Regional

ST-Elevated Myocardial Infarction

(STEMI) Plan

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Approved by Board of Director 8/19/2015

LORD FAIRFAX EMERGENCY MEDICAL SERVICES COUNCIL, INC.
REGIONAL STEMI PLAN

Revision History

Description of Change	Change Effective Date
Original Document approved by Board of Directors	8/2015

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Executive Summary

***Scope*:** Care provided to patients experiencing an acute ST-elevation myocardial infarction (STEMI) should be structured and methodical. This treatment begins with patient's first medical contact (FMC) (calling 9-1-1) through to the arrival of EMS, recognition of a STEMI (via 12-lead acquisition) and contact with medical control if required to determine appropriate patient destination.

***Purpose*:** This document is appropriate for all agencies and individuals involved in the care of STEMI patients, including pre-hospital providers, Fire and EMS agencies, dispatch centers and MedComm, private ambulance services/companies, medevac, hospitals (PCI centers and non-PCI centers), emergency room physicians, cardiologists, nursing staff, hospital laboratory staff, etc.

***Mission Statement*:** *"To increase the accuracy and efficiency of STEMI patient identification and treatment."*

***Regional Approach*:** Development of a regional STEMI committee including representatives from dispatch centers, Fire/EMS (career and volunteer), inter-facility transport providers/agencies, liaisons from emergency departments as well as cardiology and administrative leaders (PCI and non-PCI centers).
The committee is seeking to collaboratively develop guidelines and recommendations for the development of systems and strategies to improve the care of STEMI patients.

Note: In the black text boxes contain, The American Heart Association-Mission: Lifeline™ information for reference.

***Goal*:** All participating entities share the common goal and responsibility for the successful and well-organized care of the STEMI patient.
1) System-wide care of acute chest pain patients should be <u>excellent</u> and <u>uniform</u>.
2) We will always provide:
    - ♥ Impeccable service
    - ♥ Prompt response and transfer
    - ♥ Timely professional advice
    - ♥ Feedback to referring facilities
3) Coordinate, collaborate, and educate EMS services.
4) Provide Community outreach.

Regional Objectives

♥ Provide education to enhance patient knowledge and ability to identify the signs and symptoms of a potential cardiac event, and activate EMS via 911 without further delay.

♥ Establish a system where the dispatchers in the call centers are able to obtain the "right" information (asking the correct questions), send the correct resources, and provide pre-arrival instructions to the 911 caller.

♥ Establish clearly defined patient care protocols that are followed by EMS personnel (FR/BLS/ALS) including, assessment, treatment, identification of STEMI on ECG, transmission of the ECG findings and transport to the closest *appropriate* facility.

♥ Establish a system where the hospital actions for identified STEMI patients are clearly defined for both non-PCI capable facilities and PCI centers.

♥ Establish a system for ***ALL*** who are affected to recognize, understand and strive to meet American Heart Association Guidelines for the care of STEMI patients.

♥ Establish and maintain a list of key contact individuals for each agency involved in STEMI patient care to provide continuous performance improvement data.

♥ Provide a purposeful method of continuous 3performance improvement, evaluation, and communication to monitor the effectiveness and to define areas for improvement.

Theory (or Assumptions)

♥ Public campaigns, "All Your Heart Needs" and EHAC pamphlets.

♥ Classes offered within the Valley Health facilities are also extended to pre-hospital providers.

♥ Open invitation for pre-hospital providers to observe in the Cardiac Catheterization Lab.

A Regional STEMI System

Public Education

- ♥ Continue with EHAC Campaign/Educational pamphlet and oath :

   "I understand that heart attacks have beginnings that may include chest discomfort, shortness of breath, shoulder and/or arm pain, and weakness. These may occur hours or weeks before the actual heart attack.
   I solemnly swear that if it happens to me or anyone I know, I will call 9-1-1 or activate our Emergency Medical Services."

- ♥ Educate specialty clinics to provide information about the signs and symptoms of ACS

Two education links: AHA Patient Information, HeartHub for Patients Portal, and Johnston Health: Early Heart Attack Care

Initial Contact

Activating the Emergency 911 system is imperative, this is done through calling 911 and speaking with a dispatcher and painting a picture of the patient for the dispatcher to alert the correct apparatus to the destination.

Those who become Emergency Medical Dispatchers (EMD) are trained to be attentive to the symptoms of an acute cardiac event and acute cardiac syndromes (ACS). EMD's will then without delay dispatch the correct resources to the location of the patient.

Recommendations and guidelines for 911- Call Centers

- ♥ Utilization of a formal Emergency Medical Dispatch (EMD) program
- ♥ Recommendation to direct patient who is believed to be suffering a cardiac event to self-administer Aspirin.
- ♥ Recommendation to direct patient who is believed to be suffering a cardiac event to self-administer sublingual Nitroglycerin, if that patient has a valid prescription under their own name, and is within expiration dates.
- ♥ Send the correct resources, ALS and extra manpower is imperative on this type of call.
- ♥ Performance improvement for EMD compliance and integration of data to follow the patients from onset of signs and symptoms to discharge from hospital.

Pre-hospital Care

Recognition

Learning to recognize a STEMI in the field begins with training and education prior to the actual call.

Recognition of a STEMI in the pre-hospital setting depends on the initial team of responding providers, quickly assessing the signs and symptoms, performing a rapid 12-lead (within 5 minutes of arrival to patient) and recognizing a STEMI. Providers need continuous training and education on 12-lead interpretation, which may include the use of different learning tools. They should maintain a high level of suspicion, particularly in atypical situations, and proficiency in promptly and accurately obtaining a 12-lead ECG.

An EMS agency needs to provide a mechanism for 12-lead acquisition at the earliest appropriate juncture. All EMS agencies within the Lord Fairfax EMS region have the capability to perform a 12-lead. This needs to be completed within minutes of the patient's first medical contact (FMC). Transmission of field ECG's to a hospital receiving station for review and confirmation by a physician providing on-line medical command should be integrated in the regional EMS STEMI system, but is not necessary to activate resources at the receiving hospital.

Providers who are not trained and experienced in the interpretation of ECGs can communicate the monitor's software interpretation of the ECG to on-line medical command, and other alternative methods of communicating (e.g. transmission of cell-phone picture of the ECG) may also be utilized.

There are three typical ways to recognize the STEMI patient:
1) Transmission of the 12-lead ECG
2) Device interpretation of 12-lead ECG findings
3) Provider interpretation of the 12-lead ECG findings

Some strategies to consider:
- ♥ Pre-hospital 12-lead capability needs to be an available resource at the earliest appropriate time.
- ♥ Does the patient have a recognized Do Not Resuscitate (DNR) order?
- ♥ Good communication between pre-hospital and the ED is critical for subsequent patient care.

Pre-hospital Patient Care Decision Making

Decisions involving patient destination require pre-planning between EMS agencies and the receiving hospitals, both PCI and non-PCI hospitals. Transport guidelines for STEMI patients need to consider both the time/distance to the <u>nearest</u> hospital, and the time/distance to the <u>most appropriate</u> hospital. Typically this is the hospital that can provide comprehensive cardiac care including emergent PCI for STEMI patients. These guidelines need to address situations in which it is in the patient's best interest to bypass the closest hospital in favor of transport to a facility with PCI services.

Quality Improvement

Recommend that our EMS System participate in a regular quality improvement program designed to examine all facets of the ACS patient's care from initial contact with the EMS system through destination decision making and initial care at the receiving hospital. Particular attention should be given to critical decision making and transition or "hand-off" points in the continuum of care. Every effort should be made to facilitate sharing of pertinent patient information between components of the system including data from the initial phases of the patient's hospital care, such as "door-to-balloon" (D2B) time, with appropriate safeguards for patient privacy and confidentiality.

Community-based research to help identify effective interventions for improving universal utilization of EMS for STEMI and eliminate associated regional variation should be promoted.

Pre-hospital 12-lead ECG systems and reliability of data transfer should be evaluated.

Recommendations and Guidelines for Pre-hospital EMS Agencies

To prove the best care possible a 12-lead ECG program for EMS <u>should</u> include the following. These recommendations should not limit an agency to exceed the guidelines mentioned below.

- ♥ Provide a mechanism for 12-lead acquisition at the earliest appropriate juncture.
- ♥ Acquire a 12-lead ECG if possible within 5 minutes of arrival at patient with signs and symptoms consistent with a STEMI and on those with atypical signs and symptom.
- ♥ Communicate early with on-line Medical Control. Early notification increases coordination with specialty resources.

- Perform a reperfusion "checklist" as outlined by the American Heart Association (AHA). Relay the 12-lead ECG checklist findings to a predetermined medical control facility and/or receiving hospital. Print the 12-lead ECG and deliver tracing to ED physician or cardiologist upon arrival at the receiving facility.
  - The reperfusion "checklist" should be designed to determine the presence or absence of co-morbid conditions and underlying conditions in which fibrinolytic therapy may be harmful. The checklist should also facilitate detection of patient with suspected STEMI who are at especially high risk, including those with severe heart failure or cardiogenic shock, for those who primary PCI is generally the preferred reperfusion strategy. Do Not Resuscitate (DNR) status is another consideration.
- Written protocol that guides EMS personnel in determining the most appropriate receiving facility and method of transport to that facility for their suspected or confirmed STEMI patient.
- EMS is encouraged to follow the American Heart Association (AHA) STEMI care guidelines. These include, but are not limited to, the administration of Oxygen, Aspirin (ASA) 162-325mg chewed, Nitroglycerin (contraindicated in patients with hypotension and/or bradycardia), Fentanyl, and Morphine Sulfate.
- In addition to the appropriate tools and treatment, the agencies should also assure that EMS providers receive adequate training with appropriate updates.
- Thorough documentation regarding patient information and related destination determinations is essential. This includes the utilization of all patient transfer methods (i.e. medevac) to ensure the patient arrives at the most appropriate receiving facility.

American Heart Association- Mission: Lifeline
Strategies for the IDEAL EMS

Initial Contact

EMT Basic or Intermediate Provider

- 911 operator trained to recognize potential acute cardiac symptoms and dispatch appropriate EMS resources to potential STEMI patient
- ECG equipment and personnel dispatched to allow for 12 lead ECG within a total scene time of less than or equal to 15 minutes
- ECG acquisition to be extended to basic providers including EMT basic and first responders
- ECG obtained on all patients with chest discomfort suspected to be of ischemic origin
- In the field ECG (to be interpreted by receiving physician on arrival or by transmission)
- Documentation of symptom onset
- Scene time of less than 15 minutes
- Patient stays on ambulance stretcher for STEMI evaluation for hospitals that routinely transfer all or some patients by same ambulance

EMT-Paramedic

In addition to above:

- Training to diagnose STEMI by symptoms and ECG
- In the field ECG with a goal scene time of 15 minutes (An ECG machine should be dispatched to all potential STEMI calls to meet this 15 minute window)
- Administer reperfusion checklist (See tools)
- If patient is fibrinolytic ineligible, EMS notifies and diverts to a STEMI-Receiving hospital, as long as transportation time < 90 minutes
- Early notification of the receiving hospital on all STEMI patients prior to arrival that includes direct and/or indirect communication with the physician capable of activating a reperfusion plan regarding symptom onset, ECG findings, and reperfusion checklist in addition to:
  o Patient Age, gender, and DNR status
  o Time of onset of symptoms
  o Primary physician/cardiologist
  o Whether patient taking warfarin
  o Past history of MI, PCI/stent/CABG, renal failure, contrast allergy
- Administer aspirin (162 to 325 mg, chewed) to chest pain patients suspected of having STEMI unless contraindicated or an adequate dose of immediate-release aspirin can be verified as taken
- EMS data elements collected, made available to receiving hospitals via run event sheet, and reviewed on a regular basis regarding symptom onset, time of 1st medical contact, ECG performance and findings, and transportation complications including arrest and death

American Heart Association- Mission: Lifeline™
Recommendations for EMS

1) Each EMS system should maintain a standardized algorithm for evaluation and treatment of patients with symptoms suggestive of myocardial ischemia that should include acquisition of a 12-lead ECG and appropriate communication of the ECG findings (via direct paramedic interpretation/voice communication, automated computer algorithm interpretation, wireless transmission and physician interpretation, or any combination of these three strategies) to the receiving hospital.

2) Each EMS system should maintain a standardized reperfusion STEMI care pathway that designates primary PCI as the preferred reperfusion strategy if initiated within 90 minutes of first medical contact or fibrinolytic therapy in eligible patients when primary PCI within 90 minutes is not possible.

3) Prearranged EMS destination protocols for STEMI patients should include:

   a) Bypassing non-PCI hospitals/STEMI Referral Centers and going directly to primary PCI hospitals/STEMI-Receiving Centers for patients with anticipated short transport interval (e.g. <30 minutes in urban/suburban settings, so as to achieve primary PCI within 90 minutes)

   b) Emergency transfer by EMS or other agencies to a STEMI-Receiving Center of patients with STEMI who transport themselves to a STEMI Referral Center.

   c) Air transport if possible (or default to ground transport) to STEMI-Receiving Center or stabilization in STEMI Referral Center for patients with anticipated long transport time and/or either fibrinolytic ineligible and/or in cardiogenic shock

   d) Administration of fibrinolytic therapy pre-hospital or in a STEMI Referral Center for fibrinolytic eligible patients with anticipated time to primary PCI exceeding 90 minutes

   e) Emergency transfer to a STEMI-Receiving Center of patients who develop STEMI while in hospital at STEMI Referral Center (non-PCI hospital).

4) When taken directly to a STEMI-Receiving Center, all STEMI patients should be transported to the most appropriate facility as determined by Mission: Lifeline hospital criteria, with a system goal of first medical contact to balloon inflation (initial device used) within 90 minutes.

5) EMS medical director or designate should monitor care related to EMS patients with STEMI by meeting at least quarterly with prehospital providers, emergency physicians, interventional cardiologists, nursing staff, receiving hospital representatives, and other appropriate individuals (i.e. STEMI Survivor).

6) The following measurements should be evaluated on an ongoing basis:

   a) Symptom onset to 911 call

   b) Time 911 call is first received by primary public safety answering point to vehicle arrival at hospital door

   c) Time from first medical contact to balloon inflation (first device used).

   d) Time from pre-hospital ECG to balloon inflation (first device used).

   e) Proportion of patients with non-traumatic chest pain > 35 years treated by EMS for whom 12-lead ECGs were obtained

   f) Proportion of patients with STEMI treated by EMS for whom 12-lead ECGs were obtained

   g) Proportion of patients with field diagnosis of STEMI and activation of the Cardiac Catheterization Laboratory for intended primary PCI that

   I.   do not undergo acute catheterization because of misdiagnosis

   II.   undergo acute catheterization and found to have no elevation in cardiac biomarkers and no revascularization in the first 24 hours

   h) Proportion of patients with EMS treated ventricular fibrillation (VF) who are taken to the Cardiac Catheterization Laboratory

   i) Survival to hospital discharge of all STEMI patients and of patients with VF (EMS and STEMI-Receiving Center to monitor jointly)

Recommendations and Guidelines for Patient Transfers

♥ All treatment facilities need to have procedures in place that allow for the closest most appropriate transport unit (ground or air resources) to be dispatched to pick up a STEMI patient and transfer them to the closest appropriate facility.

♥ Non-PCI facilities should have a protocol with a goal to transfer the patient to a PCI facility within 30 minutes (Door-in-door-out).

♥ PCI centers should have an existing plan to properly treat transferred patients.

American Heart Association- Mission: Lifeline™ Recommendations for Inter-hospital Transfer

- ♥ STEMI patient for reperfusion has same priority as a 911 call and trauma.
- ♥ Patient stay on EMS stretcher for STEMI evaluation for inter-hospital transfer.
- ♥ Transfer plan including preferred transport modality and backup transport modality is established.
- ♥ Transport directly to catheterization laboratory when laboratory is staffed and available for PCI without reevaluation in the ED.
- ♥ When possible, minimize or avoid continuous IV infusions such as Nitroglycerin or Heparin.
- ♥ Transfer protocol should focus on rapid transport to catheterization laboratory rather than pain relief with medications.
- ♥ Transfer patients to STEMI-receiving hospital with similar consideration to patient registration, bed availability, and accepting physician as trauma patients (use dummy registration numbers, acceptance of all STEMI patients regardless of bed availability, and reliance on a simple accepting physician that is on call 24 hours per day/ 7 days per week).
- ♥ When transporting a patient treated with fibrinolysis that has continuous chest pain and < 50% ST resolution (in the lead showing the worst initial elevation) after 90 minutes following the initiation of fibrinolysis, notify the receiving hospital about the potential need for angioplasty.
- ♥ Hospital records should be faxed to the receiving catheterization laboratory so as not to delay patient pickup.
- ♥ EMTALA/COBRA/medical necessity of transfer form should be completed as soon as possible after the decision to transfer.

Helicopter Transfer: In addition to above:

- ♥ Local EMS should generally be used if available and 30 minutes transportation time to destination hospital.
- ♥ Whenever possible, helipad adjacent to the emergency department.
- ♥ Helicopter capable of transporting patients on ten minutes notice 24/7; when not available, alternate transport options identified.
- ♥ Immediately active helicopter transport during initial communication between referral hospital ED and receiving hospital regarding the need for reperfusion.
- ♥ Establish a system whereby all patient transfers of any type can be specified as time critical within one hour versus diversion possible.

Recommendations for All Hospitals

♥ All ED-based STEMI protocols should emphasize rapid evaluation and decision making to determine reperfusion strategy and to administer adjunctive medical treatments as appropriate. Process maps are helpful in the development phase of these protocols.

  ♥ All STEMI hospitals should have written guidelines and standing orders for administration of fibrinolytic therapy and additional treatments.

♥ Emergency physicians in all STEMI hospitals should be empowered to activate cardiac catheterization laboratory resources within a standardized clinical pathway without fear of reprisal for false-positive activation.

♥ All ED staff taking care of STEMI patients should complete specific educational modules adapted to the local process.

♥ Mock STEMI drills should be encouraged in low-volume centers (as defined by ACC guidelines) to maintain skill sets and to help further refine processes that cause delays at these individual institutions.

♥ All participants in a STEMI system should receive formal feedback as part of an organized quality improvement process.

Recommendations for Non-PCI Hospitals

♥ Quick STEMI identification and rapid transport/transfer to a PCI facility is the goal of the non-PCI facilities.
- ♥ Is there a STEMI identification protocol in place?
- ♥ Are there standardized transport protocols?
- ♥ Do you have direct communication with the receiving facility?
- ♥ Is there a quality improvement process?

♥ Based on AHA guidelines STEMI identification should be made by ECG interpretation within 10 minutes of patient arrival. A STEMI Alert Notification should be activated that immediately activates a transport service and notifies the receiving PCI center.

♥ All treatment facilities should have procedures in place that allow for the closest most appropriate transport unit (ground or air resource) to be dispatched to pick up a STEMI patient and transfer them to the closest most appropriate facility. (See the "Recommendations for Patient Transfers" above.)

♥ The key data elements needed to monitor performance at a non-PCI facility are:
- ♥ EMS pick-up time (if applicable)
- ♥ Hospital arrival time
- ♥ Initial ECG interpretation time
- ♥ Transport service arrival to non-PCI facility time
- ♥ Transport service left the non-PCI facility time
- ♥ Transport service arrival to PCI facility time

♥ Processes should be monitored to minimize the time intervals of each of these elements.

♥ Facilities should share their STEMI patient related data and identify a liaison for their facility to collaborate regionally with quality improvement and data reviews activities.

American Heart Association- Mission: Lifeline™
Recommendations for Non-PCI Hospital/ STEMI Referral Center

1. Appropriate protocols and standing orders should be in place for the identification of STEMI. At a minimum, these protocols should be present in the Intensive Care Unit/Coronary Care Unit and Emergency Department (ED)

2. Each ED should maintain a standardized reperfusion STEMI care pathway that designates primary PCI as the preferred reperfusion strategy if transfer of patients to a primary PCI hospital/STEMI-Receiving Center can be achieved within times consistent with ACC/AHA guidelines.

3. Each ED should maintain a standardized reperfusion STEMI care pathway that designates fibrinolysis in the ED (for eligible patients) when the system cannot achieve times consistent with ACC/AHA guidelines for primary PCI.

4. If reperfusion strategy is for primary PCI transfer, a streamlined, standardized protocol for rapid transfer and transport to a STEMI-Receiving Center should be operational.

5. If reperfusion strategy is for primary PCI transfer, all patients should be transported to the most appropriate STEMI-Receiving Center where the expected first door-to-balloon (first device used) time should be within 90 minutes (considering ground versus air transport, weather, traffic).

6. The STEMI Referral Center should have an ongoing quality improvement process, including data measurement and feedback, for the STEMI population and collect and submit Mission: Lifeline required data elements (using the Mission: Lifeline Bridging form*).

7. A program should be in place to track and improve treatment (acutely and at discharge) with ACC/AHA guideline based Class I therapies.

8. A multidisciplinary STEMI team, including EMS, should review hospital specific STEMI data on a quarterly basis.
    - a) Door-to-first ECG time (goal <10 minutes)
    - b) Proportion of STEMI-eligible patients receiving any reperfusion (PCI or fibrinolysis) therapy.
    - c) STEMI Referral Center ED door-to-balloon (first device used) time for patients transferred to PCI center
        - i) STEMI Referral Center ED door to ED discharges
        - ii) STEMI Referral Center ED door-to-balloon (first device used) time within 90 minutes (including transport time)

The Mission: Lifeline Bridging Form is being developed for the use of STEMI Referral Hospitals and will focus on abbreviated STEMI emergency treatment, process times, and discharge data.

Recommendations for PCI-Capable Hospitals

- ♥ Quick STEMI identification
    - ♥ Is there a STEMI identification protocol in place?
    - ♥ Is there a quality improvement process?

- ♥ Based on AHA guidelines STEMI identification should be made by ECG interpretation within 10 minutes of patient arrival. A STEMI Alert Notification should be activated.

- ♥ Facilities should share their STEMI patient related data and identify a liaison for their facility to collaborate regionally with quality improvement and data reviews activities.

- ♥ Designated emergency physician(s), nurse leaders, and cardiologists should be identified and involved in their institution's STEMI system development, management, quality improvement, and outreach to referring hospitals, physicians, and EMS providers.

- ♥ The hospital administration should provide infrastructure support to the emergency physician(s), nurse, and cardiology leaders, which should include protected time for activities related to STEMI system management

- ♥ Protocols should be established that allow EMS-diagnosed STEMI patients to bypass the ED to go directly to the cardiac catheterization laboratory, when appropriate.

- ♥ Protocols should be established to minimize the time it takes to get the patient to the catheterization lab, when appropriate.

American Heart Association- Mission: Lifeline™
Recommendations for PCI Hospitals/ STEMI-Receiving Center

1. Protocols for triage, diagnosis and Cardiac Catheterization Laboratory activation should be established within the primary PCI hospital/STEMIReceiving Center. A single activation phone call should alert the STEMI team. Criteria for EMS activation of the Cardiac Catheterization

2. Laboratory should be established in conjunction with EMS offices.

3. The STEMI-Receiving Center should be available 24 hours/7 days a week to perform primary PCI.

4. The Cardiac Catheterization Laboratory staff including interventional cardiologist should arrive within 30 minutes of activation call.

5. There should be universal acceptance of STEMI patients (no diversion). There should be a plan for triage & treatment for simultaneous presentation of STEMI patients.

6. Interventional cardiologists should meet ACC/AHA criteria for competence. Interventional cardiologists should perform at least 11 primary PCI procedures per year and 75 total PCI procedures per year.

7. The STEMI-Receiving Center should meet ACC/AHA criteria for volume and perform a minimum of 36 primary PCI procedures and 200 total PCI procedures annually.

8. The STEMI-Receiving Center should participate in the Mission: Lifeline-approved data collection tool, ACTION Registry – GWTG.

9. A program should be in place to track and improve treatment (acutely & at discharge) with ACC/AHA guideline based Class I therapies.

10. There should be a recognized STEMI-Receiving Center liaison/system coordinator to the system and a recognized physician champion.

11. There should be monthly multidisciplinary team meetings to evaluate outcomes and quality improvement data. Operational issues should be reviewed, problems identified, and solutions implemented. The following measurements should be evaluated on an ongoing basis:
    a. Door-to-balloon (first device used) time, non-transfer within 90 minutes
    b. STEMI Referral Hospital ED door-to-balloon (first device used) time, transfer within 90 minutes
    c. First Medical contact to balloon inflation (first device used) non-transfer within 90 minutes
    d. First Medical contact to balloon inflation (first device used) transfer
    e. Proportion of eligible patients receiving reperfusion therapy
    f. Proportion of eligible patients administered guideline-based Class I therapies
    g. Proportion of patients with field diagnosis of STEMI and activation of the Cardiac Catheterization Laboratory for intended primary PCI that
        i) do not undergo acute catheterization because of misdiagnosis
        ii) undergo acute catheterization and found to have no elevation in cardiac biomarkers and no revascularization in the first 24 hours
    h. In hospital mortality

Recommended Data Collection Points

Pre-Hospital and Inter-Facility

- ♥ Number of cardiac patients
- ♥ Number of STEMI patients
- ♥ Aspirin given—when?
- ♥ Nitrates given—when?
- ♥ Oxygen?
- ♥ Morphine?
- ♥ Fentanyl?
- ♥ Utilization of 12-lead
- ♥ Time to initial ECG reading
- ♥ On-scene time
- ♥ Use of medevac
- ♥ Activation of STEMI Team
- ♥ Transport time to definitive care

Hospital

- ♥ Presentation—time from pain onset?
- ♥ Time spent in ED
- ♥ ED to lab time
- ♥ Lab time to balloon interval
- ♥ Transmission capabilities with EMS
- ♥ PCI Center
- ♥ Non-PCI Center
- ♥ False STEMI identification
- ♥ Contraindications to fibrinolysis
- ♥ Patient Outcome

Recommended Acute STEMI Protocol for Hospitals without PCI Capability

A. **Initial adjunctive therapy:**
   1. ASA 162-325 mg PO
   2. Nitroglycerin paste 1 to 2 inches
   3. Morphine Sulfate IV PRN
   4. Supplemental oxygen

B. **Indications for Fibrinolytic therapy:**
   1. Expected Door-to-Balloon (D2B) time is **greater than** 90 minutes.
   2. Catheterization laboratory occupied/ not available or vascular access difficulties.
   3. Target: Door-to-needle time ≤ **30 minutes.**

C. Indications for Primary PCI:
   1. Late presentation (> 3 hours from pain onset).
   2. Early presentation (≤ 3 hours from pain onset) and anticipated door-to-balloon (D2B) time is **less than** 90 minutes.
   3. Severe CHF/pulmonary edema, cardiogenic shock,
   4. Contraindications to fibrinolysis (see G): ↑ risk of bleed, intracranial hemorrhage.
   5. Diagnosis is not certain (e.g. equivocal ECG with symptoms of MI).
   6. Target: 1st hospital D2B time < **90 minutes.**

D. Contraindication to Primary PCI:
   1. Asymptomatic patients > 12 hours after onset of STEMI and they are hemodynamically and electrically stable.
   2. Extensive co-morbidities in which the risks of revascularization outweigh the benefits (e.g. significant advanced age, prolonged CPR with uncertain neurological status).
   3. Delay to catheterization lab: consider fibrinolytic therapy.
   4. Vascular access difficulties: consider fibrinolytic therapy.

E. Primary PCI Protocol:
   1. Emergency department (ED) first calls transport (ambulance or helicopter). If patient initially arrived to ED by ambulance, then keep ambulance at ED for possible transfer to another hospital with cath lab capability.
   2. ED then calls the hospital access line to activate the team and contact the cardiologist on call. The cardiologist is connected to the ED to discuss the case. Transport and the cath team will be activated prior to any discussion with the cardiologist on the ED physician's decision to proceed with PCI.
   3. Local hospital with a STEMI call roster will inform the access line who will contact the receiving physician (Must be an Interventional Cardiologist).

4. When the diagnosis is made in the field, EMS should notify the ED at the receiving facility to expedite care.

D. Adjunctive medical regimen for PCI:

      1. Anticoagulation, choose either:

          a. Heparin IV 60 units/kg IV bolus (max 4000 units) or,

      2. Gb IIb/IIIa inhibitor:

          a. Integrilin (eptifibatide): 180mcg/kg IV bolus (max 22.6 mg).

          b. Reopro (abciximab): for renal failure patients on hemodialysis, 0.25 mg/kg IV bolus.

      3. Clopidogrel 600 mg oral bolus (optional prior to cardiac cath).

E. Target times:

      1. Door-to-ECG and decision: 10 minutes   **ED door-in to**

      2. Call for transport-to-door out: 20 minutes   **door-out <30 minutes**

      3. Transport time: approximately 30 minutes

      4. Cath lab arrival-to-balloon time: 30 minutes

      *Goal 1st hospital door-to-balloon time ≤ 90 minutes.

F. Important notes:

      1. When primary PCI is indicated, call transport immediately and <u>do not wait for response from cardiologist.</u> A decision to cancel transport can always be made afterwards.

      2. In order to reduce transport time, <u>avoid continuous IV infusions.</u>

      3. If the patient initially arrived to ED by ambulance, then <u>keep ambulance</u> for possible transfer to another hospital with cardiac catheterization lab.

      4. ED may fax ECG to cardiologist if requested: however, activation of transportation (call for ambulance) should <u>not</u> be delayed.

American Heart Association- Mission: Lifeline™
STEMI System of Care
(All must be present in order to be certified)

1. The system should be registered with Mission: Lifeline.
2. There should be ongoing multidisciplinary team meetings that include EMS, non-PCI hospitals/ STEMI Referral Centers, and PCI hospitals/STEMI- Receiving Centers to evaluate outcomes and quality improvement data. Operational issues should be reviewed, problems identified, and solutions implemented.
3. Each STEMI System should include a process for pre-hospital identification and activation, destination protocols to STEMI Receiving Centers, and transfer for patients who arrive at STEMI Referral Centers and are primary PCI candidates, and/or are fibrinolytic ineligible and/or in cardiogenic shock.
4. Each system should have a recognized system coordinator, physician champion, and EMS medical director.

Each system component (EMS, STEMI Referral Centers and STEMI-Receiving Centers) should meet the appropriate criteria listed above.

Definitions

12-Lead Electrocardiogram (ECG) - a test using a device that measures electrical activity of the heartbeat and can help medical personnel determine if a heart attack has occurred. It can also help determine whether the heart attack was a STEMI or non-STEMI event. When a 12-lead ECG is done, 10 wires ("leads") are attached to the arms, legs, and chest. These wires each record electrical impulses, but from a different position in relation to the heart.

Acute – in medicine, a disease with a rapid onset and/or short duration.

Acute Myocardial Infarction (AMI) - commonly known as a "heart attack", is the interruption of blood flow to part of the heart.

Angioplasty – a surgical procedure that requires a slender balloon-tipped tube to be threaded from an artery in the groin to a trouble spot in the artery of the heart. The balloon is then inflated, which compresses the blockage and widens the narrowed artery to restore blood flow. This procedure is used to treat patients with a partially or completely blocked artery that restricts blood flow through the heart.

Acute Coronary Syndrome (ACS) – this is an umbrella term for types of coronary artery disease associated with a sudden rupture of plaque inside the coronary artery. These may include unstable angina, non-ST segment elevated myocardial infarction (NSTEMI), and ST segment elevation myocardial infarction (STEMI). These are all life-threatening conditions requiring emergency medical care.

Balloon Inflation – see angioplasty.

Catheterization Laboratory – the department in a medical facility that specializes in cardiac catheterization, which is a procedure to examine blood flow to the heart and test how well the heart is pumping.

Cardiogenic Shock – a state of inadequate tissue perfusion due to cardiac dysfunction, most commonly caused by an acute myocardial infarction.

Door-to-Balloon Time – is the amount of time between a heart attack patient's arrival at the hospital and the time he/she receives percutaneous coronary intervention (PCI), such as angioplasty.

Door-to-Needle Time – is the amount of time between the heart attack patient's arrival to the hospital to the time he/she receives clot busting medications, referred in medical terms to fibrinolytics or thrombolytics.

Electrocardiogram (ECG/EKG) - a recorded tracing of the electrical activity of the heart.

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

Fibrinolysis – a normal body process that keeps naturally occurring blood clots from growing and causing problems. Primary fibrinolysis refers to the normal breakdown of clots. Secondary fibrinolysis is the breakdown of blood clots due to a medical disorder, medicine, or other cause.

Fibrinolytic Therapy – the use of pharmaceuticals or injections of medications to break up a blood clot inside an artery or cavity of the heart so that blood flow can be improved or restored. Also called thrombolytics.

Mission- Lifeline – is the American Heart Association's national initiative to improve healthcare system readiness and response to STEMI patients. It seeks to reduce mortality and morbidity and improve the overall of care and outcomes for STEMI patients. The ultimate goal of Mission: Lifeline is to save lives by closing gaps that separate STEMI patients from timely access to appropriate treatments.

Non-PCI Hospital – is a type of hospital that does not have the means to deliver percutaneous coronary intervention (PCI), the preferred means of treating a STEMI heart attack patient if done within the critical 90-minute window. Non-PCI hospitals can: administer clot-busting medicines that meet the healthcare needs of the non-STEMI patients to PCI hospitals; and treat STEMI patients with medications when it is not feasible for them to get to a PCI-capable hospital for treatment in a timely manner.

Percutaneous Coronary Intervention (PCI) – see angioplasty.

PCI-Capable Hospital – is a hospital that has the equipment, expertise, and facilities to administer percutaneous coronary intervention (PCI), a mechanical means of treating heart attack patients.

Point of Entry (POE) – is the part of the healthcare community where treatment of a patient begins, such as when emergency medical services arrive on scene or the patient walks into the emergency department at a hospital.

Reperfusion Therapy – is one or more techniques to restore blood flow to part of the heart muscle damaged during a heart attack. It may include clot-dissolving drugs (thrombolysis), balloon angioplasty or surgery.

STEMI (ST-elevated myocardial infarction) – is an acute ischemia (lack of blood) to the heart tissue sufficient to cause tissue damage where there is ST segment elevation on the electrocardiographic (ECG) readings.

Thrombolytics – is the use of pharmaceuticals or injections of medication to break up a blood clot inside an artery or cavity of the heart so that blood flow can be improved or restored. Also known as fibrinolytic therapy.

Documents Referenced

- AHA Mission: Lifeline™ documents and tools

- AHA Taskforce, et al. 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction: Executive Summary. AHA Circulation. 2012; 127, 533-538

- Northern Virginia Pre-hospital and Inter-facility Regional STEMI Plan; March 2011