Management of Acute Coronary Syndrome (ACS)

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ACUTE CORONARY SYNDROME (ACS)

WORKING DEFINITION
Clinical syndrome characterized by transient or permanent reduction in coronary blood flow due to thrombotic occlusion from acute atheromatous plaque rupture or endothelial (vessel) wall disruption with resultant myocardial ischemia and infarction
ACUTE CORONARY SYNDROME

With myonecrosis

Cardiac troponin +ve
1) Non ST elevation MI (NSTEMI)
2) ST elevation MI (STEMI)

No myonecrosis

Cardiac troponin -ve
Unstable angina
ACUTE CORONARY SYNDROME (ACS)

CASE VIGNETTE 1
64 year male with central chest pain
**History**: Presentation to ED with 4 hours of dull CP radiating to the jaw associated diaphoresis, nausea and dyspnea

**Past medical history**: Dyslipidemia, T2DM, TIA

**Drug history**: Aspirin 100 mg OD, Atorvastatin 20 mg daily, Metformin 1 g daily

**Social history**: Retired IT executive, smoker (10 cig/day), alcohol (2 std drinks/day)

**Family history**: Father (aortic dissection), mother (IHD)
64 year male with central chest pain

Physical exam:
Distressed, cold, clammy.

BP 160/90 mmHg, equal both arms, HR 92 bpm

Cardiovascular exam: normal s1, s2 no murmurs

Lungs: equal breath sounds, no added sounds

JVP: 3cm, No peripheral edema
Initial Clinical Evaluation is time-critical process

Australasian Triage Scale recommends patients presenting to ED with CP to be assessed within 10 min of presentations (CAT 2 priority)

### ATS triage guidelines

The Australasian Triage Scale (ATS) is designed for use in hospital-based emergency services throughout Australia and New Zealand. It is a scale for rating clinical urgency.

All patients presenting to an Emergency Department should be triaged on arrival by a specifically trained and experienced registered nurse. The triage assessment and ATS code allocated must be recorded.

#### Description of scale

<table>
<thead>
<tr>
<th>ATS Category</th>
<th>Treatment Acuity (Maximum waiting time)</th>
<th>Performance Indicator Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATS 1</td>
<td>Immediate</td>
<td>100%</td>
</tr>
<tr>
<td>ATS 2</td>
<td>10 minutes</td>
<td>80%</td>
</tr>
<tr>
<td>ATS 3</td>
<td>30 minutes</td>
<td>75%</td>
</tr>
<tr>
<td>ATS 4</td>
<td>60 minutes</td>
<td>70%</td>
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<tr>
<td>ATS 5</td>
<td>120 minutes</td>
<td>70%</td>
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</table>
Utilization of the Suspected ACS Assessment Protocol (Suspected ACS-AP)

All patients presenting with suspected ACS should receive care guided by an evidence based suspected ACS assessment protocol.

A suspected ACS assessment protocol aids evaluation, treatment (pharmacotherapies, early invasive management) and disposition (CCU, monitored environment, short stay or discharge).

Allows identification of high-risk patients or patients who could potentially be discharged.
A Locally Validated Suspected ACS-AP
For the Royal Darwin Hospital Emergency Department which incorporates the iHeart score
Initial 12-lead ECG with rapid assessment by an experienced clinician within 10 minutes of acute clinical contact

RATIONALE:
1) Exclude STEMI which will require activation of your institutional STEMI pathway and emergency reperfusion (PCI or lytics).

2) Diagnose NSTEMI/UA

*** Remember serial ECG every 10-15 minutes, if patient has ongoing CP
iHEART Score - Risk Stratification of patients with suspected cardiac chest pain
The Heart Score is a clinical tool to aid risk assessment in suspected cardiac chest pain. Patients receive a score based on risk factors, clinical parameters, and troponin level. Patients scoring 3 or less had less than 2.5% risk of a MACE (major adverse coronary event) over the following 6 weeks, and are generally considered safe for outpatient follow up (Six, Backus, & Kelder, 2008).

The Royal Darwin Hospital ED protocol uses serial, highly-sensitive troponins and a modified score, the iHEART (see table over page). The iHEART modifies the original score with addition of a point for indigenous status and a binary approach to troponin level, with removal of a +1 score for a mildly elevated troponin. This iHEART score should be calculated for all patients with suspected cardiac chest pain, if STEMI has been excluded and first troponin negative.
66 year male with central chest pain

hsTrop 200 (elevated)

I Heart score = 9 (REFER CARDIOLOGY)
66 year male with central chest pain

Diagnosis:

ACS - NSTEMI
66 year male with NSTEMI

Patient’s inpatient journey

ACS – Unstable angina/NSTEMI

Estimate ischemic and bleeding risks

Initiate Pharmacotherapy
66 year male with NSTEMI

Integrate stratification of ischemic and bleeding risk into clinical decision-making.

The routine use of validated tool to estimate ischemic and bleeding risk will allow for a patient-centered clinical decision making for ACS care and improve objectivity in clinicians assessment

When compared to risk scores, (GRACE – ischemic risk) and (CRUSADE-bleeding risk), physician clinical intuition alone in estimation of risks has been shown to be less accurate discriminator.
GRACE SCORE WEB BASED CALCULATOR

1. INPUT DATA > 2. DEATH / DEATH MI RESULTS

- Age (years)
- Heart rate (bpm)
- Systolic blood pressure (mmHg)
- CHF (Killip class)
- Diuretic usage
- Creatinine (mg dL⁻¹ / µmol L⁻¹)
- Renal failure
- ST-segment deviation
- Cardiac arrest at admission
- Elevated troponin*

* Or other necrosis cardiac biomarkers

RESET  CALCULATE
66 year male with NSTEMI

<table>
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<th>Clinical characteristic</th>
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| Very High           | • Haemodynamic instability, heart failure, cardiogenic shock or mechanical complications of MI  
                      • Life-threatening arrhythmias or cardiac arrest  
                      • Recurrent or ongoing ischaemia (i.e. chest pain refractory to medical treatment), or recurrent dynamic ST-segment and/or T-wave changes, particularly with intermittent ST-segment elevation, de Winter T-wave changes, or Wellens' syndrome, or widespread ST-segment elevation in two coronary territories |
| High                | • Rise and/or fall in troponin level consistent with MI  
                      • Dynamic ST-segment and/or T-wave changes with or without symptoms  
                      • GRACE Score >140 |
| Intermediate        | • Diabetes mellitus  
                      • Renal insufficiency (glomerular filtration rate <60mL/min/1.73m²)  
                      • Left ventricular ejection fraction <40%  
                      • Prior revascularisation: Percutaneous coronary intervention or coronary artery bypass grafting  
                      • GRACE score >109 and <140 |

GRACE = Global Registry of Acute Coronary Events
66 year male with NSTEMI

Initial clinical management and pharmacotherapy

1) Oxygen therapy
2) Aspirin
3) Sublingual nitrates
4) Opiod analgesia
5) P2Y12 inhibitors (clopidogrel/prasugrel/ticagrelor)
6) Unfractionated heparin/ low molecular weight heparin
7) Glycoprotein IIb/IIIa inhibitors
8) Direct thrombin inhibitors
9) Beta-blocklers
66 year male with NSTEMI

Oxygen supplementation

1) Routine use of O2 in patients, with SaO2 >93% is NOT recommended.¹-³
2) Caution for oxygen supplementation in COPD, aim for SaO2 88-92%
3) A single RCT has shown increase infarct size in patients who were given oxygen supplementation, if they were not hypoxic.⁴

¹. Cabello et al. Cochrane database 2013;8:CD007160
⁴. Welford et al. Circ 2015;132(suppl1. s146-s76
66 year male with NSTEMI

Aspirin

1) Aspirin 300mg orally (dissolved or chewed) and 100-150mg/day is recommended for all patients with ACS, without hypersensitivity.
2) Inhibitor of the platelet cyclooxygenase pathway and further inhibits platelet activation by thromboxane A2.
3) Use is supported by meta-analysis of 15 RCT.¹

¹ Antithrombotic Trialists’ Collaboration. BMJ 2002;324(7324):71-86
66 year male with NSTEMI

Nitrates

1) No mortality benefit
2) Vasodilatory properties (sublingual/intravenous) controls symptoms of myocardial ischemia.
3) Intravenous more effective than sublingual
4) Contraindicated in patients taking phosphodiesterase inhibitors (profound hypotension)
66 year male with NSTEMI

Opioid analgesia

1) Indicated if patient has ongoing ischaemic pain, despite anti-ischemic therapy.
2) Morphine and fentanyl preferred agents.
3) Caution as opioids may delay gastric emptying and absorption of oral P2Y12 inhibitors.
66 year male with NSTEMI

P2Y12 inhibitor (Ticagrelor/Prasugrel/Clopidogrel)

1) Recommended for patients with confirmed ACS in addition to aspirin.
2) Efficacy of clopidogrel + aspirin is well-established, newer P2Y12 inhibitors (prasugrel and ticagrelor) have demonstrated superior efficacy (reduction in ischemic events, composite endpoint of death, recurrent MI and stroke compared to clopidogrel).
3) However, these benefits come with increase major bleeding.

1. Yusuf et al. NEJM 2001;345(7):494-502
2. Wiviott et al. NEJM 2007;357(20):2001-
66 year male with NSTEMI

P2Y12 inhibitor (Ticagrelor/Prasugrel/Clopidogrel): choice of agent

1) Ticagrelor and prasugrel preferred 1st line
2) Ticagrelor recommended both STEMI, ACS in the absence of high-grade AV-block, Asthma/COPD
3) Prasugrel recommended for patients who have not received any P2Y12 inhibitors, in whom PCI is planned. Should not be used for patients >75 years, <60kg or history of TIA.
4) Newer P2Y12 inhibitor also recommended for stent thrombosis while on clopidogrel or patient with recurrent MI while being in clopidogrel.
Figure 5 Considerations for dual antiplatelet therapy (DAPT) in patients with ACS [163].
66 year male with NSTEMI

Anticoagulant therapy (UFH/LMWH)

1) Both indicated for ACS patients (intermediate-high ischemic risk)
2) UFH is indirect thrombin inhibitor
3) LMWH is an inhibitor of factor Xa
4) Meta-analysis of trials of NSTEMI patients demonstrated reduced recurrent MI and death or MI. No real mortality benefit was observed when compared to placebo.
5) LMWH vs UFH not associated with reduction or MI in direct comparison but meta-analysis showed mortality benefit with LMWH when used in PCI setting (ACS/non ACS) with effect seen mostly in STEMI.

2. Silvian et al. BMJ 2012;344:e553
66 year male with NSTEMI

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66 year male with NSTEMI

Direct thrombin inhibitor (Bivalirudin)

1) Can be considered an alternative to heparin and glycoprotein IIb/IIIa especially in patients with ACS undergoing PCI who have increase bleeding risk.

2) In STEMI, bivalirudin vs UFH was compared in 4 RCTs. Bivalirudin showed lesser bleeding but associated with increased risk of very early stent thrombosis. Overall, ischemic event rates were similar.

3) Consider bivalirudin in high bleeding risk ACS (STEMI) patients but consider prolongation of infusion for upto 2 hours post PCI (mitigate risk of stent thrombosis)

4) Cost of bivalirudin much higher compared to heparin

1. Stone et al. NEJM 2008;358(21) 2218-30
2. Valgimigli et al. NEJM 2015;373(11) 997-1009
66 year male with NSTEMI

Glycoprotein IIb/IIIa inhibitors

1) Recommended in combination with heparin during PCI in patients with high risk clinical and angiographic characteristics or thrombotic complications among patients with ACS.
2) Meta-analysis showed reduced rates of death/recurrent MI in troponin +ve ACS patients who were undergoing PCI
3) Most trial data were in the era prior to routine use of P2Y12 inhibitors.
4) Can consider in combination with heparin in high ischemic risk patients, +ve positive with anticipated delay to the cath lab.
5) Caution as it has been associated with increased bleeding risk.
66 year male with NSTEMI

Beta-blockers

1) Decreased myocardial oxygen demand – reduces ischemia
2) Contemporary trial evidence suggest reduction in recurrent MI, angina but increase risk of heart failure, cardiogenic shock
3) Caution in heart failure, AV block, inferior MI and hemodynamic instability.
ACS – Unstable angina/NSTEMI

Initiate Pharmacotherapy

Invasive management +/- PCI or CABG

Estimate ischemic and bleeding risks

1) Oxygen therapy
2) Aspirin
3) Sublingual nitrates
4) Opioid analgesia
5) P2Y12 inhibitors (clopidogrel/prasugrel/ticagrelor)
6) Unfractionated heparin/low molecular weight heparin
7) Glycoprotein IIb/IIIa inhibitors
8) Direct thrombin inhibitors
9) Beta-blockers

Intermediate risk
High risk
Very high risk
66 year male with NSTEMI

Invasive management

1) In high, very-high risk patients with ACS, early angiography with coronary revascularization (PCI/CABG) is recommended.

2) In patients with no recurrent symptoms, no risk criteria (low risk for ischemic events), may consider selective invasive strategy guided by provocative testing for inducible ischemia.

3) Need to consider the relative benefits and harms within the context of patient preference, comorbidities and competing clinical risks.

4) Routine invasive approach estimate to reduce absolute rates of combined death, recurrent MI and CV rehospitalization at 12 months by nearly 5%.
66 year male with NSTEMI

**Table 10** Markers of increased risk of mortality and recurrent events among patients with confirmed ACS

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|                     | • Left ventricular ejection fraction <40%  
|                     | • Prior revascularisation: Percutaneous coronary intervention or coronary artery bypass grafting  
|                     | • GRACE score >109 and <140  |

GRACE = Global Registry of Acute Coronary Events
66 year male with NSTEMI

Mode of revascularization

1) Patient comorbidities, fitness of major surgery, coronary anatomy, severe airways disease are main determinants for PCI vs CABG
2) Urgent CABG may be indicated for failed PCI, mechanical complications of MI
66 year male with NSTEMI

Elderly patients (RISK-TREATMENT PARADOX)

1) Eligibility for routine invasive should not be determined by chronological age, in isolation.
2) Meta-analyses indicated that elderly patients experience more events and derive greater absolute reductions in recurrent ischemic events from a routine invasive approach.
3) A careful assessment of potential harms, benefits, estimated life-expectancy, comorbidity burden, current QoL, frailty, patient value and preferences.
66 year male with NSTEMI

Invasive approach is selected
Risk profile is high, therefore aim for coronary angiogram within 24 hours
ACS – Unstable angina/NSTEMI

1. Estimate ischemic and bleeding risks

2. Initiate Pharmacotherapy

   1) Oxygen therapy
   2) Aspirin
   3) Sublingual nitrates
   4) Opioid analgesia
   5) P2Y12 inhibitors (clopidogrel/prasugrel/ticagrelor)
   6) Unfractionated heparin/low molecular weight heparin
   7) Glycoprotein IIb/IIIa inhibitors
   8) Direct thrombin inhibitors
   9) Beta-blockers

3. Invasive management with PCI and stents

4. Secondary preventative therapy and cardiac rehabilitation
66 year male with NSTEMI

Secondary preventative therapy for ACS

1) Statins – indefinitely, consider highest-tolerated dose, if intolerant, can consider ezetimibe

2) Beta-blockers - most benefit if LVEF <40% (consider vasodilatory agents) lower risk of death, reinfarction and sudden cardiac death among patients with LV dysfunction. Least benefit in low risk patients, normal LVEF, asymptomatic (consider cease after 12 mths)

66 year male with NSTEMI

Secondary preventative therapy for ACS

Cardiac rehabilitation
All patients hospitalized with ACS is recommended to attend cardiac rehabilitation program or undertake a structured secondary prevention service.

Patients who attend such programs have a significant reduction of absolute risk of CV death, MI and stroke at 12 months (4.5%)
ACUTE CORONARY SYNDROME (ACS)

CASE VIGNETTE 2
72 year female with syncope and chest pain
History: Presentation to ED after witness collapse at home with subsequent chest pain

Past medical history: T2DM, HTN, Lipids

Drug history: Aspirin 100 mg OD, Atorvastatin 40 mg daily, Metformin 1 g daily

Social history: Lives with son, non-smoker, independent ADLS, no cognitive issues
74 year female with syncope and chest pain

Physical exam:
Alert, cold, peripherally shutdown

BP 100/80 mmHg, equal both arms, HR 60 bpm

Cardiovascular exam: normal s1, s2 no murmurs

Lungs: equal breath sounds, no added sounds

JVP: 5 cm, No peripheral edema
74 year female with syncope and chest pain

12-lead ECG
TIME IS MYOCARDIUM, MORTALITY INCREASES AND CLINICAL OUTCOMES ARE POORER WITH SYSTEMS DELAY
74 year female with syncope and chest pain

Infero-posterior STEMI
Emergency reperfusion pathways

Reperfusion strategies (PCI vs lytics) depends on clinical status of patient, geographical location of patient and whether initial hospital is PCI capable.
74 year female with inferoposterior STEMI,

Emergency reperfusion with primary PCI or lytics is recommended

 Depending on whether centre is PCI-capable.

In non-PCI capable hospital with an anticipated delay to PCI, lytic therapy is recommended
74 year female with inferoposterior STEMI,

PCI capable centre

1) Immediate loading of DAPT
2) Transfer to cardiac cath lab for PCI
74 year female with inferoposterior STEMI,

Non-PCI capable centre

1) Lytic therapy (tenectaplace), weight-adjusted
2) DAPT
3) IV enoxaparin
4) Urgent transfer to PCI-capable centre – ‘drip and ship’
POSITION STATEMENT

National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand: Australian Clinical Guidelines for the Management of Acute Coronary Syndromes 2016

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Guidelines should be read in conjunction with the ACS Clinical Care Standards¹ and the Australian acute coronary syndromes capability framework²

Clinical guidelines are not meant to be replaced by clinical judgement but only to serve as a guidance.
THANK YOU

Questions ?