithms [83,89,90] (cut points are assay-specific and not the 99th percentile)</td>
<td>Highly sensitive assay</td>
</tr>
<tr>
<td>0 and 2 hours after presentation</td>
<td>ADAPT protocol [43] Modified ADAPT protocol [49,57] (cut points are the assay-specific 99th percentile)</td>
<td>Sensitive assays Highly sensitive assays</td>
</tr>
<tr>
<td>0 and ≥3 hours after presentation</td>
<td>Previous NHF protocol [9] HEART pathway, [45,48] (cut points are the assay-specific 99th percentile)</td>
<td>Highly sensitive assays Both sensitive and highly sensitive assays</td>
</tr>
<tr>
<td>0 and ≥6-12 hours after presentation</td>
<td>Rule-in and rule-out AMI algorithms [10] (cut points are the assay-specific 99th percentile)</td>
<td>Sensitive and point-of-care assays</td>
</tr>
</tbody>
</table>
Acute Coronary Syndromes (ACS)

WACHS Pathway

Only have standard sensitivity and using TIMI

Therefore, timing is 0, 4, 8 post arrival

If pain occurred more than 12 hours ago and you are confident there has been no recurrence of pain, a single troponin may be adequate – beware of POC though

Accelerated pathway. In certain low risk patients (TIMI 0 with no high risk features and low clinical suspicion of ACS, you can do 0 & 4 hours but only on LABORATORY troponin (not point of care) )
Acute Coronary Syndromes (ACS)

**Pain / Presentation suspicious of ACS:**

- ECG changes, positive troponins or TIMI > 4, then admit or transfer, ticagrelor (clopidogrel if HR<50), anti-coagulation, beta blocker

- TIMI < 5, then serial troponins and ECG. If serial troponins, ECGs normal, no ongoing or recurrent pain, then:
  - TIMI 0,1,2 – refer back to GP for risk factor modification and stress test
  - TIMI 3 – organise urgent cardiology outpatient
  - TIMI 4 or high risk features – admit/transfer
Pulmonary Embolus

Blood clot in lungs

Pain – inspiratory, sharp, pleuritic. Often with SOB

Risk factors

<table>
<thead>
<tr>
<th>Recent Travel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past history DVT / PE or thrombophilia</td>
</tr>
<tr>
<td>Family history DVT / PE or thrombophilia</td>
</tr>
<tr>
<td>Malignancy</td>
</tr>
<tr>
<td>Prolonged immobility including leg plaster</td>
</tr>
<tr>
<td>Pregnancy or exogenous oestrogen</td>
</tr>
<tr>
<td>Smoker who is taking exogenous oestrogen</td>
</tr>
<tr>
<td>Recent invasive surgery</td>
</tr>
</tbody>
</table>
Pulmonary Embolus

Wells Score

<table>
<thead>
<tr>
<th>Clinical Signs and Symptoms of DVT</th>
<th>3 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE is most likely diagnosis, or Equally Likely</td>
<td>3 points</td>
</tr>
<tr>
<td>Heart Rate &gt; 100</td>
<td>1.5 points</td>
</tr>
<tr>
<td>Immobilization &gt; 3 days, or surgery &lt; 4 weeks</td>
<td>1.5 points</td>
</tr>
<tr>
<td>Previous, objectively diagnosed PE or DVT</td>
<td>1.5 points</td>
</tr>
<tr>
<td>Malignancy with treatment within 6/12 or palliative</td>
<td>1 point</td>
</tr>
</tbody>
</table>

0-3 – low probability; 4-6 moderate probability; >6 high probability

If high probability, need to proceed straight to imaging
Pulmonary Embolus

PERC System

PE highly unlikely if all true:

- Age < 50
- HR < 100
- Sats ≥ 95% R/A
- No trauma or surgery < 4 weeks

- No unilateral leg swelling
- No previous VTE
- No haemoptysis
- No exogenous oestrogen

- However, they must be low risk to start with.
- Exclude patients in whom shortness of breath is not the most important, or equally most important, presenting complaint, cancer, thrombophilia, strong family history of thrombophilia, beta blockers that may mask tachycardia, patients with transient tachycardia, patients with amputations, patients who are massively obese and in whom leg swelling cannot be reliably ascertained, with baseline hypoxemia in whom a pulse oximetry reading < 95% is long-standing
Pulmonary Embolus

D-Dimer

Non specific marker of clot breakdown products

A positive value doesn’t mean much, but a negative value means a PE/DVT is unlikely in certain patients

Two types of assay available – high sensitivity or standard sensitivity

For High sensitivity D-Dimer: Low/moderate probability – if negative, can exclude PE

For Standard sensitivity D-Dimer: Low probability – if negative, can exclude PE

If high probability, go straight to imaging as D-Dimer is not useful

_D-dimer is probably not useful in pregnancy, though maybe in low risk_
PE Flow Chart – Standard Sensitivity D-Dimer

Wells Score

Low
- PERC positive
- D-Dimer negative
- No VTE
- Moderate
- Imaging

Moderate
- D-Dimer positive
- Imaging

High
- D-Dimer positive

Values
Community | Compassion | Quality | Integrity | Justice
PE Flow Chart – High Sensitivity D-Dimer

Wells Score

- Low
  - PERC
    - positive
    - negative
  - No VTE
- Moderate
  - D-Dimer
    - negative
    - positive
- High
  - Imaging
Pulmonary Embolus – Outpatient Treatment

- Low risk of death – defined as pulmonary embolism severity index (PESI) class I or II or simplified PESI (sPESI) score = 0.
- No requirement for supplemental oxygen
- No requirement for narcotics for pain control
- No respiratory distress
- Normal pulse and blood pressure
- No recent history of bleeding or risk factors for bleeding
- No serious comorbid conditions (e.g., ischemic heart disease, chronic lung disease, liver or renal failure, thrombocytopenia, or cancer)
- Normal mental status with good understanding of risk and benefits, are not needle averse (if low molecular weight (LMW) heparin chosen), and have good home support (e.g., do not live alone, have access to a telephone and physician, can return to the hospital quickly if there is clinical deterioration)
- Absence of concomitant deep venous thrombosis (a high clot burden in the lower extremities may increase the risk of death or warrant additional therapy)
### Pulmonary Embolism Severity Index

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>+1 per year</td>
</tr>
<tr>
<td>Male sex</td>
<td>+10</td>
</tr>
<tr>
<td>Heart failure</td>
<td>+10</td>
</tr>
<tr>
<td>Chronic lung disease</td>
<td>+10</td>
</tr>
<tr>
<td>Arterial oxygen saturation &lt;90%</td>
<td>+20</td>
</tr>
<tr>
<td>Pulse ≥110 beats per minute</td>
<td>+20</td>
</tr>
<tr>
<td>Respiratory rate ≥30 breaths per minute</td>
<td>+20</td>
</tr>
<tr>
<td>Temperature &lt;36°C</td>
<td>+20</td>
</tr>
<tr>
<td>Cancer</td>
<td>+30</td>
</tr>
<tr>
<td>Systolic blood pressure &lt;100 mm Hg</td>
<td>+30</td>
</tr>
<tr>
<td>Altered mental status</td>
<td>+60</td>
</tr>
</tbody>
</table>

### Prognostic Assessment of Patients With Acute PE

#### PESI

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>age</td>
</tr>
<tr>
<td>Male sex</td>
<td>10</td>
</tr>
<tr>
<td>Cancer</td>
<td>30</td>
</tr>
<tr>
<td>Chronic HF</td>
<td>10</td>
</tr>
<tr>
<td>Chronic pulmonary disease</td>
<td>10</td>
</tr>
<tr>
<td>Pulse rate &gt; 110 bpm</td>
<td>20</td>
</tr>
<tr>
<td>Systolic BP &lt; 100 mm Hg</td>
<td>30</td>
</tr>
<tr>
<td>Resp rate &gt; 30 breaths per minute</td>
<td>20</td>
</tr>
<tr>
<td>Temperature &lt; 36°C</td>
<td>20</td>
</tr>
<tr>
<td>Altered mental status</td>
<td>60</td>
</tr>
<tr>
<td>Arterial hemoglobin O₂ saturation &lt;90%</td>
<td>20</td>
</tr>
</tbody>
</table>

#### Simplified PESI

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1</td>
</tr>
<tr>
<td>Male sex</td>
<td>10</td>
</tr>
<tr>
<td>Cancer</td>
<td>30</td>
</tr>
<tr>
<td>Chronic HF</td>
<td>10</td>
</tr>
<tr>
<td>Chronic pulmonary disease</td>
<td>1</td>
</tr>
<tr>
<td>Pulse rate &gt; 110 bpm</td>
<td>1</td>
</tr>
<tr>
<td>Systolic BP &lt; 100 mm Hg</td>
<td>1</td>
</tr>
<tr>
<td>Resp rate &gt; 30 breaths per minute</td>
<td>1</td>
</tr>
<tr>
<td>Temperature &lt; 36°C</td>
<td>1</td>
</tr>
<tr>
<td>Altered mental status</td>
<td>1</td>
</tr>
<tr>
<td>Arterial hemoglobin O₂ saturation &lt;90%</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Risk stratification

<table>
<thead>
<tr>
<th>Class</th>
<th>30-day Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0–1.6%</td>
</tr>
<tr>
<td>II</td>
<td>1.7%–3.5%</td>
</tr>
<tr>
<td>III</td>
<td>3.2%–7.1%</td>
</tr>
<tr>
<td>IV</td>
<td>4.0%–11.4%</td>
</tr>
<tr>
<td>V</td>
<td>10.0%–24.5%</td>
</tr>
</tbody>
</table>

### Notes

Oesophageal Perforation

Potentially life threatening

- Notoriously difficult to diagnose
- Usually from severe vomiting
- Associated with haematemesis and painful swallowing
Aortic Dissection

Split in the wall of the aorta and blood enters the wall

- Potentially life threatening
- Pain described as “tearing”, through to back
- Unequal blood pressures
- Radio-radio and/or radio-femoral pulse delays
- *Think dissection in any patient with chest pain and some vague neurology or unusual symptom*
Spontaneous pneumothorax

Risk factors

Sudden onset pleuritic chest pain with SOB
Tall, thin male
History of asthma / COPD
Previous pneumothorax
Smoker
Myocarditis / Pericarditis

Inflammation of cardiac muscle. Huge range of aetiologies:

Viral, Rickettsia, Bacterial, Spirochetes, Fungal, Bites, Drugs, Chemotherapy, Antibiotics (penicillin, chloramphenicol, sulfonamides), Antihypertensives (spironolactone, methyldopa), Antiepileptics (phenytoin, carbamazepine), Amphetamines, Chemicals, Acute rheumatic fever, Systemic inflammatory diseases (SLE, Kawasaki’s, Ulcerative Colitis)......
Myocarditis / Pericarditis

Clinical

- Chest Pain
- SOB
- Palpitations
- Syncope
- Signs of heart failure
- Features of underlying cause (eg. Viral illness preceding, stigmata of rheumatic heart disease)
Myocarditis / Pericarditis

Investigations

- ECG – pericarditis has a classic ECG
- FBC
- Inflammatory markers (CRP, ESR)
- Troponin – elevated in 50%
- Echocardiography
Healthier country communities through partnerships and innovation

Values  Community | Compassion | Quality | Integrity | Justice
ST elevation MI

- Early reperfusion the key
  - Ideally have angioplasty but not practical in WACS
  - Therefore, most will get tenecteplase

- Thrombolysis packs in ED
ST elevation MI
ST elevation MI

Healthier country communities through partnerships and innovation

Values  Community |  Compassion |  Quality |  Integrity |  Justice
Cardiac thrombolysis Pack

ST segment elevation Acute Myocardial Infarction is a life threatening condition that requires time critical treatment with cardiac reperfusion. In metropolitan regions, this is usually provided with acute angioplasty, however, in non-metropolitan areas where the time to a cardiac catheter lab is greater than 90 minutes, thrombolysis with Tenecteplase is the main treatment.

All Emergency Department and Emergency Services should keep a cardiac thrombolysis pack in their Department to ensure quick and timely reperfusion for patients who require it.

The pack should contain the following:

**Medications**
- 1 x Tenecteplase 50mg box
- 6 x Heparin 5000 units ampoules
- 8 x 75mg Clopidogrel tablets (administer half only - 300mg)
- 300mg Aspirin
- 1 x 20mg, 1 x 40mg, 1 x 60mg, 1 x 80mg, 1 x100mg enoxaparin syringes
- 1 x 500mL Sodium Chloride (0.9%) bag
- 1 x IV giving set

**Forms / Paperwork**
- 1 X Adult Observation and Response Chart MR140a
- 1 x Tenecteplase contraindications checklist MR172A
- 1 x Tenecteplase administration checklist MR172B
- 1 x “High risk ACS/post cardiac thrombolysis” anti-coagulation guidelines
- 1 x Anti-coagulation medication chart MR170C
- 1 x Patient information sheet
# Tenecteplase Contraindication Checklist

## Absolute Contraindications to Tenecteplase

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Patient has known allergy / hypersensitivity / adverse reaction to Thrombolytic agents OR Gentamicin</td>
<td></td>
</tr>
<tr>
<td>2. Risk of Bleeding</td>
<td></td>
</tr>
<tr>
<td>- Active or recent internal bleeding &lt;14 days (excluding menstruation)</td>
<td></td>
</tr>
<tr>
<td>- Significant closed head trauma, facial trauma or other severe trauma within past 3 months</td>
<td></td>
</tr>
<tr>
<td>- Suspected aortic dissection or pericarditis</td>
<td></td>
</tr>
<tr>
<td>3. Risk of Intracranial Haemorrhage</td>
<td></td>
</tr>
<tr>
<td>- Recent (within 2 months) intracranial or intraspinal surgery</td>
<td></td>
</tr>
<tr>
<td>- Any prior intracranial haemorrhage</td>
<td></td>
</tr>
<tr>
<td>- Ischemic stroke within the past 2 to 6 months or previous haemorrhagic stroke</td>
<td></td>
</tr>
<tr>
<td>- Known structural cerebral vascular lesion (i.e. Arteriovenous malformation, aneurysm)</td>
<td></td>
</tr>
<tr>
<td>- Known malignant intracranial or intraspinal neoplasm (primary or metastatic)</td>
<td></td>
</tr>
<tr>
<td>- Known severe bleeding disorder</td>
<td></td>
</tr>
</tbody>
</table>

## Relative Contraindications to Tenecteplase

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Risk of Bleeding</td>
<td></td>
</tr>
<tr>
<td>- Patient on Warfarin – only thrombolyse if INR &lt; 2.0</td>
<td></td>
</tr>
<tr>
<td>- Non-compressible vascular punctures &lt; 10 days i.e recent CVAD</td>
<td></td>
</tr>
<tr>
<td>- Recent major surgery (&lt; 3 weeks)</td>
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</tr>
<tr>
<td>- Traumatic or prolonged CPR (&gt;10 minutes)</td>
<td></td>
</tr>
<tr>
<td>- Recent internal bleeding (2 to 4 weeks prior)</td>
<td></td>
</tr>
<tr>
<td>5. Risk of Intracranial Haemorrhage</td>
<td></td>
</tr>
<tr>
<td>- History of chronic, severe, poorly controlled hypertension</td>
<td></td>
</tr>
<tr>
<td>- Severe uncontrolled hypertension on presentation (systolic &gt;180 mmHg or diastolic &gt;130 mmHg)</td>
<td></td>
</tr>
<tr>
<td>- Ischemic stroke &gt; 3 months ago</td>
<td></td>
</tr>
<tr>
<td>- Dementia or known intracranial pathology</td>
<td></td>
</tr>
</tbody>
</table>

## Other

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>6.</td>
<td></td>
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<tr>
<td>- Pregnancy</td>
<td></td>
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<tr>
<td>- Previous TIA</td>
<td></td>
</tr>
<tr>
<td>- Haemorrhagic ophthalmic conditions</td>
<td></td>
</tr>
<tr>
<td>- History of headaches</td>
<td></td>
</tr>
<tr>
<td>- Previous Streptokinase / Alteplase / Retepase treatment (&gt;5 days prior) or allergy to these agents</td>
<td></td>
</tr>
<tr>
<td>- Active peptic ulcer, or other ulcerative conditions (i.e. Crohn’s Disease)</td>
<td></td>
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<tr>
<td>- Age &gt;75 years</td>
<td></td>
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<tr>
<td>- Advanced kidney or liver disease</td>
<td></td>
</tr>
</tbody>
</table>

## IF NO TO ALL QUESTIONS, PROCEED TO MR172B TENECTEPLASE ADMINISTRATION CHECKLIST

<table>
<thead>
<tr>
<th>Date:</th>
<th>Time:</th>
<th>Name:</th>
<th>Signature:</th>
<th>Designation:</th>
</tr>
</thead>
</table>

*WAGHS TRIAL VERSION 31 MARCH 2016 (For Trial at Pilot sites April to June 2016)*

On behalf of the WAGHS Emergency Management Leadership Group (EMLG)

Kathy adapted from Whiteman MR172b Tenecteplase Contraindication Checklist

Any queries contact: *First.Nurse@health.wa.gov.au*
The prescribing medical officer (MO) will remain contactable by phone during the administration of Tenecteplase and in the post administration phase.

If the administering registered Nurse (RN) is unable to interpret cardiac rhythm/12 lead ECG, discuss with MO the risk of administering thrombolysis.

All changes to be immediately sent to MO for review within 10 minutes.

<table>
<thead>
<tr>
<th>PRE-ADMINISTRATION</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Move patient to resuscitation area. The RN caring for patient must have Basic Life Support and AED Defibrillation Competency. Where possible also an Advanced Life Support Competency.</td>
<td></td>
</tr>
<tr>
<td>2. Ensure STEMI diagnosis has been made by MO and documented on the 12 lead ECG and labelled “Pre-Tenecteplase”</td>
<td></td>
</tr>
<tr>
<td>3. Complete Tenecteplase Contraindications Checklist (MR172A). If any contraindications, RN URGENTLY discuss with appropriate MO (or FACEM / ETS or cardiologist)</td>
<td></td>
</tr>
<tr>
<td>4. Confirm patient states symptoms of chest pain started less than 12 hours ago. If onset &gt;12 hours ago, MO to URGENTLY discuss with cardiologist regarding further management</td>
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<tr>
<td>5. Perform baseline urinalysis for haematuria if patient able to void</td>
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<tr>
<td>6. Establish IV access x 2 (dedicated line for Tenecteplase)</td>
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<tr>
<td>7. Collect bloods, FBP, U&amp;E, BGL, APTT, INR are recommended (if testing is available)</td>
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<tr>
<td>8. Undertake a baseline head to toe assessment. Apply pressure dressings to all existing puncture sites and superficial wounds</td>
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<tr>
<td>9. Lie patient 0-30 degrees (semi Fowler) if possible</td>
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<tr>
<td>10. Consider ongoing pain relief / analgesia – discuss with MO for prescription, check medications as per WACHS Medication Policy and document appropriately</td>
<td></td>
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<tr>
<td>11. Ensure patient has been administered Aspirin 300mg PO (unless contraindicated) and documented on NIMC</td>
<td></td>
</tr>
<tr>
<td>12. Ensure the following drugs were used for treatment of advanced life support or perfusion abnormalities are readily available, ONLY to be given as per Medical Officer order or as part of ALS algorithm.</td>
<td></td>
</tr>
<tr>
<td>▪ Adrenaline 1mg IV as per Advanced Life Support ARC guidelines cardiac arrest protocol</td>
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</tr>
<tr>
<td>▪ Atropine IV 300-600 micrograms for symptomatic bradycardia</td>
<td></td>
</tr>
<tr>
<td>▪ Amodiazone 100mg IV (dilute in 5% dextrose) for ventricular tachyarrhythmias</td>
<td></td>
</tr>
<tr>
<td>13. Prepare anticoagulant therapy as per MO order (verbal or faxed) as per the WA Anticoagulation Medication Chart (MR170C), the “High risk ACS / post cardiac thrombolytic anticoagulation guidelines” and 17 and 19 of this Tenecteplase administration checklist.</td>
<td></td>
</tr>
<tr>
<td>▪ &lt; 60kg: 6,000 units Tenecteplase 30mg Volume 6mL</td>
<td></td>
</tr>
<tr>
<td>▪ 60 – 70kg: 7,000 units Tenecteplase 35mg Volume 7mL</td>
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</tr>
<tr>
<td>▪ 70 – 80kg: 8,000 units Tenecteplase 40mg Volume 8mL</td>
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</tr>
<tr>
<td>▪ 80 – 90kg: 9,000 units Tenecteplase 45mg Volume 9mL</td>
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<tr>
<td>▪ &gt;90kg: 10,000 units Tenecteplase 50mg Volume 10mL</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ADMINISTRATION</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. Flush IV cannula with 10mls 0.9% Sodium Chloride</td>
<td></td>
</tr>
<tr>
<td>16. Administer weight based dose of Tenecteplase as IV bolus over 10 seconds. Do not administer into a line containing glucose</td>
<td></td>
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</tbody>
</table>

**TIM 172B**

Tenecteplase Administration Checklist

Between 15 minutes before and 30 minutes after Tenecteplase administration, administer enoxaparin CR heparin. If expected time to administering catheterisation laboratory is less than 6 hours AND APPT monitoring is available, use heparin.

**Enoxaparin Dosing (do not administer if using heparin)**

- If the patient is <75 years and there is no renal impairment (creatinine clearance is ≥ 30 ml/min)
  - Single IV bolus dose of 30 mg into a separate IV line
  - Plus SUBCUTANEOUSLY 1mg/kg to a maximum of 100mg
- If the patient is ≥75 years, administer 0.75mg/kg (to a maximum of 75mg subcut stat)
- If the patient has renal impairment (creatinine clearance <30 ml/min) administer 1mg/kg (to a maximum of 100mg) subcut stat

**Heparin Dosing (do not administer if using enoxaparin)**

1. IV Bolus – 60UKIU IV Heparin (to a maximum 4000iu)
2. Followed by infusion 25,000iu in 500ml 0.9% sodium chloride @ 20ml/hr
3. Re-measure APPT within 6 hours of commencing infusion & again within 6 hours of each rate change

17. Administer Clopidogrel 300mg PO as ordered by MO 15 - 30 minutes after Tenecteplase administration

18. Ensure that ongoing anticoagulation (as per “High risk ACS/post cardiac thrombolytic anticoagulation guidelines”) is charted on MR170C.

<table>
<thead>
<tr>
<th>POST- ADMINISTRATION</th>
<th>Yes</th>
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<tbody>
<tr>
<td>20. Monitoring and Observations</td>
<td></td>
</tr>
<tr>
<td>▪ Continuous cardiac monitoring</td>
<td></td>
</tr>
<tr>
<td>▪ Record observations on Adult Observation and Response Chart (MR140a). Record observations 10 minutes for one hour, then 30 minutes for two hours then every two hours unless patient condition changes. Observations include pain score and AVPU. Report ongoing chest pain post thrombolysis to MO</td>
<td></td>
</tr>
<tr>
<td>▪ If AVPU deteriorates, commence neurological status on neurological observation form MR147 and inform MO promptly</td>
<td></td>
</tr>
<tr>
<td>▪ Monitor for complications:</td>
<td></td>
</tr>
<tr>
<td>▪ External bleeding</td>
<td></td>
</tr>
<tr>
<td>▪ Internal bleeding: check for signs of shock e.g. hypotension and/or fast/slow heart rate</td>
<td></td>
</tr>
<tr>
<td>▪ Cardiac rhythm changes, arrhythmias or signs of heart failure (eg new shortness of breath)</td>
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<tr>
<td>▪ Nausea and vomiting</td>
<td></td>
</tr>
<tr>
<td>▪ Signs of stroke, intracranial haemorrhage – change in AVPU or neuro status</td>
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</tr>
</tbody>
</table>

| ECGs |
| 21. Perform ECGs 5 minutes, 30 minutes, 60 minutes and 90 minutes post Tenecteplase or if patient reports any new chest pain |
| ▪ Review ECG (in conjunction with MO) for at least 50% reduction in ST segment elevation compare to pre-Tenecteplase ECG. Discuss with cardiologist if 50% reduction hasn’t occurred by 30 minute ECG |

22. Prepare patient for transfer to tertiary centre

23. Draw blood for Troponins at 60 minutes post Tenecteplase administration. Repeat at 4 and 8 hours.

**DATE:**

**TIME:**

**NAME:**

**DESIGNATION:**
High Risk ACS / Post Cardiac Thrombolysis Anticoagulation Guidelines

Anticoagulation guidelines for patients post cardiac thrombolysis OR high risk ACS (TIMI > 3 or a High Risk Feature).

Note – all anticoagulation should be prescribed on a WA Anticoagulation Medication Chart (MR170C)

1. **Patients with**
   - Expected time to angiography < 6 hours
   - AND
   - ePPT monitoring is available

   **Yes**
   - Prescribe INTRAVENOUS INFUSION of Heparin as per guidelines on WA Anticoagulation Medication Chart using Acute Coronary Syndrome nomogram advice.

   **No**

2. **Patients with known renal impairment**
   - (Creatinine Clearance < 30 mL/min)

   **Yes**
   - Administer Enoxaparin 1mg/kg (to a maximum 100mg)
     - SUBCUTANEOUSLY STAT
     - then DAILY for 48 hours

   **No/Unknown**

3. **Patient ≥ 75 years**

   **Yes**
   - Administer Enoxaparin 0.75 mg/kg (to a maximum 75mg)
     - SUBCUTANEOUSLY STAT
     - then 12 hourly for 48 hours

   **No**

   Administer Enoxaparin 1mg/kg (to a maximum 100mg)
   - SUBCUTANEOUSLY STAT
   - then 12 hourly for 48 hours

   For patients thrombolysed, also give a single IV dose of 30mg 15 – 30 minutes after tenecteplase.
Non Hospital Management

- Consider use of Health Pathways
Acute Chest Pain

Indicates specific advice for Aboriginal and Torres Strait Islander people. Indicates information specific to people from culturally and linguistically diverse communities.

Clinical Editor's Note
General practitioners working in a WACHS hospital should follow WACHS guidelines.

This pathway applies to patients with acute chest pain and/or suspected acute coronary syndrome (ACS) in the past 72 hours.

About acute chest pain
- Acute coronary syndrome (ACS) includes myocardial infarction (MI) and unstable angina.
- ACS currently accounts for 20% of all deaths in WA. This figure can be significantly reduced by appropriate early intervention.
- Aboriginal patients are 3 times more likely to have an acute coronary event at an earlier age, and are more likely to die, than other Australians.

Assessment

Practice Point!
- Assess all patients presenting with chest pain within 10 minutes of arrival.
- If the likelihood of ACS is high, call an ambulance (000) before any further assessment, then perform an ECG.

1. Assess for ACS:
- If high likelihood, call an ambulance (000) for immediate transfer to emergency department.
- Perform an ECG (if available) within 10 minutes on all patients.
  - Review ECG for new ECG changes.

New ECG changes (i.e., not known to be old)
- ST deviation $>0.5\text{ mm}$ in 2 or more contiguous leads.
- T wave inversion $\geq1\text{ mm}$ in 2 or more contiguous leads.
- New bundle branch block.

- If unsure about any ECG findings, consider requesting cardiology advice.
- Check for high-risk features of ACS.
New ECG changes (i.e., not known to be old)

- ST deviation, ≥ 0.5 mm in 2 or more contiguous leads.
- T wave inversion ≥ 1 mm in 2 or more contiguous leads.
- New bundle branch block.

- If unsure about any ECG findings, consider requesting cardiology advice.
  - Check for high-risk features of ACS.
  - If acute S-T elevation myocardial infarction (STEMI), inform the ambulance service so the patient can be fast-tracked to the most appropriate treatment.

2. If ECG is normal, and the patient has not been assessed as high risk of ACS, assess for other cardiovascular risk factors, and explore non-cardiac causes.

3. Perform examination:
   - Look for sweating.
   - Check temperature, blood pressure, heart rate, oxygen saturation.
   - Perform full examination of the chest and abdomen to look for non-cardiac cause.

Management

1. While waiting for the ambulance, give medications:
   - Oxygen (only if oxygen saturation < 94%) to maintain normoxia:
     - 94 to 98%, or
     - with COPD – 88 to 92%
   - Aspirin 300 mg loading dose, if not contraindicated.
   - Glyceryl trinitrate (GTN) sublingual or spray for pain – titrate to pain and blood pressure.
   - Note – GTN is only safe to administer 24 hours after last dose of sildenafil (Viagra) or vardenafil (Levitra), and 3 to 5 days after last dose of tadalafil (Cialis).
   - Morphine (IV) antiemetic for pain – titrate to pain.

2. Otherwise manage for non-cardiac causes:
   - Refer immediately to the nearest emergency department if:
     - spontaneous pneumothorax.
     - aortic dissection.
     - oesophageal perforation.
   - See Deep Vein Thrombosis (DVT) or Pulmonary Embolism (PE).

Request

- Call an ambulance (000) for immediate transfer to the emergency department if:
  - likely ACS.
  - spontaneous pneumothorax.
  - aortic dissection.
If unsure about any ECG findings, consider requesting Cardiology advice.

Information

- Cardiovascular Health Network – The Model of Care for Acute Coronary Syndrome in Western Australia
- WA Department of Health – Pathways for the Assessment and Management of Chest Pain/Suspected Acute Coronary Syndromes in the WA Country Health Services

Patient Information

Heart Foundation:

- Heart Attack Warning Signs
- Heart Attack Action Plan and Factsheet (in several languages)
- Aboriginal Health: Resources for Health Professionals (see information sheets halfway down the page)
- Heart Attack (Indigenous resource)

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Note: Only the electronic version is controlled. Once printed, this is no longer a controlled document.
Questions ??