

CG008.v2 Acute Coronary Syndromes

1. Key Recommendations for operational use				
1	Initial	<ul style="list-style-type: none"> • Apply oxygen if required to keep $S_pO_2 > 90\%$. • Perform 12 lead ECG within 10 minutes of first medical contact. <ul style="list-style-type: none"> - including after resuscitation from cardiac arrest. • Start continuous cardiac rhythm monitoring attached to a defibrillator. • If testing available, measure serum troponin. • With ongoing ischaemic chest pain, give sublingual or buccal nitrate. • Consider IV opioids if pain fails to settle. <ul style="list-style-type: none"> - give IV antiemetic if using opioids. 		
2	Refer for PCI	<ul style="list-style-type: none"> • If ECG shows any acute ischaemia discuss with local PCI centre <ul style="list-style-type: none"> - contact details in section 4.2 		
3	If for percutaneous intervention	<ul style="list-style-type: none"> • 120 min target time from ECG diagnosis of STEMI to balloon. • Give Aspirin 300mg PO. • Give second anti-platelet agent as per local pathway: <ul style="list-style-type: none"> - Ticagrelor 180mg PO or - Prasugrel 60mg PO or - Clopidogrel 600mg PO • Give Heparin 5000 IU (70-100 IU/kg) IV. 		
4a	If for thrombolysis	<ul style="list-style-type: none"> • 10 min target time from ECG diagnosis to thrombolytic administration. • Consider printing and using the SAS thrombolysis checklist (back two pages). • Exclude contraindications to thrombolysis (section 4.4). • Give Aspirin 300mg PO. • If younger than 75: <ul style="list-style-type: none"> - give Clopidogrel 300mg PO. - give Heparin 5000 IU IV. - give Enoxaparin 1mg/kg SC. - give Tenecteplase as weight adjusted dose. • If older than 75: <ul style="list-style-type: none"> - give Clopidogrel 75mg PO - give Enoxaparin 0.75 mg/kg SC - give half dose weight adjusted dose Tenecteplase • Transfer to PCI centre as soon as possible after thrombolysis 		
4b	Tenecteplase dose	<i>Weight (kg)</i>	<i>Dose for <75yr olds</i>	<i>Dose for >75yr olds</i>
		<60	30mg (6000 IU)	15mg (3000 IU)
		60 to 70	35mg (7000 IU)	17.5 mg (3500 IU)
		70 to 80	40mg (8000 IU)	20mg (4000 IU)
		80 to 90	45mg (9000 IU)	22.5mg (4500 IU)
>90	50mg (10 000 IU)	25mg (5000 IU)		

CG008.v2 Acute Coronary Syndromes

5	If not for reperfusion	<ul style="list-style-type: none"> • Give Aspirin 300mg PO. • Give second anti-platelet agent as per local pathway: <ul style="list-style-type: none"> - Ticagrelor 180mg PO or - Prasugrel 60mg PO or - Clopidogrel 600mg PO • Give Fondaparinux 2.5mg SC. • In renal failure (eGFR <20ml/min) use Enoxaparin 1mg/kg instead.
6	Cardiogenic shock	<ul style="list-style-type: none"> • Priority is rapid transfer to an interventional cardiology centre. <ul style="list-style-type: none"> - limited rapid stabilisation may be indicated depending on the severity of haemodynamic upset and the logistics of transport. • Consider inserting a urinary catheter. • Consider inserting an arterial line: <ul style="list-style-type: none"> - do not place into the right radial artery. - try to avoid the right femoral artery. • Consider echocardiography if available: <ul style="list-style-type: none"> - assess ventricular / valve function and filling. • Consider 250ml fluid boluses if no clinical / echo evidence of overload. • Consider IV vasoactive infusion: <ul style="list-style-type: none"> - consider Noradrenaline as the first line agent. - consider adding Dobutamine if available and heart rate low. - consider using Adrenaline in refractory situations, with caution around tachycardia and dysrhythmias. • Ideally administer vasoactive infusions through a central venous line: <ul style="list-style-type: none"> - if Noradrenaline or Adrenaline are given peripherally then use the 4mg/50ml dilution. • Institute respiratory support as guided by usual criteria. • Inform interventional cardiologist.
7	Glucose	<ul style="list-style-type: none"> • Consider control of hyperglycaemia (>11 mmol/l) with IV Insulin infusion (target blood glucose 7 - 11 mmol/l)

CG008.v2 Acute Coronary Syndromes

2. Document History			
Reference Number	CG008		
Version	2		
Writing group (Lead author in bold)	Alastair Baird	Emergency Physician	EMRS West
	Richard Price	Intensivist	EMRS West
	Paul Rees	Interventional Cardiologist	Barts Heart Centre
	Duncan Scott	Acute Physician	BASICS Scotland
	Pernille Sorensen	Pharmacist	Scottish Adult Critical Care Pharmacists Network
	Stuart Watkins	Interventional Cardiologist	GJNH
Associate Medical Director	Andrew Inglis		
Date issued	12th August 2022	v1: September 2018.	
Date for review	August 2025		
Distribution	BASICS Scotland		✓
	Medic 1		X
	Referring centres via service websites		✓
	Rural GPs Association of Scotland		✓
	SAS	Air Ambulance	for information
		Specialist Services Desk	X
	ScotSTAR	EMRS West	✓
		EMRS North	✓
		Paediatric	X
		Neonatal	X
Tayside Trauma Team		X	



3. Scope and purpose

- Overall objectives:

The aim of this guideline is to summarise an incremental management plan to adult patients with acute coronary syndrome that can be applied to a remote and rural healthcare setting, mindful of variable resources between these facilities. A co-operative multi-disciplinary approach between referring clinicians, the ambulance service and the interventional cardiology centres is required.

- Statement of intent:

This guideline is not intended to be construed or to serve as a standard of care. Adherence to guideline recommendations will not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgement must be made by the appropriate healthcare professional(s) responsible for clinical decisions regarding a particular clinical procedure or treatment plan. Clinicians using this guideline should work within their skill sets and usual scope of practice.

- Feedback:

Comments on this guideline can be sent to: sas.cpg@nhs.scot

- Equality Impact Assessment:

Applied to the ScotSTAR Clinical Standards group processes.

- Guideline process endorsed by the Scottish Trauma Network Prehospital, Transfer and Retrieval group.



4. Explanatory Statements		
4.1 Initial management	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> • <i>Apply oxygen if required to keep $S_pO_2 >90\%$.</i> <p>The ESC guideline [1] advises oxygen avoidance unless $S_pO_2 <90\%$. This is largely consistent with the SIGN148 guideline [2]; a large RCT [3] and an earlier Cochrane review [4].</p>	Strong	Guidelines [1,2] 1++ [3,4]
<ul style="list-style-type: none"> • <i>Perform 12 lead ECG within 10 minutes of first medical contact.</i> 	Strong	Guideline [1]
<ul style="list-style-type: none"> - <i>including after resuscitation from cardiac arrest.</i> 	Strong	Guideline [1]
<ul style="list-style-type: none"> • <i>Start continuous cardiac rhythm monitoring attached to defibrillator</i> 	Strong	Guidelines [1,2]
<ul style="list-style-type: none"> • <i>If testing available, measure serum troponin.</i> <p>A baseline serum troponin level should be taken and measured locally if testing exists but do not let this delay transfer for reperfusion. Detection of elevated troponin early may help with onward triage decisions, particularly with regards to selection of a centre capable of providing interventional cardiology facilities.</p>	Strong	Guideline [1]
<ul style="list-style-type: none"> • <i>If there is ongoing ischaemic chest discomfort, give sublingual or buccal nitrate.</i> <p>Nitrate therapy is a GPP recommendation of SIGN148; it does not alter mortality.</p>	GPP	Guideline [2]
<ul style="list-style-type: none"> • <i>Consider IV opioids if pain fails to settle.</i> <p>Opioids are a class 2a recommendation from the ESC. Opioids may delay uptake of oral anti-platelet agents.</p>	Conditional	Guideline [1]
<ul style="list-style-type: none"> - <i>give IV antiemetic if using opioids.</i> <p>An antiemetic is useful to ensure anti-platelet agents are not lost through vomiting.</p>	GPP	

CG008.v2 Acute Coronary Syndromes

4.2 Refer for PCI	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> If ECG consistent with acute ischaemia discuss with local PCI centre. PCI should be provided immediately for ST segment elevation MI and may also be required urgently for non-ST segment elevation MI with high-risk features or ongoing ischaemia.	Strong	Guideline [1,2,5]

PCI Centre contact details		
Centre	Telephone	ECG Fax and Email
Aberdeen	01224 553292	01224 559567 gram.ppiccucardiology@nhs.scot
Edinburgh	0131 242 1148	0131 242 1145 cardiolrie.AS021411@nhs.scot
GJNH	0141 951 5299 (Urgent, non PCI calls: 07976 986058)	0141 951 5867 ecg.gjnh@nhs.scot
Hairmyres	01355 584819	01355 584807 primary.pci@nhs.scot
Ninewells	01382 740490	01382 496392. ecg.tayside@nhs.scot
Raigmore (Mon-Fri 9-5 as of writing – planned 24/7 by 2023)	01463 729711	01463 705993 ECG.highland@nhs.scot

4.3 If for percutaneous intervention	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> 120 min target time from ECG diagnosis of STEMI to balloon. 	Strong	Guidelines [1,5]
<ul style="list-style-type: none"> Give Aspirin 300mg PO. Give second anti-platelet agent as per local pathway: <ul style="list-style-type: none"> Ticagrelor 180mg PO or Prasugrel 60mg PO or Clopidogrel 600mg PO Give Heparin 5000 IU IV (70 - 100 IU/kg) <p>Combination therapy reduces the composite of adverse outcomes when compared to aspirin alone. Second anti-platelet agents should be given as per local guidance – options vary depending on patient demographics and concomitant anticoagulation. Heparin anticoagulation should be used, most experience being with unfractionated heparin. Fondaparinux should not be used in context of PCI.</p>	Strong	Guidelines [1, 5]
4.4 If for thrombolysis		
<ul style="list-style-type: none"> 10 min target time from ECG diagnosis to thrombolytic administration. <p>Thrombolysis should be administered if PCI cannot be performed within 120 minutes of diagnosis and symptoms are <12hr duration and there are no contraindications. The greatest benefit is seen within 2hr of symptom onset.</p>	Strong	Guideline [1]
<ul style="list-style-type: none"> Exclude contraindications to thrombolysis. <p>Absolute Contraindications: major surgery, trauma or GI bleeding within 1 month; bleeding disorders; aortic dissection; previous intracranial haemorrhage; ischaemic stroke within 6 months.</p> <p>Relative Contraindications: prolonged resuscitation; transient ischaemic attack within 6 months; oral anticoagulants; pregnancy; refractory hypertension; advanced liver disease; active peptic ulcer, endocarditis.</p>	Strong	Guideline [1]
<ul style="list-style-type: none"> Give Aspirin 300mg PO. 	Strong	Guideline [1,5]

4.4 If for thrombolysis, continued.	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> • <i>If younger than 75:</i> <ul style="list-style-type: none"> - <i>give Clopidogrel 300mg PO.</i> - <i>give Heparin 5000 IU IV.</i> - <i>give Enoxaparin 1mg/kg SC.</i> - <i>give Tenecteplase as weight adjusted dose.</i> <p>Heparin anticoagulation is indicated until revascularisation or for at least 48hr. When thrombolysis will be performed due to a delay in accessing a PCI capable centre, heparin anticoagulation should start at scene. The use of enoxaparin is associated with overall benefit compared to unfractionated heparin [6,7] and this is reflected in guidelines [1]. However, these trials used IV then SC enoxaparin; the availability of IV formulation of enoxaparin precludes this approach. An unfractionated heparin infusion however requires both an infusion pump and therapeutic monitoring, with implications to the remote / rural / transfer setting. On balance, IV unfractionated heparin should be given with thrombolysis and then be followed with SC enoxaparin. The writing group consider a dose of 5000 IU to be less prone to error than 60 IU/kg [1,6,7] and is common local practice.</p>	Conditional for this regime	Guideline [1,5] 1++ [6,7]
<ul style="list-style-type: none"> • <i>If older than 75:</i> <ul style="list-style-type: none"> - <i>give Clopidogrel 75mg PO.</i> - <i>give Enoxaparin 0.75 mg/kg SC.</i> - <i>give half dose weight adjusted dose Tenecteplase.</i> <p>A consideration in patients over 75 years old is to omit IV heparin and use 0.75mg/kg SC enoxaparin: this reduces bleeding risk [8].</p>	Conditional for this regime	Guideline [1,5] 1++ [7]
<ul style="list-style-type: none"> • <i>Tenecteplase dose</i> 		Guideline [1]
<ul style="list-style-type: none"> • <i>Transfer to PCI centre as soon as possible after thrombolysis.</i> <p>Incidence of requirement for rescue angiography may be one third; thrombolysis followed by delayed angiography gives comparable results to PPCI if PPCI cannot be performed within the hour.</p>	Strong	Guideline [1] 1++ [9]

4.5 If not for reperfusion	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> • Give Aspirin 300mg PO. • Give second anti-platelet agent as per local pathway: <ul style="list-style-type: none"> - Ticagrelor 180mg PO or - Prasugrel 60mg PO or - Clopidogrel 600mg PO • Give Fondaparinux 2.5mg SC. <ul style="list-style-type: none"> - with renal failure (eGFR <20ml/min) use Enoxaparin 1mg/kg instead. <p>Fondaparinux is associated with reduced mortality and major bleeding when compared to enoxaparin.</p>	Strong	Guideline [2]
4.7 Cardiogenic shock		
This is generally considered to be systolic BP <90mmHg with evidence of reduced end organ or peripheral perfusion.		
<ul style="list-style-type: none"> • Priority is rapid transfer to an interventional cardiology centre. <ul style="list-style-type: none"> - limited rapid stabilisation may be indicated depending on the severity of haemodynamic upset and the logistics of transport. 	GPP	
<ul style="list-style-type: none"> • Consider inserting a urinary catheter. 	GPP	
<ul style="list-style-type: none"> • Consider inserting an arterial line. 	Conditional	Guidelines [11,12]
<ul style="list-style-type: none"> - do not place into the right radial artery. <p>The right radial artery is the preferred cannulation site for angiography [1] due to reduced adverse events including all cause mortality reduction [10].</p>	Strong	Guideline [1] 1++ [10]
<ul style="list-style-type: none"> - try to avoid the right femoral artery. <p>The right femoral is the usual access point for an intra-aortic balloon pump</p>	GPP	
<ul style="list-style-type: none"> • Consider echocardiography if available: <ul style="list-style-type: none"> - assess ventricular / valve function and filling. <p>Echo is a class 1 recommendation of the ESC guidelines. In the remote / rural / transfer setting, this writing group view this as a conditional recommendation (to consider), given the variable availability of equipment, echocardiography skills and risk of delay to transfer.</p>	Conditional	Guideline [11]
<ul style="list-style-type: none"> • Consider 250ml fluid boluses if no clinical / echo evidence of overload. <p>SIGN [2] and ESC [11] conditionally recommend fluid challenge (with the comment that there is little evidence to support it). The assessment of volume state is very difficult even before the limitations of the remote / rural / transfer setting are factored in. Most patients in cardiogenic shock will have evidence of congestion [11], however if this is not the case, consider a 250ml fluid challenge and careful reappraisal.</p>	Conditional	Guidelines [2,11]

4.7 Cardiogenic shock, continued	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> • <i>Consider IV vasoactive infusion:</i> <ul style="list-style-type: none"> - <i>consider Noradrenaline as the first line agent.</i> - <i>consider adding Dobutamine if available and heart rate low.</i> - <i>consider using Adrenaline in refractory situations, with caution around tachycardia and dysrhythmias.</i> <p>The evidence base is limited [13] and difficult to apply to short term infusions in the retrieval setting. Noradrenaline is recommended as the first line vasoactive drug by the AHA [12]. The ESC [11] suggest its use after an inotropic agent with the suggestion that adrenaline use is restricted to persistent hypotension. In a propensity scored cohort study, longer term adrenaline use was associated with increased mortality [14]. In a small RCT in patients following revascularisation, adrenaline use was potentially associated with some unfavourable outcomes but with no difference in mortality [15].</p>	Conditional	1+ [13] Guidelines [11,12] 2+ [14] 1- [15]
<ul style="list-style-type: none"> • <i>Ideally administer vasoactive infusions through a central venous line.</i> <ul style="list-style-type: none"> - <i>if noradrenaline or adrenaline are given peripherally then use the 4mg/50ml dilution</i> 	GPP	
<ul style="list-style-type: none"> • <i>Institute respiratory support as guided by usual criteria.</i> <p>This may be in the form of non-invasive ventilation or following endotracheal intubation for the management of hypoxaemia, hypercarbia, acidosis, excessive work of breathing or reduced level of consciousness.</p>	Strong	Guidelines [11,12]
<ul style="list-style-type: none"> • <i>Inform interventional cardiologist.</i> <p>These patients may be suitable for a variety of mechanical circulatory support interventions and advanced notice is useful. Rarely, these patients may require corrective surgery.</p>	GPP	
<h3>4.8 Glucose Control</h3>		
<ul style="list-style-type: none"> • <i>Consider control of hyperglycaemia (>11 mmol/l) with IV Insulin infusion (target blood glucose 7 - 11 mmol/l).</i> <p>Guidelines [1,2,5] vary in their strength of recommendation. Glycaemic control with IV insulin reduces mortality in ACS patients with diabetes mellitus or glucose >11mmol/l. Lower target glucose (4.7-6.1 mmol/l) does not confer benefit and is associated with adverse events. Do not delay transfer for PCI. Given the potential logistic implications in the remote / rural / transport setting, this can be considered with delayed transfer, if infusion pumps are available and regular monitoring feasible.</p>	Conditional	Guideline [1,2,5]

5 References

1. Ibanez B et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *European Heart Journal* 2018; 39: 119.
2. Scottish Intercollegiate Guidelines Network (SIGN). Acute Coronary Syndrome. Edinburgh: SIGN; 2015. (SIGN publication no. 148). [April 2016]. <http://www.sign.ac.uk>
3. Hoffman R et al. Oxygen therapy in suspected myocardial infarction. *NEJM* 2017; 377: 1240.
4. Cabello JB et al. Oxygen therapy for acute myocardial infarction. *Cochrane Database of Systematic Reviews* 2013, Issue 8. Art. No.: CD007160.
5. NICE. Acute Coronary Syndromes. NICE; 2020. (NICE guideline 185). [April 2022]. www.nice.org.uk/guidance/ng185
6. ASSENT-3 investigators. Efficacy and safety of tenecteplase in combination with enoxaparin, abciximab, or unfractionated heparin: the ASSENT-3 randomised trial in acute myocardial infarction. *Lancet* 2001; 358: 605.
7. Giraldez RR et al. Enoxaparin is superior to unfractionated heparin in patients with ST elevation myocardial infarction undergoing fibrinolysis regardless of the choice of lytic: an ExTRACT-TIMI 25 analysis. *European Heart Journal* 2007; 28: 1566.
8. White HD et al. Enoxaparin vs. unfractionated heparin with fibrinolysis for ST-elevation myocardial infarction in elderly and younger patients: results from ExTRACT-TIMI 25. *European Heart Journal* 2007; 28: 1066.
9. Armstrong PW et al. Fibrinolysis or Primary PCI in ST-Segment Elevation Myocardial Infarction. *NEJM* 2013; 368: 1379.
10. Valgimigli M et al. Radial versus femoral access in patients with acute coronary syndromes undergoing invasive management: a randomised multicentre trial. *Lancet* 2015; 385: 2465.
11. McDonagh T et al. 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. *European Journal of Heart Failure* 2021; 42: 36.
12. van Diepen S et al. Contemporary management of cardiogenic shock: a scientific statement from the American Heart Association. *Circulation* 2017; 136: 232-268.
13. Schumann J et al. Inotropic agents and vasodilator strategies for the treatment of cardiogenic shock or low cardiac output syndrome. *Cochrane Database of Systematic Reviews* 2018, Issue 1. Art. No.: CD009669. DOI: 10.1002/14651858.CD009669.pub3.
14. Tarvasmäki T et al. Current real-life use of vasopressors and inotropes in cardiogenic shock - adrenaline use is associated with excess organ injury and mortality. *Critical Care* 2016; 20: 208.
15. Levy B et al. Epinephrine versus norepinephrine for cardiogenic shock after acute myocardial infarction. *Journal of the American College of Cardiology* 2018; 72: 173-182.