

# Acute Coronary Syndromes (Excluding STEMI)

(Update October 2016. Version 6)

## Guideline Readership

*All doctors, nurses and other members of the multidisciplinary team dealing with patients presenting with acute coronary syndromes (ACS).*

## Guideline Objectives

*The objectives of this guideline are to outline the investigation and management of patients with acute onset cardiac sounding chest pain suspected to be due to an acute coronary event.*

***This guideline applies only to patients whose history and clinical examination are suggestive of an acute coronary syndrome as the cause of their chest pain.***

***Use this protocol for patients with chest pain suggestive of cardiac ischaemia, lasting longer than 15 minutes***

## Other Guidance

This guideline outlines the standard approach to the management of ACS in this trust and outlines further updates on pharmacological management of ACS.

**Ratified Date:** October 2016

**Launch Date:** 1<sup>st</sup> February 2017

**Review Date:** 1<sup>st</sup> February 2020

**Guideline Authors:** Dr Bethan Freestone, Dr Richard Watkin (originally adapted from bedside clinical guidelines).

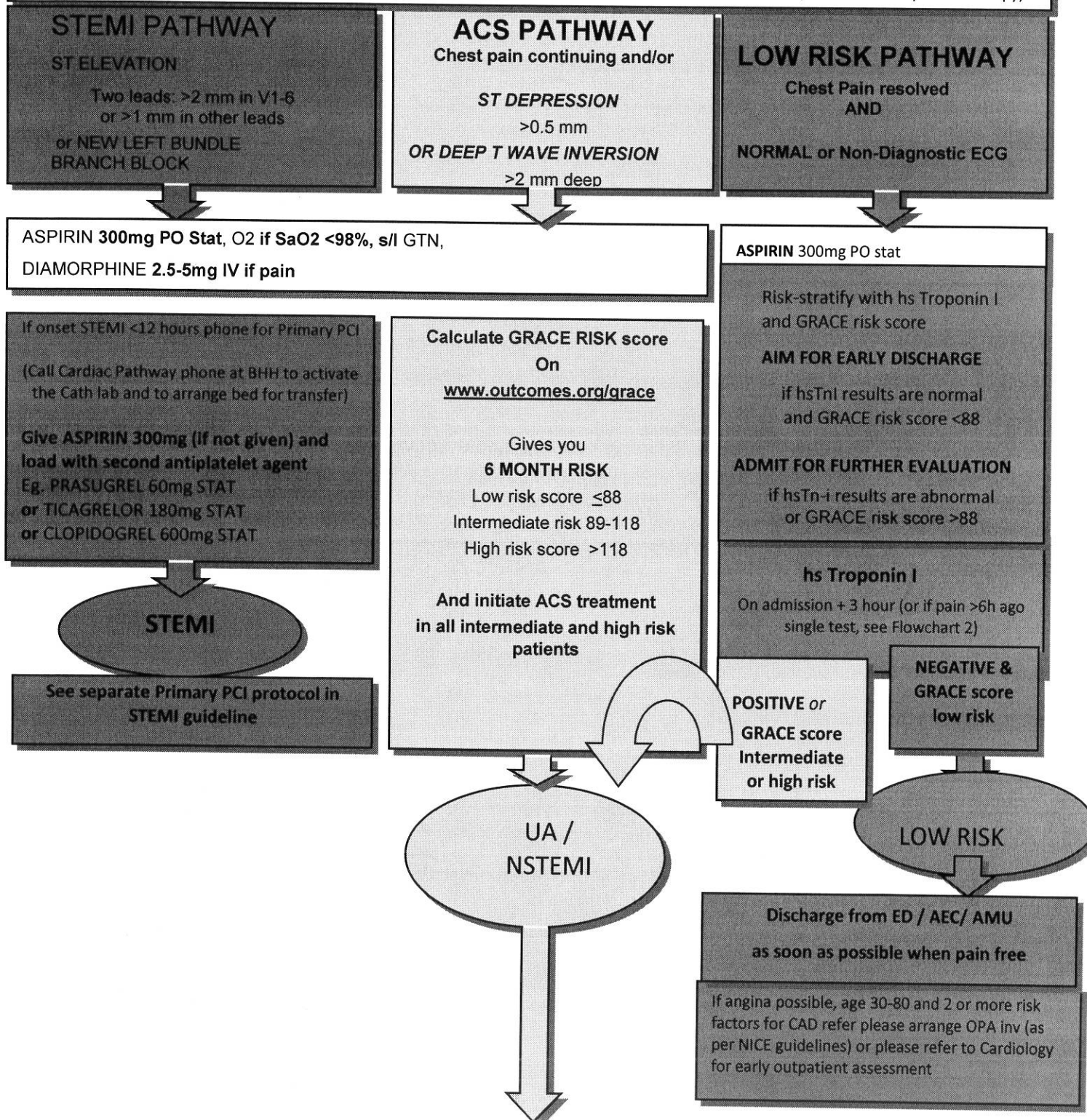
GLOSSARY OF TERMS

ACE	angiotensin-converting enzyme
ACS	acute coronary syndrome
AMU	acute medical unit
ARB	angiotensin receptor blocker
bd	twice daily
BHH	Birmingham Heartlands Hospital
BMS	bare-metal stent
BP	blood pressure
CABG	coronary artery bypass graft
CAD	coronary artery disease
CCU	Coronary care unit
CK	creatinine kinase
CKD	chronic kidney disease
CT	computed tomography
CXR	chest X ray
DAPT	dual(oral) antiplatelet therapy
DES	drug-eluting stent
DOAC	direct oral anticoagulant
ECG	electrocardiogram
ED	Emergency department
ESC	European Society of Cardiology
FBC	Full blood count
GFR	estimated glomerular filtration rate
GHH	Good Hope hospital
GRACE	Global Registry of Acute Coronary Events
hsTnI	high sensitive Troponin i
INR	international normalized ratio
i.v.	intravenous
LBBB	left bundle branch block
LFT	liver function tests
LMWH	low molecular weight heparin
LV	left ventricular
LVEF	left ventricular ejection fraction
MACE	major adverse cardiovascular event
MI	myocardial infarction
MINAP	Myocardial Infarction National Audit Project
NICE	National Institute for Clinical Excellence
NSAID	non-steroidal anti-inflammatory drug
NSTE-ACS	non-ST-elevation acute coronary syndromes
NSTEMI	non-ST-elevation myocardial infarction
NYHA	New York Heart Association
OAC	oral anticoagulation/anticoagulant
od	once daily
PCI	percutaneous coronary intervention
RCT	randomized controlled trial
sc	subcutaneous
SHH	Solihull hospital
STEMI	ST-segment elevation myocardial infarction
TIA	transient ischaemic attack
TIMI	Thrombolysis In Myocardial Infarction
TVR	target vessel revascularization
UA	unstable angina
U&E	urea and electrolytes
UFH	unfractionated heparin
VKA	vitamin K antagonist

1. Flow Chart 1.

**SUSPECTED ACUTE CORONARY SYNDROME PROTOCOL**  
Heart of England NHS Foundation Trust 2016  
(modified from Worcestershire Acute Hospitals NHS trust guideline)

**HISTORY AND EXAMINATION:** These are crucial. This guideline applies only to patients whose history and clinical examination are suggestive of an acute coronary syndrome (ACS) as the cause of their chest pain (pain suggestive of cardiac ischaemia, often with sweating/nausea, lasting longer than 15 mins). **Use the ECG for initial risk stratification:** ST elevation myocardial infarction (STEMI)/ ST depression or T inversion /normal. 12 LEAD ECG – every 15 minutes until pain-free, then at 1 hour and 4 hours after pain. **Check BP** both arms. **IV ACCESS and BLOODS** – trop, U&E, lipids, LFT, glucose, FBC, and consider CXR (but do not delay other therapy)



**STEMI PATHWAY**

**ST ELEVATION**

Two leads: >2 mm in V1-6  
or >1 mm in other leads  
or NEW LEFT BUNDLE  
BRANCH BLOCK

**ACS PATHWAY**

Chest pain continuing and/or

**ST DEPRESSION**

>0.5 mm  
**OR DEEP T WAVE INVERSION**  
>2 mm deep

**LOW RISK PATHWAY**

Chest Pain resolved  
**AND**

**NORMAL or Non-Diagnostic ECG**

ASPIRIN 300mg PO Stat, O2 if SaO2 <98%, s/l GTN,  
DIAMORPHINE 2.5-5mg IV if pain

ASPIRIN 300mg PO stat

Risk-stratify with hs Troponin I  
and GRACE risk score

**AIM FOR EARLY DISCHARGE**

if hsTnI results are normal  
and GRACE risk score <88

**ADMIT FOR FURTHER EVALUATION**

if hsTn-i results are abnormal  
or GRACE risk score >88

**hs Troponin I**

On admission + 3 hour (or if pain >6h ago  
single test, see Flowchart 2)

POSITIVE or  
GRACE score  
Intermediate  
or high risk

NEGATIVE &  
GRACE score  
low risk

**STEMI**

See separate Primary PCI protocol in  
STEMI guideline

**Calculate GRACE RISK score**  
On

[www.outcomes.org/grace](http://www.outcomes.org/grace)

Gives you

**6 MONTH RISK**

Low risk score ≤88  
Intermediate risk 89-118  
High risk score >118

And initiate ACS treatment  
in all intermediate and high risk  
patients

**UA /  
NSTEMI**

**LOW RISK**

Discharge from ED / AEC/ AMU  
as soon as possible when pain free

If angina possible, age 30-80 and 2 or more risk  
factors for CAD refer please arrange OPA inv (as  
per NICE guidelines) or please refer to Cardiology  
for early outpatient assessment

**ACUTE CORONARY SYNDROMES (YELLOW) PATHWAY RISK STRATIFICATION**

HEFT 2016

**HIGH RISK PATHWAY**

**INTERMEDIATE RISK PATHWAY**

**TREATMENT FOR ACS**

- ASPIRIN 300mg stat followed by 75mg od
- CLOPIDOGREL 300mg stat followed by 75mg od (or TICAGRELOR 180mg stat then 90mg bd if high risk\*)
- BISOPROLOL 2.5mg-5.0mg od if not contraindicated
- FONDAPARINUX- 2.5mg sc od (or if Cr Clearance <20ml/min consider enoxaparin 1mg/kg sc od)
- GTN 2-10 mg/hr IV infusion if continuing pain
- ATORVASTATIN 80mg daily
- RAMIPRIL 2.5mg od to be started the following day (or current ACE I/ARB) if UE normal

\*Ticagrelor should be given in preference to clopidogrel in HIGH RISK ACS if recommended after discussion with Cardiology

If high risk **TRIAGE TO CCU** by contacting Cardiac pathway team (BHH) or CCU at SHH/GHH

**Other high risk features:**  
Heart failure,  
Haemodynamic instability,  
Ongoing pain -  
Contact Cardiac pathway team for CCU admission and discussion with on call cardiology team

Intermediate risk  
**TRIAGE TO AMU**

Discuss with interventional cardiologist if continuing chest pain with ECG changes

**Check hsTnI at presentation**

Repeat at 3 hour if 1<sup>st</sup> sample >5ng/L\*\*. Calculate difference ( $\Delta$ ) as %

\*\*If chest pain <6 hour before presentation, repeat TnI should be checked at 3 hours  
INTERPRET THE RESULTS WITH ALL AVAILABLE INFORMATION – CAREFUL HISTORY, ECG, CXR

6h hsTnI  
<5ng/L

hsTnI  
<16ng/L (f) or  
34ng/L (m)  
with <20%  
change

**ACS excluded**  
• Consider other diagnoses  
• Consider discharge

Refer Cardiology for early OP investigations if new angina felt likely

hsTnI  
>16 ng/L (f) or  
>34ng/L (m)  
With >20% change

**ACS likely**  
Admit /refer cardiology and consider  
"Early Invasive Strategy"  
(Cath lab in < 72 hrs)

- Other e.g.
- hsTnI abnormal with  $\Delta$ <20%
  - Raised hsTnI, no chest pain

**CONSIDER OTHER DIAGNOSIS**

**Examples of other (non- ACS) causes of a raised hsTnI**

- Chronic or acute renal dysfunction
- Severe congestive heart failure – acute and chronic
- Hypothyroidism
- Hypertensive crisis
- Burns, if affecting >30% of body surface area
- Inflammatory diseases, e.g. myocarditis
- Acute neurological disease, including stroke, or subarachnoid haemorrhage
- Aortic dissection, aortic valve disease or hypertrophic cardiomyopathy
- Cardiac contusion, ablation, pacing, cardioversion, or endomyocardial biopsy
- Rhabdomyolysis
- Critically ill patients, especially with respiratory failure, or sepsis
- Tachy- or bradyarrhythmias
- Pulmonary embolism, severe pulmonary hypertension
- Acute neurologic disease, including stroke, or subarachnoid haemorrhage
- Aortic dissection, aortic valve disease or hypertrophic cardiomyopathy
- Cardiac contusion, ablation, pacing, cardioversion, or endomyocardial biopsy

## 2. Executive Summary & Overview

This guideline should be followed for the investigation and management of patients with acute onset cardiac sounding chest pain suspected to be due to an acute coronary event.

## 3. Body of Guideline

### RECOGNITION AND ASSESSMENT OF AN ACUTE CORONARY SYNDROME

#### *Definition*

- Acute coronary artery syndromes comprise myocardial infarction and unstable angina, and are currently distinguished by history, ECG and presence or absence of markers of myocardial injury (enzyme series). The history is important and severe disease can be present even without elevation of cardiac enzymes
- Raised markers signify myocardial infarction, not unstable angina
- Unstable angina is:
  - onset of **frequent** attacks of angina for the first time, **OR**
  - sudden worsening of previously stable angina without change in medical treatment, **OR**
  - recurrent angina at rest

***An attack of angina that lasts >20 min or keeps recurring despite repeated use of glyceryl trinitrate (GTN) is an indication for immediate admission to hospital***

#### *Symptoms and signs*

- Central chest pain/tightness or discomfort (pain can also occur in arms, shoulders, throat, jaw, teeth, back, or upper abdomen)
- Breathlessness

#### *Investigations*

- ECG on admission, during further episodes of chest pain, and 24 hr after admission
  - ST segment **depression** occurring only during pain suggests myocardial ischaemia (consider acute posterior infarction if seen in leads V1–3 only and slow to resolve; check V4R and V7–9)
  - ST segment **elevation** occurring only during pain suggests coronary artery spasm (Prinzmetal angina) or acute infarction
  - ST segment **elevation** that does not resolve rapidly after giving GTN suggests acute infarction – see **Acute myocardial infarction STEMI** guideline
  - Subsequent occurrence of deep symmetrical T-wave inversion without Q waves suggests ischaemia or NSTEMI
- Bloods: U&E, FBC, hs Troponin I, lipid profile, glucose and HbA1c
- PLEASE NOTE a raised hs Troponin I concentration can suggest myocardial necrosis but can also occur in a number of other conditions including: auto-immune disease, congestive cardiac failure, critical illness, dilated cardiomyopathy, extreme physical effort, hypertension, hypothyroidism, multiple injury, myocarditis, pericarditis, pneumonia, pulmonary embolism, renal failure, sepsis/septic shock, subarachnoid haemorrhage, tachyarrhythmias, vasculitis. For this reason Troponin testing should be reserved for patients with cardiac sounding chest pain or where myocardial infarction is strongly suspected to be the cause of an acute presentation.
- The diagnostic criteria for NSTEMI includes a hs Troponin I >16 nanograms/L for females or >34 nanograms/L for males with a significant change on repeat sampling. (See following flowchart 2).

#### **Paper Copies of this Document**

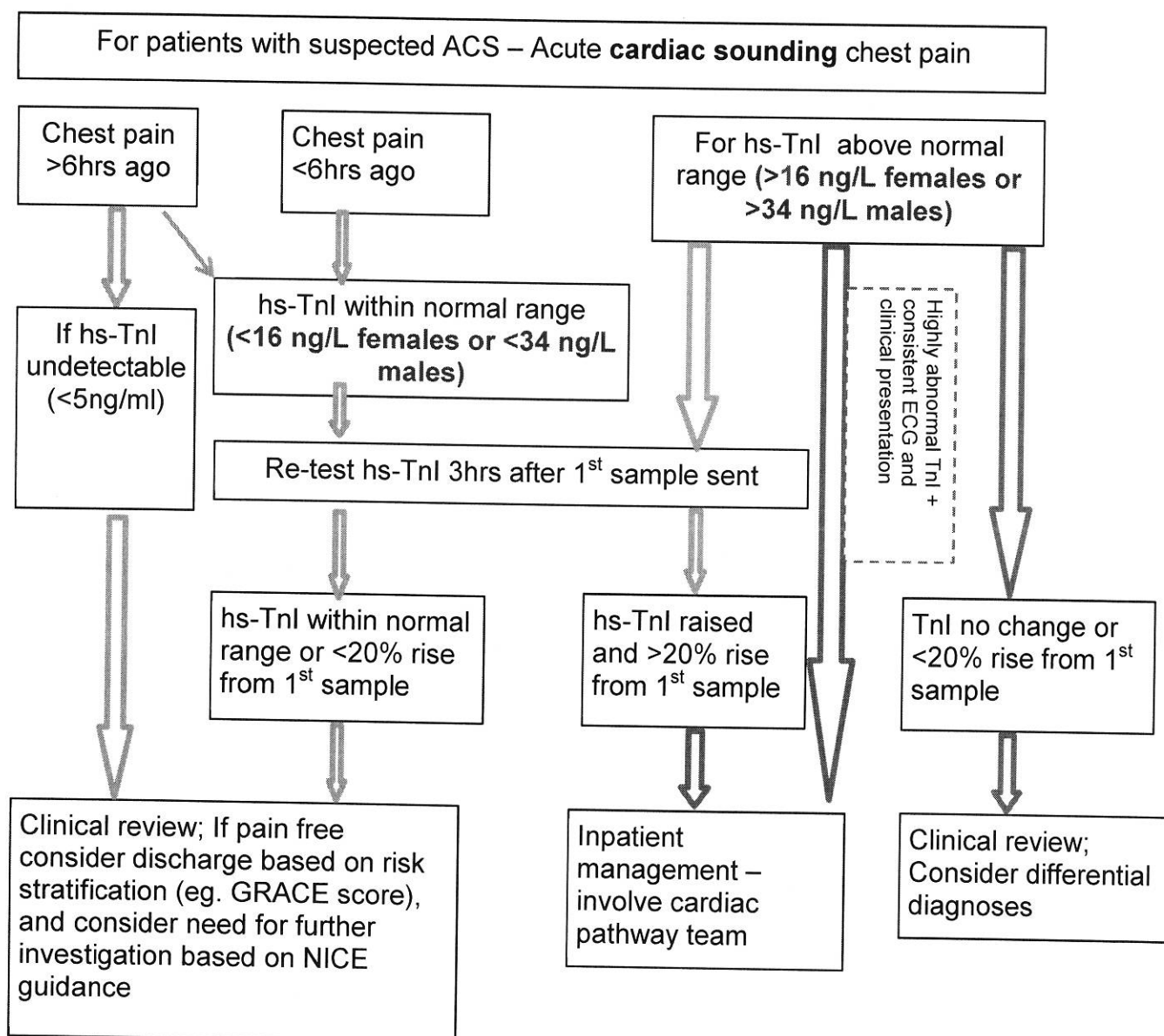
- If you are reading a printed copy of this document you should check the **Trust's Guideline website** to ensure that you are using the most current version.

## Flowchart 2. Use of hs Troponin I in the diagnosis of Acute Coronary Syndromes

The trust uses gender specific Troponin results – for Males <34ng/l and for Females <16ng/l are considered to be within normal range.

**If the patient had chest pain onset >6hrs ago then a single point troponin test can be used alongside patient risk stratification.** Paired troponin samples should still be sent at 0h and 3h for patients with onset of chest pain within the last 6 hrs or with ongoing chest pains whilst in hospital.

The flowchart below summarises this change and is a reminder of the role troponin plays in the suspected ACS pathway.



## Calculations

- Risk stratify the patient using the **GRACE risk** prediction model ([www.outcomes.org/grace](http://www.outcomes.org/grace)) to evaluate 6 month and short term mortality and in order to guide treatment.

Risk category (tertiles)	GRACE risk score	In-hospital deaths (%)
Low	≤108	<1
Intermediate	109-140	1-3
High	>140	>3

Risk category (tertiles)	GRACE risk score	Post-discharge to 6 months deaths (%)
Low	≤88	<3
Intermediate	89-118	3-8
High	>118	>8

For calculations, see <http://www.outcomes.org/grace>.

- Calculate **Creatinine clearance** for dosing Fondaparinux

Calculating Creatinine Clearance (CrCl) Note: Do not use eGFR		
$(140 - \text{age}) \times \text{Weight (kg)} \times 1.04$ Female	=	_____ ml/min
$\frac{\text{Serum Creatinine (micromol/l)}}{\text{_____}} \times 1.23$ Male		

## IMMEDIATE TREATMENT OF ALL SUSPECTED ACS

- Admit all patients with unstable angina with acute ST depression and/or raised serial hs Tn i and/or elevated GRACE score (in the intermediate or high range) to a monitored bed on AMU (BHH), Wd 17 (SHH) or Wd 23 (GHH). All suitable patients should then be reviewed by Cardiology as an inpatient.
  - Give aspirin 300 mg orally (chew and swallow)
  - Give a second antiplatelet agent loading dose (eg. clopidogrel 300mg stat or ticagrelor\* 180mg for confirmed high risk ACS if recommended after discussion with Cardiology).
- Please see Flow chart 1**

*\*Cardiology review is recommended before initiation of ticagrelor*

### PRESCRIBE:

- Ongoing dual antiplatelet therapy with aspirin and clopidogrel 75mg od (or ticagrelor 90mg bd)
- Sublingual GTN as needed to control symptoms
- Bisoprolol 2.5 mg orally daily (or diltiazem 60 mg orally 8-hrly if beta-blocker contraindicated) aiming for a resting heart rate of 60bpm.
- Analgesia eg. Diamorphine 2.5 - 5 mg (2.5 mg in elderly or frail patients) by slow IV injection (1 mg/min)
- Antiemetic to be given alongside opiates eg. Metoclopramide 10 mg IV over 1-2 min (5 mg in young adults 15-19 yr <60 kg); allow ≥8 hr before repeating
- Weigh patient, work out Creatinine clearance and prescribe fondaparinux (provided there are no contraindications, and if no existing anticoagulation) for all intermediate and high risk patients. For patients with Cr Clearance of <20ml/min fondaparinux **is not** recommended and enoxaparin at a dose of 1 mg/kg ONCE DAILY should be prescribed instead of fondaparinux. This is to continue for 48hr after pain is relieved, until post PCI or can be immediately discontinued if troponin negative. **For patients already on anticoagulation please see following notes.**

## **SPECIAL CONSIDERATIONS FOR PATIENTS ALREADY TAKING ANTICOAGULANTS:**

For ACS patient taking warfarin

- Ensure a blood sample for an INR is sent. Aspirin and clopidogrel should be given
  - If warfarin continuation not mandatory (e.g. atrial fibrillation), omit warfarin and start fondaparinux when INR<2.0
  - If warfarin continuation mandatory (e.g. mechanical heart valve, recurrent thromboembolism), continue warfarin until cardiology review, **DO NOT PRESCRIBE FONDAPARINUX**

For ACS patient taking a Direct Oral Anticoagulant Drug (DOAC) e.g. Dabigatran, Rivaroxaban, Apixaban, Edoxaban

- If continuation not mandatory (e.g. atrial fibrillation), temporarily discontinue these drugs on presentation with ACS
- Aspirin and clopidogrel should be given as per above guidance. After discontinuation and waning of effect of DOAC (usually at least 12 hours after last intake, fondaparinux can be initiated
- If coronary angiography is not urgent, the DOAC should have been discontinued for at least 24 hours prior to the procedure. If DOAC continuation mandatory (e.g. pulmonary embolism, recurrent thromboembolism), continue until cardiology review



***Urgent referral to cardiology is indicated for patients with ongoing ST segment depression on ECG – consider for urgent coronary arteriography with a view to revascularisation. Contact on-call Cardiac pathway nurse or Cardiology Registrar at BHH for review***

Refer to **on call** cardiology team (cardiac pathway nurse or Cardiology Registrar), patients who have:

- failed to respond to initial treatment
- ECG changes as above
- ongoing pain with ST segment depression/T-wave inversion or elevated enzymes
- haemodynamic instability, arrhythmia
- early post-infarction unstable angina

## **SUBSEQUENT MANAGEMENT**

- **All patients with NSTEMI should be referred for a Cardiology opinion** if suitable for further investigation/revascularisation. These will be seen the following day on the Cardiology team AMU ward rounds or should be referred to on call cardiology registrar or cardiac pathway nurse (BHH) if on other wards.
- Continuing dual antiplatelet therapy with aspirin 75 mg **and** clopidogrel 75mg orally od **or** ticagrelor\* 90mg bd. Generally 12 months dual antiplatelet therapy is standard duration of therapy with aspirin continued lifelong.

Secondary prevention:

- Continue beta-blocker (use diltiazem only if beta-blocker contraindicated)
- ACE inhibitor (1<sup>st</sup> line- Ramipril 2.5mg once a day) should be initiated once haemodynamic stability confirmed and provided there are no contraindications or intolerances – see BNF
- Atorvastatin 80mg od (is standard therapy) or simvastatin 40mg od (Nb. care to be taken with Simvastatin>10mg if GFR <30ml/min)
- Consider an IV GTN infusion if chest pain is ongoing (50mg GTN in 50mls sodium chloride 0.9%, start infusion at 0.6ml/hr and aim to keep systolic BP above 90mmHg)
- **TARGET:** Coronary angiography+/- PCI to occur within 72 hours of admission as per NICE guidance

***Patients who fail to settle or whose GTN infusion cannot be withdrawn – consider for urgent coronary arteriography with a view to revascularisation. Contact on-call cardiology registrar or cardiac pathway nurse for BHH***

## **MONITORING TREATMENT**

- Hourly pulse and BP during GTN infusion until stable, then 4-hrly
- Check serial troponin levels at 0 and 3 hours to confirm diagnosis of NSTEMI
- All high risk patients should be on cardiac monitor or telemetry until post coronary angio (+/- coronary intervention recovery time)

*\*Ticagrelor is used instead of clopidogrel as the second anti-platelet agent for **high risk** acute coronary syndromes as per ESC guidance.*

#### **4. Reason for Development of the Guideline**

*This guideline has been updated to bring up to date with ESC and NICE recommendations and current practice in local trusts.*

#### **5. Methodology**

*This guideline is originally based on the Bedside clinical guidelines. It has been updated taking into account most recent NICE guidance and ESC guidelines. The flow chart is modified for local use from the flow chart used at Worcester Acute trust. The guideline has been agreed within Cardiology and after consultation with representatives from Acute Medicine, Emergency medicine and Pharmacy.*

#### **6. Implementation in HEFT & Community**

*The guideline will be published and advertised on the intranet after introduction at departmental and site medical meetings.*

#### **7. Monitoring & Suggested Quality Standards**

*Existing national audits in Cardiology (MINAP and BCIS) can be used to look at whether local practice is following guidance. Key targets would include invasive coronary angiography within 72hrs and the institution of appropriate medical therapies.*

#### **8. References**

*European Society of Cardiology Guidelines for the diagnosis and treatment of non-ST-segment elevation acute coronary syndromes. European Heart Journal (2015)*

*NICE Clinical Guideline CG94: Unstable angina and NSTEMI: the early management of unstable angina and non-ST-segment-elevation myocardial infarction  
<http://guidance.nice.org.uk/CG94>*

*NICE Technology appraisal TA236: Ticagrelor for the treatment of Acute coronary syndromes.  
<https://www.nice.org.uk/guidance/ta236>*

**Meta Data**

<b>Guideline Author:</b>	Dr Richard Watkin, Dr B Freestone (originally taken from Bedside Clinical Guidelines, and incorporating new Worcester guidelines)
<b>Guideline Sponsor:</b>	Dr Mike Pitt
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<b>Approved by:</b>	Dr Mike Pitt
<b>Date of CGG Ratification:</b>	
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<b>Related Policies / Topic / Driver</b>	

**Revision History**

<b>Version No</b>	<b>Date of Issue</b>	<b>Author</b>	<b>Reason for Issue</b>
1	May 2013	RW	CG development
2	Feb 2012	BF	Troponin I levels updated
3	May 2013	RW	Clexane guidance changed
4	Nov 2013	BF	HS Troponin I levels changed
5	Oct 2016	BF	Rewritten to include new troponin pathway
6	Oct 2016	BF/RW	Major revision to include recommended treatment with ticagralor, fondaparinux and advice on anticoagulation

**Clinical Director:**

**Signed**

**Name...**

**Date....**

*(Signature)* CP

18/2/17