



Thomas Jefferson EMS Council

STEMI Triage Plan 202 Edition

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Definitions

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

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

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

Angioplasty – A surgical procedure that requires a slender balloon-tipped tube to be threaded from a radial or femoral artery 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. It is used to treat patients with a partially or completely blocked artery that restricts blood flow through the heart.

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

Balloon Inflation – see Angioplasty.

Cath lab (Cardiac) – The department in a medical facility that specializes in cardiac catheterization, which is a procedure to examine blood flow to the heart, test how well the heart is pumping, and perform minimally-invasive cardiac interventions.

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

Door to Balloon Time – The amount of time between a heart attack patient’s arrival at the hospital and the time he/she receives Percutaneous Coronary Intervention (PCI), or Angioplasty.

Door to Needle Time – 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 Services (EMS) – A system of health care facilities, equipment, and professionals providing pre-hospital emergency care.

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

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

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

Non-PCI Hospital – 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; and treat STEMI patients with medications when it is not feasible for them to get to a PCI-capable hospital for treatment in a timely manner.

Percutaneous Coronary Intervention (PCI) – see Angioplasty.

PCI-Capable Hospital – A hospital that has the expertise and facilities to administer Percutaneous Coronary Intervention (PCI), a mechanical means of treating heart attack 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.

STEMI (ST-Segment Elevation Myocardial Infarction) – An acute ischemia (lack of blood flow) to the heart tissue sufficient to cause tissue damage where there is ST-segment elevation on the electrocardiographic (ECG) readings.

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.

Executive Summary

The Thomas Jefferson Emergency Medical Services Council, Inc. (TJEMS) is responsible for establishing a strategy through a formal region-wide ST-segment elevation myocardial infarction (STEMI) Triage System incorporating the region's geographic variations and STEMI care capabilities and resources (e.g., PCI vs. non-PCI facilities).

The purpose of the TJEMS Council Regional STEMI Plan is to establish a consistent baseline of criteria for prehospital and inter-facility triage and transport of STEMI patients. The plan will identify formalized regional STEMI plans to augment the State STEMI triage plan to recognize and address variations with the regional EMS and hospital resources. This Regional STEMI Plan addresses patients experiencing a "STEMI," defined as, "an acute ischemia (lack of blood flow) to the heart tissue sufficient to cause tissue damage where there is ST segment elevation on the electrocardiographic (ECG) readings." The primary focus of this plan is to provide guidelines to facilitate the early recognition of the STEMI patient and to expedite transport to a designated PCI center able to provide definitive care as quickly as possible.

The primary goal of the TJEMS Regional STEMI Plan is: **To develop a STEMI emergency care system that, when implemented, will result in improved STEMI recognition, notification, rapid transport and treatment, thus reducing time to reperfusion in STEMI patients in the TJEMS Region.** In order to accomplish this, a number of specific processes are essential. These are:

1. The rapid and accurate identification of patients experiencing a STEMI.
2. The triage of patients to an appropriate transport destination to provide timely and definitive treatment of the STEMI patient.
3. The provision of quality patient care to those utilizing the EMS System.
4. The continuous evaluation and improvement of the prehospital stroke care system based on established EMS performance measures for STEMI.

Guidance Materials

STEMI Alert Criteria

STEMI Patient (ST-segment elevation myocardial infarction)

Cardiac symptoms **AND**

- 12-lead ECG criteria of 1 or more millimeters of ST elevation in 2 or more contiguous leads **OR**
- 12-lead ECG interpretation with an “ACUTE MI” or “MEETS ST ELEVATION MI CRITERIA” statement

12-lead Acquisition Guideline

Providers of all levels should be trained to acquire 12-lead ECG's. Although cardiac rhythm interpretation remains an EMT-I and EMT-P skill, all providers should be encouraged to communicate concerning findings regardless of level.

Initiating care of the clinically unstable patient takes precedence over 12-lead ECG acquisition; whenever possible, patient care and 12-lead ECG should take place simultaneously. **Obtaining a 12-lead ECG should be performed within ten (10) minutes of EMS patient contact.**

The 12-lead ECG is not a triage tool used to make a decision whether or not to transport the patient.

Once a 12-lead ECG has been obtained, the patient **should** be transported. EMRs, EMTs and AEMT level providers must transmit the ECG anytime a provider suspects an MI or the ECG displays **“***ACUTE MI SUSPECTED***”** or **“***MEETS ST ELEVATION MI CRITERIA***”** to the receiving hospital and contact Medical Command and speak with the attending physician at that hospital **within ten (10) minutes of ECG acquisition suspicious for MI** for ECG interpretation. Once the 12-lead ECG is acquired and transmitted, the EMS provider should leave the leads connected and the ECG monitor on to allow the monitor to evaluate for ST segment changes.

If the patient has unstable vital signs **AND/OR** has a high risk history or complicated ALS complaints, reasonable attempts must be made to rendezvous with a medic level provider for transport.

Any change in patient status or condition should result in a medic being summoned to meet during transport. EMS should not delay transport while attempting to find or meet with a medic.

Acquisition Criteria:

EMS should acquire a 12-lead ECG on the following patients **in no more than 10 minutes of EMS patient contact:**

Patients greater than 30 years old experiencing any of the following:

- Chest pain, discomfort, pressure or tightness
- “Heartburn” or epigastric pain
- Complaints of “heart racing” (HR > 150 or irregular and > 120)
- Complaints of “heart too slow” (HR < 50 and symptomatic)
- A syncopal episode or severe weakness in patients > 45 years old
- New onset stroke symptoms (< 24 hours old)
- Difficulty breathing (with no obvious non-cardiac causes)

Patients (regardless of age) with any of the above symptoms and a history of:

- Prior cardiac disease such as a heart attack
- A family history of early heart attack
- Diabetes mellitus
- Severe obesity
- Recent illicit drug use

Consider 12-lead monitoring for suspicious or unknown MOI – e.g., ground level falls and single vehicle motor vehicle collisions with no clear or obvious cause.

STEMI Patients: (All providers)

If an acute ischemic event or myocardial infarction is identified, or the monitor reads: “***ACUTE MI SUSPECTED***” or “***MEETS ST ELEVATION MI CRITERIA***”, the **receiving Attending Physician should be contacted within ten (10) minutes of recognition**; the care of the patient discussed, and additional resources may be mobilized as necessary to expedite patient care (i.e., potentially including Medic rendezvous, critical care transport, or Medevac). If transmitting a 12-lead ECG, you must contact medical command and request to speak to the Attending Physician. **Inability to transmit 12-lead ECG should NOT delay voice communication to the receiving Attending Physician.** If SMJH ER Attending Physician is not immediately available, do not delay giving full report to the RN. When a STEMI is suspected, providers should use the phones to communicate with the Attending Physician so a name and date of birth can be communicated to pre-register the patient.

Obtaining the field 12-lead ECG is valuable for comparison to later 12-lead ECG's; the field ECG may be repeated if the patient's clinical situation changes. ALS providers should attempt to establish IV access, preferred 18-20 gauge. If at all possible, the patient's right hand/wrist should be avoided for IV access.

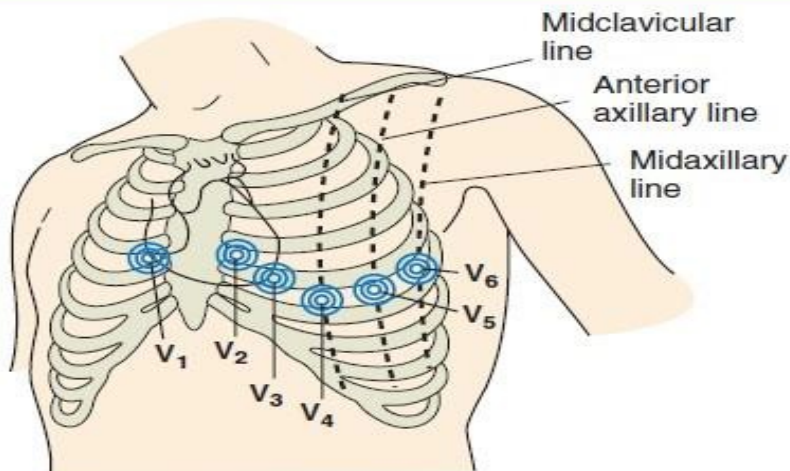
Field 12-lead ECG tracings should be provided to the receiving hospital for documentation in the patient's chart upon arrival.

Procedure:

- Expose chest and prep as necessary
- Apply chest leads and extremity leads using following landmarks:
 - V1 – 4th intercostal space at the right sternal border
 - V2 – 4th intercostal space at the left sternal border
 - V3 – Directly between V2 and V4
 - V4 – 5th intercostal space at mid-clavicular line
 - V5 – 5th intercostal space at anterior axillary line
 - V6 – 5th intercostal space at mid-axillary line
 - Instruct patient to hold still
 - Press appropriate button to acquire 12-lead
 - Print and transmit ECG, include patient's sex and age

Chest Leads

Standard Chest Lead Electrode Placement



Elements of Chest Leads

Lead	Positive Electrode Placement	View of Heart
V ₁	4th Intercostal space to right of sternum	Septum
V ₂	4th Intercostal space to left of sternum	Septum
V ₃	Directly between V ₂ and V ₄	Anterior
V ₄	5th Intercostal space at left midclavicular line	Anterior
V ₅	Level with V ₄ at left anterior axillary line	Lateral
V ₆	Level with V ₅ at left midaxillary line	Lateral

I - Lateral	aVR	V1 - Septal Left Anterior Descending Artery	V4 - Anterior Left Anterior Descending Artery
Circumflex Artery	II - Inferior	V2 - Septal Left Anterior Descending Artery	V5 - Lateral
Right Coronary Artery	Circumflex Artery	V3 - Anterior Left Anterior Descending	V6 - Lateral Circumflex Artery
III - Inferior Right Coronary Artery	aVF - Inferior Right Coronary Artery		
SITE	ST ELEVATION LOCATION		RECIPROCAL
ANTERIOR	V3, V4		NONE
ANTEROLATERAL	I, aVL, V3, V4, V5, V6		II, III, aVF
ANTEROSEPTAL	V1, V2, V3, V4		NONE
EXTENSIVE ANTERIOR	I, aVL, V1, V2, V3, V4, V5, V6		II, III, aVF
INFERIOR	II, III, aVF		I, aVL
LATERAL	I, aVL, V5, V6		II, III, aVF
POSTERIOR	V7, V8, V9		V1, V2, V3, V4
RIGHT VENTRICLE	II, III, aVF, V1, V4R		I, aVL
SEPTAL	V1, V2		NONE

Modified 12-lead Placement (Posterior)

Posterior ECG lead placement

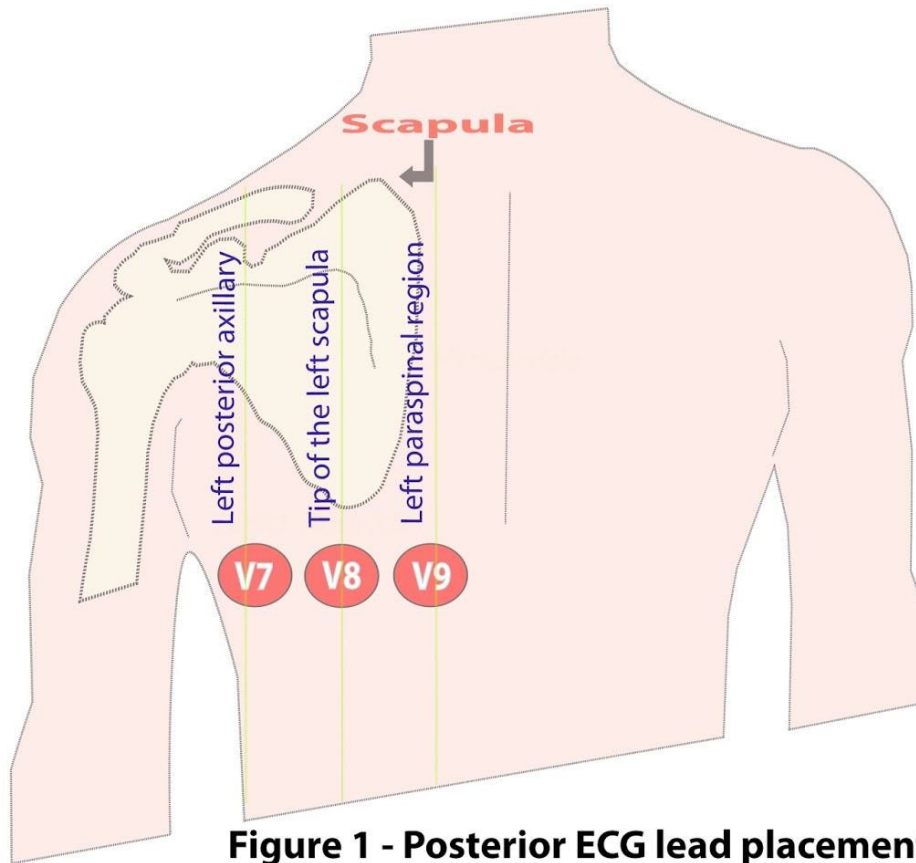


Figure 1 - Posterior ECG lead placement

V7

Left posterior axillary line:
in the same horizontal plane as V4-V6

V8

Tip of the left midscapula:
in the same horizontal plane as V7-V9

V9

Left paraspinal region:
in the same horizontal plane as V4-V6

V1-V3

Should remain unchanged from standard 12-lead ECG

Posterior MI is suggestive by the following changes in V1-V3:

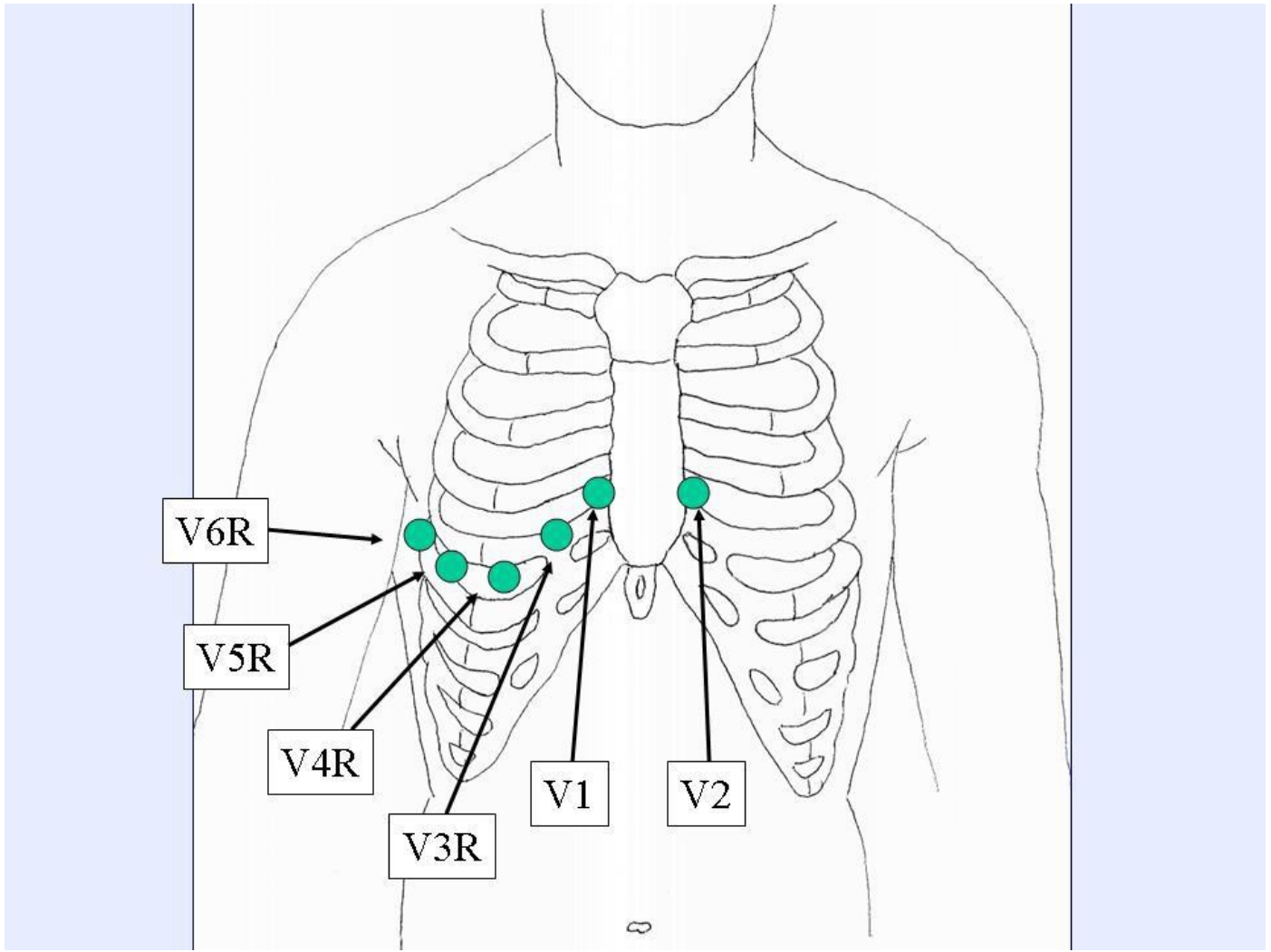
- *Horizontal ST depression
- *Tall, broad R waves (>30ms)
- *Upright T waves
- *Dominant R wave (R/S ratio >1) in V2

Please note that V6 is a good reference point for the horizontal placement of the posterior electrodes V7-9.

If you don't have access to a 15 or 18 lead ECG machine, then leave V1-3 in their normal position and use V4-6, these leads will then become V7-9.

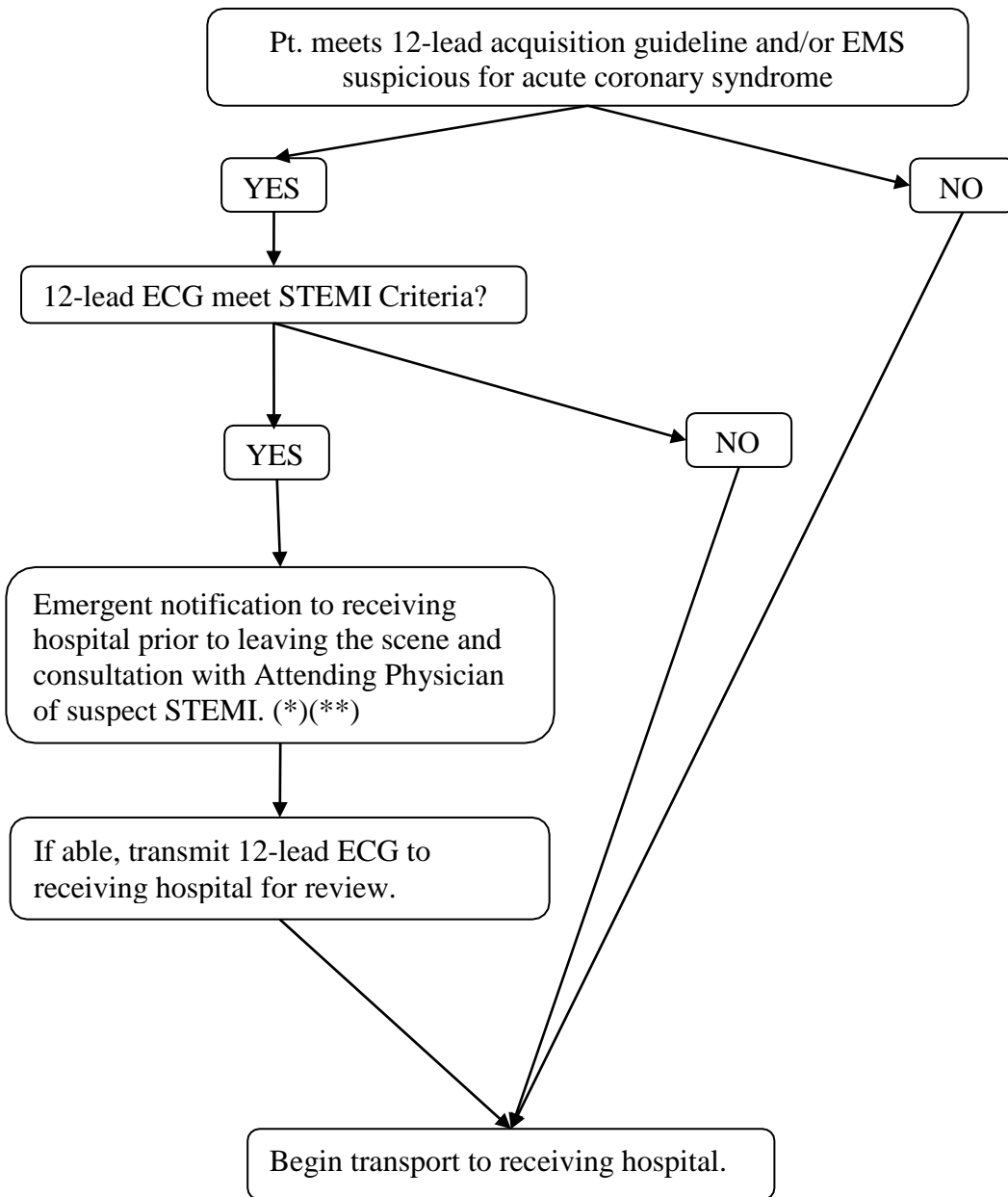
Be sure to strike through lead labels V4 - V6 and change to V7 - V9 on the print out

Modified 12-lead Placement (Right Sided)



Be sure to change the V3 – V6 lead labels to V3R - V6R on print out

Field STEMI Triage Decision Scheme



(*) Inability to transmit ECG should not delay early notification to receiving hospital.

(**) If SMJH ER Attending Physician is not immediately available, do not delay giving full report to the nurse on the phone.

TJEMS Regional Chest Pain – Cardiac Suspected Guideline:

History	Physical	Differential Diagnoses
Age Use of Viagra®, Cialis®, Levitra® or herbal equivalents Past medical history Recent physical exertion Onset Provocation/palliation Quality Radiation Severity Time	Chest pain (pain, pressure, aching, tightness) Location (substernal, epigastric, arm, jaw, neck, shoulder) Pale, diaphoretic Dyspnea Nausea, vomiting Anxiety	Trauma vs. Medical Angina vs. STEMI Pericarditis Pulmonary embolism Asthma/COPD Pneumothorax Aortic dissection or aneurysm Reflux or hiatal hernia Esophageal spasm Pleuritic pain Cocaine overdose

PEARL/S:

- If use of Viagra® or Levitra® use within the past 24 hours or Cialis® within 72 hours contact medical command.
- Inferior STEMI is preload dependent and may not tolerate NTG or morphine well; use IV fluids as needed.
- Use of nitropaste may be preferable to SL NTG if hypotension is likely to occur.
- Diabetics, females, and geriatric patients often present with atypical chest pain or generalized complaints.
- For medication administration all patients should have cardiac monitoring.

Continued.....

TJEMS Regional Chest Pain – Cardiac Suspected Guideline:

EMT	Universal Care Guideline
	Perform and transmit 12-lead ECG, consult medical command
	Transport to cath lab facility for known or suspected MI
	Aspirin 324 mg (4 baby aspirin) chewed
	Assist patient with nitroglycerin 0.4 mg every 5 minutes as needed. No maximum, keep BP > 100 mm Hg
TJEMS – EMT	Nausea and/or vomiting, consider ondansetron (Zofran®) 4 mg ODT (orally disintegrating tablet)
	Administer nitroglycerin tablet 0.4 mg or 1” of nitropaste.
A	IV/IO/Vascular Access
	Nausea and/or vomiting, consider ondansetron (Zofran®) 4 mg IV/IM, repeated in 10 minutes if needed.
I/P	Refer to hypotension and dysrhythmia protocols as indicated
	<p>Fentanyl (Sublimaze®)</p> <p>Adults: 1 microgram/kg IV, may be repeated once in 10 minutes Maximum single dose is 100 micrograms</p> <p><i>Reduced dose for elderly or ill patients = 0.5 micrograms/kg IV</i></p> <p>Adults: 2 microgram/kg IN, half of dose in each nostril, may be repeated in 10 minutes Maximum single dose is 100 micrograms</p> <p>Consider administration of ondansetron (Zofran®) to patients with significant pain who will receive narcotic pain medications and are already nauseated or at risk for nausea/vomiting.</p> <p>Adults: 4 mg ODT (orally disintegrated tablet), may be repeated once in 10 minutes 4mg IV, may be repeated once in 10 minutes</p> <p>Observe patient carefully for any signs of respiratory depression or changes in vital signs when administering pain medications.</p>

Guideline Updated: 2017

STEMI Recognition

Recognition of a STEMI in the prehospital environment by EMS depends on the initial responding team of providers' ability to quickly recognize both objective and subjective signs and symptoms of a STEMI. Providers should **obtain a 12-lead ECG in no more than 10 minutes after patient contact**. It is essential for EMS providers to have ongoing training and continuing education to maintain proficiency in treatment of acute coronary symptoms as well as 12-lead acquisition and interpretation for STEMI recognition.

The regional EMS STEMI system should have an integrated process in place that allows on-line medical command for prehospital 12-lead ECG's to be transmitted to the receiving facility for review and interpretation and/or confirmation by the attending physician. Transmission of prehospital ECG's is not required for STEMI activations.

On suspected STEMI patients, once the 12-lead ECG has been acquired, EMS should attempt transmission and contact the receiving facility by phone (preferable) or radio in no more than 10 minutes. Once contact with receiving attending physician is established, the patient and the 12-lead ECG should be discussed. Providers who are not trained and experienced in the interpretation of ECG's must communicate the monitor's software interpretation of the 12-lead ECG to on-line medical command, and other alternative methods of communication (e.g. transmission of cell-phone pictures of the ECG) may also be utilized.

There are three typical ways to identify STEMI patients:

1. Provider interpretation of 12-lead ECG findings
2. Device interpretation of 12-lead ECG findings
3. Transmission and online medical interpretation of 12-lead ECG

Some strategies to consider:

- Prehospital 12-lead capability needs to be an available resource at the earliest appropriate time.
- There needs to be good communication between pre-hospital and the ED for subsequent patient care and early cath lab activation.
- It is recommended to have a STEMI screening checklist.

Prehospital Patient Care Decision Making

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

Optimally, when there are multiple PCI facilities in relatively close proximity, hospital protocols should consider planning for situations in which the primary PCI facility might be unable to accept the patient initially, requiring real-time communication with the next closest PCI facility. The next closest PCI facility may also require communication with those facilities that may be positioned outside of the regional area proper or outside of a facility's home network.

STEMI Patient Transport Considerations

MODE OF TRANSPORTATION: TJEMS is unique in it has the availability of two PCI Centers within the region (UVA and SMJH). Consideration should be given to both hospitals available to the region and the resources they have available for STEMI patients. Additional PCI Centers around the TJEMS region include Augusta Health, Henrico Doctor's Hospital, and Spotsylvania Regional Medical Center.

STEMI patients who meet any of the STEMI Criteria, indicative of an ST-segment elevation myocardial infarction, should be transported to the **closest appropriate PCI center**.

STEMI patients not within 30 minutes ground transport time to a PCI Center should be transported to the closest hospital, unless they can be delivered to a PCI Center more rapidly by a Helicopter EMS (HEMS) agency.

Transport of STEMI patients, as defined in this plan, by HEMS should:

1. Significantly lessen the time from scene to a PCI Center compared to ground transport.
2. Be utilized to achieve the goal of having STEMI patients expeditiously transported to a PCI center, unless consultation with on-line medical control has occurred and advised otherwise.

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

RAPID TRANSPORTATION: Because a STEMI is a time-sensitive event, EMS providers should **contact the receiving hospital immediately** and speak with the attending physician for **early cath lab activation** on suspected STEMI patients. Once the receiving facility's attending physician has been notified, EMS should initiate **rapid transport** of the patient. Consideration should also be given to prehospital resources, including use of HEMS, available at the time of the incident, and other conditions such as transport time, road and weather conditions. If HEMS is utilized, ground EMS units involved in transfer of care should not hesitate to provide receiving facility with report – duplication is preferred over failure of either unit to notify receiving facility.

ED Bypass Information: For STEMI patients that meet certain circumstances during the day, EMS personnel may be given an ED bypass. This means that the EMS providers will take the patient directly to the catheterization lab suite for immediate catheterization, instead of stopping in the emergency department.

Patients that may qualify for ED bypass:

- Stable patients without the need for immediate life-saving intervention/resuscitation
- ED physician agrees with STEMI and is an appropriate candidate.
- Age 30-90 years old
- Able to give informed consent
- Not a DNR
- QRS <0.12 (OK if RBBB)
- Confirmed catheterization lab is able to accept patient directly.
- No contrast allergy

American Heart Association - Mission: Lifeline™ Recommendations for EMS

1. Each EMS system should maintain a standardized algorithm for evaluating and treating patients with symptoms suggestive of myocardial ischemia that should include acquisition of a 12-lead ECG and appropriate communication of the ECG findings (via direct paramedic interpretation/voice communication, automated computer algorithm interpretation, wireless transmission and physician interpretation, or any combination of these three strategies) to the receiving hospital.
 2. Each EMS system should maintain a standardized reperfusion STEMI care pathway that designates primary PCI as the preferred reperfusion strategy if initiated within 90 minutes of first medical contact or fibrinolytic therapy in eligible patients when primary PCI within 90 minutes is not possible.
 3. Prearranged EMS destination protocols for STEMI patients should include:
 - a. Bypassing non-PCI hospitals/STEMI Referral Centers and going directly to primary PCI hospitals/STEMI-Receiving Centers for patients with anticipated short transport interval (e.g. < 30 minutes in urban/suburban settings, so as to achieve primary PCI within 90 minutes).
 - b. Emergency transfer by EMS or other agencies to a STEMI-Receiving Center of patients with STEMI who transport themselves to a STEMI Referral Center.
 - c. Air transport if possible (or default to ground transport) to STEMI-Receiving Center or stabilization in STEMI Referral Center for patients with anticipated long transport time and/or either fibrinolytic ineligible and/or in cardiogenic shock
 - d. Administration of fibrinolytic therapy prehospital or in a STEMI Referral Center for fibrinolytic eligible patients with anticipated time to primary PCI exceeding 90 minutes.
 - e. Emergency transfer to a STEMI-Receiving Center of patients who develop STEMI while in hospital at STEMI Referral Center (non-PCI hospital).
 4. When taken directly to a STEMI-Receiving Center, all STEMI patients should be transported to the most appropriate facility as determined by Mission: Lifeline hospital criteria, with a system goal of first medical contact to balloon inflation (initial device used) within 90 minutes.
 5. EMS medical director or designate should monitor care related to EMS patients with STEMI by meeting at least quarterly with prehospital providers, emergency physicians, interventional cardiologists, nursing staff, receiving hospital representatives, and other appropriate individuals (i.e. STEMI Survivor).
 6. The following measurements should be evaluated on an ongoing basis:
 - a. Symptom onset to 9-1-1 call
 - b. Time 9-1-1 call is first received by primary public safety answering point to vehicle arrival at hospital door
 - c. Time from first medical contact to balloon inflation (first device used)
 - d. Time from prehospital ECG to balloon inflation (first device used)
 - e. Proportion of patients with non-traumatic chest pain > 35 years treated by EMS for whom 12-lead ECGs were obtained
 - f. Proportion of patients with STEMI treated by EMS for whom 12-lead ECGs were obtained
 - g. Proportion of patients with field diagnosis of STEMI and activation of the Cardiac Catheterization Laboratory for intended primary PCI that:
 - i. Do not undergo acute catheterization because of misdiagnosis
 - ii. Undergo acute catheterization and found to have no elevation in cardiac biomarkers and no revascularization in the first 24 hours
 - h. Proportion of patients with EMS treated ventricular fibrillation (VF) who are taken to the Cardiac Catheterization Laboratory
 - i. Survival to hospital discharge of all STEMI patients and of patients with VF (EMS and STEMI- Receiving Center to monitor jointly)
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Recommendations and Guidelines for Prehospital EMS Agencies

To allow for the best care possible, EMS should follow the regional 12-lead and STEMI guidelines or have a guideline of their own that will encompass the following. These guidelines and recommendations do not limit any agency's individual actions to exceed the guidelines and recommendations mentioned below:

- An EMS agency needs to provide a mechanism for 12-lead acquisition at the earliest appropriate juncture.
- Acquire a 12-Lead ECG, if possible, **within 10 minutes of patient contact** on patients exhibiting symptoms consistent with a STEMI and as outlined by the regional 12-lead acquisition guideline.
- If able, attempt 12-lead ECG transmission to receiving hospital for suspected STEMI patients. Providers unable to interpret 12-lead ECG's will contact receiving hospital immediately for interpretation when a STEMI is likely or the machine displays or prints: "**** ACUTE MI ****" or "**** MEETS ST ELEVATION CRITERIA ****".
- For suspected STEMI patients, **communicate within 10 minutes of 12-lead ECG acquisition** with on-line medical command because early notification increases coordination with specialty care resources.
- Allow the ability to perform a reperfusion "checklist" as outlined by AHA. Relay the 12-lead ECG check list findings to a predetermined medical control facility and/or receiving hospital as well as print their 12-lead ECG rhythm upon arrival at the receiving facility.
 - The checklist should be designed to determine the presence or absence of co- morbid conditions and underlying conditions in which fibrinolytic therapy may be hazardous. The checklist should also facilitate detection of patients with suspected STEMI who are at especially high risk, including those with severe heart failure or cardiogenic shock, for whom primary PCI is generally the preferred reperfusion strategy.
- Written protocol that guides EMS system personnel in determining the most appropriate receiving facility and method of transport to that facility for their suspected or confirmed STEMI patient.
- EMS should continue to be encouraged to follow the American Heart Association (AHA) guidelines regarding STEMI care to include, but not limited to, the administration of oxygen (as needed to maintain O₂ saturation above 94%), aspirin (325 mg chewed), nitroglycerin, and fentanyl.
- In addition to the appropriate tools and treatment, the agencies should assure that adequate training and continuing education is provided to providers.
- Thorough documentation regarding patient information and related destination determinations is essential. This will include the utilization of any patient transfer methods (i.e., HEMS) to ensure the patient arrives at the most appropriate receiving facility.

Public Safety Answering Point (PSAP) Recommendations

Public Safety Answering Points are typically the first point of contact for a patient entering the Emergency Medical Services system. Emergency medical telecommunicators serve as a vital connection between the patient, responding EMS providers, and the ACS system of care. It is imperative that the ACS system of care provide education and training to 9-1-1 personnel to provide early recognition and to minimize delays in prehospital dispatch. Emergency medical telecommunicators must identify and provide high-priority dispatch to patients with ACS symptoms. Current literature suggests that the use of scripted ACS-specific questions and instructions during a 9-1-1 call may be helpful.

PSAPs should develop the following procedures or programs to better serve the ACS system of care:

- Emergency Medical Dispatch (EMD) - A systematic program of handling medical calls for assistance. Trained telecommunicators, using locally-approved EMD guidecards, quickly and properly determine the nature and priority of the call, dispatch the appropriate response, and then give the caller instructions to help treat the patient until the responding EMS unit arrives.
- Questioning in the EMD program to determine the time of onset of signs and symptoms, which should be relayed to responding EMS units.
- Include instruction to take aspirin (ASA) to anyone experiencing ACS signs or symptoms by a trained EMD.
- See Appendix C for suggested guidelines for questioning by 9-1-1 dispatch centers without established protocols or EMD.

STEMI Triage Quality Monitoring

The TJEMS Council, will report aggregate STEMI triage findings on an intermittent basis, but no less than annually, to assist EMS systems and the Virginia Heart Attack Coalition improve the local, regional and Statewide STEMI Triage Plans. A de-identified version of the report will be available to the regional agencies and will include, minimally, as defined in the statewide plan, the frequency of:

- (i) Over- and under- triage to PCI Centers in comparison to the total number of STEMI patients delivered to hospitals
- (ii) Helicopter EMS utilization
- (iii) EMS Benchmarks: under development

TJEMS STEMI Triage Committee will produce a report which will be used as a guide and resource. This report will have three primary evaluation areas: timeliness of care, treatment provided, and outcomes of care. The fields identified are critical to analysis for the following reasons:

- a) They allow linking of EMS data and hospital STEMI data
- b) They allow for “real time” collection of data focused upon process improvement
- c) They allow for retrospective systemic analyses.

The ultimate goal of collecting this data is to provide actionable information, to the TJEMS medical director committee and the TJEMS training staff, relative to the care processes and outcomes associated with their treatment of STEMI patients as it relates to EMS.

The 2019 Performance Improvements Metrics for STEMI are:

- a) Percentage of patients who received a 12 lead within 10 minutes.
- b) Time difference between arrival on scene and leaving scene in the case of STEMI.
- c) Time difference between arrival at patient and first set of vital signs in STEMI.
- d) Measure prehospital cardiac arrest, % of ROSCs, and transported patients in cardiac arrest.
- e) Percentage of patients with STEMI that was transported via HEMS.

Quality Improvement

EMS systems in the Thomas Jefferson EMS region are involved in a regular quality improvement program designed to examine all facets of the ACS patient’s care, from initial contact with the EMS system through to definitive care at an appropriate treatment destination. Every effort should be made to facilitate sharing of pertinent patient information between components of the system, including data from the initial phases of the patient’s hospital care, such as “door-to-balloon” time and first medical contact to balloon time, with appropriate safeguards for patient privacy and confidentiality.

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

Every STEMI activation will generate an automatic feedback from the receiving hospital to the transporting EMS crew within 48 business hours of the event. This should outline the hospital 12-lead ECG interpretation, course of treatment of the patient, and the patient outcome. The feedback will be on a standard form and will be sent to the EMS providers via the routes utilized by either SMJH or UVA.

Recommended Data Collection Points

Pre-hospital & -facility:

- Number of cardiac patients
- Number of STEMI patients
- Aspirin administration and what time given
- Nitrates given?
- Oxygen needed – Patient O2 saturations
- Morphine or fentanyl given?
- Time of Sign & Symptom Onset to 911
- First medical contact time (at patient side)
- Utilization of 12-lead ECG
- First medical contact to 12-lead ECG acquisition
- 12-lead ECG acquisition to hospital notification
- 12-lead ECG acquisition to transmission
- Total on-scene time
- Use of HEMS?
- Activation of STEMI team
- Transport time to definitive care
- First medical contact to reperfusion
- 911 Call to Ambulance Dispatch
- Ambulance Dispatch to Ambulance en route
- Ambulance en route to Ambulance arrival
- Ambulance arrival to first medical contact
- Hospital notification to hospital arrival

Hospital:

- Onset of patient symptoms to emergency department arrival/presentation
- Time spent in emergency department
- Time en route to cath. lab from emergency department
- Cath. lab arrival to balloon
- Transmission capabilities with EMS
- False STEMI ID
- Patient outcome

Appendix A

STEMI Related Resources

- Virginia Heart Attack Coalition Web page: [c](#)
- Project Upstart: <http://www.projectupstart.com>
- Virginia Office of EMS Web page: <http://www.vdh.virginia.gov/OEMS/>
- Joint Commission: <http://www.qualitycheck.org/consumer/searchOCR.aspx>
- AHA Mission Lifeline:
http://www.heart.org/HEARTORG/Professional/MissionLifelineHomePage/Mission-Lifeline-Home-Page_UCM_305495_SubHomePage.jsp

Appendix B

EMS STEMI Reperfusion Checklist

Agency: _____

Patient ID: _____

DOB: _____



REPERFUSION CHECKLIST for Evaluation of the Patient with STEMI

STEP 1

Has patient experienced chest discomfort for greater than 15 minutes and less than 12 hours?

YES

NO

STEP 2

Are there contraindications to fibrinolysis?
If ANY of the below are checked "Yes," fibrinolysis is **contraindicated**
Consider direct transport to PPCI capable facility where feasible.

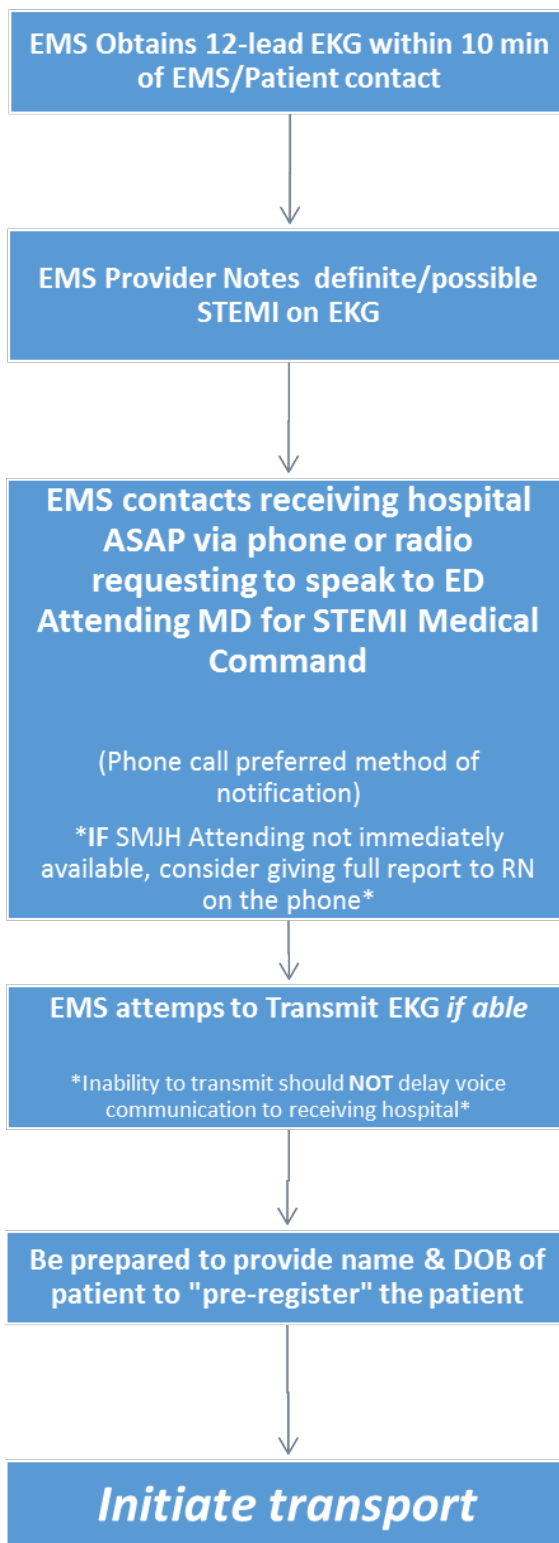


YES	NO	ABSOLUTE CONTRAINDICATIONS:	YES	NO	ABSOLUTE CONTRAINDICATIONS:
		Any prior intracerebral hemorrhage			Active bleeding or bleeding diathesis (excluding menses)
		Known structural cerebral vascular lesion (eg, arteriovenous malformation)			Significant closed-head or facial trauma within 3 months
		Known malignant intracranial neoplasm (primary or metastatic)			Intracranial or intraspinal surgery within 2 months
		Ischemic Stroke within 3 months EXCEPT acute ischemic stroke within 4.5 hours			Severe uncontrolled hypertension (unresponsive to emergency therapy)
		Suspected aortic dissection			For streptokinase, prior treatment within the previous 6 months

O'Gara PT, et al. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. Circulation. 2013;127

Appendix C

TJEMS Regional STEMI Activation Pathway



Appendix D

Dispatch Guidance/Resources

The following information is offered as a guide in questioning by dispatch centers within the Thomas Jefferson EMS Council region that do not have established procedures.

911 Call Received

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graph TD; A[911 Call Received] --> B[Standard questioning: 1. What is the address of the emergency? 2. What is the phone number you are calling from? 3. What is the problem, tell me exactly what happened? a. Are you with the patient now? b. How many people are hurt? (if not obvious) 4. Patient's age 5. Patient's gender 6. State of consciousness of patient 7. Patient's respiratory status]; B --> C[Cardiac Dispatch Protocol: 1. Is the patient awake (alert)? 2. Is the patient breathing normally? 3. Is the patient able to talk normally? 4. When was the last time the patient was seen without this or these problems? (Last time seen normal) 5. Has the patient ever had any heart problems before?]; C --> D[• Any post-dispatch questions or agency required questions? • If EMD – Pre-arrival instructions should be given.];
```

Standard questioning:

1. What is the address of the emergency?
2. What is the phone number you are calling from?
3. What is the problem, tell me exactly what happened?
 - a. Are you with the patient now?
 - b. How many people are hurt? (if not obvious)
4. Patient's age
5. Patient's gender
6. State of consciousness of patient
7. Patient's respiratory status

Cardiac Dispatch Protocol:

1. Is the patient awake (alert)?
2. Is the patient breathing normally?
3. Is the patient able to talk normally?
4. When was the last time the patient was seen without this or these problems? (Last time seen normal)
5. Has the patient ever had any heart problems before?

- Any post-dispatch questions or agency required questions?
- If EMD – Pre-arrival instructions should be given.