

HEMS Nottingham City Hospital PPCI Admission SOP

Introduction

ST elevation myocardial infarction is defined as presentation with clinical symptoms consistent with acute coronary syndrome (generally of ≥ 20 minutes duration) with persistent (> 20 minutes) ECG features in ≥ 2 contiguous leads of:¹

- Chest leads V2-3
 - o ≥ 2.5 mm (i.e. ≥ 2.5 small squares) ST elevation in men under 40 years
 - o ≥ 2.0 mm (i.e. ≥ 2 small squares) ST elevation in men over 40 years
 - o ≥ 1.5 mm ST elevation in women
- ≥ 1 mm ST elevation in other leads
- New LBBB (LBBB should be considered new unless there is evidence otherwise)

Patients with clinical and ECG evidence of STEMI should be considered a potential candidate for primary percutaneous coronary intervention (PPCI). In Nottingham, PPCI is offered by City Hospital Trent Cardiac Centre, and patients should be taken directly for PPCI rather than taken to the Emergency Department (ED) as this will result in undue delay PPCI. NICE guidance makes the following recommendations regarding PPCI:²

- 1.1.1: Immediately assess eligibility for coronary reperfusion therapy (either primary percutaneous coronary intervention [PCI] or fibrinolysis) in people with STEMI
- 1.1.2: Do not use level of consciousness after cardiac arrest caused by suspected acute STEMI to determine whether a person is eligible for coronary angiography
- 1.1.3: Deliver coronary reperfusion therapy (either primary PCI or fibrinolysis) as quickly as possible for eligible people with acute STEMI
- 1.1.4: Offer coronary angiography, with follow-on primary PCI if indicated, as the preferred coronary reperfusion strategy for people with acute STEMI if:
 - o Presentation is within 12 hours of onset of symptoms **and**
 - o Primary PCI can be delivered within 120 minutes of the time when fibrinolysis could have been given.

- 1.1.5: Offer fibrinolysis to people with acute STEMI presenting within 12 hours of onset of symptoms if primary PCI cannot be delivered within 120 minutes of the time when fibrinolysis could have been given

Patients with clinical and ECG evidence of STEMI following cardiac arrest with a return of spontaneous circulation (ROSC) should therefore be considered potential candidates for PPCI. However, anaesthetic cover at Nottingham City Hospital (NCH) is limited, and the resuscitation of comatose and cardiovascularly unstable patients at the Trent Cardiac Centre is resource limited. Specific guidance has been agreed between TAAS, LNAA and Nottingham University Hospitals NHS Trust. Patients with haemodynamically compromising bradycardia requiring emergent temporary pacing wire insertion should also be conveyed directly to NCH Trent Cardiac Centre.

The COACT trial has demonstrated that immediate PPCI following cardiac arrest without STEMI does not improve survival and that delayed PPCI is appropriate.^{3,4} As such, patients who sustain an out of hospital cardiac arrest with return of spontaneous circulation, without ECG evidence of STEMI, should be taken directly to QMC ED.

The MIRACLE₂ Risk Score⁵ (Appendix 1) is a clinical decision-making tool for predicting neurologic outcomes in out of hospital cardiac arrest. A MIRACLE₂ score of >4 is at high risk of poor neurological outcome and can be used to risk stratify patients to either ED or direct to PPCI if not co-located.

Guidance

The referral process for conscious patients with clinical and ECG evidence of ST elevation myocardial infarction has not changed, and they should be referred directly to the PPCI team at Nottingham City Hospital. Patients with symptomatic bradycardia or who have had an out of hospital cardiac arrest with return of spontaneous circulation should be considered for immediate PPCI if the following criteria are met:

Inclusion Criteria^{6,7}

Primary Percutaneous Coronary Intervention:

- ECG features of STEMI
- Definitive airway (endotracheal tube)
- Relative haemodynamic stability
 - Sustained ROSC >15 minutes
 - SBP >100mmHg or MAP >80mmHg
 - Minimal vasopressor/inotrope use post ROSC (over 10 minutes)
 - <300mcg Adrenaline
 - <3mg Metaraminol
 - Sinus rhythm or rate controlled atrial fibrillation (<120/min)

Temporary Pacing Wire Insertion:

- ECG Criteria:
 - Bradycardia <40bpm, or
 - Complete heart block, or
 - Ventricular pauses >3s
- Cardiovascular compromise: syncope, shock, ischaemia, heart failure

Exclusion Criteria

- Associated traumatic injuries
- Possible neurological aetiology for cardiac arrest (ICH or SAH)
- Suspected non-cardiac aetiology (i.e. asphyxiation, overdose, hypothermia)
- Any cardiac arrest or haemodynamic instability following ROSC
- MIRACLE₂ Score >4

Intubated patients who are deemed to meet the above inclusion criteria should be referred directly to the PPCI team at NCH via conference call through EMAS control to QMC switchboard. If there is any diagnostic uncertainty by the pre-hospital team, the ECG can be shared via the FastECG application on the duty phone, and the case should be discussed with the on-call cardiology consultant. The on-call cardiologist may request a MIRACLE-2 score (Appendix 1) for prognostication, and their decision for PPCI is final. Should a referral be declined, the patient should be transferred to QMC ED.

Following successful referral to NCH, the PPCI nurse specialist will activate the PPCI/pacing team and inform the resident anaesthetist at NCH. It is essential the pre-hospital team communicates to the cardiology nurse specialist that the patient is intubated and ventilated and requires anaesthetic support on arrival.

It is the pre-hospital team's responsibility to remain with the patient until the resident anaesthetist has arrived to take over care. This may require the on-call non-resident anaesthetic consultant to attend from home and EMAS control should not re-task the pre-hospital team until this handover has occurred. If the anaesthetic consultant is required to attend from home because the resident anaesthetist is otherwise unavailable, this is the responsibility of the anaesthetic team to arrange.

The conveying pre-hospital team will pit-stop in the resuscitation bay outside of the PPCI room, to support any ongoing resuscitation and to handover to the resident anaesthetic/ICU doctor. The PPCI will not be commenced until this handover has happened, and the receiving anaesthetic/ICU doctor are happy to proceed.

Due to the limited resuscitation facilities at NCH Trent Cardiac Centre, any patient who deteriorates en route should be diverted to QMC ED. The pre-hospital team will update the cardiology team at NCH should this occur. If a patient deteriorates on arrival to NCH, prior to handover to the resident anaesthetist, this should be incident reported for internal case review.

If on arrival to NCH, the cardiology team do not feel the patient has a STEMI amenable to PPCI and warrants an urgent CT head, the pre-hospital team may be asked to facilitate onwards conveyance to QMC Nottingham Emergency Department. Alternatively, it may be decided to admit the patient directly to ICU at NCH. In this eventuality, the patient will be handed over to the anaesthetic team for transfer and handover to ICU.

Contact Numbers

- EMAS Referral Line: 01159675090
- QMC Switchboard: 01159249924
- PPCI Nurse Specialist (NCH): 01159934995
- Resident Anaesthetist (NCH): 07812275072

References

1. Thygesen K, Alpert JS, Jaffe AS, Chaitman BR, Bax JJ, Morrow DA, et al. Fourth universal definition of myocardial infarction (2018). Eur Heart J. 2019 Jan 14;40(3):237–69.
2. Recommendations | Myocardial infarction with ST-segment elevation: acute management | Guidance | NICE [Internet]. [cited 2019 Oct 22]. Available: <https://www.nice.org.uk/guidance>
3. Lemkes JS, Janssens GN, van der Hoeven NW, Jewbali LSD, Dubois EA, Meuwissen M, et al. Coronary Angiography after Cardiac Arrest without ST-Segment Elevation. N Engl J Med. 2019 Apr 11;380(15):1397–407.
4. Abella BS, Gaieski DF. Coronary Angiography after Cardiac Arrest - The Right Timing or the Right Patients? N Engl J Med. 2019 11;380(15):1474–5.
5. Pareek N, Kordis P, Beckley-Hoelscher N, Pimenta D, Kocjancic ST, Jazbec A, et al. A practical risk score for early prediction of neurological outcome after out-of-hospital cardiac arrest: MIRACLE2. Eur Heart J. 2020 Dec 14;41(47):4508–17.

6. Nottingham University Hospitals NHS Trust PPCI STEMI Guidelines (2019): PPCI Referral Pathway via East Midlands Ambulance Service.
7. Nottingham University Hospitals NHS Trust Emergency Pacing Pathway (2021).

Appendix 1: MIRACLE₂ Risk Score

