

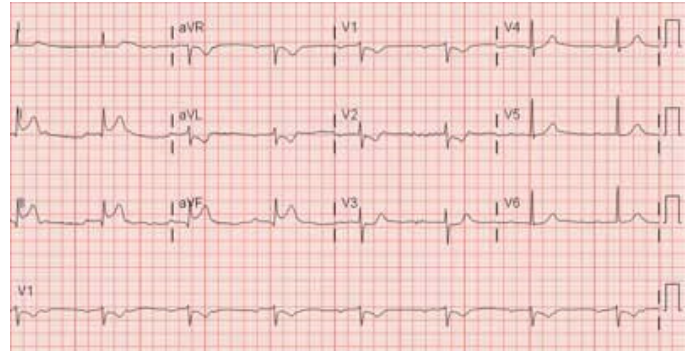


TUCSON FIRE DEPARTMENT

STEMI 2015

2015 YEAR IN REVIEW

TFD Medical Division



Calling 9-1-1 is historically the fastest way to get lifesaving treatment when a true emergency occurs. Emergency medical services (EMS) personnel can begin treatment when they arrive on scene, and treatment starts based upon a skilled assessment and chief complaint; up to an hour sooner than if someone gets to the hospital by car.

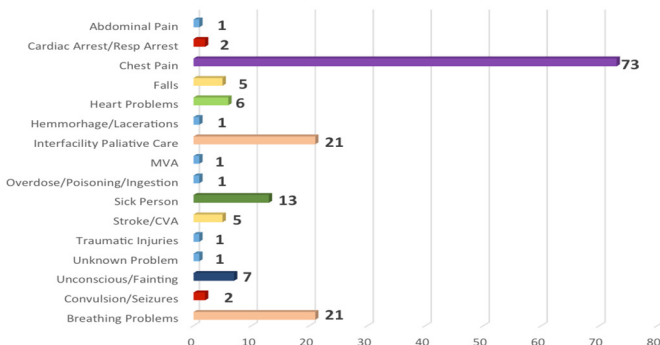
In Tucson, the continuity of care begins when the 9-1-1 callers connects with the Tucson Medical Communication Center (MEDS). MEDS dispatchers can start the treatment avenue by having the patient take Aspirin for chest pain or instructing how to do life-saving chest compressions for a patient in cardiac arrest.

The emergency department staff of each hospital can anticipate evidence-based interventions for transported TFD patients.

The prehospital interventions from a TFD Paramedic unit for patients with chest pain can include a transmitted 12-Lead ECG, administration of Aspirin and Nitroglycerin if applicable; as well as Intravenous Access (IV) and Oxygen. All patient interventions are based upon a highly skilled EMS assessment.

In 2015, Tucson Fire Medical Direction and Medical Administration compiled the 2015 Administrative Guidelines. These guidelines provide the TFD personnel a tailored guidance document, which allows the department an evidence-based avenue to practice care for the citizens of Tucson, Arizona. One avenue is the ability to transfer care of the patient based upon the level of acuity such as those patients who meet the stable criteria for Basic Life Support. This transfer frees up the TFD Paramedics to transport the highest acuity or the sickest of the sick.

2015 STEMI Data
911 MEDS Dispatch to TFD



ST- Segment Elevation Myocardial Infarction

The rapid recognition and treatment of STEMI's has become a major focus all around the country. The term STEMI is actually an acronym for ST segment Elevated Myocardial Infarction. Ultimately in laymen's terms, this is a very serious heart attack that a victim's survivability is dependent upon the quick and aggressive treatment from all involved in the patients' response and care.

Strength in numbers using evidence based knowledge leads to the best care possible for the patient; especially when the patient is suffering from a time sensitive complaint(s) such as a STEMI, Stroke or Trauma. *Strength in numbers providing evidence based care is an example of Tucson Fire Departments dual Paramedic Ambulances.*

ST-elevation on an ECG tracing is an indication of a myocardial injury. This means that the heart muscle is experiencing tissue death due to a blockage of a coronary artery. Blockages are normally caused by excessive plaque build-up or a lodged blood clot. The damage to the heart muscle will continue to spread until the blockage or blockages are opened up via angioplasty or thrombolytic (clot buster) medication.

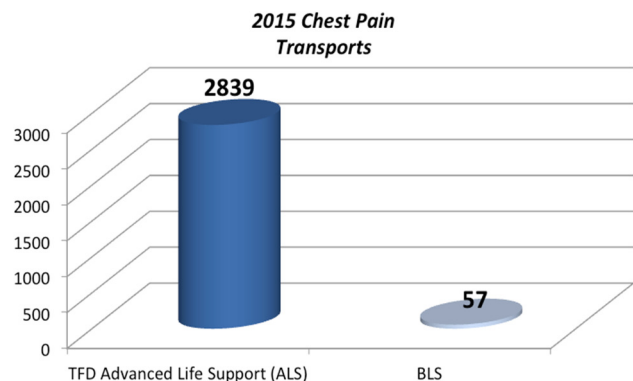
STEMI's are classified as "Time Sensitive" calls that require definitive care. It is all about getting the patient to the right destination to receive definitive care. Transport options for the patient are based upon the on-scene assessment of the Tucson Fire Department Paramedic. This is why a STEMI is viewed as a time sensitive assault to the heart muscle.

The term "Time is Muscle" is a reminder that each minute that is lost on-scene or by transporting to an inappropriate facility is critical. The lost time causes irreversible damage to the heart muscle.

Treatment of a STEMI can begin by administering Oxygen, assessing vital signs and administering with oral Aspirin, establishing Intravenous Access (IV) and administering sublingual Nitroglycerin. With highly competent, ECG trained Paramedics like those on TFD Paramedic Assessment Units (PAU), ALS Rescue Trucks and Dual Paramedic Ambulances are validating and transmitting 12-Lead ECG's to the receiving emergency departments. Their rapid recognition through validation and prehospital care will create a stronger continuity of care and outcome for the patient.

In 2015 Tucson Fire Department was dispatched to 79,498 medical calls, which included 5770 Chest Pain dispatches. 3,145 were assessed and treated as Chest Pain and 161 were documented as STEMI's.

Paramedics are strategically placed on Paramedic Assessment Units (PAU), ALS Rescue Trucks and Paramedic Ambulances. TFD has the ability to transfer care of the patient based upon the level of acuity and if they meet the criteria for Basic Life Support. In 2015, TFD transported 2,839 Chest Pain patients and 57 patients met the criteria for the stable BLS transport.



Approved Medical Interventions

Aspirin slows the bloods clotting action by reducing the clumping of platelets. Platelets are cells that clump together and help to form blood clots. Aspirin keeps platelets from clumping together, thus helping to prevent or reduce blood clots.

During a heart attack blood clots form in an already-narrowed artery and block the flow of oxygen-rich blood to the heart muscle. When taken during a heart attack or myocardial infarction (MI), aspirin slows clotting and decreases the size of the blood clot that is forming.

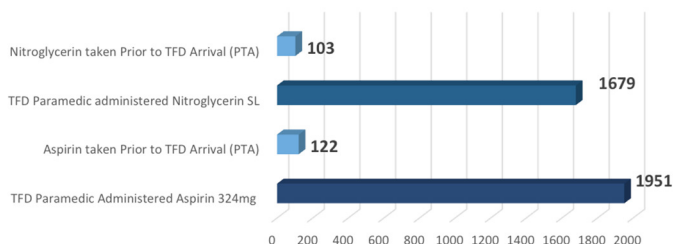
Nitroglycerin is a vasodilator, a medicine that opens up blood vessels to improve blood flow to the heart (coronary arteries), which improves symptoms and can reduce how hard the heart has to work during a heart attack. It is used to treat angina symptoms, such as chest pain or pressure that happens when there is not enough blood flowing to the heart. Nitroglycerin can quickly relieve the symptoms of chest pain but it can also quickly drop the patients' blood pressure; thus making Intravenous Access (IV) important for the provider who needs to quickly administer fluid or life-saving medications to counteract the drop in blood pressure.

The **12-Lead ECG's** importance cannot be stressed enough as the 12-Lead ECG allows the Paramedic to locate the area of the heart being damaged or stressed by showing elevation, or a cardiac anomaly; validating a pathway for treatment and transport of the patient.

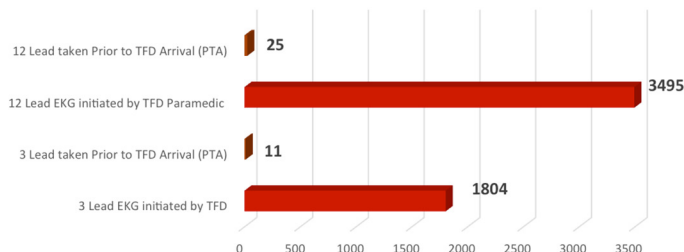
A traditional 12-Lead ECG looks at four-planes of the heart. The four planes are: the Inferior (bottom) the Anterior (front) the Lateral (outside wall closest to the patients left arm), and the Septal plane (the inside wall closest to the sternum). Another qualification for a STEMI is that there must be at least two leads of the same wall or contiguous (connected) walls that are elevated. So for instance should leads II and III be elevated this would be known as an Inferior STEMI. Or if leads V4 and V5 had elevation this would be known as an Antero-lateral STEMI. No matter the STEMI location, it is a serious life threatening emergency and rapid assessment and treatment can drastically impact the quality of life for the patient.

Tucson Fire Department transmits the 12-Lead ECG prior to arrival at the emergency department, which will allow an ED physician to determine the need to activate the cardiologist and Cath Lab team to rapidly intervene, in an attempt to save the cardiac muscle.

2015 Chest Pain
Medical Interventions Nitroglycerine & Aspirin

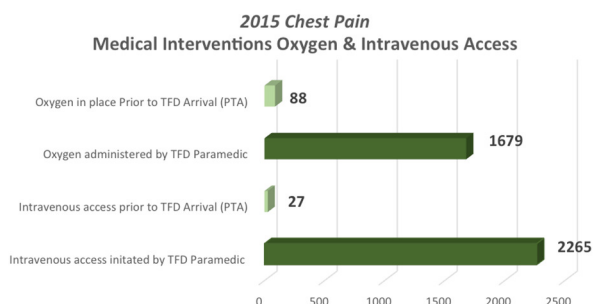


2015 Chest Pain
Diagnostic Interventions 3 & 12-Lead ECG's



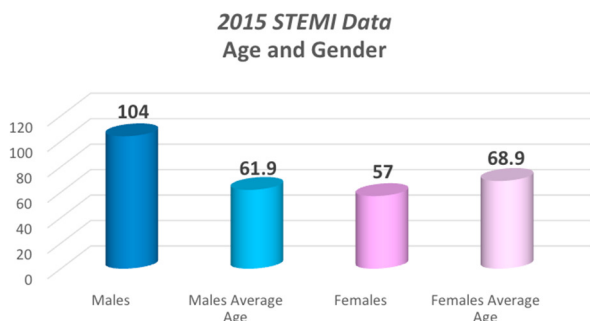
Oxygen research suggests that the application of oxygen should be administered only to patients that are exhibiting symptoms of hypoxia. This requires a thorough patient assessment. Pulse oximetry readings of < 94% coupled with a TFD Paramedic assessment can indicate the need for supplemental oxygen.

Intravenous Access (IV) creates an essential avenue to raise hypotensive episodes (low blood pressure) as well as provide an avenue for medications. High acuity patients transported by TFD Paramedics routinely receive an IV and IV fluids. Having Intravenous Access is important when a patient receives Nitroglycerin for the symptoms of chest pain.



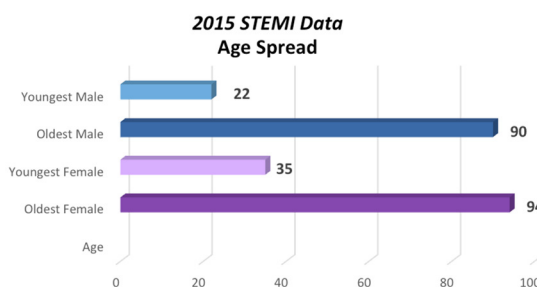
When Chest Pain Evolves Into The Time Dependent Emergency... The STEMI

Tucson appears to follow the national norms pertaining to the male to female ratio for STEMI's. Males outnumber the female patients suffering from a STEMI by 104 to 57; and the males were younger than the females in 2015 when they experienced a STEMI.



Males are more likely to experience a heart attack than a female, and men also have heart attacks earlier in life compared to women.

The comparison of both genders transported by TFD validate that STEMI can affect the young and the very old alike.



Signs and symptoms of chest pain can vary from males to females with the males experiencing symptoms such as chest pressure and pain that is often described as an elephant that is sitting on the chest, upper body pain and discomfort, rapid or irregular heartbeat, stomach discomfort or indigestion, shortness of breath, dizziness and even breaking out in a cold sweat.

Female victims most frequently reported symptoms that did not include chest pain. Instead women reported unusual fatigue lasting for several days, or sudden fatigue, sleep disturbances, and lightheadedness.

Symptoms also include shortness of breath, indigestion or gas pains, upper back shoulder or throat pain, jaw pain or pain that spreads to the jaws; including pressure or pain in the center of the chest that can spread to the arm, sleep disturbances, and anxiety. Nearly 80% also reported experiencing a least one of the above symptoms for more than a month before their heart attack.

Heart Disease is the leading cause of death and a major cause of disability in the United States. About 600,000 Americans die of heart disease annually. This represents almost 25% of all U.S. deaths. (2015 CDC)

Medical conditions, such as high cholesterol, high blood pressure (hypertension), and diabetes, as well as lifestyle factors, like an unhealthy diet, obesity, physical inactivity, and alcohol and tobacco use, can put people at a higher risk for developing heart disease. Also a tendency toward heart disease can cluster in families; therefore a family medical history offers important information for identifying risk in individuals.

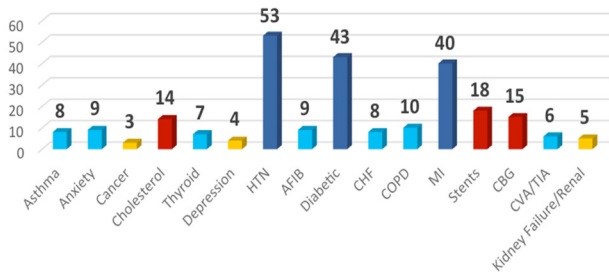
The documented medical history of the STEMI patients transported by TFD follow the national norms pertaining to their medical histories confirming histories of hypertension (53) and diabetes (43) and elevated cholesterol (14). It was also noted that of the patients who suffered a STEMI and who had a previous history of a Myocardial Infarction (MI) – ½ of these patients had a history of previously placed Stents (18).

Statistically research has shown that Inferior STEMI's are the most common type of STEMI. The Inferior STEMI makes up between 40-50 percent of all STEMI's. Of those, about 80% percent of the blockages are located in the right coronary artery. The most lethal STEMI's are those located in the Anterior wall and have a mortality rate of 27%, earning them the ominous nickname "the widow maker." As with all medical and cardiac modalities it remains vital that all providers "treat the patient and not the monitor".

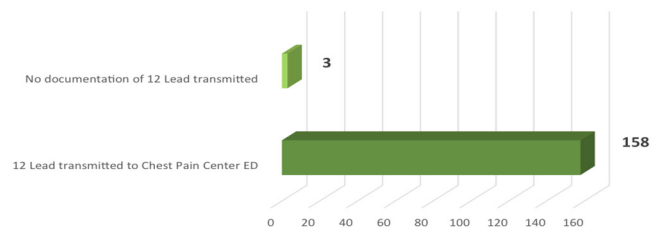
When assessing a potential cardiac patient it is important to obtain a 12-Lead ECG as soon as possible. TFD strives for a 12-Lead ECG that is transmitted to the receiving emergency departments within 10 minutes of reaching the patients side. The 12-Lead ECG is a diagnostic tool that can guide and validate TFD's Paramedics with the patients' care and treatment. Tucson Fire documents 98% (158) of the 12-Lead ECG's performed which is sent to the receiving emergency departments providing validation of the inbound STEMI.

The 12-Lead ECG's performed, validated and transmitted can assist the ED Physician in making the decision to call in the Cath Lab personnel; keeping costs down for inaccurate activations of the Cath Lab personnel. Requirements of transmitting a 12-Lead ECG keep TFD on the forefront with numbers of 98% (158) documentation of this intervention.

2015 STEMI Data
Patient History



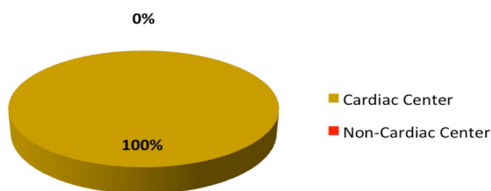
2015 STEMI Intervention
12-Lead ECG Transmitted



While Advanced Cardiac Life Support (ACLS) medications and interventions are important, ultimately the only cure to any STEMI is the eradication of the blockage and reperfusion of the damaged heart tissue. Studies have shown that the total patient outcome/recovery is better when a patient is transported to an accredited Cardiac Center with a Cath Lab; bypassing closer hospitals without them.

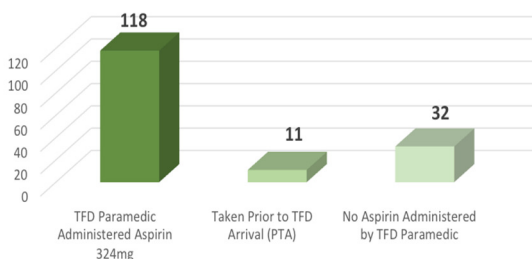
Tucson Fire Department Paramedics transported 100% of STEMI patients to designated Cardiac Centers. In 2015, all Tucson emergency departments had an Interventional Cath Lab with appointed hospital personnel.

2015 STEMI Intervention Transport to Cardiac Center



A total of 129 (80%) STEMI patients received oral Aspirin by TFD or Prior to Arrival (PTA) of TFD. Of the 20% of STEMI patients that had no Aspirin administered, minimal documentation within the narrative occurred for the lack of the intervention.

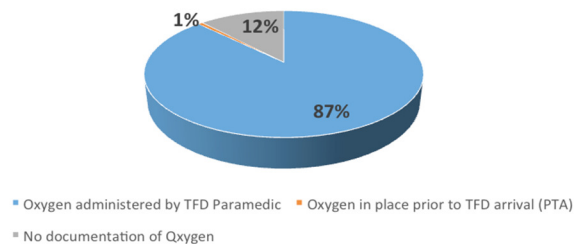
2015 STEMI Intervention Aspirin



Documentation in TFD's electronic patient care reports (ePCR's) showed that 87% (141) of TFD patients suffering from a STEMI received Oxygen; and 12% (19) did not. 1% of the patients received Oxygen prior to TFD's arrival.

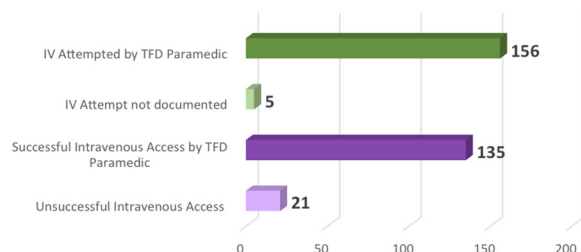
Further investigation was warranted for the 19 patients who did not receive Oxygen. Fifteen of the 19 patients who did not receive Oxygen met the TFD 2015 Administrative Guidelines of having a pulse oximetry over 94% on room air. In total, 97% of the patients had a documented avenue validating whether or not the patient needed Oxygen.

2015 STEMI Intervention Oxygen Percentage



Initiating Intravenous Access (IV) in an emergency situation is commonplace for the TFD Paramedic based upon the volume and severity of the patients transported. Further investigation of the data showed whether the 156 initial IV attempts was successful or not requiring multiple attempts. Of the 156 initial attempts, 135 IV's were successful and 21 were unsuccessful and required further attempts.

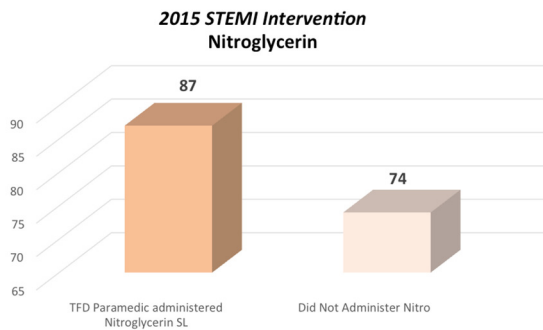
2015 STEMI Intervention Intravenous Access (IV)



All Chest Pain Interventions create a pathway of care that leads to the administration of Nitroglycerin.

Decreasing the workload of the heart is in itself critical with patients suffering from a STEMI; but the cardiac interventions need to fall into place for the Paramedics to safely administer Nitroglycerin.

The documentation of Nitroglycerin administration (87) versus not being administered (74) needs to be investigated further based upon the importance of providing Nitroglycerin. The areas of concern, blood pressure and the necessity of Intravenous Access need to be weighed against the lack of administration.

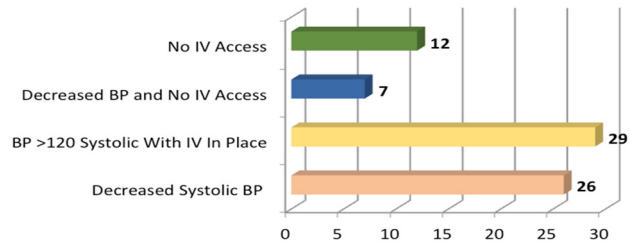


The transportation of critical, time-sensitive patients creates a need for pertinent interventions to be performed by a level of importance and patients need.

Seventy-four non-documented instances of no Nitroglycerine administration was compared against whether TFD had obtained successful Intravenous Access (IV) and whether the patient had an appropriate systolic blood pressure.

Of the 74 patients who did not receive Nitroglycerin, only 29 instances could not be validated against a blood pressure and Intravenous Access (IV).

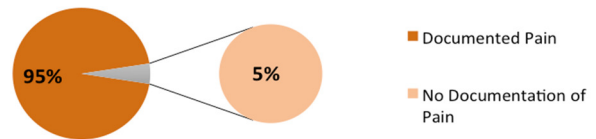
2015 STEMI Intervention Nitroglycerin II



Additional STEMI Interventions

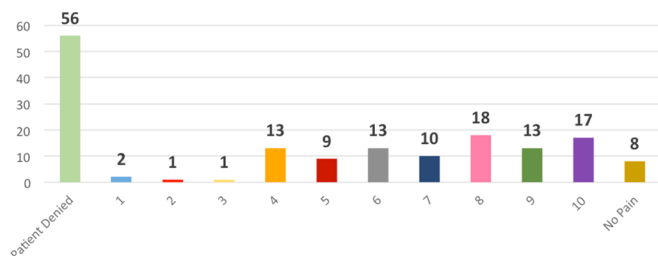
Decreased Transport Times within the City of Tucson make prioritizing medical interventions more relevant to the patients' presenting condition and complaint. This is the case with the documentation of pain using a numeric scale with 95% of the transported STEMI patients.

2015 STEMI Intervention Documentation of Pain



The 95% of the patients documented level of pain averaged out to 4.46.

2015 STEMI Intervention Numeric Pain Scale



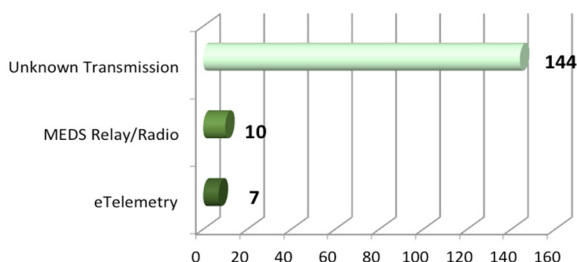
Hospital Notification of an inbound STEMI is imperative to activate the Cath Lab. Tucson Fire utilizes 2 forms of communication with the hospitals: eTelemetry (electronic) and MEDS (Radio Relay or Telemetry).

The 2015 TFD Administrative Guidelines indicate the preferred form of contact with the hospitals is electronic using eTelemetry.

The 12-Lead ECG transmission sent to the receiving Cardiac Center is in itself a notification of an impending STEMI transport and is time-stamped and trackable; but is not classified as an Alert.

Documentation within the ePCR notifying hospitals for inbound STEMI patients using a "STEMI Alert" could not be adequately QA'd or accounted for. In 2015, 17 instances of a STEMI Alert was documented in the narrative of the TFD electronic patient care report (ePCR).

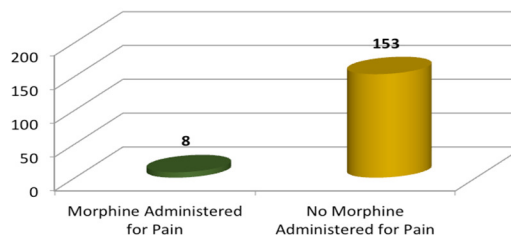
2015 STEMI Intervention Hospital Notification



Morphine is an analgesic with vasodilation properties. The Paramedics decision to use Morphine is not directly related to an intrinsic influence (knowledge or experience of Paramedic); but more related to extrinsic contextual influences such transport time and medical interventions to accomplish associated with the length of time of an average transport.

Tucson Fire is conscious of the need for keeping on-scene times down, and initiates the majority of medical interventions during the transport to the hospital. The medical interventions are priority based upon the patients' chief complaint and presentation.

2015 STEMI Intervention Morphine Administered for Pain

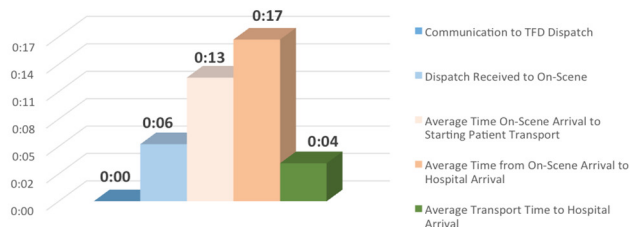


Each medical intervention is dependent upon the patients' continuing presentation; and the cause and effect of the intervention performed.

Tracking Times is an important aspect of the STEMI process. Creating a "time trail" in order to decrease on-scene times is imperative when minimizing delays to definite care is the primary goal of getting the patient to a PCI-capable hospital.

There were a handful of instances that a non-transporting unit arrived on scene first and then requested a Paramedic Ambulance which may have lengthened the average times of 6 minutes for dispatch to Arrival times; TFD's On-Scene times averaged at 13 minutes with an average 4 minute Transport time to the hospitals. TFD averaged 17 minutes from On-Scene to Hospital Arrival.

2015 STEMI DATA TFD Paramedic Transport Averages



STEMI Report Conclusion

The STEMI Quality Assurance (QA) completed for the year 2015 show the strength of the Tucson Fire Department Paramedic, this is based upon the care provided and documented in the Tucson Fire Department electronic Patient Care Report (ePCR). All documentation QA'd was based upon the documentation of the transporting Paramedics.

Using strength in numbers providing evidence-based care starts from the first point of medical contact by TFD Paramedics strategically placed on the non-transporting trucks designated as the ALS Rescue Trucks, Paramedic Assessment Units (PAU's) and the transporting dual Paramedic Ambulance, all working to provide a seamless continuum of care.

Having a Paramedic on-scene prior to the arrival of the Paramedic Ambulance creates a transfer of care that is superior. This is especially pertinent with Time Sensitive calls that require quick decisive interventions related to medical care. Having knowledgeable Paramedics on the ALS Rescue Truck and Paramedic Assessment Units (PAU's) keep the patients care and treatment on the same level as the Paramedic Ambulance. Enough cannot be said about the dual Paramedic Ambulances; as both paramedics are able to focus fully as a team on patient care based upon the same level of service when the patient is at their most vulnerable.

The care the patient receives from TFD begins on-scene. All medical interventions from the responding on-scene crew cohesively bridges the transfer of care to the transporting dual Paramedic Ambulance. The importance of keeping the patients' medical care at the highest level of certification allows for quicker medical interventions creating an increase in balanced care. The on-scene medical interventions begin with the patient assessment and the care provided is based upon the patients' chief complaint. One of the most important interventions for cardiovascular complaints is the 12-Lead ECG which can indicate that the patient is experiencing a STEMI.

The 12-Lead ECG initiated and transmitted on-scene creates the patients picture of need for the receiving emergency department, prior to the patients actual arrival. The 12-Lead ECG can assist in the validation of alerting the Cath Lab team. Tucson Fire Department consistently provides a transmitted 12-Lead ECG that is documented 98% of the time.

Continuing with the evidence-based prehospital interventions, the administration of Oxygen requires that the application of oxygen should be based upon whether the patient is symptomatic, and exhibits a need for Oxygen based upon vital signs and the Paramedics assessment. In total, 97% of the patients had a documented avenue validating whether or not the patient needed Oxygen.

Tucson Fire Paramedics and attending personnel provided solid judgment decisions when and when not to provide a medical intervention for the patient experiencing a STEMI; none more than with the administration of sublingual Nitroglycerin. The overall judgment of the Tucson Fire Department Paramedic weighed the patients' possible outcome based upon the current status of the patient and whether the patient had Intravenous Access and if the patient's blood pressure could withstand an anticipated decrease based upon the medications side effects.

Medical interventions are primarily performed while transporting the patient to the hospital as "Time is Muscle" and the assault to the cardiac muscle can be decreased with every minute that is saved by quick efficient use of interventions on-scene and during transport. The average transport time from the scene to the receiving emergency department is a mere 4 minutes.

The average on-scene time is 13 minutes with 6 minutes to reach the scene. The transport averages create a continuity of care that is adventitious to the patient being cared for by TFD. Decreasing times is the best way to combat a time sensitive call and this is no different with the documented STEMI transport averages. An average on-scene time of 10-minutes is considered ideal and a time to strive towards.

Alert documentation to the receiving emergency departments of an impending STEMI is an avenue that will need to be improved upon. Current validation of the arriving STEMI does indeed occur but the documentation is not captured within the ePCR.

Documentation of the 12-Lead ECG being transmitted by the TFD personnel is in itself an Alert and is captured with a time stamp and/or On-scene or Enroute time stamp within the ePCR. The STEMI Alert that is available to the documenting crews is not visibly available for QA in the patient care report that is viewed or printed.

Lastly, ongoing education related to the medical interventions and the need for the appropriate Primary Impression would be advisable. The proper categorization of what the patient is being treated for allows for improved treatment methodology for the presented signs and symptoms of the call being treated. It is believed that if this were instituted more instances of obtaining data based upon the Primary Impression would be recognized.

The data obtained is from the 2015 Tucson Fire Department electronic Patient Care Reports (ePCR's) as well as the 2015 Tucson Fire Department Annual Report.

Interventions included: Obtaining and Transmission of 12-Lead ECG, Aspirin, Oxygen and, Nitroglycerin Administration, initiating Intravenous Access, Documentation of a Numeric Pain Scale, Morphine Administration as well as Hospital Notification; Transportation of patient to accredited Cardiac Center with documentation of Transport Times. Interventions were evaluated against the current TFD Administrative Guidelines. *Page 3-4*

In 2015, TFD was dispatched to 79,498 medical calls, 5,770 of these calls were dispatched as Chest Pain in nature. 3,145 were assessed and treated as Chest Pain; the numbers included: all Refusals, Treat and Release, BLS Transfers (57) and TFD Transports (2839). *Page 1-2*

Of the 2,839 TFD Chest Pain Transports 161 were treated and documented as a STEMI. *Page 4*

STEMI Medical Intervention Numbers

Gender and Age *Page 4*

Males – 104 Average Age: 61.9 years old Male: Youngest 22 years old Oldest 90 years old

Females – 57 Average Age: 68.9 years old Female: Youngest 35 years old Oldest 94 years old

Patient History followed the National norms: Hypertension (53), Diabetes (43) and increased Cholesterol (14). 40% of the STEMI patients stated they had a previous MI (40) with ½ of them said they had Stents placed. *Page 5*

12 Lead ECG: 98% of STEMI patients had a 12-Lead ECG (158) documented and transmitted to Tucson's Cardiac Centers. The 12-Lead ECG provides the most pertinent of medical interventions for cardiovascular complaints which can indicate that the patient is experiencing a STEMI. The 12-Lead ECG that TFD initiates, assesses and transmits on-scene creates the patients picture of need for the receiving emergency department, prior to the patients actual arrival. The 12-Lead ECG transmitted by TFD assists emergency room physicians in making the decision to activate the Cath Lab team, which can assist in decreasing false activations. *Page 5*

Cardiac Center: 100 % of STEMI patients were transported to an accredited Cardiac Center with Interventional Cath Lab capability. *Page 6*

Medical Interventions: Aspirin 80% of the patients transported by TFD paramedics received oral Aspirin and 97% of the patients transported received the appropriate intervention for **Oxygen** based upon the patient's assessment and the 2015 Administrative Guidelines. *Page 6*

Medical Interventions: Intravenous Access and Nitroglycerin. Tucson Fire Paramedics and attending personnel provided solid judgment decisions when and when not to provide a medical intervention for the patient experiencing a STEMI; none more then with the administration of sublingual Nitroglycerin. The overall judgment of the Tucson Fire Department Paramedic weighed the patients' possible outcome based upon the current status of the patient and whether the patient had Intravenous Access and if the patient's blood pressure could withstand an anticipated decrease based upon the medications side effects. *Page 6-7*

Transport Times: Medical interventions are primarily performed while transporting the patient to the hospital as "Time is Muscle" and the assault to the cardiac muscle can be decreased with every minute that is saved by quick efficient use of interventions on-scene and during transport. The average transport time from the scene to the receiving emergency department is a mere 4 minutes. The average on-scene time is 13 minutes with 6 minutes to reach the scene. The transport averages create a continuity of care that is adventitious to the patient being cared for by TFD. *Page 8*