Treatment Guideline

Gloucestershire Hospitals
NHS Foundation Trust

Acute Coronary Syndrome (ACS) Trust Protocol

Prepared by: Dr Yik Hon Ho & Dr Caryn Tsujean Lim
Verified by: Dr Sylvia Siedlecka
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Contents

**Gloucestershire Royal Hospital is a percutaneous coronary intervention (PCI) capable hospital.*

1. Introduction

1.1 Classification

Acute coronary syndrome (ACS) includes a spectrum of conditions:

- ST-elevation myocardial infarction (STEMI)
- Non-ST-elevation acute coronary syndrome (NSTE-ACS)
    - Non-ST-elevation myocardial infarction (NSTEMI)
    - Unstable angina (UA)

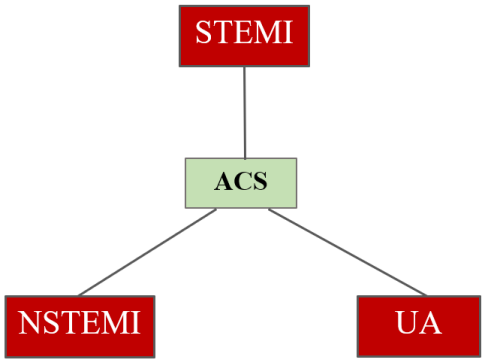

***Figure 1**. ACS spectrum.*
ACS, acute coronary syndrome; NSTEMI, non-ST-elevation myocardial infarction; STEMI, ST-elevation myocardial infarction; UA, unstable angina.

1.2 Risk factors

Established risk factors:

- Family history of early myocardial infarction (≤55 years of age)
- Smoking
- Diabetes mellitus
- Hyperlipidaemia
- Hypertension

Other possible risk factors:

- Physical inactivity
- Obesity
- Recreational drug (e.g. cocaine)

2. Diagnosis

The following algorithm is for clinical suspicion of a high likelihood of ACS.

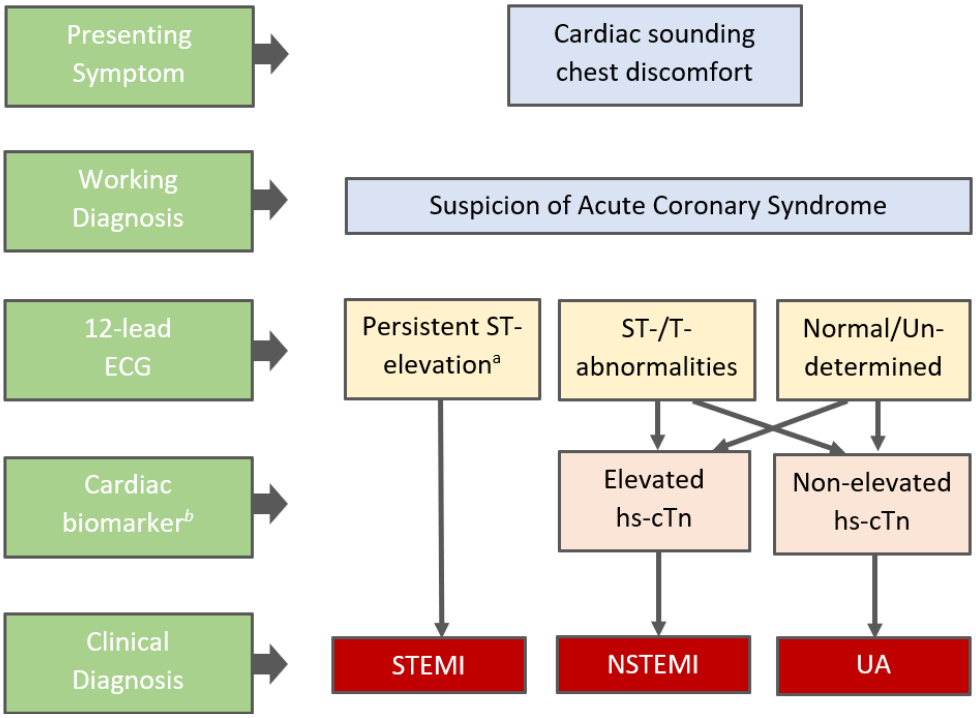

***Figure 2**. Algorithm of diagnosing ACS.*
ACS, acute coronary syndrome; ECG, electrocardiogram; hs-cTn, high-sensitivity cardiac troponin; NSTEMI, non-ST-elevation myocardial infarction; STEMI, ST-elevation myocardial infarction; UA, unstable angina.
[a]Refer to Heading 2.1
[b]Refer to Figure 3

2.1 Diagnosis of ACS

Acute myocardial infarction (AMI) is defined as **acute myocardial injury** with clinical evidence of **acute myocardial ischaemia**, a rise and/or fall of **cardiac troponin (cTn) values (**at least one value above the 99th percentile URL) and at least one of the following:

- Symptoms of myocardial ischaemia
- New ischaemic ECG changes
- Development of pathological Q waves

STEMI

- Symptoms of myocardial ischaemia and new ST elevation at the J-point in at least 2 contiguous leads
  - In leads V2-V3:
    - ≥2.5 mm in men <40 years old
    - ≥2 mm for men ≥40 years old
    - ≥1.5 mm for women of all ages
- ST depression in leads V1-3 (especially with dominant R wave and positive terminal T wave) is highly suggestive of posterior coronary artery occlusion.

- ST depression ≥1 mm in ≥6 surface leads (inferolateral depression), coupled with ST elevation in aVR and/or V1 suggests multivessel ischaemia or left main coronary artery obstruction (particularly in the presence of haemodynamic compromise).

NSTEMI

- AMI with either a normal ECG or with ECG changes of ST depression and/or T wave inversion; alongside hs-cTn T level of ≥14 ng/L; or a dynamic hs-cTn trend of ≥ 20% rise or fall of hs-cTn levels (refer to *Figure 3*).

UA

- Defined as myocardial ischaemia at rest or upon minimal exertion in the absence of acute cardiomyocyte injury/necrosis (normal 12-lead ECG and negative hs-cTn).
- It is characterized by:
  - Prolonged angina at rest/on minimal exertion (>20 minutes)
  - New onset of severe angina
  - Angina that is increasing in frequency/longer in duration/lower in threshold
  - Angina that occurs after a recent episode of myocardial infarction (MI)

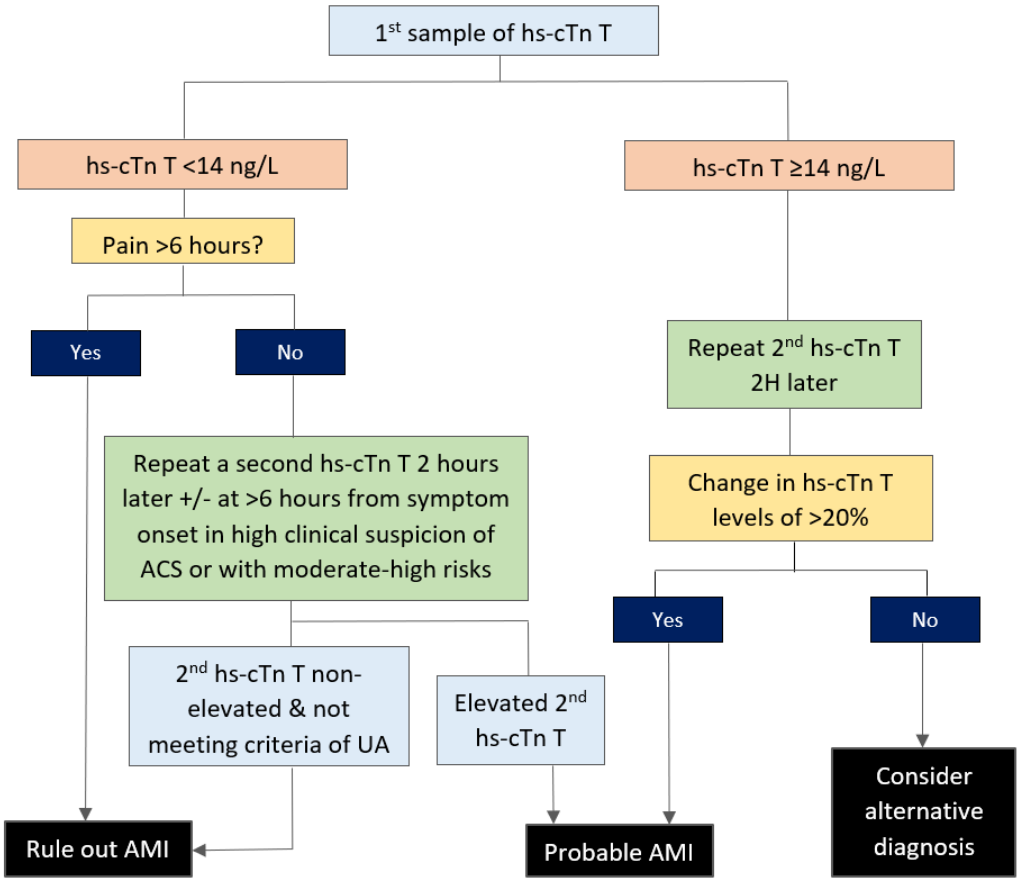

Figure 3. *'Rule-in' and 'rule-out' pathway for ACS based on hs-cTn T level and risk stratification.*
ACS, acute coronary syndrome; AMI, acute myocardial infarction; hs-cTn T, high-sensitivity cardiac troponin T; UA, unstable angina.

3. Management

3.1 Acute/early management of STEMI

Coronary angiography with follow-on primary PCI is the choice of reperfusion therapy in a PCI-capable hospital. However, in cases when PCI is not possible, fibrinolysis should be considered instead (refer to *Appendix 1 for 'Fibrinolysis pathway'*).

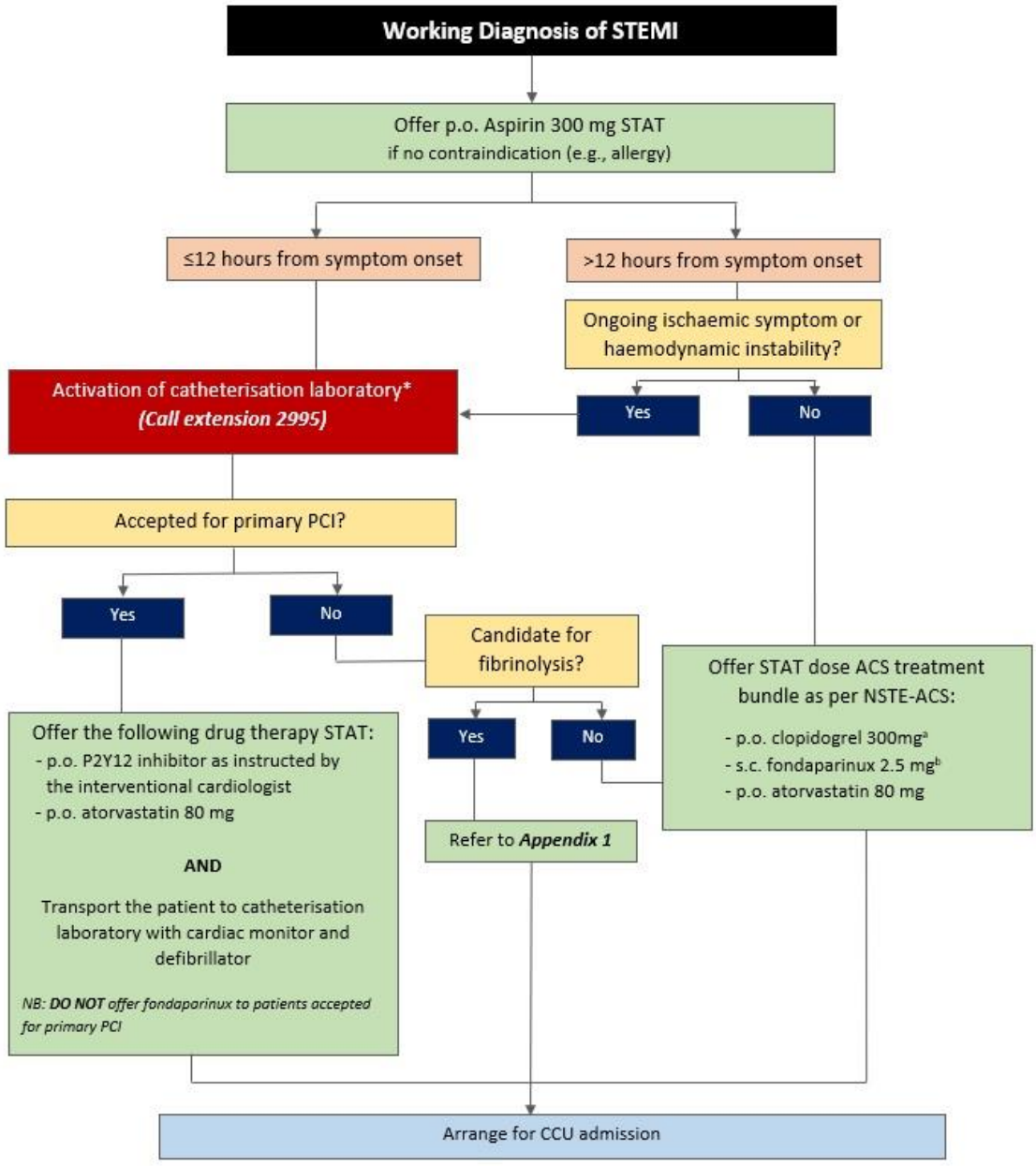

Figure 4. *STEMI pathway.*
ACS, acute coronary syndrome; NSTE-ACS, non-ST-elevation acute coronary syndrome; PCI, percutaneous coronary intervention; p.o., per oral; s.c., subcutaneous; STEMI, ST-elevation myocardial infarction.
[a]p.o. ticagrelor 180mg can be used in patients allergic to clopidogrel but to avoid in patients with high bleeding risk.
[b]s.c. enoxaparin 1mg/kg in patients with renal impairment (i.e., creatinine > 265 µmol/L or creatinine clearance <20 mL/min), ***avoid*** *in patients considered for coronary angiography with follow-on primary PCI in the presence of high-risk clinical features.*
** Activation of catheterisation laboratory should only be a consultant/registrar-to-PCI consultant discussion.*

3.2 Acute/early management of NSTEMI/unstable angina

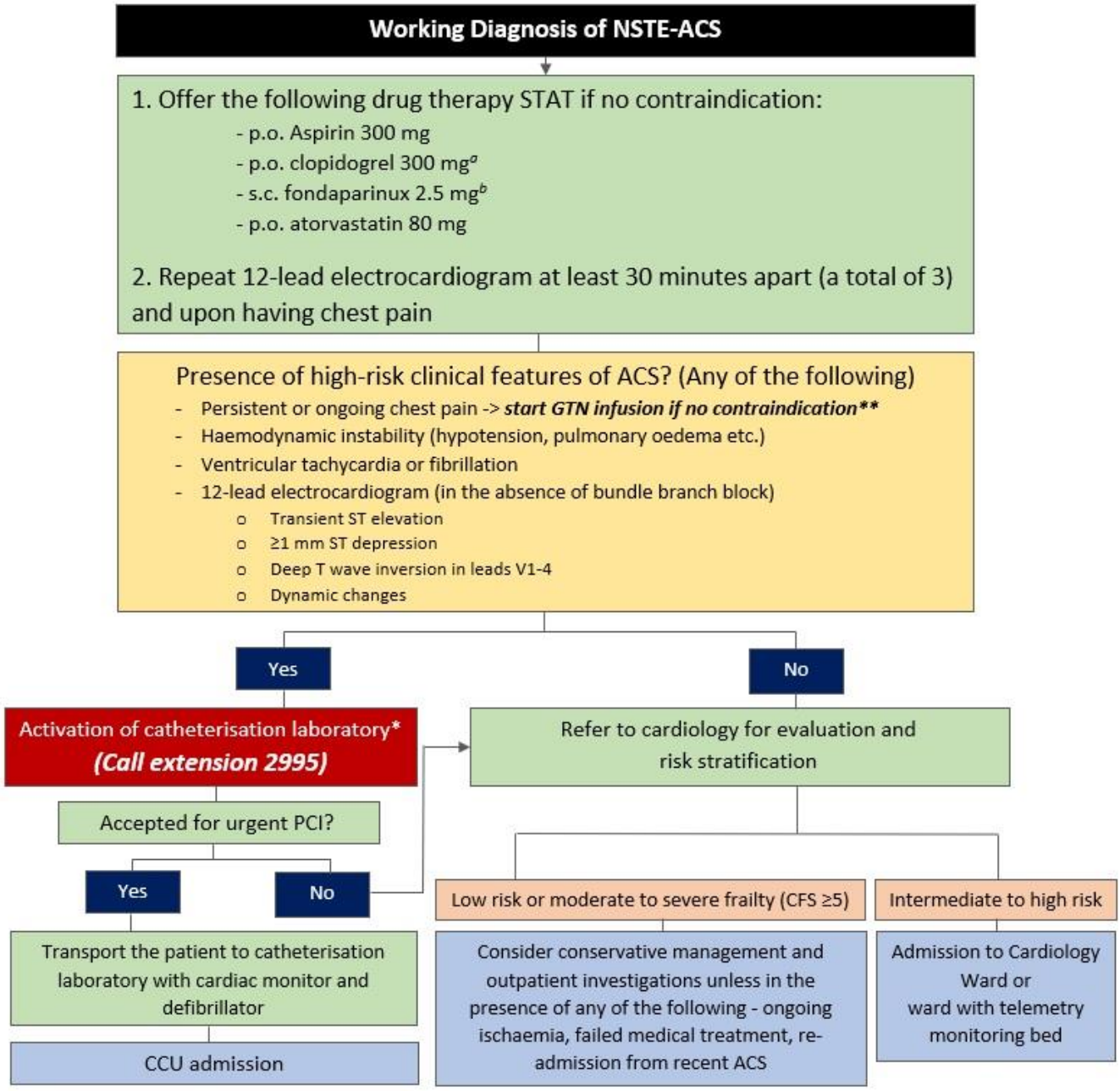

Figure 5. *NSTE-ACS pathway.*
ACS, acute coronary syndrome; CFS, Clinical Frailty Scale; GTN, glyceryl trinitrate; NSTE-ACS, non-ST-elevation acute coronary syndrome; PCI, percutaneous coronary intervention; p.o., per oral; s.c., subcutaneous; TIMI, Thrombolysis in Myocardial Infarction.
[a]p.o. ticagrelor 180mg can be used in patients allergic to clopidogrel but to avoid in patients with high bleeding risk.
[b]s.c. enoxaparin 1mg/kg in patients with renal impairment (i.e., creatinine > 265 µmol/L or creatinine clearance <20 mL/min), ***avoid*** *in patients considered for coronary angiography with follow-on primary PCI in the presence of high-risk clinical features.*
**Activation of catheterisation laboratory should only be a consultant/registrar-to-PCI consultant discussion.*
***If GTN infusion is being started for a patient, this needs to be escalated to the cardiology consultant or registrar for urgent intervention. The patient should be moved to a cardiology bed in the first instance.*

3.3 Summary of approach to ACS diagnosis and management

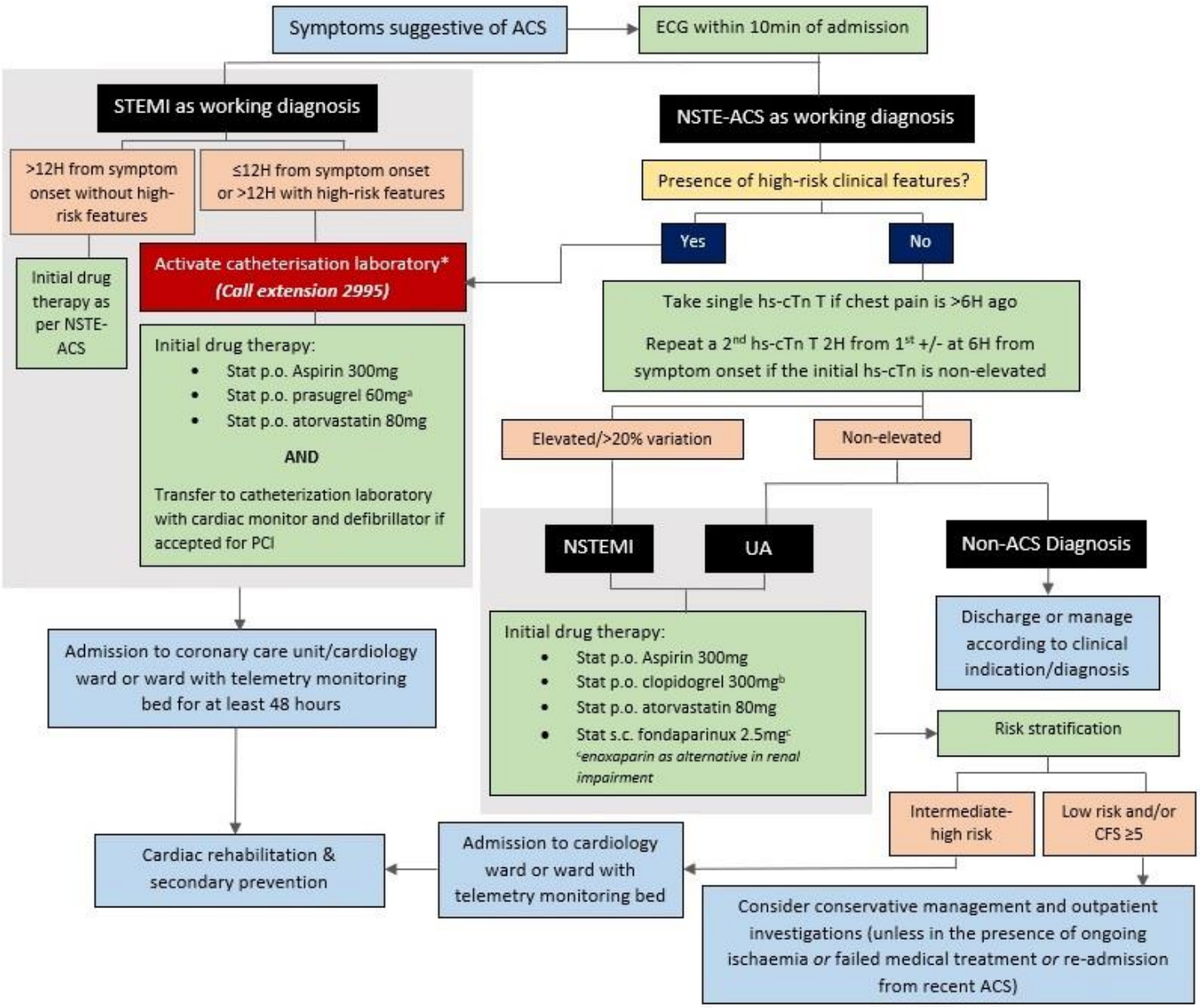

***Figure 6**. Summary of diagnosis and management of ACS.*
ACS, acute coronary syndrome; CFS, Clinical Frailty Scale; ECG, electrocardiogram; hs-cTn, highly-sensitive cardiac troponin; NSTE-ACS, non-ST-elevation acute coronary syndrome; NSTEMI, non-ST-elevation myocardial infarction; PCI, percutaneous coronary intervention; PPI, proton pump inhibitor; STEMI, ST-elevation myocardial infarction; TIMI, Thrombolysis in Myocardial Infarction; UA, unstable angina.
[a]Contraindicated in history of stroke/transient ischaemic attack. Use with cautions in those who are ≥75 years or ≤60kg. Stat dose of p.o ticagrelor 180mg can be used as an alternative.
[b]p.o. ticagrelor 180mg can be used in patients allergic to clopidogrel but to avoid in patients with high bleeding risk.
*[c]s.c. enoxaparin 1mg/kg in patients with renal impairment (i.e., creatinine > 265 µmol/L or creatinine clearance <20 mL/min), **avoid** in patients considered for coronary angiography with follow-on primary PCI in the presence of high-risk clinical features.*
**Activation of catheterisation laboratory should only be a consultant/registrar-to-PCI consultant discussion.*

Appendix 1: Fibrinolysis

- Offer if presenting within 12 hours from symptom onset and PCI is not possible (refer to ***Figure 7*** for *'Fibrinolysis pathway'*).
- It should be delivered within 10 minutes of STEMI diagnosis and should not be delayed by waiting for cardiac biomarkers results.

Contraindications to fibrinolysis therapy:

Absolute contraindications:

- Recent intracranial haemorrhage
- Structural cerebral vascular lesion
- Intracranial neoplasm
- Ischaemic stroke within 3 months
- Possible aortic dissection
- Active bleeding or bleeding diathesis (excluding menses)
- Significant head injury or facial trauma within 3 months
- Recent intracranial/spinal surgery
- Severe uncontrolled hypertension
- For streptokinase, previous treatment within 6 months

Relative contraindications:

- History of severe/poorly controlled hypertension
- Severe hypertension at presentation (systolic blood pressure >180mmHg or diastolic blood pressure >110mmHg)
- Prolonged (>10 minutes) cardiopulmonary resuscitation (CPR) or major surgery within 3 weeks
- History of ischaemic stroke
- Dementia
- Internal bleeding within 2-4 weeks
- Non-compressible vascular punctures
- Pregnancy
- Active peptic ulcer
- Concurrent therapy of anti-coagulants associated with an elevated international normalized ratio (INR) >1.7 or a prothrombin time (PT) >15 seconds

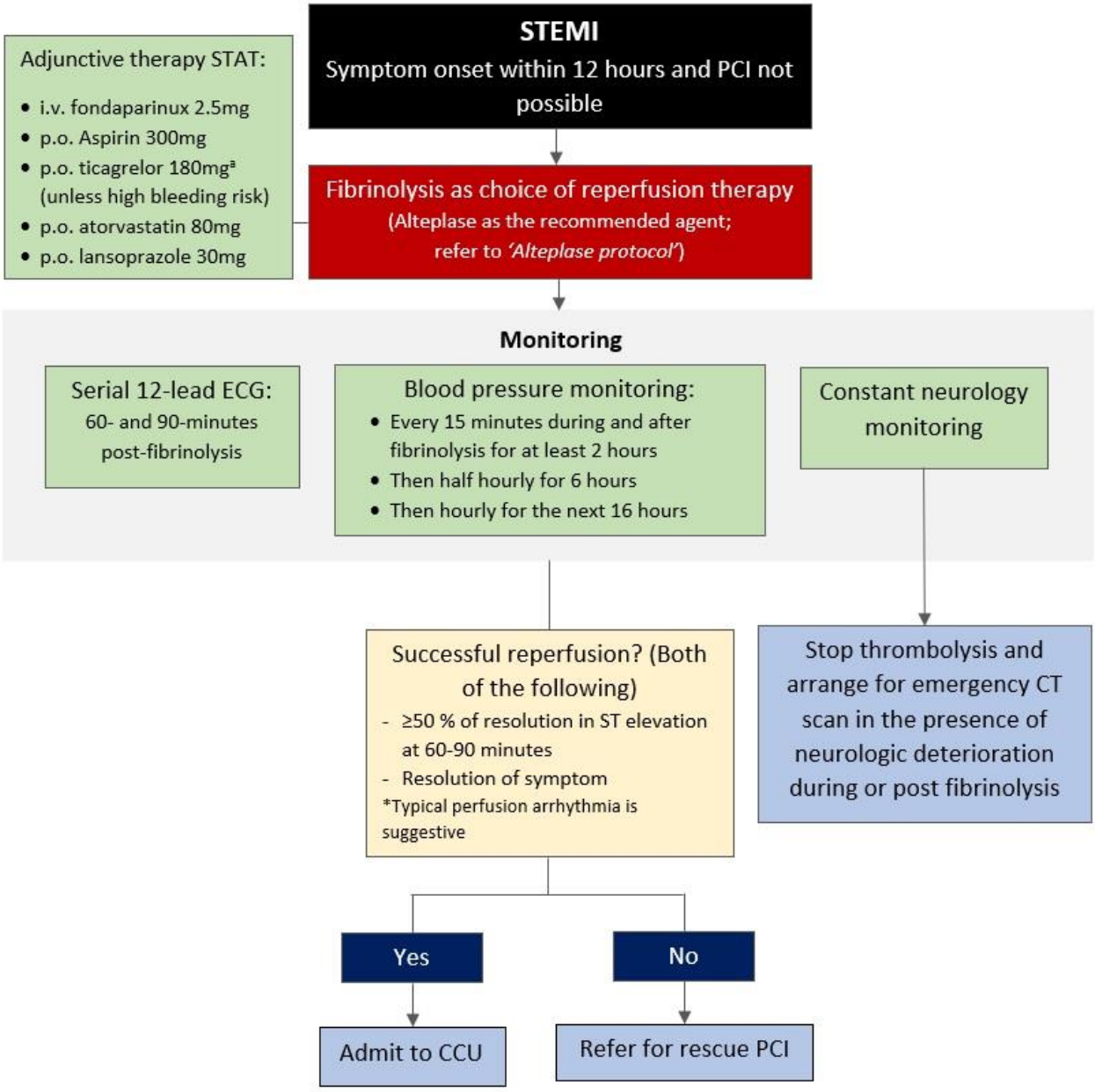

Figure 7. *Fibrinolysis pathway.*
CCU, coronary care unit; CT, computed tomography; ECG, electrocardiogram; PCI, percutaneous coronary intervention.
[a]Consider clopidogrel with aspirin, or aspirin alone, for high bleeding risk

Alteplase (recombinant plasminogen activator, rt-PA) Protocol:

Reconstitution:
Reconstitute two 50mg vials; each with 50mL Water for injections (giving a 1mg in 1mL solution).

Administration:
90-minute (accelerated) regimen:

Step 1: *Slow i.v. injection:*
Give 15mg (15mL) by slow i.v. injection over 3 to 5 minutes.

Step 2: *Intermittent infusion via syringe pump:*
The remainder of the dose should be given as follows:

Patient body weight ≥65kg:
50mg (50mL) over 30 minutes, followed immediately by
35mg (35mL) over 60 minutes

Patient body weight <65kg (refer to 'Alteplase dosing table' below):
0.75mL/kg over 30 minutes, followed immediately by
0.5mL/kg over 60 minutes

Alteplase dosing table (1 mg/mL following reconstitution):

Patient weight	Step 1 Slow i.v. injection	Step 2 30 minutes infusion	Step 3 60 minutes infusion
40kg	15mL	30mL (60mL/hr)	20mL (20mL/hr)
45kg	15mL	34mL (64mL/hr)	23mL (23mL/hr)
50kg	15mL	38mL (76mL/hr)	25mL (25mL/hr)
55kg	15mL	41mL (82mL/hr)	28mL (28mL/hr)
60kg	15mL	45mL (90mL/hr)	30mL (30mL/hr)
≥65kg	15mL	50mL (100mL/hr)	35mL (35mL/hr)

Adjunctive therapy:

i.v. fondaparinux 2.5mg stat followed by **s.c.** fondaparinux 2.5mg o.d. 24 hours later

Appendix 2: Consideration of Anti-platelets

Consideration regarding Ticagrelor:

- Contraindicated with strong CYP3A4 inhibitors (e.g. ketoconazole, clarithromycin, nefazodone, ritonavir, atazanavir).
- Should be avoided due to reduction in efficacy with strong CYP3A4 enzyme inducers (e.g. rifampicin, dexamethasone, phenytoin, carbamazepine, phenobarbital).
- May not be tolerated due to side effects/adverse reactions (e.g., unexpected bradycardia, dyspnea).
- A possible concern with patients' compliance with its twice-daily dosing (if so consider once-daily alternatives such as Prasugrel or Clopidogrel).

Consideration regarding Prasugrel:

- Contraindicated in previous stroke/transient ischaemic attack
- Avoid in patients already taking oral anticoagulant
- Use with caution in patients aged ≥75 years and with high bleeding risk
- Particularly considered in diabetics
- For treatment of acute stent thrombosis on Clopidogrel

Clopidogrel:

- To be used as part of dual antiplatelet therapy with aspirin if they are already taking an oral anticoagulant.
- To consider for patients: aged ≥75 years, with a high clinical risk of upper gastrointestinal bleeding, weight <60kg

Appendix 3: Cardiac Rehabilitation & Secondary Prevention

Offer all ACS patients the following before discharge:

- **Transthoracic echocardiogram** to assess left ventricular function and to identify other structural complications post ACS and mural thrombus.
- **Nicotine replacement therapy** with smoking cessation advice for patients who are active smokers.
- Other lifestyle advice:
    - **Diet**: Mediterranean diet
    - **Alcohol**: Low-risk drinking (<14 units per week)
    - **Regular physical exercise**: 20-30 minutes a day (gradual increment of duration and intensity)

Cardiac Rehabilitation (refer to primary care service):

- Physical activity: adapted to clinical condition and ability
- Lifestyle advice: advice on driving, flying and sex
- Stress management
- Health education

Drug therapy:

- **Dual anti-platelet therapy**: aspirin (unless contraindicated) + a second anti-platelet for up to 12 months and to continue aspirin for life.
- **Statin**: to intensify statin therapy during admission
- **Angiotensin-converting enzyme inhibitor (ACE-i)/Angiotensin II receptor blocker (ARB)**: titrate every 12-24 hours over 4 to 6 weeks with monitoring of renal function, electrolytes and blood pressure; and continue indefinitely
- **Beta-blockers**: titrate to a maximum tolerated dose and continue for at least 12 months or indefinitely for patients with reduced left ventricular ejection fraction. (To consider **ivabradine** if beta-blocker is contraindicated)
- **Aldosterone antagonist** for heart failure with reduced ejection fraction: start 3 to 4 days post-MI, preferably after ACE-i/ARB, with renal function and serum potassium level monitoring.