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The States of Jersey Department for
Health & Social Services

Guidelines for the Management of Suspected Acute Coronary Syndromes

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CONTENTS LIST:

1.0 Summary

Chest pain is a very common presentation to the emergency department. Identifying those with acute coronary syndrome is critical in ensuring they receive appropriate and timely treatment.

Electrocardiograms should be performed rapidly at presentation to help determine those in need of urgent treatment.

Those with ST elevation myocardial infarction should receive reperfusion therapy in the form of thrombolysis where not contra-indicated. If contra-indicated consider urgent transfer for percutaneous coronary intervention.

For those with unstable angina or non-ST elevation myocardial infarction, risk stratify according to recognised risk scores to decide upon medical versus invasive management strategies.

Medical treatment should include dual antiplatelet therapy for one year with aspirin continued life-long. Additionally patients should receive a statin and be considered for an ACE inhibitor and Beta-blocker.

All patients should receive lifestyle modification advice and be invited to attend cardiac rehabilitation, coordinated through the cardiac specialist nurses.

The cardiology team should be involved in the care of all acute coronary syndrome patients**.**

If an alternative diagnosis is made, cardiovascular risk factors should still be addressed to lower their risk of developing coronary artery disease in the future.

2.0 Introduction

This guideline addresses the early and ongoing management of patients with suspected Acute Coronary Syndromes (ACS), including ST Elevation Myocardial Infarction (STEMI) and Non-ST Elevation Myocardial Infarction (NSTEMI), from investigation to diagnosis and on to hospital discharge and follow-up.

Appropriate triage, risk assessment and timely use of acute pharmacological or invasive interventions in patients with ACS are important for the preservation of health and reduction in risk of future adverse cardiovascular events such as myocardial infarction (MI), arrhythmias, repeat hospitalisation or death.

These guidelines should be used alongside appropriate training, ECG interpretation and good medical practice. Patients who have been admitted with an ACS should be discussed during their admission with the cardiology team. Data indicate that those under the care of a cardiologist have improved outcomes compared with those looked after by a non-specialist. One of the main reasons for this is that a cardiologist can advise on correct pharmacological management in addition to deciding when and who should undergo complex procedures such as cardiac catheterisation. For this reason, all Jersey patients who are being considered for referral for coronary angiography in the UK must be discussed with the cardiology team.

2.1 Background

The clinical presentation of coronary heart disease (CHD) includes silent ischemia, stable angina pectoris, unstable angina, myocardial infarction, heart failure, ventricular arrhythmias and sudden cardiac death. Patients with chest pain represent a very substantial proportion of all acute medical hospitalisations in both the UK and Jersey. Distinguishing patients with ACS within this group can be a diagnostic challenge, especially in individuals without clear symptoms or electrocardiographic features. Admissions and treatment are expensive; cardiovascular medicine accounts for one fifth of all health care expenditure and this cost is projected to triple over the next twenty years.

Expectations and management strategies for cardiology patients have changed dramatically over the last 5 to 10 years. We are now treating more elderly patients with complex presentations, difficult arrhythmia management, and utilising revascularisation techniques and sophisticated device therapies. Treatment and care should take into account patients' individual needs and preferences. Good communication is essential, supported by evidence-based information, to allow patients to reach informed decisions about their care.

2.2 Coronary heart disease (CHD)

- Cardiovascular disease affects at least 13% of the population.
- 4% of the population will have had a heart attack.
- 1 in 20 will have angina.
- Whereas mortality from CHD is falling, morbidity from CHD is rising, especially in older age groups.
- In those aged 65 and older, morbidity has risen by around 20% since the late 1980s.
- Prevalence rates for CHD increase with age, with more than 1 in 3 men and around 1 in 4 women aged 75 and over living with the condition.
- Referrals for invasive procedures such as coronary angiography, percutaneous coronary intervention and cardiac surgery are expected to increase by about 7.5% per year.

2.3 Definition of Acute Coronary Syndromes (ACS)

Acute coronary syndromes are a collection of clinical conditions involving acutely compromised myocardial perfusion:

- Acute ST segment elevation myocardial infarction (STEMI)
- Non ST segment elevation myocardial infarction (NSTEMI)
- Unstable angina - an ACS without myocardial damage

The definition of an ACS depends on the specific characteristics of each element of the triad of:

1. Clinical presentation (including a history of coronary artery disease)
2. Electrocardiographic (ECG) changes
3. Biochemical cardiac markers.

An elevated cardiac biomarker in isolation or as part of a non-cardiac clinical presentation does not immediately mean that the patient has had an ACS (see section 3.2).

The early management of a patient with an ACS is determined by the characteristics of the presenting ECG and, in particular, the presence or absence of ST segment elevation. (see section 3 for details)

2.4 Aims

The aims of these pathways are to:

i. Increase the effectiveness of the primary assessment - 'From symptoms to secondary care.' This is about getting the right patients on the right treatment pathway in the right place looked after by the right people as early as possible.
ii. Improve the interface between secondary care teams, by defining referral criteria to both cardiology services locally and to the tertiary referral centre.
iii. Define the clinical management of ACS, encompassing ST-segment elevation myocardial infarction (STEMI), unstable angina and non-ST elevation myocardial infarction (NSTEMI). This includes risk stratification, patient education, life-style modification, rehabilitation and pharmacological treatment.

2.5 Provision of Information

Patients should be offered clear information about the risks and benefits of the various treatments so that they can make informed choices about management strategies. Information should be appropriate to the patient's underlying risk of a future adverse cardiovascular event and any co-morbidities.

2.6 Assessment of a patient's risk of future adverse cardiovascular events

This should be assessed for all patients diagnosed with unstable angina or NSTEMI. There are numerous scoring systems to assess prognosis but we suggest using the data from the Global Registry of Acute Cardiac Events (GRACE). Further details can be found in section 3.4.5 and appendix 3.

3.0 Guidelines for the management of ACS

All patients with an ACS should be admitted to the High Dependency Unit (HDU) or Intensive Care Unit (ICU).

3.1 Making the diagnosis

Angina pain is typically "tight", "heavy", "band-like" or "compressing" in quality with retrosternal location ± radiation to (left) arm or jaw and occasionally to the back or epigastrium. The severity is highly variable. Angina may not necessarily indicate coronary artery disease - aortic stenosis, left ventricular outflow tract obstruction and anaemia are all possible causes.

Chronic stable angina is provoked by physical exertion, cold (leading to peripheral vasoconstriction) and emotional stress, and is relieved by rest. Sublingual GTN, where effective, will work within minutes.

Unstable angina occurs at rest or on minimal exertion and is more likely to be severe and sustained. Stuttering or rapidly increasing symptoms leading up to the acute presentation

may occur and are termed crescendo angina. There may be associated 'autonomic' features e.g. sweating and nausea ± vomiting.

The physical examination is frequently normal. Signs of heart failure or haemodynamic instability must prompt the clinician to expedite diagnosis and treatment. An important goal of the physical examination is to exclude non-ischaemic cardiac disorders (e.g. pericarditis, valvular heart disease) or non-cardiac causes (e.g. pulmonary embolism, aortic dissection, pneumothorax, pneumonia, or pleural effusion). In this regard, differences in blood pressure between limbs, an irregular pulse, heart murmurs, a friction rub, pain on palpation, and abdominal masses are physical findings that may suggest a diagnosis other than ACS. Other physical findings such as pallor, increased sweating, or tremor may point towards precipitating conditions such as anaemia or thyrotoxicosis.

3.2 Cardiac biomarkers

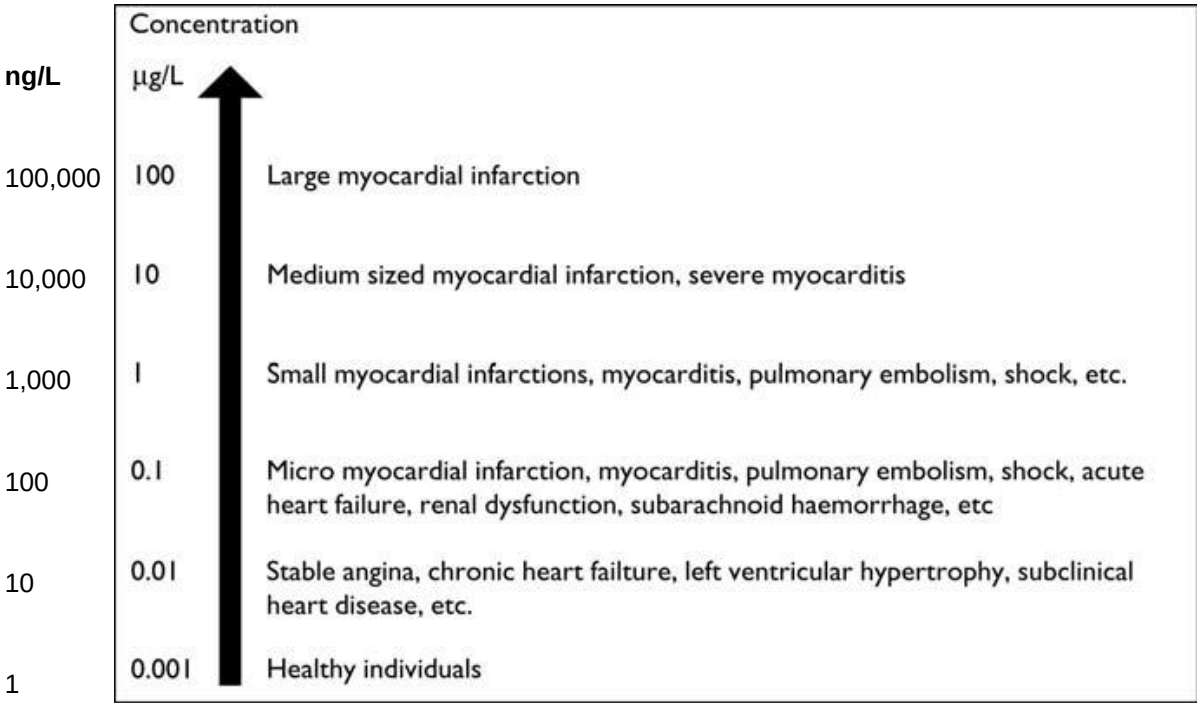
Cardiac troponins play a central role in establishing a diagnosis and stratifying risk, and make it possible to distinguish between NSTEMI and unstable angina. Cardiac troponin assays should be performed on admission (baseline troponin) and 6 hours after the reported time of peak pain (6-hour troponin). We measure highly sensitive troponin I in Jersey and results are reported as:

- *Troponin I less than 34 ng/L : "No indication of myocardial injury"*
- *Troponin I between 34 and 120 ng/L : "Intermediate elevation of Troponin"*
- *Troponin I greater than 120 ng/L : "Significant myocardial injury likely"*

Please remember to request troponin as part of a clinical diagnostic strategy and only diagnose a MI based on the clinical scenario. Always look back to the clinical diagnosis at the time the request was taken. An elevated troponin does not always mean there is obstructive coronary heart disease. For example, troponin can be significantly elevated in an exacerbation of COPD, sepsis, pericarditis or myocarditis. An elevated troponin is almost universal in marathon runners.
The following two tables give the suspected percentage of patients who will have an elevated troponin with various conditions (1-3) and potential levels of those troponins (4).

Stroke (Haemorrhagic and Ischaemic) (1)	10%
Sub arachnoid haemorrhage (2)	20-40%
Pulmonary embolism (1)	10-50%
Endocarditis (1)	65-81%
Pericarditis (3)	32-49%
Myocarditis (2)	34%
Heart failure using high sensitivity assay (2)	92%
ICU non-cardiac admissions (1)	50%
Sepsis - patients admitted to ICU (1)	43%
Asymptomatic ESRD (1)	7%
Strenuous exercise (2)	78%

(4)



(4)

The left-hand column gives the relative troponin in ng/L using the local assay.

Please also consider the type of MI when making a diagnosis as management differs. A Type 1 MI occurs as a result of plaque rupture and thrombus formation and may need anti-thrombotic therapy and consideration of coronary angiography whereas a Type 2 MI occurs due to a reduction in coronary perfusion (e.g. hypotension, arrhythmia, blood loss, peri-operatively) and requires correction of the trigger.

An elevated troponin level **does not** mean that you should automatically start treatment for an ACS.

3.3 Acute ST elevation myocardial infarction (STEMI)

This is a medical emergency usually caused by thrombotic occlusion of a major epicardial coronary artery. Irreversible ischaemic injury to the myocardium is threatened (or may have occurred at presentation). Prompt action conserves myocardium and prevents complications, including death. Patients should be treated in a high dependency area e.g. Emergency Department resuscitation area, ICU or HDU.

3.3.1 Symptoms

- Severe 'crushing' central chest pain ± radiation to jaw, neck or arms
- 'Autonomic' features: diaphoresis (sweating), nausea and vomiting
- Breathlessness due to left ventricular dysfunction
- Atypical presentations include pain in the back or abdomen, confusion
- MI may be silent (especially in the elderly and in patients with diabetes)

3.3.2 Determine

- Current haemodynamic status
- Timing of the onset of symptoms
- Are there contra-indications to thrombolysis? (section 3.3.10)
- Has aspirin been given e.g. in ambulance?
- Is there a history of coronary disease?

3.3.3 Signs

- Pain or distress
- Clammy (sweating and cutaneous vasoconstriction) and grey

3.3.4 Look for:

- Hypotension
- Lung crepitations and other evidence of heart failure
- Rhythm disturbances, e.g. bradycardia, heart block, atrial fibrillation, sinus tachycardia (pain, anxiety or compensatory)
- Murmurs (mitral regurgitation due to papillary muscle ischaemia or chordal rupture; acquired ventricular septal defect)
- Fever <38°C is common in the first 48 hours

3.3.5 Investigations

- 12-lead ECG
    - If ST segment elevation is present, a rapid decision on revascularisation is required
    - In patients with inferior MI, right sided ECG leads should be obtained, to identify possible right ventricular infarction
    - Where ECG-diagnostic criteria are not met initially, but pain persists, obtain serial ECGs every 10 minutes
- ECG monitoring should be initiated as soon as possible to facilitate immediate diagnosis and management of life-threatening arrhythmias
- A portable chest radiograph should be obtained but, where the clinical diagnosis is STEMI, this should not delay reperfusion therapy
- Blood for FBC, U&E, lipid profile, glucose and troponin with a repeated troponin level 6 hours after the time of peak pain severity.
    - In STEMI, initial treatment decisions are NOT dependent on blood test results
    - Remember that serum cholesterol may decrease after 24 hours and persist at lower level for several weeks following an acute MI

3.3.6 Immediate Management

- Patients may understandably be anxious. Provide reassurance where possible.
- Oxygen - if SaO2 < 94% (caution in chronic airways disease)
- Load with Aspirin 300 mg, chewed for rapid buccal absorption, then 75mg od po.
- Load with Clopidogrel 300mg po, then 75mg po od.
- Consider reperfusion therapy (section 3.3.8)
- Diamorphine 2.5-5mg IV or Morphine 5-10 mg IV plus GTN spray or infusion for pain control.
- Metoclopramide 10 mg IV to reduce nausea and vomiting.
- Oral beta-blocker e.g. Bisoprolol 1.25-2.5 mg od or Metoprolol 25-50 mg tds in the absence of cardiac failure, hypotension (BP<100 mmHg) or atrioventricular block. Intravenous beta-blockers e.g. Metoprolol 2.5-5 mg IV can also be used, particularly to counter tachyarrhythmias or marked hypertension.
- Patients should not receive Ticagrelor, this is not approved in the context of thrombolysis.

3.3.7 Important differential diagnoses

Aortic dissection can present with chest pain and ST segment elevation. The pain is usually distinguished by its abrupt onset, migration to the back and tearing nature. Where ST segment elevation is recorded, it is usually in the inferior (i.e. right coronary) territory. Thrombolytic therapy in acute aortic dissection is potentially lethal. Where there is significant suspicion of dissection, further imaging (e.g. contrast CT aorta) should be obtained.

Acute pericarditis may present with chest pain and ST segment elevation on the ECG. The pain is typically exacerbated by inspiration and relieved by sitting upright. The ECG changes are classically con-cave upwards (saddle shaped) and may be widespread spanning the equivalent of multiple coronary territories. Look for PR segment depression. Cardiac troponin is often elevated even to levels of thousands of ng/L.

3.3.8 Reperfusion therapy for STEMI

The goals of reperfusion therapy are prompt restoration of coronary flow and myocardial perfusion. Rapid action is vital: the door-to-needle time (thrombolysis) should be <15 minutes. Delays increase myocardial necrosis, decrease the efficacy of eventual reperfusion therapy and increase mortality.

Indications for reperfusion therapy

- Symptoms of myocardial ischaemia
- And, onset within the prior 12 hours (or up to 24 hours if symptoms of ischaemia persist)
- And, ST segment elevation of >0.1 mV (usually 1 mm) in at least two adjacent limb leads
- Or ST segment elevation of >0.2 mV (usually 2 mm) in at least two contiguous chest leads
- Or new (or presumed new) left bundle branch block
- Or true posterior MI*

** Posterior MI is notorious for the absence of definitive ECG changes. ST segment depression in leads V2 and V3, particularly in the context of concomitant inferior and or lateral ST segment elevation, should suggest posterior MI, where the clinical syndrome fits. If the changes are inconclusive, an echocardiogram may help.*

3.3.9 Thrombolysis

In Jersey, thrombolysis is the standard reperfusion treatment for ST elevation MI. Recent data suggests that early thrombolysis is as good as primary PCI in preventing death, shock, congestive heart failure or re-infarction at 30 days, providing that it is followed by timely angiography. There is however an increased incidence of intracranial haemorrhage, especially in those over 75 years (5).

Primary PCI (at the tertiary referral centre) can be considered in daylight hours in patients with contraindication to thrombolysis. Remember that many of the contraindications for thrombolysis (mostly bleeding problems) are similar contraindications for PCI. Contact the cardiology team urgently for advice.

Angiographic patency and flow at 90 minutes in the infarct-related artery are directly related to 30-day mortality. This is at best only 80% at 90 minutes with thrombolysis. Reperfusion is suggested by relief of pain and >50% resolution of ST segment elevation following thrombolysis (see 3.3.11).

Exclude contraindications (see 3.3.10) and warn of the small risk of stroke (1%) or bleeding (5-10%). Avoid arterial punctures, multiple venous punctures and intramuscular injections in patients where thrombolysis is likely.

Give **Tenecteplase** (TNK) 500-600 micrograms per kilogram (max 50mg) over 10 seconds:

Weight (Kg)	TNK (units)	TNK (mg)	Volume (mls)
<60	6000	30	6
60-70	7000	35	7
70-80	8000	40	8
80-90	9000	45	9
>90	10000	50	10

TNK should be followed by one or two doses of enoxaparin dependant on age:

Under 75: An initial IV bolus of enoxaparin 30mg followed by a s/c abdominal injection of enoxaparin 1 mg / kg (max 100mg for first two doses, continued bd until PCI or hospital discharge, up to a maximum of 8 days)

Over 75: a SC abdominal injection of enoxaparin 750micrograms/Kg (max 75mg for first two doses, continued bd until PCI or hospital discharge, up to a maximum of 8 days)

3.3.10 Contraindications to thrombolysis

Absolute

- Any previous intracranial haemorrhage
- Ischaemic stroke within 6 months
- Central nervous system damage or neoplasms or atrioventricular malformation
- Recent major trauma/surgery/head injury within 3 weeks
- Gastrointestinal bleeding within the past month
- Known bleeding disorder (excluding menses)
- Aortic dissection
- Non-compressible punctures in the past 24 hours (e.g. liver biopsy, lumbar puncture)
- Acute Pancreatitis

Relative

- Transient ischaemic attack within 6 months
- Oral anticoagulant therapy
- Pregnancy or within 1 week postpartum
- Refractory hypertension (systolic >180 mmHg; diastolic >110 mmHg) despite treatment
- Advanced liver disease
- Infective endocarditis
- Active peptic ulcer
- Traumatic or prolonged CPR

3.3.11 Failure to re-perfuse

On-going ischaemic symptoms and/or persistent ST segment elevation (>50% in the lead of greatest ST elevation, 60-90 minutes after thrombolysis) may result from a failure to achieve patency of the epicardial vessel or due to distal (microvascular) occlusion. These patients should be considered for emergency (salvage) PCI, with transfer to the tertiary centre within two hours when possible.

If rescue PCI is not available and a large infarction is in process or threatened, and the risk of bleeding is assessed not to be high, second administration of thrombolytic can be considered, although the REACT trial showed no benefit from repeat thrombolysis over conservative management.

3.3.12 Additional treatments

- Anti-platelet therapy post STEMI will depend on whether the patient has been treated with coronary intervention or are medically managed:
    - In patients who undergo PCI post-thrombolysis, the choice of antiplatelet therapy will be guided by the interventional centre.
    - In patients who are medically managed, Clopidogrel 75mg od in combination with Aspirin 75mg is recommended for up to 12 months. At the end of 12 months, Clopidogrel is stopped and Aspirin continued for life. Note when commencing Clopidogrel a one off loading dose of 300mg od is needed.
- An ACE inhibitor e.g. Ramipril 2.5 mg od should be commenced within the first 24 hours following acute MI if the systolic blood pressure is >100 mmHg. There is particular benefit in the presence of left ventricular dysfunction. The dose should be titrated upwards as blood pressure permits.
- Statin treatment should be instigated as soon as possible (e.g. Atorvastatin 80mg).
- In post STEMI patients with left ventricular ejection fraction <40%, already receiving an ACE inhibitor and with either symptomatic heart failure or diabetes, but without significant renal dysfunction or hyperkalaemia, consider adding an aldosterone antagonist.
- Diabetic patients should receive an insulin infusion based on a sliding scale if blood sugars are inadequately controlled to maintain glucose concentration between 5 and 11mmol/L.
- Consider adding Omega 3 fish oils 1-2g/day.
- Consider venous thromboembolism prophylaxis (e.g. enoxaparin) after completion of anticoagulation.

3.3.13 Post infarct management

- In the absence of complications or persistent ischemia, patients should be mobile within 24 hours.
- After successful thrombolysis, consider in-patient diagnostic angiography in UK tertiary centre (within 24 hours) for most patients. Contact the cardiac nursing team during working hours once a decision has been made. They will arrange for a cardiology bed and liaise with the in-flight co-ordinator (see Appendix 1).
- Outside of normal working hours, during weekends and holidays, the case should be discussed with the cardiology on-call registrar at the tertiary centre.
- A more conservative strategy is for a pre-discharge (day 5-7) submaximal exercise test in selected patients.
- A low-level positive test indicates further myocardium at risk, and pre-discharge angiography is usually indicated. A negative test indicates a low-risk group and is also helpful to rebuild patient confidence.
- Refer all inpatients to be seen by one of the cardiac specialist nurses for enrolment in the cardiac rehabilitation programme.

3.4 Unstable angina and non-ST elevation myocardial infarction (non-STEMI)

In the absence of sustained ST segment elevation, ischaemic pain of abruptly worsening severity or occurring at rest is classed as unstable angina (UA) or non-ST segment elevation MI (NSTEMI). The distinction depends on the eventual presence (NSTEMI) or absence (UA) of an elevated troponin measurement. The underlying pathology (ruptured or eroded coronary plaque with non-occlusive or intermittently occlusive thrombus) and initial management is the same. The immediate objectives are to relieve pain and to prevent progression to acute STEMI.

3.4.1 Symptoms

- Similar to STEMI
- Central chest pain/ache of variable severity and duration – may radiate to the jaw or (left) arm and typically not relieved by GTN
- Pain is sometimes accompanied by 'autonomic' features diaphoresis (sweating), nausea and vomiting
- There may be a history of prior chronic stable angina

3.4.2 Signs

- There may be no abnormal physical signs
- Pain or distress
- Clammy (a result of sweating and cutaneous vasoconstriction)
- Occasionally accompanied by intermittent pulmonary oedema, depending on degree of ischaemia and underlying left ventricular function

3.4.3 Investigations

- At presentation, the diagnosis is clinical
- The ECG may be normal
- ECG changes include ST segment depression and T wave inversion, which may be “dynamic” - coming and going with symptoms
- Exclude sustained ST-segment elevation
- If the ECG is normal but pain persists, obtain serial ECGs
- Bloods – FBC (exclude anaemia), U&E, serum cholesterol, glucose and troponin with repeated troponin level 6 hours after the time of peak pain severity.

3.4.4 Immediate management

There are 4 principal categories of therapy:

1. Agents to reduce ischaemia.
2. Antiplatelet agents.
3. Anticoagulants.
4. Coronary angiography to determine revascularisation strategy.

A general scheme is given below, but the precise management is determined in part by decisions on ‘early conservative’ management versus an ‘early invasive’ strategy (i.e. angiography ± PCI / CABG). See appendix 2 for a flow chart.

- Aspirin 300 mg chewed to achieve rapid buccal absorption, then 75mg daily.
- If troponin is elevated then load with ticagrelor 180mg po then commence 90mg bd for 12 months. If already loaded with clopidogrel wait 24 hours before commencing ticagrelor.
- Anticoagulation: Fondaparinux 2.5mg od s/c until PCI or hospital discharge up to a maximum of 8 days. If eGFR <20ml/min consider IV unfractionated heparin infusion with dose adjustment according to activated partial thromboplastin time.
- Consider prophylactic enoxaparin 40mg od s/c after cessation of fondaparinux.
- Sublingual (2 puffs PRN) or intravenous glyceryl trinitrate (1-10mg/hr) maintaining BP ≥90/60mmHg
- Diamorphine 2.5-5 mg or Morphine 5-10 mg IV for analgesia as required.
- Metoclopramide 10 mg IV PRN Max 30mg/24hr for nausea (give with opiates if prescribed).
- Beta-blocker e.g. Bisoprolol 1.25-2.5 mg od po or metoprolol 25-50mg po tds.
- Oral diltiazem is an alternative when beta blockers are contra-indicated (and there is no evidence of cardiac failure, atrioventricular block or hypotension), e.g. Diltiazem 90 mg SR BD.
- ± Revascularisation in selected patients according to risk (section 3.4.5).

3.4.5 Assess risk for future cardiovascular events

Assess risk with an established risk scoring system that predicts 6-month mortality (for example, Global Registry of Acute Cardiac Events (GRACE).

The GRACE model calculates the risk for all-cause mortality or new MI across the spectrum of ACS. The components of the score (range 1–372) are age, heart rate, systolic blood pressure, Killip class, cardiac arrest, serum creatinine, ST-segment deviation, and cardiac biomarker status.

See on-line tool for calculation: http://tinyurl.com/jerseyacs

Or refer to Appendix 3 for details

Risk of future adverse cardiovascular events	Predicted in-hospital mortality	Post-discharge to 6-month death
Low	<1%	<3%
Intermediate	1-3%	3-8%
High	>3%	>8%

Low risk

Low risk patients can usually be managed medically. Exercise testing can be helpful to reassure patients and clinicians that medical treatment is optimal.

Intermediate risk

Intermediate risk patients can be managed medically in the first instance but should often have further investigations to delineate their coronary anatomy to decide on the need for invasive intervention. CT coronary angiography can be helpful in these cases.

High risk

Patients at high risk of recurrent cardiac events after an ACS should be considered for an early invasive strategy with in-patient coronary angiography and possible revascularisation. This is currently performed using invasive cardiac catheterisation at a UK tertiary referral centre. Most patients require follow-on coronary intervention. Contact the cardiology team who will guide decision-making. Out of hours, contact the on-call cardiology registrar at the tertiary centre. Transfer should occur within 48 hours of time of referral. Some patients may be considered for in-patient cardiac CT prior to transfer.

Other indications for an early invasive strategy include on-going symptomatic ischaemia, especially dynamic ST segment depression on the ECG (i.e. changes with the pain), haemodynamic compromise, (recurrent) major arrhythmias and recent (e.g. within 6 months) PCI. An elevated troponin also suggests a high-risk category.

Using an early invasive strategy the number needed to treat to prevent one death at 2-5 years is 43.

3.4.6 Assessing left ventricular function

This should be assessed in all patients diagnosed with ACS. Please refer to clinical investigations for trans-thoracic echocardiography as an in-patient.

3.4.7 Lifestyle modification

All patients with ACS should be referred to the cardiac nurses for enrolment in cardiac rehabilitation. They should be counselled regarding lifestyle modification including

- Regular exercise and weight loss (where appropriate)
- Smoking cessation
- Dietary modification

3.4.8 Long-term management and secondary prevention after ACS

In addition to the above lifestyle modifications all patients should receive the following pharmacological interventions unless contra-indicated.

- Aspirin 75mg od lifelong
- Ticagrelor 90mg bd or Clopidogrel 75mg od for 1 year
- Statins lifelong aiming for LDL < 1.8 mmol/L.
- Beta-blockers lifelong for those with LVEF < 40% and for 1 year to all others. Calcium channel-blockers are alternatives if beta-blockers are contraindicated.
- ACE inhibitors lifelong for those with LVEF < 40%, symptomatic heart failure, hypertension, diabetes or kidney disease and for 1 year to all others.
- If intolerant to ACE inhibitors use an ARB licensed for use in patients with impaired LVEF.
- Aldosterone antagonists to patients already on a Beta-blocker/ACE inhibitor with LVEF < 35%.
- GTN Spray PRN

3.4.9 Chest pain pathway

The management of patients who present with cardiac chest pain and have a diagnosis of ACS ruled out in the ED has now changed. Management follows the 'chest pain pathway' outlined in Appendix 2.

4.0 Drug Information

4.1 Ticagrelor

Ticagrelor is an oral antagonist at the P2Y12 adenosine diphosphate receptor, which inhibits platelet aggregation and thrombus formation in atherosclerotic disease. Ticagrelor has been approved for the treatment of ACS by NICE - TA 236 (October 2011). Compared with clopidogrel in the PLATO trial, it significantly reduced ischaemic endpoints and mortality without an increase in major bleeding (6). See BNF for detailed drug information (7).

The number needed to treat to prevent one death from vascular causes, MI or stroke at 1 year is 53, or death from any cause at 1 year is 72.

Indications

- A new STEMI treated with primary PCI
- A **confirmed** diagnosis of NSTEMI or unstable angina irrespective of revascularisation strategy.

Dose

- Loading dose of 180mg followed by 90mg bd.
- If taking clopidogrel 75mg od, load as normal and stop clopidogrel.
- If already loaded with clopidogrel 300mg or 600mg wait 24 hours before loading with ticagrelor as above and stop clopidogrel.

Contra-indications

- Active pathological bleeding.
- History of intracranial haemorrhage.
- Moderate to severe hepatic impairment.
- Co-administration of ticagrelor with strong CYP3A4 inhibitors (e.g., ketoconazole, clarithromycin, nefazodone, ritonavir, and atazanavir).
- Hypersensitivity to the active substance or to any of the excipients.

Cautions

- Increased bleeding risk (i.e. significant thrombocytopenia or anaemia, GI bleed within the past 6 months or major surgery within the past 30 days).
- Co-administration of drugs that may increase the risk of bleeding (e.g. non-steroidal anti-inflammatory drugs (NSAIDs), oral anticoagulants, or fibrinolytics).

- Patients at risk of bradycardia.
- Asthma/COPD: If a patient, particularly those with pre-existing asthma/COPD reports new, prolonged or worsened dyspnoea this should be investigated fully and if not tolerated, treatment with ticagrelor should be stopped and replaced with clopidogrel.
- Renal impairment: Creatinine levels may increase during treatment with ticagrelor. Renal function should be checked at baseline and after one month and six months, paying special attention to patients >75 years, patients with moderate/severe renal impairment and those receiving concomitant treatment with an ARB.
- Do not stop prematurely without discussion with a cardiologist as this is associated with a high risk of adverse cardiovascular events.

Common side effects

- Dyspnoea, haemorrhage, nausea, vomiting, diarrhoea, dyspepsia, rash, pruritus

4.2 Fondaparinux

Fondaparinux sodium is a synthetic pentasaccharide that inhibits activated factor X. Compared with Enoxaparin (Clexane) in the OASIS-5 trial, fondaparinux significantly reduced the risk of major bleeding which resulted in a significant reduction in the risk of death at 30 days. **The number needed to treat to prevent one death at 30 days is 91**. See BNF for detailed drug information (8).

Indications

- Treatment of unstable angina and NSTEMI

Dose

- Fondaparinux is given as a subcutaneous injection of 2.5mg once daily for up to eight days or until hospital discharge if sooner

Contra-indications

- Active bleeding.
- Severe renal impairment (eGFR < 20ml/min).
- Bacterial endocarditis.
- Avoid in severe hepatic impairment, pregnancy or breast-feeding.
- Avoid in those taking alternative oral anticoagulants (e.g. Warfarin if INR >2 or dabigatran, rivaroxaban or apixaban) until they have been safely discontinued.

Common Side effects

- Bleeding, purpura, anaemia

Less common side effects

- GI disturbance, oedema, chest pain, dyspnoea, thrombocytopenia, rash, pruritus, thrombocythaemia

5.0 Development and consultation progress

5.1 Consultation Schedule

Name and Title of Individual	Date Consulted
Drugs and Therapeutic Committee	18/02/13
Drugs and Therapeutic Committee	31/03/14
Medical Division Meeting	10/12/13

6.0 References

1) Increases of cardiac troponin in conditions other than ACS and heart failure. Kelley et al. Clinical Chemistry 2009; 55 (12): 2098-2112

2) Troponin elevation in conditions other than acute coronary syndromes. Tanindi A, Cemri M. Vascular Health and Risk Management. 2011:7 597–603

3) Differential diagnosis of elevated troponins. Korff S. et al. Heart 2006; 92(7): 987–993

4) Troponin elevation in coronary vs. non-coronary disease. Agewall et al. Eur Heart J. 2011; 32(4): 404-11

5) Fibrinolysis or Primary PCI in ST-Segment Elevation Myocardial Infarction. Armstrong PW et al, NEJM 2013 online.

6) NICE. Ticagrelor for the treatment of acute coronary syndromes. Technology appraisal 236. October 2012.

7) BNF 64. 2.9 Antiplatelet drugs: Ticagrelor; p135-8. Sept 2012.

8) BNF 64. 2.8.1 Parenteral Anticoagulants. Fondaparinux Sodium; p147. Sept 2012.

7.0 Bibliography

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European Society of Cardiology Guidelines (2011). Acute Coronary Syndromes (ACS) in patients without persistent ST-segment elevation (Management of).

Early invasive versus conservative strategies for unstable angina and non-ST elevation myocardial infarction in the stent era. Hoenig MR, Aroney CN, Scott IA. Cochrane Database of Systematic Reviews 2010, Issue 3. Art. No.: CD004815. DOI: 10.1002/14651858.CD004815.pub3

8.0 Glossary of terms

Definitions of technical or specialised terminology used within the document.

ACE – Angiotensin converting enzyme
ACS – Acute Coronary Syndrome
ARB – Angiotensin II receptor blocker
BD – Twice daily
CABG – Coronary artery bypass grafting
CHD – Coronary heart disease
COPD – Chronic obstructive pulmonary disease
CPR – Cardio-pulmonary resuscitation
CT – Computed Tomography
ECG – Electrocardiogram
eGFR – Estimated Glomerular Filtration Rate
ESRD – End Stage Renal Disease
FBC – Full Blood Count
GI – Gastro-intestinal
GRACE – Global Registry of Adverse Cardiovascular Events
GTN – Glyceryl Trinitrate
IV – Intravenously
LFT's – Liver Function Tests
LVEF – Left Ventricular Ejection Fraction
MI – Myocardial Infarction
NICE – National Institute of Clinical Excellence
NSAIDs – Non-steroidal anti-inflammatory drugs
NSTEMI – Non-ST elevation MI
OD – Once daily
PCI – Percutaneous coronary intervention
PO – Orally
S/C – Subcutaneously
STEMI – ST elevation MI
TDS – Three times daily
Trop – Troponin I
U&E's – Urea and electrolytes
UA – Unstable angina

9.0 Implementation plan

Action	Responsible Officer	Timeframe
Emergency Department staff education	Dr Hamish MacLachlan	Within 1 month of initial approval
Pharmacy staff education	Sebastian McNeilly	Within 1 month of initial approval

10.0 Appendices

Appendix 1 – Transfer to tertiary referral centre
Appendix 2 – Management for Suspected ACS
Appendix 3 – GRACE Risk score for ACS
Appendix 4 – Thrombolysis protocol for STEMI

Appendix 1 – Transfer to tertiary referral centre

Medical team identify STEMI patient or high risk ACS patient based on GRACE score who might benefit from coronary intervention

↓

If in normal hours, refer to Cardiology Team including Cardiac Specialist Nurses.

If out of normal hours (i.e. nights, weekends, bank holidays) leave a message for cardiac nurses and consider discussing with cardiology registrar on-call in Oxford

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If deemed appropriate liaise with cardiology registrar on-call at the John Radcliffe Hospital Oxford – 01865 741166 – Bleep 4205

↓

Cardiac Specialist Nurse or Nurse in charge must contact:
Oxford cardiology bed manager – Bleep 4570
Ryan McNay (Flight co-ordinator) to arrange transfer from Jersey –Bleep 060 or Nurse in charge out of hours

↓

Nurse caring for patient please give the patient the following:
Cardiac Information leaflet
John Radcliffe Oxford booklet
British Heart Foundation booklet
Accommodation information

↓

Discharge Summary/Transfer Letter
To be sent with patient to Oxford
And faxed/e-mailed to Liz Norman on 442266/E.Norman@health.gov.je

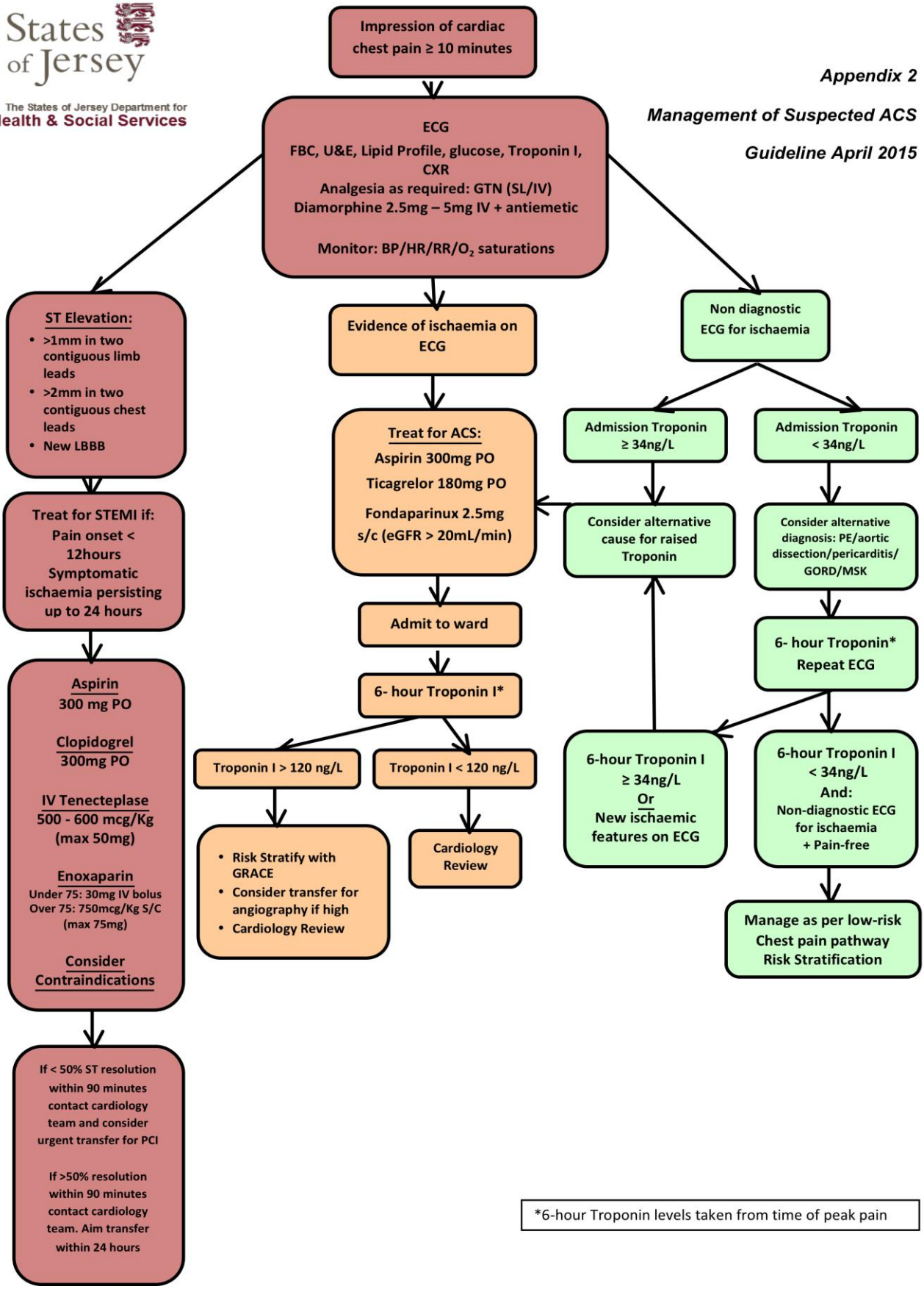
States of Jersey

The States of Jersey Department for Health & Social Services

Appendix 2

Management of Suspected ACS

Guideline April 2015



Appendix 3 – GRACE Risk Score for ACS

Age (years)

- <30 = 0
- 30–39 = 8
- 40–49 = 25
- 50–59 = 41
- 60–69 = 58
- 70-79 = 75
- 80-89 = 91
- ≥90 = 100

Heart rate (bpm)

- <50 = 0
- 50–69 = 3
- 70–89 = 9
- 90–109 = 15
- 110–149 = 24
- 150-199 = 38
- >200 = 46

Creatinine (micromole/L)

- 0 – 34 = 1
- 35–69 = 4
- 70–105 = 7
- 106–140 = 10
- 141–175 = 13
- 176–353 = 21
- >353 = 28

Systolic BP (mmHg)

- <80 = 58
- 80–99 = 53
- 100–119 = 43
- 120–139 = 34
- 140–159 = 24
- 160–199 = 10
- >200 = 0

Killip class (evidence of heart failure)

- Class I = 0
- Class II = 20
- Class III = 39
- Class IV = 59

Presence of:

- Cardiac Arrest = 39
- Elevated cardiac markers = 14
- ST segment changes = 28

Grace Score	Risk	Probability of death in-hospital
1-108	Low	<1%
109-140	Intermediate	1-3%
141-372	High	>3%

Appendix 4 - Thrombolysis Protocol for STEMI

Patient Name	
DOB	
URN	

Both of these features **must** be present	☑☒
Symptoms of myocardial ischaemia	
Onset within the prior 12 hours (or up to 24 hours if symptoms of ischaemia persist)	
***And* one** of the following **must** be present	☑☒
ST segment elevation of >0.1 mV (usually 1 mm) in at least two adjacent limb leads	
ST segment elevation of >0.2 mV (usually 2 mm) in at least two contiguous chest leads	
New (or presumed new) left bundle branch block	
True posterior MI*	

* Posterior MI is notorious for the absence of definitive ECG changes. ST segment depression in leads V2 and V3, particularly in the context of concomitant inferior and or lateral ST segment elevation, should suggest posterior MI, where the clinical syndrome fits. If the changes are inconclusive, an echocardiogram may help.

Absolute Contraindications	☑☒
Any previous intracranial haemorrhage	
Ischaemic stroke within 6 months	
Central nervous system damage or neoplasms or atrioventricular malformation	
Recent major trauma/surgery/head injury within 3 weeks	
Gastrointestinal bleeding within the past month	
Known bleeding disorder (excluding menses)	
Aortic dissection	
Non-compressible punctures in the past 24hours (e.g. liver biopsy, lumbar puncture)	
Acute pancreatitis	
Relative contraindications	☑☒
Transient ischaemic attack within 6 months	
Oral anticoagulant therapy	
Pregnancy or within 1 week postpartum	
Refractory hypertension (systolic >180 mmHg; diastolic >110 mmHg) despite treatment	
Advanced liver disease	
Infective endocarditis	
Active peptic ulcer	
Traumatic or prolonged CPR	

If not contraindicated give **Tenecteplase** (TNK) 500-600 micrograms per kilogram (max 50mg) over 10 seconds (1% risk of intracranial haemorrhage, 5-10% risk of major bleeding)

Weight (Kg)	TNK (units)	TNK (mg)	Volume (mls)
<60	6000	30	6
60-70	7000	35	7
70-80	8000	40	8
80-90	9000	45	9
>90	10000	50	10

TNK should be followed by one or two doses of enoxaparin dependant on age:
Under 75: An initial IV bolus of enoxaparin 30mg followed by a s/c abdominal injection of enoxaparin 1 mg / kg (max 100mg for first two doses, continued bd until PCI or hospital discharge, up to a maximum of 8 days)
Over 75: a s/c abdominal injection of enoxaparin 750micrograms/Kg (max 75mg for first two doses, continued bd until PCI or hospital discharge, up to a maximum of 8 days)

Additional Medications	☑☒	**If not given, please give reason**
Aspirin 300mg Stat then 75mg od		
Clopidogrel 300mg Stat then 75mg od		
Statin (eg. Atorvastatin 80mg od)		
ACE inhibitor (e.g. Ramipril 2.5mg od)		
Betablocker (e.g. Bisoprolol 1.25 - 2.5mg od)		

Clinician Name		Clinician Signature		Date	