



## CENTRAL OHIO TRAUMA SYSTEM

### **WHITE PAPER FOR CENTRAL OHIO EMS AGENCIES ON THE PREHOSPITAL TRANSPORT OF STEMI PATIENTS TO LOCAL HOSPITALS BASED ON AHA/ACC STEMI GUIDELINES**

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## **BACKGROUND ON THE CENTRAL OHIO TRAUMA SYSTEM'S STEMI TASK FORCE**

The Central Ohio Trauma System (COTS) is a regional consortium of emergency medical technicians, paramedics, physicians, nurses, data specialists, researchers, acute care hospitals, trauma centers and others working together to resolve issues related to trauma and emergency care in the central Ohio region. COTS mission is to save and improve lives through the coordination of trauma and emergency healthcare resources. The purpose of the Central Ohio Trauma System (COTS) is to serve as the forum for addressing issues affecting the delivery of trauma/emergency healthcare services and injury prevention in central Ohio. COTS work is driven in one of two ways: (1) By issues and requests presented from participating stakeholders at the committee level; and/or (2) Directed to a committee by the COTS Board based on a perceived community need. COTS is a voluntary, cooperative, self-regulatory organization with charitable, educational, and scientific intent.

On August 24, 2004, COTS Prehospital Committee members shared the newly published ACC/AHA STEMI Guidelines at a meeting with the request that the COTS forum be used to address one particular item, namely “*every **community** should have a written protocol that guides EMS system personnel in determining where to take patients with suspected or confirmed STEMI.*<sup>1</sup>”

The COTS forum brought Franklin County's 21 public EMS agencies and 9 not-for-profit hospitals together into a STEMI Task Force. This White Paper is the work of the Task Force.

### **WHITE PAPER INTENT**

This document is meant to serve as a resource for Central Ohio EMS agencies. The intent of this White Paper is to accurately describe local hospitals' abilities to care for STEMI patients so that EMS providers can make informed decisions as they create operating procedures that address the treatment and destination options available for their patients. In addition, a brief summary of the Class I recommendations for prehospital care of the STEMI patient is provided. It is the sole responsibility of each EMS agency to create protocols that address the prehospital care and destination of STEMI patients within in their jurisdiction. This White Paper is *not* intended to depict ongoing quality assurance aspects of STEMI care at individual institutions. This Paper is also not meant to suggest or recommend any facility over another for the care of STEMI patients, or to mandate specific hospital destinations for EMS STEMI patients.

This White Paper is based on the 2004 ACC / AHA Guidelines for STEMI care<sup>1</sup> and may not reflect the most recent literature. It is the responsibility of EMS medical directors to stay current with recent publications and incorporate the findings into their practices and protocols.

## AHA/ACC STEMI GUIDELINES

The American College of Cardiology (ACC)/American Heart Association (AHA) Task Force on Practice Guidelines issued a joint executive summary of guidelines for the management of ST-elevation myocardial infarction (STEMI) in early 2004. The ACC/AHA guidelines were formally published in the August 3, 2004, issue of *Circulation*<sup>1</sup> and are available online at [www.acc.org/clinical/guidelines/stemi/index.htm](http://www.acc.org/clinical/guidelines/stemi/index.htm).

The ACC/AHA authors state that the mortality and morbidity rates associated with STEMI can be reduced significantly if people recognize the symptoms early, activate the EMS system, and thereby reduce the time to definitive treatment. Recommendations in the ACC/AHA guidelines for STEMI patient care summarize both medical evidence and expert opinion. Definitions of the evidence levels are as follows:

- **Level A:** Data derived from multiple randomized clinical trials or meta-analyses.
- **Level B:** Data derived from a single randomized trial, or nonrandomized studies.
- **Level C:** Only consensus opinion of experts, case studies, or standard-of-care.
- **Class I:** Procedure or treatment *should be* performed or administered (evidence and/or general agreement supports that a given procedure or treatment is beneficial, useful, and effective)
- **Class IIa:** *It is reasonable* to perform procedure or administer treatment (additional studies with focused objectives needed).
- **Class IIb:** Procedure or treatment *may be considered* (additional studies with broad objectives needed; additional registry data would be helpful).
- **Class III:** Procedure or treatment *should not* be performed or administered because *it is not helpful and may be harmful* (no additional studies needed).

Class I recommendations for STEMI patients as specified by the ACC/AHA STEMI Guidelines include but are not limited to the following<sup>1</sup>:

- All EMS first responders who respond to patients with chest pain and/or suspected cardiac arrest should be trained and equipped to provide early defibrillation. (*Level of evidence : A*)
- Supplemental oxygen should be administered to patients with arterial oxygen desaturation (SaO<sub>2</sub> less than 90 percent). (*Level of evidence: B*)
- Patients with ongoing ischemic discomfort should receive sublingual nitroglycerin (0.4 mg) every five minutes for a total of three doses, after which an assessment should be made about the need for intravenous nitroglycerin. (*Level of evidence: C*)
- Prehospital EMS providers should administer 162 mg to 325 mg chewed to chest pain patients suspected of having STEMI unless contraindicated or already taken by the patient.. Although

some trials have used enteric-coated aspirin for initial dosing, more rapid buccal absorption occurs with non-enteric-coated aspirin formulations. (*Level of evidence: C*)

- Intravenous nitroglycerin is indicated for relief of ongoing ischemic discomfort, control of hypertension, or management of pulmonary congestion. (*Level of evidence: C*)
- Morphine sulfate (2 to 4 mg intravenously [IV] with increments of 2 to 8 mg IV at five- to 15-minute intervals) is the analgesic of choice for management of pain associated with STEMI. (*Level of evidence: C*)
- Oral beta-blocker therapy should be administered promptly to those patients without a contraindication, irrespective of concomitant fibrinolytic therapy or performance of primary PCI. (*Level of evidence: A*)
- Hospitals should establish multidisciplinary teams (including primary care physicians, emergency medicine physicians, cardiologists, nurses, and laboratory personnel) to develop guidelines-based, institution-specific written protocols for triaging and managing patients who are seen in the prehospital setting or present to the emergency department with symptoms suggestive of STEMI. (*Level of evidence: B*)
- The delay from patient contact with the health care system (typically, arrival at the emergency department or contact with paramedics) to initiation of fibrinolytic therapy should be less than 30 minutes. Alternatively, if percutaneous coronary intervention (PCI) is chosen, the delay from patient contact with the health care system (typically, arrival at the emergency department or contact with paramedics) to balloon inflation should be less than 90 minutes. (*Level of evidence: B*)
- The choice of initial STEMI treatment should be made by the emergency medicine physician on duty based on a predetermined, institution-specific, written protocol that is a collaborative effort of cardiologists (both those involved in coronary care unit management and interventionalists), emergency physicians, primary care physicians, nurses, and other appropriate personnel. For cases in which the initial diagnosis and treatment plan is unclear to the emergency physicians or is not covered directly by the agreed-on protocol, immediate cardiology consultation is advisable. (*Level of evidence: C*)
- Patients with STEMI who have cardiogenic shock and are less than 75 years of age should be brought immediately or secondarily transferred to facilities capable of cardiac catheterization and rapid revascularization (percutaneous coronary intervention [PCI] or coronary bypass graft surgery [CABG]) if it can be performed within 18 hours of onset of shock. (*Level of evidence: A*)
- Patients with STEMI who have contraindications to fibrinolytic therapy should be brought immediately or secondarily transferred promptly (i.e., primary-receiving hospital door-to-departure time less than 30 minutes) to facilities capable of cardiac catheterization and rapid revascularization (PCI or CABG) (*Level of evidence: B*)
- Every community should have a written protocol that guides EMS system personnel in determining where to take patients with suspected or confirmed STEMI. (*Level of evidence: C*)

Table 1 outlines the ACC/AHA recommended treatment options for patients with STEMI.

TABLE 1: Assessment of Reperfusion Options for Patients with STEMI<sup>2</sup>

<p><b>STEP 1: Assess Time &amp; Risk</b></p> <ul style="list-style-type: none"> <li>• Time since symptom onset</li> <li>• Risk of STEMI</li> <li>• Risk of fibrinolysis</li> <li>• Time to skilled facility with percutaneous coronary intervention (PCI)</li> </ul> <p><b>STEP 2: Determine whether fibrinolysis or PCI is best for the STEMI patient:</b></p> <p><i>If presentation is less than 3 hours AND there is no delay to an invasive strategy, there is no preference for either strategy.</i></p>	
<p><b>PCI is preferred if:</b></p>	<p><b>Fibrinolysis is preferred if:</b></p>
<ul style="list-style-type: none"> <li>• Skilled PCI lab is available with surgical back-up* ±             <ul style="list-style-type: none"> <li>▪ Medical contact-to-balloon or door-to-balloon is less than 90 minutes</li> <li>▪ Door to balloon time minus door to needle time is less than one hour §</li> </ul> </li> <li>• High Risk from STEMI             <ul style="list-style-type: none"> <li>▪ Cardiogenic shock</li> <li>▪ Killip Class is three or greater (pulmonary edema) £</li> </ul> </li> <li>• Fibrinolysis is contraindicated             <ul style="list-style-type: none"> <li>▪ Including risk of bleeding and intracranial hemorrhage</li> </ul> </li> <li>• Late presentation (symptom onset greater than three hours)</li> <li>• STEMI diagnosis is in doubt</li> </ul>	<ul style="list-style-type: none"> <li>• Early presentation (less than or equal to three hours from symptom onset and delay to invasive strategy inevitable)</li> <li>• Invasive strategy is not an option             <ul style="list-style-type: none"> <li>▪ PCI lab is occupied/not available</li> <li>▪ Vascular access difficulties</li> <li>▪ Lack of access to a skilled PCI lab* ±</li> </ul> </li> <li>• Delay to invasive strategy             <ul style="list-style-type: none"> <li>▪ Prolonged transport</li> <li>▪ Door to balloon time minus door to needle time is more than one hour §</li> <li>▪ Medical contact-to-balloon or door-to-balloon is more than 90 minutes</li> </ul> </li> </ul>
<p>* Operator experience greater than a total of 75 primary PCU cases per year              ± Team experience greater than a total of 36 primary PCI cases per year              § Applies to fibrin-specific agents              € This calculation implies that the estimated delay to the implementation of the invasive strategy is greater than one hour versus initiation of fibrinolytic therapy immediately with a fibrin-specific agent              £ Killip class definitions: Class I = no rales, no S<sub>3</sub>; Class II = rales less than 50%; Class III = pulmonary edema; Class IV = cardiogenic shock</p>	

## **FRANKLIN COUNTY HOSPITALS' PRIMARY PCI CAPABILITY**

### Hospitals Without Primary Percutaneous Coronary Intervention (PCI)

Mount Carmel St. Ann's and The Ohio State University Hospitals East (OSU East) are "non-primary PCI facilities" meaning that they do not provide interventional cath lab services for STEMI patients. Both hospitals have a protocol to care for STEMI patients, a protocol to transfer STEMI patients to a PCI-capable facility, and the ability to administer thrombolytics within 30 minutes of a patient's arrival to the hospital. Both have multidisciplinary teams operating under a guideline-based, written STEMI protocol and are committed to transferring STEMI patients to a PCI-capable facility so PCI can be initiated within 90 minutes. Mount Carmel St. Ann's has future plans to become a primary PCI facility. OSU East does not have plans to become a primary PCI facility at this time. *Table 2* provides specific details and hospital contacts for additional information about these two non-primary PCI hospitals in Franklin County, Ohio.

### Primary PCI Facilities

The following Columbus, Ohio area hospitals have primary PCI capabilities: Doctors Hospital, Grant Medical Center, Mount Carmel East, Mount Carmel West, The Ohio State University Medical Center and Riverside Methodist Hospital. These hospitals have multidisciplinary teams operating under a guideline-based, written STEMI protocol and are committed to taking STEMI patients to the cath lab, 100% of the time for PCI as opposed to using fibrinolytics (unless contraindicated). These hospitals are committed to meeting the ACC/AHA goal of door to balloon time within 90 minutes of STEMI patients' arrival to the hospital. *Table 3* presents additional hospital specific details and contact information about these primary PCI hospitals in Franklin County.

## **ADVANCED PREHOSPITAL FUNCTION: 12 LEAD EKG IN THE FIELD**

In the past several years, a number of studies have examined the various aspects of the use of 12-Lead ECGs in the out of hospital setting with the goal of decreasing the "door-to-drug" time in patients with acute myocardial infarction. A series of reports by the National Institutes of Health (NIH, 1993), titled *Rapid Identification and Treatment of Myocardial Infarction*<sup>3</sup>, recommend that "EMS systems should consider providing out of hospital setting 12-Lead ECGs to facilitate early identification of AMI." The NIH further recommends that "all ALS vehicles should ideally have the capability to transmit a 12-Lead ECG to the hospital."

The American College of Emergency Physicians believes that the out of hospital 12 Lead ECG may facilitate early identification of patients with acute coronary syndromes and advocates hospital and community cooperation in the study and implementation of this resource<sup>4</sup>. A pre-hospital 12-lead ECG showing STEMI allows the receiving hospital to mobilize resources for the patient, thus streamlining the process and allowing for decreased door-to-drug or door-to-PCI times. If the ECG does not show STEMI, transport to a PCI facility may not be needed, allowing the EMS system to optimally use its resources.

Review of a large number of studies<sup>5,6,7</sup> involving the use of the 12-Lead ECG in the out of hospital setting identified several areas for concern:

- Considerations for implementation of out-of-hospital 12 Lead ECG programs should include local factors such as EMS vehicle staffing, response and transport times, and the capabilities and resources of the local emergency departments.
- 12-Lead ECGs in the out-of hospital setting should be obtained in a selected population of those patients presenting with chest pain.
- The use of 12-Lead ECGs in the out-of-hospital setting should not prolong field times; that is, should not delay transport to definitive care.
- The out-of-hospital 12-Lead ECG should not be used as a screening tool in “no transport” decisions.

The out-of-hospital 12-Lead ECG should be viewed as part of a continuum of patient care, to identify acute coronary syndromes before the initiation of standard chest pain protocols, including treatment that may produce resolution of ischemic changes. It should not replace timely evaluation and treatment upon arrival to the Emergency Department.

## **FINAL COMMENTS**

We anticipate that this document may need to be revised as the ACC / AHA guidelines are updated. We remind EMS medical directors that the scientific literature is constantly evolving and that they must maintain an awareness of the ongoing evidence base that forms the foundation of these guidelines. EMS Medical Directors and Coordinators are encouraged to review the full ACC/AHA STEMI Guidelines as they develop their agency’s standard operating procedures for STEMI.

## REFERENCES

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- <sup>1</sup> Antman EM, Anbe DT, Armstrong PW, Bates ER, Green LA, Hand M, Hochman JS, Krumholz HM, Kushner FG, Lamas GA, Mullany CJ, Ornato JP, Pearle DL, Sloan MA, Smith SC. ACC/AHA Guidelines for the Management of Patients with ST-Elevation Myocardial Infarction: a Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Revise the 1999 Guidelines for the Management of Patients with Acute Myocardial Infarction). *Circulation*. 2004. 110:e82-292.
  - <sup>2</sup> Antman EM, Anbe DT, Armstrong PW, Bates ER, Green LA, Hand M, Hochman JS, Krumholz HM, Kushner FG, Lamas GA, Mullany CJ, Ornato JP, Pearle DL, Sloan MA, Smith SC. American College of Cardiology Foundation & American Heart Association, *ACC/AHA Pocket Guideline for the Management Patients with STEMI*. Eli Lilly & Company. July 2004: p. 18. From [www.acc.org/clinical/guidelines/stemi/index\\_pkt.pdf](http://www.acc.org/clinical/guidelines/stemi/index_pkt.pdf) as of 10/10/05.
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  - <sup>5</sup> Kudenchuck PJ, Ho MT, Weaver WD, et al: Accuracy of Computer-Interpreted Electrocardiography in Selecting Patients for Thrombolytic Therapy. *J Am Coll Cardiol* 1991; 17(7):1486-91.
  - <sup>6</sup> Ho MT, Kudenchuck PJ, Eisenberg MS, et al: Patient Selection for Thrombolytic Therapy: Emergency Physician Versus Electrocardiographer (abstr.) *J Am Coll Cardiol* 1990; 15:192A.
  - <sup>7</sup> Aufderheide TP, Hendley GE, Thakur RK, et al: The Diagnostic Impact of Prehospital 12-Lead Electrocardiography. *Ann Emerg Med* 1990; 19:1280-7.

# Hospitals without Primary PCI Capabilities

**TABLE 2**

	Mount Carmel St. Ann's Hospital	OSU East
Our hospital protocol for transfer to PCI facility is:	Once STEMI patient identified by EKG, the ED physician contacts the patient's cardiologist and activates the heart team alert and cath lab team. If the patient does not have a cardiologist, the attending has pre-selected a cardiologist of his choice on record in the ER who is then contacted. The ED physician follows a pre-set medication protocol in preparation for PCI, i.e. heparin, IIb/IIIa drugs etc. Mount Carmel transport is located at this facility to transport the patient urgently to the receiving cath lab. Process Improvement teams review data monthly for process improvement.	When a STEMI patient is identified, interventional cardiology at the Ross is paged and MedFlight or Rural Metro is contacted at the same time for transfer. ED Staff assists Rural Metro in transporting patient to prevent delay.
Hospital has and is willing to share their written PCI transfer protocol	Yes	
Hospital committed 100% of the time to affecting the transfer of STEMI patients to a PCI-capable hospital so that PCI is initiated within 90 minutes.	Yes	
Hospital's future plans regarding PCI capability	Yes, 2006 potential	No, we do not plan to add primary PCI capability
Hospital has a multidisciplinary team (including primary care physicians, emergency medicine physicians, cardiologists, nurses, and ancillary staff) operating under a guideline-based, institution-specific written protocol for triaging and managing patients who are seen in the prehospital setting or present to the ED with symptoms suggestive of STEMI.	Yes	
Hospital has and is willing to share our written STEMI protocol	Yes	
Hospital has the capability to administer thrombolytics within 30 minutes of the patient's arrival.	Yes	
Hospital contact for protocols and additional information	Patricia A Blake, RN (614) 234-2163 pblake@mchs.com	Dr. Brian Hiestand (614) 293-8305 brian.hiestand@osumc.edu

## Hospitals with Primary PCI Capabilities

**TABLE 3**

	Doctors Hospital	Grant Medical Center	Mount Carmel East	Mount Carmel West	OSU Main	Riverside Methodist Hospital
My hospital has open-heart surgery in house.	Yes					
Hospital has a multidisciplinary team (including primary care physicians, emergency medicine physicians, cardiologists, nurses, and ancillary staff) operating under a guideline-based, institution-specific written protocol for triaging and managing patients who are seen in the prehospital setting or present to the ED with symptoms suggestive of STEMI.	Yes					
Hospital has and is willing to share written STEMI protocol.	Yes					
Hospital is committed to taking STEMI patients to the cath lab 100% of the time for PCI as opposed to using fibrinolytics except for extenuating medical contraindications/circumstances.	Yes					
Number of angioplasties (STEMI and otherwise) performed in 2004.	101-500	501-1,000	>1,000	>1,000	>1,000	>1,000
Hospital's hours of operation that cath lab staff is available in hospital are (denoted in military time)	0700-1730	Mon-Fri, 0700-1730	0700-1930	0700-1930	0700 to 1900	Sun. 2300- Fri. 1930
Hospital's hours of operation that cath lab staff is on call and not in the hospital are (denoted in military time)	1730-0700	1730-0700 & 24 hrs. on weekends & holidays	1930-0700	1930-0700	1900 to 0700	Fri. 1930- Sun. 2300
Following CORE measurements for STEMI definitions, hospital is committed, 100% of the time, to meeting the ACC/AHA goal of ED door to balloon time within 90 minutes.	Yes					
Hospital willing to conduct STEMI education for local EMS Providers.	Yes					
Hospital contact for protocols and additional information	Nancy Colburn, RN, MSN (614) 544.2196 ncolburn@ohiohealth.com	Kelly Roese, RN (614) 566-8285 kroese@ohiohealth.com	Patricia A Blake, RN (614) 234-2163 pblake@mchs.com	Patricia A Blake, RN (614) 234-2163 pblake@mchs.com	Dr. Craig Key (614) 293-8305 key.30@osu.edu	Nancy McBride, RN (614) 566-5517 nmcbride@ohiohealth.com