

# Birmingham Regional EMS System STEMI System Plan

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### **Regional STEMI Plan: Rationale**

- 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. If all hospitals currently providing acute interventional therapy within the BREMSS region opt to participate in the plan, the proximity to interventional centers is close enough that routine triage to hospitals capable of providing acute interventional reperfusion would generally be indicated. 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.
- Every hospital providing care to cardiac patients will have a recognized STEMI Plan that defines the optimal treatment pathways appropriate for that particular institution.
- Response systems, including optimal time frames, must be established, maintained, and monitored in the region from EMS recognition to Emergency Department arrival to cardiac catheterization lab intervention. The goal should be to (a) recognize potential STEMI patients in the field and rapidly conduct a 12 lead ECG (b) identify when criteria is met for the presence of a STEMI on the initial ECG as recognized by their 12 lead monitor defibrillators (c) enter the patient in STEMI system with ATCC and transport to the closest available facility capable of PCI (d) establish a system to rapidly transfer STEMI patients in need of PCI if at a non-PCI facility.
- Patients who have chest pain should be evaluated with an initial ECG within 10 minutes of hospital arrival. Patients who meet thrombolytic or invasive cardiac care criteria should have access to cardiology expertise within 30 minutes of hospital arrival (phone or physical presence) and invasive cardiac expertise within 90 minutes of hospital arrival.
- Health professional training programs should be enhanced to include a focus on standards of STEMI recognition and management.

### **Regional STEMI Plan: Goals**

The primary goal of this Regional STEMI Plan is:

**To develop a STEMI Emergency Care System that, when implemented, will result in decreased cardiac mortality and morbidity in the BREMSS 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\*:-

\*This term used throughout the plan refers to the current STEMI definition by the American College of Cardiology (ACC) and American Heart Association (AHA) guidelines of ST segment elevations greater than or equal to 1mm in 2 or more contiguous limb leads or greater than or equal to 2mm in 2 or more contiguous precordial leads lacking features of non-infarction causes of ST-segment elevation (e.g. early repolarization, pericarditis, left ventricular hypertrophy, incomplete bundle branch block.) However, if future ACC/AHA definitions of a STEMI patient change, the plan and system will be amended to reflect any approved change.

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. Additionally, receiving hospitals must provide access to rehabilitation programs and participate in data collection.
3. There must be 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 program 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. The system must have an ongoing and effective Quality Improvement (QI) Program, in order to assure continuing appropriate function in providing the highly specialized care necessary in the management of STEMI. This program will include evaluation of: pre-hospital management, hospital management, and overall system function. Collection of a standard pre-hospital dataset and hospital dataset will be required of all system participants, allowing uniform system evaluation to document the effectiveness of the function of the STEMI system.

### **Regional STEMI Plan: Overview**

A Task Force comprised of the regional leaders in EMS, Emergency Medicine, and Cardiology have developed a plan for a STEMI System that meets the goals set forth in the previous section. A system is a group of individual components brought together to function in a unified manner to achieve a specific end result. In this case, the end result is improvement in STEMI patient survival and outcome in BREMSS. The components to some degree have separate and individual identities and functions; however, there should be an understanding, a desire, and willingness to work together in a unified effort to reach the end result. Since there is

no legally sanctioned mandate for development and implementation of a Regional STEMI System, the only option the Task Force had was to develop a voluntary system. A voluntary system requires a uniquely strong commitment to STEMI patients and their care. The Regional System is constituted of the hospitals designated as STEMI Centers and the protocols to be implemented for pre-hospital and hospital treatment of patients that have a STEMI event. These patients will be selected based upon the presence of STEMI system entry criteria included in the Regional STEMI Plan. If patients meet the primary triage criteria for system entry, the STEMI Centers will be utilized for their care. Patients who do not meet the primary triage protocols for entry into the system will not be designated as STEMI System patients and any reference to “STEMI System Patients” in this document does not pertain to this group of patients.

Systems require oversight of project concept, overall responsibility, developmental aspects, implementation, and evaluation of continuing activities. Such an entity is commonly referred to as a lead agency and, in this program; the lead agency is the Birmingham Regional Emergency Medical Services System (BREMSS). This body has the responsibility for coordinating pre-hospital EMS and hospital Emergency Department activities in our region. The authority of this agency is derived from specific activity goals and plans approved by the ADPH/OEMS & T office, the State Emergency Medical Control Committee, and the State Board of Health. Also, the willingness of pre-hospital and hospital healthcare providers in our region to allow BREMSS to serve as the lead agency so that STEMI care in our region is systemically improved is key to this programs success. The Executive Committee of BREMSS serves as the leadership body for this organization and therefore will serve as the oversight for this program along with the Medical Direction and Accountability Committee (MDAC).

The Regional STEMI System involves the organization of already existing resources into a program providing comprehensive care for STEMI patients through all phases of their management from the moment of onset through rehabilitation. The two basic patient management components of this system are the pre-hospital providers and individual hospital organizations.

The system function involves the establishment and implementation of the protocols and STEMI triage criteria included in this Plan. Based upon need, modifications and additions may be developed by the STEMI system Implementation Committee and the STEMI system Operations Committee (both are defined later in this document). The entry criteria are intended to select patients with actual STEMI events. However it is recognized that not all patients with a positive pre-hospital 12 lead ECG are candidates for reperfusion therapy due to current medical/trauma problems, past or present medical history, co-morbid factors, patient preference, or a false positive monitor interpretation and these patients will be excluded from any system, hospital, or EMS performance studies. Upon determination that a patient has had a STEMI event and would benefit from interventional management, specific entry into the STEMI System will be accomplished and resource availability will be surveyed. Protocol directed STEMI Center destination will be determined and the care of these patients will be evaluated through the QI Program.

Once a patient is entered into the System, the closest system hospital with available resources matching the level of patient need can then be selected as the appropriate destination

for that patient, using the Regional STEMI Plan criteria and protocols. Hospitals participating in this system and receiving STEMI system patients will have organized response systems, including 1) equipment and facilities 2) trained and committed personnel and 3) organized management protocols. A regional STEMI system database will be established using the BREMSS LifeTrac STEMI documentation sheet (appendix B), which will provide the region with insight into the Quality Improvement needs in the care of STEMI patients in the BREMSS region. Furthermore, this system will allow documentation of modifications implemented to improve care of STEMI patients in the BREMSS region

Finally, it is important to emphasize that STEMI is an emergent cardiovascular disease. The Emergency Department plays a critical role in STEMI management. Rapid availability of a cardiologist and the ability to perform interventional cardiology care are absolutely pivotal services in determining the survival and recovery of STEMI patients. Emergency Medicine and Cardiology leadership of hospital STEMI programs is, therefore, essential in order for hospitals to participate in the STEMI System. This leadership role must be clearly defined within the Hospital STEMI Plan along with specific appropriate authority to carry out that leadership role. Evidence of continuing leadership should be demonstrated through emergency physician and cardiologist participation in the Regional STEMI System activities and through the individual hospital QI programs.

### **Regional STEMI System: Components and Organization**

The Regional STEMI System is comprised of a number of separate components, which are organized and work together as a system. The individual components and elements, which make up the system, will be described in this section.

#### **I. PRE-HOSPITAL COMPONENT**

EMS Units are an integral part of the Regional STEMI System. All EMT Basics, Intermediates and Paramedics need to have a basic knowledge and awareness of the Regional STEMI System elements and system function. This specifically refers to the entry criteria (identification of a STEMI) and communications procedures. On-line and off-line medical control physicians within the region will also need to be aware of the Regional STEMI System elements and system function. . If either pre-hospital providers or medical control physicians are unclear about entry criteria or system function this information can be easily obtained on a 24 hour a day basis from the Trauma Communications Center.

#### **II. HOSPITAL COMPONENT**

Hospitals will participate in this system on a voluntary basis. Standards are present in Appendix A. Each hospital will be able to determine whether they are on-line (have adequate resources currently available and receive patients based on system operations protocols), are off-line (do not have adequate resources currently available and do not receive patients per the STEMI System), or are conditionally available (have resources

available for certain STEMI patients). The participating hospitals will be able to go on-line and off-line at will.

Each STEMI hospital must have an Emergency Physician and Cardiologist responsible for oversight of the STEMI Program. This responsibility includes:

1. Working with administration to maintain the resources necessary to be a recognized STEMI Center.
2. Establishing and maintaining basic STEMI care protocols for the hospital.
3. Oversight responsibility for the Hospital STEMI QI Program per Plan standards, and participation in Regional STEMI System administrative and QI activities as per the Regional STEMI Plan, including data collection and reporting to BREMSS.

Hospital participation in the Regional STEMI System is accomplished as follows:

- The decision to participate must be made jointly by both Hospital Administration and Medical Staff, with the commitment of human and physical resources. An application is obtained from BREMSS, completed and returned, documenting the hospital's desire to participate.
- An on-site orientation meeting at each applying facility is to be held to review the system design and function, plus the requirements to assure there is a full and complete understanding on the part of the hospital and the medical staff. This meeting must be attended by a minimum of the Emergency Medicine and Cardiologist leader of the STEMI program in that hospital, the Medical Director of the Emergency Department and a Hospital Administrator.
- The STEMI Operations Committee will review the application and on site visit report to document compliance with requirements and knowledge of system design and function and provide a report to the BREMSS Executive Committee.
- The BREMSS Executive Committee will make the final decision regarding hospital participation as a STEMI Center in the System. If approved, the hospital will become part of the System by executing a Memo of Understanding (MOU) with BREMSS documenting their willingness to actively participate in the System.

Hospitals, therefore, must elect whether or not to participate in this system based upon their individual ability to meet the standards for a STEMI Center, the desire of the Medical Staff to participate and support this program, and the willingness of the Hospital Administration to support the Regional STEMI Program.

### III. COMMUNICATIONS COMPONENT

Communications are critical to the function of the STEMI System. Communications provide (1) essential knowledge of the overall status of pre-hospital STEMI activities and hospital resource availability on a continuous basis, (2) access to system organization and function protocols whenever such information is requested by pre-hospital personnel or hospital based personnel, (3) a link between the field and

STEMI Centers for the rapid exchange of information including 12 lead ECG findings resulting in efficient pre-hospital care provision and hospital preparation for STEMI patient arrival, (4) collection of uniform System-wide data for both QI activities and development of a Regional STEMI database. Providing all of these functions to the entire System on a continuous basis requires a central communications facility with constant communications capabilities to all pre-hospital units and participating hospitals, plus the ability to immediately and directly link the pre-hospital providers to the STEMI Centers. This central communications will be facilitated by the existing Trauma Communications Center (ATCC).

The ATCC is staffed 24 hours a day by personnel who will be provided with specific in-depth knowledge of the Regional STEMI System design, function, and protocols. It will be the primary responsibility of the ATCC to coordinate the Regional STEMI System activities by maintaining and providing information whenever needed on field status and hospital status so this data can be used by the pre-hospital and hospital personnel in providing care to patients meeting system entry criteria. The ATCC, a part of the Regional STEMI System, will be managed by BREMSS, and oversight of the day-to-day operations of the ATCC is the responsibility of the BREMSS Executive Director. The ATCC will operate through the system operations protocols. The ATCC will serve as a resource for such protocol information to paramedics who may not be familiar with the protocols. The ATCC will provide the coordination of pre-hospital and hospital resource utilization for STEMI management. Therefore, the general functions of the ATCC are:

1. Assigns unique system I.D. number for each patient meeting system entry criteria for tracking throughout the system.
2. Collects brief pre-hospital data including the pre-hospital 12 lead ECG findings.
3. Provides information on system entry criteria based on preset protocols as requested by EMTs when it is not clear if a patient meets STEMI entry criteria.
4. Maintains knowledge of the functional status of all system hospitals at all times.
5. Maintains knowledge of the STEMI patient activity status in the pre-hospital setting at all times.
6. Coordinates patient destination based on preset protocols as to the closest currently operational Regional STEMI Center.
7. Coordination for optimal resource utilization using pre-established protocols for system function when there are multiple simultaneous events in the region.
8. Establish communication link between EMS provider and receiving facility.
9. Records and enters pre-hospital data for Regional STEMI database.

An Emergency Resources Display is also part of the communications component. The Emergency Resources Display provides each participating hospital and the STEMI Communications Center with the continuous real-time functional status display of all STEMI Centers. The Emergency Resources Display is a simple computer system with terminals at each participating facility and the ATCC. This system provides a display grid listing each individual hospital, and the primary resource components indicating the availability or non-availability of these individual components in each hospital, including their current STEMI

capability status. The STEMI Centers will be able to change their resource availability status and activity level at any time. A record of STEMI hospital activity status for the entire system will be maintained through the Emergency Resources Display at the ATCC. Any change in hospital status as made by hospital personnel at its own display terminal will be automatically communicated to the central system monitoring station at the ATCC. The ATCC maintains a consolidated system wide display status indicating the individual resource availability at the STEMI Centers and their overall functional status at any given time. This consolidated information table will be transmitted back to hospitals. The system is maintained automatically by central monitoring computers with automatic polling and display refresh. If a station's computer fails to acknowledge the poll, that hospital's information will be blanked out on all resource display monitors in the system. If there is an isolated failure at a resource display at a hospital that will not cause a total system fault, rather that hospital will be blanked out and the ATCC will call requesting the information directly. The system integrity is not dependent upon any single station's operation.

#### IV. DATA QUALITY IMPROVEMENT COMPONENT

This component is absolutely essential for function of the Regional STEMI System. The efficacy of the initial care in STEMI patients plays a pivotal role in determining their outcome. Therefore, there is a need to evaluate the system function to determine continuing effectiveness in the management of STEMI. This component uses a system-wide STEMI database, which provides an overall look at STEMI emergencies, care and outcomes, provides information for use in determining and developing STEMI teaching programs, and provides information for use in potential STEMI research studies.

The STEMI QI Dataset is designed as a small dataset, with only twelve fields, and it is intended to fulfill the goals of this component as stated in the previous paragraph. A unique STEMI identification number will allow unification of pre-hospital and hospital data which will increase the data usefulness. The data fields are noted in the following list:

1. Incident location
2. Pre-hospital unit(s)
3. Activity times of pre-hospital
4. Co-morbid factors, current patient vitals and medications.
5. Receiving hospital
6. Patient and system demographics
7. Pre-hospital outcome
8. Hospital status/response
9. Emergency Department disposition
10. Initial (within the first 24 hours) procedures
11. Disposition within first 24 hours
12. Disposition at discharge

A more thorough listing of the STEMI QI Data set is present in Appendix B.

In addition to data collection, the quality improvement (QI) program is a component of the STEMI System. This program is necessary to the STEMI System to document continuing function and allows the implementation of improvements in a system where the patients may not have the ability to make their own personal medical care choices and depend on the system for adequacy and completeness of care. This program will be system-wide, with the individual agencies and hospitals performing their own QI evaluations and reporting to the STEMI Operations Committee. The appropriateness, quality and quantity of all activities in the system must be continuously monitored in the areas of pre-hospital care, medical care of the patients in the hospitals and overall system function.

The basic QI process involves specific steps to be performed by each individual entity. These steps are:

1. Assignment of a QI manager to oversee the process in the organization and coordinate all STEMI system QI activities.
2. Development of a written QI program to evaluate STEMI patient care.
3. Establishment of a QI data collection method
4. Completion of QI evaluations by the individual system participants. Cases to be evaluated include specific automatic audit filters such as major complications and death as well as those cases which are requested for review by those involved in the care of the patient.
5. Determination of the presence (or absence) of QI issues through the data evaluation process.
6. Discussion of QI issues at the formal QI Conference of each individual system participant.
7. Development and implementation of a corrective action plan
8. Re-evaluation of the efficacy of the corrective action plan.

Adequate documentation of these activities is essential. In STEMI Centers a multi-disciplinary peer review process must occur. In STEMI Center QI programs both medical care and STEMI Center function must be evaluated.

The STEMI Operations Committee has the goal of reviewing the entire Regional STEMI Program activities for appropriateness, quality, and quantity of activities. That review is to include system administration/organization activities, pre-hospital care and hospital care. The Operations Committee will document effectiveness of hospital and EMS Service QI evaluations through routine reports of these QI activities provided by each participating entity. The Operations Committee will perform focused review of specific items as determined appropriate, but these reviews will include evaluation of both pre-hospital and hospital activities. It is expected that most issues will be resolved by developing an action plan in conjunction with the various STEMI System entities. A re-evaluation for results is to be undertaken. If it is determined that a change in system configuration or standard function should occur, a recommendation will be sent to the STEMI Operations Committee for evaluation and report to BREMSS Executive Committee. A more detailed outline of the Regional Quality Improvement Program is

available in Appendix B. If the above procedure/process is not in compliance with an approved ADPH/OEMS&T State-Wide QI Plan the plan is automatically amended to reflect compliance with the approved plan.

V. STEMI SYSTEM IMPLEMENTATION COMMITTEE

The STEMI system Implementation Committee will be established by BREMSS for the purpose of implementation of the STEMI Plan. This is done under the authority of BREMSS with action plans developed and presented as recommendations to BREMSS Executive Committee. As part of the implementation plan, operational protocols for the STEMI System will be developed and forwarded to BREMSS MDAC and Executive Committees for approval. This committee will function only during the implementation period.

Committee development will occur in the following manner:

- A. Co-chair's will be chosen by the MDAC from a list of candidates offered by all hospitals in the region. The co-chairs of the STEMI systems Implementation Committee will be an Emergency Medicine Physician and Cardiologist, and they will continue on as the initial co-chairs of the STEMI Operations Committee in order to maintain continuity through initial system implementation and activity. The hospital and the candidate must jointly understand that the co-chair's positions will require an estimated four to six hours per week work effort, and a commitment to availability for that time must be made by the hospital and the candidate. Requirements for co-chairs:
  - 1. A Cardiologist and an Emergency Medicine Physician respectively actively practicing cardiology or emergency medicine in a BREMSS hospital.
  - 2. Knowledge of BREMSS structure and function.
  - 3. Ability to commit an average of four hours per week to this project.
  
- B. Hospitals and other agencies/groups will provide committee membership nominations as per the following groups:
  - 1. Hospitals
    - a) Emergency Medicine Physician
    - b) Emergency Nursing
    - c) Hospital Administration
    - d) Cardiologist
    - e) Cardiac Surgeon
    - f) STEMI Nursing (primary experience with invasive catheterization lab experience)
    - g) STEMI Registry personnel

2. Pre-Hospital Agencies
  - a. Paramedic
  - b. Fire Service Administration
  - c. Ambulance Service Administration

STEMI Implementation Committee membership nomination form is Appendix E.

- C. The STEMI co-chairs under the guidance of BREMSS staff, the MDAC, and the Executive Committee chairman, will select a proposed committee from the nominations received encompassing members from the groups above. There will be 12 to 16 members on the committee.
- D. The MDAC will approve and appoint the STEMI Implementation Committee membership.
- E. BREMSS will staff the STEMI Implementation Committee, to include participation of the Regional medical Director.

At the initial meeting the Implementation Committee will draw up an implementation schedule and provide that schedule along with at least bi-monthly progress reports to the BREMSS Executive Committee.

## VI. STEMI OPERATIONS COMMITTEE (STEMI OC)

Monitoring and primary management of system function during the continuing operation of the STEMI System will be the responsibility of the STEMI Operations Committee. This committee will be directly responsible and report to BREMSS Executive Committee. The committee will have a specific accountability for direct ongoing system governance which will occur by evaluation of issues/situations/ideas and standard system data regarding operations and configuration. Recommendations for action will be developed by the committee based on analysis of data/information evaluated during committee function.

### A. Membership

1. The co-chairs shall serve for two-year terms. The STEMI Implementation co-chairs shall be the initial co-chairs of the STEMI Operations Committee. Future co-chairs of the STEMI Operations Committee shall be chosen by the MDAC from nominations provided by hospitals actively participating in the STEMI System. Requirements for the co-chairs of this committee include:

- a. A Cardiologist and an Emergency Medicine Physician respectively actively practicing cardiology or emergency medicine in a BREMSS hospital
- b. Adequate knowledge of BREMSS structure and function.
- c. Ability to commit an average of four hours a week to this project.

Nominees for the co-chair positions of the STEMI Operations Committee and their sponsoring institutions must understand the expected 4 hours per week time availability for carrying out the duties of this position.

Responsibility of the co-chairs includes:

- a. Serve as leader for committee meetings.
- b. Responsibility for carrying out the assigned duties of the STEMI Operations Committee.
- c. Report to the BREMSS Executive Committee regarding overall system function plus system monitoring activities, suggestions, problems, QI activities, and other issues as deemed appropriate.

2. General membership will be constituted from the following groups making nominations for specific membership positions (although not all nominees will necessarily become committee members).

- a. Hospitals actively participating in the STEMI System.
  - 1) Emergency Medicine Physician
  - 2) Emergency Nursing
  - 3) Hospital Administration
  - 4) Cardiologist
  - 5) Cardiac Surgeon
  - 6) STEMI Nursing (primary experience with invasive catheterization lab experience)
  - 7) STEMI Registry personnel
- b. Hospital not directly involved in the STEMI System.
  - 1) Physician – Cardiologist, Internal Medicine or Emergency Medicine physician
- c. Pre-hospital members
  - 1) Paramedic
  - 2) Fire service administration
  - 3) Ambulance service administration

- d. A community person will be selected by the BREMSS Executive Committee to be a member.
- e. A local government official will be selected by the BREMSS Executive Committee to be a member.
- f. BREMSS will staff the STEMI Operations Committee to include participation of the Regional Medical Director.
- g. American Heart Association representatives will be invited as ex-officio non-voting members of the committee (Alabama staff representatives as assigned by the Greater Southeast Affiliate)

The general membership term is for two years and the committee will be constructed so there is a one-half turnover each year. There will be 17 to 24 committee members.

## B. Duties

The duties of the STEMI Operations Committee include the review of the overall function of the STEMI program including hospital and pre-hospital activities. This includes review of criteria, data, or reports. This information will be evaluated regarding adequacy of these various activities and for development of system function reports and recommendations regarding the hospital or pre-hospital components or functions, including responsibilities, standards, and activities. If recommendations directly involve pre-hospital aspects of the STEMI program they will be referred to the MDAC for review and comment and then re-evaluated by the STEMI Operations Committee regarding the MDAC input and then, the recommendation in final form will be sent to the Executive Committee for action. Areas of responsibilities include:

1. STEMI Center resource requirements criteria
2. STEMI Center membership in the System
3. STEMI Center removal from the System
4. Communications within the System
5. Pre-hospital and hospital dataset
6. Pre-hospital and hospital quality improvement programs
7. Patient entry criteria into the STEMI System
8. Pre-hospital activities in the System
9. Monitoring of ongoing system requirements/standards/activities and use of system function protocols

## **Regional STEMI System: Function**

General function of the System will follow the scenario of:

1. STEMI event occurs or warning signs/symptoms are present and 911 is called.
2. Field evaluation done by EMT who determines if the patient meets system entry criteria as determined by 12 lead ECG. When a patient meets system entry criteria, ATCC will be contacted.
3. Communication is established with the ATCC and brief basic information, including 12 lead ECG findings, is provided to the ATCC on all STEMI patients to be transported to a hospital.
4. The current STEMI Center activity status (from the Emergency Resources Display) and patient location determine hospital destination. Patient choice shall always be honored, however if a STEMI patient makes a hospital destination choice that is not in his/her best interest, the paramedic may request that the On-Line medical control physician speak with the patient.
5. A direct patched communications link to the closest available STEMI Center or STEMI center of patient choice is provided by the ATCC to the field EMT if needed.
6. Medical direction is established with the receiving STEMI Center by the communications link; orders are provided as needed.
7. Pre-hospital care is completed and transport to the destination STEMI Center is initiated.
8. Destination STEMI center initiates care following their approved care plan.
9. Data points on the ATCC form are completed by the receiving hospital and returned via fax to BREMSS. BREMSS will enter the data in the data base and will forward a copy to the EMS organizations involved with the patient.
10. At thirty days or less the hospital data responsible party will be contacted by BREMSS to determine the patient discharge data points.
11. Data is reviewed by hospital QI committee as well as STEMI Operations Committee and any needed system changes are recommended to the BREMSS Executive Committee.

Specific functions relative to the STEMI System are described in the following sections.

### **I. SYSTEM ENTRY CRITERIA**

Patients are to be entered into the STEMI System based on the following criteria:

1. STEMI as identified by 12 Lead ECG monitor/defibrillator.
2. Possible STEMI  
Paramedics will be given some discretion to alert ATCC of a "Possible" STEMI based upon ECG findings and clinical presentation, allowing the patient to be preferentially triaged to the nearest STEMI capable hospital after consultation with the receiving emergency physician. For purposes of this document,

“STEMI” patients and “Possible STEMI” patients will be cared for in the same manner.

## II. COMMUNICATIONS

Maintenance of adequate and prompt communications is essential to function of the STEMI System. Knowledge of the system-wide pre-hospital STEMI activities and the current (and possibly changing) status of the functional capabilities of the various hospitals in the system is important at all times as it is possible multiple STEMI activities are occurring simultaneously. Communications allow differential system resource utilization when there are multiple STEMI activities ongoing simultaneously. The key to system function is full knowledge of ongoing activities in all parts of the system at all times.

Knowledge and coordination of the continuous status of STEMI Center activity will be monitored by the ATCC. All STEMI patients requiring transport are to be called in to the ATCC. The responding paramedic will provide basic system entry data to the ATCC and the ATCC will thereby assist the paramedic with locating the closest appropriate STEMI Center.

If the transporting paramedic determines in his/her best judgment the patient is/will be a STEMI patient, ATCC will determine the closest available STEMI hospital and link the EMT-P and EM Doctor. The EM Doctor’s decision to place the patient in/out of the STEMI system is final.

The ATCC will establish a direct patched communications link with the receiving STEMI Center hospital, and provide them with the basic information. The field paramedic will then be able to communicate any additional pertinent data and receive medical control while the hospital is simultaneously activating its STEMI response system. The transporting paramedic will maintain contact as appropriate with the receiving STEMI Center hospital, and provide information updates if changes in the patient's status or transport plan occur. The paramedics are to reconfirm STEMI Center ETA once transport has been initiated. If radio failure occurs, direct contact between the EMS unit and their dispatch should be established with relay of information to the ATCC by phone.

## III. SYSTEM OPERATIONS

System operations refers to the activities that occur once it is determined a patient meets system entry criteria and communications has been established within the system. These activities include STEMI Center destination determination, continuing communications, provision of field care, patient transport, and STEMI Center management.

1. Hospital Destination

Hospital destination will be determined by the closest available STEMI Center or the patient choice. The hospital status is determined by the Emergency Resources Display at the ATCC. That equipment is described in the Communications Component, and details the status of individual resources in the hospital and therefore, the activity status of the hospital. Hospitals will usually be either at a green (active), yellow (conditional), or red (inactive) status.

Green status means the hospital has all resources available and may receive STEMI patients based on location. Green status requirements involve the following resources be available: Emergency Department (ED), Cardiac Care Unit (CCU), Catheterization Laboratory (CATH Lab), Cardiologist (CARD). Hospitals may self-designate their STEMI status as available even if on ED diversion. This decision must be made at the individual hospital level.

Yellow status indicates that the Catheterization Lab and or the cardiologist are not immediately available (but is/are promptly available), but the ED and CCU are available.

Red status indicates at least some primary STEMI care resources in that hospital are not actively available and the hospital is not to receive STEMI patients at that time.

In the event that a patient or family member requests transport to a specific facility that does not meet system guidelines, efforts will be made to clarify and encourage the advantage of using the STEMI System and a specific request to follow the established STEMI System Plan will be made of the patient. The patient's wishes will, however, ultimately prevail.

In situations where EMS-to-PCI time will likely exceed 90 minutes due to delays such as prolonged transport times, Paramedics with the assistance of the ATCC communicator will screen STEMI patients for thrombolytic eligibility using the State of Alabama EMS Protocols Thrombolytic Checklist for Cardiac Symptoms (Protocol 10.1). If cardiogenic shock or an absolute contraindication to thrombolytic therapy is present, the patient will be routed to the nearest available PCI center with a goal of EMS-to-balloon time of 90 minutes or less, although this may not always be practically achievable. If thrombolytic therapy is the chosen reperfusion modality, the goal will be to administer this with an EMS-to-drug time of thirty minutes or less. When any uncertainty exists about the most appropriate routing for a particular STEMI patient, Paramedics will seek online medical direction with the assistance of the ATCC as to appropriate routing.

If the patient is unstable (inadequate spontaneous ventilations without a secured airway or in cardiac arrest) the patient should be transported to the closest hospital with full time Emergency Physician coverage as coordinated by the ATCC. A

secured airway includes any airway device that allows adequate ventilation and oxygenation.

2. Interfacility Transfers

In the event that a STEMI patient is received by a non-STEMI hospital or a STEMI hospital without current capacity for the patient, ATCC will assist with arranging an inter-facility transfer to a hospital with active STEMI capabilities. This will be performed by arranging physician to physician communication. Any hospital participating in the STEMI system which is STEMI ready, agrees to accept the STEMI patient upon ATCC's request.

3. Pre-hospital System Activities

Pre-hospital care will be carried out following the guidelines of the Regional Medical Direction Plan. The ADPH/OEMS&T pre-hospital care protocols will be used for primary guidance in pre-hospital STEMI management. Patients entered into the STEMI System will receive their medical control from the STEMI receiving hospital, which will be immediately accessible through the communications link between the ATCC and that destination hospital. Any significant patient condition changes are to be communicated directly to medical direction at the receiving STEMI Center as those changes may result in updating the orders and altering the destination hospital STEMI Team activation. Field time should be kept to a relative minimum; however pre-hospital care should not be sacrificed for less time on scene. In transit treatment of STEMI patients should be considered. STEMI patients are best served by rapid transport to the most appropriate facility.

4. Hospital System Activities

Hospital STEMI management is an essential part of any STEMI System. This phase of STEMI care requires adequate resources (equipment and facilities) and personnel with adequate training and commitment to carry out rapid initial assessment, stabilization, and definitive care including invasive treatment plus critical care and recuperative care as necessary. In addition, cardiac rehabilitation services should be initiated as appropriate. Resources necessary to provide care are documented through the STEMI Center standards.

IV. SYSTEM COMPLIANCE EVALUATION AND ACTION

Compliance by participating agencies and hospitals with the requirements and protocols of this STEMI system is essential for proper patient management. Therefore, a specific program for monitoring compliance with requirements and function protocols will be a part of the STEMI System. This will be a function of the STEMI Operations Committee. Reports regarding compliance issues will be made to the BREMSS Executive Committee. Maintenance of compliance with requirements, standards, and

system function protocol activities for individual personnel and agencies involved in the STEMI System means:

- A. Maintaining component and organization standards as established by the Plan.
  - 1. Pre-hospital: Pre-hospital entities have the responsibility to assure their individual paramedics have a basic knowledge and awareness of the STEMI System including entry criteria and basic operations. This includes ability of paramedics use their monitor/defibrillator to identify STEMI on a 12 lead ECG.
  - 2. Hospital Component: Continue to meet all STEMI Center resource requirements for their status.
  - 3. Communications Component: Each entity is responsible for maintaining communications equipment used in the STEMI System in proper working order.
  - 4. Data/QI Component: Each entity is responsible for maintaining and providing data to the STEMI System as indicated in the Regional STEMI System Plan. For pre-hospital EMS services this means providing data to the STEMI Communications Center which is then placed in the STEMI System Database. For hospitals this means maintaining and providing the hospital based information in the STEMI QI dataset. Participating entities need to maintain their individual STEMI QI Programs. They are to provide reports of these activities to the Regional STEMI Operations Committee on a timely basis. If the above procedure/process is not in compliance with an approved ADPH/OEMS&T State-Wide QI Plan the plan is automatically amended to reflect compliance with the approved plan.
  - 5. Personnel from pre-hospital and hospital organizations are to participate in STEMI Operations Committee activities per membership responsibilities. It is expected there will be 75% attendance of meetings by members.
- B. Maintaining system function as noted in the Regional STEMI System Plan.
  - 1. System entry criteria as specifically defined in the Plan or currently active protocols are to be used by paramedics to determine patient entry into the STEMI System.
  - 2. Communications as outlined in the Plan and currently approved protocols are to be initiated and maintained by EMS units. This involves initiating communications with and providing information to the ATCC and compliance with the system operations protocols.

3. System operations are provided by individual entities as per the Regional STEMI System Plan including currently approved protocols.

Failure of compliance with MOU performance criteria or requirements, standards, or adherence to system function protocols as stated in the most current version of the written BREMSS Regional STEMI System Plan will result in specific actions to be taken by the BREMSS Executive Committee. Questions of compliance will be generated by system oversight review by the STEMI Operations Committee. Issues regarding a question of compliance when brought to the attention of BREMSS will be directed to the STEMI Operations Committee for evaluation. The Operations Committee will evaluate questions of compliance and if a compliance infraction has occurred a report will be forwarded to the BREMSS Executive Committee.

- C. The pre-hospital component requirements, standards, and system function protocols are part of the Regional Medical Control Plan and deviation from that plan will result in the following actions by the BREMSS Executive Committee:
  1. First breach of activity standards will result in a letter to the pre-hospital service indicating there has been a breach of activity standards with an explanation of the situation and an indication of the need for corrective action to be taken. There will be a one- month time period for implementation of the corrective action.
  2. The second breach of the same activity will result in another letter to the pre-hospital service with a copy to the ADPH/OEMS&T indicating that a second breach has occurred and again allowing a one month period for corrective action.
  3. A third breach of the same activity will result in a letter to the ADPH/OEMS&T Office for evaluation and action.
  4. If the above procedure/process is not in compliance with an approved ADPH/OEMS&T State-Wide QI Plan the plan is automatically amended to reflect compliance with the approved plan.
- D. Hospital participation in the System is governed by the MOU between BREMSS and each hospital. Deviations from requirements, standards or system function protocols governed by the MOU may result in the following actions by the BREMSS Executive Committee:
  1. The first breach of an activity standard will result in a letter indicating there has been a breach of an activity standard with an explanation and an indication that there is a need for corrective action. A one-month period for corrective action implementation will be allowed.

2. If a second breach of the same activity occurs a letter to the responsible entity indicating that a second breach has occurred with a warning that a third breach in that activity standard will result in suspension from the STEMI System for a 30 day period of time. A one-month period for corrective action implementation will occur.
3. A third breach of the same activity will result in MOU failure and suspension of that facility from the STEMI System for a period of 30 days as per decision of the BREMSS Executive Committee with the suspension time doubled for subsequent deviations of the same standard.

It will be the duty of the BREMSS Executive Committee to carry out these pre-determined actions in cases of violation of requirements, standards, or failure of adherence to system function protocols.

## **APPENDIX A: STEMI (STEMI) CENTER STANDARDS**

A hospital to be recognized as a STEMI Center must have available the following minimum personnel, facility, and plans:

### **HOSPITAL ORGANIZATION**

1. STEMI Service Line or Equivalent
2. STEMI Service Director
3. Hospital Department/Sections
  - a. Cardiology
  - b. Catheterization Lab
  - c. Emergency Medicine
  - d. Cardiac Care Unit or beds set aside specifically for STEMI patients
4. STEMI treatment protocols or care plan in place

### **CLINICAL CAPABILITIES**

1. Specialty availability (means contact made and care plan determined) upon notification of patient need:
  - a. Emergency Medicine (10 minutes)
  - b. Cardiology (30 minutes after notification by the Emergency physician, or by hospital plan)
  - c. Catheterization Lab and with intervention capability, within 30 minutes of notification by the cardiologist
2. Consultants availability (on-call):
  - a. Internal Medicine
  - b. Neuroimaging

### **FACILITIES & RESOURCES**

1. Emergency Department
  - a. Personnel
    - 1) Designated Physician Director
    - 2) Emergency Medicine Specialists present
    - 3) Nursing personnel with expertise (ACLS) to provide continuous monitoring to cardiac patients until their admission to a hospital unit
  - b. Equipment
    - 1) Airway control & ventilation equipment
    - 2) Pulse oximetry
    - 3) End-tidal CO2 determination
    - 4) Suction devices

- 5) Electrocardiograph - 12 lead
  - 6) Cardiac marker capability to collect and read
  - 7) Standard intravenous fluid administration equipment
  - 7) Sterile sets for percutaneous vascular access (venous & arterial)
  - 8) Gastric decompression
  - 9) Drugs necessary for emergency cardiac care
  - 10) Two-way communication with emergency vehicles
2. Intensive Care Unit-bed (CCU) for STEMI Patients
    - a. Personnel
      - 1) Designated medical director
      - 2) Specialists with privileges in critical care, in-house or immediately available
    - b. Equipment
      - 1) Appropriate cardiac monitoring equipment
  3. Catheterization Lab
    - a. In-house lab technical personnel capable of assisting in all phases of cardiac catheterization and appropriate cardiac invasive techniques. Must be available within 30 minutes of notification by the cardiologist.
  4. Rehabilitation
    - a. Rehabilitation services protocol for cardiac patients
    - b. Full in-house service or transfer agreement with cardiac rehabilitation facility
  5. Clinical Laboratory Services
    - a. Standard analyses of blood, urine, etc.
    - b. Blood typing and cross-matching
    - c. Comprehensive blood bank or access to equivalent facility
    - d. Blood gases and pH determinations
    - e. Comprehensive coagulation testing
    - f. Cardiac Marker Testing

## **CONTINUING EDUCATION**

Formal programs on Acute Coronary Syndrome-STEMI provided for

1. Staff physicians
2. Nurses
2. Allied health personnel
4. Community physicians

## **STEMI SERVICE SUPPORT PERSONNEL**

STEMI coordinator  
LifeTrac STEMI information coordinator

## APPENDIX B: STEMI QI DATA SET

Data will be collected and placed on the LifeTrac STEMI sheet and faxed to BREMSS. This data will then be entered by BREMSS on the individual ATCC data sheet and the hospitals data base will also be updated. Predetermined query programs will be installed on each hospitals computer as well as at ATCC. This information is listed below and the information faxed to BREMSS:

### STEMI – ATCC – Hospital Admission Data Points

- To be completed by hospital on the ATCC STEMI form and faxed to BREMSS
- BREMSS to provide CC to EMS organization, ATCCC involved, and enter into the database
- Hospital performed 12 Lead STEMI positive -  Yes,  No,  LBBB,  Inconclusive
- Thrombolytics used -  Yes,  No
- Patient emergently sent to cath. lab -  Yes,  No
- Cath. Lab. Outcome – Was PCI attempted  Yes,  No  
Was PCI successful  Yes,  No  
Door to PCI time in minutes \_\_\_\_\_  
Did the patient have an ACS?  Yes,  No
- Patient sent to Cardiac Surgery -  Yes,  No
- Patient admitted to -  CCU,  ICU,  Floor,  Home,  Other
- Patient alive -  Yes,  No \_\_\_\_\_ Date \_\_\_\_\_ Time

### STEMI Hospital Discharge Data Points

To be completed by the hospital data responsible party, who will be contacted by BREMSS 30 days after admission to determine the following data points based on discharge information:

- Alive or dead
- Discharge date \_\_\_\_\_
- Coronary Artery Bypass surgery -  Yes,  No
- Percutaneous re-intervention on same vessel -  Yes,  No
- Percutaneous re-intervention on another vessel(s) -  Yes,  No

## APPENDIX C: CONTINUOUS QUALITY IMPROVEMENT

- A. Quality improvement is a vital part of a STEMI System. It is used to document continuing proper function of the system and evaluation of that function to implement improvements in system function and STEMI victim management. In a STEMI System patients have virtually no time to make specific choices regarding acute and critical medical care and therefore, the System itself has a moral responsibility to perform evaluation functions to assure that the highest level of care is being provided and that improvements are implemented whenever possible in a timely manner.
- B. This QI program will be System-wide. There will be individual agency efforts on the part of all participating agencies. Every participating facility or organization will be represented on the STEMI Operations Committee and continuing participation of all the various entities involved in STEMI care is mandatory.
- C. The appropriateness, quality, and quantity of all activities of the System must be continuously evaluated. Specific audit filters will be established by the STEMI Implementation Committee and continuously re-assessed by the STEMI Operations Committee.
- D. In general the following processes should be performed by each agency or institution. The results of these reviews are to be reported to the STEMI Operations Committee.
  - a. Each organization assigns QI person to oversee process
  - b. Standards established
  - c. Determine audit filters
  - d. Collect data
  - e. Evaluate data
  - f. Determine QI issues present
  - g. Develop corrective action plan
    - 1) professional resolution
    - 2) administrative resolution
  - h. Re-evaluation to document results/effectiveness of corrective action plan
- E. Pre-Hospital Specific Items for Evaluation (included but not limited to):
  - a. Accuracy of patient assessment and 12 lead ECG interpretation via the monitor/defibrillator
  - b. protocol adherence
  - c. procedures initiated/completed
  - d. on-scene time
  - e. medical control interaction
  - f. transport-mode (ground/air)
  - g. resource availability/needs match
  - h. arrival report
  - i. record/documentation
  - j. inter-facility care/transport

- F. Hospital Care Items for Evaluation (included but not limited to):
  - a. Complications
  - b. Deaths
  - c. Outcome Review
  - d. Achievement of Time-sensitive goals (e.g. door to balloon time)
  
- F. Regional System Items for Evaluation (included but not limited to):
  - a. Communications Function and Appropriateness
  - b. Triage matching of needs/resources
  
- G. STEMI Operations Committee: QI Function
  - 1. Goals – The STEMI Operations Committee will be responsible for the QI oversight of the Regional STEMI Plan. All agencies and organizations have representation on the STEMI Operations Committee and are expected to actively participate, as previously outlined.
  
  - 2. STEMI System QI Process
    - a. Brief report of QI activities from each participating agency and organization
    - b. General system information
    - c. Focused review of items of major concern/impact including selected cases
    - d. Develop consensus of issues that represent QI concerns
    - e. Develop action plan
    - f. Have re-evaluation process to determine effectiveness of action plan results
    - g. Complete reports of a summary nature including any recommendations for change or action will be made to the MDAC and the BREMSS Executive Committee. Individual physician medical care issues will initially only be reported to the STEMI director of the facility providing care in that situation and be made by personal communication from the STEMI Operations Committee Chair or Vice-chair
  
  - 4. An individual appointed by the ADPH/OEMS&T will be invited to participate in all STEMI meetings involving QI issues to act as a liaison to the State-Wide QI process.
  
- H. If the above procedure/process is not in compliance with an approved ADPH/OEMS&T State-Wide QI Plan the plan is automatically amended to reflect compliance with the approved plan.

**APPENDIX D: STEMI IMPLEMENTATION COMMITTEE  
NOMINATION FORM**

- Hospital

Name \_\_\_\_\_

| <u>Area of Representation</u> | <u>Name of Nominee</u> |
|-------------------------------|------------------------|
| Emergency Medicine Physician  | _____                  |
| Emergency Nursing             | _____                  |
| Hospital Administration       | _____                  |
| Cardiologist                  | _____                  |
| Cardiac Surgeon               | _____                  |
| STEMI Nursing                 | _____                  |
| STEMI Registry Personnel      | _____                  |

- Pre-hospital agency

Name \_\_\_\_\_

| <u>Area of Representation</u>    | <u>Name of Nominee</u> |
|----------------------------------|------------------------|
| Paramedic                        | _____                  |
| Fire service administration      | _____                  |
| Ambulance Service administration | _____                  |

**APPENDIX E: STEMI OPERATIONS COMMITTEE  
NOMINATIONS FORM**

- Hospital participating in System as STEMI Center

Name \_\_\_\_\_

| <u>Area of Representation</u> | <u>Name of Nominee</u> |
|-------------------------------|------------------------|
| Emergency Medicine Physician  | _____                  |
| Emergency Nursing             | _____                  |
| Hospital Administration       | _____                  |
| Cardiologist                  | _____                  |
| Cardiac Surgeon               | _____                  |
| STEMI Nursing                 | _____                  |
| STEMI Registry Personnel      | _____                  |

- Hospital not participating in system as STEMI Center

Name \_\_\_\_\_

| <u>Area of Representation</u>     | <u>Name of Nominee</u> |
|-----------------------------------|------------------------|
| Physician (IM, EM, or Cardiology) | _____                  |

- Pre-hospital agency

Name \_\_\_\_\_

| <u>Area of Representation</u>    | <u>Name of Nominee</u> |
|----------------------------------|------------------------|
| Paramedic                        | _____                  |
| Fire service administration      | _____                  |
| Ambulance service administration | _____                  |