Management of ST Elevation Myocardial Infarction Guidelines

(Version 2, Update 2016)

Guideline Readership

This guideline is intended to be used by all members of staff within Heart of England NHS trust who treat patients presenting with STelevation myocardial infarction.

Guideline Objectives

- Ensure prompt treatment of STEMI with Primary PCI
- Clarify the pathway of care for STEMI
- Improve patient outcomes
- Ensure STEMI patients are discharged on appropriate secondary prevention and have plans for their cardiac rehabilitation organised.

Other Guidance

ESC Guidelines. Management of acute myocardial infarction in patients presenting with persistent ST-segment elevation. Eur Heart Journal .(2012) 33, 2569–2619

Myocardial infarction with ST segment elevation. NICE Clinical Guideline (CG 167) July 2013.

Ratified Date: June 2016
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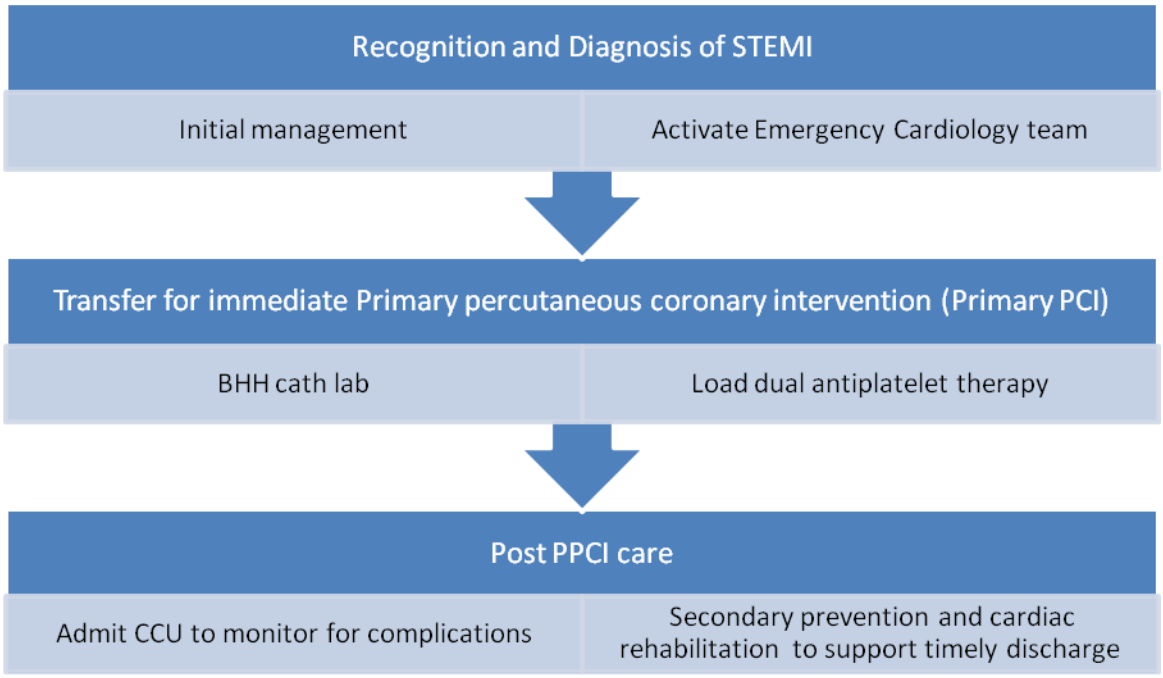
Guideline Author: Dr Bethan Freestone

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.

1. Flow Chart



2. Executive Summary & Overview

The aim of this document is to provide an update on the treatment of ST elevation Myocardial infarction (STEMI) for use in the Heart of England NHS Trust.

These guidelines are for use by medical and nursing staff involved in the treatment of patients presenting with acute myocardial infarction, where the diagnosis is made on the presence of ongoing ischaemic symptoms and persistent ST elevation on the ECG.

These management guidelines are not intended to be an exhaustive literature review but a practical document to provide a summary of standards of care for patients diagnosed with STEMI.

The guidelines are largely based on the European Society of Cardiology guidelines and NICE clinical guidelines, which should be referred to where more detail is required.

3. Body of Guideline

Diagnosis of STEMI and aims of treatment

The diagnosis of STEMI is made on the presence of ongoing ischaemic symptoms and persistent ST elevation on the ECG (or new left bundle branch block). Most of these patients will show a typical rise of biomarkers of myocardial necrosis and progress to Q-wave myocardial infarction.

Initial working diagnosis of STEMI if

- History of ischaemic sounding chest pain/discomfort
- Persistent ST-segment elevation or (presumed) new left bundle-branch block (LBBB).

- (Confirmed by elevated markers of myocardial necrosis (eg. CK-MB, troponins) **But DO NOT wait** for the blood results to initiate reperfusion treatment).

Most cases of STEMI are caused by occlusion of a major coronary artery and we know that rapid diagnosis and treatment improves outcome.

Primary percutaneous coronary intervention (PCI) is the term given to mechanical intervention to open the occluded artery. Fibrinolysis or thrombolysis is the term given to pharmacological reperfusion.

Multiple trials of Primary PCI versus thrombolysis have shown clinical benefit in terms of mortality, stroke and re-infarction favouring primary PCI as long as it is delivered in a timely fashion. Primary PCI also avoids some of the bleeding risk of thrombolysis.

Prompt treatment is very important as long delay times to Primary PCI are associated with a worse clinical outcome, and pre-hospital or early emergency department ECG and diagnosis are key to early treatment.

NB. Thrombolysis can be used where Primary PCI is not available (provided no contraindications) but Primary PCI is the reperfusion strategy of choice at Heart of England NHS trust for patients with STEMI and is delivered at Heartlands hospital.

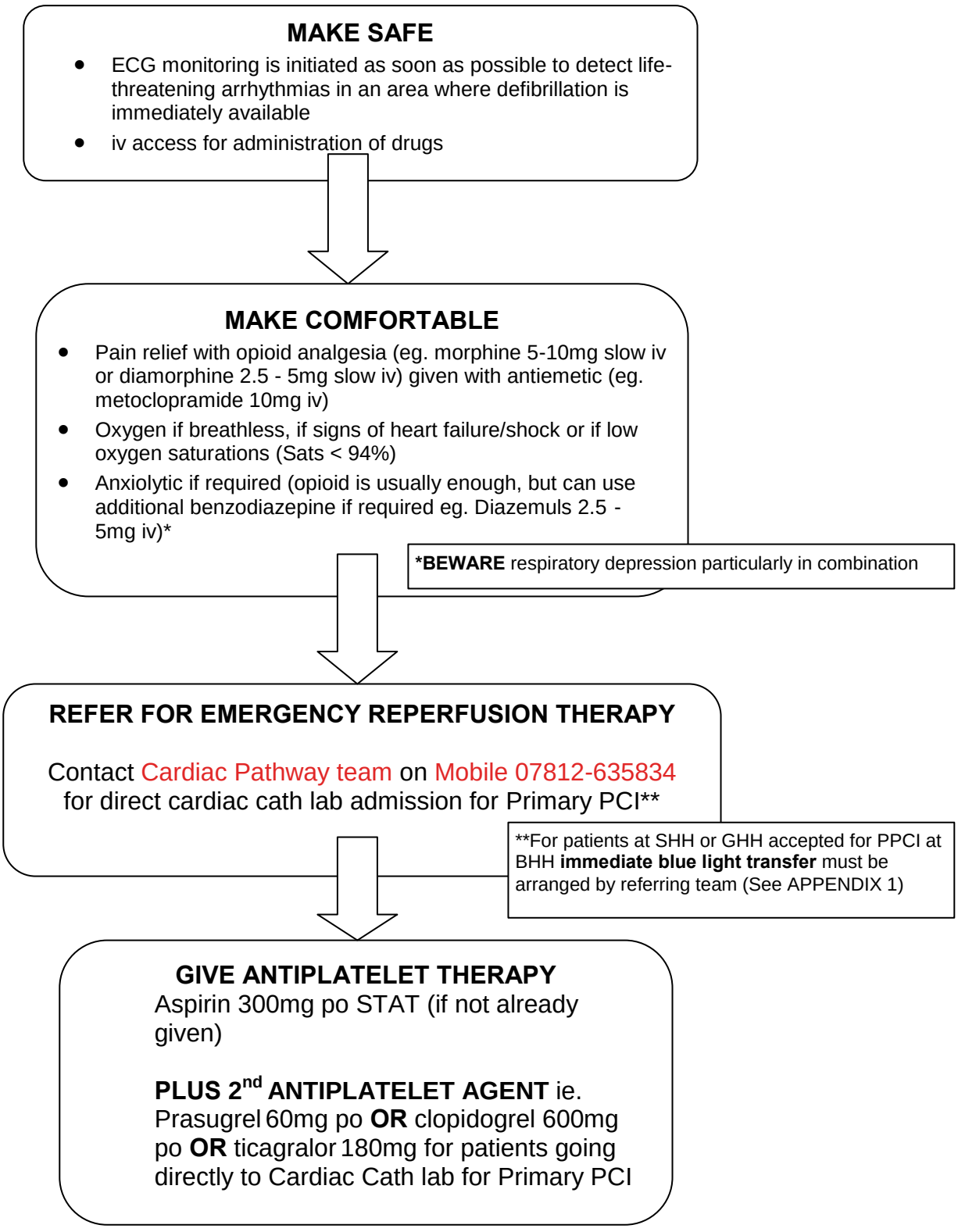
All patients with ST-elevation or new LBBB on their ECG with ongoing chest pain and/or onset of chest pain <12hrs should be referred via the Cardiac Pathway team nurse or Cardiology Registrar on call for consideration for primary PCI.

NATIONAL TARGETS FOR DELIVERY OF PRIMARY PCI:

Call-to-balloon time (patient call for help to device time in Cath lab) **< 150mins**
Door-to-balloon time (door of hospital to device time in Cath lab) **< 90mins**

(NB. Primary PCI beyond 24hrs after onset of symptoms has not been shown to improve outcome).

INITIAL MANAGEMENT OF THE STEMI PATIENT



ROLE OF THE CARDIAC PATHWAY NURSE IN THE MANAGEMENT OF AN ST ELEVATION MYOCARDIAL INFARCTION (STEMI) PATIENT

The aim of the Cardiac Pathway Team is to minimise any delays in the treatment of patients presenting to hospital with an acute myocardial infarction.

The Cardiac Pathway Nurse plays a pivotal role in the management of patients identified as having a STEMI/suspected STEMI by West Midlands Ambulance Service (WMAS) and Emergency departments (ED) in BHH/GHH/SOH, and should be the first point of contact to activate the STEMI pathway.

For a patient identified as having a suspected STEMI, contact the Cardiac Pathway Nurse on duty immediately on mobile phone number **07812 635834** OR **Pager 2331**. This is a 24 hour service at BHH. The Cardiac Pathway Nurse will then liaise with the on call Cardiology Registrar/Cardiologist and activate the Cardiac Catheter Lab.

The Cardiac Pathway Nurse on duty will ask a few pertinent and relevant questions before advising for the patient to be transported either directly to the Assessment Room on Ward 6/CCU at Heartlands Hospital, **OR** directly to the Catheter Lab for a Primary PCI as soon as the team is present and ready to accept the patient.

If there is diagnostic uncertainty or the patient requires stabilization then the Cardiac Pathway Nurse on duty may ring the registrar on call to assess the ECG/patient first. The case should then be discussed with the consultant interventional cardiologist on call if there is any uncertainty related to the diagnosis of a STEMI.

NB: Patients identified as having a STEMI who are haemodynamically unstable or with out-of-hospital cardiac arrest and return of spontaneous cardiac output 'out of hours' will be diverted to the Heartlands emergency department resuscitation room by the Cardiac Pathway Nurse. (WMAS and Cardiac Pathway nurse will inform ED to be ready to receive patient).

On receiving the STEMI patient, the role of the Cardiac Pathway Nurse, supported by the CCU Sister is as follows:

- Meet & Greet the patient (+/- ambulance crew) to receive a formal handover
- Check patient is attached to a defibrillator and ensure IV access established
- Review ECG already recorded
- Immediately assess history, current symptoms and haemodynamic state
- If ECG and history support the diagnosis of a STEMI
    - Inform the patient of the diagnosis and proposed Primary PCI in preparation for formal consent if appropriate
    - Prepare the patient for the procedure with the assistance of the CCU Sister on duty (see Protocols for Roles of Staff receiving STEMI in Cardiac Assessment Room/Cardiac Catheter Lab)
    - Assist with the safe transfer of patient to the Cardiac Catheter Lab within 15 minutes of arrival in Assessment Room.

If a STEMI is **not** confirmed by ECG and history the Cardiac Pathway team nurse will refer patient to appropriate medical or senior ED staff as soon as possible for continued investigation and management. If further Cardiology input is still required this will be highlighted by the Cardiac Pathway Nurse on duty for the Cardiology on call team to review on the next ward round.

PRIMARY PCI: The process in the Cath lab

The Cardiac Cath lab team are activated for every appropriate patient with a suspected STEMI who is suitable for immediate treatment with primary PCI, as assessed by the Cardiac Pathway Team or Cardiology registrar.

Cath lab team

Consultant Interventional Cardiologist

Cardiology Registrar

Radiographer

Cardiac Physiologist

2 nurses

Role of the Cardiology Cath lab team

Aim to provide swift and safe treatment with primary PCI for patients admitted with STEMI

- During working hours the team is the first Cardiac Cath lab free to receive the patient
- Out-of-hours the on call team come in from home (supported by nurses on site) to open Cath lab after being contacted by the cardiac pathway team/ CCU sister

!!! AIM TO OPEN CATH LAB WITHIN 30MINS OF ACTIVATION !!!

The Cath lab team should then:

- Take SBAR handover from Cardiac Pathway team nurse (who has assessed diagnosis, pre-morbid status, bleeding risks)
- Consent for Primary PCI (abbreviated consent process, may just be verbal and deemed 'in best interests' as per GMC guidance)
- Check that double antiplatelet therapy has been given
- Check ECG monitoring, oxygen saturations monitoring and defibrillator pads are on
- Complete WHO check list or a verbal team brief
- Give safe analgesia and/or sedation
- Gain arterial access (Operator)
- Take admission bloods (to be sent off for U&E, FBC, CK, blood glucose and lipid profile).
- Give parenteral antithrombotic therapy (unfractionated heparin dose of 70-100 units/kg to give target ACT of 250-300secs, or alternatively Bivalirudin 0.75mg/kg iv bolus followed by 1.75mg/kg/hr ivi) can be used
- Perform immediate diagnostic coronary angiogram
- Perform Primary PCI to infarct related artery
- Consider use of additional antiplatelet agents (ie. Glycoprotein IIbIIIa inhibitors)
- Provide additional support as required for immediate complications of MI (eg. intra-aortic balloon pump, temporary pacing, inotropes, CPAP).
- Manage arterial access site (or leave clear instructions for management of sheath removal at interval if required for femoral artery access)
- Document case in notes and complete BCIS database entry
- Talk with patients and relatives/ next-of-kin post procedure
- Arrange admission to CCU and document plan for continuing care.
- Commence or complete MINAP form

NB. If there is no primary PCI performed after diagnostic imaging, consider differential diagnosis and make arrangements for continuing patient care.

CCU Admission Post Primary PCI

IMMEDIATE CARE

Nursing staff care:

- Handover
- Cardiac monitoring and bed rest at least 24hrs
- Observations
- Post PCI ECG
- Alert medical staff to any immediate issues
- Counselling of patient and relatives
- Refer to cardiac rehabilitation team on same or next working day

Doctor/Advanced nurse practitioner to:

- Admit patient (history and examination if not already done)
- Check patient's current haemodynamic status and check arterial access site
- Identify any possible immediate post MI complications (eg. arrhythmia, heart failure, mechanical complications such as acute mitral regurgitation or ventricular septal rupture)
- Prescribe drugs on EP system and titrate medication if appropriate
- Check ECG, bloods and CXR

SUBSEQUENT INPATIENT CARE

Purpose of CCU and ward round reviews

- Check patient's current symptoms, observations, examination (including arterial access site)
- Identify any post MI complications
- Order echo (to be done pre discharge for Anterior MI) and check results
- Check on blood results and ECG
- Counselling of patient
- Ensure maintained on dual antiplatelet therapy after stenting and appropriate secondary prevention (with uptitration of medications as able)
- Plan for mobilisation and discharge
- Identify low risk patients who can return to 'home' hospital (if live nearer to GHH/Solihull)
- Identify and advise on any medical issues to be addressed at follow up (eg. plans for staged revascularisation, uptitration of medication, plans for recommencing warfarin for anticoagulated patients, duration of dual antiplatelet therapy etc)
- Fill out KMR

DRUGS POST STEMI

1. Dual antiplatelet therapy (DAPT)

- Prescribe aspirin 75mg po od (lifelong) provided no true allergy

- PLUS second anti-platelet agent:

  - Prescribe prasugrel 10mg po od for STEMI patients already started on prasugrel at the time of their primary PCI with no contra-indication to continuing therapy[4] (see **Appendix 2. Antiplatelet Prescribing Algorithm**)
  - **OR** ticagralor 90mg bd (as alternative)[5]
  - **OR** clopidogrel 75mg po od (prescribed for patients already started on clopidogrel at the time of their primary PCI, or those with contraindications to continued prasugrel treatment)

Dual antiplatlet therapy is recommended for 1 year after STEMI and up to 1 year post implantation of drug-eluting stents. The duration of DAPT should be specified by the operator.

2. Secondary Prevention medications[6]

Provided there are no contra-indications then patient should be started on:

Statin eg. Atorvastatin 80mg po nocte

- ➢ Statins shown to reduce mortality in patients with cardiovascular disease
- ➢ More intensive lipid lowering associated with reduced mortality in acute coronary syndromes

Beta blocker eg. Bisoprolol 1.25 – 2.5mg po od (uptitrate, BP and HR allowing, to a max of 10mg od)

- ➢ Use of beta-blockers in the setting of STEMI reduces incidence of VF and studies have shown that longterm use reduces mortality and reinfarction

× Beware beta-blockers early post MI especially with bradyarrhythmia/heart block or if MI complicated by hypotension or heart failure (may have to delay until stabilised)

ACE inhibitors eg. Ramipril 2.5mg po od (then uptitrate, BP allowing, to a max of 5mg bd)

- ➢ ACE inhibitors should be started in the first 24hrs if there are no contra-indications (shown to have mortality benefit in first 30 days) and longterm reduce cardiovascular events

× Patients who don't tolerate ACEi because of cough should be switched to an angiotensin receptor blocker (eg. Valsartan or losartan)

× Monitor renal function after initiation of ACEi or ARB

CONSIDER:

Aldosterone antagonist ie. Eplerenone 25mg po od

- ➢ Shown to improve outcome in patients with severe LV dysfunction post STEMI in patients with LVEF<40% (with diabetes or signs of HF) post MI

× Monitor carefully for hyperkalaemia and monitor renal function after initiation

3. Hyperglycaemia/Diabetes management[7]

- Check blood glucose on admission, and check fasting blood glucose at day 4 or HBA1C predischarge for anyone with hyperglycaemia at presentation (blood glucose >11mMol/L)

- For diabetics, glucose control is important (aim BM 6-11 mmol/L), but take care to avoid hypoglycaemia (BM <4.4) which can worsen outcomes in diabetic patients with acute coronary syndromes

  - Original studies showed that use of insulin infusion for tight glycaemic control, followed by multiple dose insulin regime reduced mortality, but more recently it has been shown that there is no difference if standard glucose control is used post MI as long as glucose control is good

  - If glucose control is not good then, in the first instance, consider use of a dose-adjusted insulin infusion with regular monitoring of blood glucose levels

  - Diabetic specialist nurse input may be required if changes are made to usual medications

x Use of routine glucose-insulin-potassium infusion no longer recommended

x Suspension of some newer diabetic agents may be required post MI or if patient is in heart failure (eg. nateglinide, repaglinide, pioglitazone, rosiglitazone). Please check BNF.

4. Smoking cessation

- Advise on importance of smoking cessation
- Nicotine replacement therapy should be offered and prescribed as required
- Offer contact for community smoking cessation services if not ready at the moment to stop.

5. Anticoagulation

Provided there is no contraindication then the following patients should be anticoagulated:

- Consider prophylactic LMW heparin in patients with prolonged immobility post MI (>24hrs)
- Continue warfarin in all patients with a long term indication for anticoagulation already on warfarin therapy (eg. mechanical valve, recurrent DVT/PE, chronic AF with high CHADSVaSc risk score) alongside antiplatelet therapy
- Consider longterm formal anticoagulation with warfarin or a novel oral anticoagulant in patients with newly diagnosed atrial fibrillation guided by CHADS2 or CHADSVASc risk score (see AF guideline for further details)
- Anticoagulation with LMW heparin then warfarin is indicated before discharge for patients with LV thrombus identified on echocardiography or a thromboembolic event post MI

6. Dietry advice

Encourage the consumption of a Mediterranean diet which should include oily fish or nuts if vegetarian, five portions of fruit and vegetables, reduced saturated fats and increase soluble fibre in the diet

7. Exercise advice

On an individual basis, encourage early mobilisation and build up to increased activity of 150 minutes per week of moderate intensity.

MOBILISATION AND DISCHARGE PLANNING POST STEMI

All post STEMI patients should be on a cardiac monitor for a minimum of 48hrs post MI.

Uncomplicated post infarct patients who have undergone early primary PCI with good results should be able to be mobilised and discharged early.

The Zwolle PPCI index can also be used as a tool to identify patients for early mobilisation and discharge[8].

Category	Points
Killip class	
1	**0**
2	**4**
3–4	**9**
Thrombolysis In Myocardial Infarction (TIMI) flow grade following angioplasty	
3	**0**
2	**1**
0–1	**2**
Age, years	
<60	**0**
≥60	**2**
Three-vessel disease	
No	**0**
Yes	**1**
Anterior infarction	
No	**0**
Yes	**1**
Ischemic time	
≤4 h	**0**
>4 h	**1**
Highest possible score	**16**

Patients with a Zwolle index of ≤3 can be considered low risk and can therefore be safely mobilised at 24hrs and discharged at 48-72hrs post MI following treatment with primary PCI.

In uncomplicated cases, the patient can sit out of bed late on the first day, be allowed to use a commode, and undertake self-care and self-feeding. Ambulation can start the next day, and such patients can be walking up to 200 m on the flat, and walking up stairs within a few days.

A patient with a Zwolle index of >3, with a high CK level or a large regional wall motion abnormality on echo or LVEF<40% indicating significant myocardial damage will be on bed rest longer, should follow the standard post MI pathway and expect to be discharged at Day 4 - 5 post MI (provided they develop no additional complications).

Those who have experienced complications, heart failure, shock, or serious arrhythmias should be kept in bed longer, and their physical activity increased slowly, dependent upon their symptoms and the extent of myocardial damage.

DISCHARGE LETTERS

The eTTO as a minimum should include:

- Date of admission and discharge
- Diagnosis
- Treatment (eg. Primary PCI with stent to…)
- LV function (from echo)
- Drugs on discharge (including GTN s/l to use prn)
- Duration of dual antiplatelet therapy (and any plans for anticoagulation if appropriate)
- Advice on up-titration of beta-blocker and ACEi (or if applicable the reasons why not started/continued on secondary prevention medication as an inpatient)
- Any changes to original medication
- Complicating medical conditions if discharge delayed
- Outpatient follow up plans (Consultant and hospital)
- Plans for staged intervention eg. revascularisation with PCI or CABG, further risk stratification at interval and device therapy if appropriate when LV dysfunction noted post MI

NB. For patients going home on Prasugrel, ticagralor or eplerenone an additional letter (a copy of **the RICaD**) is required for the GP.

SUMMARY OF THE ROLE OF THE CARDIAC REHABILITATION TEAM

Cardiac rehabilitation is aimed at restoring the patient to as full a life as possible (including return to work) taking into account physical, psychological and socioeconomic factors. Cardiac rehab nurses see all post MI patients. If the cardiac rehabilitation team is not available then the nurse discharging the patient must provide written and verbal information on discharge and complete a referral for cardiac rehabilitation team who will follow up post discharge. Aims of Cardiac rehabilitation are to:

- Provide education and counselling for patients post MI
- Check on appropriate dual anti-platelet therapy and secondary prevention medications and that these are titrated as appropriate depending on patient blood pressure and urea and electrolyte status
- Give patient advice on lifestyle changes including:
    - Smoking cessation
    - Regular exercise
    - Healthy diet and weight loss if overweight
    - Medication
    - Occupation
    - Driving
    - Flying
    - Sex

- Enrol patient in cardiac rehabilitation programme for ongoing support and education at a venue appropriate to their needs either at their local hospital or community service.
- Provide an exercise rehabilitation program
- Identification of any hurdles to delivering Cardiac Rehabilitation

4. Reason for Development of the Guideline

This is an update on the previous guideline and is to provide a guide to local practice (based on national and ESC guidelines).

5. Methodology

Guideline based on ESC guidance and appropriate NICE guidance (see Refs).
Written by Dr Bethan Freestone, in consultation with other Cardiology Consultant staff, Cardiac Pathway lead, Cardiac Rehabilitation nurse lead and other members of the Cardiology nursing and primary PCI team

6. Implementation in HEFT & Community

Update to be launched on HEFT intranet

7. Monitoring & Suggested Quality Standards

Ongoing national audit through MINAP and BCIS databases

8. References

1. ESC Guidelines. Management of acute myocardial infarction in patients presenting with persistent ST-segment elevation. Eur Heart Journal (2012) 33, 2569–2619

2. Myocardial infarction with ST segment elevation. NICE Clinical Guideline (CG 167) July 2013.

3. Bivalirudin for the treatment of ST-segment-elevation myocardial infarction. NICE Technology Appraisal (TA230) July 2011.

4. Prasugrel for the treatment of acute coronary syndromes with percutaneous coronary intervention. NICE Technology Appraisal (TA182) Oct 2009.

5. Ticagralor for the treatment of Acute Coronary Syndromes. NICE Technology appraisal (TA 236) Oct 2011.

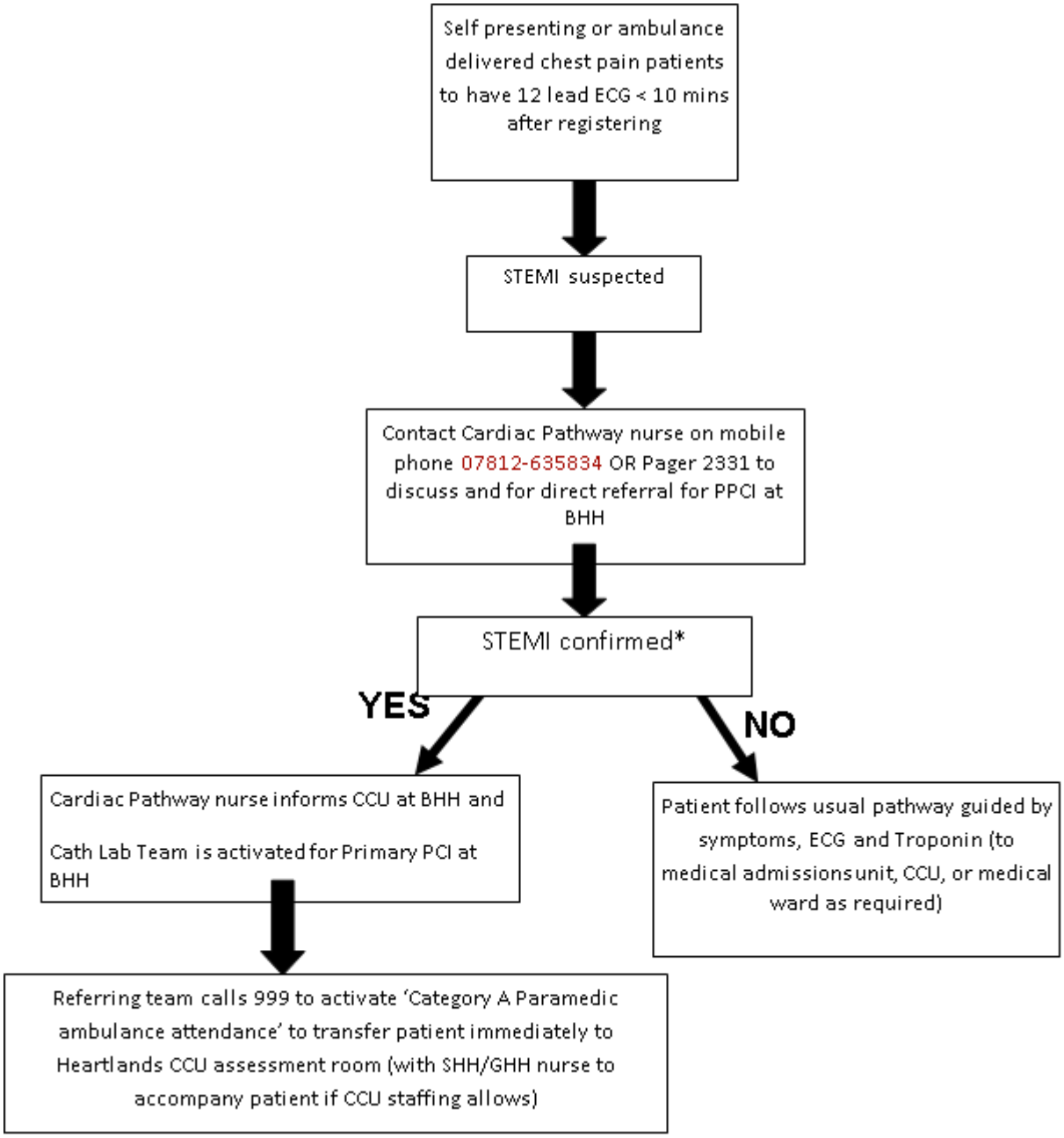
6. MI – secondary prevention: Secondary prevention in primary and secondary care for patients following a myocardial infarction NICE (CG 172). Nov 2013

7. Hyperglycaemia in Acute coronary Syndromes. NICE Clinical Guideline (CG 130) Oct 2011.

8. Giuseppe De Luca, Harry Suryapranata, Arnoud W.J. van't Hof, Menko-Jan de Boer, Jan C.A. Hoorntje, Jan-Henk E. Dambrink, A.T. Marcel Gosselink, Jan Paul,Ottervanger and Felix Zijlstra. Prognostic Assessment of Patients With Acute Myocardial Infarction Treated With Primary Angioplasty: Implications for Early Discharge. Circulation 2004, 109:2737-2743.

Appendix 1.

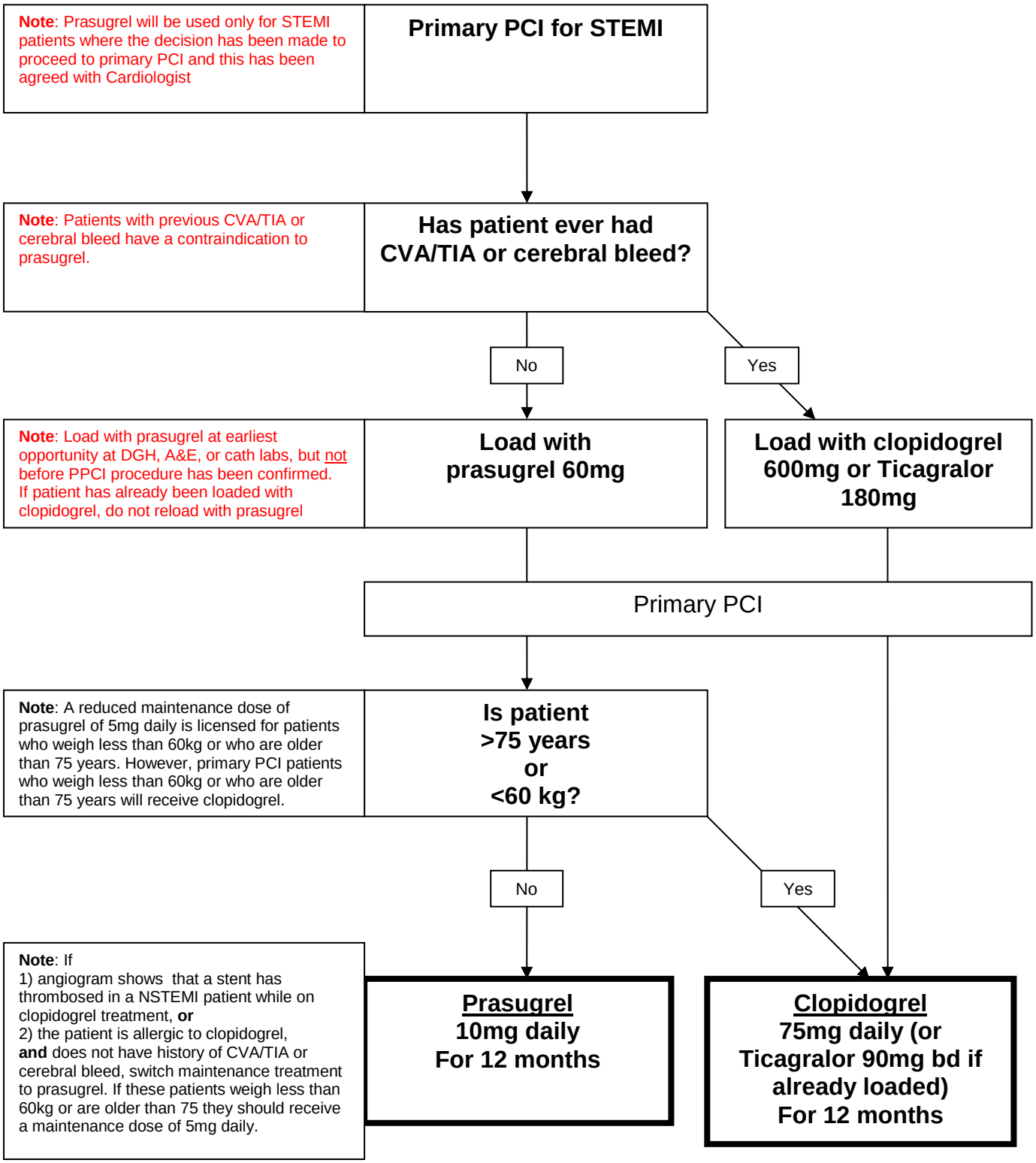
MANAGEMENT OF ST ELEVATION MYOCARDIAL INFARCTION PRESENTING IN SOLIHULL or GOOD HOPE HOSPITAL



*STEMI has to be agreed and accepted for transfer before ambulance called

NB. Paramedics picking up STEMI patients in Solihull or Good Hope Hospital catchment area are advised to bypass local hospital and deliver patient directly to Coronary Care Unit Assessment Bed at Heartlands Hospital after liaison with Cardiac Pathway team

Appendix 2. Antiplatelet prescribing algorithm



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1	Jan 2012	BF	Required update
2	June 2016	BF	Update

Clinical Director: Signed……

Name……

Date……23/5/16……