



Peninsulas EMS Council, Inc.
Regional STEMI Plan

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Executive Summary

Under the direction of the Peninsulas EMS Council Medical Advisory Committee, The Peninsulas EMS Council has been charged with the responsibility of maintaining a Regional STEMI Triage Plan. The Regional STEMI Triage Plan establishes a strategy that incorporate the region's geographic variations and STEMI care capabilities and resources, including hospitals self designated as "STEMI Centers". The purpose of the Regional STEMI Triage Plan is to establish a uniform set of criteria for the pre-hospital triage and transport of acute STEMI patients.

It is important to note that STEMI patients should be recognized as quickly as possible to identify those eligible for thrombolytic or invasive therapy. Copious data have shown that both morbidity and mortality can be optimized by an approach of rapid interventional reperfusion targeted to within ninety minutes of hospital arrival. Further data have demonstrated that in-the-field recognition by pre-hospital providers utilizing 12-lead ECG coupled with pre-hospital notification of the receiving facilities can further reduce time to reperfusion, and is associated with further improvement in outcomes. EMS personnel must be trained to recognize, treat and transport ST Elevation Myocardial Infarction (STEMI) patients in a timely manner. Although this diagnosis may be confirmed by physicians in the emergency departments, it should be recognized by pre-hospital care providers competent to apply STEMI diagnostic criteria through the use of their 12 lead monitor defibrillators.

The primary goal of the PEMS Regional STEMI Plan is: **To develop a STEMI Emergency Care System that, when implemented, will result in decreased cardiac mortality and morbidity in the PEMS Region.** In order to accomplish this, a number of specific processes are essential. These are:

1. The ability to rapidly and accurately identify patients suffering from STEMI.
2. Patients who have sustained a STEMI event must receive care in a hospital that has a STEMI treatment program in place which is capable of providing immediate and comprehensive assessment, resuscitation, intervention, and definitive care.
3. The Peninsulas EMS Council must assist in the coordination of a process for continuous and effective region-wide coordination of pre-hospital and hospital care resources, so that STEMI patients will be most expeditiously transported to the closest available interventional center or facility capable of performing PCI, so patient care can be provided in a manner that is both appropriate and timely, while establishing and maintaining continuity. To accomplish this process there must be a method of tracking the care capability for STEMI patients and reviewing the quality of the process itself.
4. The regional plan must provide all hospitals in the region the opportunity to participate in the system (an inclusive system), and to receive STEMI patients if they are willing to meet the system and operational criteria, as established by this plan.
5. Provide quality EMS service and patient care to the EMS Systems citizens.
6. Continuously evaluate the EMS System based on established STEMI EMS performance measures.

Definitions

12-lead electrocardiogram (ECG) - A test using a device that measures the electrical activity of the heartbeat and can help medical personnel determine if a heart attack has occurred and whether the heart attack was a STEMI or non-STEMI event. When a 12-lead ECG is done, 10 wires ("12 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 Myocardial Infarction - The medical term for a heart attack, which occurs when the blood supply to part of the heart muscle itself - the myocardium — is severely reduced or stopped.

Angioplasty - A procedure used to treat patients with a partially or completely blocked artery that restricts blood flow through the heart. A type of percutaneous coronary intervention (PCI), this procedure 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.

Balloon Inflation - Another name for angioplasty, which is a surgical procedure used to treat patients with a partially or completely blocked artery that restricts blood flow through the heart. A type of percutaneous coronary intervention (PCI), this procedure 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.

Cath Lab - 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.

Door-to-Balloon Time (D2B) - The amount of time between a heart attack patient's arrival at the hospital to the time he/she receives percutaneous coronary intervention (PCI), such as angioplasty.

Door-to-Needle Time (D2N) - The amount of time between a heart attack patient's arrival at the hospital to the time he/she receives clot-busting medications, referred to in medical terms as fibrinolytics or thrombolytics.

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

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

EMS-to-Balloon Time (E2B) - The amount of time between a heart attack patient's entry into the pre-hospital system (*entry into the pre-hospital system begins when they call 911*), the time he/she receives percutaneous coronary intervention (PCI), such as angioplasty.

Fibrinolytic Therapy - 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 called thrombolytics, this type of treatment is widely available at hospitals across the United States.

Non-PCI hospital - 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 health care needs of non-STEMI patients; refer STEMI patients to PCI hospitals, thus the name PCI-referral hospital; 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) - The family of medical procedures that uses a "mechanical" means to treat patients with partially or completely restricted blood flow through an artery of the heart. Examples include balloon angioplasty and stents.

PCI-Capable Hospital - A hospital that has the equipment, expertise and facilities to administer percutaneous coronary intervention (PCI), a mechanical means of treating heart attack patients. Although PCI is the preferred means of treating STEMI patients, only 25% of hospitals in the U.S. are equipped to do so. These PCI-capable hospitals are called STEMI-receiving hospitals because they are well equipped to receive and treat STEMI patients.

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

Reperfusion Therapy - 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.

ST-elevation myocardial infarction (STEMI) - A severe heart attack caused by a prolonged period of blocked blood supply that affects a large area of the heart. These attacks carry a substantial risk of death and disability and call for a quick response by many individuals and systems.

STEMI System - An integrated group of separate entities focused on reperfusion therapy for STEMI within a region that typically includes emergency medical services (EMS) providers, at least one community (non-PCI or STEMI-referral) hospital and at least one tertiary (PCI-capable or STEMI-receiving) hospital. The system may include one or more of the following components: leadership teams of EMS, emergency medicine, cardiology, nursing and administration; standardized communication (i.e., STEMI alert system); standardized transportation; and data collection and feedback. Please note: In some systems, there may be a single hospital with PCI capabilities that has established protocols with EMS providers and contains at least one of the components stated above.

Thrombolytics - 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 called fibrinolytic therapy, this type of treatment is widely available at hospitals across the United States.

VHAC – Virginia Heart Attack Coalition

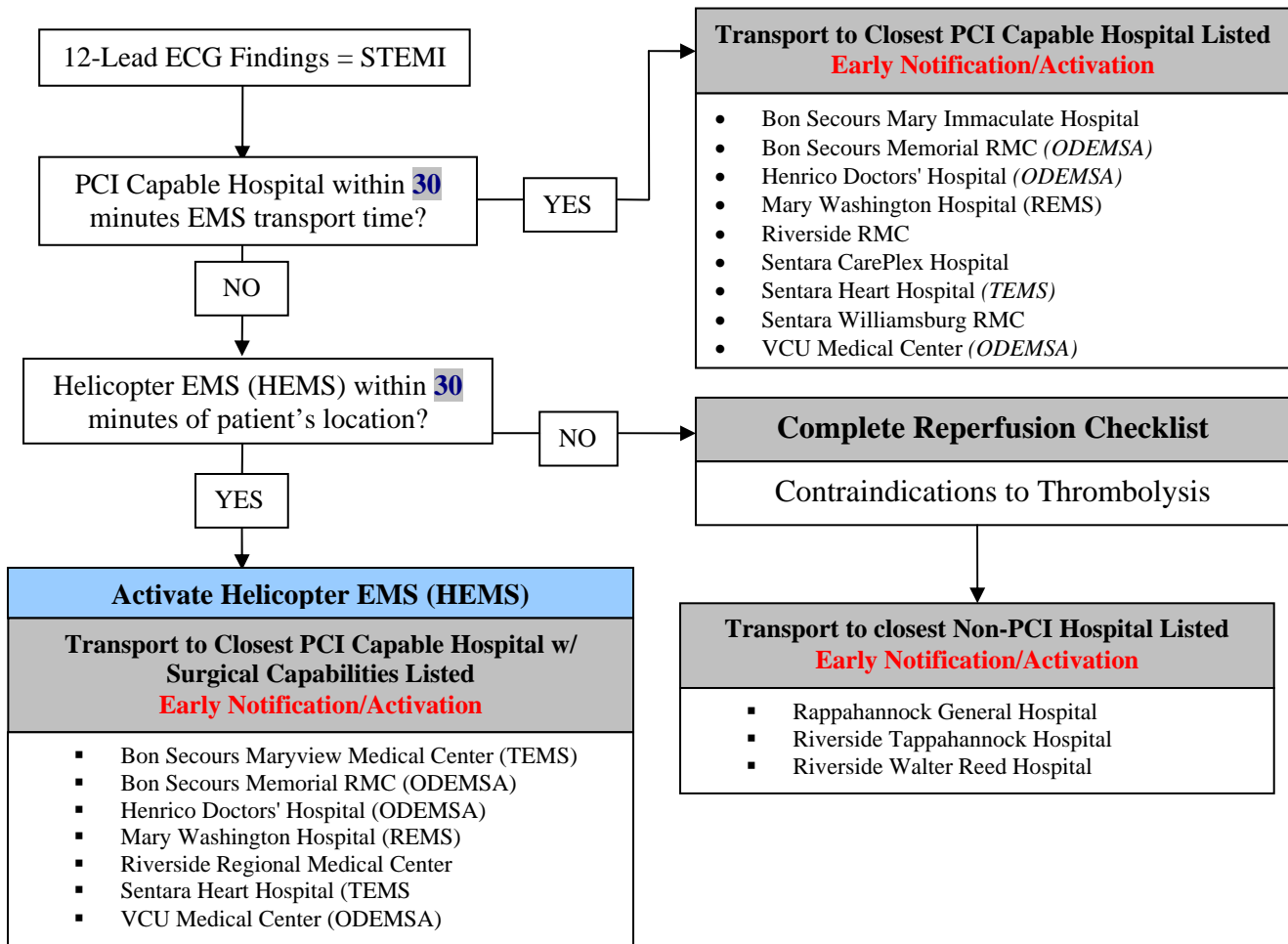
Field STEMI Triage Decision Scheme

The Purpose of this Decision Scheme is to:

- Rapidly identify STEMI patients who call 911 or present to EMS
- Minimize the time from onset of STEMI symptoms to coronary reperfusion
- Quickly recognize a potential STEMI by 12-lead ECG
- Complete a reperfusion checklist (unless being transported directly to a PCI hospital) to determine thrombolytic eligibility
- Rapidly identify the best hospital destination based on symptom onset time, reperfusion checklist, and predicted transport time
- Early activation/notification to the hospital prior to patient arrival
- Minimize scene time to 15 minutes or less (including a 12-lead ECG)

STEMI Patient (ST Elevation Myocardial Infarction)

1. Cardiac symptoms **AND**
 - 12-lead ECG criteria of 1 mm ST elevation (or more) in 2 or more contiguous leads **OR**
 - 12-lead ECG interpretation with an “ACUTE MI” statement **OR**
 - Left Bundle Branch Block **NOT KNOWN** to be present in the past



Any patient with a compromised airway or impending circulatory collapse must be transported to the closest hospital Emergency Department.

Percutaneous Coronary Intervention (PCI) Capable Hospital

The Peninsulas EMS Council defines a **PCI (Percutaneous Coronary Intervention) Capable Hospital** as a hospital with “an emergency interventional cardiac catheterization laboratory capable of providing the following services to acute STEMI patients.”

1. Protocols for triage, diagnosis and Cardiac Catheterization Laboratory activation should be established within the primary PCI hospital/STEMI-Receiving Center. A single activation phone call should alert the STEMI team. Criteria for EMS activation of the Cardiac Catheterization Laboratory should be established in conjunction with EMS.
2. The PCI Capable Hospital should be available 24 hours/7 days a week to perform primary PCI.
3. The Cardiac Catheterization Laboratory staff including interventional cardiologist should arrive within 30 minutes of activation call.
4. There should be universal acceptance of STEMI patients (no diversion due patient volume). There should be a plan for triage and treatment for simultaneous presentation of STEMI patients.
5. The PCI center must meet the Hampton Roads VHAC quality measures. Hampton Roads VHAC will then provide a list of those centers to the PEMS Medical Advisory Committee on a semi-annual basis.
6. The STEMI-Receiving Center must participate in the Peninsulas EMS Council Performance Improvement Program.
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. There should be a recognized STEMI-Receiving Center liaison/system coordinator to the system and a recognized physician champion.
9. 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 do not undergo acute catheterization because of misdiagnosis
 - i. undergo acute catheterization and found to have no elevation in cardiac biomarkers and no revascularization in the first 24 hours
 - h. In-hospital mortality
10. Free standing emergency departments and satellite facilities are not considered a PCI Capable Hospital.

The process of PCI Center identification is entirely voluntary on the part of the hospitals. As of September 15, 2010, the current PCI Capable Hospitals are:

- Bon Secours Mary Immaculate Hospital
- Bon Secours Memorial Regional Medical Center (*ODEMSA*)
- Henrico Doctors' Hospital (*ODEMSA*)
- Mary Washington Hospital (*REMS*)
- Riverside Regional Medical Center
- Sentara CarePlex Hospital
- Sentara Heart Hospital (*TEMS*)
- Sentara Williamsburg Regional Medical Center
- VCU Medical Center (*ODEMSA*)

PCI Capable Hospital w/ Surgical Capabilities is defined as a PCI Capable Hospital with onsite surgical backup capabilities available 24 hours/7 days.

The process of PCI Center identification is entirely voluntary on the part of the hospitals. As of March 24, 2010, the current PCI Capable Hospital w/ Surgical Capabilities are:

- Bon Secours Maryview Medical Center (*TEMS*)
- Bon Secours Memorial Regional Medical Center (*ODEMSA*)
- Henrico Doctors' Hospital (*ODEMSA*)
- Mary Washington Hospital (*REMS*)
- Riverside Regional Medical Center
- Sentara Heart Hospital (*TEMS*)
- VCU Medical Center (*ODEMSA*)

Non-PCI Hospital is defined as “a local hospital within the EMS System’s service area which provides emergency care, including thrombolytic administration, to an acute STEMI patient but does NOT provide PCI services.”

As of March 24, 2010, the current Non-PCI Capable Hospitals are:

- Rappahannock General Hospital
- Riverside Tappahannock Hospital
- Riverside Walter Reed Hospital

PEMS Regional Patient Care Guideline

ALS 5 - Acute Coronary Syndromes (Chest Pain)

CRITERIA

1. Description of symptoms sounds suspiciously cardiac
2. Pulse rate greater than 60 and less than 140 per minute
3. Evaluate for atypical presentation of signs and symptoms
4. Short EMS to Balloon time is a primary goal in treatment of chest pain



Medication administration must not delay patient transport.

E I P 1. Place patient in position of comfort

E I P 2. Ensure adequate airway and oxygenation

E I P 3. Obtain patient history for:

- Active internal bleeding
- Prolonged CPR
- Recent surgery
- Prior CVA
- Severe hypertension
- Pregnancy
- Cocaine usage within 24 hours

E I P 4. Monitor cardiac status, and record 12-lead ECG (*if available*) prior to Nitroglycerin administration



12-lead ECG criteria of 1 mm ST elevation in 2 or more contiguous leads **OR** 12-lead ECG interpretation with an “**ACUTE MI**” statement **OR** Left Bundle Branch Block **NOT KNOWN** to be present in the past, immediate transport (< 15 minute scene time) to PCI center, See *STEMI Triage Decision Scheme*, Administrative Policies & Procedures.

For an inferior wall MI, the provider should complete a right sided ECG to determine if a right ventricular infarct is present. If present, an IV must be established before the administration of any nitroglycerin, morphine, or diuretics. An administration of 250-500cc of IV fluid, if breath sounds are clear, will help offset the patient's potential hypotensive response.

E I P 5. Administer **four (4) 81 mg baby aspirin** (chewed); **Give aspirin even if patient is on daily aspirin regimen**

E I P 6. Establish IV access

Limit IV attempts in anticipation of subsequent anticoagulation therapy

[E] I P 7. Administer one **0.4 mg Nitroglycerin SL** if BP is 100 mm/Hg, or greater
a. **If blood pressure is 100 mm/Hg, or greater, and no pain relief results**, repeat NTG every 5 minutes up to a total of three doses


Do not administer Nitroglycerin if the patient has taken Viagra (Sildenafil), Revatio (Sildenafil) for Pulmonary Hypertension, Levitra (Vardenafil HCL) or a similar drug within the last 24 hours, Cialis (Tadalafil) within 48 hours.

b. **If blood pressure is 100 mm/Hg, or greater, and pain continues**, consider **2-5 mg increments Morphine Sulfate IV** (over 1 minute), repeated every 3-5 minutes, titrated to pain relief (**10 mg maximum dose**).

8. **If the pain persists**, contact Medical Control.

BLS 5 - Chest Pain

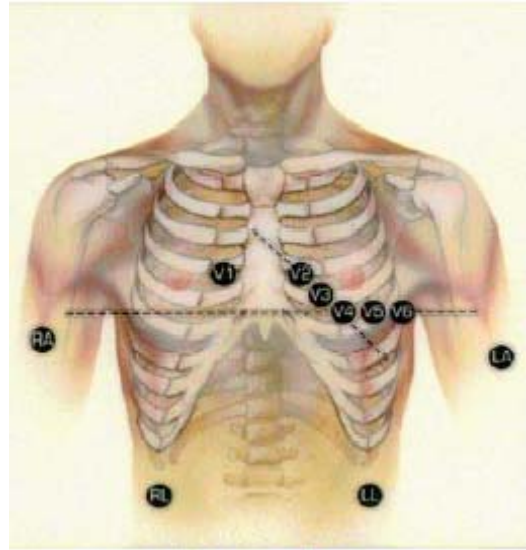
1. Perform an initial assessment and treat priority conditions
2. Provide high-flow oxygen (15 L/min) by non-rebreather mask
3. Perform a Focused History and Physical Exam, including OPQRST history for:
 - Active internal bleeding
 - Prolonged CPR
 - Recent surgery
 - Prior CVA
 - Severe hypertension
 - Pregnancy
 - Cocaine usage within last 24 hours
4. Place and record 12-lead ECG (*if available*):
 - 12-lead ECG machine interpretation with an “ACUTE MI” statement, immediate transport (< 15 minute scene time) to PCI center, See *STEMI Triage Decision Scheme*, Administrative Policies & Procedures.
5. If the patient has prescribed NTG spray or tablets:
 - a. Check medication for date of expiration, and recent administration.
 - b. Evaluate blood pressure:
 - i. If blood pressure is less than 100 mm/Hg transport immediately
 - ii. If blood pressure is equal to or greater than 100 mmHg continue protocol

 **Do not administer Nitroglycerin if the patient has taken Viagra (Sildenafil), Revatio (Sildenafil) for Pulmonary Hypertension, Levitra (Vardenafil HCL) or a similar drug within the last 24 hours, Cialis (Tadalafil) within 48 hours.**
6. **Contact Medical Control**
7. Administer **four (4) 81 mg baby aspirin** (chewed)
8. Administer one dose of the **patient’s prescribed** NTG spray or tablet sublingually.
9. Continuously reassess vital signs
10. **If the pain persists**, contact Medical Control.

Skills 1 – 12 Lead ECG

A 12 lead should be performed for any patient presenting the following clinical indications:

- Suspected cardiac patient
- Suspected tricyclic overdose
- Electrical injuries
- Syncope/Near-Syncope
- CHF
- Vomiting
- Chest Pain
- Shortness of Breath
- Abdominal Pain
- Upper back pain (non-muscular)



Procedure:

1. Prepare ECG monitor and connect patient cable with electrodes
2. Expose chest and prep as necessary; modesty of the patient should be respected
3. Apply chest leads and extremity leads using the following landmarks:
 - RA - Right arm or as directed by manufacturer
 - LA - Left arm or as directed by manufacturer
 - RL - Right Leg
 - LL - Left Leg
 - V1 - 4th intercostal space at right sternal border
 - V2 - 4th intercostal space at left sternal border
 - V3 - Directly between V2 and V4
 - V4 - 5th intercostal space at midclavicular line
 - V5 - Level with V4 at left anterior axillary line
 - V6 - Level with V5 at left midaxillary line
4. Instruct patient to remain still
5. Press the appropriate button to acquire the 12-Lead ECG
6. Print data as per guidelines and attach a copy of the 12-Lead to the PPCR. Place the name and age of the patient on the paper copy of the ECG.
7. If STEMI suspected, transmit ECG to receiving facility (if possible)
8. Document the procedure, time, and results on/with the patient care report (PPCR)

Administrative Policies & Procedures – Air Medical Transport

Indications:

1. Patients meeting specialty care criteria (*see EMS Triage & Designation Procedures*) who can be delivered to an appropriate facility more rapidly by air ambulance than by ground transport.
2. The air ambulance service can provide needed medical capability at the scene.
3. Difficult-access situations:
 - Wilderness rescue
 - Ambulance egress or access impeded at the scene by road conditions, weather, or traffic

Policy: Senior technicians and designated officers shall have discretionary authority to summon appropriate air medical transport service prior to contacting Medical Control.

Procedure:

1. Establish a safe and logistically feasible landing zone.
2. Request air ambulance standby/response according to department procedure.
3. Establish number of patients, primary injuries/medical condition, and approximate patient weight(s). Forward this information to the responding air medical service.
4. Contact on-line Medical Control. Provide a situation report.
5. Trauma patients should be fully immobilized. IV access should be established as time allows.
6. One individual, on-scene, should be responsible for providing the patient report(s) to the flight crew upon arrival.

Note:

If the patient becomes ready for transport and air ambulance ETA is delayed for more than 10 minutes, initiate immediate ground transport as outlined in EMS Triage & Designation Procedure.

Performance Improvement Process

Purpose

The purpose of the PEMS **STEMI PI Project** is to evaluate the Pre-hospital care provided to patients diagnosed with ST elevation MI or new onset of LBBB. The project will have three primary evaluation areas: timeliness of care, treatment provided, and outcomes of care. The fields identified are critical to analyses for the following reasons: they allow linking of EMS data and hospital STEMI data, they allow for “real time” collection of data focused upon process improvement, and they allow for retrospective systemic analyses. The ultimate goal of collecting this data is to provide actionable information, to the PEMS Performance Improvement Committee (PI Committee) and the PEMS Medical Advisor Committee (MAC), relative to the care processes and outcomes associated with their treatment of STEMI’s as it relates to EMS.

Patient Eligibility Criteria

STE/ LBBB

Patients identified with a diagnosis with ST elevation MI or new onset of LBBB as determined by initial receiving hospital.

Data Collection Process

1. Receiving hospitals will identify patients with a diagnosis with ST elevation MI or new onset of LBBB and that were transported by EMS to their facility
 - a. The receiving hospital will complete a STEMI Data form or sent the need data to the PEMS office
2. The STEMI Data form will be forward to the transporting EMS agency for completion or forward the copy of the PPCR to PEMS Council office to enter the data
3. PEMS Staff will collect the patient care statistics to evaluate system effectiveness and identify trends in EMS patient care
4. The PEMS PI Committee will establish Regional Clinical Bench Marks to measure the PEMS Regional system effectiveness and report all findings to the MAC Committee

Performance Measures

There should be quarterly Performance Improvement 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:

1. EMS-to-balloon time, with in 90 minutes
2. Hospital Door-to-balloon (first device used) time, non-transfer within 90 minutes
3. STEMI Referral Hospital ED door-to-balloon (first device used) time, transfer within 90 minutes
4. EMS Field bench markers
 - a. Patient contact to 12 acquired
 - b. EMS system on scene time
 - c. Compliance with ASA administration
 - d. Compliance with NTG administration
 - e. Compliance with MS administration
 - f. 12 lead acquired to Medical Control notification
5. Proportion of patients with EMS diagnosis of STEMI and activation of the Cardiac Catheterization Laboratory (Transmission vs. non transmission) for intended primary PCI that
 - a. do not undergo acute catheterization because of misdiagnosis
 - b. undergo acute catheterization and found to have no elevation in cardiac biomarkers and no revascularization in the first 24 hours
6. In-hospital mortality

Appendix A: Thrombolytic Checklist

PHOTOCOPY THIS FORM AND LEAVE A COPY WITH ED PHYSICIAN AT BEDSIDE

INCIDENT DATA

Date	<input type="text"/>	Agency	<input type="text"/>	Unit #	<input type="text"/>
Patient Name	<input type="text"/>	Age	<input type="text"/>	DOB	<input type="text"/>

INDICATIONS FOR USE OF CHECKLIST

Patient experiencing chest discomfort for greater than 15 minutes and less than 12 hours, **AND...**
12-lead ECG shows STEMI or presumably new LBBB.

Are there any contraindications to fibrinolysis?

- | | | | | | | |
|---|--------------------------|-----|--------------------------|-----|--------------------------|----|
| Systolic BP greater than 180 mm Hg | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO | | |
| Diastolic BP greater than 110 mm Hg | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO | | |
| Right vs. left arm systolic BP difference greater than 15 mm Hg | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO | | |
| History of structural central nervous system disease | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO | | |
| Significant closed head/facial trauma within the previous 3 months | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO | | |
| Recent (within 6 weeks) major trauma, surgery (including laser eye surgery), GI/GU bleed | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO | | |
| Bleeding or clotting problem or on blood thinners | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO | | |
| CPR greater than 10 minutes | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO | | |
| Pregnant female | <input type="checkbox"/> | N/A | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| Serious systemic disease (e.g., advanced/terminal cancer, severe liver or kidney disease) | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO | | |

Is patient at high risk?

- | | | | | |
|---|--------------------------|-----|--------------------------|----|
| Heart rate greater than or equal to 100 bpm AND systolic BP less than 100 mm/Hg | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| Pulmonary edema (rales) | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| Signs of shock (cool, clammy) | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| Contraindications to fibrinolytic therapy | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |

Comments

