

Performance Audit

**Department of Public Safety
BUREAU
Of
EMERGENCY MEDICAL
SERVICES**

Report by the
Office of City Controller

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CITY CONTROLLER**

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MICHAEL E. LAMB

CITY CONTROLLER

First Floor City-County Building • 414 Grant Street • Pittsburgh, Pennsylvania 15219

October 29, 2014

To the Honorable: Mayor William Peduto and
Members of Pittsburgh City Council:

The Office of City Controller is pleased to present this performance audit of the *Department of Public Safety Bureau of Emergency Medical Services (EMS)* conducted pursuant to the Controller's powers under Section 404(c) of the Pittsburgh Home Rule Charter.

EXECUTIVE SUMMARY

Pittsburgh's Emergency Medical Services (PEMS) was started in 1975 through a Federal Comprehensive Employment and Training Act (CETA) grant program to provide emergency medical care and hospital transport services. Today's PEMS Bureau is made up of three divisions (Ambulance Division, Rescue Division and Training Division), along with a Special Operations component for staffing City events. PEMS is also involved in community outreach projects and participates in national treatment studies.

The City is divided into thirteen PEMS districts, numbered 1 through 14 (there is no Medic #13). Each district has one PEMS station and one ambulance. Two person crews provide ambulance service 24 hours a day, covering three work shifts: 7 a.m. to 3 p.m., 3 p.m. to 11 p.m. and 11 p.m. to 7 a.m.

The 911 Center uses a CAD software system for both the City and County which provides a timeline of events from the time the call is received until the responding ambulance is cleared for subsequent calls. In addition, PEMS generates its own more detailed report through its EMS Charts System, first put into operation in March, 2013.

Findings and Recommendations

Dispatches:

Finding: The highest demand for medical service is between the hours of 9:00 AM to 11:00PM, when PEMS receives 70% of its dispatched calls, or 86,236 calls of the 121,662 received during the audit period. Call volume by time of day and shift shows lowest PEMS demand during the 23:00 (11 PM) - 7:00 AM shift for both years.

Finding: Both the time and shift dispatch analysis support the PEMS operational practice of reducing the number of ambulance units during the third (23:00 PM - 7:00 AM) shift.

Dispatches by Units:

Finding: In both 2012 and 2013 the Downtown unit #5114 responded to the most calls 11,417. Following is the Upper Hill District unit #5105 with 11,252 calls; the North Side unit #5104 with 10,873 calls; the West End unit #5103 with 10,652 calls and the Beltzhoover unit #5108 with 10,507 calls.

Calls by Neighborhood:

Finding: PEMS currently reports the street address and zip code but not the neighborhood that generated the call.

Recommendation: PEMS should implement the inclusion of a City-designated neighborhood identification field for calls such as census tract that would populate automatically, along with the street address, on its reports for management purposes. If this cannot be done automatically then the Paramedics should be required to enter neighborhood information manually.

Null (Cancelled) Calls:

Finding: In 2012, 15.5% of the dispatches (9,512) were null, and in 2013, 14.4% of the dispatches (8,658) were null. Over the audit period 15.0% of the calls (18,197) were null.

Finding: Units that reported a null call spent less than five minutes between dispatch and the return to duty 71% of the time, and spent under fifteen minutes before being ready for duty 92% of the time. This demonstrates a quick turnaround for the majority of null calls, suggesting that in most cases, the original unit dispatched was replaced by one nearer the scene.

Finding: The reason for registering a null call is not given on the PEMS reports.

Recommendation: A code for null calls that explains the cause should be included in EMS Charts for management purposes. Reduction of null calls, which amounted to 18,197 trips (15% of the total dispatches) during the audit period, should be a management goal.

Response Time:

Finding: There were 33,222 priority calls in 2012 and 32,636 in 2013. In 2012, 61.0% of the calls were answered under 9 minutes; in 2013, 58.8% of the calls. During 2012-13 combined, PEMS met the 8:59 standard in 59.9% (39,431) of its calls.

Recommendation: PEMS administration should make improving the response time for priority (E0, E1) calls a major objective for the Bureau.

Response Times for Cardiac, Acute Coronary Syndrome, Stroke and Severe Trauma:

These four categories were chosen because they are commonly used nationally as indicators of response time due to their critical nature.

Finding: In 2012, the average response time for the four priority categories was 8 minutes, 29 seconds while in 2013 the average response time was 8 minutes, 43 seconds, an increase of 2%.

Finding: The percentage of runs that met the under-nine minute response time standard differed by 14.9% in 2012 (71.4% - 56.5%) and 13.4% in 2013 (69.0% - 55.6%) among the four selected categories, an unusually wide variation in response times.

Recommendation: PEMS management should investigate and examine the differences in the response times with the goal of improving the response times for ACS and Stroke dispatches.

Rescue Vehicle Response Time (Units #'s 5201 and 5202):

PEMS' two rescue vehicles are on duty 24 hours a day. These units are staffed with a minimum of two paramedics at all times to respond to any type of rescue operation required in the City of Pittsburgh. They also assist ambulance units on runs if needed.

Finding: In 2012, the rescue vehicles met the response time standard of less than nine minutes 58.0% of the time. In 2013, the rescue units met the standard 56.8% of the time. The response time percentages are similar to those of the medic units, 61.0% in 2012 and 58.8 % in 2013.

Finding: Almost half the calls made for rescue vehicles (49.4%) were cancelled during 2012-13.

Recommendation: The procedure used by PEMS to dispatch its rescue vehicles in the City should be adjusted, if possible, to reduce the number of cancelled calls sent to rescue vehicles.

Unit Hour Utilization:

The generally accepted standard measurement of ambulance usage is unit-hour utilization (UHU). UHU is the ratio of the number of hours spent delivering emergency medical services to the total amount of hours the Units are available. For example, a UHU of 0.50 indicates that a Unit was utilized 50% of the total amount of time possible throughout the year. The auditors chose to use .500 as the maximum acceptable work ratio for a unit, the same UHU ratio used in the City Controller's 2008 audit.

Finding: Two Units exceeded the maximum workloads. Unit 5103 (West End) had UHU ratio of .567 in 2012 and .540 in 2013, indicating overly high usage of that unit. Unit 5102 (Knoxville) in 2012 exceeded the .500 UHU ratio by .006 and was under the UHU maximum with a ratio of .496 in 2013.

Recommendation: PEMS administration should consider placing another daytime unit in the West End to primarily serve the West End area. It is the only ambulance that exceeded the UHU maximum workload for both 2012 and 2013.

Call Priority Analysis:

Finding: In 2012, out of the 29,032 priority (E0 and E1) calls dispatched by 911, 64% were diagnosed on-scene with having a medical issue with a lower priority level, E2 or E3. In 2013, out of the 28,764 dispatched priority calls (E0 and E1), 64% were diagnosed on-scene with having a medical issue with a priority level of E2 or E3. The consistent 64% error rate is a material amount of incorrectly prioritized calls.

Recommendation: PEMS management should strive to reduce the high percentages of E0 and E1 priority calls that are downgraded by the paramedics in the field. PEMS Management should review and if possible, revise, the dispatch protocol so calls could be clarified and assigned more accurate disposition codes.

Finding: There were 3,910 calls (12%) in 2012 where the paramedics failed to enter a diagnosis code after arriving on scene and 3,255 calls (10%) in 2013. Ten and 12% are a high percentage of incomplete entries.

Recommendation: PEMS management should emphasize to paramedics that all data boxes must be completed.

Transports to Hospital:

Finding: The number of transports to a hospital is consistent for 2012 and 2013, as 81% of the calls responded to by PEMS ambulance units required transport to a hospital.

Finding: Four hospitals (UPMC Mercy, Allegheny General, UPMC Shadyside and UPMC Presbyterian) received 65,199 patients from PEMS in 2012-13 or 77.3% of the total transports.

Finding: Hospitals located out of the City received 1,455 transports in 2012 and 1,413 in 2013. Both figures represent 3.4% of the annual PEMS transports.

Recommendation: Ohio Valley, St. Clair, Jefferson and Passavant hospitals all have Emergency Departments, and PEMS may wish to consider increasing their use for patient treatment from neighborhoods outside the rivers that do not have a near-by City hospital.

Finding: There was virtually no difference in the percentage of transports to the hospital between priority calls and less serious calls.

Mutual Aid:

Finding: There is no way currently to separate mutual aids calls in response to another municipality from approved non-critical transports to suburban hospitals.

Recommendation: PEMS reporting should include a data field to distinguish mutual aid trips from transports to non-City hospitals approved by the District Chief.

Paramedic Down Time:

Finding: In 2012, paramedic down time was 30 minutes or less following a transport 57% of the time and 40 minutes or less 84% of the time. The down time percentages in 2013 were 63% for 30 minutes or less and 89% for 40 minutes or less.

Recommendation: PEMS should continue the practice of waiting in central locations for calls rather than expend time and fuel returning to the paramedic station.

Finding: In 2012, 521 (1.3%) of the calls that were included in the “over one hour” category in Table 8 had nearly 24 hours downtime, and 515 calls (1.2%) in 2013 also approached a full day’s downtime. This could be caused by reporting errors or indicate that the ambulance was disabled.

Finding: In 2012, 468 calls had an ambulance transport time but did not have a hospital arrival time, while 303 calls in 2013 did not give a hospital arrival time. These are reporting errors and these calls were not included in the analysis.

Data Collection Analysis:

Finding: Blank/incomplete entries in the CAD database ranged from 1% to 12%, depending on the field examined. Additionally, some of the data entered was incorrect, but the auditors could not determine the error rate.

Finding: The EMS report format does not include First Responder (BLS) response times nor the survival rates of patients because they are not generated by PEMS or the County 911 Call Center.

Recommendation: As the lead agency of a multi-agency system, PEMS should attempt to integrate both the Fire Bureau’s first responder times and the hospitals’ survival rates into its EMS Charts Report.

Finding: PEMS data collection captures much useful information, but is not sorted into an easily manipulated format for management purposes.

Recommendation: PEMS should employ a data-base manager, either hired through the EMS Bureau or provided as a liaison by the Innovation and Performance Department, to organize its data so that it can be sorted or queried in a management friendly fashion.

Finding: The Geographic Information System (GIS) used by PEMS to track and route its vehicles is comprehensive, and the PEMS staff whom the auditors observed utilizing the system are knowledgeable in its use. It also provides unit locations to the paramedics, which have GIS software available through a laptop in each ambulance, to show the closest available unit and provide the driver with directions when responding to calls.

EMS Charts:

Finding: A sampling of EMS Charts by the auditors discovered several blank fields in the database. Because of the late start date and incomplete data, EMS Charts was not used.

Paramedic Payroll and Overtime:

Finding: PEMS payroll meets its annual budgeted allotment, spending 99.6% of its payroll budget in 2013 and 99.5% in 2012. Overtime pay went from \$3,879,041 in 2012 to \$4,023,618 in 2013, an increase of 3.7%

Finding: During the audit period, \$7,505,191.42 or 95% of overtime earnings were paid to paramedics and crew chiefs for overtime work, with the remainder \$397,467.36 or 5% paid to administrative employees (District Chief and above). Without the overtime hours categorized (staffing, training, special events, etc.), an analysis of the manpower needs and the efficiency of training schedules could not be determined.

Recommendation: PEMS Management should have Payroll staff categorize overtime hours worked into work-related overtime hours, training overtime hours and special events overtime for management purposes.

Sincerely,



Michael E. Lamb
City Controller

INTRODUCTION

This performance audit of the Department of Public Safety Bureau of Emergency Medical Services (EMS) was conducted pursuant to the Controller's powers under Section 404(c) of the Pittsburgh Home Rule Charter. The audit focuses on EMS' Ambulance Division, the Bureau's largest and primary division.

OVERVIEW

Pittsburgh's Emergency Medical Services (PEMS) was started in 1975 through a Federal Comprehensive Employment and Training Act (CETA) grant program to provide emergency medical care and hospital transport services. Today's PEMS Bureau is made up of three divisions (Ambulance Division, Rescue Division and Training Division), along with a Special Operations component for staffing City events. PEMS is also involved in community outreach projects and participates in national treatment studies.

Divisions

The Ambulance Division provides pre-hospital emergency medical care and hospital transport to any sick or injured person within the City limits. In addition, the ambulance division supports neighboring suburbs with assistance through mutual aid as needed. The paramedics provide medical coverage for sporting, entertainment and other special events held in the City. All division paramedics are certified through the Pennsylvania Department of Health EMS bureau in basic life support (BLS), Advanced Life Support (ALS) and other optional certificates available through the State.

The Training Division oversees compliance with paramedic continuing education class requirements. It also provides educational opportunities in areas such as automatic external defibrillator use to other City personnel and to the public at large. It offers related specialized training to paramedics and also trains City Fire Bureau officers and recruits in First Responder procedures.

The Rescue Division provides medically directed technical, tactical and heavy rescue delivery.

Organization and Staffing

PEMS is governed by one Chief, one Deputy Chief, two Division Chiefs, one Patient Care Coordinator and ten District Chiefs. The bureau has four clerical staff members, 53 crew chiefs and 108 paramedics. Seventy nine of the paramedics are classified as fifth year paramedics, the City's highest paramedic classification (paramedics are classified by years of service up to five years).

Fleet

The PEMS vehicle fleet consists of 13 ambulances, all 2013-14 models, and three stocked and ready for use back-up ambulances that are 2011 models. They also have one

older ambulance (2007 model) stocked for tactical medicine situations, 2 stocked bariatric ambulances for severely overweight patients (2006 and 2007 models), and six stocked special event ambulances (two each of 2011, 2010 and 2006 models). There are 10 spare ambulances (5 – 2009, 3 – 2007, 2- 2006 models) held for emergency use and vehicle breakdowns.

PEMS Districts

The City is divided into thirteen PEMS districts, numbered 1 through 14 (there is no Medic #13). Each district has one PEMS station and one ambulance. Two person crews provide ambulance service 24 hours a day, covering three work shifts: 7 a.m. to 3 p.m., 3 p.m. to 11 p.m. and 11 p.m. to 7 a.m. Listed below are the locations of the PEMS ambulance and specialty units as found on the EMS webpage:

- Medic 1 and 11- Homewood
- Medic 2 - Knoxville
- Medic 3- West End
- Medic 4 - North Side
- Medic 5 - Upper Hill District
- Medic 6 - Garfield
- Medic 7 - Greenfield
- Medic 8 - Beltzhoover
- Medic 9 - North Oakland
- Medic 10 - Marshall/Shadeland
- Medic 12 - Hays
- Medic 14- Downtown
- Rescue 1 - North Oakland
- Rescue 2 - Downtown
- River Rescue - North Shore
- Mass Casualty (PA Region 13 Task Force) - Shadyside

Paramedic units are neighborhood-based but service is not limited to that area. The units closest to the emergency are called to respond.

Other Duties and Outreach

The Bureau of Emergency Medical Services provides Special Event coverage to major venues (Heinz Field, PNC Park, CONSOL Energy Center, etc.) and for registered special City events. The number of events throughout the year average 56 per month according to the 2014 City Council Budget narrative. The paramedics that cover Special Events are off-duty personnel who request to work overtime and are then assigned duty by seniority.

PEMS is also part of other City and regional public safety teams such as Rescue, River Rescue, Hazardous Materials (Hazmat), Tactical Medics and the Pennsylvania

Region 13 Counter Terrorism Task Force. The paramedics that participate in these units are only scheduled to participate with the joint team during training, or when the team is called into action. Otherwise, they remain with their own PEMS Unit.

The Bureau sponsors community outreach and education programs (COPE):

- First Aid and CPR/AED training;
- Child car seat installation and education program;
- Envelope of Life (EOL) program;
- Community and Senior Center visits for vital sign and glucose evaluations;
- High School career days and diversity recruitment; and
- Honor Guard.

EMS Participation with Outside Agencies

PEMS participates with adjoining municipalities by crossing service boundaries to provide mutual aid in emergency situations, as requested.

They partner in the Congress of Neighboring Communities (CONNECT) Community Paramedic pilot program. Specially trained EMS personnel provide in-home visits and education to help clients manage chronic conditions in an effort to make the patient more self-sufficient and reduce their dependency on emergency care.

PEMS also participates in the Resuscitation Outcome Consortium (ROC), which is preparing the largest study to date of treatment for cardiac arrest and trauma. Pittsburgh's EMS has participated in past studies leading to changes in Cardiopulmonary Resuscitation (CPR) procedures and other protocol improvements.

State Requirements

Pittsburgh's EMS must comply with Pennsylvania Code and State Department of Health Bureau of Emergency Medical Services requirements for its licensing and certification.

Medical Director

One of the statutory requirements for PEMS licensing is oversight by a qualified Advanced Life Support (ALS) Service Medical Director. State statute (28 Pa. Code 1003.5) defines the role and responsibilities of an ALS Service Medical Director. The State law does not require the Medical Director be a licensed Medical Doctor. However PEMS's Medical Director is a Licensed Medical Doctor. The primary role of the Medical Director is to provide guidance and advice to the ALS ambulance service during emergency treatment, as well as assign and manage UPMC intern Doctors to assist in the same ALS ambulance service.

The PEMS contracts with the Center for Emergency Medicine of Western Pennsylvania (CEM) for the ALS Service Medical Director and to supply resident

physicians, who are doctors in training from the University of Pittsburgh Medical Center (UPMC). Currently, PEMS and CEM are working without a contract as the previous contract expired July 2013. Both PEMS and CEM are working under an extension of the expired contract as per a memorandum of understanding by the City. It will remain in effect until a new contract is signed.

911 Combined City-County Emergency Operations Center (EOC)

In 2005, the City's 911 Center merged with Allegheny County's 911 Center. Allegheny County is divided into four call zones, with the Central Zone consisting of the City of Pittsburgh and Mt. Oliver. It is manned 24 hours per day, seven days per week.

When a call comes into the Center, the operator asks the caller to identify which municipality they are calling from. If the emergency is within the Central Zone, the 911 operator contacts a PEMS unit.

The Center uses a computerized Medical Priority Dispatch System based on internationally accepted Standard Operating Guidelines (SOG). The system assigns a medical priority to each call based on standardized questions that are prompted and analyzed by computer.

The computer assigns the call a coded priority number to establish a proper response based on the given answers. There are four categories for medical calls: E0, E1, E2 or E3, with E0's considered life threatening in nature, E1's serious health threats, and E2 and E3 health issues that are more minor in nature.

First Responders, who are City firefighters trained in basic life support, are dispatched to all E0 and E1 calls to provide prompt BLS while awaiting an EMS ambulance with an ALS crew. A District Chief, and sometimes a resident physician, may also respond to life threatening calls such as a cardiac arrest or severe trauma.

The 911 Center uses a CAD software system for both the City and County which provides a timeline of events from the time the call is received until the responding ambulance is cleared for subsequent calls. In addition, PEMS generates its own more detailed report through its EMS Charts System, first put into operation in March, 2013.

SCOPE

The audit scope is limited to EMS dispatch data from January 1, 2012 through December 31, 2013. First Responder information was not examined. That program is operated by the Pittsburgh Bureau of Fire and its performance is audited separately.

OBJECTIVES

1. To determine if PEMS paramedics are arriving below the 8:59 on scene response time threshold determined by the auditors.
2. To determine if PEMS ambulance workload is below the .50 maximum ambulance usage ratio (UHU).
3. To assess critical care responses regarding cardiac problems, stroke and trauma dispatches.
4. To make recommendations for improvement.

METHODOLOGY

The auditors interviewed Pittsburgh's EMS Chief, Medical Director, Deputy Chief, Patient Care Coordinator, Training Officer, Quality Control Specialist, Office Manager and the PEMS computer analysts.

The auditors accompanied a District Chief and a paramedic crew in the field to familiarize themselves with dispatch procedures and field operations.

The PEMS administration made available EMS - Charts and Computer Aided Dispatch (CAD) reports. The auditors based their analyses on the CAD data because it had a full two years of data available.

The auditors selected several key data fields to examine and analyze from the CAD database. They are: the date of the 911 call, the case number (an assigned sequential number), unit number assigned to answer the call, priority code (seriousness of the call), call type (what happened), disposition of call (final outcome when ambulance arrives at scene), the name of the hospital the ambulance went to (if necessary), level (911 computer assignment), create (the time the 911 call was received), dispatch time (time the ambulance leaves to answer the call), on scene (when the ambulance arrives on the site of the call), transport (the time the ambulance arrives at a hospital), complete (the time the ambulance leaves the hospital), and clear (the time the unit is available for reassignment). The underlined word is the actual word used in the database. The fields of transport and complete, are used only if the ambulance went to the hospital and returned.

Other information was obtained from the City's budget documents, the City Controller's Office "Expenditures by Cost Center" report and from the PEMS payroll office. Pennsylvania's Statewide ALS and BLS Protocols were reviewed.

The auditors also reviewed the National Highway Traffic Safety Administration's "EMS Performance Measures" (2009), California's "EMS System Core Quality Measures" (2013) and conducted internet research on EMS protocols, governing laws, and performance metrics of other governmental units.

FINDINGS AND RECOMMENDATIONS

Analysis of CAD Database

Dispatches

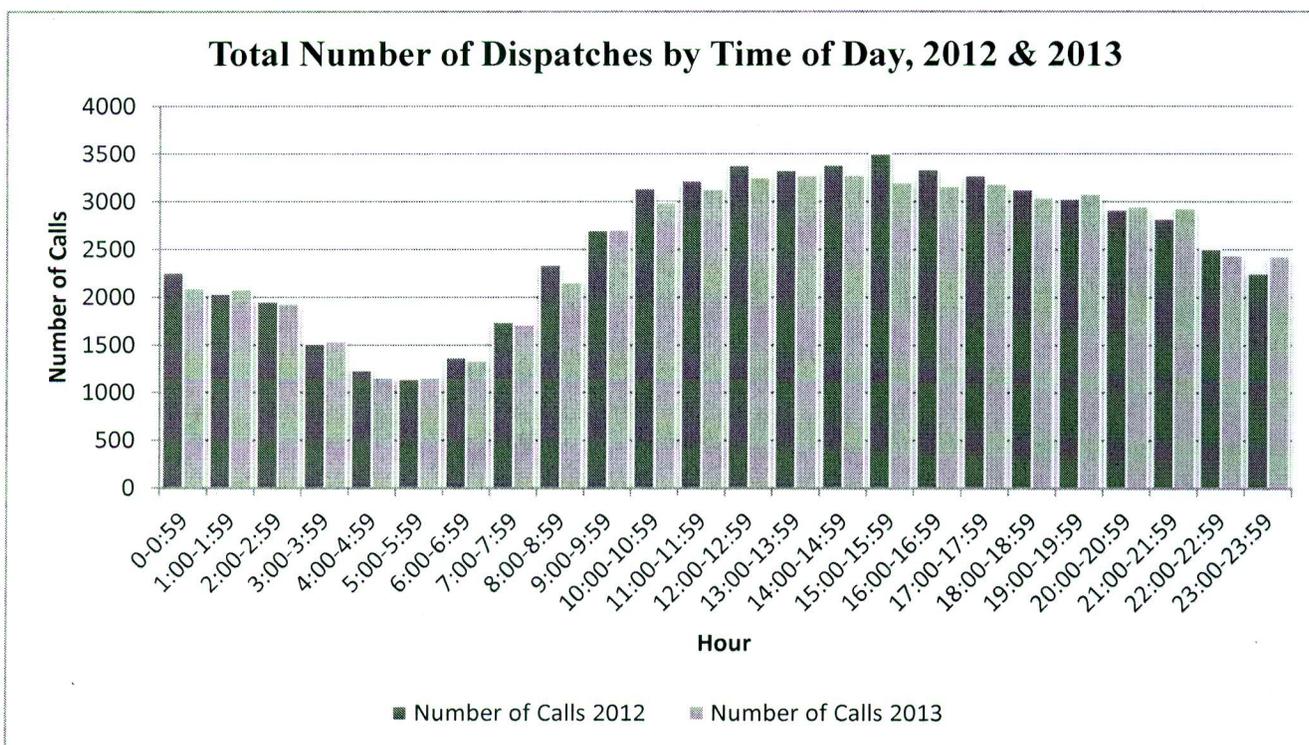
The auditors obtained the PEMS January 2012 through December 2013 CAD database. This database lists general performance statistics for every ambulance or Medic unit dispatched during the day. Analysis for Charts 1, 2A, 2B and 3 include all dispatches, even the null dispatches as defined later in the audit.

PEMS operates thirteen (13) medic ambulance units during the 7:00 - 23:00 (7 AM - 11 PM) shifts, and ten units between 23:00 - 7:00 (11 PM - 7 AM) shifts. Due to decreased demand, three medic units (Medic #5110 in Marshall-Shadeland; Medic #5111 in Homewood and Medic #5112 in Hays) are unmanned during the 23:00 - 7:00 shift.

Medic unit numbers are identified by four (4) digit numbers. The first two digits (51) identify that the unit is a PEMS ambulance unit (and not a rescue unit) while the last 2 digits of the unit number are the Medic District number. This means that Medic #5110 is Medic District 10; Medic #5111 is Medic District 11 and this continues for all 13 Districts.

The auditors examined the 2012 and 2013 PEMS dispatched data by time, shift and unit. Chart 1 is a graph representation of the total number of dispatches deployed by time of day.

Chart 1 — Dispatches by Time of Day 2012-13

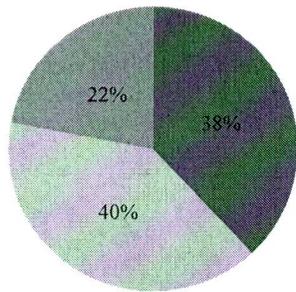


Data collected from 2012-13 CAD Report

Paramedics work 1 of 3 shifts; 7:00 am to 3:00 pm; 3:00 pm to 11:00 pm or 11:00 pm to 7:00 am. Charts 2A and 2B are a pie representation of the total number of dispatches by shift for 2012 and 2013.

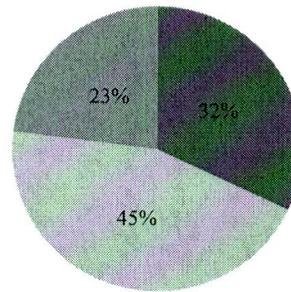
Charts 2A & 2B — Dispatches by Shift 2012-13:

Percent of Total Dispatches by Shift, 2012



■ 7:00-15:00 ■ 15:00-23:00 ■ 23:00-7:00

Percent of Total Dispatches by Shift, 2013



■ 7:00-15:00 ■ 15:00-23:00 ■ 23:00-7:00

Finding: The highest demand for medical service is between the hours of 9:00 AM to 11:00PM, when PEMS receives 70% of its dispatched calls, or 86,236 calls of the 121,662 received during the audit period.

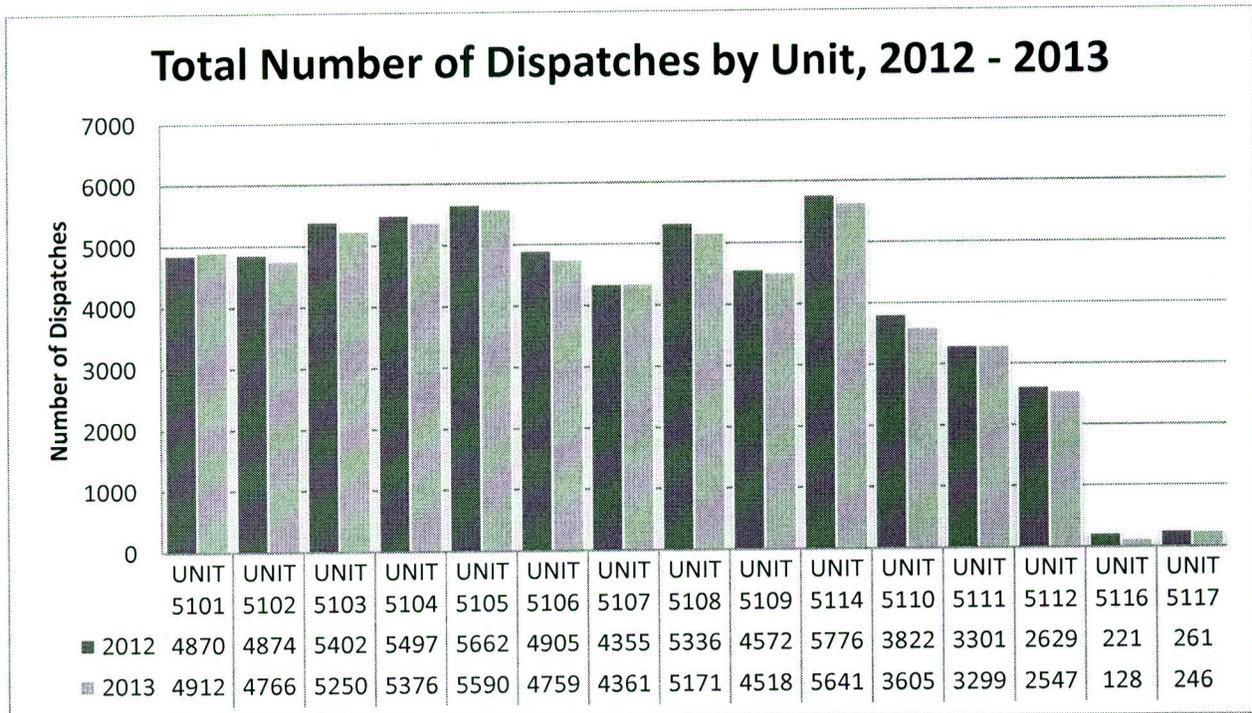
Finding: Call volume by time of day and shift shows lowest PEMS demand during the 23:00 (11 PM) - 7:00 AM shift for both years.

Finding: Both the time and shift dispatch analysis support the PEMS operational practice of reducing the number of ambulance units during the third (23:00 PM - 7:00 AM) shift.

Dispatches by Units

Chart 3 is represents the total number of dispatches deployed by unit for both 2012 and 2013. Under the graph is the actual number deployed in each specific year per unit.

Chart 3 — Dispatches by Unit 2012-13



Data collected from 2012-13 CAD Report

Finding: Chart 3 shows that for both 2012 and 2013 unit #5114 (Downtown- total of 11,417) responded to the most calls. Following close behind is unit #5105 (Upper Hill District-11,252 calls); unit #5104 (North Side-10,873 calls); #5103 (West End-10,652 calls) and #5108 (Beltzhoover-10,507 calls).

Two of the units that are least used, #5110 (Marshall/Shadeland) and unit #5111 (East End), serve in areas that have multiple units to provide coverage. Unit # 5110 shares the North Side with unit # 5104 and unit #5101 shares Homewood with unit #5111.

To meet demand during instances of high call volume or “surge,” PEMS operates two “overflow” ambulance units, #5116 and #5117, in addition to the thirteen regularly scheduled ambulances and two rescue units. The overflow units are not regularly staffed and are usually scheduled when PEMS anticipates increased activity because of special events, multi-injury incidents or weather. They are also placed in service when another unit is out of service.

Finding: In 2012-13, the overflow units were dispatched to 856 calls, representing less than 1% of the calls received by PEMS.

Calls by Neighborhood

To analyze the distribution and availability of ambulance service to all neighborhoods within the city, detailed information pertaining to where services are delivered is needed. Both

the zip code and street address of calls can be accessed from reports generated by EMS Charts and the CAD database. The overlay of zip codes over multiple neighborhoods generally does not allow for the identification of specific neighborhoods. The only way to complete this task would be to track each individual address to determine the neighborhood, a cumbersome and time consuming task given the thousands of calls during the audit period.

Finding: PEMS currently reports the street address and zip code but not the neighborhood that generated the call.

RECOMMENDATION NO. 1:

PEMS should implement the inclusion of a City-designated neighborhood identification field for calls such as census tract that would populate automatically, along with the street address, on its reports for management purposes. If this cannot be done automatically then the Paramedics should be required to enter neighborhood information manually.

Null (Cancelled) Calls

Null, or cancelled, runs by PEMS units result from several causes. The primary causes are that the original unit called to a scene was replaced by a closer unit or had its call cancelled by the First Responder team, nulling its dispatch. Other possible reasons to cancel a dispatch include a call for multiple units was determined unnecessary by the first unit to arrive; the call was cancelled or there was human error in reporting the data.

Finding: In 2012, 15.5% of the dispatches (9,512) were null, and in 2013, 14.4% of the dispatches (8,658) were null. Over the audit period 15.0% of the calls (18,197) were null.

Table 1 shows the distribution of null calls from the time the called is dispatched until the time the unit is again ready for another call. Frequency time was from 0 to 4:59 minutes, 5 to 14.59 minutes, 15 to 59.59 minutes and over 60 minutes. Void Data were entries that could not be calculated.

Table 1 – Time Distribution of Null Calls From Dispatch to Ready for Duty For 2012-13

Dispatch to Duty Time	2013	Cumulative %	2012	Cumulative %	Combined 2012-13	Cumulative 2012-13 %
0:00 - 4:59	6,155	70.87	6,815	71.65	12,970	71.27
5:00 - 14:59	1,906	92.82	1,813	90.71	3,719	91.71
15:00 - 59:59	292	96.18	377	94.67	669	95.39
60:00 +	19	96.4	71	95.42	90	95.88
Void Data	313	100	436	100	749	100
Total	8,685		9,512		18,197	

Data collected from 2012-13 CAD Report

Finding: Units that reported a null call spent less than five minutes between dispatch and the return to duty 71% of the time, and spent under fifteen minutes before being ready for duty 92% of the time. This demonstrates a quick turnaround for the majority of null calls, suggesting that in most cases, the original unit dispatched was replaced by one nearer the scene.

Finding: The reason for registering a null call is not given on the PEMS reports.

RECOMMENDATION NO. 2:

A code for null calls that explains the cause should be included in EMS Charts for management purposes. Reduction of null calls, which amounted to 18,197 trips (15% of the total dispatches) during the audit period, should be a management goal.

Response Time

Response time is the amount of time from when a PEMS Unit is dispatched until it arrives on the scene of the emergency.

There are no federal or state response time standards for ambulances. The National Fire Protection Association (NFPA) Standard 1710 regarding emergency medical service response times states that first responders and BLS units should arrive on scene within a four (4) minute time frame 90% of the time for all incidents (Section 5.3.3.4.2). The NFPA also states that an ALS crew should respond within eight (8) minutes for priority (E0, E1) calls (Section 5.3.3.4.3); this is considered the “gold standard” though not legally binding.

It should be noted that for Priority Calls a Basic Life Support First Responder team (firefighters) is also dispatched and reaches the scene of an emergency usually minutes before the PEMS Unit arrives.

To analyze response times, the auditors used an 8 minute 59 second ALS window to remain consistent with the standard used in the last Pittsburgh City Controller’s audit of 2008.

The auditors performed a frequency distribution analysis of the priority (E0 & E1) 911 calls. Null entries and entries with bad data (arrival time earlier than dispatch time or were blank) were eliminated. Table 2 shows the results of this analysis.

Table 2 -- Priority Call Response Times 2012-13

2012 AND 2013 FREQUENCY DISTRIBUTION OF ON-SCENE PRIORITY CALL RESPONSE TIMES (E0s,E1s)						
Minute Range	Number of On-Scene Responses		Percentage		Cumulative Percentage	
	2012	2013	2012	2013	2012	2013
≤ 8:59	20,254	19,177	60.97%	58.76%	60.97%	58.76%
9:00-14:59	9406	9,793	28.31%	30.01%	89.28%	88.77%
15:00-29:59	3202	3,281	9.64%	10.05%	98.92%	98.82%
≥ 30:00	360	385	1.08%	1.18%	100.00%	100.00%
On-Scene Total	33,222	32,636	-	-	-	-
Cancelled En Route (Percent of Total Calls)	5,768	4,000	14.79%	10.92%	-	-
TOTAL CALLS	38,990	36,636	-	-	-	-

Data collected from 2012- 2013 CAD report

Finding: There were 33,222 priority calls in 2012 and 32,636 in 2013. In 2012, 61.0% of the calls were answered under 9 minutes; in 2013, 58.8% of the calls. During 2012-13 combined, PEMS met the 8:59 standard in 59.9% (39,431) of its calls.

RECOMMENDATION NO. 3:

PEMS administration should make improving the response time for priority (E0, E1) calls a major objective for the Bureau.

Response Times for Cardiac, Acute Coronary Syndrome, Stroke and Severe Trauma

Early intervention is considered crucial in the treatment of all life threatening and severe medical conditions, and especially for dispatches involving Cardiac Arrest, Acute Coronary Syndrome (ACS), Stroke and Severe Trauma. The auditors focused on these four conditions to determine if response times were comparable among these priority groups.

Cardiac Arrest, ACS and Stroke are all specifically identified conditions in the CAD database. The auditors chose for the Trauma analysis a combination of the most severe types of traumatic cases categorized in the database: Traumatic Injuries, Severe Traffic Accidents, Stabbings, Gunshot and Penetrating Trauma.

Response time results are found in Tables 3A, 3B, 3C and 3D for Cardiac Arrest, ACS, Stroke and Severe Trauma respectively along with an average response time for each category.

Tables 3A-3D -- Response Times for Selected Priority Dispatches in 2012-13

RESPONSE TIMES FOR ON-SCENE ARRIVALS TO CARDIAC ARREST CASES, 2012 & 2013				
Minute Range	2012		2013	
	No.	Percent.	No.	Percent
≤ 8:59 (Industry Standard)	481	71.37%	518	68.97%
9:00-14:59	157	23.29%	196	26.10%
15:00-29:59	31	4.6%	36	4.80%
≥ 30:00	5	.74%	1	0.13%
TOTAL CALLS	674	100%	751	100%
AVERAGE RESPONSE TIME	00:07:36		00:07:58	

RESPONSE TIMES FOR ON-SCENE ARRIVALS TO ACUTE CORONARY SYNDROME CASES, 2012 & 2013				
Minute Range	2012		2013	
	No.	Percent.	No.	Percent
≤ 8:59 (Industry Standard)	404	58.72%	421	60.32%
9:00-14:59	215	31.25%	205	29.37%
15:00-29:59	60	8.72%	58	8.31%
≥ 30:00	9	1.31%	14	2.00%
TOTAL CALLS	688	100%	698	100%
AVERAGE RESPONSE TIME	00:09:16		00:09:21	

RESPONSE TIMES FOR ON-SCENE ARRIVALS TO STROKE CASES, 2012 & 2013				
Minute Range	2012		2013	
	No.	Percent.	No.	Percent
≤ 8:59 (Industry Standard)	434	56.51%	439	55.57%
9:00-14:59	251	32.68%	250	31.65%
15:00-29:59	78	10.16%	88	11.14%
≥ 30:00	5	.65%	13	1.64%
TOTAL CALLS	768	100%	790	100%
AVERAGE RESPONSE TIME	00:09:18		00:09:47	

RESPONSE TIMES FOR ON-SCENE ARRIVALS TO SEVERE TRAUMA CASES, 2012 & 2013				
Minute Range	2012		2013	
	No.	Percent.	No.	Percent
≤ 8:59 (Industry Standard)	1,591	71.25%	1,512	70.65%
9:00-14:59	473	21.18%	470	21.96%
15:00-29:59	154	6.90%	148	6.92%
≥ 30:00	15	.67%	10	0.47%
TOTAL CALLS	2,233	100%	2,140	100%
AVERAGE RESPONSE TIME	00:07:46		00:07:45	

All data collected from 2012- 2013 CAD Reports

Finding: In 2012, the average response time for the four priority categories was 8 minutes, 29 seconds while in 2013 the average response time was 8 minutes, 43 seconds, an increase of 2%.

**Table 4
2012-2013 Selected Priority Dispatches
Sorted in 2012 by Highest to Lowest Percentage
Successfully Meeting the < 9 Minute Response Time Standard**

CATEGORY	2012	2013
Cardiac Arrests	71.37%	68.97%
Severe Trauma	71.25%	70.65%
Acute Coronary Syndrome	58.72%	60.32%
Stroke	56.51%	55.57%

All data collected from 2012- 2013 CAD Reports

Finding: The percentage of runs that met the under-nine minute response time standard differed by 14.9% in 2012 (71.4% - 56.5%) and 13.4% in 2013 (69.0% - 55.6%) among the four selected categories.

Compared to the universe of priority calls answered under nine minutes during the audit period (61.0% in 2012 and 58.8% in 2013), Cardiac Arrests and Severe Trauma response times outperformed that standard in both 2012 and 2013. For 2012 Cardiac Arrest met the standard 71.4% of its calls and 69.0% of the time in 2013. Severe Trauma met the standard 71.3% of the time in 2012 and for 70.7% of its responses in 2013.

Acute Coronary Syndrome (ACS) had split results in matching the overall under-nine minute response averages. In 2012, ACS response times met the standard 58.7% in 2012 and 60.3% of the time in 2013; one year falling somewhat below the standard response average and the following year outperforming it.

Conversely, Stroke responses failed to meet the standard more often than the overall database percentages of 61.0% in 2012 and 58.8% in 2013. In 2012 Stroke runs were under the nine minute response time for 56.5% of its responses, and in 2013 met it 55.6% of the time. Response time during the two-year period for Stroke dispatches were 6.4% less likely to meet the standard than calls overall.

Considering the need for quick intervention and treatment among the four selected priority categories, one would expect the response times for the eight minute, 59 second standard to be comparable. Table 4 shows the percentage rate comparisons among the four conditions and how they differ.

Finding: Among the 4 selected high priority conditions, Cardiac Arrest, Acute Coronary Syndrome (ACS), Stroke and Severe Trauma, the percent response times were not comparable.

RECOMMENDATION NO. 4:

PEMS management should investigate and examine the differences in the above response times with the goal of improving the response times for ACS and Stroke dispatches.

Rescue Vehicle Response Time (Units #'s 5201 and 5202)

The 2012 and 2013 CAD data also reported run times for their two rescue vehicles that are on duty 24 hours a day. These units are staffed with a minimum of two paramedics at all times to respond to any type of rescue operation required in the City of Pittsburgh. They also assist ambulance units on runs.

Table 5 -- PEMS Rescue Vehicle Data 2012-13

RESPONSE DATA FOR PEMS RESCUE UNITS, 2012 & 2013		
	2012	2013
Dispatches to Priority Calls	5,219	5,388
Number of On-Scene Arrivals	2,682	2,686
Percent of On-Scene Response Times ≤ 8 Minutes 59 Seconds	58.02%	56.81%

Data collected from 2012- 13 CAD Report

The rescue vehicles were dispatched to 5,219 priority calls in 2012 and reported on scene to the incident 2,682 (51.4%) of the time. In 2013, the rescue units were dispatched to 5,388 priority calls and responded on scene to 2,686 calls (49.9%).

Finding: Almost half the calls made for rescue vehicles (49.4%) were cancelled during 2012-13.

RECOMMENDATION NO. 5:

The procedure used by PEMS to dispatch its rescue vehicles in the City should be examined and adjusted, if possible, to reduce the number of cancelled calls sent to rescue vehicles.

Finding: In 2012, the rescue vehicles met the response time standard of less than nine minutes 58.0% of the time. In 2013, the rescue units met the standard 56.8% of the time. The response time percentages are similar to those of the medic units, 61.0% in 2012 and 58.8 % in 2013.

Unit Hour Utilization

The generally accepted standard measurement of ambulance usage is unit-hour utilization (UHU). UHU is the ratio of the number of hours spent delivering emergency medical services to the total amount of hours the Units are available. UHU can be thought of as a metric reporting the percent of time that the particular Unit is in use. For example, a UHU of 0.50 indicates that a Unit was utilized 50% of the total amount of time possible throughout the year.

Along with responding to medical calls, the ambulance crews perform many additional duties during their work shift such as restocking supplies, sanitizing and cleaning vehicles, refueling, crew recovery, filling out patient reports etc. These additional responsibilities run concurrently with their primary duty of responding to medical calls. It is not realistic or feasible to expect an ambulance unit to report a UHU of 100%.

UHU ratios are also affected by outside factors such as population density, distance from hospitals, city/urban service area, topography, etc.

UHU Formula:

While there are many different variants of UHU, the one used in this audit calculates the amount of time that an ambulance is in service. To determine this number, the auditors used a ratio derived by dividing the total number of hours that an ambulance is available to respond to calls into the total number of dispatched hours within a year's time frame. The formula used to compute UHU for each PEMS unit is:

$$\text{Unit - Hour Utilization (UHU)} = \frac{\text{Total Number of Dispatched Hours}}{8,760 \text{ Hours}}$$

Although useful for determining if the current ambulance fleet is sufficient to respond to demand throughout the year, this measure is not representative of the utilization of an ambulance unit at any given time of the day. Surges in demand can cause an ambulance Unit's UHU to reach 100% for certain segments of time, even entire shifts. PEMS attempts to address this issue by operating an increased number of ambulance units during those hours of increased demand.

Table 6 -- Unit Hour Utilization by Unit 2012-13

UNIT HOUR UTILIZATION BY UNIT 2012-13									
AMBULANCE UNIT	TOTAL NUMBER OF DISPATCHES		TOTAL NUMBER OF HOURS DISPATCHED		AVERAGE DURATION OF CALL		TOTAL POSSIBLE NUMBER OF HOURS	ANNUAL UNIT HOUR UTILIZATION	
	2012	2013	2012	2013	2012	2013	2012 - 2013	2012	2013
5101	4,837	4,888	4,224.36	4,089.41	00:52:24	00:50:12	8,760	0.4822	0.4668
5102	4,851	4,746	4,430.19	4,347.95	00:54:48	00:54:58	8,760	0.5057	0.4963
5103	5,348	5,221	4,962.46	4,728.48	00:55:40	00:54:20	8,760	0.5665	0.5398
5104	5,463	5,353	4,145.75	4,080.71	00:45:32	00:45:44	8,760	0.4733	0.4658
5105	5,623	5,551	4,270.24	4,192.79	00:45:34	00:45:19	8,760	0.4875	0.4786
5106	4,870	4,725	4,056.78	3,835.35	00:49:59	00:48:24	8,760	0.4631	0.4378
5107	4,311	4,344	3,806.94	3,669.15	00:52:59	00:50:41	8,760	0.4346	0.4189
5108	5,283	5,143	4,065.77	4,030.22	00:46:11	00:47:11	8,760	0.4641	0.4601
5109	4,536	4,487	3,699.51	3,574.38	00:48:56	00:47:48	8,760	0.4233	0.4080
5114	5,732	5,622	4,166.55	3,996.01	00:43:37	00:50:17	8,760	0.4756	0.4562
5110*	3,798	3,583	2,900.46	2,812.72	00:45:49	00:59:13	5,840	0.4967	0.4816
5111*	3,289	3,280	2,858.10	2,748.86	00:52:08	00:40:59	5,840	0.4894	0.4707
5112*	2,619	2,529	2,610.35	2,495.72	00:59:48	00:49:32	5,840	0.4470	0.4273
5116**	217	126	174.50	86.09			N/A	-	-
5117**	259	245	212.68	202.25			N/A	-	-
UHU				-			-	0.4775	0.4623

**These ambulances work 2 shifts per day (16 hours total) **Extra ambulance unit: fields hours N/A
Data collected from 2012 -13 CAD Reports (Does not include null or incomplete times)
Shaded boxes are over .500 in UHU.*

During research, the auditors found that there were various acceptable UHU ratios, ranging from .333 to .500 among different municipalities. The auditors chose to use .500 as the maximum work ratio for a unit, the same UHU ratio used in the City Controller's 2008 audit.

Finding: Two Units exceeded the maximum workloads. Unit 5103 (West End) had UHU ratio of .567 in 2012 and .540 in 2013, indicating overly high usage of that unit. Unit 5102 (Knoxville) in 2012 exceeded the .500 UHU ratio by .006 and was under the UHU maximum with a ratio of .496 in 2013. Unit 5110 (Marshall-Shadeland) had the third highest usage but did not exceed the .500 UHU ratio. Unit 5110 operated at 0.4967 in 2012 and 0.4816 in 2013.

RECOMMENDATION NO. 6:

PEMS administration should consider placing another daytime unit in the West End to primarily serve the West End area. It is the only ambulance that exceeded the UHU maximum workload for both 2012 and 2013.

Call Priority Analysis

During the audit period PEMS received 103,390 calls (minus nulls), of which 65,858 (64%) were high priority E0 and E1 calls (33,222 in 2012 and 32,636 in 2013). In the CAD database there is a disposition field that the paramedics complete with an on-scene code, determined after patient examination. The dispatched priority level code was compared to the patient determination code that the responders enter after their on scene arrival.

Blank disposition fields, patients who refused treatment and dead on arrival (DOA) cases were removed from the analysis. Among the high priority calls the disposition field was left blank 3,910 times or 11.8% in 2012 and 3,255 times or 10% in 2013. In 2012, patients refused treatment 280 times (.8%) and 460 times (1.4%) in 2013. In 2013, 157 patients (.5%) were DOA but for 2012 the DOA code was not part of CAD data.

Finding: In 2012, out of the 29,032 priority (E0 and E1) calls dispatched by 911, 64% were diagnosed on-scene with having a medical issue with a lower priority level, E2 or E3. In 2013, out of the 28,764 dispatched priority calls (E0 and E1), 64% were diagnosed on-scene with having a medical issue with a priority level of E2 or E3. The consistent 64% error rate is a material amount of incorrectly prioritized calls and if properly coded would impact the response provided by the answering unit.

The units responded to all high priority calls with lights and sirens, making the run stressful for the paramedics and anecdotally frustrating when responding to a condition that is not a medical emergency.

The reasons for these differences in priority determination are varied. It may be the method that the 911 computer software uses to categorize medical issues, it may be that the caller is in an excited state and exaggerates the actual medical condition, or it may simply be that the proper diagnosis cannot be accurately determined by phone alone.

RECOMMENDATION NO. 7:

PEMS management should strive to reduce the high percentages of E0 and E1 priority calls that are downgraded by the paramedics in the field. PEMS Management should review and if possible, revise, the dispatch protocol so calls could be clarified and assigned more accurate disposition codes.

Finding: There were 3,910 calls (12%) in 2012 where the paramedics failed to enter a diagnosis code after arriving on scene and 3,255 calls (10%) in 2013. Ten and 12% are a high percentage of incomplete entries.

RECOM0MENDATION NO. 8:

PEMS management should emphasize to paramedics that all data boxes must be completed.

Transports to Hospital

The Pittsburgh region hosts several hospitals in the City or in close proximity of the City. Certain hospitals are trauma centers and priority calls must go to the nearest hospital trauma. Trauma centers in the City are in Allegheny General Hospital (AGH) on the North Side, Mercy Hospital downtown (trauma and burns) and Presbyterian Hospital in Central Oakland. Pediatric cases are taken to Children's Hospital in Lawrenceville, and patients that require specialty treatment will be taken to one of those hospitals.

If the patient's medical condition is not considered serious, the PEMS ambulance can transport the patient to the closest City hospital or to one of the suburban hospitals. The patient often prefers to be taken to the hospital where his/her doctor practices and where their medical records are kept. An out-of-City transport depends on medical needs, closeness, traffic and prior experience with the hospitals. An out-of-City transport must be approved by a district chief.

Table 7 on the following page shows the number of transports to hospitals in and around the City in 2012 and 2013. This data includes PEMS Ambulance and Rescue Units, which both transport patients.

Table 7 — PEMS Patient Transports by Hospital 2012-13

NUMBER OF TRANSPORTS BY HOSPITAL FOR ALL AMBULANCES INCLUDING RESCUE UNITS			
	Inside City Limits	2012	2013
Allegheny General Hospital	Yes	7,261	6,954
Children’s Hospital of Pittsburgh of UPMC	Yes	2,217	2,173
Jefferson Regional Medical Center	No	408	389
Magee-Womens Hospital of UPMC	Yes	1,910	1,904
UPMC Mercy	Yes	12,764	12,660
Ohio Valley General Hospital	No	258	257
UPMC Passavant	No	0	21
Saint Clair Memorial Hospital	No	789	746
UPMC Shadyside	Yes	6,912	6,724
UPMC St. Margarets	Yes	770	640
UPMC Presbyterian	Yes	5,824	6,100
Veterans Administration Pittsburgh Health System	Yes	800	756
Western Pennsylvania Hospital	Yes	2,248	2,530
Not Completed	N/A	167	153
Totals	N/A	42,328	42,007

Data collected from 2012-13 CAD Report

The total number of calls responded to in 2012 was 55,703 and in 2013, 55,095 total calls. PEMS transported 42,328 (76.0%) patients to a hospital in 2012, and 42,007 (76.2%) patients to a hospital in 2013; this includes rescue units.

Finding: The number of transports to a hospital is consistent for 2012 and 2013. For both years the percentage was identical; 76% of the calls were transported including the rescue units and 81% of the calls responded to by ambulance units alone required transported to a hospital.

Finding: Four hospitals (UPMC Mercy, Allegheny General, UPMC Shadyside and UPMC Presbyterian) received 65,199 patients from PEMS in 2012-13 or 77.3% of the total transports.

Finding: Hospitals located out of the City received 1,455 transports in 2012 and 1,413 in 2013. Both figures represent 3.4% of the annual PEMS transports.

The City transports its patients to hospitals within its borders as operational policy. These hospitals are clustered from Uptown to the East End, along with Allegheny General Hospital in the North Side.

RECOMMENDATION NO. 9:

Ohio Valley, St. Clair, Jefferson and Passavant hospitals all have Emergency Departments, and PEMS may wish to consider increasing their use for patient treatment from neighborhoods outside the rivers that do not have a near-by City hospital.

Paramedics cannot refuse to deliver a patient to a hospital, and through paramedic interview, many of the less serious calls use the Units for preliminary diagnosis and/or as transportation to a local emergency room.

In 2012, 33,222 priority calls had a transport rate of 81.0% (26,899) and in 2013, 32,636 priority calls had a transport rate of 81.4% (26,567). In 2012, 18,749 less serious calls had a transport rate of 80.0% (14,950) and in 2013, 18,783 less serious calls had a transport rate of 79.8% (14,984). During the audit period, priority calls resulted in transports 81.1% of the time while less serious cases were transported 79.9% of the time.

Finding: There was virtually no difference in the percentage of transports to the hospital between priority calls and less serious calls.

Mutual Aid

The City has tacit agreements with the surrounding municipalities to assist one another in cases of medical overload and provide transport to out-of-zone hospitals. PEMS can measure how many calls are assisted in the City by suburban ambulance crews through CAD reports, but do not have a method of counting City assistance to suburban EMS units, which is County-generated and sent only to the user municipality.

The PEMS administration believes that the number of annual mutual aid calls made by outside EMS agencies into the City number approximately 300 per year, while the number of mutual aid responses provided by PEMS to these agencies number less than two dozen per year.

Finding: There is no way currently to separate mutual aids calls in response to another municipality from approved non-critical transports to suburban hospitals.

RECOMMENDATION NO. 10:

PEMS reporting should include a data field to distinguish mutual aid trips from transports to non-City hospitals approved by the District Chief.

Paramedic Down Time

After paramedics transport a patient to the hospital they have a period of down time until they report that they are clear to receive their next call from 911. Paramedics currently use this down time for rest, eating, ambulance maintenance, to contact their district chief for resupplies and to complete their daily run reports.

Paramedics generally recover at the EMS station room located at the hospitals till their next call. These rooms have access to general, non-narcotic supplies and a computer to access EMS Charts database software. During a ride-along by the auditors, the paramedics explained that by remaining in a central location they save time and fuel when there is high call volume.

Table 8 shows how much down time the paramedics had between calls. (The only calls that were analyzed were calls that had a completely documented ambulance run from dispatch, hospital arrival, and notification of their availability for the next call.)

Table 8 – Frequency of Paramedic Complete-to-Clear (Available) Time 2012-13

2012-2013 FREQUENCY DISTRIBUTION OF PARAMEDIC COMPLETE to CLEAR TIME						
MINUTE RANGE	2012			2013		
	Number of Calls	Percentage	Cumulative Percentage	Number of Calls	Percentage	Cumulative Percentage
≤ 19:59	7,782	18.75%	18.75%	8,016	19.43%	19.43%
20:00-29:59	15,938	38.40%	57.15%	17,912	43.41%	62.84%
30:00-39:59	11,055	26.63%	83.78%	10,676	25.87%	88.71%
40:00-49:59	4,243	10.22%	94.00%	3,134	7.59%	96.30%
50:00-59:59	1,316	3.17%	97.17%	680	1.65%	97.95%
≥ 1 Hour	1,176	2.83%	100.00%	848	2.05%	100.00%
TOTAL	41,510	100.00%	100.00%	41,266	100.00%	100.00%

Data collected from 2012 -13 CAD Reports

Finding: In 2012, paramedic down time was 30 minutes or less following a transport 57% of the time and 40 minutes or less 84% of the time. The down time percentages in 2013 were 63% for 30 minutes or less and 89% for 40 minutes or less.

This finding shows that there is quick turnover for ambulance availability. It suggests that the policy of allowing paramedics to recover and restock at hospitals after a transport rather than returning to their home base allows the units to respond to dispatches more quickly.

RECOMMENDATION NO. 11

PEMS should continue the practice of waiting in central locations for calls rather than waste time and fuel returning to the paramedic station.

Finding: In 2012, 521 (1.3%) of the calls that were included in the “over one hour” category in Table 8 had nearly 24 hours downtime, and 515 calls (1.2%) in 2013 also approached a full day’s downtime. This could be caused by reporting errors or indicate that the ambulance was disabled.

Finding: In 2012, 468 calls had an ambulance transport time but did not have a hospital arrival time, while 303 calls in 2013 did not give a hospital arrival time. These are reporting errors and these calls were not included in Table 9.

Performance Measurements Summary

Below are selected general performance data including dispatches, cancelled runs, actual on-scene responses, overall/priority response time and the Unit Hour Utilization ratio.

Table 9 -- Selected PEMS Performance Standards 2012-13

Measurements	2012	2013
PEMS 911 Dispatches	61,483	60,179
PEMS Null Runs (Cancelled/Non-Primary)	9,512	8,760
PEMS On-Scene Responses	51,971	51,419
% of Priority Call Responses ≤ 8 mins 59 secs*	60.97%	58.76%
Average Response Time: All Priority Levels	00:09:41	00:09:56
Average Response Time: Priority Calls E0 & E1 *	00:09:05	00:09:18
Average Unit Hour Utilization	0.4775	0.4623

**Does not include "nulls" (secondary units/cancelled calls) and incorrect entries
Data collected from 2012-13 CAD (Computer Aided Dispatch) Report*

The response time for priority calls indicates on-scene arrivals of a PEMS unit with Advanced Life Support capabilities. It does not include First Responder arrival time, which should precede the PEMS unit's arrival and begin providing Basic Life Support as needed. PEMS and the Fire Bureau, which provides First Responders, do not share data.

Finding: There were 61,483 PEMS 911 dispatches in 2012 and 60,179 dispatches in 2013, a 2.1% drop in calls.

Finding: PEMS on-scene responses totaled 51,971 in 2012 and 51,419 in 2013, a 1.1% drop in the number of on-scene responses.

Data Collection Analysis

Transcribing the events of individual calls in CAD and EMS Charts in a complete, timely and accurate manner is essential for quality assurance, liability, proper medical billing and in creating internal and external audit trails.

Finding: Blank/incomplete entries in the CAD database ranged from 1% to 12%, depending on the field examined. Additionally, some of the data entered was incorrect, but the auditors could not determine the error rate.

As Recommendation No. 8 states, paramedics should completely and accurately fill in all the data boxes on all reports.

The Bureau of Emergency Medical Services is part of an integrated response program involving the County 911 Call Center, the Pittsburgh Fire Bureau as first responders, the hospitals and PEMS. The County 911 Call Center provides its own report that is available to PEMS and populates certain time fields in the EMS Charts Report.

Two crucial elements of patient care are not integrated into the EMS Charts report. The Fire Bureau keeps its own stand-alone records of first responder response times, and the hospitals do not share survival information on the patients treated and transported by PEMS.

Finding: The EMS report format does not include First Responder (BLS) response times nor the survival rates of patients because they are not generated by PEMS or the County 911 Call Center.

RECOMMENDATION NO. 12:

As the lead agency of a multi-agency system, PEMS should attempt to integrate both the Fire Bureau's first responder times and the hospitals' survival rates into its EMS Charts Report.

PEMS captures a great deal of data, and "big data" can sometimes be difficult to organize into manager-friendly report formats. CAD data lends itself more readily to manipulation, while the EMS Charts data seems to be useful on an individual basis or by selecting testing samples.

Finding: PEMS data collection captures much useful information, but is not sorted into an easily manipulated format for management purposes.

RECOMMENDATION NO. 13:

PEMS should employ a data-base manager, either hired through the EMS Bureau or provided as a liaison by the Innovation and Performance Department, to organize its data so that it can be sorted or queried in a management friendly fashion.

Finding: The Geographic Information System (GIS) used by PEMS to track and route its vehicles is comprehensive, and the PEMS staff whom the auditors observed utilizing the system are knowledgeable in its use. It also provides unit locations to the paramedics, which have GIS software available through a laptop in each ambulance, to show the closest available unit and provide the driver with directions when responding to calls.

EMS Charts

PEMS has a comprehensive software package (EMS Charts) that contains a number of specific fields. Some are populated by CAD and hospital data, but most are dependent on the paramedics, who have 72 hours to complete their reports after a call. The EMS Charts software package was started beginning in March 2013.

Finding: A sampling of EMS Charts by the auditors discovered several blank fields in the database. Because of the late start date and incomplete data, EMS Charts was not used.

In order to promote higher completion rates of EMS Charts, PEMS management has begun to equip ambulance personnel with iPads and routers that display interactive digital charts rather than the current bulkier laptops. The iPads can be taken with paramedics to the side of the patient and completed while administering treatment.

Paramedic Payroll and Overtime

Paramedics work overtime for numerous reasons. Paramedics may bid to work special event details and to work extra shifts, based on seniority, to fill in for call-offs, scheduled time off, emergency situations, etc. Also included as overtime are training classes. All paramedics are required to undergo training three days a year and specialized training in rescue, etc. is required for certification. Because paramedics must be available during their entire shift, all training is done outside the regular work hours.

Paramedics and Crew Chiefs are represented by the Fraternal Association of Professional Paramedics (FAPP) and are paid time-and-a-half for overtime hours.

District Chiefs and Division Chiefs are eligible for overtime for training or if an event requires supervision. They can elect to take their overtime hours as compensatory time figured at time-and-a-half, or can elect to receive their regular rate for the hours of overtime worked plus one-half time compensatory time. The Chief and Deputy Chief receive straight compensatory time if they work overtime.

Table 10 shows the total PEMS payroll, overtime paid from that payroll and the percentage of total payroll represented by overtime.

Table 10 - PEMS Payroll 2012-13

	TOTAL PAYROLL	OT PAY	OT %
2013	\$12,840,448.01	\$4,023,617.98	31.3
2012	\$12,726,757.01	\$3,879,040.80	30.5
Total	\$25,567,205.02	\$7,902,658.78	30.9

Figures provided by PEMS Payroll

Finding: PEMS payroll meets its annual budgeted allotment, spending 99.6% of its payroll budget in 2013 and 99.5% in 2012.

Finding: During the audit period, \$7,505,191.42 or 95% of overtime earnings were paid to paramedics and crew chiefs for overtime work, with the remainder \$397,467.36 or 5% paid to administrative employees (District Chief and above).

Finding: Overtime pay went from \$3,879,041 in 2012 to \$4,023,618 in 2013, an increase of 3.7%

Overtime costs can often be controlled to a degree through management decisions regarding personnel and training. The auditors requested an hourly overtime breakdown by scheduled/fill-in work shifts, training time and special events from PEMS Payroll, but one was not available.

Finding: Without the overtime hours categorized (staffing, training, special events, etc.), an analysis of the manpower needs and the efficiency of training schedules could not be determined.

RECOMMENDATION NO. 14:

PEMS Management should have Payroll staff categorize overtime hours worked into work-related overtime hours, training overtime hours and special events overtime for management purposes.

Pittsburgh EMS Response to Audit Recommendations

Recommendation 1: We agree with this recommendation and currently have the capability to develop a database system to generate this information out of existing Computed Aided Dispatch (CAD) data.

Recommendation 2: We agree that null calls are a strain on the response capability of the system. Many of these calls are generated by “drive by” cell phone 911 calls by the public that we must dispatch units for to investigate. We are evaluating options for community education programs to reduce the incidence of these calls.

Recommendation 3: We agree with this recommendation and are currently investigating different options and strategies to improve response times to high priority calls.

Recommendation 4: We agree with this recommendation and as in our response to recommendation 3 are exploring options to improve response time to these calls and all high priority calls

Recommendation 5: We disagree with this recommendation. Our concept of operations for an aggressive, forward leaning response strategy to life threatening emergency calls requires the current approach of early initial dispatch of the rescue vehicles. We are willing to accept the null call rate so that these specialty resources are in a position to be on life threatening emergency calls early on.

Recommendation 6: We agree with this recommendation. If manpower and staffing would allow for placing an addition medic unit in service in the West End we would do so.

Recommendation 7: We agree with this recommendation. We will work with our partners at the Allegheny County 911 center to explore evidence based options for reducing the number of over-prioritized calls.

Recommendation 8: We agree with this recommendation. We are currently developing a quality improvement and educational program to improve documentation and data collection system wide.

Recommendation 9: We disagree with this recommendation. We will continue to monitor and allow transports to out of city hospitals on a case by case basis. Yet, out of city transports have a negative effect on unit availability, unit utilization, system status management and response times.

Recommendation 10: We disagree with this recommendation. While we have no issue with data collection on these issues (as noted in Recommendation 8), transports to out of city hospital and mutual aid calls are two separate operational issues and should not be addressed as one.

Recommendation 11: We agree with this recommendation. The District Chiefs currently perform system status management and dynamic redeployment of units during periods of high unit utilization.

Recommendation 12: We agree with this recommendation. We would be happy to work with our partners in Innovation & Performance to improve our capability to acquire and integrate data so that we can enhance our capability to generate easily interpretable reports on operational and clinical issues. We are currently exploring our options for improving the hardware and software we are using for data collection system-wide.

Recommendation 13: We agree with this recommendation. As is Recommendation 12 we would be happy to work with Innovation & Performance on our data management systems.

Recommendation 14: We agree with this recommendation. We will explore enhancing our current technology to achieve this metric.

