Worcestershire Acute Hospitals NHS Trust

Acute Coronary Syndrome Guideline (Including management of ST elevation and non-ST elevation myocardial infarction)

This guidance does not override the individual responsibility of health professionals to make appropriate decision according to the circumstances of the individual patient in consultation with the patient and /or carer. Health care professionals must be prepared to justify any deviation from this guidance.

INTRODUCTION

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.

THIS GUIDELINE IS FOR USE BY THE FOLLOWING STAFF GROUPS:

All Medical staff.

Lead Clinician(s)

Dr Jasper Trevelyan	Consultant Cardiologist
Approved by Cardiology Directorate and DMB:	11th December 2024
Review Date: This is the most current document and is to be used until a revised version is available	11th December 2027

Key amendments to this guideline

Date	Amendment	By:
21.03.11	Cardiology CG Group agreed to extend guideline for six months to await further review.	Dr J Trevelyan
29.11.11	Extended for a further six months to allow time for agreement on changes to the current guidelines.	Dr J Trevelyan
17.05.12	Revised version with changes regarding pPCI and reperfusion therapy approved by Medicines Safety Committee on 9 May 2012	Dr J Trevelyan Alison Smith
04.12.12	PPCI pathway New dual anti-platelet therapy New hyperglycaemia treatment	Dr J Trevelyan
9.10.14	New hyperglycaemia recommendations Warfarin and novel oral anticoagulant guidelines included Updated CRT/ICD guidelines as per NICE TA314 Appendix 3 Resuscitated cardiac arrest included	Dr J Trevelyan
25.9.17	2.0 Risk stratification for NSTEMI updated for current hsTnT 5.4 Ezetimibe/PCSK9 inhibitors 8.0 Hyperglycaemia and diagnosis of DM	Dr J Trevelyan
5.5.21	Adjustment of antiplatelets: Prasugrel preferred over ticagrelor for PPCI Further clarification for use of DOACs and antiplatelets and extended therapy after 12 months Change to TnI and 0/1 hour sampling protocol Referral to heart failure nurses	Dr J Trevelyan
13.01.22	Glucose Control (point 8) for STEMI and NSTEMI amended	Dr J Trevelyan/ Alison Hall
22.5.24	Adjustment of antiplatelets: Prasugrel preferred over clopidogrel when PCI performed PPI recommendations added MIRACLE2 score recommended in OOH arrest Update to lipid guidance as per NHSE lipid guidance 2022 DM guidance updated with DM team	Dr J Trevelyan

Who will monitor compliance with the guideline?

Key control:	Checks to be carried out to confirm compliance with the policy:	How often the check will be carried out:	Responsible for carrying out the check:	Results of check reported to: *(Responsible for also ensuring actions are developed to address any areas of non-compliance)*	Frequency of reporting:
WHAT?	**HOW?**	**WHEN?**	**WHO?**	**WHERE?**	**WHEN?**
This area is monitored as part of the national MINAP audit, to which the Trust has always contributed	MINAP audit	All NSTEMI/STEMI patients submitted to MINAP	Cardiology Nurse Specialists	MINAP national audit	Continuously

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SUSPECTED ACUTE CORONARY SYNDROME PROTOCOL

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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 longerthan 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 one hour and four hours after pain. **BP** both arms

IV ACCESS and BLOODS - troponin, U&E, lipids, LFT, glucose, FBC, Coag screen, CXR (do not delay other therapy)

STEMI PATHWAY

ST ELEVATION
Two adjacent leads: >2 mm in V1-6
or >1 mm in other leads

With a history indicating acute MI

(NB LBBB is NOT usually an indication for PPCI)

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 <94%, s/l **GTN/DIAMORPHINE** 2.5-5mg IV if pain, **Consider CVRII (previously known as sliding scale) if** BG >11mmol/L

ASPIRIN 300mg PO stat

If onset STEMI <12 hours phone for Primary angioplasty on:
01905 760526 (internal 30196)
Give ASPIRIN 300mg (if not given) and PRASUGREL 60mg STAT (OR clopidogrel 300mg if taking oral anticoagulant or previous CVA/TIA)

STEMI

Aspirin 75mg od, **Prasugrel** 10mg od (5mg if >75 or wt<60kg, clopidogrel 75mg od if CVA/TIA), **Bisoprolol** 2.5-5.0mg od, **Atorvastatin 80mg** od, **Perindopril** 2mg od following day. **Refer** to Cardiac Rehab Nurses.

TIMI RISK SCORE

RISK FACTOR	POINTS
• Age > 65	1
• ≥3 CAD risk factors (↑Chol, FHx, HTN, DM, Smoker, PVD)	1
• Known CAD (stenosis ≥50%)	1
• Aspirin use in the past 7 days	1
• Severe angina (≥2 episodes in last 24 hours)	1
• ↑cardiac markers	1
• ST deviation ≥ 0.5m	1

RISK SCORE = Total Points (0-7)

Risk-stratify with Troponin I and TIMI (see box) risk score

AIM FOR EARLY DISCHARGE
if TnI results are normal
and TIMI risk score ≤2
Cardiology Nurse Specialists if stable angina likely (see below)
ADMIT
if TnI results are abnormal
or are delayed
or TIMI risk score 3-7

TROPONIN-I
On admission (repeat if detectable, see pathway below)

POSITIVE or TIMI 3-7

NEGATIVE & TIMI 0-2

UA / NSTEMI

See over for
MIDDLE PATHWAY

LOW RISK

Discharge from ED / MAU as soon as possible when pain free

If angina probable or significant risk factors for CAD, refer to **Cardiology Nurse Specialists** for early O/P assessment (wah-tr.cprcreferral@nhs.net)

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ACUTE CORONARY SYNDROMES (YELLOW) PATHWAY RISK STRATIFICATION

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HIGH RISK PATHWAY

TIMI Risk Score 5-7

INTERMEDIATE RISK PATHWAY

TIMI Risk Score 1-4

TREATMENT(unless already given)**:**
ASPIRIN 300mgs stat followed by 75mgs od
CLOPIDOGREL 300mgs stat followed by 75mgs od
BISOPROLOL 2.5mg-5.0mg od if not contraindicated
FONDAPARINUX- 2.5mg s/c od (if eGFR <20ml/min; consider iv unfractionated heparin)
GTN 2-10 mg/hr IV infusion if continuing pain
ATORVASTATIN 80mg daily
PERINDOPRIL 2mg od started the following day (or current ACE I/ARB)

TRIAGE TO CCU

Other high risk features:
Heart failure,
Haemodynamic instability,
Ongoing pain -
Triage CCU, discuss with on call cardiologist

TRIAGE TO MAU
Continuous ECG monitoring
refer to Cardiology within 24hours

Discuss with interventional cardiologist if continuing chest pain with ECG changes

hsTnI at presentation
If 1st sample <4ng/L and presentation >3 hours from pain onset, no repeat. If not, repeat at 1 hour. Calculate difference (**Δ**)

- If ACS clinically likely but not supported by initial TnI results, perform 3rd sample at 3 hours
- INTERPRET THE RESULTS WITH ALL AVAILABLE INFORMATION – CAREFUL HISTORY, ECG, CXR

Pain>3 hours, hsTnI **<4ng/L**

hsTnI **<5ng/L AND Δ<4ng/L**

ACS excluded
●Consider other diagnoses
●Consider discharge

Refer Cardiology Nurse Specialists for early OP Investigations if new angina felt likely

hsTnI **Δ>15ng/L OR >50ng/L**

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

Other:
- **hsTnI <50 AND Δ<15**

CONSIDER OTHER DIAGNOSIS. If ACS clinically likely, rpt TnI 3 hours; Δ>22ng/L ACS likely

Examples of other (non- ACS) causes of a raised hsTnT
●Chronic or acute renal dysfunction ●Rhabdomyolysis ●Severe congestive heart failure – acute and chronic ●Hypothyroidism ●Critically ill patients, especially with respiratory failure, or sepsis ●Hypertensive crisis ●Burns, if affecting >30% of body surface area ●Tachy- or bradyarrhythmias ●Pulmonary embolism, severe pulmonary hypertension ●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

Contents

MANAGEMENT OF ACUTE ST SEGMENT ELEVATION MYOCARDIAL INFARCTION (STEMI)

INTRODUCTION

The preferred therapy for reperfusion in ST elevation MI is mechanical reperfusion by angioplasty (primary percutaneous coronary intervention – PPCI). The advantages of PPCI are more complete reperfusion, treatment of the underlying coronary disease at the same time This is the preferred strategy for reperfusion when it can be administered in a timely fashion; regionally this has been agreed as the patient being at the door of the PCI centre within 90 minutes of the initial call for help. Thrombolysis is an alternative an option for patients who cannot get to a PPCI centre safely in time for the benefits to be realised.

Both strategies are most effective when administered promptly. The emphasis should be on speed and accuracy of diagnosis and administration of appropriate treatment.

Both therapies include treatment with:

1. Dual platelet inhibition: aspirin plus second anti-platelet agent (clopidogrel, prasugrel or ticagrelor)
2. Anti-coagulant (heparin or fondaparinux, administered in cath lab for PPCI)

1. INITIAL MEASURES

- ECG within 5 minutes of arrival
- Focussed history and examination including BP both arms
- Large IV cannula
- Oxygen if Sa02 <94% (unless history of COPD), pain relief with GTN, morphine or diamorphine, metoclopramide
- FBC, coagulation screen, U+E, glucose, lipids, LFT, troponin, CK
- Nurse in high care area (resuscitation in A+E, transfer to CCU)
- CXR after PPCI or thrombolysis unless clinical concern

2. INDICATION FOR REPERFUSION THERAPY

Eligibility is assessed on clinical and ECG criteria.

- Symptoms of MI: central crushing chest pain, usually severe, persisting for 15 minutes or more. Often accompanied by sweating; nausea, belching or vomiting. Resistant to GTN and rest.

- Time from onset of symptoms
  - Within 12 hours of pain onset (even if pain no longer present).
  - Within 24 hours if pain persists or recurs.

- ECG findings
  ST elevation > 2 mm in at least 2 anatomically adjacent chest leads.

  Or: ST elevation > 1 mm in at least 2 anatomically adjacent limb leads.

  NOT: LBBB. LBBB is **NOT** usually an indication for primary PCI as it is **NOT** usually a STEMI equivalent (indicating occluded major epicardial vessel)

3. DECISION FOR REPERFUSION THERAPY

Definite	Typical symptoms with definite ECG changes and no contraindications to treatment. Arrange PPCI

Uncertain	Usually borderline or unclear ECG. Senior / cardiology advice. Repeat ECG every 15 minutes.
Not indicated	Presenting features do not meet criteria.

4. PERCUTANEOUS CORONARY INTERVENTION (PCI)

Terminology	Primary PCI - PCI as first line therapy for acute STEMI Rescue PCI - PCI as second line therapy after failed thrombolysis

4.1 Primary PCI

- For full details see the "WRH Primary Angioplasty Protocol"
- PPCI is available at WRH 24 hours/day, 7 days/week
- Patients diagnosed with ST elevation MI pre-hospital and within 90 minutes of WRH will be taken directly to WRH for PPCI by the paramedic crew. Patients >90 minutes from a PPCI centre (e.g. some groups in Herefordshire) may still receive pre-hospital thrombolysis
- For patients arriving in ED, PPCI at WRH should be arranged. Call **01905 760526, internal 30196.** Give aspirin 300mg and ticagrelor 180mg. Use the checklist (appendix 1)(See NPSA loading doses reference).
- ECGs can be sent to Wah-tr.primarypciworcester@nhs.net
- **Out of hospital cardiac arrest** cases can involve difficult decision making and non-diagnostic, but highly abnormal, ECGs. Patients with cardiac arrest and a STEMI on the ECG should usually be managed by primary PCI. Please discuss cases with the interventional cardiologist on call. Additional guidance is provided in appendix 2

4.2 Rescue PCI

- Rescue PCI is superior to conservative management and/or repeat thrombolysis after failed reperfusion by initial thrombolysis
- Failed reperfusion is defined as continuing chest pain with <50% resolution of the ST elevation in the lead with the most ST elevation pre-thrombolysis
- Contact cardiologist at WRH to discuss cases

4.3 Thrombolysis

- Most patients will be treated with PPCI, as detailed above. Some patients may arrive at WRH having been treated with pre-hospital thrombolysis. There may be some occasions when PPCI is not available (multiple patients arriving at the same time, cardiac catheter laboratory failure) and thrombolysis is the preferred option. Discuss these cases with the on call interventional cardiologist:

4.3.1 Contra-indications to Thrombolysis

Absolute contraindications

- Haemorrhagic stroke or stroke of unknown origin at any time

- Ischaemic stroke in previous 6 months
- Central nervous system damage or neoplasm
- Recent major trauma/surgery/head injury (within 3 weeks)
- Gastro-intestinal bleeding within the last month
- Known bleeding disorder
- Aortic dissection

Relative contraindications

- Transient ischaemic attack in preceding 6 months
- Oral anticoagulant therapy (warfarin or direct agents e.g. dabigatran, rivaroxaban, apixaban, edoxaban)
- Pregnancy or within 1 week post partum
- Non-compressible puncture
- Traumatic resuscitation
- Refractory hypertension (systolic BP > 180)
- Advanced liver disease
- Infective endocarditic
- Active peptic ulcer disease

If contra-indications are present, discuss with on call interventional cardiologist.

4.3.2 Thrombolytic agent – Tenecteplase (TNK). Administer as single iv bolus over 10 seconds. There have been worldwide shortage of thrombolytic agents; streptokinase 1.5 million units over 1 hour is an alternative.

Dose according to body weight - see table.

Patient weight (kg)	TNK dose (U)	TNK dose (mg)	Volume (ml) of reconstituted solution
< 60	6,000	30 mg	6
60-69	7,000	35	7
70-79	8,000	40	8
80-89	9,000	45	9
> 90	10,000	50	10

4.3.3 Anticoagulant

Administer fondaparinux 2.5mg iv stat immediately after thrombolysis then 2.5mg s/c daily (see fondaparinux guideline WAHT-CAR-042). Continue until coronary angiography performed (omit on the morning of the procedure) or until hospital discharge.

If eGFR<20mls/min consider unfractionated heparin (UFH) as per trust heparin policy**
If UFH given already (e.g. ambulance pre-hospital thrombolysis), give first dose of fondaparinux 2.5mg s/c 30 mins after UFH

4.3.4 Monitoring the effects of thrombolytic therapy

Repeat ECG at 90 mins after thrombolytic
Successful reperfusion is defined as resolution of >50% of ST elevation in the single lead showing the most ST elevation pre-thrombolysis

If transient accelerated idioventricular rhythm occurs this reperfusion arrhythmia is often a clear sign of successful thrombolysis

Failed reperfusion – do not repeat thrombolytic (haemorrhagic risks without benefit). Consider rescue PCI (see above). Contact interventional cardiologist on call

5. PHARMACOTHERAPY

5.1 Platelet Inhibition

Aspirin 300 mg + prasugrel 60mg (OR clopidogorel 300mg if patient is already taking an oral anticoagulant OR previous CVA/TIA) STAT (loading doses, see NPSA loading doses reference) followed by daily maintenance doses of aspirin 75 mg od and prasugrel 10mg od (prasugrel 5mg od if age >75 or weight <60kg, clopidogrel 75mg od if previous CVA/TIA). Ticagrelor is used at consultant discretion

- Give if patient already on maintenance dose, including clopidogrel
- Aspirin can be dissolved sublingually if patient vomiting.
- Omit one or both loading doses if given pre-hospital.

Duration of Dual Anti-Platelet Therapy (DAPT)

DAPT is indicated for one year after ST elevation MI, irrespective of treatment.

In patients treated by PCI with stent, premature cessation of antiplatelets can result in stent thrombosis with high mortality. DAPT is usually mandated for 1 year after PCI with stent. There may be occasions when it can be discontinued earlier if there are bleeding complications or forthcoming surgery, **BUT in no circumstances should treatment be discontinued early without reference to an interventional cardiologist**

For patients on oral anticoagulants, the consultant cardiologist will indicate the appropriate long term antiplatelet regime. The published trials in this area are summarised in appendix 3.

5.2 Beta Blockers

Contemporary data show that STEMI patients with no evidence of heart failure benefit from early beta blocker therapy.

Oral beta blockers should be started as soon as possible. Suitable agents and doses include metoprolol 25-50mg bd and bisoprolol 2.5-5mg od. The role of early iv therapy is unclear.

Contraindications - cardiogenic shock, bradycardia HR<60/min; hypotension BP<100 mmHg systolic, any clinical or radiographic signs of heart failure; asthma; untreated phaeochromocytoma; sinoatrial or AV nodal dysfunction, 2nd or 3rd degree block; severe COPD; severe peripheral vascular disease

Patients already on a beta blocker should continue on one of the above agents/doses if free of the listed contraindications. Beta blocker therapy should be stopped if a contraindication develops but can be restarted at a later date if the patient is clinically stable.

5.3 ACE Inhibitors/Angiotensin Receptor Blockers (ARB)

ACE inhibitors improve survival and reduce heart failure when started 1-2 days after acute ST elevation MI, and may also reduce risk in patients with chronic stable coronary artery disease.

Start a test dose of ACEI on day 1 or 2, increase to target dose by discharge if as OP if early discharge (or continue current ACE I/ARB if prescribed pre-admission):

Drug	Initiation dose	Target dose
Perindopril (preferred 1st line agent)	2 mg daily	4 mg daily
Ramipril	1.25 mg bd	5 mg bd

ARB are an alternative in patients with side effects on ACE I (e.g. ACE I cough):

- Losartan 25-100mg od
- Candesartan 4-32mg od

Reduce dose in patients with severe kidney disease (GFR<30mls/min).

Monitor U&E closely and reduce or stop drug if renal function deteriorates abruptly or progressively.

Contraindications/cautions - hypotension systolic BP<90 mmHg, acute renal failure, Reno vascular disease, severe aortic stenosis, angioedema, known hypersensitivity.

5.4 Lipid lowering

Statins

Statins improve prognosis in coronary artery disease. There is also evidence of additional benefit of high dose statins early after acute coronary syndromes:

Start atorvastatin 80mg od. Reduce dose to 20-40 mg od if there are concerns regarding tolerability of high dose statin therapy.
Contraindicated in active liver disease and pregnancy. Check LFT within 3 months

Ezetimibe

Ezetimibe 10mg has additional effects on cholesterol and prognosis in ACS, and should be considered in addition to a statin in patients not achieving target cholesterol or intolerant of statins (reduces cholesterol by an additional 10-14%, and major adverse CV events by 7%, see NICE TA 132, NEJM 2015;372, 2387).

Target cholesterol – aim for reduction in non-HDL cholesterol of 40% (NICE CG 181)

PCSK-9 inhibitors

PCSK-9 inhibitors (evolocumab/alirocumab) produce profound reductions in LDL by increasing the expression of the LDL receptor on hepatocytes. They are indicated if LDL remains high despite maximal tolerated lipid lowering therapy (NICE ta393/394). The local process to follow is as follows:

- Start high intensity statin

- Lipids to be re-checked at the end of cardiac rehab (or by cardiology clinic/GP if rehab not completed)
- If non-HDL cholesterol not reduced by 40% or LDL>3.5, add ezetimibe
- Repeat lipids after 3 months. If LDL above limits below, consider PCSK-9 inhibitor (complete Blueteq initiation documentation – refer to lipid clinic/Dr Shetty/Goyal if required):

	Without CVD	With CVD	
		High risk of CVD[1]	Very high risk of CVD[2]
Primary non-familial hypercholesterolaemia or mixed dyslipidaemia	Not recommended at any LDL-C concentration	Recommended only if LDL-C concentration is persistently above 4.0 mmol/litre	Recommended only if LDL-C concentration is persistently above 3.5 mmol/litre
Primary heterozygous-familial hypercholesterolaemia	Recommended only if LDL-C concentration is persistently above 5.0 mmol/litre	Recommended only if LDL-C concentration is persistently above 3.5 mmol/litre	

[1]High risk of CVD is defined as a history of any of the following: acute coronary syndrome (such as myocardial infarction or unstable angina needing hospitalisation); coronary or other arterial revascularisation procedures; chronic heart disease; ischaemic stroke; peripheral arterial disease.

[2]Very high risk of CVD is defined as recurrent cardiovascular events or cardiovascular events in more than 1 vascular bed (that is, polyvascular disease).

Abbreviations: CVD, cardiovascular disease; LDL-C, low-density lipoprotein cholesterol.

5.5 Aldosterone antagonists

If heart failure with LV impairment present, consider spironolactone 25-50mg od or eplerenone 25-50mg od
Contra-indicated in hyperkalaemia or renal failure (Cr>200µmol/l). Caution in hypotension. Monitor potassium.

5.6 Proton pump inhibitors

PPIs are recommended for patients on dual antiplatelet therapy at higher-than-average risk of gastrointestinal bleeds (i.e. history of gastrointestinal ulcer/haemorrhage, anticoagulant therapy, chronic non-steroidal anti-inflammatory drug/corticosteroid use), or two or more of: (a) Age ≥65 years (b) Dyspepsia (c) Gastro-oesophageal reflux disease (d) Helicobacter pylori infection (e) Chronic alcohol use (see ESC ACS guidelines 2023). If used, lansoprazole is preferred

6. ECHOCARDIOGRAPHY

Echocardiography should be performed in all patients after STEMI to assess LV function. In-patient echocardiography should usually be performed, but can be

deferred in case of early discharge if there is no clinical suspicion of severe LV impairment (Q waves) or heart failure.

If severe LV impairment (EF<35%) and QRS duration is >120ms, refer for CRT/ICD (current NICE Guidance TA314 June 2014) opinion (Dr Foster/Dr Wilson clinic) as in- or out-patient depending on symptoms, and arrange for repeat scan at 4 weeks post-MI.

If there is moderate – severe LV impairment, refer to acute and/or community heart failure nurses (wah-tr.acuteheartfailurenurses@nhs.net, wah-tr.communityheartfailurenursesnorth@nhs.net, wah-tr.communityheartfailurenursessouth@nhs.net)

7. CARDIAC CATHETERISATION +/- PCI

If thrombolysis is used for reperfusion therapy, early (ideally the following day) cardiac catheterisation should be performed in all patients who have successful thrombolysis, with a view to PCI to reduce risk of recurrent angina and further infarction.

More urgent cardiac catheterisation should be considered for any patient who has further symptoms, further infarction or threatened further infarction after thrombolysis.

8. GLUCOSE CONTROL

Glucose control offers benefits in patients admitted with ACS.
Consider commencing Continuous Variable Rate Insulin Infusion (CVRII, previously known as sliding scale) in all patients with ACS and an admission blood glucose of 11.1mmol/l or higher (see guideline WAHT-END-002). Use of glucose and potassium is not a routine component of this management. Manage hyperglycaemia in patients admitted to hospital with ACS by keeping blood glucose levels <11.0mmol/l while avoiding hypoglycaemia (blood glucose <4.0mmol/L). Contact Diabetes Specialist Nurse (DSN) at WRH on ext 33846 or bleep 315 or at the Alexandra Hospital on 45782 or bleep 1030 when a referral is required as outlined below.

- **Patients with a previous diagnosis of Diabetes (Type 1 or 2) on subcutaneous insulin**

    - If the patient is a known diabetic already on subcutaneous insulin injections then their usual regime (see point 1.4 regarding basal insulin) can be restarted as soon as he/she is able to eat and drink (*see WAHT-END-011 for further guidance on discontinuing continuous variable rate intravenous insulin infusions*). Adjust insulin to keep BM 7-11, change insulin if HbA1c>57, contact DSN

- **Patients with a previous diagnosis of Diabetes (Type 2) taking oral hypoglycaemic agents and/or injectable GLP-1 analogues**

    - Patients diagnosed with Type 2 Diabetes who were previously taking oral therapy and/or injectable GLP-1 analogues e.g. exenatide should have these agents discontinued and subcutaneous insulin injections initiated. This is even more important if recent diabetes control in this patient has been suboptimal. HbA1c levels over the previous 12 months should be reviewed

- After 24-48 hours at the first breakfast or evening meal, the patient should be commenced on premixed biphasic insulin (**suggested insulin Novomix® 30**) administered subcutaneously twice daily. The starting dose is 8 units twice daily unless the patient required more than 30 units over the previous 24 hours in which case the initial dose should be increased appropriately. Other insulin types and regimes (e.g. once daily Insulatard®) can be considered in any individual patient at the discretion of the Physician or Consultant Diabetologist. Refer the patient to the Diabetes Specialist Nurses for education on initi8ation of insulin and commence the patient on the initiation of insulin care pathway (*See 'Guideline for the Management of the Initiation of Insulin' WAHT-END-006)*
- If recent diabetes control has been good (HbA1c <52mmol/mol) and/or hypoglycaemia is a significant concern. The Diabetes team may advise that this subset of patients be switched back to and maintained on oral therapy prior to discharge
- Stop Pioglitazone (permanently) and Metformin therapy (at least temporarily) and SGLT2 e.g. Dapagliflozin (at least temporarily). DPP4 inhibitors can be continued. Refer to DSN.

- **Patients previously *unknown* to have diabetes**

  - Perform HbA1c. This tests should not delay discharge of the patient and can be carried out in primary care
    - If HbA1c is <48mmol/mol then diabetes is *excluded* but these patients are still at a higher risk of developing diabetes. HbA1c between 42mmol/l and 47mmol/l is indicative of pre diabetes and this group should be offered advice about healthy eating, weight management, smoking cessation, alcohol consumption and physical exercise in line with NICE guidance and to consult their GP if they experience frequent urination, excessive thirst, weight loss or fatigue. GPs should offer annual monitoring of HbA_{1c} and refer to pre-diabetes community courses with health trainers.

      If the HbA1c is more than =/>48 mmol/mol, they meet the diagnostic criteria for diabetes. It can be assumed that these patients have previously undiagnosed diabetes and need to be treated following NICE guidance for Type 2 Diabetes. Refer to DSN. These patients can be offered diabetes structured education courses provided by WAHT. (A new diagnosis of Type 2 diabetes should not delay discharge as follow up can be arranged as an outpatient. Please leave a telephone message not an EPR referral if discharged before being seen by a DSN.)

MANAGEMENT OF UNSTABLE ANGINA AND NON-ST ELEVATION MYOCARDIAL INFARCTION (NSTEMI).

INTRODUCTION

Although sometimes regarded as lower risk than ST elevation MI, unstable angina and non-ST elevation MI are associated with similar risks over 6 months, and represent a spectrum of the same disease process (acute coronary syndromes).

Risk stratification is performed with simple clinical markers combined with the ECG and troponin measurement.

ALTERNATIVE DIAGNOSES

It is always important to consider causes of chest pain other than myocardial infarction/angina. Life-threatening non-cardiac causes include aortic dissection and pulmonary embolus and are the most important alternatives to have a high index of suspicion for. Clues for aortic dissection include persistent severe pain, often radiating to the back, background of hypertension, Marfan's disease, widened mediastinum on CXR (>8cm at level of arch on PA film), BP differential >20mmHg in arms, neurological deficit with chest pain; a negative D-dimer may be helpful in excluding dissection. Numerous other diagnoses may also need to be considered: pericarditis, aortic stenosis, pneumothorax, pneumonia, musculoskeletal diseases, oesophageal spasm, oesophagitis, gastric ulcer, cholecystitis, pancreatitis.

Physical examination may identify signs of non-coronary causes of chest pain (e.g. pulmonary embolism, aortic dissection and other acute aortic syndromes, myopericarditis, aortic stenosis) or extracardiac pathologies (e.g. pneumothorax, pneumonia or musculoskeletal diseases). In this setting, the presence of a chest pain that can be reproduced by exerting pressure on the chest wall has a relatively high negative predictive value for ACS. According to the presentation, abdominal disorders (e.g. oesophageal spasm, oesophagitis, gastric ulcer, cholecystitis, pancreatitis) may also be considered in the differential diagnosis. Differences in blood pressure between the upper and lower limbs or between the arms, irregular pulse, jugular vein distension, heart murmurs, friction rub and pain reproduced by chest or abdominal palpation are findings suggestive of alternative diagnoses. Pallor, sweating or tremor may point towards precipitating conditions such as anaemia and thyrotoxicosis.

1. INITIAL MEASURES

- ECG within 5 minutes of arrival
- History and examination including BP both arms
- IV cannula
- Oxygen if Sa02 <94% (unless history of COPD), pain relief with GTN, morphine or diamorphine, metoclopramide if pain still present
- FBC, coagulation, U+E, glucose, lipids, LFT, troponin, CXR
- Consider other diagnoses e.g. PE, aortic dissection, pneumothorax

2. RISK STRATIFICATION

Risk stratification is performed using a combination of clinical variables, the ECG and cardiac markers (troponin I). These are usually amalgamated into scoring systems such as GRACE or TIMI. GRACE is a more accurate risk score but more difficult to calculate.

The Emergency Department will use the ED heart score (appendix 4) to aid initial streaming and discharge of low risk patients.

2.1 Troponin

Cardiac troponins are cardiac proteins that form part of the sarcomeric apparatus. They are highly specific to cardiac muscle. They are often elevated in acute coronary syndromes, but numerous other illnesses can be associated with troponin release in the blood stream: in one study, 57% of patients on an acute medical take had an elevated troponin on the current assays. The assays for troponin have become increasingly sensitive. Modern assays are termed “highly sensitive” (hs) and can detect circulating troponin in some normal individuals. The units for reporting highly sensitive troponin I (hs TnI) assays are ng/ml. With the current hsTnI assay, early sampling according to the protocol below **at presentation and 1 hour** is recommended:

Note:

- For patients presenting >3 hours since pain with an undetectable troponin (<4ng/L), no second sample is required and ACS is excluded
- For any patient an initial sample >50ng/L makes ACS likely – start treatment AND send a second sample
- For other patients, send samples at presentation and 1 hour after presentation and calculate the difference between the values (Δ)
    - Δ<4ng/L makes ACS unlikely
    - Δ<4-15ng/L is usually due to non-ACS causes (see list below)
    - Δ>15ng/L makes ACS likely – start treatment
    - For patients in the Amber boxes (non-ACS cause of Tn elevation more likely), if ACS is still clinically suspected, send a 3rd sample at 3 hours, Δ>22ng/L makes ACS likely

1st hs-TnI at presentation		<4ng/L	<5ng/L	5-50ng/L	>50ng/L
2nd hs-TnI 1 hour later		2nd hs-TnI not required ACS excluded • Consider other diagnoses • Consider discharge			Send 2nd hs-TnI • ACS likely • Start treatment • Admit/refer cardiology
	Δ < 4ng/L		ACS excluded • Consider other diagnoses • Consider discharge	• Other causes of TnI elevation more likely *	
	Δ 4-15ng/L		• Other causes of TnI elevation more likely *	• Other causes of TnI elevation more likely *	
	Δ >= 15ng/L		•ACS likely • Start treatment • Admit/refer cardiology	ACS likely • Start treatment • Admit/refer cardiology	

*If ACS still suspected clinically, send 3 hour troponin (Δ >22ng/L makes ACS likely)

Alternative causes of troponin release:

- Chronic or acute renal dysfunction
- Heart failure – acute and chronic
- Other chronic cardiac diseases e.g. ischaemic heart disease, cardiomyopathy
- Critically ill patients, especially with respiratory failure, or sepsis
- Hypertensive crisis
- Aortic dissection, aortic valve disease or hypertrophic cardiomyopathy
- Tachy- or bradyarrhythmias
- Pulmonary embolism, severe pulmonary hypertension
- Apical ballooning syndrome (Tako-Tsubo cardiomyopathy)
- Inflammatory diseases,e.g.myocarditis
- Acute neurological disease, including stroke, or subarachnoid haemorrhage
- Cardiac contusion, ablation, pacing, cardioversion, or endomyocardial biopsy
- Infiltrative diseases, e.g. amyloidosis, haemochromatosis, sarcoidosis, sclerodermia
- Rhabdomyolysis
- Hypothyroidism
- Burns, if affecting >30% of body surface area
- Drug toxicity, e.g. adriamycin, 5-fluorouracil, herceptin, snake venoms

Calculate TIMI risk score:

RISK FACTOR	POINTS	
• Age > 65	**1**	
• ≥3 CAD risk factors (↑Chol, FHx, HTN, DM, Smoker, PVD)	**1**	
• Known CAD (stenosis ≥50%)	**1**	
• Aspirin use in the past 7 days	**1**	
• Severe angina (≥2 episodes in last 24 hours)	**1**	
• ↑cardiac markers	**1**	
• ST deviation ≥ 0.5m	**1**	**RISK SCORE = Total Points (0-7)**

2.1 Low risk (TIMI risk score 0-2, green pathway)

If the TIMI risk score is low and hsTnI negative, aim for early discharge:

- Normal ECG, age <35 and 0-1 risk factors (DM, smoking, FH premature CAD, HTN, hypercholesterolaemia, PVD) – consider alternative diagnoses. GP follow-up if discharged

- Normal ECG, age >35 or ≥2 more risk factors – arrange early out-patient review with cardiac assessment sisters for consideration of further testing (preferred at WRH) or in-patient assessment (preferred at Alex, refer to cardiology team). Discharge with aspirin 75mg od, statin, antianginal if appropriate (e.g. B-blocker or rate limiting CCB), GTN spray with advice to return if recurrent symptoms

- Non-diagnostic (known pre-existing ECG abnormalities) or uninterpretable ECG (e.g. bundle branch block, LVH) – refer to cardiac assessment sisters or cardiology out-patients if angina is suspected. Discharge with aspirin 75mg od, statin, antianginal if appropriate (e.g. B-blocker or rate limiting CCB), and GTN spray with advice to return if recurrent symptoms.

2.2 Alternative Causes of Troponin Elevation

If hsTnI <5-50ng/L with change <15ng/L, or raised hsTnI without history suggestive of MI, consider alternative diagnoses.

If ACS is still felt to be likely clinically, send 3rd hsTnI sample 3 hours after presentation. A change >22 ng/L makes ACS likely – start treatment and admit

In one series, 57% of patients admitted on a general medical take had a troponin measured about the upper limit of normal. Patients with elevated troponin often have an adverse prognosis, even if the diagnosis is not ACS. Patient should only be discharged after due consideration is given to alternative diagnoses, and if clinically well.

2.3 Moderate – High Risk (TIMI risk score 3-7, yellow pathway)

If the patient has ECG or hsTnI (initial result >50 or change >15ng/ml) evidence of an ACS, or if in the opinion of the admitting physician this is felt to be likely, treatment should be initiated immediately on admission. Refer the patient to cardiology unless there are felt to be comorbidities indicating medical therapy is the only option (e.g. extreme frailty, advanced cancer, etc).

3. INITIAL PHARMACOTHERAPY

Treatment should consist of:

- Aspirin 300 mg then 75 mg od
- Clopidogrel 300 mg then 75 mg od (See NPSA loading doses reference)
- Fondaparinux 2.5mg od s/c
- IV nitrates if still in pain or ECG evidence of ischemia
- Beta blocker (e.g. bisoprolol 2.5 – 5mg od) titrated to achieve HR<60 bpm
  If beta blocker contra-indicated diltiazem may be used though rate control is less effective
- Statin – the default for ACS cases is Atorvastatin 80 mg od – see below 3.3
- ACE inhibitor (e.g. perindopril 2mg, titrated to 4mg od or ramipril 1.25mg bd titrated to 5mg bd) started the day after admission if BP>100 and creatinine <200 (or current ACE I/ARB if prescribed pre-admission)

- See STEMI guidelines section 5.0 Additional Therapy for detailed contra-indications

3.1 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

3.2 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
- **For patients on oral anticoagulants, or started on one, the consultant cardiologist will indicate the appropriate long term antiplatelet regime. The published trials in this area are summarised in appendix 3.**

4 ADDITIONAL PHARMACOTHERAPY

4.1 IIbIIIa inhibitors - In the highest risk patients, or if there is evidence of recurrent chest pain with dynamic ECG changes (especially ST depression), use glycoprotein IIbIIIa inhibitor infusion (eptifibatide)

4.2 Dual Antiplatelet Therapy (DAPT)
Maintenance dose of aspirin 75mg od and clopidogrel 75mg od unless there are contra-indications to either (discuss with cardiologist). Cardiologists will usually recommend prasugrel rather than clopidogrel if PCI has been performed

Duration of Dual Anti-Platelet Therapy (DAPT)

DAPT is indicated for one year after non-ST elevation MI, irrespective of treatment.
In patients treated by PCI with stent, premature cessation of antiplatelets can result in stent thrombosis with high mortality. DAPT is usually mandated for 1 year after PCI with stent. There may be occasions when it can be discontinued earlier if there are bleeding complications or forthcoming surgery, **BUT in no circumstances should treatment be discontinued early without reference to an interventional cardiologist**

Longer term anti-platelets and low dose rivaroxaban

Where the long term risk of ischaemic events is high and bleeding risk low, consideration may be given to extended duration antiplatelets or low dose rivaroxaban, beyond 12 months, in addition to aspirin therapy:

- Clopidogrel 75mg od
- Ticagrelor 60mg bd
- Rivaroxaban 2.5mg bd

4.3 Lipids lowering

Statins

Statins improve prognosis in coronary artery disease. There is also evidence of additional benefit of high dose statins early after acute coronary syndromes:

Start atorvastatin 80mg od. Reduce dose to 20-40 mg od if there are concerns regarding tolerability of high dose statin therapy.
Contraindicated in active liver disease and pregnancy. Check LFT within 3 months

Ezetimibe

Ezetimibe 10mg has additional effects on cholesterol and prognosis in ACS, and should be considered in addition to a statin in patients not achieving target cholesterol

or intolerant of statins (reduces cholesterol by an additional 10-14%, and major adverse CV events by 7%, see NICE TA 132, NEJM 2015;372, 2387).

Bembedoic acid 180mg when combined with ezetimibe produces an additional LDL-C reduction of 28% but no clinical outcome evidence is currently available

Target cholesterol

Aim for reduction in non-HDL cholesterol of 40% (NICE CG 181)
OR non-HDL-C <2.5mmol/L (NHSE national lipid guidance 2022)

PCSK-9 inhibitors

PCSK-9 inhibitors (evolocumab/alirocumab) produce profound reductions in LDL by increasing the expression of the LDL receptor on hepatocytes. They are indicated if LDL remains high despite maximal tolerated lipid lowering therapy (NICE ta393/394). The local process to follow is as follows:

- Start high intensity statin
- Lipids to be re-checked at the end of cardiac rehab (or by cardiology clinic/GP if rehab not completed)
- If non-HDL cholesterol not reduced by 40% or LDL>3.5, add ezetimibe
- Repeat lipids after 3 months. If LDL above limits below, consider PCSK-9 inhibitor (complete Blueteq initiation documentation – refer to lipid clinic/Dr Shetty/Goyal if required):

	Without CVD	With CVD	
		High risk of CVD[1]	Very high risk of CVD[2]
Primary non-familial hypercholesterolaemia or mixed dyslipidaemia	Not recommended at any LDL-C concentration	Recommended only if LDL-C concentration is persistently above 4.0 mmol/litre	Recommended only if LDL-C concentration is persistently above 3.5 mmol/litre
Primary heterozygous-familial hypercholesterolaemia	Recommended only if LDL-C concentration is persistently above 5.0 mmol/litre	Recommended only if LDL-C concentration is persistently above 3.5 mmol/litre	

[1]High risk of CVD is defined as a history of any of the following: acute coronary syndrome (such as myocardial infarction or unstable angina needing hospitalisation); coronary or other arterial revascularisation procedures; chronic heart disease; ischaemic stroke; peripheral arterial disease.

[2]Very high risk of CVD is defined as recurrent cardiovascular events or cardiovascular events in more than 1 vascular bed (that is, polyvascular disease).

Abbreviations: CVD, cardiovascular disease; LDL-C, low-density lipoprotein cholesterol.

Inclisiran

Consider if non-HDL-C >2.5mmol/L despite maximally tolerated statin + ezetimibe (NICE TA733) – refer to lipid clinic/Dr Goyal if required

4.4 Aldosterone antagonists

If heart failure with LV impairment present, consider spironolactone 25-50mg od or eplerenone 25-50mg od
Contra-indicated in hyperkalaemia or renal failure (Cr>200µmol/l). Monitor potassium

4.5 Proton pump inhibitors

PPIs are recommended for patients on dual antiplatelet therapy at higher-than-average risk of gastrointestinal bleeds (i.e. history of gastrointestinal ulcer/haemorrhage, anticoagulant therapy, chronic non-steroidal anti-inflammatory drug/corticosteroid use), or two or more of: (a) Age ≥65 years (b) Dyspepsia (c) Gastro-oesophageal reflux disease (d) Helicobacter pylori infection (e) Chronic alcohol use (see ESC ACS guidelines 2023). If used, lansoprazole is preferred

5. NURSING

- Transfer high risk ACS patients (TIMI risk 5-7) to CCU
- Manage moderate risk ACS patients initially on MAU with ECG monitoring if no cardiology bed available, but aim to transfer to Laurel 1/CCU as soon as possible

6. CARDIAC CATHETERISATION

- All patients at high or moderate risk with an elevated troponin or dynamic ST depression >1mm should be considered for in-patient coronary angiography and revascularisation unless there are contra-indications. Refer to cardiology/ Cardiology Nurse Specialists within 24 hours.
- Even in the absence of an elevated troponin or dynamic ST changes, patients with a TIMI risk score 3-7 may still be best managed by in-patient coronary angiography. Refer to cardiology/ Cardiology Nurse Specialists within 24 hours.
- Emergency cardiac catheterisation may be required if there are on-going or recurrent symptoms with dynamic ST changes or haemodynamic instability. Consult with on call interventional cardiologist
- Patients undergoing cardiac catheterisation +/- PCI should have received a total loading dose of aspirin 300mg and clopidogrel 600mg at some point before the procedure. If clopidogrel 300mg was given at diagnosis, a further 300mg should be prescribed the night before the procedure (See NPSA loading doses reference).

7. ECHOCARDIOGRAPHY

Echocardiography should be performed in all patients after NSTEMI to assess LV function. In-patient echocardiography should usually be performed, but can be deferred in case of early discharge if there is no clinical suspicion of severe LV impairment (Q waves) or heart failure.

If severe LV impairment (EF<35%) and QRS duration is >120ms, refer for CRT/ICD (current NICE Guidance TA314 June 2014) opinion (Dr Foster/Dr Wilson clinic) as in-

or out-patient depending on symptoms, and arrange for repeat scan at 4 weeks post-MI.

If there is moderate – severe LV impairment, refer to acute and/or community heart failure nurses (wah-tr.acuteheartfailurenurses@nhs.net, wah-tr.communityheartfailurenursesnorth@nhs.net, wah-tr.communityheartfailurenursessouth@nhs.net)

8. GLUCOSE CONTROL

Glucose control offers benefits in patients admitted with ACS.
Consider commencing Continuous Variable Rate Insulin Infusion (CVRII, previously known as sliding scale) in all patients with ACS and an admission blood glucose of 11.1mmol/l or higher (see guideline WAHT-END-002). Use of glucose and potassium is not a routine component of this management. Manage hyperglycaemia in patients admitted to hospital with ACS by keeping blood glucose levels <11.0mmol/l while avoiding hypoglycaemia (blood glucose <4.0mmol/L). Contact Diabetes Specialist Nurse (DSN) at WRH on ext 33846 or bleep 315 or at the Alexandra Hospital on 45782 or bleep 1030 when a referral is required as outlined below.

- **Patients with a previous diagnosis of Diabetes (Type 1 or 2) on subcutaneous insulin**

  - If the patient is a known diabetic already on subcutaneous insulin injections then their usual regime (see point 1.4 regarding basal insulin) can be restarted as soon as he/she is able to eat and drink (*see WAHT-END-011 for further guidance on discontinuing continuous variable rate intravenous insulin infusions*). Adjust insulin to keep BM 7-11, change insulin if HbA1c>57, contact DSN

- **Patients with a previous diagnosis of Diabetes (Type 2) taking oral hypoglycaemic agents and/or injectable GLP-1 analogues**

  - Patients diagnosed with Type 2 Diabetes who were previously taking oral therapy and/or injectable GLP-1 analogues e.g. exenatide should have these agents discontinued and subcutaneous insulin injections initiated. This is even more important if recent diabetes control in this patient has been suboptimal. HbA1c levels over the previous 12 months should be reviewed
  - After 24-48 hours at the first breakfast or evening meal, the patient should be commenced on premixed biphasic insulin (**suggested insulin Novomix® 30**) administered subcutaneously twice daily. The starting dose is 8 units twice daily unless the patient required more than 30 units over the previous 24 hours in which case the initial dose should be increased appropriately. Other insulin types and regimes (e.g. once daily Insulatard®) can be considered in any individual patient at the discretion of the Physician or Consultant Diabetologist. Refer the patient to the Diabetes Specialist Nurses and commence the patient on the initiation of insulin care pathway (*See 'Guideline for the Management of the Initiation of Insulin' WAHT-END-006)*If recent diabetes control has been good (HbA1c <52mmol/mol) and/or hypoglycaemia is a significant concern. The Diabetes team may advise that this subset of patients be switched back to and maintained on oral therapy prior to discharge

- Stop Pioglitazone (permanently) and Metformin therapy (at least temporarily) and SGLT2 e.g. Dapagliflozin (at least temporarily). DPP4 inhibitors can be continued. Refer to DSN.

- **Patients previously *unknown* to have diabetes**

  - Perform HbA1c. This test and subsequent treatment should not delay discharge of the patient and can be carried out in primary care
    - If HbA1c is <48mmol/mol then diabetes is *excluded* but these patients are still at a higher risk of developing diabetes. HbA1c between 42mmol/l and 47mmol/l is indicative of pre diabetes and this group should be offered advice about healthy eating, weight management, smoking cessation, alcohol consumption and physical exercise in line with NICE guidance and to consult their GP if they experience frequent urination, excessive thirst, weight loss or fatigue. GPs should offer annual monitoring of HbA_{1c} and refer to pre-diabetes community courses with health trainers.

      If the HbA1c is more than =/>48 mmol/mol, they meet the diagnostic criteria for diabetes. It can be assumed that these patients have previously undiagnosed diabetes and need to be treated following NICE guidance for Type 2 Diabetes. Refer to DSN. These patients can be offered diabetes structured education courses provided by WAHT. (A new diagnosis of Type 2 diabetes should not delay discharge as follow up can be arranged as an outpatient. Please leave a telephone message not an EPR referral if discharged before being seen by a DSN.)

Reference:

1. NPSA Loading Doses, Rapid Response Report NPSA/2010/RRR018

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Appendix 1

Primary PCI checklist

Patient Label

☐ Verbal consent by cardiologist

☐ Medical notes / Drug charts:

☐ Name Band

☐ Cannula (ideally left side / 18g (green))

☐ Jewellery/Nail Varnish removed

☐ Prasugrel 60mg

☐ Bloods (including Group and save)

☐ ECG

☐ Patient Stickers

☐ Rings taped

☐ Pedal pulses present and marked

☐ Aspirin 300mg

NBM since: Diet……...
Fluids……

Weight: ……
Height: …….

Baseline Obs: BP: …… Pulse: …… Sats: …… Temp: ……

Is the patient Diabetic? Yes ☐ No ☐ If diabetic last BM:…… (Time:…..)

Allergies: …….

Checklist completed by: …….. (Signature and designation)
Date: ……

MINAP

(Can be filled in retrospectively from the ambulance sheet and cath lab sheet)

Date & time of call for help:

Date & time of arrival of first responder:

Date and time of arrival of ambulance:

Date & time of arrival at hospital|:

Date & time of first balloon:

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Chest Pain Triage by CCU on A&E

Primary Complaint:		
History of Present Illness		
Onset	When did it start?	
Location /Radiation	Does it radiate?	
Duration	How long has has this gone on?	
Character	Encourage descriptive words.	
Aggravating factors	What makes it worse?	
Relieving factors	What makes it better?	
Timing	Is it constant, cyclic, or does it come and go?	
Severity	Pain 1-10?	

Past Medical history and Risk Factors

Medications	

ECG findings	
First	
Second	
Third	

Assessing Nurse opinion	
Consultant referred to	
Consultant opinion	
Name of A&E Nurse informed	

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Phone Patch & Initial Nursing Care Record for Primary PCI

Patient name:……

DOB:……

Age:……..

Hospital No:……

MI SUSPECTED

ANTERIOR **LATERAL** ☐

INFERIOR ☐ **POSTERIOR** ☐

Other:

Pre hospital information:

BP:

Pulse:

Sats:

Resps:

Relevant PMHx:

Current geographical location of patient:

Air / Road:

Other relevant info:

Previous WRH admission?:

Consider exclusion criteria:

- Acute haemorrhage
- Trauma (not including CPR)
- Decreased conscious level
- Unresuscitated cardiac arrest at scene – any diagnosis
- Resuscitated cardiac arrest at scene – diagnosis uncertain
- Intubated and ventilated
- TRANSFER TO NEAREST A&E

Phone Patch Received

Time of call: ……..Date:……..

Crew call sign …….ETA:……..

Name of person receiving call:

Name of consultant discussed with:

Call PPCI team: Y ☐ **N** ☐

Cardiopulmonary call time:
Radioloigy call time:
Scrub nurse call time:

Ambulance Assessment

Onset of pain:

Location:

Duration:

Characteristics:

Assocaited symptoms:

Relieved by:

Treatment/Drugs: given pre hospital/procedure:

GTN ☐ _____

Morphine ☐ _____

Oxygen ☐ _____

Aspirin ☐ _____

Prasugrel ☐ _____

Other meds ☐ _____

Also consider:

- LBBB or PPM (with paced rhythm)
- Extreme age >90, severe co-morbidities (e.g. cancer, severe neurological disease, PVD with amputations or severe frailty (e.g. nursing home resident))

Appendix 2
Resuscitated Out of Hospital Cardiac Arrest and Interventional Cardiology

Patients suffering out of hospital cardiac are a complex and varied group. Acute myocardial infarction is an underlying pathology amenable to treatment, usually by interventional cardiology procedures, but such procedures may be unhelpful, or dangerous, in patients with other pathological processes, and even in some patients with acute MI.

It is not possible to provide clear guidelines on the management of such patients, and each case should be assessed on it's own merits, usually involving discussion between the Intensive Care and Interventional Cardiology consultants.

Recent research presentations can give some guidance to aid these discussions and decisions on management:

Decision to Perform Cardiac Catheterisation After OOH Cardiac Arrest

Clinical indications for cardiac catheterisation after resuscitated OOH cardiac arrest are:

- STEMI on ECG after resuscitation
- Other cases should be decided on an individual basis

Decision to Not Perform Cardiac Catheterisation After OOH Cardiac Arrest

Similarly, clinical criteria have been used to attempt to identify groups in whom the likelihood of recovery after resuscitated cardiac arrest is low. The MIRACLE$_2$ score is composed of seven variables with a potential total of 10 points. Higher scores predict an increasing risk of poor neurological outcome (CPC 3–5). The score components are: unwitnessed cardiac arrest (1 point), non-shockable initial rhythm (1 point), changing rhythms (any two of VF, pulseless electrical activity (PEA) or asystole; 1 point), any adrenaline dose (2 points), no pupil reactivity at ROSC (1 point), initial blood pH <7.20 (1 point) and age category (≤60 years, 0 points; 61–80 years, 1 point; >80 years, 2 points).

Timeliness of Cardiac Catheterisation After OOH Cardiac Arrest

It must be emphasised that the benefits of cardiac catheterisation/PCI in such patients are highly dependent on rapid treatment to open the infarct related artery. If patients are to be considered for cardiac catheterisation, this must be considered urgently

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Appendix 3

ESC Guidelines for antiplatelet therapy in Coronary artery disease with an indication for Oral Anticoagulant

Timeline	0 Months	1 Month	6 months	12 Months	Evidence
High Bleeding Risk	**Triple Therapy** OAC + A + C	**Dual Therapy** OAC + A OR C		OAC Monotherapy	2017 ESC focused update on dual antiplatelet therapy in coronary artery disease EHJ 2017;39:213-260. OAC = Oral Anticoagulant, A= Aspirin, C = Clopidogrel (ESC does not recommend Ticagrelor and Prasugrel for triple therapy)
	Dual Therapy OAC + A or C			OAC Monotherapy	
High ischemic/ thrombotic risk	**Triple Therapy** OAC + A + C		**Dual Therapy** OAC + A OR C	OAC Monotherapy	

Evidence of Oral Anticoagulant treatment options for patients undergoing PCI based on Clinical Trial results

Timeline	0 Months	1 Month	6 months	12 Months	Evidence		
					Trial	Design	Outcome
Warfarin	Warfarin + Clopidogrel (1-12 months)			Warfarin monotherapy	WOEST (Lancet 2013;381:1107-1115)	Warfarin + Clopidogrel vs Warfarin + Clopidogrel + Aspirin. Duration 1-12 months at investigator discretion, loading doses of antiplatelets, Warfarin or LMWH during PCI procedure	Reduced bleeding on dual therapy with similar thrombotic events
Rivaroxaban 2.5 mg BD	Rivaroxaban 2.5mg BD +Aspirin + Clopidogrel	Rivaroxaban 15mg OD + Aspirin (10mg OD if CrCL 49-30 ml/min)		Rivaroxaban 20mg OD (For CrCl 30-49 ml/min, Rivaroxaban 15mg)	PIONEER AF trial (N Engl J Med 2016; 375:2423-2434).	Rivaroxaban 2.5mg BD + Aspirin + Clopidogrel (or Ticagrelor or Prasugrel) vs Warfarin + Aspirin + Clopidogrel. DAPT pre-specified to 1, 6 or 12 months. Initiated within 72 hours after sheath removal. After triple therapy, Rivaroxaban 15mg OD + Aspirin. Moderate renal impairment (CrCl 49-30) received Rivaroxaban 10mg OD + Aspirin	Lower bleeding than warfarin arm, similar efficacy
	Rivaroxaban 2.5mg BD + Aspirin + Clopidogrel		Rivaroxaban 15mg OD + Aspirin (For CrCL 30-49 ml/min, Rivaroxaban 10 mg)				
Rivaroxaban 15mg OD	Rivaroxaban 15mg OD + Clopidogrel or Ticagrelor or Prasugrel (For CrCl 30-49 ml/min, Rivaroxaban 10 mg)			Rivaroxaban 20mg OD (For CrCl 30-49 ml/min, Rivaroxaban 15mg)	PIONEER AF trial (N Engl J Med 2016; 375:2423-2434).	Rivaroxaban 15mg OD + Clopidogrel or Ticagrelor or Trasugrel vs Warfarin + Clopidogrel + Aspirin. Initiated within 72 hours after sheath removal. Moderate renal impairment (CrCl 49-30) received Rivaroxaban 10mg OD + Aspirin	Lower bleeding than warfarin arm. Regime included in SMPC since 2017
Dabigatran 150mg BD	Dabigatran 150 mg BD + Clopidogrel or Ticagrelor			Dabigatran 150 mg BD	RE-DUAL (N Engl J Med 2017;377:1513-24)	Dabigatran 150mg BD + Clopidogrel or Ticagrelor for 12 months vs Warfarin + Clopidogrel or Ticagrelor + Aspirin (1 month BMS, 3 months DES). Anticoagulant initiated 6-72 hours after PCI	Dabigatran less bleeding, non-inferior for efficacy. Regime included in SMPC since 2018
Dabigatran 110mg BD	Dabigatran 110 mg BD + Clopidogrel or Ticagrelor			Dabigatran 110 mg BD	RE-DUAL (N Engl J Med 2017;377:1513-24)	Dabigatran 110mg BD + Clopidogrel or Ticagrelor for 12 months vs Warfarin + Clopidogrel or Ticagrelor + Aspirin (1 month BMS, 3 months DES). Anticoagulant initiated 6-72 hours after PCI	Dabigatran less bleeding, non-inferior for efficacy. Regime included in SMPC since 2018
Apixaban 5 mg BD	Apixaban 5 mg BD + **Clopidogre**l (or other $P2Y_{12}$ inhibitor)		Apixaban 5 mg BD		AUGUSTUS (N Engl J Med 2019; doi:10.1056/NEJMoa1817083)	Apixaban 5mg BD + Clopidogrel (or other $P2Y_{12}$ inhibitor) vs Warfarin + Clopidogrel (or other $P2Y_{12}$ inhibitor) for 6 months. Aspirin or Placebo in addition to above in a two by two factorial design.	Apixaban superior to Warfarin for bleeding, no difference in death and ischemic events. Triple therapy with Aspirin increases bleeding risk, no improvement in ischemic outcomes.
Apixaban 2.5 mg BD	Apixaban 2.5 mg BD + **Clopidogre**l (or other $P2Y_{12}$ inhibitor)		Apixaban 2.5 mg BD		AUGUSTUS (N Engl J Med 2019; doi:10.1056/NEJMoa1817083)	Trial design as above. Apixaban 2.5mg BD considered if patients fulfilled 2 of the following 3 criteria: Age ≥80 years old, Weight ≤ 60 kg, Creatinine ≥ 133µmol/L (≥1.5mg/dL)	Apixaban superior to Warfarin for bleeding, no difference in death and ischemic events. Triple therapy with Aspirin increases bleeding risk, no improvement in ischemic outcomes.
Edoxaban	CURRENTLY NO PUBLISHED DATA, **ENTRUST AF-PCI on-going**						

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Appendix 4

Notes on the HEART Score

HEART

HEART score for chest pain patients

History (Anamnesis)	Highly suspicious	2	
	Moderately suspicious	1	
	Slightly suspicious	0	
ECG	Significant ST-deviation	2	
	Non-specific repolarisation disturbance / LBBB / PM	1	
	Normal	0	
Age	≥ 65 years	2	
	45 – 65 years	1	
	≤ 45 years	0	
Risk factors	≥ 3 risk factors *or* history of atherosclerotic disease	2	
	1 or 2 risk factors	1	
	No risk factors known	0	
Troponin	≥ 3x normal limit	2	
	1-3x normal limit	1	
	≤ normal limit	0	
		Total	

Risk of Major Adverse Cardiac Events

LOW	<4	1- 2%	at 6 weeks

In general for patient streaming or referral, patients with cardiac sounding chest pain and a HEART score of:

≤3

Should be considered for referral to AEC, depending on ECG and Clinical Assessment

≥4

Should be considered for referral to the Medical Team

REMEMBER ACS is not the only cause of chest pain, please also consider:

Thoracic Aortic Dissection
Pulmonary Embolus
Pneumothorax
Pericarditis
Oesophageal Rupture

History

Concerning history for ACS:
•Chest pain radiating to one or both arms
•Pressure like pain with associated nausea, vomiting, or sweating
•Exertional chest pain
•Response of chest pain to GTN
•Chest pain similar to prior MI

Non-specific for ACS:
•Pleuritic or positional chest pain
•Chest pain reproducible with palpation
•Stabbing quality of pain
•Pain localized to an area on chest smaller than a coin

ECG

2points: horizontal or down-sloping ST depression ≥0.5 mm in 2 contiguous leads

1 point: for either right or left bundle branch block (LBBB), left ventricular hypertrophy, or ventricular paced rhythm (PM);

0 point: if the ECG does not meet any of the criteria of the other 2 categories.

Atherosclerotic Disease

•History of revascularization (PCI or CABG)
•History of myocardial infarction
•History of ischemic stroke
•History of peripheral arterial disease

Risk Factors Atherosclerotic Disease:

●Hyperlipidemia ●Hypertension
●Diabetes Mellitus ●Smoking (last 90 days)
●FH Coronary Artery Disease ●Obesity (BMI >30)

Troponin (hsTnI)

≤ normal limit	≤4 ng/L
1-3*normal limit	5-12ng/L
≥ 3* normal limit	>12ng/L

Do not use the HEART score if there is:

- new ST-segment elevation ≥ 1 mm
- Hypotension
- Life expectancy < 1 year,
- Identified non-cardiac medical, surgical, or psychiatric illness requiring admission.

Do not use the HEART score if the ECG shows new ST-segment elevation requiring immediate intervention, or with clinically unstable patients.

Worcestershire Acute Hospitals NHS Trust

CONTRIBUTION LIST

Key individuals involved in developing the document

Name	Designation
Dr J Trevelyan	Consultant Cardiologist, WRH
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Circulated to the following individuals for comments

Name	Designation
Katherine Smith	Lead cardiology pharmacist
Sue Amos	Cardiology Nurse Specialist, WRH

Circulated to the following CD's/Heads of dept for comments from their directorates / departments

Name	Directorate / Department
Dr W Foster/Dr W Roberts	Clinical Directors Medicine, WRH

Circulated to the chair of the following committee's / groups for comments

Name	Committee / group
Alison Smith	Medicines Safety Committee

Supporting Document 1 – Checklist for review and approval of key documents

This checklist is designed to be completed whilst a key document is being developed / reviewed.

A completed checklist will need to be returned with the document before it can be published on the intranet.

For documents that are being reviewed and reissued without change, this checklist will still need to be completed, to ensure that the document is in the correct format, has any new documentation included.

1	Type of document	Clinical guideline
2	Title of document	Acute Coronary Syndrome Guideline (including management of ST elevation and non-ST elevation myocardial infarction)
3	Is this a new document?	Yes ☐ No ☒ If no, what is the reference number WAHT-CAR-043
4	For existing documents, have you included and completed the key amendments box?	Yes ☒ No ☐
5	Owning department	Cardiology
6	Clinical lead/s	Dr Trevelyan
7	Pharmacist name (required if medication is involved)	Katherine Smith/Rachel Konarzewski
8	Has all mandatory content been included (see relevant document template)	Yes ☒ No ☐
9	If this is a new document have properly completed Equality Impact and Financial Assessments been included?	Yes ☐ No ☐
10	Please describe the consultation that has been carried out for this document	Circulated to individuals on contribution list and members of the Medicine Safety Committee
11	Please state how you want the title of this document to appear on the intranet, for search purposes and which specialty this document relates to.	Acute Coronary Syndrome Guideline (including management of ST elevation and non-ST elevation myocardial infarction)
Once the document has been developed and is ready for approval, send to the Clinical Governance Department, along with this partially completed checklist, for them to check format, mandatory content etc. Once checked, the document and checklist will be submitted to relevant committee for approval.		

Implementation

Briefly describe the steps that will be taken to ensure that this key document is implemented

Action	Person responsible	Timescale
Presentation to Cardiology CG-Directorate Committee	Dr Trevelyan	Decmeber 2012

Plan for dissemination

Disseminated to	Date
Publication on Trust Intranet	
Department meetings	December 2012-January 2012

1	**Step 1 To be completed by Clinical Governance Department** Is the document in the correct format? Has all mandatory content been included? Date form returned	Yes ☒ No ☐ Yes ☒ No ☐	
2	Name of the approving body (person or committee/s)	Medicine Safety Committee	Cardiology Directorate-CG Committee
	Step 2 To be completed by Committee Chair/ Accountable Director		
3	Approved by (Name of Chair/ Accountable Director):		
4	Approval date		

Please return an electronic version of the approved document and completed checklist to the Clinical Governance Department, and ensure that a copy of the committee minutes is also provided (or approval email from accountable director in the case of minor amendments).

Office use only	Reference Number	Date form received	Date document published	Version No.
	WAHT-CAR-043			