



**Arkansas STEMI Systems of Care
Best Practice and Operations Manual
for
EMS, Non-PCI and PCI Hospitals**



Version 1.0 July 2018

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INTRODUCTION

Across the United States, hospitals and emergency medical systems are organizing coordinated regional plans for ST-Elevation Myocardial Infarction (STEMI) diagnosis and rapid reperfusion. Arkansas volunteer stakeholders from EMS agencies, Inter-facility Transport Agencies, NPCI-Referral and PCI-Receiving hospitals, and other coalitions, such as, STEMI Advisory Council (STAC), American Heart Association (AHA), Arkansas Hospital Association (AHA), and the Heart Disease and Stroke Prevention Coalition are collaborating to decrease death and disability from ST-elevation myocardial infarction.

Project Overview

KEY PROCESS OBJECTIVES:

1. **Markedly accelerate the development of regional systems** to diagnose, treat, and deliver follow-up care for patients with acute myocardial infarction. Regional systems will be composed of all hospitals and emergency medical service providers within a geographic region following agreed-upon diagnostic and treatment protocols and supported by ongoing data collection and feedback. Building upon established national guidelines and building a local consensus, these networks will help facilitate effective delivery of emergency cardiac care in a timely, coordinated and consistent manner.
2. **Bring together leading health care providers and institutions** in a collaborative fashion facilitated by professional organizations, national experts in regional system organization, key local thought leaders in cardiology and emergency medicine, and leading emergency cardiac care businesses.
3. **Identify and establish regional leadership** in emergency cardiac care that includes key physicians and administrators in hospitals, emergency medicine, and cardiology.

SPECIFIC OBJECTIVES:

1. **Increase the rate and speed of reperfusion**, specifically from the time the STEMI patient accesses the health care system, be it via EMS or self-presentation to the emergency department, to reperfusion (preference for primary PCI; fibrinolysis when time goals for primary PCI cannot be met).
2. **Establish a predetermined plan for STEMI identification, acute treatment, and timely disposition to the most appropriate hospital**, regardless of where the STEMI patient enters the system.

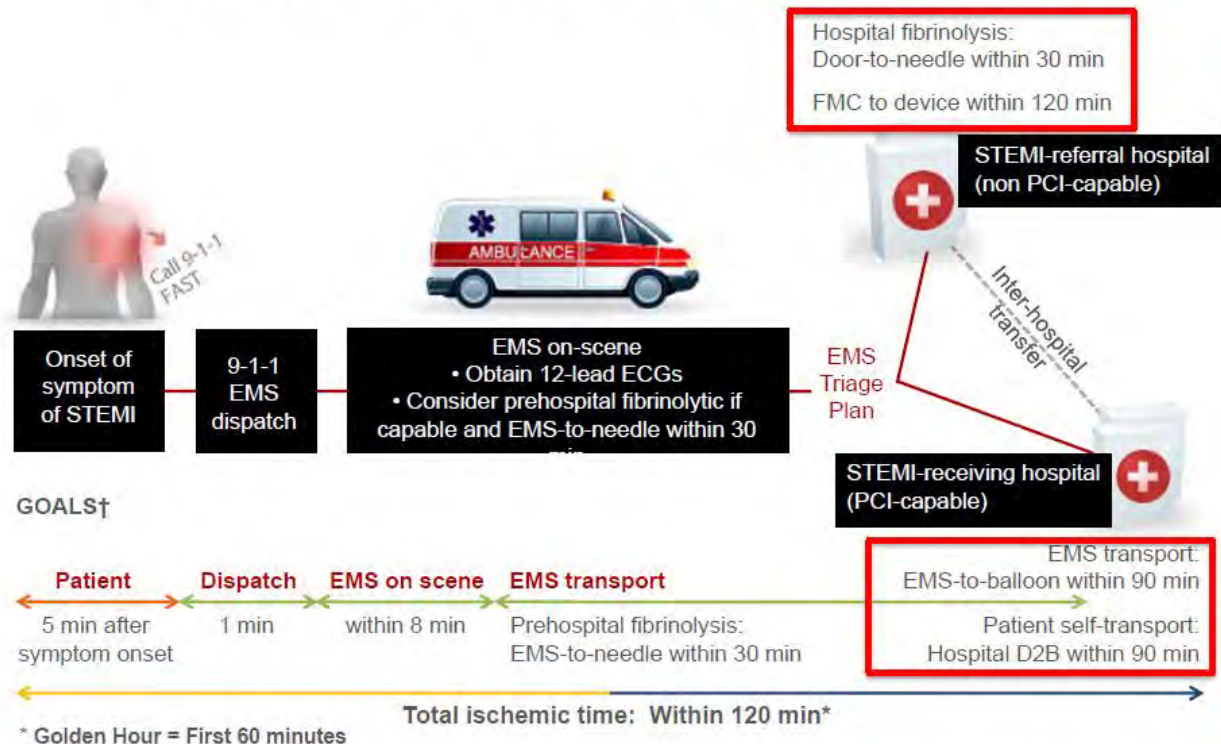
Project Overview-continued

3. **Empower EMS and NPCI-Referral hospital emergency departments to determine the best reperfusion plan and most appropriate destination protocol**, using pre-hospital ECG and telephone support by PCI hospitals.
4. **Improve pre-hospital and hospital care of high-risk STEMI patients** according to guideline-directed, evidence-based medicine.
5. **Perform a baseline assessment** to create an ideal plan for system improvements, and implement these improvements through ongoing data assessment and feedback on a quarterly basis.

A Changing Landscape for Reperfusion Times and Processes: Angiography and Interventions Guidelines for Percutaneous Coronary Intervention

According to the 2015 ACC/AHA STEMI guidelines, STEMI patients presenting to NPCI-Referral hospitals should proceed with inter-hospital transfer to PCI-Receiving hospitals if the First Medical Contact to Balloon time is expected to be ≤ 120 minutes. STEMI patients presenting directly to a PCI-Receiving hospital, the guidelines call for reperfusion within 90 minutes of first medical contact. These guidelines reflect a collective recognition that timely primary PCI is the preferred reperfusion strategy for STEMI. This manual aims to provide specific strategic and tactical guidance on how to design and implement successful regional systems, particularly in the context of the new guidelines.

STEMI Point of Entry Protocol

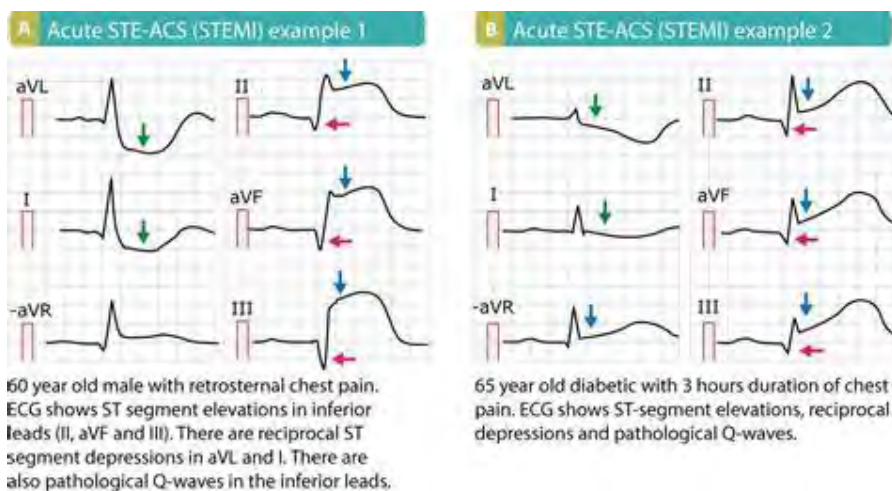


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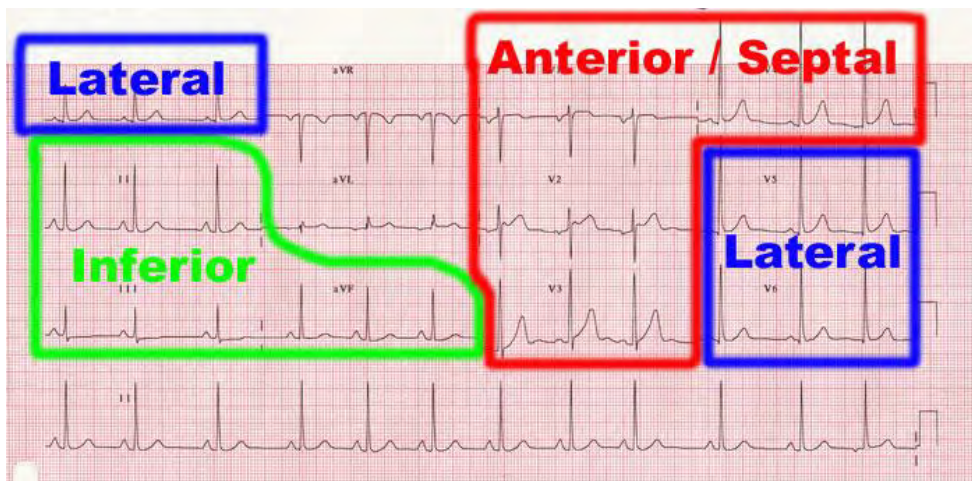
STEMI Criteria

ST Elevation-Myocardial Infarction (STEMI) is diagnosed by the presence of both:

1. ECG criteria of 1 mm ST-elevation in 2 or more contiguous leads.
2. Cardiac symptoms are greater than 15 minutes and less than 12 hours.



- ST segment elevation
- Pathological Q-waves
- Reciprocal ST-segment depression



STEMI SYSTEMS OF CARE (EMS, NPCI, & PCI)

BASIC RECOMMENDATIONS

Each system should have the following:

- A recognized STEMI coordinator, physician champion and EMS Medical Director.
- An administration that is committed to the facility's reperfusion strategy of first choice primary PCI or strategies other than primary PCI for optimal STEMI care, as well as, providing the necessary resources to establish a successful system of care. This commitment should be demonstrated by a written document signed by facility leadership.
- Monthly PCI Receiving hospital Chest Pain Committee meetings consisting of an established multidisciplinary STEMI team composed of the following representatives: Administration, Physician Champions, Cardiology, ED Physician Leads, Quality Assurance staff, Cardiac Cath Lab Nurses, ED Nurses, Clinical Nurse Educators, ICU Nurses, Laboratory, NPCI and EMS medical staff involved in the care of acute myocardial infarctions.
- Conduct monthly team meetings to review and revise the system. Use "improvement science" to increase the quality of care (i.e. process mapping, team organization, multidisciplinary teamwork, cause analysis, report cards, measures of dispersion, continuous quality improvement, and data collection, measurement, and feedback). Operational issues should be reviewed, problems identified and solutions implemented.
- Appoint a PCI STEMI Coordinator to provide STEMI Feedback Communication Forms within 48 hours of primary PCIs outlining performance measures located on pages 33-34 and including the following: catheterization results, false and missed STEMI activations, deaths in transfer and systematic delays. These should be shared with the hospital's multidisciplinary team.
- Participate in a regional or national myocardial infarction registry.

Systems of Care- continued

- Each STEMI System should include a process for pre-hospital identification and activation, destination protocols to PCI center and transfer for patients who arrive at NPCI centers who are primary PCI candidates and/or are fibrinolytic ineligible and/or in cardiogenic shock.
- Collaborate and develop a flowchart of the process that demonstrates decisions regarding mode of transport based on a reperfusion strategy, geography and distance and should include a preferred and backup transport modality.
- Share a fibrinolytic protocol according to the ACC/AHA and local guidelines.
- When possible, minimize or avoid continuous IV infusions such as nitroglycerin or heparin. Bolus dosing is more simple and faster.
- All clocks should be synchronized in all areas that care for the ACS patient is performed, including ECG machine(s), ED, CCL, NPCI-Referral hospitals and EMS. Use **COMPUTER** times only when documenting. **DO NOT** go by the clocks on the wall or your watch.
- Collaborate mock STEMI drills to PCI-Receiving hospital.
- Provide ongoing training and assessment of the system.
- PCI-Receiving hospitals should establish a dedicated fax machine for receiving medical records from NPCI-Referral hospitals.
- PCI-Receiving hospitals should collaborate with EMS and NPCI-Referral hospitals to receive 12-lead ECG transmissions 24 hours per day/ 7 days a week.
- PCI-Receiving hospitals should educate EMS on STEMI bypass protocols for both NPCI-Referral and PCI-Receiving capable hospitals.
- Encourage prompt data feedback immediately after procedures, including a call by the interventional cardiologist to the referring ED physician and EMT/ Paramedic.
- Demonstrate a commitment to improve STEMI care for all hospitals regardless of affiliation.

EMS: DISPATCH

BASIC RECOMMENDATIONS

- Establish a STEMI Plan: Coordinate a regional plan focused on providing timely EMS response and transfer in collaboration with all hospitals and emergency medical systems in the region. The plan should require early notification from the field to receiving hospitals for all STEMI patients, including communication with a physician capable of activating a reperfusion plan. EMS should consider transport to the most appropriate facility for optimum patient care for their current condition.
- Train 911 operators to recognize acute cardiac symptoms and dispatch appropriate EMS resources with the ability to perform 12-Lead ECG.
- Instruct patient to take Aspirin per protocol.
- Target total scene time ≤ 10 minutes from EMS arrival to departure (including ECG acquisition).
- Empower EMS units identifying STEMI patients to bypass the closest NPCI-Referral hospital and go directly to a primary PCI capable hospital, if:

1. First medical contact to device deployment can be achieved within 90 minutes

AND/OR

2. Reperfusion checklist shows contraindication to fibrinolysis

EMS Initial Contact: Basic, Advanced, Paramedic

BASIC RECOMMENDATIONS

- Know your geographical area for transport.
- Empower EMS units identifying STEMI patients to bypass the closest non-PCI hospital and go directly to a primary PCI capable hospital, if:
 - 1. First medical contact to device deployment can be achieved within 90 minutes**
 - AND/OR**
 - 2. Reperfusion checklist shows contraindication to fibrinolysis** (See page 14, Appendix B)
- Document symptom onset date, time and description.
- Goal for scene time of ≤ 10 minutes or less.
- Keep patient on ambulance stretcher for STEMI evaluation in hospitals that routinely transfer by the same ambulance.

12-LEAD ECG

- PCI-Receiving hospitals should collaborate with EMS to receive 12-lead ECG transmission 24 hours per day/ 7 days a week. EMS should transmit 12-lead ECGs if technically feasible, reliable and if a system exists for immediate ECG interpretation by a physician. This is helpful for ECGs that have an uncertain EMS interpretation.
- STEMI alert is activated from the field as a direct result of EMS personnel's ability to read and transmit a 12-lead ECG.
- Obtain ECG on all patients with ACS signs and symptoms. See ECG Acquisition, page 32.
- Obtain prehospital ECG. First Medical Contact (FMC) to ECG ≤ 5 minutes.
- First positive ECG to STEMI alert ≤ 5 minutes.

MEDICATIONS/ TREATMENTS

Aspirin

- Administer non-enteric coated Aspirin 162mg to 325mg PO, chewed, to patients with no history of aspirin allergy and without signs of active or recent gastrointestinal bleeding.

Oxygen

- Maintain oxygen saturation > 90% with the lowest concentration of supplemental oxygen possible.

Nitroglycerin- (After 12-lead ECG is obtained)

- Administer 3 nitroglycerin (tablets or spray) at intervals of 3 to 5 minutes, if the patient is still symptomatic. Monitor for hypotension.
- Nitrates in all forms are contraindicated in patients:
 - SBP < 90 mmHg
 - Extreme caution advised in patients with known inferior wall STEMI and suspected right ventricular (RV) involvement. These patients require adequate RV preload. A right-sided ECG should be performed to evaluate the RV infarction.
 - Patients taking phosphodiesterase-5 (PDE-5), Sildenafil (Viagra, Revatio) or Vardenafil (Levitra) in past 24 hours or Tadalafil (Cialis) in the past 36 hours due to potential severe hypotension.

Narcotics

- Morphine or Fentanyl IV PRN for chest pain unrelieved by NTG.

IV Fluids

- Per protocol.
- Two IV's if possible, with **left** arm preference. Do **NOT** delay transport for a second IV.

Vital Signs

- Monitor for hypotension and respiratory depression after administration of NTG, narcotics and anti-hypertensive agent.

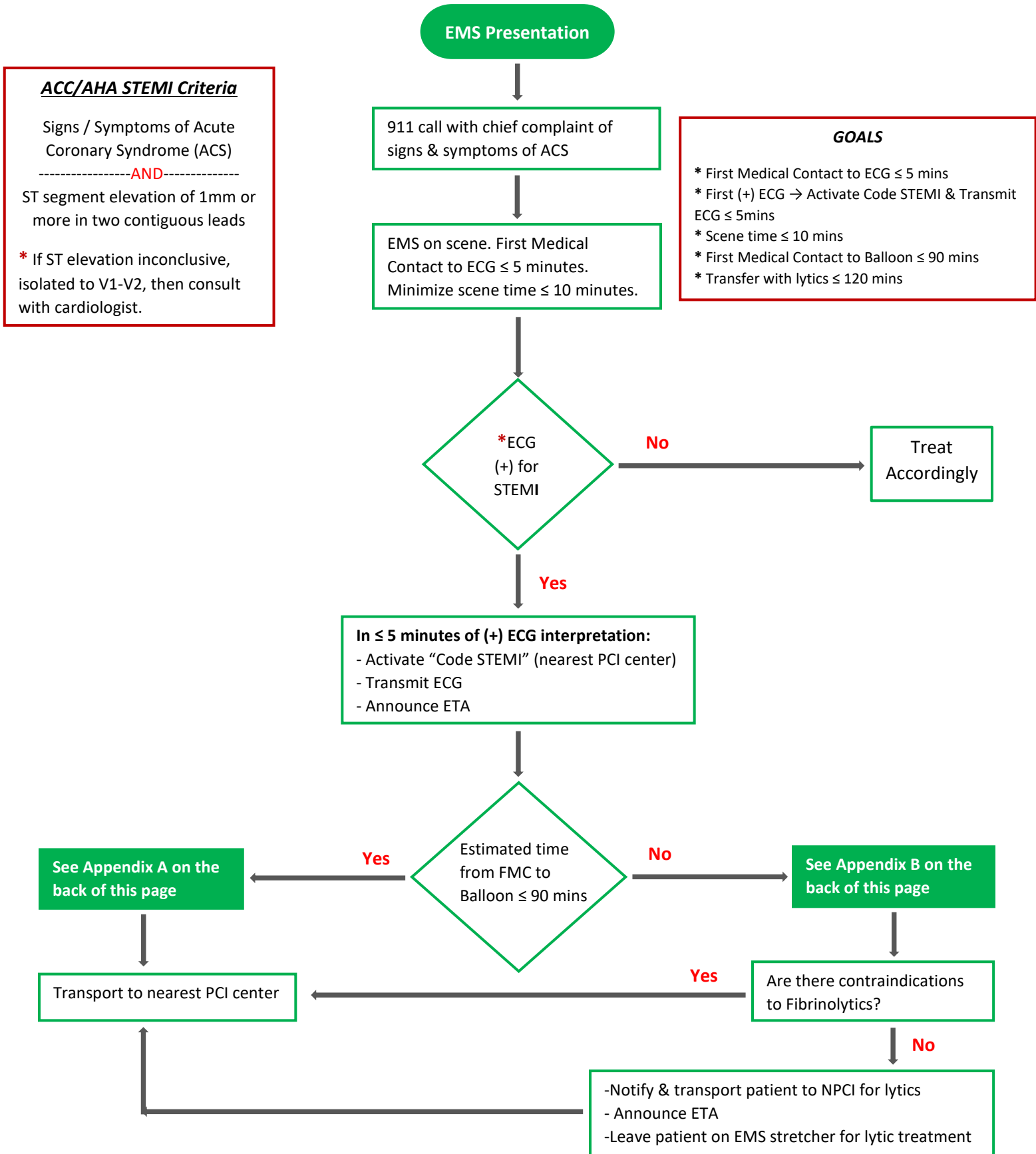
REPERFUSION

- Review the reperfusion checklist for potential contraindications to fibrinolysis in situations where a patient may be taken to a NPCI-Referral hospital that uses fibrinolytic therapy. See EMS Point of Entry, page 13-14.
- If lytics are administered at NPCI-Referral hospital, perform 12-lead ECG during transport to assess for reperfusion indicators, i.e. no ST-elevation. If ST remains elevated, notify PCI-Receiving hospital immediately.
- If the patient is fibrinolytic ineligible, EMS should divert to a primary PCI-capable receiving hospital.

ARRIVAL and DEPARTURE FROM HOSPITAL

- For patient transport from NPCI-Referral hospital to PCI-Receiving hospital, minimize “Load and Go” to ≤ 10 minutes.
- Make EMS run sheets immediately available to PCI-Receiving hospital before departure. Suggestions for making EMS data available:
 - Allow adequate time for EMS crews to complete run sheets before hospital departure
 - Provide paper or electronic format that is readily accessible to hospital personnel
 - Give hospital Quality staff access to electronic EMS records
 - Link EMS data to hospital data in electronic format
 - Send EMS records to hospital Quality staff within 24 hours
- Provide copies of all ECG’s that include acquisition time at the PCI-Receiving hospital.

EMS: STEMI POINT OF ENTRY



ACC/AHA STEMI Criteria

Signs / Symptoms of Acute Coronary Syndrome (ACS)

-----AND-----

ST segment elevation of 1mm or more in two contiguous leads

* If ST elevation inconclusive, isolated to V1-V2, then consult with cardiologist.

GOALS

- * First Medical Contact to ECG ≤ 5 mins
- * First (+) ECG → Activate Code STEMI & Transmit ECG ≤ 5mins
- * Scene time ≤ 10 mins
- * First Medical Contact to Balloon ≤ 90 mins
- * Transfer with lytics ≤ 120 mins

Appendix A

Patient Priorities Prior to or During Transport

DO NOT DELAY TRANSPORT

- Oxygen- titrate to maintain O2 Sat between 94-99%
- Establish saline lock- large bore, (AC preferred, avoid hand)
- Chewable Aspirin PO: Adult 325mg; Baby 324mg
- Heparin 60 units/kg IV, max dose is 4,000 units (if available)
- Cardiac Monitor – attach d-fib pads
- Obtain vital signs and pain scale

Patient Care when time allows

DO NOT DELAY TRANSPORT

- Transmit ECG to nearest PCI Receiving center
- Establish 2nd saline lock – large bore, (avoid hand)
- Nitroglycerin 0.4mg SL every 5 min (max 3 doses) until pain subsides & SBP remains > 100 (Caution with Inferior MI)
- Morphine or Fentanyl IV PRN for chest pain unrelieved by NTG

*Appendix B

Fibrinolytic Checklist:

Must be completed prior to administration. If any below are “yes”, fibrinolysis may be contraindicated. Contact receiving physician for guidance.

Absolute Contraindications

- Yes No: Any prior intracranial hemorrhage
- Yes No: Known structural cerebral vascular lesion (ie: arteriovenous malformation)
- Yes No: Allergy to thrombolytics
- Yes No: Ischemic stroke < 3 months
- Yes No: Known malignant intracranial neoplasm
- Yes No: Suspected aortic dissection
- Yes No: Active bleeding or bleeding diathesis (excluding menses)
- Yes No: Significant closed-head or facial trauma < 3 months
- Yes No: Severe uncontrolled hypertension (unresponsive to emergency therapy)
- Yes No: Intracranial or intraspinal surgery within 2 months
- Yes No: For streptokinase, prior treatment within the previous 6 months

Relative Contraindications

- Yes No: History of chronic, severe, poorly controlled hypertension
- Yes No: Significant HTN on presentation (SBP >180mmHg or DBP > 110mmHg)
- Yes No: History of prior ischemic stroke > 3 months
- Yes No: Dementia
- Yes No: Known intracranial pathology not covered in absolute contraindications
- Yes No: Traumatic or prolonged CPR > 10 minutes
- Yes No: Recent internal bleeding (<4 weeks)
- Yes No: Major surgery < 3 weeks
- Yes No: Noncompressible vascular punctures
- Yes No: Pregnancy
- Yes No: Active peptic ulcer
- Yes No: Oral anticoagulant therapy

* Viewed as advisory for clinical decision making and may not be all-inclusive or definitive.

O’Gara, P.T. et al (2013). 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction. *Circulation*, 2013;127: e362-e425.
Doi: <https://doi.org/10.1161/CIR.0b013e3182742c84>

EMS Inter-Facility Transfer: Basic, Advanced, Paramedic

BASIC RECOMMENDATIONS

- Hospitals should assign a priority to STEMI patient transfers and process these transfers as 911 calls or trauma patients to meet the goal of 120 minutes.
- Use a local, paramedic-staffed EMS ground ambulance to transport hemodynamically stable STEMI patients when:
 - Ambulance is available
 - Drive time to destination hospital is less than 45 minutes
- Patients should remain on the EMS stretcher with EMS in attendance until a transfer decision is made.
- Transport directly to CCL when the laboratory is staffed and available.
- Transfer protocol should focus on rapid transport to CCL, rather than on pain relief with medications.
- When transporting a patient treated with fibrinolysis who has continued chest pain and/or < 50% ST resolution after 60 to 90 minutes from the initiation of fibrinolysis, notify the receiving hospital about the potential need for rescue PCI.
- Fax hospital records to the PCI-Receiving hospital dedicated fax machine so as not to delay patient pickup.
- Complete the EMTALA/COBRA/medical necessity of transfer form as soon as the decision to transfer is made.
- Advanced life support units serving a hospital should be willing to transfer the patient to any available PCI-Receiving hospital in cases where another transport option is not immediately available.

EMS Diversion from Non-PCI to PCI Hospital

- Develop diversion plans in collaboration with local EMS, medical, and hospital leadership.
- Consider EMS diversion from an NPCI-Referral hospital to a PCI-Receiving hospital in two circumstances:
 - 1. Diversion for primary PCI**
 - The EMS unit can diagnose a STEMI, directly activate an interventional cardiac catheterization facility, and achieve a first medical contact to device deployment time within 90 minutes on a consistent basis.
 - 2. Fibrinolytic ineligible**
 - The EMS unit can diagnose a STEMI, directly activate an interventional cardiac catheterization facility, and the patient is ineligible for fibrinolysis according to the reperfusion checklist.

EMS Air Medical Transport

BASIC RECOMMENDATIONS

- Helicopter transport may be suitable to meet the goal of First Medical Contact to Balloon of ≤ 90 minutes.
- Helicopter transport is also suitable for transporting hemodynamically unstable patients.
- For the transport of hemodynamically stable patients with travel times, local EMS ambulance staffed by paramedics is generally faster.
- Deployment of helicopter transport can be done by one of four strategies:
 1. As the primary method of inter-hospital transfer for primary PCI.
 2. As a reserve method of inter-hospital transfer when local EMS is not available.
 3. As a reserve method of inter-hospital transfer when patients are fibrinolytic ineligible, fail to reperfuse after fibrinolysis, or are hemodynamically unstable.
 4. As a primary method of transport from a STEMI medical scene or designated helicopter landing zone when ground transport is not feasible or too long.
- Hospitals and ground Emergency Medical Systems that rely on helicopter transport must have a suitable backup plan in place when helicopter transport is not available. Backup plans may include mutual aid agreements with other air medical services, ground transportation, and/or diversion to a closer hospital. If First Medical Contact to Balloon cannot be achieved within 120 minutes using alternate transportation modalities, then fibrinolysis should be considered.
- STEMI patients transported from the field to a helicopter landing zone adjacent to a hospital do not require medical evaluation by that hospital unless deemed necessary by the EMS crew.

Air Medical Transport- continued

- When helicopter transport to PCI center is the primary strategy, referring hospital should designate a landing zone as close to its emergency department as possible. Remote landing zones should generally be avoided.
- Immediately activate helicopter transport during initial communication with the receiving hospital regarding the need for reperfusion.
- For hemodynamically stable patients, critical care nurses and paramedics should minimize time on the ground with an overall goal of 10-minute package and load time.
- When the cath lab has adequate staff, patients should be transported directly to the cath lab. Stop in the PCI-Receiving hospital's Emergency Department only if the cath lab staff has not arrived.
- When transporting a patient treated with fibrinolysis who has continued chest pain and/or less than 50% ST resolution 60- 90 minutes after the initiation of fibrinolysis, notify the receiving hospital about the potential need for rescue PCI.
- Air medical services should establish mutual aid policies with neighboring services for STEMI patients that include transport of patients to the closest interventional cardiac catheterization facility upon request.
- For emergency medical services that use air medical transport, institute protocols that include criteria for air medical activation, communication, helicopter landing zones, patient packaging, alternate transportation plans, training and ongoing monitoring and feedback.

Air Medical Policies

- Air medical helicopter may be activated for STEMI requiring transport to an interventional cardiac cath lab facility in the following situations:
 - Air medical transport is part of the established EMS protocol for STEMI, and First Medical Contact to Balloon can be achieved within 120 minutes.
 - Consider air medical only if saving significant time.

Air Medical Transport- continued

- Ground transport not available.
- Use of local ground ambulance leaves the local community with inadequate ambulance coverage.
- EMS units will directly communicate with and activate air medical transport and PCI-Receiving hospital. If direct communication is not possible, the dispatch center will relay communication.
- Information given to Air Medical/Interventional Hospital should include:
 - EMT name and EMS unit
 - Designation of patient as “Code STEMI” protocol
 - Type and duration of cardiac symptoms and location and height of ST-segment elevation on ECG
 - Demographics including height, weight, age, gender, date of birth
 - Vital signs (blood pressure, pulse, respiratory rate)
 - Major complications such as cardiac arrest or cardiogenic shock
 - Landing zone location
 - Estimated arrival time to the landing zone
 - How to contact the on scene EMS personnel and/or the landing zone officer
- Air medical helicopters should generally transport STEMI patients to closest PCI-Receiving hospital as defined by the EMS director. This should include 24/7 capability within 30 minutes of notification, interventional cardiologist present at the start of the procedure, single call activation, accept patients regardless of bed availability, on-site cardiac surgery, and ongoing data monitoring and feedback).

Air Medical Transport- continued

- If a helicopter is not immediately available, air medical dispatch will arrange air medical transport through an alternate provider.
- If air medical transport is not feasible due to weather, a protocol-established alternate method of ground transport will be activated.

Patient Packaging

- Oxygen
- Aspirin, if not already taken by the patient.
- Two IV's if possible, with left arm preference. Transport should NOT be delayed for a second IV.
- Remove as much clothing as possible.
- Advise air medical dispatch of the patient's actual or estimated weight.
- Defibrillator pads (if compatible with air medical defibrillator).
- Three to five ECG electrode patches.

NPCI-Referral Hospitals

BASIC RECOMMENDATIONS

- Establish a predetermined, institution-specific, written protocol for early recognition and rapid reperfusion, agreed upon by all PCI hospitals and ED physicians and staff that includes:

Registration

- The first point of contact upon entrance to the ED is always a nurse. If a 24/7 triage nurse is not the first point of contact in the ED, the employees who initially greet the patient have formal training in ACS signs and symptoms, including atypical, AND receive annual updates.
- Patient registration should be completed in a similar fashion as trauma patients with the ability to fast-track critical labs, such as, Troponin, Creatinine and PT/INR, minimize ED waiting time, and provide reperfusion or rapid transfer as soon as possible.

12-Lead ECG

- Specify system for rapid ECG acquisition including having ECG equipment in the ED and specifying a location that affords prompt access and adequate patient privacy. One ECG machine is to remain in the ED at all times.
- Door-to-ECG (D2ECG) with physician interpretation ≤ 10 minutes. Perform ECG on all patients presenting to ED with ACS signs and symptoms within 10 minutes, regardless of room or nurse availability.
- Obtain ECG on all patients with ACS signs and symptoms. See ECG Acquisition, page 32.
- Positive ECG to STEMI Alert ≤ 5 minutes.

Reperfusion

- ED physicians have the authority to initiate the reperfusion strategy according to local guidelines and care pathways.
- If there is a contraindication to fibrinolysis or if an uncertain diagnosis is present, then utilization of an expedited transfer plan to PCI Receiving hospital should be initiated.
- Fibrinolytic agent stored in the emergency department and the intensive care unit.
- Ability to reconstitute and administer fibrinolytic in the emergency department.

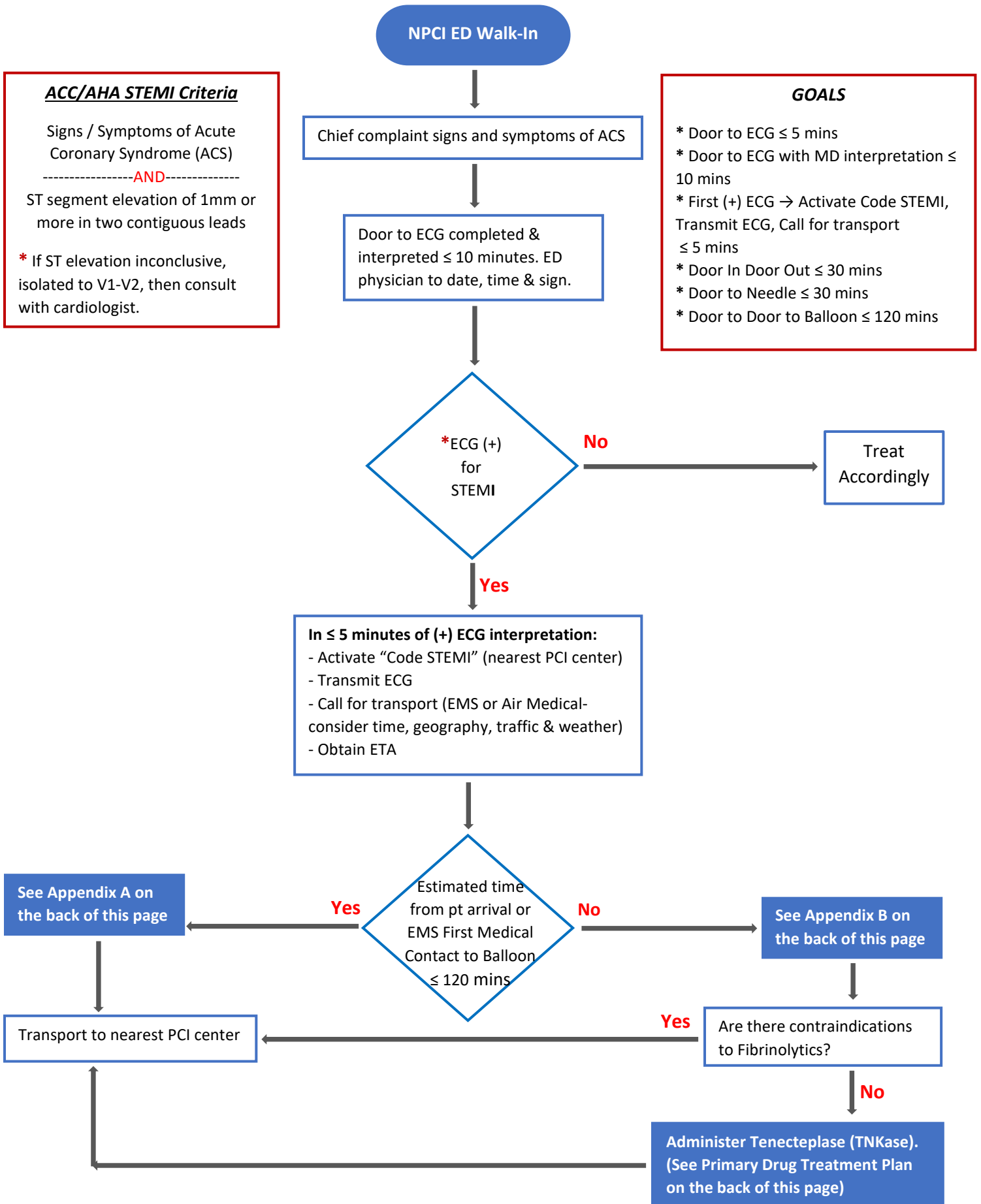
Departure

- Obtain EMS records and forward to the PCI-Receiving hospital.
- Arrange for transport of STEMI patient.

Goals

- Door-In Door-Out (DIDO) time of ≤ 30 minutes for hospitals with a predetermined plan for transfer for primary PCI and patient's ineligible for fibrinolysis or in cardiogenic shock.
- Door to Needle (D2N) time ≤ 30 minutes for hospitals with a predetermined plan for fibrinolysis. After fibrinolysis, NPCI-Referral hospitals should then aim to transfer patients to a PCI-Receiving hospital within 3-24 hours as part of a pharmaco-invasive approach to STEMI care.
- Aim to achieve EMS First Medical Contact (FMC) or First Facility Arrival to Balloon (D2D2B) ≤ 120 minutes, with or without lytics. While the updated ACC/AHA PCI guidelines allow for 120 minutes from First Facility Arrival to Balloon, 90 minutes should remain a systems goal.

NPCI: STEMI POINT OF ENTRY



Appendix A

Patient Priorities Prior to or During Transport

DO NOT DELAY TRANSPORT

- Oxygen- titrate to maintain O2 Sat between 94-99%
- Establish saline lock, large bore (AC preferred, avoid hand)
- Chewable Aspirin PO: Adult 325mg; Baby 324mg
- Plavix 600mg PO **OR** Brilinta 180mg PO (not both)
- Heparin 60 units/kg IV (Max dose is 4,000 units)
- Cardiac Monitor – attach d-fib pads
- Obtain vital signs and pain scale

Patient Care when time allows

DO NOT DELAY TRANSPORT

- Transmit ECG to nearest PCI Receiving center
- Establish 2nd saline lock, large bore (avoid hand)
- Labs: CKMB, Trop I CBC, BMP, PT/INR, PTT
- Nitroglycerin 0.4mg SL every 5 min (max 3 doses) until pain subsides & SBP remains > 100 (Caution with Inferior MI)
- Morphine or Fentanyl IV PRN for chest pain unrelieved by NTG
- Consider anti-hypertensive agent for SBP > 160/90

*Appendix B

Fibrinolytic Checklist:

Must be completed prior to administration. If any below are “yes”, fibrinolysis may be contraindicated. Contact receiving physician for guidance.

Absolute Contraindications

- Yes No: Any prior intracranial hemorrhage
- Yes No: Known structural cerebral vascular lesion (ie: arteriovenous malformation)
- Yes No: Allergy to thrombolytics
- Yes No: Ischemic stroke < 3 months
- Yes No: Known malignant intracranial neoplasm
- Yes No: Suspected aortic dissection
- Yes No: Active bleeding or bleeding diathesis (excluding menses)
- Yes No: Significant closed-head or facial trauma < 3 months
- Yes No: Severe uncontrolled hypertension (unresponsive to emergency therapy)
- Yes No: Intracranial or intraspinal surgery within 2 months
- Yes No: For streptokinase, prior treatment within the previous 6 months

Relative Contraindications

- Yes No: History of chronic, severe, poorly controlled hypertension
- Yes No: Significant HTN on presentation (SBP >180mmHg or DBP > 110mmHg)
- Yes No: History of prior ischemic stroke > 3 months
- Yes No: Dementia
- Yes No: Known intracranial pathology not covered in absolute contraindications
- Yes No: Traumatic or prolonged CPR > 10 minutes
- Yes No: Recent internal bleeding (<4 weeks)
- Yes No: Major surgery < 3 weeks
- Yes No: Noncompressible vascular punctures
- Yes No: Pregnancy
- Yes No: Active peptic ulcer
- Yes No: Oral anticoagulant therapy

* Viewed as advisory for clinical decision making and may not be all-inclusive or definitive.

Fibrinolytic Administration Guidelines

Primary Drug Treatment Plan

- Tenecteplase (TNKase) IV over 5 seconds. Do NOT exceed 50mg. If unable to give TNKase, give Reteplase (Retavase).**

Patient Weight		TNKase Reconstituted	
kg	lbs	mg	mL
<60	<132	30	6
60 to <70	132 to <154	35	7
70 to <80	154 to <176	40	8
80 to <90	176 to <198	45	9
≥90	≥198	50	10

- Clopidogrel (Plavix)**

Patient Age	Dose
≤75	300 mg PO loading dose
>75	75 mg PO dose

- Heparin 60 units/kg IV (Max dose 4,000 units)**
- Chewable Aspirin PO: Adult 325mg; Baby 324mg- if not already given**
- Oxygen- titrate to maintain O2 Sat between 94-99%**
- Repeat ECG 30 minutes after fibrinolytics administration, if possible**

Alternative Drug Treatment Plan

- Reteplase (Retavase) 10 units IV over 2 minutes x 2 at 30 minute intervals**
- Heparin 60 units/kg IV (Max dose 4,000 units)**
- Chewable Aspirin PO: Adult 325mg; Baby 324mg- if not already given**
- Oxygen- titrate to maintain O2 Sat between 94-99%**
- Repeat ECG 30 minutes after fibrinolytics administration, if possible**

OR

- Alteplase (tPA) 90 min weight based infusion**
- Heparin 60 units/kg IV (Max dose 4,000 units)**
- Chewable Aspirin PO: Adult 325mg; Baby 324mg- if not already given**
- Oxygen- titrate to maintain O2 Sat between 94-99%**
- Repeat ECG 30 minutes after fibrinolytics administration, if possible**

O’Gara, P.T. et al (2013). 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction. *Circulation*, 2013;127: e362-e425.
Doi: <https://doi.org/10.1161/CIR.0b013e3182742c84>

PCI-Receiving Hospitals

BASIC RECOMMENDATIONS

- Ongoing data monitoring/quality improvement with a recommendation for participation in the NCDR ACTION Registry for statewide benchmarks.
- Designate a STEMI Coordinator to work closely with physicians, program organizers, EMS, NPCI hospitals and other key stakeholders. See STEMI Feedback section below, page 27 and STEMI Job Description, pages 39-41.

Hospital

- 24/7 primary PCI capability within 30 minutes without lapses in the call schedule.
- CCL and interventional cardiologist should arrive within 30 minutes of STEMI activation.
- No diversion policy for patients experiencing signs and symptoms of ACS. There should be a plan for triage and treatment for simultaneous presentation of STEMI patients.
- A single call for Code STEMI activations.
- Universal acceptance of STEMI transfers, regardless of bed availability. When beds are not available, employ pre-determined protocols:
 - Care by the cath lab, ED, or ICU staff.
 - House the patient in an emergency, procedure, or recovery room until an appropriate hospital bed is available.
- Provide 24 hours per day/7 days per week telephone 'hotline' of reperfusion decision for NPCI-Referring hospitals by a cardiologist on call.
- PCI establishes a dedicated fax machine for receiving medical records from the NPCI-Referral hospital.

- PCI collaborates with NPCI to receive 12-lead ECG transmission 24 hours per day/7 days a week.
- PCI addresses ongoing STEMI education for EMS, NPCI, ED, CCL, and ICU in its strategic plan.
- PCI provides a formal education process is in place to give EMS the opportunity to observe in the CCL.
- Establish a predetermined, institution-specific, written protocol for rapid primary PCI agreed upon by all cardiology and ED physicians and staff.

Registration

- The first point of contact upon entrance to the ED is always a nurse. If a 24/7 triage nurse is not the first point of contact in the ED, the employees who initially greet the patient have formal training in ACS signs and Symptoms, including atypical, AND receive annual updates.
- Patient registration should be treated the same as for trauma patients, with the ability to fast-track critical labs, such as Troponin, Creatinine, and PT/INR, minimize ED waiting time, and provide reperfusion or rapid transfer as soon as possible.

12-Lead ECG

- STEMI alert is activated from the field as a direct result of EMS personnel's ability to read or transmit a 12-lead ECG.
- Specify system for rapid ECG acquisition including having ECG equipment in the ED and specifying a location that affords prompt access and adequate patient privacy. One ECG machine is to remain in the ED at all times.
- Obtain ECG on all patients with ACS signs and symptoms. See ECG Acquisition, page 32.
- Door-to-ECG (D2ECG) with physician interpretation \leq 10 minutes. Perform ECG on all patients presenting to ED with ACS signs and symptoms within 10 minutes, regardless of room or nurse availability.

- Positive ECG to STEMI Alert \leq 5 minutes.

ED/ Reperfusion

- ED physician has the authority to activate the CCL for walk-in, EMS, and NPCI STEMI patients.
- ED physician has the authority to initiate the reperfusion strategy according to local guidelines and care pathways.
- Institution-specific written STEMI care plan/protocols to achieve rapid primary PCI with Door to Balloon (D2B) \leq 90 minutes ($>$ 90% of the time).
- Establish medication protocols that are consistent with recommended ACC/AHA guidelines or current evidence-based published research for STEMI patients.

STEMI Feedback

- STEMI Coordinator should provide a STEMI Feedback Form to all medical personnel, including EMS and NPCI within 48 hours of primary PCI outlining performance measures located on pages 33-34 and including the following: catheterization results, false activations, deaths in transfer and systematic delays. Share with a multidisciplinary team.

Cardiac Catheterization Laboratory

- Establish a daily primary PCI operator schedule that is coordinated between all cardiologists, and involves a single rotating physician.
- CCL team and interventional cardiologist in the lab and ready within 30 minutes 24 hours/ 7 days per week basis. Employ strategies that accelerate readiness:
 - Provide sleeping quarters close to the hospital.
 - Designate protected parking zone for STEMI team.
 - Establish cross-training and multi-disciplinary teams to expedite CCL readiness and patient care. Teams may include ICU staff, ED staff or House Supervisor.

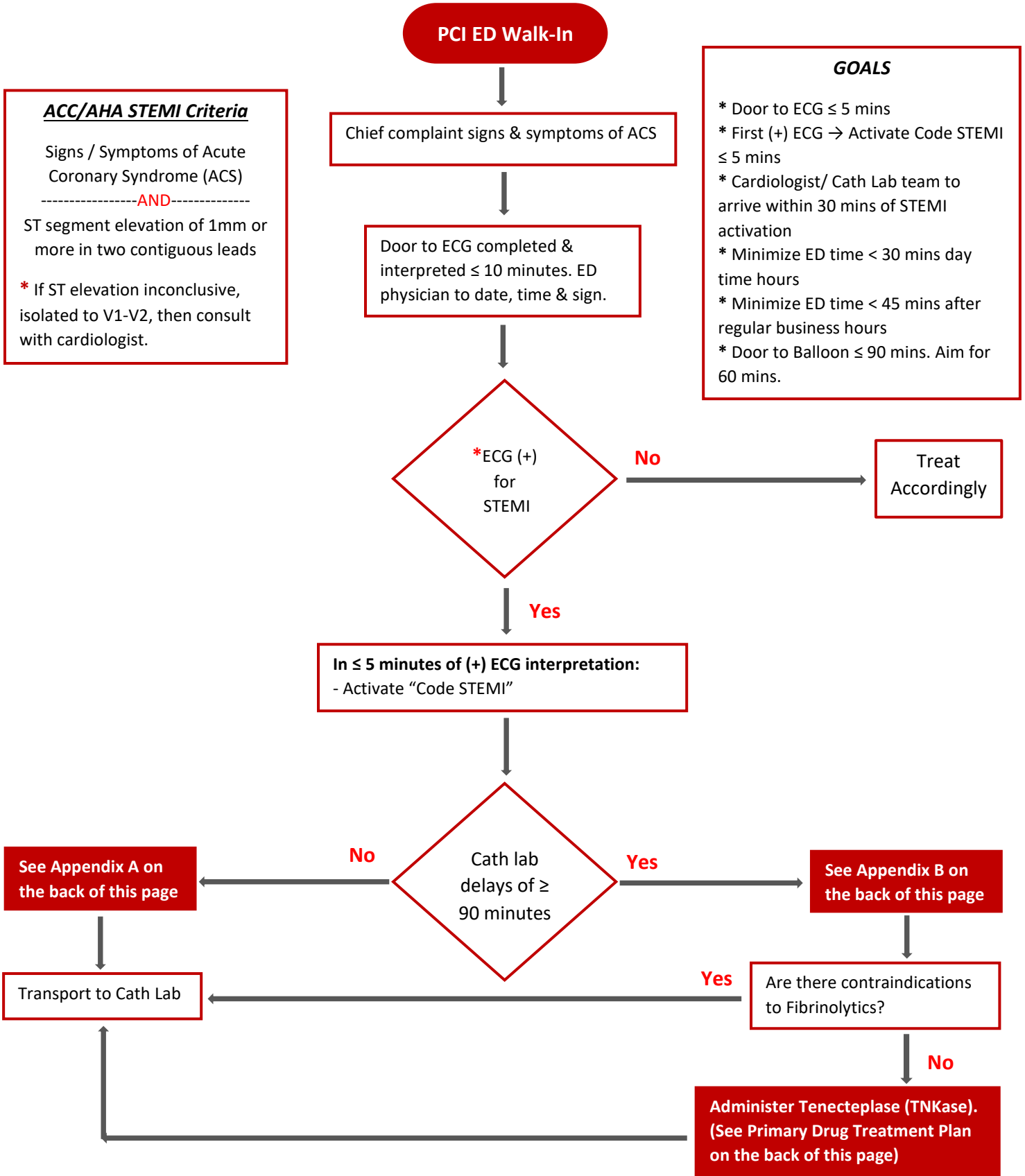
PCI-Receiving- continued

- Require on-call staff to stay close enough to the hospital to ensure readiness in ≤ 30 minutes
- Establish a backup reperfusion plan to be employed when CCL(s) are down or filled with cases that cannot be delayed or moved. Backup plans may include rapid activation of an additional CCL team, diversion of the second patient to a nearby primary PCI hospital or rapid fibrinolysis (First Medical Contact to Needle ≤ 30 minutes).
- Receive EMS and referral transfers directly from EMS transport to CCL when they are staffed and ready. If the CCL is not yet available upon patient arrival to the hospital, prepare the patient in ED or ICU.
- Update history and physical on transfer to catheterization table.
- Provide prompt data feedback immediately after procedures, including a call by the interventional cardiologist to the referring ED physician or EMT/ Paramedic.

ADVANCED RECOMMENDATIONS

- PCI Arrival to Balloon (D2B) goal ≤ 60 minutes.

PCI: STEMI POINT OF ENTRY



ACC/AHA STEMI Criteria

Signs / Symptoms of Acute Coronary Syndrome (ACS)

-----AND-----

ST segment elevation of 1mm or more in two contiguous leads

* If ST elevation inconclusive, isolated to V1-V2, then consult with cardiologist.

GOALS

- * Door to ECG ≤ 5 mins
- * First (+) ECG → Activate Code STEMI ≤ 5 mins
- * Cardiologist/ Cath Lab team to arrive within 30 mins of STEMI activation
- * Minimize ED time < 30 mins day time hours
- * Minimize ED time < 45 mins after regular business hours
- * Door to Balloon ≤ 90 mins. Aim for 60 mins.

Appendix A

Patient Priorities Prior to or During Transport

DO NOT DELAY TRANSPORT

- Oxygen- titrate to maintain O2 Sat between 94-99%
- Establish saline lock, large bore (AC preferred, avoid hand)
- Chewable Aspirin** PO: Adult 325mg; Baby 324mg
- Plavix 600mg PO **OR** Brilinta 180mg PO (not both)
- Heparin 60 units/kg IV (Max dose is 4,000 units)
- Cardiac Monitor – attach d-fib pads
- Obtain vital signs and pain scale

Patient Care when time allows

DO NOT DELAY TRANSPORT

- Fax/ transmit ECG to nearest PCI Receiving center
- Establish 2nd saline lock, large bore (avoid hand)
- Labs: CKMB, Trop I CBC, BMP, PT/INR, PTT
- Nitroglycerin 0.4mg SL every 5 min (max 3 doses) until pain subsides & SBP remains > 100 (Caution with Inferior MI)
- Morphine or Fentanyl IV PRN for chest pain unrelieved by NTG

*Appendix B

Fibrinolytic Checklist:

Must be completed prior to administration. If any below are “yes”, fibrinolysis may be contraindicated. Contact receiving physician for guidance.

Absolute Contraindications

- Yes No: Any prior intracranial hemorrhage
- Yes No: Known structural cerebral vascular lesion (ie: arteriovenous malformation)
- Yes No: Allergy to thrombolytics
- Yes No: Ischemic stroke < 3 months
- Yes No: Known malignant intracranial neoplasm
- Yes No: Suspected aortic dissection
- Yes No: Active bleeding or bleeding diathesis (excluding menses)
- Yes No: Significant closed-head or facial trauma < 3 months
- Yes No: Severe uncontrolled hypertension (unresponsive to emergency therapy)
- Yes No: Intracranial or intraspinal surgery within 2 months
- Yes No: For streptokinase, prior treatment within the previous 6 months

Relative Contraindications

- Yes No: History of chronic, severe, poorly controlled hypertension
- Yes No: Significant HTN on presentation (SBP >180mmHg or DBP > 110mmHg)
- Yes No: History of prior ischemic stroke > 3 months
- Yes No: Dementia
- Yes No: Known intracranial pathology not covered in absolute contraindications
- Yes No: Traumatic or prolonged CPR > 10 minutes
- Yes No: Recent internal bleeding (<4 weeks)
- Yes No: Major surgery < 3 weeks
- Yes No: Noncompressible vascular punctures
- Yes No: Pregnancy
- Yes No: Active peptic ulcer
- Yes No: Oral anticoagulant therapy

* Viewed as advisory for clinical decision making and may not be all-

Fibrinolytic Administration Guidelines

Primary Drug Treatment Plan

- Tenecteplase (TNKase)** IV over 5 seconds. Do NOT exceed 50mg. If unable to give TNKase, give Reteplase (Retavase).

Patient Weight		TNKase Reconstituted	
kg	lbs	mg	mL
<60	<132	30	6
60 to <70	132 to <154	35	7
70 to <80	154 to <176	40	8
80 to <90	176 to <198	45	9
≥90	≥198	50	10

- Clopidogrel (Plavix)**

Patient Age	Dose
≤75	300 mg PO loading dose
>75	75 mg PO dose

- Heparin** 60 units/kg IV (Max dose 4,000 units)
- Chewable Aspirin** PO: Adult 325mg; Baby 324mg
- Oxygen-** titrate to maintain O2 Sat between 94-99%
- Repeat ECG 30 minutes after fibrinolytics administration, if possible**

Alternative Drug Treatment Plan

- Reteplase (Retavase)** 10 units IV over 2 minutes x 2 at 30 minute intervals
- Heparin** 60 units/kg IV (Max dose 4,000 units)
- Chewable Aspirin** PO: Adult 325mg; Baby 324mg
- Oxygen-** titrate to maintain O2 Sat between 94-99%
- Repeat ECG 30 minutes after fibrinolytics administration, if possible**

OR

- Alteplase (tPA)** 90 min weight based infusion
- Heparin** 60 units/kg IV (Max dose 4,000 units)
- Chewable Aspirin** PO: Adult 325mg; Baby 324mg
- Oxygen-** titrate to maintain O2 Sat between 94-99%
- Repeat ECG 30 minutes after fibrinolytics administration, if possible**

O’Gara, P.T. et al (2013). 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction. *Circulation*, 2013;127: e362-e425.
Doi: <https://doi.org/10.1161/CIR.0b013e3182742c84>

Cardiogenic Shock

- Cardiogenic shock is defined as inadequate organ perfusion due to low cardiac output.
- Approximately 9% of STEMI patients develop cardiogenic shock. Early recognition of shock in STEMI patients is essential, as is the implementation of advanced supportive therapies.

SHOCK FAST FACTS

- STEMI patients with shock have exceedingly **high in-hospital mortality** rates. **One in three dies** before hospital discharge.
- **Early recognition and revascularization** have been shown to lower mortality in a randomized controlled trial.
- Of patients with acute MI complicated by shock, one-third present in shock, while two-thirds develop shock during their hospital course. This requires both **early and ongoing vigilance** on the part of the entire STEMI team, from EMS to the post-PCI care team.

EARLY INDICATORS OF SHOCK in Acute MI

- Hypotension (SBP \leq 90 mmHg)
- Narrow pulse pressure (SBP to DBP difference of $<$ 20 mm Hg)



INDICATORS OF PROGRESSIVE SHOCK in Acute MI

- Low urine output
- Altered mental status, confusion
- Respiratory distress/hypoxia from pulmonary edema
- Cool extremities
- Rising creatinine
- Lactic and metabolic acidosis
- Characteristic pulmonary artery catheter readings
 - Low cardiac index (\leq 2.0 L/min/m²)
 - High pulmonary capillary wedge pressure (\geq 14-16 mm Hg)
 - High systemic vascular resistance (\geq 1200 dynes cm sec)

EKG Acquisition



Common and Atypical STEMI Symptoms

Rapid EKG Criteria

EKG within 10 minutes of
ED arrival or EMS First
Medical Contact!

Any patient with symptoms,
regardless of age, with any
of the following history:

1. Heart disease
2. Diabetes
3. High cholesterol
4. Hypertension
5. Smoking
6. Recent cocaine use

- Chest pain, discomfort, or pressure
- Dyspnea (shortness of breath)
- Arm or shoulder pain (left or right)
- Jaw or neck pain
- Upper back pain
- Epigastric pain or “heartburn”
- Diaphoresis (profuse sweating)
- Nausea or vomiting
- Light-headed or dizzy
- Syncope (fainting)
- Weakness
- Palpitations (heart skips beats)
- Tachycardia (fast heart rate)
- Symptomatic Bradycardia (slow heart rate)

Women, the elderly, and diabetic
patients are more likely to present
with atypical symptoms such as:

- Generalized nausea
- Weakness
- Syncope (fainting)
- Altered mental status

When in doubt, do an EKG!

Immediately show/ transmit EKG to ED physician for a suspected *STEMI.

Systems Data Collection & Goals

EMS Ground Data Collection	Time
Symptom Onset-to-911 Call	Monitor
911 call to first 12-lead ECG	Monitor
First Medical Contact-to-ECG (FMC2ECG)	≤ 5 mins
(+) ECG-to-Transmission/ STEMI Alert Notification	≤ 5 mins
EMS Scene Time (FMC to Departure)	≤ 10 mins
EMS NPCI Arrival to EMS NPCI Departure (“Load and Go”)	≤ 10 mins
Total EMS Time (Dispatch to ED Arrival) (Rural times will vary)	≤ 30 mins
First Medical Contact-to-Balloon (FMC2B)	≤ 90 mins
First Facility Arrival-to-Balloon (D2D2B)	≤ 120 mins
Exceptions	
Document any medical delays	
Track False Activations/ Missed Activations	

EMS Air Medical Transport Data Collection	Time
(+) ECG-to-Air Transport Notification	≤ 5 mins
Air Transport Dispatch-to-Air Transport Scene Arrival	Monitor
Ground Time (Eye-to-Eye with the patient to ED Departure)	≤ 10 mins
Total Air Transport Time (Dispatch to ED Arrival)	Monitor
First Medical Contact-to-Balloon (FMC2B)	≤ 90 mins
First Facility Arrival-to-Balloon/ FMC to Balloon	≤ 120 mins
Exceptions	
Document any medical delays	
Track False Activations/ Missed Activations	

Data Collection- continued

Non-PCI Data Collection	Time
Symptom Onset-to-ED Arrival	Monitor
Door-to-ECG (D2ECG)	≤ 5 mins
Door-to ECG with MD interpretation (ED physician to date, time and sign ECG. Use ECG stamp, if needed)	≤ 10mins
(+) ECG-to-Code STEMI Activation (includes ECG transmission and call for transport -all 3 simultaneously)	≤ 5 mins
Door-to-Needle (D2N)	≤ 30 mins
Door-In Door-Out (DIDO)	≤ 30 mins
First Facility Arrival-to-PCI Arrival-to-Balloon (D2D2B)	≤ 120 mins
Exceptions	
Document any Medical Delays	
Track False Activations/ Missed Activations	

PCI Data Collection	Time
Track data elements included in the above charts, plus:	
Symptom Onset-to-ED Arrival	Monitor
Door-to-ECG (D2ECG)- includes ED physician interpretation (ED physician to date, time and sign ECG. Use ECG stamp, if needed)	≤ 5 mins
Door-to-ECG with MD interpretation (ED physician to date, time and sign ECG. Use ECG stamp, if needed)	≤ 10 mins
(+) ECG to Code STEMI Activation	≤ 5mins
Code STEMI Activation-to-Cath Lab Team Arrival Time (Based on LAST member arrival. Meet 90% of the time.)	≤ 30 mins
Code STEMI Activation to Interventional Cardiologist Arrival Time (Meet 90% of the time)	≤ 30 mins
ECG Transmission Received-to-ED MD Interpretation-to-Code STEMI Activation	≤ 5 mins
ED Arrival-to-ED Departure (or bypass ED)	≤ 30 mins
ED Departure-to-Cath Lab Arrival	Monitor
Cath Lab Room Arrival-to-Balloon	Monitor
Door-to-Balloon (D2B)	≤ 90 mins (Aim for 60 mins)
Exceptions	
Document any medical delays	
Track False Activations/ Missed Activations	

Inappropriate Activation Form



This description avoids language that may reflect a negative connotation among STEMI system participants, while cognizant of the need to define the most precise and widely applicable terminology available. The adoption of common definitions will provide the greatest support to STEMI system development. Systems may choose to vary the terms by which they refer to these common definitions without detracting from their usefulness. For example, “false activation” may also be used to refer to using other terms including “cath lab cancellation”, with the exception of reperfusion secondary to lytics. Additional terms that may be used in referring to a definition in the scenarios below. Common scenarios that illustrate the application of these definitions in practice are depicted below:

Scenarios

Scenario 1: Initial source of activation

A patient is initially evaluated by an EMT/Paramedic at his or her home who makes the diagnosis of STEMI and activates the catheterizations laboratory. The patient is transported to the emergency department where the emergency physician also activates the catheterization laboratory. The initial source of activation is the EMT/Paramedic.

Scenario 2: ECG interpretation method

A patient is diagnosed to have a STEMI according to multiple criteria including the EMT/Paramedic reading of the ECG and the ECG machine indicating definite STEMI. Both EMT/Paramedic and ECG machine readings should be selected for ECG interpretation method.

Scenario 3: Catheterization laboratory cancelled

An EMT/Paramedic/referral hospital notifies the receiving emergency physician that a STEMI patient was en route to the hospital. The catheterization laboratory is not activated because the emergency physician wishes to review the patient first. On arrival, the patient was not felt to meet criteria for STEMI. This scenario would not represent a cancellation of the laboratory.

Inappropriate Activation Form continued on the next 2 pages.

Term	Alternative Descriptions/Terms	Field Choices (Choose all that apply)	Definition
Initial source of activation		a. Physician b. EMT/Paramedic c. Other	The healthcare professional who made the initial decision to activate the catheterization laboratory. Generally, this is the first professional to evaluate the patient's symptoms and ECG on first medical contact.
ECG interpretation method		a. EMT/Paramedic b. ECG Machine c. Transmission d. Other	The method of interpreting the ECG regarding criteria for STEMI during first medical contact. More than one option may be selected.
Catheterization Laboratory canceled	False activation	a. Yes b. No c. Not available d. Not applicable	Cancellation of catheterization laboratory after the lab has been activated and personnel are en route.
Reason Catheterization Laboratory canceled		a. The patient did not have STE segment elevation (discordance in ECG interpretation) b. The patient did not have ischemic-type chest pain (discordancy in symptom interpretation) c. Resolution of chest pain and/or ST-segment elevation d. Death e. Do Not Resuscitate status f. Unwilling to undergo catheterization g. Unable to obtain consent for the procedure h. Severe dementia i. Combative/uncooperative patient j. Active bleeding k. Severe co-morbid or terminal illness	Principal or most likely reason catheterization laboratory was canceled.

		I. Other	
PCI performed		a. Yes b. No c. Not available d. Not applicable	Any coronary intervention involving a device was performed including balloon angioplasty, stent deployment, thrombectomy, or infusion of intracoronary fibrinolysis.
Reason PCI not performed		a. No infarct-related artery b. Referred for CABG c. Unable to cross lesion d. Medical management only e. Other	Principal or most likely reason PCI was not performed.
Definite STEMI patients		a. Yes b. No c. Not available d. Not applicable	Patient met criteria for STEMI diagnosis including chest pain history and ST-segment elevation and was diagnosed with myocardial infarction by the finding of an infarct-related artery on angiography and/or positive cardiac enzymes following hospital admission.
Positive cardiac enzymes		a. Yes b. No c. Not available d. Not applicable	Elevation of specific markers for myocardial necrosis according to the ACC/ ESC definition for Type 1 myocardial infarction including elevation of Creatinine kinase-MB or troponin above the 99 th percentile. Values exceeding individual hospital ranges are sufficient and meet the criteria for positive cardiac enzymes. [J Am Coll Cardiol 2000; 36:959-69]
Patient for who the catheterization laboratory should not be activated	Inappropriate patient for catheterization	a. No b. Not available c. Not applicable	A patient for who emergent catheterization cannot be performed for reasons obvious to the healthcare professional during the first medical contact including 1) do not resuscitate status, 2) unwilling to undergo catheterization, 3) neither the patient nor their proxy is able to consent for the procedure, 4) severe dementia, 5) combative/uncooperative, 6) active bleeding, 7) severe comorbid or terminal illness.

Example of STEMI Tracking Sheet

NOT A PART OF THE PATIENT RECORD – FOR INTERNAL USE ONLY

Code STEMI Tracking Sheet

_____	_____
Last name	First Name

Date: _____ Cardiologist: _____
 (Record all times using computer or cell phone reference)

Time		Est. Patient Weight
	EMS phone report received	lbs. _____
	EKG transmission received	kg. _____
	Transmitted EKG interpreted by: RN MD (circle one)	
	Decision to page STEMI based on: EMS phone report EKG (circle one)	
	Decision to page STEMI made by: RN MD (circle one)	
	Code STEMI page	Allergies:
		1.
	<u>STEMI Team: (page response)</u>	2.
	Cath Team arrival in ED	3.
	Cardiologist responded via phone to page	4.
	Intervention cardiologist arrival	5.
	<u>EMS phone report:</u>	<u>EMS</u>
	EKG rhythm:	B/P:
	ST elevation in leads:	P:
	Medication given by EMS:	Resp:
	EMS @ patient: _____ Goal: (<90 min)	<u>ED arrival</u>
	ED arrival time: _____ Goal: (<60 min)	B/P:
	EKG in Triage Yes: _____ (time) No	P:
	STEMI page cancelled Yes No	Resp:

Date: _____

Cardiologist: _____ BED: _____

For INTERNAL USE ONLY

Procedure: _____

EMS Direct Admit Summary

Case Summary: Time

Patient c/o symptoms: _____
(minutes/hours/days prior to 911)

Initial 911 call to EMS _____

EMS on scene _____

EMS at patient _____

EMS EKG performed _____

EMS EKG received @ triage _____

EMS phone report received _____

EMS departed scene _____

STEMI page placed _____
RN MD EMS

Pt arrival in triage _____

ED EKG _____

Transport to CCL from ED _____

Cath Lab admit _____

Staff cardiologist arrival _____

1st intervention _____
(type _____)

FMC to balloon: _____

D2B time: _____

Lesion: _____

Page canceled: yes no

CCL Team: _____

Clock-in: _____

Last name	First Name
STEMI PAGE #	Transfer Hospital

<u>Inter-hospital transfer patients</u>	
Hospital:	_____
City:	_____
ED Admit	_____
ED EKG	_____
Request for Transfer	_____
STEMI page	_____
Lytics	_____
ED Discharge	_____
(Your hosp) arrival	_____
CCL admit	_____

STEMI COORDINATOR JOB DESCRIPTION

BASIC FUNCTION

The STEMI Coordinator is responsible for the development, implementation, coordination, and maintenance of a comprehensive STEMI program that complies with national standards for quality of care for STEMI patients as dictated by the American Heart Association (AHA), American College of Cardiology (ACC), and governmental regulation for Medicare compliance.

PRIMARY ACCOUNTABILITIES

1. Adheres to the general hospital standards to promote a cooperative work environment by utilizing communication skills, interpersonal relationships and team building.
 - Follows hospital and departmental policies and procedures.
 - Assumes responsibility for staying informed and communicating changes in policies and procedures.
2. Develops, evaluates, and maintains a STEMI program that meets and exceeds the recommendations of the American College of Cardiology and American Heart Association.
 - Ensures compliance with nationally recognized standards of care.
 - Development and implementation of in-house policy and procedure for STEMI activation
 - Maintains STEMI protocols for treatment in consultation with the Department of Interventional Cardiology.
 - Develops short and long-term goals to ensure the quality of care for STEMI patients.
 - Monitors and oversees the utilization of EKG transmission system.
 - Develops alliances with other healthcare providers, acting as a resource and facilitator to enhance the STEMI market share.
 - Participates in research-based activities to ensure the hospital is represented on a local, regional, and national level as providing quality STEMI care.
3. Assumes responsibility for the ongoing program management for STEMI across the continuum from the EMS and hospital entry through discharge.
 - Participates in the care of STEMI patients when possible to maintain skills and identify barriers and needs.
 - Responds when possible to STEMI pages from the ED, in-house STEMI Rapid Response team and other EMS services.
 - Acts as a liaison and resource to EMS providers.
 - Acts as a liaison with the department of interventional cardiology to ensure physician coverage for AMI on-call responsibility.
 - Oversees and coordinates STEMI communications systems including, internet EKG transmission, physician pagers, and CCL staff on-call compliance.
4. Serves as a clinical expert and resource assisting to provide patient care services personnel and other healthcare professionals within the hospital, throughout the continuum, and in the community.

- Monitors trend variances in STEMI care and actively seeks tactics to reduce length of stay, reduce cost per patient day, and improve patient outcomes in collaboration with nurse managers and staff physicians.
 - Facilitates the development, implementation, and evaluation of clinical practice guidelines and order sets.
 - Assesses patients, synthesizing and analyzing data, and understanding and applying nursing and health care principles at the advanced nursing level.
 - Provides expert guidance, teaching, and counseling to STEMI patients.
 - Works with other members of the healthcare team including physicians, nurses, and EMS providers in providing appropriate educational opportunities.
 - Develops outcome measures to monitor the quality of care, effectiveness of services provided, and adherence to protocols.
 - Conducts research and utilizes research knowledge and skills.
 - Serves as an educator, mentor, and consultant for nurses, physicians, and other healthcare professionals.
 - Identifies and collaborates in the resolution of system issues which influence the provision of patient care.
 - Participates in the development of health policies.
 - Facilitates access to health care and ensure appropriate utilization of resources.
5. Promotes and develops personal and professional growth through the development of self and patient care services staff.
- Maintains professional and clinical knowledge, acting as a resource to others.
 - Attends continuing education programs and disseminates knowledge learned to others.
 - Assesses staff educational needs, and in conjunction with the Departmental STEMI champions develops, implements, and monitors required continuing education.
6. Participates in identifying needs, planning and implementing educational programs within a specialty area for patients, families, community groups, and other designated STEMI transfer healthcare facilities.
- Set up a transfer network for STEMI patients and utilize a pre-determined medical protocol as well as a “one-call” activation system.
 - Provides training and education to emergency department nurses and physicians in designated STEMI transfer healthcare facilities.
 - Provides for inter-facility, Emergency Medical System, and regional professional staff development, participating in case review, standardizing practice guidelines, and directing on-going education programs.
 - Acts as a liaison to the community through facilitation and coordination of heart disease programs.
 - Improves the care of heart patients through the facilitation and coordination of community education.
 - Actively participates in the Regional Mission: Lifeline STEMI System of Care Committee meetings.
 - Facilitates and monitors quality data from the STEMI registry and other databases.

- Facilitates and coordinates collection and evaluation of data in collaboration with Research RN such as chart reviews, implementation of concurrent review and reporting various STEMI program protocols for ACC/AHA quality parameters, etc.
 - Facilitates and coordinates process improvement activities.
 - Facilitates research activities related to the care of STEMI patients
7. Assumes a leadership role in monthly AMI/STEMI hospital committee meetings.
- Communicates on-going status of STEMI program coordination on a monthly basis.
 - Facilitates the work of the Departmental STEMI champions workgroup.
 - Facilitates in conjunction with the Service Line Director, AMI/STEMI Medical Director through the preparation of agendas and minutes.
 - Implements recommendations from the AMI/STEMI committee.
 - Monitors effectiveness of all STEMI program objectives.

DIMENSIONS

Skills assessment:

- Basic computer skills in Word documents preparation and Excel spreadsheet Database Reports: Collecting, entering to the database and methods to validate data, and designing the database to facilitate performance improvement activities, trend reports, education and research while protecting patient confidentiality.
- Case by case follow-up review to all nursing staff, physicians, and EMS care providers within 24-48 hours of patient admission.
- Overall monthly statistical reporting of all parameters associated with STEMI care.
- Quality performance reports including admit to task parameters, Door to balloon time, and CCL on-call team response time, etc.

ADDITIONAL REMARKS

Follow-up case management is included in the job description and it should be emphasized that all successful national STEMI programs support an immediate case by case follow-up to clinicians. This case follow-up is basically an information sharing tool providing outcomes such as First Medical Contact to Balloon time as well as an opportunity to educate. The follow-up requires research and includes information such as angiogram, EKG's, patient history, and patient outcomes that are shared with all staff participating in the patient's care.

Glossary of Terms

American College of Cardiology (ACC) - The American College of Cardiology (ACC), based in Washington, D.C., is a nonprofit medical association established in 1949.

Acute Coronary Syndrome (ACS) - is a syndrome (set of signs and symptoms) due to decreased blood flow in the coronary arteries such that part of the heart muscle is unable to function properly or dies.

American Heart Association (AHA) - The American Heart Association (AHA) is a non-profit organization in the United States that fosters appropriate cardiac care in an effort to reduce disability and deaths caused by cardiovascular disease and stroke.

Automatic External Defibrillator (AED) – a device that can be used by anyone with a minimal amount of training to shock (or defibrillate) a patient whose heart has stopped.

Cardiac Catheterization Lab (CCL) – an examination room in a hospital or clinic with diagnostic imaging equipment used to visualize the arteries of the heart and the chambers of the heart and treat any stenosis or abnormality found.

Cardiogenic shock – inadequate organ perfusion due to low heart output. This condition is frequently a precursor to death and can be recognized by the presence of hypotension (systolic blood pressure of 90 mmHg or less) in the setting of a myocardial infarction.

Contraindication – a specific situation in which a drug or procedure should NOT be used, because it may be more harmful than beneficial to the patient.

Coronary arteries – arteries that originate in the aorta immediately above the heart that supplies oxygenated blood to the muscular tissue of the heart.

Diastolic Blood Pressure (DBP) - The diastolic pressure is specifically the minimum arterial pressure during relaxation and dilatation of the ventricles of the heart when the ventricles fill with blood. In a blood pressure reading, the diastolic pressure is typically the second number recorded.

Diversion plan – an emergency medical service protocol to divert patients with ST-elevation myocardial infarction from the closest non-PCI hospital to a PCI capable hospital. Diversion protocols are particularly useful when patients have a contraindication to fibrinolysis, or First Medical Contact to Balloon deployment at the PCI hospital can be achieved within 90 minutes on a consistent basis.

Door to Balloon (D2B) – the time elapsed from hospital arrival or registration arrival to balloon time.

Door to Door to Balloon (D2D2B) – the time elapsed from first hospital arrival or registration arrival to arrival to PCI hospital to balloon time.

Door to Needle (D2N) – the time elapsed from hospital arrival or emergency department registration arrival to the initial infusion of fibrinolytic medication. Electrocardiogram (ECG) – a recorded tracing of the electrical activity of the heart.

Door In Door Out (DIDO) – the time elapsed from hospital arrival or registration arrival to emergency department departure.

Emergency Department (ED) - a medical treatment facility specializing in acute care of patients who present without prior appointment, either by their own means or by ambulance.

Emergency Medical Service (EMS) – a system of healthcare professionals, facilities, and equipment providing pre-hospital emergency care.

Emergency Medical Technician (EMT) – an emergency responder trained to provide pre-hospital emergency medical services (EMS) to the critically ill and injured.

Emergency Medical Treatment and Active Labor Act (EMTALA) – a statute that governs when and how a patient may be (1) refused treatment or (2) transferred from one hospital to another when in unstable condition. The EMTALA was passed as part of the Comprehensive Omnibus Budget Reconciliation Act of 1986, and is sometimes referred to as "the COBRA law."

Fibrinolysis – the breakdown of fibrin, usually by the enzymatic action of plasmin. Fibrin is a protein necessary for blood clotting that forms a web-like mesh that traps red blood cells and platelets and holds clots together. In the case of myocardial infarction, the administration of drugs that facilitate fibrin breakdown is referred to as "fibrinolysis."

First Medical Contact to Balloon (FMC2B) – the time elapsed from the first medical contact (i.e. eye to eye contact of STEMI patient) to the first device deployment in the coronary artery.

Hypertension (HTN) - abnormally high blood pressure.

Intensive Care Unit (ICU) - the department of a hospital that is designed and equipped for the monitoring, care and treatment of seriously ill or injured patients.

Myocardial infarction (MI) – sudden onset of myocardial necrosis due to the formation of a blood clot in the coronary arterial system obstructing arterial blood flow to the area of cardiac muscle supplied by that artery. This condition is often manifested by symptoms of coronary insufficiency and electrocardiographic changes of ST-segment elevation (commonly known as a heart attack).

Nitroglycerin (NTG) - vasodilator to treat angina pectoris.

Percutaneous Coronary Intervention (PCI) – a procedure used to open or widen narrowed or blocked blood vessels supplying the heart. The blood vessels are accessed through the skin over the leg (femoral) or arm (radial or brachial) arteries. A thin catheter is advanced over a soft-tipped guide-wire through the arterial tree to the base of the heart where the coronary arteries arise. A smaller guide-wire is then advanced into the coronary artery and across the blockage, followed by balloon-dilation catheters, stents, and other artery opening devices as needed.

Primary Percutaneous Coronary Intervention (PTCA) – the use of percutaneous coronary intervention to open an occluded coronary artery in the setting of an ST-elevation myocardial infarction.

Privately Operated Vehicle (POV) - refers to patients who transport themselves to the hospital, or who are transported to the hospital by a family member or friend. AKA: Privately Operated Vehicle, POV.

Reperfusion – the restoration of blood flow to an organ or tissue that has had its blood supply cut off, as after a myocardial infarction.

Rescue PCI - in the event that fibrinolysis fails to open the occluded coronary artery; the artery is opened by percutaneous coronary intervention. Approximately 25% of coronary arteries fail to open with fibrinolysis. Patients whose arteries fail to open typically have persistent chest pain and ST-segment elevation more than 60 minutes after fibrinolysis is administered.

ST-Elevation myocardial infarction (STEMI) – a myocardial infarction for which the ECG shows ST-segment elevation, usually associated with a recently closed coronary artery. Patients suffering from this type of myocardial infarction are more likely to survive if their coronary artery is opened within 12 hours of onset.

Systolic Blood Pressure (SBP) - The blood pressure when the heart is contracting. It is specifically the maximum arterial pressure during contraction of the left ventricle of the heart. The time at which ventricular contraction occurs is called systole.

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