STEMI System of Care Plan

YOLO COUNTY EMGERENCY MEDICAL SERVICES AGENCY

October 2019, v.1

Contents

Introduction

The California Emergency Medical Service Authority (EMSA) has developed STEMI Critical Care System regulations for California EMS Agencies to establish consistent and uniform standards within the state for all components of a STEMI Critical Care System. Yolo County EMS Agency (YEMSA) has developed a STEMI Critical Care System Plan in accordance with standards established under California Code of Regulations, Title 22, Division 9, Chapter 7.1. The focus of this plan is to provide an evidence-based systems approach to STEMI care with the goal of reducing mortality and increasing the chances for long-term favorable outcomes for patients suffering from life-threatening acute heart attacks within our communities. A systems approach to STEMI care requires a continuum of care that includes rapid identification of a STEMI by prehospital providers, early communication of the evidence a STEMI, direct transport to a STEMI Receiving Center, and quality definitive care through intervention and rehabilitation. Committed participation by all stakeholders in the STEMI Critical Care System is critical to optimizing and improving patient outcomes.

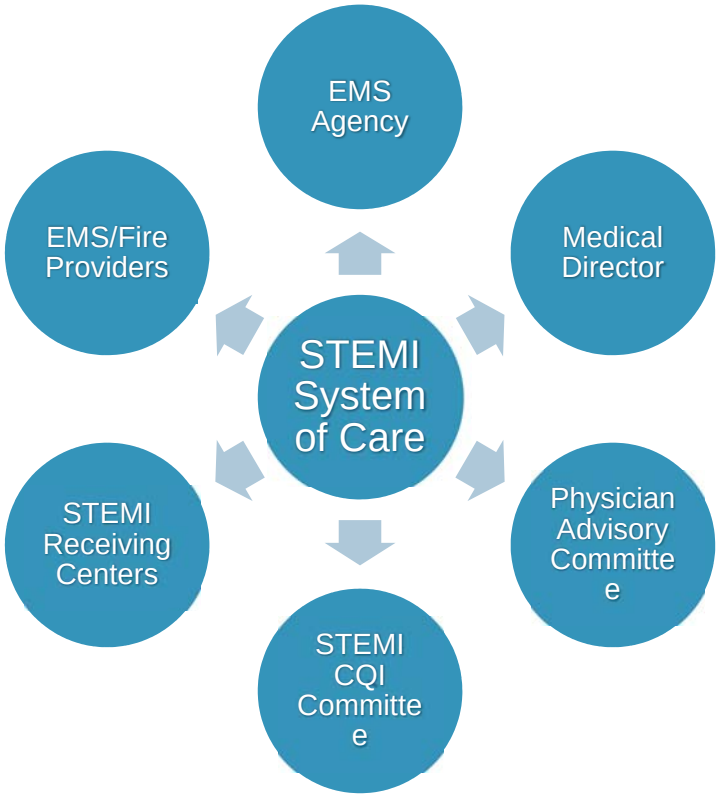
EMS Agency Personnel and System Coordination

The Yolo County STEMI Critical Care System is designed to provide quality care and improve outcomes for patients experiencing a STEMI through sharing information and ideas and through partnering with key stakeholders.

YEMSA coordinates components of the STEMI Critical Care System. Key YEMSA personnel include:

- **EMS Administrator**
- **EMS Medical Director**
- **EMS Program Coordinator**
- **EMS Specialist I**
- **The CQI STEMI Committee**
  - YEMSA: Medical Director, Administrator, Program Coordinator, and staff
  - Base Hospital Representative(s)
  - STEMI Receiving Center Representative(s)
  - First Responder (Fire) Representative(s)
  - Paramedic & EMT for approved Ambulance Providers

- **Physician Advisory Committee (PAC)**
  - Medical Director
  - Hospital and Provider Medical Directors
  - ED Physicians or Specialty Care Physicians



Yolo County Designated STEMI Centers

YEMSA designates STEMI Receiving Centers via contractual agreement. There are no STEMI Receiving Centers within Yolo County. All patients with suspected STEMIs are transported to a designated STEMI Receiving Center in either Sacramento or Solano County. Designated STEMI Receiving Centers provide specific performance data on each suspected STEMI that is transported to their facility. The data is collected quarterly and compiled for presentation at the annual STEMI Continuous Quality Improvement (CQI) meeting. Representatives in attendance from each participating facility review and discuss the data and prehospital STEMI protocols and processes.

Designated STEMI Centers:
NorthBay Medical Center, Fairfield, expires June 30, 2021
UC Davis Medical Center, Sacramento, expires June 30, 2021
Mercy General Hospital, Sacramento, expires December 31, 2021
Sutter Medical Center Sacramento, Sacramento, expires August 31, 2022

Dispatch

Yolo Emergency Communications Agency (YECA) dispatchers formalized training and evaluation protocols for calls that report warning signs of a heart attack. ProQA, a dispatching software based on Medical Priority Dispatch Systems (MPDS), ensures the appropriate response priority to the 9-1-1 call and the rapid identification of patients experiencing a cardiac event.

Protocol

The Yolo County *Chest Discomfort or Symptoms Consistent with Cardiac Etiology* protocol was developed in collaboration with EMS providers, local acute care hospitals, designated STEMI receiving centers, and the PAC. Changes and updates to the protocol are driven by current American Heart Association (AHA) standards, new research that focuses on the improvement of outcomes for STEMI patients, stakeholder feedback, and Yolo County outcome data. The protocol is updated twice a year during the YEMSA protocol update.

Appendix A – Protocol - Chest Discomfort or Symptoms Consistent with Cardiac Etiology
Appendix B – Procedure - 12-Lead ECG

Providers

The protocol is intended to assist providers in the rapid identification suspected STEMI patients and to provide guidelines for decisions regarding treatment and transport. Advanced Life Support (ALS) providers are trained to perform a 12-Lead electrocardiogram (ECG) to detect the occurrence of a STEMI. In conjunction with signs and symptoms of chest discomfort or other cardiac etiology, the electrocardiographic changes displayed by the ECG present evidence of an evolving myocardial injury. When STEMI criteria are met, ALS providers transmit the 12-Lead ECG to the closest and most

appropriate STEMI Receiving Center and send a STEMI Alert via phone or radio to notify the center and to provide an estimated time of arrival (ETA). When the 12-Lead ECG and the signs and symptoms are not consistent with STEMI, but there is a high suspicion, a STEMI Receiving Center physician may be consulted.

Early transmission of a 12-Lead ECG with a STEMI Alert provides receiving facilities with time to prepare for STEMI patients to be transport directly to cardiac catheterization laboratories for possible reperfusion therapy treatment. YEMSA and the designated STEMI Receiving Centers collaborated to meet the national standards for a STEMI referring facility where arrival-to-STEMI Receiving Center first intervention time is less than (<) ninety (90) minutes for walk-in patients, and the time for a 9-1-1 call-to-STEMI Receiving Center first intervention is < one hundred twenty (120) minutes when Emergency Medical Service (EMS) patients are initially transported to a STEMI Referring Facility. The coordination between EMS and STEMI Receiving Centers decreased the time to reperfusion and demonstrated a significant reduction in mortality.

Interfacility Transfer

Yolo County has two (2) Acute Care Receiving Center Hospitals for chest pain that meet AHA standards. It was identified that on average, patients who arrived at the Emergency Department (ED) by their own means received a lower same standard of STEMI care than patients who dialed 9-1-1 and were transported by EMS directly. Patients meeting STEMI criteria who arrived by their own means to the ED required rapid triage and transport without delay to a STEMI Receiving Center. This intermediary step resulted in the provision of a lower standard of STEMI care. *The Interfacility Transport (IFT) of STEMI Patients* policy was developed in collaboration with the local hospitals to respond swiftly to an identified STEMI in the ED, provide prompt transport to a STEMI Receiving Center, and to ultimately improve the standard of STEMI care received. The 9-1-1 system may be activated from the ED, when needed, to prevent delays in transport to a STEMI Receiving Center.

Appendix C – Policy - Interfacility Transport (IFT) of ST Elevation Myocardial Infarction (STEMI) Patients.

Data Collection

Prehospital and hospital STEMI data is collected quarterly and compiled into a database developed by YESMA entitled “STEMI Data”. The prehospital data points are derived from national and California standards. Hospital outcome quality measures remain identical to AHA guidelines and standards. A STEMI Data spreadsheet with key indicators for suspected STEMI cases is generated. These key indicators include patient contact to 12-Lead ECG time interval, time of 12-Lead lead transmission STEMI Alert notification, Paramedic and monitor impressions of the 12-Lead ECG, treatments, and hospital destination. The data is then stratified by hospital and sent securely with all prehospital information to each STEMI Receiving Center. The STEMI Receiving Center provides follow-up information to YEMSA based on predetermined indicators including activation of the Cath Lab based on the EMS alert; time of EMS arrival; time of PCI, if indicated; and time of fibrinolytics, if indicated. The spreadsheet is completed and returned securely via encryption to YEMSA. This data is compiled and presented for review at the annual STEMI CQI meeting. YEMSA developed performance measures based on AHA guidelines for STEMI patient management as and the AHA Mission: Lifeline standards. The analyzed data is used to create action plans for improvement on these measures. The data also provides information on State Core Measures and local indicators for quality assurance.

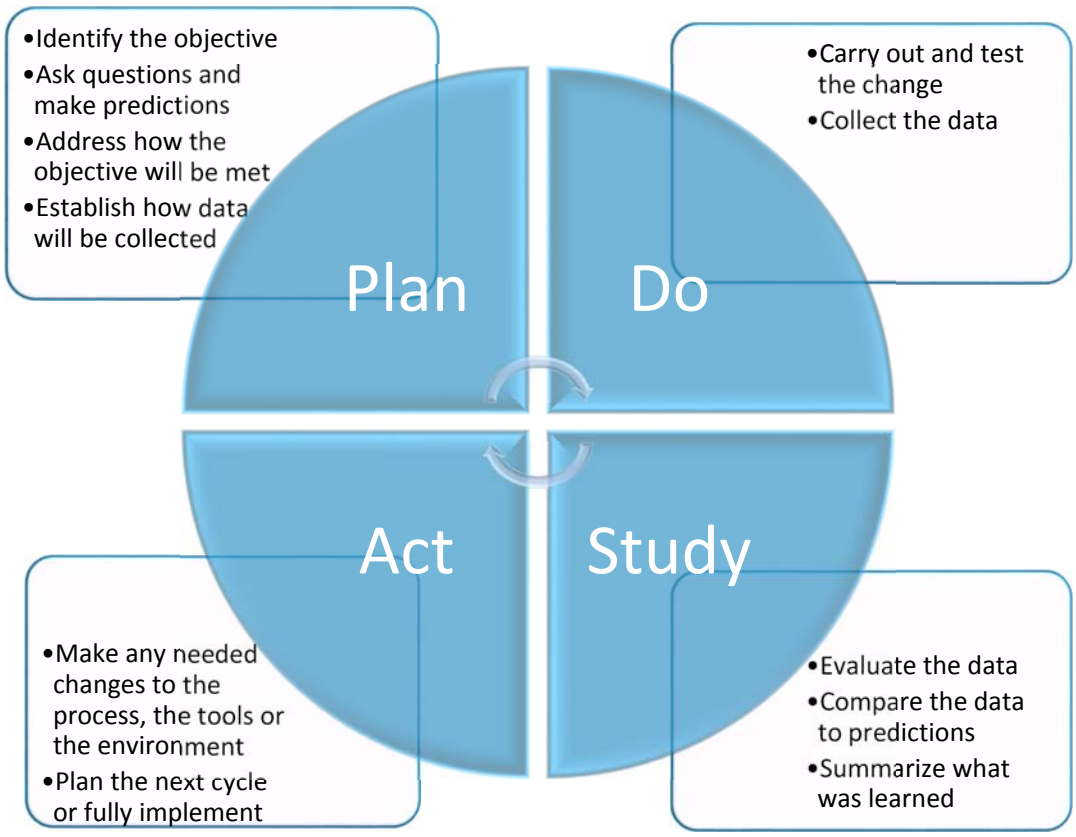
YEMSA recently implemented FirstPass as an enhancement tool for data collection and system performance. The software system provides real-time monitoring and detailed analysis of STEMI performance measures. Deviations in protocol or system problems are identified quickly through active monitoring and readily available performance reports.

Appendix D – STEMI Data Template

Continuous Quality Improvement

The Yolo County STEMI Critical Care System's quality improvement is part of the larger Yolo County EMS Quality Improvement Plan (EQIP). It was designed as a collective approach to continuous monitoring, analysis, and measurement of performance through use of the **Plan-Do-Study-Act Cycle Model.** Once a need for improvement is identified, the model is used to test and evaluate effectiveness the change. Specifically, the model is used to determine if the change resulted in the desired improvement. Representatives from multiple disciplines, including Paramedics, registered nurses (RN), physicians, prehospital care coordinators, and STEMI coordinators are encouraged to attend YEMSA's annual Continuous Quality Improvement (CQI) STEMI Committee meeting to review the data and identify objectives that drive positive change. Fostering positive relationships and participating in our neighboring counties and hospitals' CQI plans promotes generation of new ideas overcome shared challenges, builds trust, and increases opportunities for community outreach.

Additionally, each STEMI Receiving Center shall have a multidisciplinary quality improvement body that evaluates the care delivered in its facility and makes necessary recommendations regarding provision of care and utilization of resources. YEMSA will continue to monitor quality of the care provided by dispatchers, first responders, and prehospital personnel to support and promote optimal care for STEMI patients.



Programs for Public Education

In 2019 YEMSA hosted an EMS Symposium on vascular emergencies focused on emergent cardiac events and strokes for adults and pediatrics. This opportunity was made possible through the support and generosity from local hospitals, partners, and stakeholders. Through collaboration with local hospitals, opportunities to partner on outreach programs increased as well as education on cardiac health, the rapid recognition of a cardiac event, and best practices in the care and treatment of a STEMI.

An annual EMS report is distributed to all county stakeholders, out-of-county stakeholders, and the public. Distribution of the report provides an opportunity to share our system's delivery of care and continuous quality improvement through reports on specialty care, coordinated training events with our partners, clinical programs, and quality improvement activities.

Objectives

For the 2019-2020 calendar year we have set the following strategic goals using SMART objectives to improve our STEMI system.

Goal # 1	Improve Yolo County prehospital care of high-risk STEMI patients using guideline-directed, evidence-based medicine, and stakeholder feedback.

Specific:
Utilizing the Plan-Do-Study-Act Model for improvement we will:

- Engage stakeholders at our CQI STEMI meeting and the PAC to provide feedback and patient outcomes from our designated STEMI Receiving Centers.
- Participate in bordering counties' Local EMS Agency CQI programs and the STEMI Receiving Center QI programs to solicit additional feedback.
- Evaluate performances based on protocol.
- Stay informed by reading and evaluating new and existing studies on STEMI care and newly published guidelines by the AHA.

Measurable:
Measure progress through the collection and analysis of prehospital performance and patient outcome data.

Attainable:
Yes.

Relevant:
Yes, change will be driven through data collection, stakeholder engagement, and continuous evaluation of system performance.

Time:
Ongoing, long term.

Outcome:
Improvement of Yolo County prehospital STEMI patient outcomes.

Goal # 2 Standardize STEMI data fields and create benchmarks for QI and system performance feedback.

Specific:
Perform a baseline assessment of the Yolo County STEMI protocol using FirstPass, a standard platform for reviewing protocol performance at both the individual and system level.

Measurable:
Using FirstPass's designed platform, measurement of individual and system performance will be based on:

- 12-Lead ECG performed within 10 minutes of patient contact
- IV or IO established
- STEMI Alert provided
- Direct transport to a STEMI Center
- Oxygen delivery when SpO_2 is < 94%
- Scene time < 15 minutes
- Aspirin administered unless documented allergy
- Transportation mode

Attainable:
Yes.

Relevant:
Yes, YEMSA is committed to aligning with AHA goals for a STEMI system of care. With effective and accurate data collection, we can review and analyze prehospital provider performance and adherence to our STEMI protocol.

Time:
Ongoing, quarterly.

Outcome:
Standardize the QI platform in FirstPass using our STEMI protocol and improve individual and system performance based on feedback.

Goal # 3 Decrease mortality and improve overall quality of prehospital care and patient outcomes through the implementation of AHA Mission: Lifeline benchmarks.

Specific:
Using benchmarks created by AHA Mission: Lifeline

- Track the percentage of patients with non-traumatic chest pain/Acute Coronary Symptoms who receive a prehospital 12-Lead ECG within 10 minutes of arrival.
- Track hospital notification of STEMI Alert within 10 minutes of a 12-Lead ECG performed.
- Transport directly to a STEMI Center with first medical contact to PCI in < 90 minutes or < 20 minutes when transport time is greater than or equal to 45 minutes and Door to Balloon time less than or equal to 30 minutes.

Measurable:
Yes, data will be used to provide critical information and assess system performance.

Attainable:
Yes.

Relevant:
Yes, Mission: Lifeline is the AHA national initiative to advance the System of Care for STEMI patients.

Time:
Ongoing.

Outcome:
Improve prehospital quality of care and patient outcome in Yolo County.

Appendix A – Protocol – Chest Discomfort or Symptoms Consistent with Cardiac Etiology

CHEST DISCOMFORT OR SYMPTOMS CONSISTENT WITH CARDIAC ETIOLOGY
Adult
BLS
Assess vital signs O_2, titrate SpO_2 to $\geq$ 94%
ALS
Cardiac Monitor, 12-Lead ECG, Waveform $EtCO_2$, Vascular Access
For patients meeting STEMI criteria transmit the 12-Lead ECG and contact the STEMI Receiving Center with a **"STEMI Alert"** (preferably from the scene)
Aspirin 325 mg chewable PO **Aspirin should be administered to all patients **UNLESS** there is a history of anaphylaxis even if the patient has already taken Aspirin*
Chest Discomfort – SBP > 100 & HR > 50 or < 120
Nitroglycerin 0.4 mg SL tablet or spray • May repeat every 5 minutes
Chest Discomfort – SBP > 100
Fentanyl 50 mcg SIVP • May repeat every 5 minutes • Max Dose 200 mcg
SBP < 100
Fluid Bolus NS 250 mL IV • May repeat as needed
Consider
• **For patients meeting STEMI Criteria, consider placing D-fib pads.** • Pain reduction is the goal for patients experiencing cardiac-related chest discomfort. If nitroglycerine is ineffective in relieving pain, early use of Fentanyl is encouraged. • Avoid Nitroglycerin if the patient has taken erectile dysfunction medication within the past 24 hours. • Female, geriatric, and diabetic patients frequently experience atypical pain/discomfort. For these patients, a high index of suspicion should be exercised and a 12-Lead ECG performed early. • Serial 12-Lead ECG's are encouraged.
Direction
• If there is any concern about the destination decision, transmit the 12-Lead ECG to the Base Hospital Physician for a destination decision.

Appendix B – Procedure - 12-Lead ECG

12-LEAD ECG

Adult	Pediatric

Definitions

Acute Coronary Syndrome (ACS): Any group of symptoms attributed to obstruction of the coronary arteries
STEMI: ST Elevation Myocardial Infarction
PCI: Percutaneous Coronary Intervention
Cardiovascular STEMI Receiving Centers (SRC): Facilities that have emergency interventional cardiac catheterization capabilities

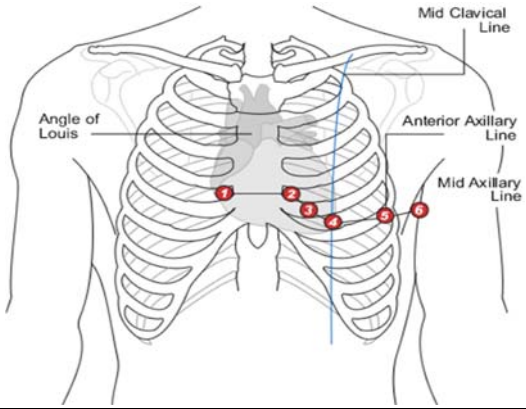
ALS

Indications

- Chest or upper abdominal discomfort
- Chest discomfort with radiation to jaw, neck, left shoulder, back, or left arm
- Chest discomfort with nausea, diaphoresis, and/or dyspnea
- Unexplained syncope or near syncope
- New onset cardiac dysrhythmia
- Onset of dyspnea suggestive of congestive heart failure
- Patient with suspected stroke (CVA)

Procedure

V1: right 4th intercostal space
V2: left 4th intercostal space
V3: halfway between V2 and V4
V4: left 5th intercostal space, mid-clavicular line
V5: horizontal to V4, anterior auxiliary line
V6: horizontal to V5, mid-auxiliary line
V4R: right 5th intercostal space, mid-clavicular line (use in all suspected inferior STEMI)



Consider

- Serial 12-Lead ECGs are encouraged during transport
- Consider right-sided 12-Lead for inferior wall MI
- Consider Base Hospital Physician Contact for unstable ventricular tachycardia, ventricular fibrillation, Second Degree Type II Heart Block (MOBITZ II), Third Degree heart blocks, and new onset left bundle branch blocks (LBBB)

Adult	Pediatric

Direction

- If the 12-Lead ECG indicates STEMI, transport to a YEMSA approved STEMI Receiving Center
- Transmit 12-Lead ECG if the receiving facility has transmission receiving capabilities
- If there is any concern about the destination decision transmit the 12-Lead ECG to the Base Hospital Physician for a destination decision

Documentation

- Interpretation of the 12-Lead ECG (amount of ST elevation in millimeters)
- Location of reciprocal changes (if applicable)
- Symptoms (including presence or absence of chest pain)
- Presence of a LBBB
- Presence of imposters (early repolarization, left ventricular hypertrophy, pericarditis or paced rhythms)
- Significant vital signs and physical findings
- Attach a copy of the 12-Lead to the ePCR

Appendix C – Policy - Interfacility Transport (IFT) of ST Elevation Myocardial Infarction (STEMI) Patients

INTERFACILITY TRANSPORT (IFT) OF ST ELEVATION MYOCARDIAL INFARCTION (STEMI) PATIENTS

PURPOSE

To provide guidelines for the IFT of patients diagnosed with STEMI and who may require emergent Percutaneous Coronary Intervention (PCI). This system of care is consistent with national standards of achieving a STEMI Referring Facility arrival-to-STEMI Receiving Center first intervention time of less than (<) ninety (90) minutes for walk in patients, and a 9-1-1 call-to-STEMI Receiving Center first intervention time of < one hundred twenty (120) minutes for Emergency Medical Service (EMS) patients initially transported to a STEMI Referring Facility.

AUTHORITY

Health & Safety Code, Division 2.5, Chapter 2, §§ 1797.67, 1797.88
Health & Safety Code, Division 2.5, Chapter 6, Article 1, § 1798.102
Health & Safety Code, Division 2.5, Chapter 6, Article 2, § 1798.150
Health & Safety Code, Division 2.5, Chapter 6, Article 3, §§ 1798.170, 1798.172
California Code of Regulations, Title 13, Division 2, Chapter 5, Article 1, § 1105 (c)
California Code of Regulations, Title 22, Division 9, Chapter 4, Article 7, § 100169

DEFINITIONS

Cardiovascular STEMI Receiving Centers (SRCs) – Yolo County Emergency Medical Services Agency (YEMSA) designated facilities that have emergency interventional cardiac catheterization capabilities available on a twenty-four/seven 24/7 basis.

STEMI Referring Facilities (SRFs) – Facilities that do not have emergency interventional cardiac catheterization capabilities.

POLICY

The Emergency Departments (EDs) of SRFs play a critical role in the care of the STEMI patient. The optimal system of care for STEMI patients consists of a well-coordinated relationship between the early recognition and care by ED staff at SRFs followed by definitive care at SRCs after rapid transfer by EMS Transport Provider Agencies.

While an SRC should be considered as the destination of choice for STEMI patients, for those patients who do not meet the patient destination criteria for immediate transport to a SRC and are transported instead to a SRF and for those patients who walk into a SRF it is vital to identify these patients quickly, provide initial stabilizing treatment, and simultaneously make contact with the appropriate SRC for possible transfer and emergent PCI.

GUIDELINES

I. Initial Treatment Goals
   A. Patients arriving at SRF by EMS or non-EMS:
   B. ECG obtained within ten (10) minutes of patient arrival
   C. If STEMI is identified:
      1. Consider transferring all STEMI patients who are candidates for primary PCI
      2. < 30 minutes at SRF ED (door in/door out)

II. Timelines
   A. Goal: < ninety (90) minutes SRF arrival-to-SRC first intervention for walk in patients and < one hundred twenty (120) minutes 9-1-1 call-to-SRC first intervention time for EMS patients initially transported to a SRF
      1. < thirty (30) minutes 9-1-1 call to SRF ED (if EMS patient)
      2. < thirty (30) minutes at SRF (door in/door out)
      3. < thirty (30) minutes to complete Paramedic or Critical Care IFT
      4. < thirty (30) minutes at SRC before coronary intervention

   B. If SRF arrival-to-SRC first intervention is anticipated to be longer than ninety (90) minutes, then administration of lytic agents should be considered in patients that meet thrombolytic eligibility. The goal for door to thrombolytics is < thirty (30) minutes for these patients. Contact the SRC early to discuss coordination of subsequent care.

PROCEDURE

I. In the event that an acute STEMI patient needs to be transferred to a SRC, the SRF ED should:
   A. Immediately after a STEMI patient is identified at the SRF, contact the SRC ED Physician to arrange an ED to ED transfer.
   B. The SRC ED Physician will assist in advising the appropriateness for transfer for emergent PCI. The SRC ED Physician will contact the SRC Interventional Cardiologist as needed.
   C. SRC facilities have agreed to accept STEMI patients at all times irrespective of payer source unless the SRC is on internal disaster diversion (including Cardiac Catheterization Lab equipment out-of-service) or other patients already being treated would prevent the patient from receiving intervention in < ninety (90) minutes from SRF arrival.
   D. Contracted Advanced Life Support (ALS) Service Provider Agencies should be utilized when agreements are in place and the ALS transport unit is available within ten (10) minutes of the initial transport request. The jurisdictional ALS Service Provider Agency may be contacted via 9-1-1 when the contracted ALS Service Provider is not available.
   E. Unless medically necessary, avoid using medication drips that are outside of the Paramedic Scope of Practice to avoid any delays in transferring of STEMI patients.
   F. If patient care has been initiated that exceeds the Paramedic Scope of Practice, the SRF may consider sending one (1) of its Registered Nurses (RNs) or other qualified medical staff with the transporting Paramedic unit if deemed necessary due to patient's condition. Nurse staffed Critical Care Transport (CCT) units may also be utilized if necessary and the response time is appropriate.
   G. Provide the ambulance transport team with a complete patient report and all appropriate documentation (diagnostic lab, X-ray, Physician and nursing notes, etc.). However, do not delay transport of the patient if complete documentation is not available. If complete documentation is not sent with the transport team, this information may be faxed to SRC when it becomes available.

Appendix D – STEMI Data Template

Prehospital

Case Number	Incident Date	First Name	Last Name	DOB	Patient Age	Patient Gender

Time of Call	Time Dispatched	Time En route	Time On Scene	Time Patient Contact	Time Transported	Time Arrived Hospital	Time First ECG	ECG Transmitted

Paramedic Impression	Monitor Impression	Suspected STEMI	Receiving Hospital	Facility Activation Time	AMR Hospital Activation Type

Blood Pressure	Oxygen	ASA	NTG	Fentanyl	Time ECG to Alert	Time Call to ECG	PT Contact to Alert	PT Contact to ECG

Hospital Data

EMS STEMI Alert Received (Y/N)	**CathLab Team Activated due to EMS Alert (Y/N)**	**Time of EMS Arrival (Door Time)**	**ED Findings - STEMI Y/N**	**PCI (Y/N)**	**Time of Perfusion**

PCI Interventions/Tx	**If No PCI - other DX and Treatment**	**Fibrolytics Given (Y/N)**	**Time Fibrolytic Given**	**Discharge Date**	**Hospital Comments**