Chest pain and Acute Coronary Syndrome (ACS) Pathway Guideline

V 6.1

19 August 2016
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1. Introduction

Acute Coronary Syndrome (ACS) describes the constellation of signs and symptoms compatible with acute myocardial ischemia – chest pain/discomfort/pressure, dizziness/light-headedness, shortness of breath and sweating. The ACS clinical spectrum includes unstable angina, non ST-segment elevation myocardial infarction (NSTEMI) and ST-segment elevation myocardial infarction (STEMI).

Disruption of atheromatous plaque is the pathophysiologic basis of ACS. Following plaque rupture and the initiation of thrombotic cascade, myocardial ischaemia and injury sets in and lead to differing clinical forms of ACS. ACS with the presence of myocyte necrosis characterises myocardial infarction. At RCHT we currently employ high sensitivity troponin assay to detect myocardial infarction. ACS with no evidence of myocardial injury constitutes the clinical spectrum of unstable angina. Patients with myocardial infarction are further classified into STEMI and NSTEMI based on the presence or not of persistent ST segment elevation on ECG.

The umbrella term “acute coronary syndrome” is useful in that it groups patients with symptoms consistent with acute myocardial ischemia and is the basis for subsequent established diagnostic and treatment decisions. In England and Wales in 2013/14 more than 80,724 hospital admissions were caused by MI. According to the Myocardial Ischaemia National Audit Project (MINAP), of these, 39% were STEMIs and 61% were NSTEMIs. Almost twice as many men had MIs as women.

At the Royal Cornwall Hospital approximately 1250 ACS patients are treated per annum of which 220 are STEMI patients. Our aim is to treat all STEMI patients by PPCI with a door to balloon time of < 30 minutes, as all the evidence point to maximal benefit of PPCI with early revascularisation. We also aim to perform invasive coronary angiography +/- PCI in all appropriate ACS patients within 72 - 96 hours of admission to hospital in accordance with the national guidelines.

If untreated, the prognosis is poor and mortality high, particularly in people who have had myocardial damage. Appropriate triage, risk assessment and timely use of acute pharmacological or invasive interventions are critical for the prevention of future adverse cardiovascular events (myocardial infarction, stroke, repeat revascularisation or death).

People who have had an acute coronary syndrome benefit from treatment to reduce the risk of further MI or other manifestations of vascular disease. This is known as secondary prevention.

The following pathway should be implemented for patients with chest pain which is suspected to be due to acute cardiac ischaemia.
2. **Purpose of this guideline**

2.1. Chest pain is a very common symptom leading to assessment of patients in the emergency department and/or acute medical unit. Acute coronary syndrome typically presents with chest pain or **discomfort**. Assessment of these patients with acute chest pain to identify acute coronary syndromes should include clinical evaluation, 12 lead ECG and serial measurement of markers of myocardial injury (currently by high sensitivity troponin at RCHT). Prompt pharmacological therapy and coronary intervention is the mainstay of treatment in this group of patients to minimise associated mortality and morbidity. Further long term evidence based drug therapy reduces future cardiovascular morbidity.

2.2. This guideline aims to assist the attending health care professionals in treating patients with acute coronary syndrome with particular emphasis on immediate pharmacotherapy, risk assessment for urgent coronary angiography, secondary prevention, cardiac rehabilitation and post MI health and lifestyle advice. It is also designed to enable an early ‘rule out’ of an acute coronary syndrome in low risk patients to facilitate early discharge from hospital within four hours of their presentation.

3. **Scope**

This document provides guidance for any professional involved in the clinical management of patients, presenting to either secondary or primary care, NHS care providers in Cornwall, with chest pain due to suspected or proven acute coronary syndrome. This will include:

- GPs
- Specialist Nurses
- Junior Drs
- Speciality Registrars
- Consultants

4. **Definitions / Glossary**

4.1. **Assessment for possible acute coronary syndrome (ACS)**

Symptoms that may indicate ACS include:
• Pain or discomfort in the chest and/or other areas (eg, the arms, back, neck or jaw) lasting longer than 15 minutes.
• Chest pain with nausea, vomiting, marked sweating and/or breathlessness, or haemodynamic instability.
• New-onset chest pain or abrupt deterioration of stable angina, with recurrent pain occurring frequently with little or no exertion and often lasting longer than 15 minutes.

Consider the history of the pain, any cardiovascular risk factors, history of ischaemic heart disease and any previous treatment, and previous investigations for chest pain.

4.2. Abbreviations:

ACS Acute Coronary Syndrome
MI Myocardial Infarction
STEMI ST elevation Myocardial Infarction
NSTEMI Non ST elevation Myocardial Infarction
UA Unstable Angina
LBBB Left Bundle Branch Block
MINAP Myocardial Ischaemia National Audit Project
PCI Percutaneous Coronary Intervention
CXR Chest X-ray
ICH Intracranial Haemorrhage
LVEF Left Ventricular Ejection Fraction
BNF British National Formulary
COW Cardiologist Of the Week
PLATO The Study of Platelet Inhibition and Patient Outcomes
Hs-TnT High sensitivity troponin T

5. Ownership and Responsibilities

5.1. This section provides a detailed overview of the strategic and operational roles responsible for the development, management and implementation of this policy/procedure.

5.2. Role of the Clinical Lead in Cardiology

• Reviewing this document every 3 years (or sooner if new, relevant national guidelines are published).

5.3. Role of the Managers

Line managers are responsible for:
• Ensuring staff are aware of, and act upon, the Trust’s procedural documents.
• Implementing the procedural documents for the areas in which they apply.
• Notifying all new and existing staff on how to access both current and archived Trust procedural documents.
• Ensuring that all staff members have access to the Trust intranet site to enable access to published procedural documents.
• Ensuring that all staff members are aware of their responsibility in maintaining

5.4. Role of the Cardiology Speciality Governance Group
The Cardiology Speciality Governance Group is responsible for:
• Signing off the reviewed document prior to upload to the document library
• Ensuring adequate monitoring of the pathway process

5.5. Role of Individual Staff
All staff members are responsible for:
• Making themselves aware of the procedural documents that relate to their role and responsibilities.
• Complying with agreed Trust procedural documents where they apply.
• Raising any queries about implementation of Trust documents with their line manager.
• Alerting their line manager of any non-compliance with procedural documents where it is noted and represents an actual risk to the Trust, its staff, patients or the public.
• Contacting the CITS Service Desk (01209 881717) if experiencing difficulties accessing the electronic Document Library.

6. Standards and Practice

6.1. Initial assessment and treatment of suspected ACS
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 minutes).

• Initial assessment should include brief history, physical examination and 12 lead ECG. These are crucial.
• 12 LEAD ECG – every 15 minutes until pain-free, then at one hour and four hours after pain.
• **Use the ECG for initial risk stratification: ST elevation myocardial infarction (STEMI Immediately proceed to 6.2 and activate the PPCI pathway).**
• Complete the cardiac chest pain care bundle sticker and attach to patient notes.
• Blood pressure should be recorded in both arms.
• IV access and blood samples – initial troponin 3 hours post maximal chest pain, U&E, lipids, LFT, glucose, CRP, FBC, Coag screen, CXR (do not delay other therapy).
• Aspirin 300 mg orally (if not already given by ambulance service).
• Morphine for pain 2.5-10mg intravenous initially, repeated if necessary after 5 minutes
• Antiemetic should be given with the first dose of Morphine unless already given prior to hospital admission. Metoclopramide 10 mg IV is first line.
• Oxygen should not be routinely prescribed, but should be initiated if hypoxaemia is evidenced by reduced O2 saturation monitoring or if oxygen saturations cannot be monitored accurately.
• If the patient is symptom free with no ECG changes and initial hs TnT at 3 hours is <5 ng/L with a TIMI score of 0-1 or GRACE 2.0 ‘in hospital’ risk <1%, discharge home and consider a referral to the Urgent Cardiac Chest Pain Pathway using the maxims referral system if their presenting symptoms are felt to be cardiac in origin. This also applies to patients who present > 12 hours after maximal chest pain with a hsTnT of <14ng/L.
• If the Initial hsTnT at 3 hours is 5-100 ng/L then repeat hsTnT 3 hours after the first test. If the second hsTnT is <14 with no other high risk features (TIMI ≤ 3, GRACE in hospital risk <1%) discharge home and consider a referral to the Urgent Cardiac Chest Pain Pathway if their presenting symptoms are felt to be cardiac in origin.
• If the TIMI score is >3 / GRACE in hospital >1% then consider obtaining a cardiology opinion prior to discharge.
• If the second hsTnT increases <20% consider chronic causes for raised Troponin.
• If the hsTnT has a >20% rise, or is >100ng/L admit the patient and refer them to a cardiologist. Give full ACS treatment to include dual antiplatelet therapy, Fondarinux, a Beta Blocker, and high dose Atorvastatin if not contraindicated.
• Refer to a cardiologist without delay if any of the following apply;
  - ST depression of >1mm,
  - initial hsTnT >100ng/L,
  - abnormal ECG with dynamic changes,
  - on-going chest pain / discomfort,
  - TIMI 5-7,
  - Haemodynamic instability.
  - Considering the need for intravenous isosorbide dinitrate.
  - Consideration should also be given for the need of a small molecule GP IIb/IIIa inhibitor in discussion with a cardiologist.

**Remember that these are guidelines only and that patients can still have significant coronary artery disease despite negative screening tests. If in doubt, and especially with a good history for ischaemic cardiac symptoms, refer for a specialist opinion**
6.2. Initial assessment suggests STEMI
- ST elevation ≥ 1 mm in 2 or more contiguous limb leads or ≥2 mm in 2 or more consecutive chest leads.
- Left bundle branch block (unless known to have LBBB previously).
- Posterior MI changes: Deep ST depression and tall R waves in leads V1 and V2
- **Activate Primary PCI Pathway** for STEMI management without delay (see appendix 4).
- Load with Aspirin 300mg and Ticagrelor 180 mg orally unless contraindicated see further information on Ticagrelor below when Prasugrel 60 mg orally should be used).

6.3. Initial assessment suggest NSTEMI / Unstable angina
- All patients with confirmed unstable angina or NSTEMI should be reviewed by Cardiologist of the week (COW) within 24 hours for consideration of invasive coronary angiography +/- percutaneous intervention, where appropriate, taking co-morbidities and patient wishes into consideration.
- Ticagrelor 180 mg orally stat, unless contraindicated (see further information on Ticagrelor below), when Clopidogrel 300 mg orally stat should be prescribed.
- Fondaparinux 2.5 mg sub cut stat and ONCE daily for 2-8 days or until intervention or discharge, whichever is sooner (unless immediate/ urgent coronary angiography planned or contraindicated – see further information on Fondaparinux below)

*Urgent discussion with on call Cardiologist is recommended for high risk ACS patients with on-going chest pain +/- dynamic ECG changes*

6.4. Concomitant Pharmacological treatment
- **Aspirin** 75 mg daily
- **Ticagrelor** 90 mg BD for 12 months
  - (if contraindicated Clopidogrel 75 mg OD – for 12 months, or if loaded with Prasugrel (in STEMI), continue on Prasugrel 10 mg OD for 12 months)
- **Fondaparinux** 2.5 mg subcutaneous stat and ONCE daily for 2-8 days or until intervention or discharge, whichever is sooner (unless immediate/ urgent coronary angiography planned within a few hours or contraindicated – see further information on Fondaparinux below)
- **Statins**: Treat all patients post MI regardless of Serum Cholesterol on admission. First line treatment should be Atorvastatin 80 mg STAT and then once daily nocte. Advise post discharge to **continue lifelong** unless it is not tolerated in which case consider reduction to 10 mg OD or switch to Simvastatin 40 mg daily (With monitoring of lipid profile after further 8 weeks to ensure target values of total cholesterol < 4 and LDL < 2 are still being met.)
• **ACE inhibitors:** Should be given to all patients post MI unless contraindicated. Renal function must be monitored. Initiate Ramipril 1.25 -2.5 mg OD and aim to double after 24-48 hours.

• **Beta blockers:** oral beta blockers should be given to all patients unless there are clear contraindications such as asthma, severe bradycardia, second or third degree AV block or severe heart failure. Initiate Bisoprolol 1.25 -2.5 mg OD and aim to double after 24-48 hours

• **Eplerenone** 25 mg OD should be initiated in any patient with evidence of cardiac failure or LVEF < 40

• Consider **anti-coagulation** with Dalteparin instead of Fondaparinux and further Warfarin – if associated Atrial fibrillation/ LV thrombus / LV aneurysm or another indication for full anti-coagulation

• **Potassium replacement** should be considered in patients with K < 3.5 especially if arrhythmias are present

6.5. Diabetes management in acute myocardial infarction

• All known and newly diagnosed patients with diabetes should have regular glucose monitoring and should be maintained within the strict targets, if needed initiate treatment with intravenous insulin and glucose for at least 24 hours (see CCU protocol).

• Existing oral hypoglycaemic agents should be stopped while intravenous Insulin is being given.

• Patients already on Insulin should be recommenced on their previous regime when stable.

• New diabetics or patients previously on oral hypoglycaemic agents should be referred to a diabetologist for consideration of further management

6.6. LV assessment in acute myocardial infarction

• All patients should have an echocardiogram pre-discharge to assess LV function not assessed by LV gram during angiogram. If there is evidence of significant LV dysfunction, please request a repeat echocardiogram after 3 months for risk stratification and further cardiology input.

6.7. Ticagrelor

• Ticagrelor is a potent antiplatelet agent licensed for use in combination with aspirin to reduce the risk of further cardiovascular events in patients presenting with acute coronary syndrome (ACS).

• Ticagrelor should be commenced in all forms of suspected and/or proven acute coronary syndrome (STEMI/NSTEMI/Unstable angina) unless contraindicated

• **Avoid Ticagrelor if the patient is on Warfarin or requires Novel Oral Anticoagulation (NOAC).** Clopidogrel is the first line alternative in patients requiring anticoagulation.

• Before Ticagrelor is continued beyond the immediate treatment, the diagnosis of ACS should be confirmed by a Cardiologist. Such patients should be reviewed on
the daily round of the Cardiologist of the week, and if necessary Ticagrelor therapy stopped Aspirin 75 mg OD and Ticagrelor 90 mg BD should be continued for 12 months in patients with all forms of ACS presentation (STEMI/NSTEMI/UA).

- Duration of treatment with Aspirin and Ticagrelor for 12 months remains the same in patients treated with Bare metal or Drug eluting stents and in those with no coronary intervention.
- Aspirin 75 mg OD lifelong thereafter.
- Patients previously on Clopidogrel or who received loading dose of Clopidogrel should further be given Ticagrelor 180 mg loading dose and 90 mg BD maintenance dose as per ACS pathway.
- Clopidogrel or Prasugrel should be discontinued on starting Ticagrelor.
- Patients on Clopidogrel can be safely switched to Ticagrelor.

**Dosing**

- **Initiation:** A loading dose of 180 mg should be given as early as possible after ACS presentation
- **Maintenance dose:** Ticagrelor should be continued at a dose of 90mg twice daily for a period of 12 months. Patients prescribed Ticagrelor should also be taking Aspirin at a dose of 75mg daily which should continue lifelong (higher aspirin doses are not recommended due to increased risk of bleeding)

**Contraindications for use of Ticagrelor**

- Hypersensitivity (e.g. angioedema)
- History of intracranial haemorrhage (ICH)
- Active pathologic bleeding (peptic ulcer, ICH)
- Moderate-Severe hepatic impairment (probable increase in drug exposure)
- Combination with strong CYP3A4 inhibitors such as Clarithromycin, Ritonavir, Azatanavir, Nefazodone, Ketoconazole

**Cautions**

- Bradycardia (HR < 50 min, 2nd or 3rd degree AV block)
- On oral anti-coagulants
- Known Uric acid Nephropathy
- On renal dialysis
• Do not stop Ticagrelor prematurely without discussion with a cardiologist.

<table>
<thead>
<tr>
<th>Effect of Ticagrelor may be increased by:</th>
<th>diltiazem, fluconazole, erythromycin, amprenavir, aprepitant, verapamil, quinidine, ciclosporin</th>
</tr>
</thead>
</table>
| Effect of Ticagrelor may be reduced by:  | rifampicin, dexamethasone, phenytoin, carbamazepine and phenobarbital |**Effects of Ticagrelor**

• When prescribing for patients on Ticagrelor therapy, consider potential drug interactions (see BNF). The use of macrolide antibiotics, such as clarithromycin, erythromycin and azithromycin, should be avoided during Ticagrelor treatment.

• The most commonly reported adverse reactions are dyspnoea, subcutaneous or dermal bleeding and epistaxis. Procedural site haemorrhage is also reported commonly. In the PLATO study the following bleeding episodes were seen uncommonly: intracranial haemorrhage, GI bleeding, haemoptysis and haematemesis, urinary and vaginal bleeding. GI side effects also included nausea, vomiting, diarrhoea and abdominal pain.

• **Dyspnoea:** in the PLATO study, 11.8% of patients reported dyspnoea with ticagrelor, and approximately 1% withdrew from ticagrelor as a result. Most reported symptoms of dyspnoea were mild to moderate, and most were reported as a single episode early after starting treatment. Dyspnoea usually resolves within 7 days.

<table>
<thead>
<tr>
<th>Effect of Ticagrelor may increase the effect of:</th>
<th>Simvastatin (avoid dose &gt;40mg), digoxin, ergot alkaloids</th>
</tr>
</thead>
</table>

 Patients previously on Clopidogrel or who received loading dose of Clopidogrel should further be given Ticagrelor 180 mg loading dose and 90 mg BD maintenance dose as per ACS pathway

Patients on Clopidogrel can be safely switched to Ticagrelor

Aspirin 75 mg OD and Ticagrelor 90 mg BD should be continued for 12 months in patients with all forms of ACS presentation (STEMI/NSTEMI/UA)

Duration of treatment with Aspirin and Ticagrelor for 12 months remains the same in patients treated with Bare metal or Drug eluting stents and in those with no coronary intervention

Aspirin 75 mg OD lifelong thereafter

Clopidogrel or Prasugrel should be discontinued on starting Ticagrelor
6.8. Anti-thrombin therapy - Fondaparinux

- Fondaparinux sodium is a synthetic pentasaccharide that inhibits activated factor X. It is recommended by NICE for use in patients with Unstable angina (UA) or non ST-elevation MI (NSTEMI).
- **Fondaparinux is approved for use for the treatment of all Acute Coronary Syndromes (UA / NSTEMI/STEMI ) patients. Patients should not be prescribed Dalteparin/ Enoxaparin simultaneously.**
- Fondaparinux 2.5mg S/C daily should be given if angiography / intervention is NOT planned within 24 hours. Where early angiography / intervention is planned unfractionated heparin (UFH) is preferred.
- Fondaparinux should be given once daily for at least 48 hours after admission up to a maximum of 8 days or until discharge, whichever is sooner.
- If the patient is undergoing PCI, Fondaparinux should be omitted on the morning of the procedure – if not omitted, additional UFH (50-100unit/kg adjusted to ACT) can be given to reduce the risk of catheter-related thrombosis; although bleeding risk will increase.
- Fondaparinux should not be used in patients with eGFR < 20 ml/min – use unfractionated heparin instead. No dosage reduction for Fondaparinux is required for the treatment of ACS patients with eGFR ≥ 20 ml/min (Note: dose adjustment is required for non-ACS indications for Fondaparinux).
- On cessation of Fondaparinux therapy for ACS, all patients should be assessed for risk of venous thromboembolism and initiated on appropriate thromboprophylaxis if needed in line with local guidance.

**Administration of Fondaparinux:**

- Fondaparinux should be administered by deep subcutaneous injection while the patient is lying down.
- Sites of administration should alternate between the left and the right anterolateral and left and right posterolateral abdominal wall.
- **Do not expel the air bubble** from the syringe before the injection to avoid the loss of medicinal product from the pre-filled syringe. The air bubble helps to minimise bruising at the site of injection.
- The whole length of the needle should be inserted perpendicularly into a skin fold held between the thumb and the forefinger; the skin fold should be held throughout the injection. The site should not be rubbed when the needle is removed.

6.9 Tirofiban

- Tirofiban is the Glycoprotein IIb/IIIa inhibitor of choice at RCHT
- Tirofiban is a non-peptidal antagonist of the GP IIb/IIIa receptor and is one of the small-molecule GP IIb/IIIa inhibitors. It prevents fibrinogen from binding to the GP IIb/IIIa receptor, thus blocking platelet aggregation.
Consider Tirofiban in ACS patients who have ECG evidence of ischaemia, especially with on-going chest pain and the patient cannot be imminently taken to cardiac cath lab for coronary angiography.

Commencement should only be on the advice of a Cardiology consultant or SpR and patients should be monitored closely on Coronary Care.

Tirofiban should be used in the cardiac cath lab during PPCI in combination with unfractionated heparin, where thrombus burden is evident. (Use accelerated bolus protocol for PPCI as compared to standard bolus for other ACS patients – dosing protocols in cardiac cath labs).

**Contraindications**
- History of stroke within 30 days
- Previous haemorrhagic stroke
- Active or recent (within 30 days) significant bleeding
- Malignant hypertension
- Recent trauma or major surgery (within last 6 weeks)
- Platelet count < 100,000/mm3
- INR > 1.5
- Severe liver failure
- Traumatic CPR/ Organ biopsy/ Lithotripsy within last 2 weeks
- Active Peptic ulcer within last 3 months
- Acute Pericarditis
- Known Vasculitis
- Haemorrhagic Retinopathy

**Monitoring**
- If bleeding occurs, consider discontinuing Tirofiban
- Platelet count, haemoglobin and haematocrit should be determined before using Tirofiban, within 2-6 hours of starting therapy and daily thereafter
- Half life of Tirofiban is about 2 hours in patients with coronary artery disease and is increased by over 50% in patients with a creatinine clearance of < 30 ml/minute

6.10. **Cardiac rehabilitation**
- All patients with STEMI requiring PPCI should be seen by the cardiac rehabilitation team, within 48 hours of admission.
- All patients diagnosed with NSTEMI should be seen prior to discharge.
- All patients are referred on to the community rehab team for follow-up post discharge.

6.11. **Follow-up post discharge**
- All patients with an LVEF <35% will be reviewed in cardiology outpatient clinic at 3 months with a preceding repeat echo and 24 hour Holter ECG between 2 and 3 months after discharge. All other uncomplicated STEMI and NSTEMI patients are referred back to Primary care on discharge with follow up from Cardiac rehab only.
6.12. Sexual activity

- Reassure patients that after recovery from an MI, sexual activity presents no greater risk of triggering a subsequent MI than if they had never had an MI. Advise patients who have made an uncomplicated recovery after their MI that they can resume sexual activity when they feel comfortable to do so, usually after about 4 weeks.
- When treating erectile dysfunction, treatment with a PDE5 (phosphodiesterase type 5) inhibitor may be considered in men who have had an MI more than 6 months earlier and who are now stable.
- PDE5 inhibitors must be avoided in patients treated with nitrates or nicorandil because this can lead to dangerously low blood pressure.

6.13 Lifestyle changes after an MI

**Changing diet**
Advising people to eat a Mediterranean-style diet (more bread, fruit, vegetables and fish; less meat; and replace butter and cheese with products based on plant oils).

Do not offer or advise people to use the following to prevent another MI:
- omega-3 fatty acid capsules
- omega-3 fatty acid supplemented foods.
- If people choose to take omega-3 fatty acid capsules or eat omega-3 fatty acid supplemented foods, be aware that there is no evidence of harm.

**Alcohol consumption**
Advising people who drink alcohol to keep weekly consumption within safe limits (no more than 14 units of alcohol per week for men and women and to avoid binge drinking (more than 3 alcoholic drinks in 1–2 hours).

**Regular physical activity**
Advising people to undertake regular physical activity sufficient to increase exercise capacity.

Advise people to be physically active for 20–30 minutes a day to the point of slight breathlessness. Advise people who are not active to this level to increase their activity in a gradual, step-by-step way, aiming to increase their exercise capacity. They should start at a level that is comfortable, and increase the duration and intensity of activity as they gain fitness.

**Smoking cessation**
Advising all people who smoke to stop and offer assistance from a smoking cessation service.

Unfortunately, in view of the frequent changes in DVLA guidance, we cannot add a
summary here. The guiding principles include the functional status of the patient,
completeness of revascularisation, effect of ACS on the left ventricular function and
the type of driving licence. Needless to say, type 2 licence (LGV licence) carries
much stricter criteria for regaining the licence.

6.15 Discharge planning:

<table>
<thead>
<tr>
<th>Prior to discharge</th>
</tr>
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<tbody>
<tr>
<td>• Cardiac rehabilitation – all patients to be reviewed by Cardiac rehab team within 48 hrs of admission – then referred to community team for follow-up post discharge</td>
</tr>
<tr>
<td>• Assessment of LV function – mandatory with ECHO or LV gram at angiography prior to discharge</td>
</tr>
<tr>
<td>• Advice regarding driving - refer to DVLA guidance</td>
</tr>
<tr>
<td>• Smoking cessation advice – where relevant</td>
</tr>
<tr>
<td>• Advice to GP – to up-titratre Beta blocker and ACE – inhibitor as tolerated</td>
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<table>
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<tr>
<th>Post discharge</th>
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<tbody>
<tr>
<td>Patients with LVEF &lt; 35 % - review in Cardiology clinic at 3 months with a preceding Echo and 24 hour Holter ECG between 2-3 months after discharge</td>
</tr>
<tr>
<td>All uncomplicated STEMI/NSTEMI patients follow-up in Primary care and Cardiac rehab only</td>
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</tbody>
</table>

7. Dissemination and Implementation

7.1. This document will be disseminated electronically to all relevant stakeholders once published. It will also be available on the RCHT Document library.
7.2 These guidelines are widely discussed at the induction meetings of junior doctors especially in the Emergency department, Medical assessment unit and Cardiology department.

7.3 User friendly posters with the guideline and pathways are displayed in all the relevant clinical areas.

8. Monitoring compliance and effectiveness

<table>
<thead>
<tr>
<th>Element to be monitored</th>
<th>All of it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>Clinical lead in Cardiology</td>
</tr>
<tr>
<td>Tool</td>
<td>Audit of the management of patients with acute coronary syndrome</td>
</tr>
<tr>
<td>Frequency</td>
<td>6 monthly audit for monitoring the guideline, pathways and recommendations. Future reviews guided by the audit outcomes.</td>
</tr>
<tr>
<td>Reporting arrangements</td>
<td>The Annual report will be reviewed through the Cardiology Speciality audit &amp; governance frameworks</td>
</tr>
<tr>
<td>Acting on recommendations and Lead(s)</td>
<td>The Clinical lead in Cardiology and Cardiology department will undertake subsequent recommendations and action planning for any or all deficiencies and recommendations within reasonable timeframes.</td>
</tr>
<tr>
<td>Change in practice and lessons to be shared</td>
<td>Required changes to practice will be identified and action will commence within 1 month of report review. A lead member of the Cardiology department will be identified to take each change forward where appropriate. Lessons will be shared with all the relevant stakeholders via the Cardiology Speciality audit &amp; governance frameworks</td>
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</tbody>
</table>

9. Updating and Review

9.1 This document will be updated by the Clinical lead for Myocardial Infarction every 3 years.

9.2 Revisions will be made ahead of the review date if new, relevant national guidelines are published. Where the revisions are significant and the overall policy is changed, the Clinical lead will ensure the revised document is taken through the standard consultation, approval and dissemination processes.

9.3 Where the revisions are minor, e.g. amended job titles or changes in the organisational structure, approval will be sought from the Executive Director.
9.4 Any revision activity will be recorded in the Version Control Table as part of the document control process.

10. Equality and Diversity

10.1 This document complies with the Royal Cornwall Hospitals NHS Trust service Equality and Diversity statement which can be found in the ‘Equality, Diversity & Human Rights Policy’ or the Equality and Diversity website.

Royal Cornwall Hospitals NHS Trust is committed to a Policy of Equal Opportunities in employment. The aim of this policy is to ensure that no job applicant or employee receives less favourable treatment because of their race, colour, nationality, ethnic or national origin, or on the grounds of their age, gender, gender reassignment, marital status, domestic circumstances, disability, HIV status, sexual orientation, religion, belief, political affiliation or trade union membership, social or employment status or is disadvantaged by conditions or requirements which are not justified by the job to be done. This policy concerns all aspects of employment for existing staff and potential employees.

10.2 Equality Impact Assessment - The Initial Equality Impact Assessment Screening Form is at Appendix 2.

11. References

2. MI – secondary prevention: Secondary prevention in primary and secondary care for patients following a myocardial infarction NICE guidelines [CG172] Published date: November 2013
3. Chest pain of recent onset: Assessment and Diagnosis. NICE Guidelines [CG95] Published Date: March 2010
4. Unstable angina and NSTEMI: Early Management. NICE Guidelines [CG94] Published Date: March 2010
### Appendix 1 - Governance Information

<table>
<thead>
<tr>
<th>Document Title</th>
<th>Guidelines for the management of acute chest pain of cardiac origin in Cornwall – Acute Coronary Syndrome (ACS) (ST elevation MI / Non ST elevation MI / Unstable angina)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Issued/Approved:</td>
<td>19/08/2016</td>
</tr>
<tr>
<td>Date Valid From:</td>
<td>19/08/2016</td>
</tr>
<tr>
<td>Date Valid To:</td>
<td>19/08/2019</td>
</tr>
</tbody>
</table>
| Directorate / Department responsible (author/owner): | Dr Sivasankar Sangaraju, SpR in Cardiology  
Dr Trevor Johnston, Consultant Cardiologist  
Miss Sian Hughes Chest Pain Nurse Specialist  
Dr Sen Devadathan, Governance lead, Cardiology |
| Contact details: | |
| Brief summary of contents | This document provides guidance for any professional involved in the clinical management of patients, presenting to either secondary or primary care NHS care providers in Cornwall, with chest pain due to suspected or proven acute coronary syndrome. |
| Suggested Keywords: | Cardiology  
Chest pain  
Acute coronary syndrome  
Ticagrelor  
Early rule out TNT |
| Target Audience | RCHT | PCH | CFT | KCCG |
| | ✓ | | | |
| Executive Director responsible for Policy: | Medical Director |
| Date revised: | January and August 2016 |
| This document replaces (exact title of previous version): | Chest Pain and Acute and Acute Coronary Syndrome (ACS) Pathway |
| Approval route (names of committees)/consultation: | Consultant Cardiologists  
Members of the Cardiology Speciality Governance group  
Medical Services Governance and Quality |
Guidelines for the management of acute chest pain of suspected cardiac origin in Cornwall – Acute Coronary Syndrome (ACS)

<table>
<thead>
<tr>
<th>Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divisional Manager confirming approval processes</td>
</tr>
<tr>
<td>Name and Post Title of additional signatories</td>
</tr>
<tr>
<td>Name and Signature of Divisional/Directorate Governance Lead confirming approval by speciality and divisional meetings</td>
</tr>
<tr>
<td>Signature of Executive Director giving approval</td>
</tr>
<tr>
<td>Publication Location (refer to Policy on Policies – Approvals and Ratification):</td>
</tr>
<tr>
<td>Document Library Folder/Sub Folder</td>
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<tr>
<td>Links to key external standards</td>
</tr>
<tr>
<td>Related Documents:</td>
</tr>
<tr>
<td>Training Need Identified?</td>
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**Version Control Table**

<table>
<thead>
<tr>
<th>Date</th>
<th>Version No</th>
<th>Summary of Changes</th>
<th>Changes Made by (Name and Job Title)</th>
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<tr>
<td>10 Jun 10</td>
<td>V1.0</td>
<td>Initial Issue</td>
<td>Andrew Rogers Corporate Records Manager</td>
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<tr>
<td>29 Oct 10</td>
<td>V2.0</td>
<td>Amendment of Governance coversheet to include ‘Suggested Keywords’, ‘Training Need’ and ‘Publication Location’.</td>
<td>Andrew Rogers Corporate Records Manager</td>
</tr>
<tr>
<td>1 Feb 11</td>
<td>V3.0</td>
<td>Addition of Monitoring Compliance table.</td>
<td>Andrew Rogers Corporate Records Manager</td>
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<tr>
<td>15 Jan 12</td>
<td>V4.0</td>
<td>Governance information moved to an appendix. EIA updated.</td>
<td>Andrew Rogers Corporate Records Manager</td>
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<tr>
<td>25 Jan 12</td>
<td>V4.1</td>
<td>Governance information amended to align with format of Document Manager Upload Form</td>
<td>Andrew Rogers Corporate Records Manager</td>
</tr>
<tr>
<td>24 Jul 13</td>
<td>V4.2</td>
<td>Updated Target Audience options in App 1.</td>
<td>Andrew Rogers Corporate Records Manager</td>
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</table>
Amendments to changes in practise in accordance with NICE guidelines 167, CG95 and CG94. Addition of early rule out low risk patient using a 3hr definitive test.

Dr Robin Van Lingen
Consultant Cardiologist

Amendments to structure and formatted to trust document format.

Dr. Sen Devadathan
Sian Armstrong

All or part of this document can be released under the Freedom of Information Act 2000

This document is to be retained for 10 years from the date of expiry.

This document is only valid on the day of printing

Controlled Document

This document has been created following the Royal Cornwall Hospitals NHS Trust Policy on Document Production. It should not be altered in any way without the express permission of the author or their Line Manager.
## Appendix 2 - Initial Equality Impact Assessment Form

<table>
<thead>
<tr>
<th>Name of the strategy / policy / proposal / service function to be assessed (hereafter referred to as policy) (Provide brief description): Guidelines for the management of acute chest pain of cardiac origin in Cornwall, ST elevation MI / Non ST elevation MI / Unstable angina V1.0</th>
<th>Is this a new or existing Policy? New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directorate and service area: Medicine, ED &amp; WCH, Cardiology speciality</td>
<td>Name of individual completing assessment: Dr Sivasankar Sangaraju</td>
</tr>
<tr>
<td>Telephone:</td>
<td></td>
</tr>
<tr>
<td><strong>1. Policy Aim</strong>*</td>
<td>To improve the outcome of patients presenting with chest pain due to acute coronary syndrome</td>
</tr>
<tr>
<td>Who is the strategy / policy / proposal / service function aimed at?</td>
<td></td>
</tr>
<tr>
<td><strong>2. Policy Objectives</strong>*</td>
<td>To provide clear speciality agreed guidelines and pathways for the diagnosis and clinical management of patients with acute coronary syndrome presenting to Royal Cornwall hospitals NHS trust</td>
</tr>
<tr>
<td><strong>3. Policy – intended Outcomes</strong>*</td>
<td>Availability of a robust, measurable, Speciality agreed pathways and guidelines for the diagnosis and clinical management of patients with acute coronary syndrome</td>
</tr>
<tr>
<td>*<em>4. <em>How will you measure the outcome?</em></em></td>
<td>Outlined in section 8 of this document.</td>
</tr>
<tr>
<td><strong>5. Who is intended to benefit from the policy?</strong></td>
<td>Patients presenting with acute coronary syndrome and health care professionals involved in their care</td>
</tr>
<tr>
<td><strong>6a) Is consultation required with the workforce, equality groups, local interest groups etc. around this policy?</strong></td>
<td>Yes, Workforce</td>
</tr>
<tr>
<td>*<em>b) If yes, have these <em>groups been consulted?</em></em></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>C). Please list any groups who have been consulted about this procedure.</strong></td>
<td>All Consultant Cardiologists Cardiology Speciality Group</td>
</tr>
</tbody>
</table>

### 7. The Impact

Please complete the following table.

Are there concerns that the policy could have differential impact on:
<table>
<thead>
<tr>
<th>Equality Strands:</th>
<th>Yes</th>
<th>No</th>
<th>Rationale for Assessment / Existing Evidence</th>
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<tr>
<td>Age</td>
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<tr>
<td>Sex (male, female, trans-</td>
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<td>gender / gender reassignment)</td>
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<td>Race / Ethnic communities /</td>
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<td>groups</td>
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<td>Disability -</td>
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<td>Learning disability, physical</td>
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<td>disability, sensory impairment</td>
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<td>and mental health problems</td>
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<td>Religion / other beliefs</td>
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<td>Marriage and civil partnership</td>
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<td>Pregnancy and maternity</td>
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<td>Sexual Orientation,</td>
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<td>Bisexual, Gay, heterosexual,</td>
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<tr>
<td>Lesbian</td>
<td>✅</td>
<td></td>
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</tr>
</tbody>
</table>

You will need to continue to a full Equality Impact Assessment if the following have been highlighted:

- You have ticked “Yes” in any column above and
- No consultation or evidence of there being consultation- this excludes any policies which have been identified as not requiring consultation. or
- Major service redesign or development

8. Please indicate if a full equality analysis is recommended. | Yes | No ✅ |

9. If you are not recommending a Full Impact assessment please explain why.

It does not meet any of the criteria to require a full assessment

Signature of policy developer / lead manager / director | Date of completion and submission |

Names and signatures of members carrying out the Screening Assessment | 1. | 2. |

Keep one copy and send a copy to the Human Rights, Equality and Inclusion Lead, c/o Royal Cornwall Hospitals NHS Trust, Human Resources Department, Knowledge Spa, Truro, Cornwall, TR1 3HD

A summary of the results will be published on the Trust’s web site.

Signed _______________  Date _______________
RCH ASSESSMENT OF SUSPECTED ACUTE CORONARY SYNDROME IN THE ED/AEC/MAU WITHOUT ST ELEVATION/NEW LBBB/POSTERIOR MI

**Principles:**
- First hSTnT3 hours post maximum chest pain
- Interpret all hSTnT results in conjunction with clinical symptoms and ECG findings
- Seek senior advice if unsure
- Chest pain nurses will advise on any patient Bleep 3177
- Review patient, repeat ECG after 15 mins, then hourly ECG’s
- Repeat TnT 3 hrs after first sample looking for a >20% rise unless admission TnT >12 hours post pain.

**Suspected Cardiac Pain**
- Of > 15 duration minutes in adults
  - Review ambulance ECG
  - ECG (within 5 minutes)
  - Risk stratification (TIMI and/or GRACE2 score)*
  - Bloods 3 hour post maximum chest pain hSTnT/ Troponin
  - Treatment Aspirin, Ticagrelor, +/- GTN

**TIMI Score/GRACE2 Score**
- Age > 65
- 3+ risk factors (BP/DM/FH/lipids/smoker)
- Known coronary stenosis > 50%
- On aspirin in last 7 days
- 2 or more episodes of angina in last 24hrs
- ST depression > 0.5mm
- Trop T ≥100 or ≥14 ng/L with >20%
- rise (if known)
- Please use the online risk stratification tool. Link below:

Refer to Cardiologist without delay if any of: ST depression >1mm - Initial trop T ≥100ng/L - abnormal ECG - On-going chest pain - TIMI 5-7 - Haemodynamic instability

- Hs TNT<14ng/L 12 hours post chest pain
- hSTnT at 3 hours <5 ng/L
  - TIMI 0-1/GRACE2 <1%
  - No ECG changes

Discharge from ED/MAU
- Advice and GP letter.
- Consider referral to New Onset CP pathway if cardiac in nature
- Refer to chest pain nurses via Maxims online referral prior to discharge.

- hSTnT at 3 or more hrs < 5 – 100 ng/L
- hSTnT at 3 or more hrs is > 100 ng/L

Consider clinical picture
- Repeat hSTnT 3hrs post 1st test

- 2nd TnT <14
  - No other high risk features
  - TIMI ≤3 GRACE <1%

- TIMI >3/GRACE >1%
  - Consider cardiology opinion prior to discharge

- Minimal rise <20%
  - Consider chronic causes for raised troponin

- Rise > 20%but ≤100ng/L
  - Moderate risk

- Rise >100ng/L
  - Acute MI likely

Admit patient, Refer to a cardiologist
- Give: Fondaparinux +/-Beta-block, Atorvastatin 80mg Stat

Remember that these are guidelines and that patients can still have significant heart disease despite negative screening tests. If in doubt and especially with a good story refer for specialist opinion.
Appendix 4 - PPCI Pathway for ST Elevation Myocardial Infarction

A. STEMI / PPCI Protocol: Patient Brought in by Ambulance

**Mobimed Failure / Red-phone only call or ECG sent to ED in error**

ED to contact CCU nurse to discuss pt, determine receiving status & activate Cath Lab team

If ambiguous ECG or pt history - transfer to ED for assessment / triage

Ambiguous ECG or pt history

CCU nurse to seek medical advice from Cardiologist of the Week (COW) or on call Interventional Cardiologist (out of hours)

If patient not appropriate for PPCI pathway - agree plan with ED team for assessment / triage in ED.

* LBBB history which would have previously triggered thrombolysis should be considered for PPCI pathway

**GREEN status**
Cath Lab active and ready to receive STEMI pts

Pt transferred by paramedics & receiving team direct to Cardiac Cath Lab
CCU nurse informs junior* doctor to review the patient * CCU SHO during working days or SHO covering CCU out of hours

SWAST Mobimed ECG and pt info to CCU

CCU nurse assesses ECG and pt info

Clear case of STEMI in appropriate pt

**AMBER status**
Cath Lab not open
CCU bed available

Pt transferred by paramedics, pit-stop / preparation pending arrival Cath Lab Team
CCU nurse informs junior* doctor to review the patient before on call team/Hot lab arrival * CCU SHO during working days or SHO covering CCU out of hours

If patient arresting or haemodynamically unstable on arrival in ED, receiving team must assess whether transfer to CCU or Cath Lab is appropriate or whether to continue resuscitation in ED

**RED status**
Cath Lab not open
No CCU bed

Incoming patient pit-stops in ED pending arrival PPCI team to collect pt for Cath Lab
ED team assess and stabilise pt as required

If patient not appropriate for PPCI pathway - agree plan with ED team for assessment / triage in ED.

Patient appropriate for PPCI pathway

CCU nurse contacts on call Cardiology Consultant and activates PPCI team
Cath lab on call team responsible to provide on call details daily

Patient with cardiac chest pain and:
a) ST elevation of 1mm in limb leads or 2mm in chest leads in 2 contiguous leads;
b) Acute ECG changes consistent with posterior STEMI;
c) New onset LBBB with good history for STEMI

Patient appropriate for PPCI pathway

CCU nurse assesses ECG and pt info

Clear case of STEMI in appropriate pt

* CCU SHO during working days or SHO covering CCU out of hours

If patient arresting or haemodynamically unstable on arrival in ED, receiving team must assess whether transfer to CCU or Cath Lab is appropriate or whether to continue resuscitation in ED

Guidelines for the management of acute chest pain of suspected cardiac origin in Cornwall – Acute Coronary Syndrome (ACS)
B. STEMI / PPCI Protocol: Patient Presenting Direct to ED

- **Patient with cardiac chest pain and:**
  - a) ST elevation of 1mm in limb leads or 2mm in chest leads in 2 contiguous leads;
  - b) Acute ECG changes consistent with posterior STEMI;
  - c) New onset LBBB with good history for STEMI*

- **ED contact Cardiologist of the week or CCU nurse (out of hours)**

- **Clear case of STEMI in appropriate pt**

- **Cardiologist contacts CCU nurse who activates Cath Lab Team**

- **GREEN status**
  - Cath Lab active and ready to receive STEMI pts

  - Pt transferred directly to Cardiac Cath Lab
    - CCU nurse informs junior* doctor to review the patient
    - * CCU SHO during working days or SHO covering CCU out of hours

- **AMBER status**
  - Cath Lab not open CCU bed available

  - Pt transferred directly to CCU for PPCI facilitation and pit stop,
    - CCU nurse informs junior* doctor to review the patient before on call team/Hot lab arrival
    - * CCU SHO during working days or SHO covering CCU out of hours

- **RED status**
  - Cath Lab not open No CCU bed

  - Incoming patient pit-stops in ED pending arrival PPCI team to collect pt for Cath Lab
    - ED team assess and stabilise pt as required

- **Ambiguous ECG or pt history**

  - If patient not appropriate for PPCI pathway - agree plan with ED team for assessment / triage in ED.

- **LBBB history which would have previously triggered thrombolysis should be considered for PPCI pathway**

* CCU SHO during working days or SHO covering CCU out of hours
C. STEMI / PPCI Protocol: Patient Presenting In House On RCHT Ward

Patient with cardiac chest pain and:
- ST elevation of 1mm in limb leads or 2mm in chest leads in 2 contiguous leads;
- Acute ECG changes consistent with posterior STEMI;
- New onset LBBB with good history for STEMI*

If not appropriate for PPCI pathway, appropriate management plan to be agreed between Cardiologist of the Week & referring team.

Ambiguous ECG or pt history

Interventional Cardiologist contacts CCU nurse who activates Cath Lab Team

GREEN status
Cath Lab active and ready to receive STEMI pts

AMBER status
Cath Lab not open but CCU bed available

Pt transferred to Cardiac Cath Lab

Transfer to CCU pending arrival
Cath Lab team or until Cath lab is available
CCU nurse informs junior* doctor to review the patient before on call team/Hot lab arrival
* CCU SHO during working days
or SHO covering CCU out of hours

RED status
Cath Lab not open
No CCU bed

Medical Registrar remains on ward with patient pending arrival
remainder PPCI team.

Pt transferred to Cardiac Cath Lab

If patient arresting or haemodynamically unstable
activate Cardiac Arrest team as appropriate.

Clear case of STEMI in appropriate pt

CCU nurse informs junior* doctor to review the patient before on call team/Hot lab arrival
* CCU SHO during working days
or SHO covering CCU out of hours

If patient arresting or haemodynamically unstable
activate Cardiac Arrest team as appropriate.

Guidelines for the management of acute chest pain of suspected cardiac origin in Cornwall – Acute Coronary Syndrome (ACS)
Anti-platelet therapy – all ACS (STEMI/NSTEMI/UA)

Acute chest pain of possible cardiac origin:
- **Aspirin 300mg** loading dose, 75mg OD - indefinite period
- **Ticagrelor 180mg** loading dose, 90mg BD – 12 months

If Ticagrelor contraindicated:
- **STEMI**
  - Prasugrel 60mg loading dose
  - 10mg OD - 12 months
- **NSTEMI / UA**
  - Clopidogrel 300mg loading dose
  - 75mg OD - 12 months

Avoid Ticagrelor if on Warfarin or other oral anti-coagulants

Contraindications for use of Ticagrelor:
- Hypersensitivity (e.g. angioedema)
- History of intracranial haemorrhage (ICH)
- Active pathologic bleeding (peptic ulcer, ICH)
- Moderate - severe hepatic impairment (probable increase in drug exposure)
- Combination with strong CYP3A4 inhibitors;
  - e.g. clarithromycin, ritonavir, azatanavir, nefazodone, ketoconazole

Cautions:
- Bradycardia
- Uric acid nephropathy
- On renal dialysis

Other known drug interactions with Ticagrelor:

Effect of Ticagrelor may be **increased** by:
- diltiazem, fluconazole, erythromycin, amprenavir, aprepitant, verapamil, quinidine, ciclosporin

Effect of Ticagrelor may be **reduced** by:
- rifampicin, dexamethasone, phenytoin, carbamazepine, phenobarbital

Ticagrelor may **increase the effect** of:
- simvastatin (avoid dose >40mg), digoxin, ergot alkaloids

Anti-thrombotic therapy - NSTEMI / UA

- Fondaparinux 2.5mg subcutaneous ONCE daily for 2-8 days or until intervention or discharge, whichever is sooner. Omit on the day of coronary angiography +/- PCI
- If eGFR< 20ml/min - Enoxaparin / Clexane 1mg/kg subcutaneous ONCE daily
- Use LMWH instead of Fondaparinux if another indication for full anti-coagulation e.g. AF, mechanical heart valve, DVT, PE
Refer to the:

RCH ASSESSMENT OF SUSPECTED ACUTE CORONARY SYNDROME IN THE MAU/E.D.WITHOUT ST ELEVATION/NEW LBBB/POSTERIOR MI

High Risk
Admit patient to Cardiology
Follow ACS Protocol

Low Risk
Complete inpatient chest pain assessment form and submit via Choose and Book for outpatient Chest Pain Pathway

Typical Angina
Chest Pain Nurse Review of Form
Calculation of NICE risk category

< 10%
Discharge back to GP No Tests Required

11—29%
Cardiac CT Direct to Test with Nurse assessment

30—60%
MBU/SSC/CMRI Direct to Test with Nurse assessment

61—90%
Nurse led Pre assessment Clinic prior to Angiogram

> 90% or with uncertain management
Nurse led RAPAC assessment clinic

Atypical Angina

Non-angina pain should not be investigated routinely unless other risk factors. Consider other causes e.g. GI or musculo-skeletal

Outpatient
Patient attends GP with Chest Pain
GP completes chest pain assessment form and submits via Choose and Book for outpatient Chest Pain Pathway

Angiogram

Consultant Management Plan
Discharge back to GP