Ambulance Dispatching Quality for Citizens Memorial Hospital

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Certification Statement

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: 

Date: 10/8/18

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Abstract

The problem is CMH was unable to determine if the dispatch centers serving them are providing high-quality EMS dispatching. The purpose of this research was to determine the level of quality of EMS dispatching for CMH. Descriptive research was used through surveys, literature review, and interviews to establish the level of dispatching quality. Four research questions were developed to elicit opinions of dispatch quality, to perform quantitative analysis of dispatch quality data, and obtain recommendations from supervisors on improving dispatch quality.

A survey was deployed to dispatchers, ambulance requesters, and responders. The survey asked for opinions of dispatch quality, ideas for tools to measure dispatch quality, and definitions of high-quality dispatching. A literature review identified tools to conduct quantitative measurements of dispatch quality such as call processing time, chief complaint accuracy, and cardiac arrest survival. Finally, interviews were conducted with EMS supervisors where the findings of the survey and quantitative analysis were presented, and the supervisors were asked their recommendations for improvement.

Overwhelmingly, the surveys and data analysis indicated that CMH EMS has poor quality EMS dispatching.

- Responders rank overall dispatch quality at 42%,
- Dispatch processing quality is at 34% (national goal is 90% (Federal Emergency Management Agency, 2012) & (National Fire Protection Association, 2017)),
- Dispatch accuracy quality is at 25%, and
- Cardiac arrest survival rates are 2.0% (national average is 9.6% (McNally, et al., 2011)).

Suggestions from the survey and EMS supervisors, in addition to the author's opinion, indicate a centralized dispatch center dedicated to high-quality EMS dispatching is the solution to improve these identified quality issues. One option is to contract with another agency already performing high-quality regional EMS dispatching. TCAD is one such agency CMH EMS should investigate as a solution to improve the current low-quality EMS dispatching for CMH.

Introduction

Citizens Memorial Hospital (CMH) operates a 9-1-1 ambulance service in four counties in Southwest Missouri. Emergency Medical Services (EMS) is a department of the hospital and is charged with responding to emergency and non-emergency requests. To provide quality services, 9-1-1 call taking, call processing, and dispatching ambulances is a critical component.

The problem is CMH EMS is unable to determine if the dispatch centers serving them are providing high-quality dispatching for emergency or non-emergency requests. The purpose of this research is to determine the level of quality of dispatching emergency and non-emergency requests for CMH EMS. Descriptive research was used through surveys to CMH EMS employees, four dispatch agencies serving CMH EMS, and facilities that are the highest utilizers of CMH EMS. Additionally, literature research was used to determine if other agencies have addressed similar problems and to help identify standardized statistical measures that can be used to analyze the performance of EMS dispatch.

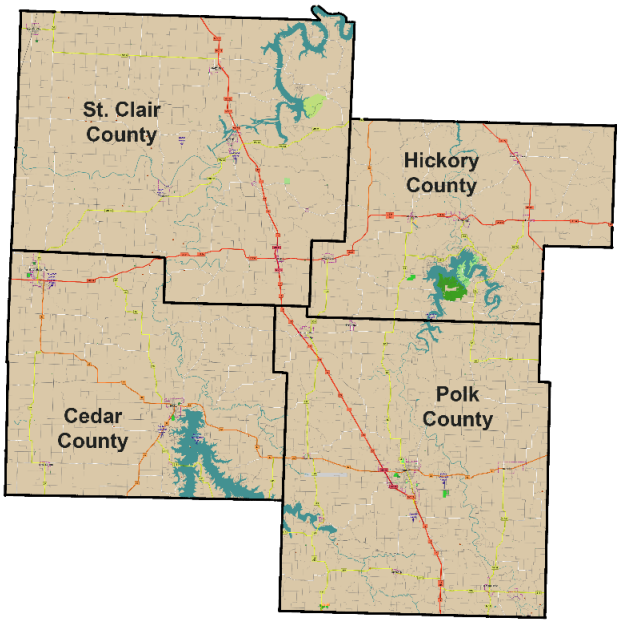
Research questions that were used include the following:

1. What do EMS staff, dispatch staff, and frequent professional users (i.e., ER and clinic staff) believe will be the results of a dispatching quality analysis?
2. What quality measures can be used to define EMS dispatching quality?
3. Using the identified quality measures, how are the dispatch centers that serve CMH EMS performing?
4. What recommendations do EMS supervisors have for dispatching quality improvement?

Background and Significance

CMH has provided ambulance service to Polk and Hickory Counties since 1982 (Citizens Memorial Hospital, 2017). In 1990, CMH created a department of the hospital to handle 9-1-1 calls in Polk County (Taylor, 2018). This new 9-1-1 service was an upgrade from the previous seven-digit emergency number that was answered by Emergency Room staff at the hospital (Taylor, 2018). In 2003, the 9-1-1 service in Polk County was consolidated with the City of Bolivar, Polk County Sheriff, and CMH (Polk County Central Dispatch, n.d.). This consolidation moved the facility to a separate agency, board of directors, and facility. Currently, Polk County Central Dispatch (PCCD) operates with its own sales tax and provides dispatch services for law enforcement, fire departments, and CMH ambulances. PCCD has its own facility with four dispatching consoles and two call-taking positions. All call-takers and dispatchers are certified Emergency Medical Dispatchers (EMD). The administrative oversight of PCCD is an elected board of directors.

Figure 1 - Map of CMH EMS Four-County District



Meanwhile, ambulance dispatching in Hickory County remained routed through the sheriff's department and was only marginally upgraded from a seven-digit access number to basic 9-1-1. Currently, Hickory County Sheriff's Department (HCSD) still dispatches for law enforcement, fire departments, and CMH ambulances. HCSD dispatch is a single-station call-taker and dispatcher that also serves as front-desk staff, reception, and jailer. None of the dispatch staff are certified EMD. The administrative oversight of HCSD is an elected sheriff.

In 2011, Cedar County Ambulance District (CCAD) put out for bid the operation of the ambulance service (Nexstar Broadcasting, Inc., 2011). CMH won the bid and started managing the operations in that county. The previous service was managed by Mercy EMS, based out of Springfield, Missouri. Ambulance dispatching in Cedar County was provided by a central EMS dispatch center out of Mercy hospital in Springfield after the calls were forwarded by the Cedar County Sheriff's Department (CCSD). When CMH took over ambulance operations, ambulance dispatching reverted to CCSD with basic 9-1-1 services. Currently, CCSD dispatches law enforcement, fire departments, and CMH ambulances. CCSD dispatch is a two-station call-taking and dispatching area that is shared with the jailers. All dispatchers are required by contract to be certified EMD. The administrative oversight of CCSD is an elected sheriff.

In 2014, Sac Osage Hospital in St. Clair County was dissolved, and services were acquired by CMH (Barba, 2017). Additionally, in 2014, CMH started a partnership agreement with Ellett Memorial Hospital (EMH) (Citizens Memorial Hospital, 2014). Ambulance service for St. Clair County is now provided by CMH and EMH. The previous service was dispatched from the St. Clair County Sheriff's Department (SCCSD) using basic 9-1-1. Currently, SCCSD dispatches law enforcement, fire departments, EMH ambulances, and CMH ambulances. SCCSD

dispatch is a two-station call-taking and dispatching area that is shared with the jailers. None of the dispatchers are certified EMD. The administrative oversight of SCCSD is an elected sheriff.

All dispatch centers are independent without any technology or processes in place to share information or coordinate responses. None of the dispatch centers have any legislative or administrative requirements to meet standards or quality guidelines for EMS dispatching. Additionally, only Polk County has a dedicated revenue source for dispatching. Until July 2018, Missouri was the only state in the country that did not have a tax on cell phone users for 9-1-1 centers (Hauswirth, 2018).

Due to all dispatch oversight being comprised of elected officials, the ability for CMH EMS to hold these agencies accountable to meet quality benchmarks is limited. There is a marginal annual fee provided to HCSD for dispatching services. However, that agreement is so old, hard copy documentation cannot be produced. The amount paid to HCSD for dispatching is $18,272.28 per year (Taylor, 2018). There is also an annual fee provided to CCSD for dispatching services and has deliverables in the contract. However, CCSD has not been able to meet those deliverables. The amount paid to CCSD for dispatching is $63,996 per year (Taylor, 2018). No contracts or deliverable agreements exist with either PCCD or SCCSD.

Table 1 - County Demographics

County	Population (United States Census Bureau, 2017)	Number of First Responder Agencies	Number of Daily On-Duty Ambulances in 2017	Number of Ambulance Requests in 2017 (PhysioControl, 2018)	Number of Transports in 2017 (PhysioControl, 2018)
Polk	31,794	17	7	5,615	4,673
Hickory	9,475	9	1	1,203	756
Cedar	14,073	10	2	2,236	1,565
St. Clair	9,362	8	2	950	600
Total	**64,704**	**44**	**12**	**10,004**	**7,594**

Without quality standards, the citizens of these four counties may not be getting the best service. CMH EMS may not be getting their ambulances dispatched and coordinated in the safest, efficient, and reliable ways. These counties are growing, and needs are increasing. However, without an ability to measure EMS dispatching quality, there is no way to know if CMH EMS is meeting these new needs. In future years, lives may be lost and resources not efficiently used due to poor EMS dispatching quality.

The National Fire Academy Course R0125 - Executive Leadership lists two course objectives that specifically relate to this research paper:

1. “Examine the systems within which the adaptive challenge exists, using purposeful collection of data to help clarify and define what occurs within these systems” (National Fire Academy, 2015).
2. “Analyze political relationships within an organizational system” (National Fire Academy, 2015).

This research has an adaptive challenge component in which the existing attitudes and thoughts of stakeholders may not be aware of the existence of poor quality EMS dispatching

because “we have always done it this way” kind of mentality. Purposeful data collection was used to identify the state of quality and the extent of the adaptive problem. Additionally, this research is politically charged due to elected officials involvement and multiple agencies with potentially differing agendas and objectives.

The U. S. Fire Administration established five goals to focus on from 2014 to 2018 in its Strategic Plan. This research addresses the first three of these goals:

1. “Reduce … life safety risk through preparedness, prevention, and mitigation” (U. S. Fire Administration, 2014).
2. “Promote response, local planning, and preparedness for all hazards” (U. S. Fire Administration, 2014).
3. “Enhance the … emergency services’ capability for response to and recovery from all hazards” (U. S. Fire Administration, 2014).

Identifying and improving the quality of EMS dispatch will directly result in CMH EMS’s ability to reduce life safety risk, promote response to all hazards, and enhance its capability for response.

Literature Review

A literature review was conducted to address the research questions. Research question number one was “What do EMS staff, dispatch staff, and frequent professional users (i.e., ER and clinic staff) believe will be the results of a dispatching quality analysis?”

An article in 2009 discussed problems with consolidated dispatch centers. The author identifies a few of these issues as “persons not knowledgeable about fire department needs making decisions about fire department communications systems; new technology that doesn't put the customer (the fire department) first” (Carver, 2009, p. 107). This author goes on to discuss how consolidated dispatch centers are often removed from the fire department organizational structure. While explicitly addressing fire department issues, these can easily be mirrored into EMS issues of consolidated centers not understanding EMS, not considering EMS needs, and EMS not having a mechanism to manage or make the needed changes.

Research question number two was “What quality measures can be used to define EMS dispatching quality?”

At the 2013 Pinnacle EMS Leadership Forum, Guillermo Fuentes with Fitch & Associates stated "Economics will drive what changes in EMS... It has less to do with patient-centric or customer-driven demands; the economic modeling is going to change a lot of what EMS does and how it delivers service in the future" (Erich, 2013, p. 42).

When American Medical Response (AMR) upgraded their Computer Aided Dispatch (CAD) in 2005, they identified “the number one issue with our business customers is the call intake process and the time it takes to exchange information” (Estes, 2005, p. 80). “NFPA 1221 has established a standard that 95% of all emergency calls must be answered in 30 seconds.

Dispatch of emergency response aid should be made within 60 seconds of the completed receipt of an emergency alarm" (National Fire Protection Association, 2017, p. 17). "The [dispatch] system should use quality assurance measures, such as outcome, comparison, and validation information, to ensure continuous improvement" (National Fire Protection Association, 2017, p. 26). The Federal Emergency Management Agency echoes these call processing standards by saying that the call processing time performance goal should be "90% of calls processed in less than 90 seconds" (Handbook for EMS medical directors, 2012, p. 79).

The American Heart Association (AHA) has advocated for decades that the "Chain of Survival" improves cardiac arrest survival. One of the components of the Chain of Survival is a high-quality EMS dispatcher. Survival to hospital discharge after Out-of-Hospital Cardiac Arrest (OHCA) in most of the communities of the United States is only 5% to 10% (Lerner, et al., 2012). However, "in communities where the Chain of Survival is strong, survival rates can approach 20%" (Lerner, et al., 2012).

A survey of almost 7,000 patients comparing two districts with multiple dispatch centers and one district with a combined dispatch center found the odds of surviving 30 days after the out-of-hospital cardiac arrest to be two times higher if the patient was in the district with a combined dispatch center than the districts with multiple centers. The authors summarize by saying "a single dispatch center was associated with a markedly improved increase of survival" (Ageron, et al., 2016, p. 1).

The Centers for Disease Control and Prevention (CDC) summarized the Cardiac Arrest Registry to Enhance Survival (CARES) database and found "approximately 92% of persons who experience an OHCA event die" (McNally, et al., 2011, p. 1). This report goes on to specify the national average of Return of Spontaneous Circulation (ROSC) in the field is 34.4%, a 26.3%

survival rate to hospital admission, and an overall 9.6% rate of survival to hospital discharge from OHCA (McNally, et al., 2011, p. 11).

"The review process should review 7% to 10% of calls. Individuals performing dispatch case reviews must have an emergency medical background (preferably experienced at an ALS level) and be specially trained in the process of EMD case review" (American Society for Testing and Materials, 2014, p. 4). Compliance should include the following: 1) Compliance with interrogation questions, 2) Compliance with pre-arrival instructions, and 3) Compliance with selecting the correct response classification code. From another source, it was recommended to "review a minimum of two percent of all calls. A random approach is best" (Haelsen, 2017).

Research question number three was "Using the identified quality measures, how are the dispatch centers that serve CMH EMS performing?" This research question is addressed in the Procedures and Results sections as this question is specific to the CMH EMS geography.

Research question number four was "What recommendations do EMS supervisors have for dispatching quality improvement?" In a paper by Lerner et al. on behalf of the American Heart Association Emergency Cardiovascular Care Committee and the Council on Cardiopulmonary, Critical Care, Perioperative, and Resuscitation, Lerner makes four main recommendations to improve OHCA survival. Two of these recommendations specifically address EMS dispatch quality: "individual dispatcher and organizational-level performance can be measured… and these metrics should be incorporated into an integrated quality assurance program that includes cooperation and collaboration of EMS and hospital stakeholders" (Lerner,

et al., 2012). Lerner (2012) goes on to say this quality assurance "program should provide feedback at the individual and organizational level." One quality assurance metric identified to have a successful EMS dispatch program is "dispatch of appropriate EMS resources…" measured by the time "interval from receipt of call to EMS dispatch" (Lerner, et al., 2012).

"A single lead agency should be responsible for coordinating EMS communications" (National Fire Protection Association, 2017, p. 25). "A systemwide communications plan should be in place that functionally consolidates dispatch centers" (National Fire Protection Association, 2017, p. 25). "The system should include computer-aided dispatch (CAD), which allows for reference location information such as location of previous incidents, duplicate incidents, or premise/hazard information. The CAD system should provide a method of selecting appropriate response units" (National Fire Protection Association, 2017, p. 25). "The CAD should be able to interface with other dispatch computers within the EMS system" (National Fire Protection Association, 2017, p. 25). "The dispatch center should establish standards for providing medically approved pre-arrival instructions" (National Fire Protection Association, 2017, p. 26). "Call receivers/dispatchers should participate in and complete a nationally recognized and accepted emergency medical dispatch certification program and should receive on-the-job, site-specific training. Call receivers/dispatchers should regularly participate in continuing education" (National Fire Protection Association, 2017, p. 26).

"Comm centers are… costly endeavors whose functions can increasingly be accomplished by distributed, decentralized technologies that are widely available and cost less. Imagine a day when you can dispatch your EMS system from home using VoIP and the Internet" (Erich, 2013, p. 42).

"There shall be a minimum of two telecommunicators on duty and present in the communications center at all times" (National Fire Protection Association, 2015, p. 24). "Ninty-five percent of alarms received on emergency lines shall be answered within 15 seconds, and 99% of alarms shall be answered within 40 seconds [and] shall be evaluated monthly" (National Fire Protection Association, 2015, p. 24). "Emergency alarm processing for … calls requiring emergency medical dispatch questioning and pre-arrival medical instructions … shall be completed within 90 seconds 90% of the time and within 120 seconds 99% of the time" (National Fire Protection Association, 2015, p. 24). "Where voice transmission is used as a dispatch method, the announcement for the emergency response shall be preceded by an audible warning or alerting signal that differentiates the emergency from routine radio traffic" (National Fire Protection Association, 2015, p. 25).

"Dispatchers should be included in the QI activities of the local EMS system. There should be EMS dispatch protocols that are coordinated with the EMS system and approved by the system medical director" (National Highway Traffic Safety Administration, 1997, p. 32). A study by Clawson et al. used protocol compliance by dispatchers as a measure of dispatch quality. The study specifically addressed improving protocol compliance by providing performance feedback to the dispatchers and found compliance improved from 76% to 96% (Clawson, Cady, Martin, & Sinclair, 1998).

In summary, a recurring theme in this literature review centered around two points: dispatch activities should be consolidated instead of distributed, and dispatch performance should be measured through an analysis of call processing time to ensure 90% of calls are dispatched within 90 seconds. Additionally, EMS professionals should be utilized to make

dispatch decisions. Calls should be reviewed for correct processing and appropriate resource dispatching at a rate of between two and ten percent of calls, and feedback of those results should be given to the dispatchers. These results influenced the research through an investigation into determining if the users of the dispatch centers serving CMH EMS would share the same opinions.

Procedures

Research question number one was "What do EMS staff, dispatch staff, and frequent professional users (i.e., ER and clinic staff) believe will be the results of a dispatching quality analysis?" This question was addressed through a survey to users of the dispatch centers serving CMH EMS. First, a spreadsheet was developed to identify agencies that should be targeted as recipients of the survey. These agencies were classified into three groups: Dispatcher, Requester, and Responder. For each of these groups, in each county served, specific agencies were selected to send surveys to based on the percent of calls they are involved. All agencies were sent requests to participate in the survey until 90% of all calls in each category were satisfied. This method of selecting agencies was done in an attempt to ensure high-volume users of ambulance dispatching services were included.

Once identified, emails and phone calls were made to identify the agency lead or their preferred contact person and method of survey delivery. Either surveys were sent directly to identified users and staff, or the survey was sent to the agency contact to be forwarded to the staff. In either case, the number of staff sent the survey was recorded.

Dispatcher agencies were simply identified as the four dispatch agencies serving CMH EMS. Below is the breakdown of the percentage of calls dispatched by each agency. After several requests for participation in the survey, no response was received by any of the dispatch agencies. Comments below marked with an asterisk (*) indicate that after several requests for participation in the survey, no response was received. A total population of 38 dispatchers was estimated, so a sample size of 35 would be required for a confidence level of 95% and a margin of error of 5%. Four (4) known individuals were sent the survey. It is unknown if those four

agency contacts forwarded the survey onto their staff as requested. Figuring only 10% of those that receive the survey complete it, responses from dispatchers was not expected.

Table 2 - Dispatch Agencies

Dispatch Agency	Percent of Calls	Number of Individuals Survey Sent To	Estimated Number of Dispatchers
Polk County Central Dispatch	54%	1 *	20
Cedar County Sheriff	22%	1 *	7
Hickory County Sheriff	13%	1 *	4
St Clair County Sheriff	9%	1 *	7
TOTALS	**98%**	**4**	**38**

Requester agencies were more challenging to identify, and a review of electronic Patient Care Reports (ePCR) was conducted to identify the highest volume requesters of ambulances. All agencies were included that requested 90% of ambulances in total and within each county. Comments below marked with an asterisk (*) indicate that after several requests for participation in the survey, no response was received. A total population of 108 requesters was estimated, so a sample size of 85 would be required for a confidence level of 95% and a margin of error of 5%. Seventy (70) known individuals were sent the survey. It is unknown if other agency contacts forwarded the survey to their staff as requested. Figuring only 10% of those that receive the survey complete it, seven (7) responses from requesters was expected.

Table 3 - Requester Agencies

Requester Agency	Total Percent of Requests	Number of Individuals Survey Sent To	Estimated Number of Requesters
CMH Emergency Room	36%	1 *	4
Cedar County Memorial Hospital	8%	1 *	4
CMH Med/Surg	8%	1 *	3
CMH Healthcare Facility	5%	1 *	6
CMH Community Springs Healthcare Facility	4%	1 *	6
CMH Parkview Healthcare Facility	4%	1 *	6
Northwood Hills Care Facility	4%	1 *	3
Hermitage Nursing and Rehab	3%	10	10
CMH ICU	3%	1 *	6
CMH Lake Stockton Healthcare Facility	2%	1 *	6
Agape Boarding School	2%	1	1
Big Springs Care Center	2%	6	6
CMH Parkview Geriatric Wellness	2%	1 *	3
CMH Osceola Medical Center	1%	10	10
Golden Valley Medical Clinic Osceola	1%	7	7
Truman Lake Manor	1%	1 *	3
Ozarks Community Health Center	1%	1 *	2
CMH El Dorado Springs Medical Center	1%	10	10
CMH Stockton Family Medical Center	1%	1	1
CMH Butterfield Residential Care Center	1%	1 *	3
Blue Castle of the Ozarks	1%	0 (Refused to participate)	0
CMH Telemetry	1%	1 *	3
CMH Walk-In Clinic	1%	1 *	2
Fresenius Kidney Care	1%	0 (No contact identified)	0
Lake Shores Residential Care	1%	1 *	3
TOTALS	**95%**	**70**	**108**

Responder agencies were identified by a review of ePCRs to identify the responders that were dispatched to the highest volume of requests for ambulances. All agencies were included that responded to 90% of ambulance requests in total and within each county. Comments below marked with an asterisk (*) indicate that after several requests for participation in the survey, no response was received. A total population of 214 responders was estimated, so a sample size of 138 would be required for a confidence level of 95% and a margin of error of 5%. One hundred twenty-two (122) known individuals were sent the survey. It is unknown if other agency contacts forwarded the survey to their staff as requested. Figuring only 10% of those that receive the survey complete it, 12 responses from responders was expected.

Table 4 - Responder Agencies

Responder Agency	Total Percent of Responses	Number of Individuals Survey Sent To	Estimated Number of Responders
Missouri State Highway Patrol	N/A	Not included in the survey	N/A
CMH EMS	N/A	71 (Survey link was sent to all CMH EMS employees)	71
Bolivar City Fire	18%	21	21
Hickory Rescue	16%	1 *	10
Cedar County First Responders	10%	1 *	10
El Dorado Springs Police	7%	1 *	7
Cedar Sheriff	5%	1 *	7
Sac Osage Fire	4%	1 *	10
Collins Fire	4%	1 *	5
Polk Sheriff	4%	1 *	7
Bolivar Police	4%	13	13
Lowry City Fire	3%	0 (No contact identified)	0
Hickory Sheriff	3%	1 *	7
St Clair Sheriff	2%	1 *	7
Central Polk Fire	2%	1 *	5
Morrisville Fire	2%	1 *	5
Humansville Fire	2%	1 *	5
Pleasant Hope Fire	1%	1 *	5
Humansville Police	1%	1 *	4
Stockton Fire	1%	1 *	5
Jerico Springs Fire	1%	1 *	5
Wheatland Fire	0%	1 *	5
TOTALS	**90%**	**122**	**214**

The survey developed utilized open-ended questions to elicit opinions of current dispatch performance and what future performance should be measured against. The survey was developed in Google Docs and can be found at this link and is included here in its entirety: https://goo.gl/forms/Q4eRAqq9XEWfoh2b2.

Figure 2 - CMH EMS Dispatch Quality Survey

CMH EMS Dispatch Quality - Survey 1

As part of the Executive Leadership curriculum at the National Fire Academy, Theron Becker is writing a research paper addressing EMS Dispatch Quality. Please take a few minutes to share your personal opinions about EMS Dispatching as it relates to you. Questions about this survey or the research project can be submitted to Theron at ka5yth@gmail.com.

This is part one of a two-part survey. The deadline for this survey to be completed is August 16th. The second survey will be sent out September 7th with a deadline for completion of September 21st. The completed research paper will be available for review by October 22nd.

How would you classify yourself? *

- ○ EMS Requester (My most frequent interaction with EMS dispatch is requesting an ambulance)
- ○ EMS Dispatcher (My most frequent interaction with EMS dispatch is processing requests for ambulances or dispatc...
- ○ EMS Responder (My most frequent interaction with EMS dispatch is being dispatched to emergency or non-emerge...

Which EMS dispatch do you interact with the most? *

1. Polk County Central Dispatch
2. Hickory County Sheriff
3. Cedar County Sheriff
4. St Clair County Sheriff

What is your overall opinion of quality of EMS dispatch? *

	1	2	3	4	5	
Very low quality	○	○	○	○	○	Very high quality

Take a second and think about how you define high or low quality dispatch. Please use the following questions to refine your thoughts.

When thinking about the EMS dispatch quality... If you had to pick only one tool to determine quality, what kind of tool would it be? *

- ○ Technical evaluation tool (Evaluates issued that are related to money, expert knowledge, or new technology)
- ○ Adaptive evaluation tool (Evaluates issues that are related to new learning and attitudes)

In your own words, describe the one best tool that could be used to evaluate the quality of EMS dispatch. *

Long answer text

Using your evaluation tool, what would be the definition of high-quality EMS dispatching? *

Long answer text

The most significant limitation of the research to answer this question is the small number of responses received. Cooperation on the part of agency leadership was much less than expected. The original intention was to deliver a follow-up survey based on the answers from the first. However, when such poor participation was encountered, the second survey was not developed or utilized.

Research question number two was "What quality measures can be used to define EMS dispatching quality?" Based on literature review, EMS dispatching quality should be measured against the standard of 90% of the calls should be processed within 90 seconds. Only one of the four dispatch centers keeps records of call processing times. Polk County Central Dispatch utilizes Computer Aided Dispatch (CAD) that records accurate timestamps (including seconds). Those timestamps are uploaded to CMH EMS ePCR software for documentation purposes. The other three dispatch centers either do not utilize CAD, their CAD does not record accurate timestamps, or their CAD cannot export to ePCR software for evaluation.

All requests for a CMH ambulance processed by Polk County Central Dispatch were reviewed for the past twelve months. The ePCR used by CMH EMS is HealthEMS by Sansio, a division of PhysioControl. HealthEMS categorizes the two data fields in question as "Call Received" and "Dispatched." This data was analyzed using the denominator as the number of calls dispatched and the numerator as the number of calls where the "Dispatched" time was less than 90 seconds after the "Call Received" time.

The obvious limitation to this research is only one of four dispatch center's data is available for evaluation. While it is the dispatch center with the highest volume and the most resources, it is only an assumption it is the highest quality of the four centers.

Research question number three was “Using the identified quality measures, how are the dispatch centers that serve CMH EMS performing?” Another quality measure identified in the literature review was to review call processing to ensure EMD scripts were followed correctly, the call was accurately coded, and the appropriate resources were dispatched. Internal data from the different dispatch centers was not available, and only one of the four centers utilizes EMD on 100% of the requests for an ambulance. However, data available through the CAD interface to HealthEMS does indicate the dispatch code utilized which can be compared to the actual patient condition encountered by the ambulance crew.

Data fields in question are entitled “Dispatch Code,” “Chief Complaint,” “Dispatched Service Level,” and “Recommended Service Level.” “Dispatched Service Level” is the billing code assigned to the dispatch code selected by the dispatch center. “Recommended Service Level” is the billing code assigned to the actual treatments provided to the patient by the ambulance crew.

Comparisons between “Dispatch Code” and “Chief Complaint” were made. Additionally comparisons between “Dispatched Service Level” and “Recommended Service Level” were made. Denominators were the number of requests for an ambulance, and the numerators were the calls where there was a similar match between dispatched and actual patient condition.

Additionally, ePCR data for the past 12 months was evaluated to determine survival rates of patients suffering from OHCA to compare to national averages. “Sustained ROSC” is a data field to indicate the patient regained pulse in the field. All OHCA patients with sustained ROSC that were transported to CMH were followed-up on to determine the percentage of OHCA

patients admitted to the hospital. Finally, all admitted patients were also followed-up on to determine the percentage of OHCA patients that were discharged from the hospital.

Again, a significant limitation was only one of the four dispatch centers have the data available to evaluate. However, the centers without data do not perform EMD at all or do not perform EMD on 100% of ambulance requests, so it can be assumed the quality of correct pre-arrival instructions and the correct ambulance dispatching is zero. Additionally, a standardized benchmark was not identified in the literature review as a goal. What should be the standard to measure correct patient condition identification and the correct ambulance type and priority dispatched?

Research question number four was “What recommendations do EMS supervisors have for dispatching quality improvement?” After review of dispatch quality data, that data was presented to EMS supervisors. Then, one question was asked of them: “What would you recommend to improve EMS dispatching quality?” EMS supervisors were selected because of the finding in the literature review that stated EMS leadership should be involved in EMS dispatching decision-making. The limitation of this research is the small number of responses, and the foundation of this data is based on individual opinions without numeric supporting data.

Results

Research question number one was "What do EMS staff, dispatch staff, and frequent professional users (i.e., ER and clinic staff) believe will be the results of a dispatching quality analysis?" Responses from the survey sent to dispatchers, requesters, and responders were much less than hoped. All the results from the survey were separated by classification of the person answering the survey and by the primary dispatch agency they interact. Utilizing estimated numbers of staff that were requested to answer the survey, the following percentages of responses were received.

Table 5 - Survey Replies

Dispatch Agency	Percent Dispatcher Replies	Percent Requester Replies	Percent Responder Replies	**TOTAL REPLIES**
Polk County Central Dispatch	0%	13%	14%	**12%**
Hickory County Sheriff	0%	50%	6%	**17%**
Cedar County Sheriff	71%	29%	8%	**19%**
St Clair County Sheriff	0%	22%	3%	**10%**
TOTALS	**13%**	**23%**	**10%**	**14%**

When asked "What is your overall opinion of the quality of EMS dispatch?" on a scale of one (low quality) to five (high-quality), the results are below. Overall replies indicated around the middle of the range between low-quality and high-quality. Higher than three out of five opinions were received by dispatchers and requesters and indicated Hickory and Cedar County Sheriff Dispatches are performing in the higher-quality range. Significantly lower opinions were received from responders and for St Clair County Sheriff Dispatch.

Table 6 - Dispatch Quality Margin of Error

Dispatch Agency	Dispatcher Margin of Error	Requester Margin of Error	Responder Margin of Error	**OVERALL MARGIN OF ERROR**
Polk County Central Dispatch	No responses	38%	24%	**21%**
Hickory County Sheriff	No responses	30%	68%	**32%**
Cedar County Sheriff	25%	30%	48%	**21%**
St Clair County Sheriff	No responses	40%	98%	**38%**
TOTALS	**41%**	**17%**	**20%**	**31%**

Table 7 - Dispatch Quality Average Reply (Out of Five)

Dispatch Agency	Average Dispatcher Reply	Average Requester Reply	Average Responder Reply	**TOTAL AVERAGE**
Polk County Central Dispatch	No responses	3.8	2.1	**2.7**
Hickory County Sheriff	No responses	3.8	2.5	**3.5**
Cedar County Sheriff	4.0	3.5	2.3	**3.4**
St Clair County Sheriff	No responses	2.6	1.0	**2.3**
TOTALS	**4.0**	**3.5**	**2.1**	**3.0**

Table 8 - Dispatch Quality Reply Range (Out of Five)

Dispatch Agency	Dispatcher Reply Range	Requester Reply Range	Responder Reply Range	**TOTAL RANGE**
Polk County Central Dispatch	No responses	3.1 to 4.6	1.9 to 2.4	**2.4 to 2.9**
Hickory County Sheriff	No responses	3.3 to 4.4	1.7 to 3.4	**2.9 to 4.1**
Cedar County Sheriff	3.5 to 4.5	3.0 to 4.0	1.7 to 2.8	**3.0 to 3.7**
St Clair County Sheriff	No responses	2.1 to 3.1	0.5 to 1.5	**1.9 to 2.8**
TOTALS	**3.2 to 4.8**	**3.2 to 3.8**	**1.9 to 2.4**	**2.5 to 3.4**

Research question number two was “What quality measures can be used to define EMS dispatching quality?” The national standard of call processing time of 90 seconds 90% of the time was used to evaluate the previous 12 months of ambulance request data for CMH EMS. Additional analysis of call data was conducted from the previous 12 months to evaluate the accuracy of chief complaint identification and appropriate resource dispatching. In the tables below, shaded cells indicate quality at or above 90%.

The overall results indicate that the national standard call processing benchmark is only met 34% of the time for CMH EMS. Additionally, calls accurately identify the chief complaint only 25% of the time and the correct ambulance type (BLS or ALS) is requested 70% of the time.

Table 9 - Percent of Calls Processed in 90 Seconds

Dispatch Code	Polk County Central Dispatch	Hickory County Sheriff	Cedar County Sheriff	St Clair County Sheriff	**System Total**
1 (abdominal)	72%	N/A	0%	N/A	**45%**
2 (allergies)	73%	N/A	0%	N/A	**67%**
3 (animal)	50%	N/A	0%	N/A	**25%**
4 (assault)	68%	N/A	0%	N/A	**48%**
5 (back)	50%	N/A	0%	N/A	**37%**
6 (breathing)	82%	N/A	0%	N/A	**54%**
7 (burns)	0%	N/A	0%	N/A	**0%**
8 (CO)	67%	N/A	0%	N/A	**50%**
9 (arrest)	79%	N/A	0%	N/A	**43%**
10 (chest)	84%	N/A	0%	N/A	**46%**
11 (choking)	88%	N/A	N/A	N/A	**88%**
12 (convulsions)	78%	N/A	0%	N/A	**54%**
13 (diabetic)	79%	N/A	0%	N/A	**60%**
14 (drowning)	N/A	N/A	0%	N/A	**0%**
15 (electrocution)	100%	N/A	N/A	N/A	**100%**
16 (eye)	50%	N/A	N/A	N/A	**50%**
17 (fall)	65%	N/A	0%	N/A	**42%**
18 (headache)	64%	N/A	0%	N/A	**45%**
19 (heart)	76%	N/A	0%	N/A	**57%**
20 (heat/cold)	100%	N/A	0%	N/A	**42%**
21 (hemorrhage)	67%	N/A	0%	N/A	**56%**
22 (inaccessible)	0%	N/A	N/A	N/A	**0%**
23 (overdose)	67%	N/A	0%	N/A	**44%**
24 (pregnancy)	82%	N/A	0%	N/A	**56%**
25 (psychiatric)	57%	N/A	0%	N/A	**37%**
26 (sick)	65%	N/A	0%	N/A	**38%**
27 (stab)	71%	N/A	0%	N/A	**50%**
28 (stroke)	77%	N/A	0%	N/A	**55%**
29 (traffic)	63%	N/A	0%	N/A	**48%**
30 (traumatic)	73%	N/A	0%	N/A	**48%**
31 (unconscious)	78%	N/A	0%	N/A	**67%**
32 (unknown)	78%	0%	0%	0%	**13%**
33 (transfer)	48%	N/A	0%	N/A	**43%**
TOTALS	**60%**	**0%**	**0%**	**0%**	**34%**

Table 10 - Percent of Calls Accurately Coded by Chief Complaint

Dispatch Code	Polk County Central Dispatch	Hickory County Sheriff	Cedar County Sheriff	St Clair County Sheriff	**System Total**
1 (abdominal)	93%	N/A	95%	N/A	**93%**
2 (allergies)	86%	N/A	0%	N/A	**78%**
3 (animal)	100%	N/A	100%	N/A	**100%**
4 (assault)	95%	N/A	100%	N/A	**96%**
5 (back)	68%	N/A	88%	N/A	**73%**
6 (breathing)	78%	N/A	77%	N/A	**77%**
7 (burns)	100%	N/A	100%	N/A	**100%**
8 (CO)	33%	N/A	N/A	N/A	**33%**
9 (arrest)	73%	N/A	88%	N/A	**80%**
10 (chest)	80%	N/A	78%	N/A	**79%**
11 (choking)	100%	N/A	N/A	N/A	**100%**
12 (convulsions)	84%	N/A	87%	N/A	**85%**
13 (diabetic)	84%	N/A	77%	N/A	**83%**
14 (drowning)	N/A	N/A	100%	N/A	**100%**
15 (electrocution)	100%	N/A	N/A	N/A	**100%**
16 (eye)	100%	N/A	N/A	N/A	**100%**
17 (fall)	90%	N/A	89%	N/A	**90%**
18 (headache)	86%	N/A	100%	N/A	**90%**
19 (heart)	58%	N/A	69%	N/A	**61%**
20 (heat/cold)	80%	N/A	67%	N/A	**73%**
21 (hemorrhage)	73%	N/A	78%	N/A	**73%**
22 (inaccessible)	100%	N/A	N/A	N/A	**100%**
23 (overdose)	78%	N/A	77%	N/A	**77%**
24 (pregnancy)	80%	N/A	80%	N/A	**80%**
25 (psychiatric)	90%	N/A	97%	N/A	**92%**
26 (sick)	69%	N/A	58%	N/A	**65%**
27 (stab)	100%	N/A	100%	N/A	**100%**
28 (stroke)	56%	N/A	89%	N/A	**65%**
29 (traffic)	99%	N/A	100%	N/A	**100%**
30 (traumatic)	83%	N/A	71%	N/A	**80%**
31 (unconscious)	50%	N/A	75%	N/A	**53%**
32 (unknown)	0%	0%	0%	0%	**0%**
33 (transfer)	0%	N/A	0%	N/A	**0%**
TOTALS	**30%**	**0%**	**39%**	**0%**	**25%**

Table 11 - Percent of Calls Accurately Coded BLS vs. ALS

Dispatch Code	Polk County Central Dispatch	Hickory County Sheriff	Cedar County Sheriff	St Clair County Sheriff	**System Total**
1 (abdominal)	68%	N/A	51%	N/A	**62%**
2 (allergies)	77%	N/A	0%	N/A	**71%**
3 (animal)	50%	N/A	100%	N/A	**75%**
4 (assault)	91%	N/A	89%	N/A	**90%**
5 (back)	77%	N/A	75%	N/A	**77%**
6 (breathing)	83%	N/A	80%	N/A	**82%**
7 (burns)	50%	N/A	33%	N/A	**40%**
8 (CO)	67%	N/A	100%	N/A	**75%**
9 (arrest)	70%	N/A	74%	N/A	**72%**
10 (chest)	84%	N/A	80%	N/A	**82%**
11 (choking)	38%	N/A	N/A	N/A	**38%**
12 (convulsions)	59%	N/A	49%	N/A	**56%**
13 (diabetic)	65%	N/A	76%	N/A	**68%**
14 (drowning)	N/A	N/A	100%	N/A	**100%**
15 (electrocution)	100%	N/A	N/A	N/A	**100%**
16 (eye)	100%	N/A	N/A	N/A	**100%**
17 (fall)	72%	N/A	62%	N/A	**68%**
18 (headache)	64%	N/A	67%	N/A	**65%**
19 (heart)	87%	N/A	69%	N/A	**82%**
20 (heat/cold)	40%	N/A	29%	N/A	**33%**
21 (hemorrhage)	61%	N/A	67%	N/A	**62%**
22 (inaccessible)	0%	N/A	N/A	N/A	**0%**
23 (overdose)	59%	N/A	63%	N/A	**60%**
24 (pregnancy)	45%	N/A	60%	N/A	**50%**
25 (psychiatric)	89%	N/A	65%	N/A	**81%**
26 (sick)	67%	N/A	50%	N/A	**60%**
27 (stab)	43%	N/A	33%	N/A	**40%**
28 (stroke)	93%	N/A	83%	N/A	**90%**
29 (traffic)	66%	N/A	67%	N/A	**66%**
30 (traumatic)	52%	N/A	38%	N/A	**47%**
31 (unconscious)	79%	N/A	74%	N/A	**78%**
32 (unknown)	63%	65%	62%	56%	**62%**
33 (transfer)	82%	N/A	56%	N/A	**80%**
TOTALS	**77%**	**65%**	**63%**	**56%**	**70%**

A review of 12 months of ePCR data reviewing OHCA found the following:

- 14.4% of patients suffering from OHCA obtained sustained ROSC.
- 12.5% of patients suffering from OHCA were admitted to the hospital.
- 2.0% of patients suffering from OHCA were discharged.

Research question number three was "Using the identified quality measures, how are the dispatch centers that serve CMH EMS performing?" Below are responses to the survey question "When thinking about EMS dispatch quality… If you had to pick only one tool to determine quality, what kind of tool would it be?"

The overall results indicate respondents to the survey in all categories identify EMS dispatch problems as an adaptive problem instead of a technical problem.

Figure 3 - Type of Problem - All Responses

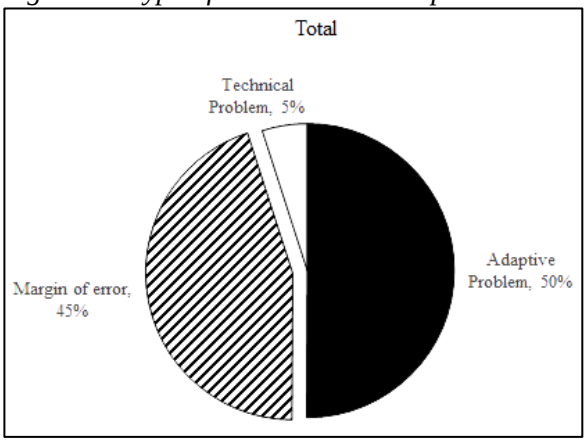


Figure 4 - Type of Problem - Responses Directed at Polk Dispatch

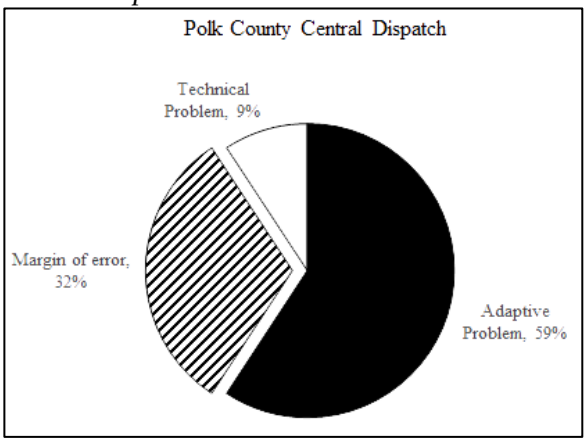


Figure 5 - Type of Problem - Responses Directed at Hickory Dispatch

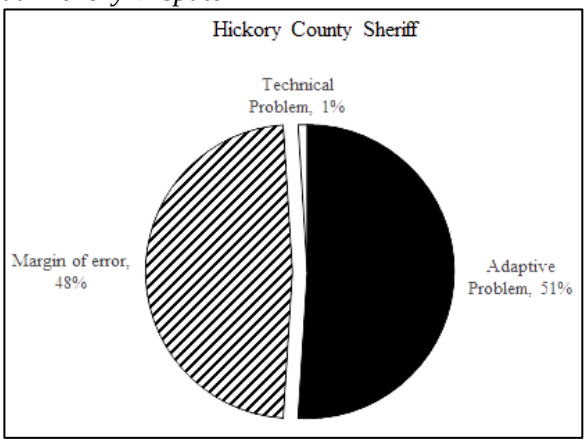


Figure 6 - Type of Problem - Responses Directed at Cedar Dispatch

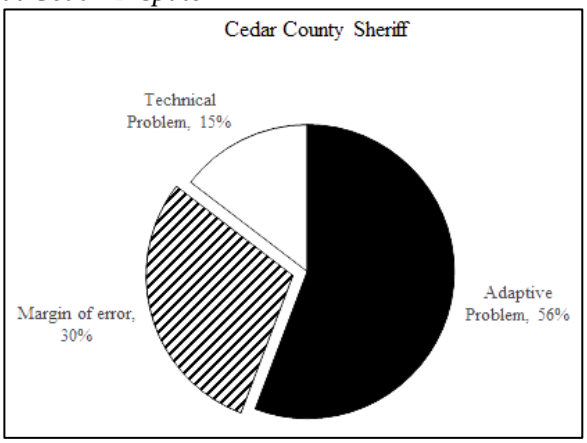


Figure 7 - Type of Problem - Responses Directed at St Clair Dispatch

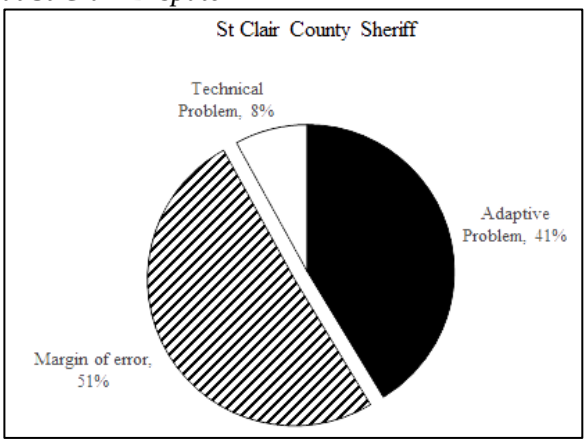


Figure 8 - Type of Problem - Responses from Dispatchers

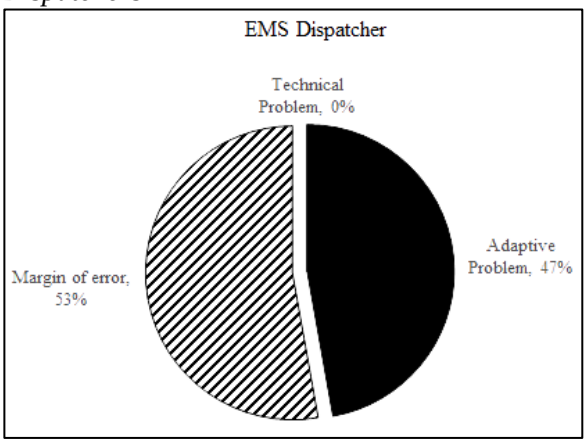


Figure 9 - Type of Problem - Responses from Requesters

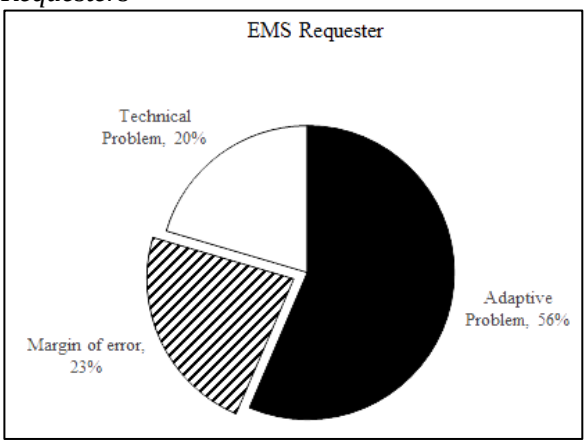
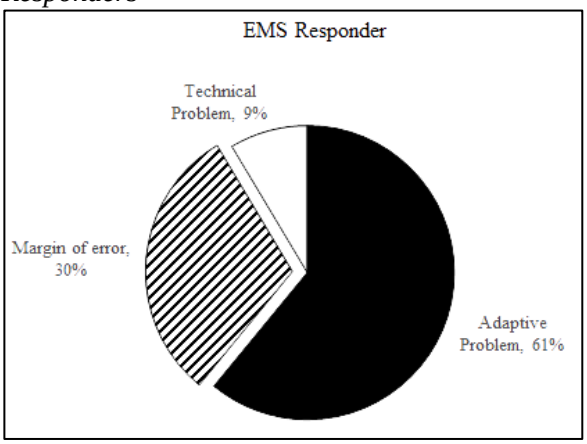


Figure 10 - Type of Problem - Responses from Responders



Specific answers to the survey question “In your own words describe the one best tool that could be used to evaluate the quality of EMS dispatch” are displayed in word clouds below. Refer to Appendix A - Survey Responses (Best Tool) on page 60 for a complete list of all survey responses. Overwhelming free-text responses were related to dispatcher attitude but lacked any specific guidance on how to build such a tool. Other tools that were explicitly defined involved three areas:

1. Call time compliance to national standards,
2. Call reviews to compare dispatcher actions to EMD standards, and
3. Utilizing patient outcomes to evaluate dispatch actions.

Figure 11 - Best Tool - All Responses

Figure 12 - Best Tool - Responses Directed at Polk Dispatch

Figure 13 - Best Tool - Responses Directed at Hickory Dispatch

Figure 14 - Best Tool - Responses Directed at Cedar Dispatch

Figure 15 - Best Tool - Responses Directed at St Clair Dispatch

Figure 16 - Best Tool - Responses from Dispatchers

Figure 17 - Best Tool - Responses from Requesters

Figure 18 - Best Tool - Responses from Responders

Specific answers to the survey question "Using your evaluation tool, what would be the definition of high-quality EMS dispatching" are displayed in word clouds below. Refer to Appendix B - Survey Responses (Quality Definition) on page 63 for a complete list of all survey responses. Free-text responses were difficult to consolidate into a few themes, but a few topics did recur multiple times:

1. Accurate and quick dispatching utilizing tools available (i.e., GPS and CAD),
2. Professional and consistent dispatcher attitudes,
3. Continued dispatcher training, and
4. Relaying all information to responding units consistently.

Figure 19 - Quality Definition - All Responses

Figure 20 - Quality Definition - Responses Directed at Polk Dispatch

Figure 21 - Quality Definition - Responses Directed at Hickory Dispatch

Figure 22 - Quality Definition - Responses Directed at Cedar Dispatch

Figure 23 - Quality Definition - Responses Directed at St Clair Dispatch

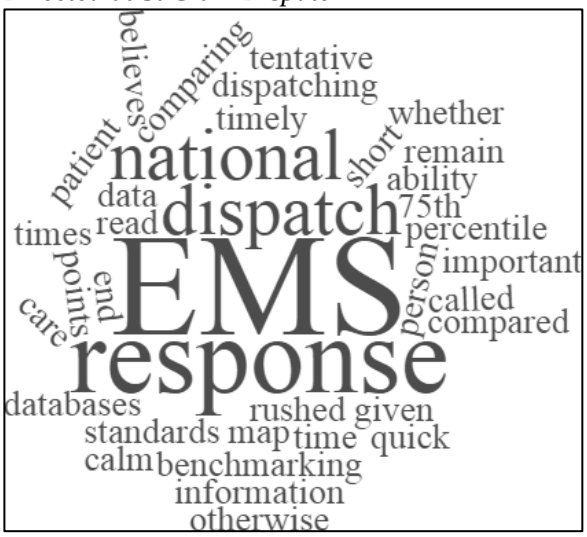


Figure 24 - Quality Definition - Responses from Dispatchers

Figure 25 - Quality Definition - Responses from Requesters

Figure 26 - Quality Definition - Responses from Responders

Research question number four was “What recommendations do EMS supervisors have for dispatching quality improvement?” The overall impression from interviews from supervisors was a resounding opinion that CMH EMS needs a centralized dispatch center dedicated to meeting the needs of EMS with EMS-centered oversight to ensure dispatch accountability. Other common themes include EMTs and paramedics as dispatchers that utilize cutting-edge technology, follow integrated policies, and have continuing education and training.

In an interview with Neal Taylor (2018), who is the CMH EMS Director, his recommendation for dispatching quality improvement includes equipment, dispatcher training, and policies. Mr. Taylor’s full response is below and was a list of recommendations.

> Communications equipment that works across all agencies [and a] high-speed CAD. Updated [and] well-maintained dispatch equipment. [Dispatch] integration into the full [EMS] system [to include] attending agency quality meetings [and meeting] quality metrics to improve patient outcomes. An orientation, training, and onboarding system that sets the dispatcher up for longevity and success [in addition to] regular dispatcher competencies and continued training. An accountability system that holds both the dispatch center and all agencies to quality standards. TEAMWORK between dispatch and all agencies [to provide] the best service to citizens. Mutual respect. Grievance procedure. Dispatch as part of the career ladder: EMTs and paramedics that choose to leave the field or have to leave the field have the opportunity to use their experience [and] continue service in EMS with equal pay as those in the field if not more pay. Policies that are developed and reviewed by both the agency that is being dispatched and the dispatch center.

In an interview with Brice Flynn (2018), who is the CMH EMS Safety Chief, his recommendation for dispatching quality improvement includes equipment, dispatcher training, and policies. Mr. Flynn's full response is below.

> I would recommend first that the proper equipment be setup and all the "bugs" of technology get worked out if that is possible. Some of this might be hardware, and some of this is technique, such as clipping off voice traffic because they do not wait the one second for the repeater to open and getting their volume consistent. Secondly, I would recommend standardized training on dispatch information that we receive. Standardize the pre-alert information (how much and what type), address (how many times repeated and in what fashion), secondary (always share all information with the incoming ambulance instead of just with Rescue, on transfers share secondary before ambulance goes en route). Thirdly, I would recommend, and this already might be the case, gathering the most important information first and dispatching the closest (use fleet eyes) and longest in service ambulance first. There have been occasions that I have been given a 17A code and arrive on scene to find a stroke patient. The same risk we run when we get tunnel vision when given information, can and does happen to dispatch, they need to ask thorough and consistent questions to all callers. This type of miscoding can and does under treat patients and delay patient care. (Flynn, 2018)

In an interview with Thomas Ryan (2018), who is the EMS manager for Cedar County, his response to how to improve EMS dispatching was related to suggestions to improve dispatch accountability. Mr. Ryan's full response is below.

> The only thing I have at this time to help improve Cedar County Dispatch is to staff one EMS person in the dispatch center; if not 24/7, then looking at call volume times and during peak times. Until we get help with people over the dispatchers and hold them accountable, nothing will change. There is no accountability or QA done at this time, even after we have asked over and over for this. (Ryan, 2018)

In an interview with Morgan Young (2018), who is an instructor for CMH EMS, his response to how to improve EMS dispatching was to "employ a combined, regional dispatch center." Mr. Young goes on to say

> I think in the least, we need more cooperation from our dispatch center. I think the best option would be to have our employees dispatch our ambulances. In that fashion, we can make policy and have our employees enforce it. (Young, 2018)

Discussion

Research question number one was "What do EMS staff, dispatch staff, and frequent professional users (i.e., ER and clinic staff) believe will be the results of a dispatching quality analysis?" Dispatchers responded to the survey that dispatch quality was around four (4) out of five (5), responders responded around two (2) out of five (5), and requesters were between those at around 3.5 out of five (5). A literature review identified an article by Carver (Sometimes technology is not the answer, 2009, p. 107) where an issue was identified where "persons not knowledgeable about the fire department needs [were] making decisions about fire department communications." Similar cases occur in all four of the dispatch centers serving CMH where sheriffs and elected boards make EMS dispatch decisions and are not knowledgeable about the needs of EMS dispatching. It is also reflected in these survey results there were much higher opinions of dispatch quality by dispatchers and requesters (at 4/5 and 3.5/5) than responders (at 2/5).

Table 12 - Summarized Dispatch Quality Opinions

Type of Respondent	Average Quality Score out of Five (5)
Dispatchers	4.0
Requesters	3.5
Responders	2.0

The interpretation of these results to answer the research question is the individuals inputting information into the system (requesters) and those processing the information (dispatchers) believe dispatch quality is a higher quality than those receiving information (responders). The organizational implications include continued barriers to improving EMS dispatching quality and continued frustration on the part of responders. Dispatch center leaders

are tasked with delivering a quality product without the knowledge and experience tools needed to meet that mission. Responders are tasked with reacting to poor dispatch quality knowing there are problems but without a method of affecting positive change.

Research question number two was "What quality measures can be used to define EMS dispatching quality?" Data review indicates CMH EMS dispatch centers process calls within 90 seconds 34% of the time, accurately identify chief complaint 25% of the time, and dispatch the correct ambulance type (BLS or ALS) 70% of the time. CMH EMS cardiac arrest resuscitation success rates indicate 14.4% of OHCA patients attain ROSC, 12.5% are admitted to the hospital, and 2.0% survive to hospital discharge.

All of those metrics for CMH EMS fall drastically below national standards and national averages. Call processing time, dispatch accuracy, and OHCA survival rates were identified by literature review as having a direct reflection on the quality of EMS dispatch. "Call intake process and the time it takes to exchange information" was identified as the number one issue by AMR (Erich, 2013, p. 80). FEMA and NFPA set performance expectations of "90% of calls [should be] processed in less than 90 seconds" (Federal Emergency Management Agency, 2012, p. 79). Cardiac arrest resuscitation success rates are a tool to measure the Chain of Survival. National averages identified by McNally, et al. (Out-of-hospital cardiac arrest surveillance - Cardiac arrest registry to enhance survival (CARES), United States, October 1, 2015-December 31, 2010, 2011, p. 11) describe 34.4% of OHCA patient attain ROSC, 26.3% are admitted to the hospital, and 9.6% survive to hospital discharge.

Table 13 - Summarized Quality Measures

	CMH EMS Data	National Data (Goal or Average)
Calls processed within 90 seconds	34%	90%
Chief complaint accuracy	25%	Unknown
Ambulance selection accuracy	70%	Unknown
OHCA ROSC	14.4%	34.4%
OHCA admitted to hospital	12.2%	26.3%
OHCA discharged	2.0%	9.6%

The interpretation of these results to answer the research question is there are only a few standardized quality measures for EMS dispatching that include time-based measurements, accuracy measurements, and patient outcome measurements. The organizational implications include an evident apparent low performance in delivering EMS to the community. Call processing time, chief complaint accuracy, and ambulance selection accuracy are direct results of poor dispatch quality. OHCA survival rates have a dispatch component but are also a reflection of the rural setting and limited community and first responder resources.

Research question number three was “Using the identified quality measures, how are the dispatch centers that serve CMH EMS performing?” Survey responses indicate problems with EMS dispatch are at least 50% an adaptive problem compared to at least 5% a technical problem. Free-text replies identify call time compliance, call reviews, and patient outcome evaluations as tools to be used to improve quality. Additionally, free-text replies to define a high-quality EMS dispatch center include accurate and quick dispatching utilizing tools available (i.e., GPS and CAD), professional and consistent dispatcher attitudes, continued dispatcher training, and relaying all information to responding units consistently. Opinions of dispatch quality ranged

from 4.0 out of five (5) from dispatchers, 3.5 out of five (5) from requesters, and 2.1 out of five (5) from responders.

Literature review addressing this research question was not available due to the specific geography and agencies involved. However, it is apparent, there is an palpable disconnect between dispatch agencies and responder agencies. Cooperation from dispatch agency leadership was not present to forward the survey to their employees where requester agencies and responder agencies participated without difficulty. Referring to Table 13 - Summarized Quality Measures (page 48), call processing time at 34%, chief complaint accuracy at 25%, and OHCA patient outcomes at 2% indicate low-quality EMS dispatching for CMH.

The interpretation of these results to answer the research question is dispatch centers for CMH EMS are performing poorly. Organizational implications include an obvious adaptive challenge and barriers to cooperation between agencies in addition to a poorly-served community.

Research question number four was “What recommendations do EMS supervisors have for dispatching quality improvement?” Results from supervisor interviews indicate a common opinion there should be only one dispatch center serving CMH EMS. That dispatch center should have state-of-the-art equipment, coordinated policies, and dispatcher training. The Literature review revealed a similar theme of “A single lead agency should be responsible for EMS communications… that functionally consolidates dispatch centers” (National Fire Protection Association, 2017, p. 25). In an article titled “EMS in the clouds,” the concept of virtual dispatch was discussed as an alternative to a traditional brick-and-mortar communication center (Erich, 2013).

The National Fire Protection Association (NFPA) (Guide for emergency medical services and systems, 2017, p. 25) goes on to indicate equipment such as CAD and GPS is also required for quality dispatch centers. The National Highway Traffic Safety Administration (NHTSA) (A leadership guide to quality improvement for emergency medical services systems, 1997, p. 32) echo the supervisor opinions about coordinated dispatch protocols with EMS and dispatcher inclusion in EMS quality activities. On-the-job training and continuing education is also recommended by the NFPA (Guide for emergency medical services and systems, 2017, p. 25).

Interviews with supervisors indicated several ideas for dispatching quality improvement. “Equipment that works…, integration into the full [EMS] system…, [and] an accountability system that holds… all agencies to quality standards” were the EMS Director’s (Taylor, 2018) opinions on how to improve dispatch quality. “Proper equipment…, training…, standardiz[ation]…, thourough[ness]…, [and] consistent[cy]” were the EMS Safety Chief’s (Flynn, 2018) opinions on how to improve dispatch quality. “Staff EMS [personnel] in the dispatch center… [and] accountabl[ity]” were the Cedar County Manager’s (Ryan, 2018) opinions on how to improve dispatch quality. “More cooperation…[and] have our employees dispatch our ambulances” were a CMH instructor’s (Young, 2018) opinions on how to improve dispatch quality.

The interpretation of these results to answer the research question is more integration of EMS into dispatch and organizational oversight ability of dispatch by EMS are common threads of recommendations from EMS supervisors. The organizational implications include a need to pursue possible centralization of dispatch and virtual connectivity of technology and resources. Funding for updated equipment is needed for current dispatch locations if centralization is not approved. Finally, overcoming adaptive barriers between agencies will be the biggest struggle

where there is little incentive for dispatch agencies to cooperate with EMS needs to update policies and provide EMS-specific education for their dispatchers.

Recommendations

The problem addressed by this paper is CMH EMS is unable to determine if the dispatch centers serving them are providing high-quality dispatching for emergency or non-emergency requests. The purpose of this research is to determine the level of quality of dispatching emergency and non-emergency requests for CMH EMS. Based on surveys to users of CMH EMS dispatch, quality analysis of dispatch performance data, and interviews with EMS supervisors, there is little doubt that the level of quality of dispatching for CMH EMS is low.

- Responders rank overall dispatch quality at 42%,
- Dispatch processing quality is at 34% (national goal is 90% (Federal Emergency Management Agency, 2012), (National Fire Protection Association, 2017), & (National Fire Protection Association, 2015)),
- Dispatch accuracy quality is at 25%, and
- Cardiac arrest survival rates are 2.0% (national average is 9.6% (McNally, et al., 2011)).

As a follow-up from this research, Taney County Ambulance District (TCAD) was contacted to discuss regional EMS dispatching. TCAD is an ambulance district about 50 miles from CMH EMS district, and they have their own dispatch center to process and dispatch requests for ambulances. Their dispatch center has recently been upgraded with modern hardware and software that is fully compatible with CMH EMS GPS tracking, ePCR software, and radio equipment. During an interview with Darryl Coontz (2018), Chief of TCAD, he indicated TCAD is actively looking to expand their services to include dispatching for other agencies for a fee. Below are some points of consideration and information about their dispatch center:

- TCAD has had its own communications center since the 1970s.
- TCAD is Commission on Accreditation of Ambulance Services (CAAS) accredited and has applied to become an International Academies of Emergency Dispatch (IAED) Accredited Center of Excellence (ACE).
- As a tax district, TCAD is geographically locked without much room for growth, so they are adding services to grow their agency. They are not looking for profit streams, but want to better serve an obvious need of EMS dispatching. Mr. Coontz saw the need in his fellow agencies with too many dispatch centers, too little resources at each dispatch center, and dispatchers that concentrate on law enforcement instead of EMS.
- TCAD started looking into providing regionalized dispatch as a way to bolster their dispatch center to provide more career paths for employees and capacity to the center. They currently provide the highest level of Missouri Local Government Employees Retirement System (MOLAGERS) and stay above the pay rate of other dispatch agencies to have long-term employees that want to retire from TCAD.
- TCAD has Ozark County EMS on board to dispatch for them, and that will go live March 2019. They are also in talks with several other agencies to provide dispatch services:
    - Adair County Ambulance District
    - NTA EMS in Bethany, MO
    - Achison/Holt Ambulance District

- TCAD is currently using Zoll Rescuenet CAD and are looking to upgrading to ESO CAD when that product is released.
- TCAD ambulances use ESO ePCR and Genesis Pulse AVL. Both of which, CMH EMS have had talks of moving to due to improved performance, and Mr. Coontz echoed those thoughts.
- The dispatch center has a Zetron MAXX console fully IP-based with redundant internet service providers. CMH EMS radio network is IP-based as well. Remote access to CMH EMS network should be as easy as typing in an IP address to TCAD's consoles and provisioning CMH's network to accept the traffic.
- TCAD also has a dedicated off-site center. If the primary site goes down, they only need to log into the computers at the back-up site to be back in. In addition, they are part of a five-county network where the other four county dispatch centers can immediately pick up services if Taney County goes down.
- Mr. Coontz does not have a *concrete* number, but he said he was floating near the $35 per transport as a budgetary number for CMH to use as a starting point. The only existing "recent" dispatching contract CMH has is with Cedar County at $63,996 per year (Taylor, 2018). There are about 1,600 transports per year from Cedar County (PhysioControl, 2018), therefore, CMH is paying about $40 per transport already with much lower quality. The other dispatching contract with Hickory County at $18,272.28 (Taylor, 2018) and around 750 transports (PhysioControl, 2018) works out to be about $24 per transport.
- Budgetary annual estimates put this proposal at about $273,000 (based on 7,800 transports (PhysioControl, 2018)). CMH is currently spending $83,628 on

dispatch contracts that would be eliminated. The increased cost to CMH to solve the problem addressed in this paper would be about $189,000 per year.

- However, if the other three dispatch centers requested equivalent contracts to the one that exists with Cedar County, a contract with TCAD would save CMH about $40,000 per year.

Table 14 - Contract Amounts

County	Number of Transports in the last 12 Months (PhysioControl, 2018)	Current Contract Amount	Potential Contract Amount	Proposed TCAD Contract Amount
Polk	4,866	$0	$194,640	$170,310
Hickory	756	$18,272.28 ($24/transport)	$30,240	$26,460
Cedar	1,588	$63,996 ($40/transport)	$63,996	$55,580
St Clair	561	$0	$22,440	$19,635
TOTAL	**7,771**	**$82,268.28 ($11/transport)**	**$311,316 ($40/transport)**	**$271,985 ($35/transport)**

This author's recommendation is for CMH EMS to develop a relationship with TCAD to further discuss a contract to move all ambulance call processing and dispatching from the four low-quality dispatch centers to TCAD. If negotiations are successful, a 9-1-1 from within CMH EMS district would be answered by the local agency just like it is now. Once a request for an ambulance is made, the call would be transferred to TCAD dispatch where EMD would be performed accurately on every call, and the appropriate ambulance would be dispatched utilizing GPS positioning and the correct BLS/ALS determination. The result of this increase in dispatching quality will be realized in lives saved, and quality of life improved for the citizens living in Polk, Hickory, Cedar, and St. Clair Counties.

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Appendix A - Survey Responses (Best Tool)

Below are all of the responses to the survey to the question “In your own words, describe the one best tool that could be used to evaluate the quality of EMS dispatch.”

Table 15 - Responses Directed at Polk County Central Dispatch

Classification	Responses
Dispatcher	NO RESPONSES IN THIS CATEGORY
Requester	Outside peer review of calls
	Attidues
	Patient and requestor outcomes
	not sure
	Evaluating time; Time of request to on scene time
	The quality of information relayed to EMS as reported to Dispatch from the reporting party, and appropriate action taken by EMS in reference to information known by EMS.
Responder	Patient outcomes as they relate to easily obtainable quality measures such as call processing time
	Call processing time, dispatch time, enroot time and reaction time evaluation.. A tool to evaluate that the correct EMD code protocol was used.Efficiency of communication to responders.
	A tool that evaluates the accuracy of the call.
	A web-based form that allows responders to provide feedback on a specific incident number in regards to dispatch quality. The form responses would be reviewed by the dispatch liaison and addressed as appropriate. After addressing the issue, the liaison would follow-up with the responders. This tool could be bidirectional allowing dispatchers to provide feedback in regards to responders helping resolve issues full circle. Furthermore, this could be developed to allow positive feedback as well for when dispatchers or responders display exceptional service.
	Complete information given on every call. Consistently given information in a usable order.
	improve moral at dispatch.
	Knowledge based testing of dispatchers
	A better form of feedback from responders who interact with dispatch and the other way around. 2 way street
	After action reviews of dispatch performance
	Careing, calm, collected. Attitude goes a long ways.
	Time critical dispatch goals met
	A tool that analysis the culture of the current dispatch center and would provide outcomes to reach the desired state. This tool would focus on the mission of the organization, specifically the "why's" of what they do, not just the "what" and the "how".
	peer review by end users.

Table 16 - Responses Directed at Hickory County Sheriff

Classification	Responses
Dispatcher	NO RESPONSES IN THIS CATEGORY
Requester	Computer generate survey
	gps locater
	communication and GPS location
	Making sure the EMS has respect for everyone, including the other medical staff they come in contact with.
	communication is the best why to care for those who are in needs of Emergency care
	Timeliness, Concern for patient
Responder	Since dispatch centers vary do to funding issues & most do the best they can with what they have available. Mandated funding for all local level dispatch should be a tool. Funding is desperately needed in order to continue to improve tools/training that is commonly required for quality of dispatch locations. Making them all capable of doing the same thing as that of a larger dispatch center. And with the needed personnel to do the job.
	Communication

Table 17 - Responses Directed at Cedar County Sheriff

Classification	Responses
Dispatcher	time, time from call to dispatch, time from dispatch to on scene taking into consideration mileage and traffic conditions.
	COMPUTER AID DISPATCH
	reveiw of calls maybe even computer reviewed
	Digital Ems.
	Knowledge
Requester	QA - Quality Assurance Program
	Adaptive tool
	Triage experience for telephone operator would be beneficial
	They are helpful and listen to details.
	Unsure
	NA
	Attitude
	Basic, no medical knowledge.
Responder	education and accountability
	While being open to learning new things is important, the dispatch center MUST have money, 1. to use for training, 2. to purchase new equipment, and 3. to pay dispatchers a quality wage. If both of these items are not present, this center will flounder.
	Round table
	The quality of times between cALL TAKING AND CALL DISPATCHING.

Table 18 - Responses Directed at St Clair County Sheriff

Classification	Responses
Dispatcher	NO RESPONSES IN THIS CATEGORY
Requester	Quantitative tools that identify response times compared to dispatch times.
	better attitude, patient care.
	remained calm
	I HAVE ONLY CALLED A COUPLE TIMES FOR EMS. MOST CALLS FINE, ONCE A LITTLE SHORT IN OUR CONVERSATION
	Ability to work with person making call for EMS.
Responder	EMD

Appendix B - Survey Responses (Quality Definition)

Below are all of the responses to the survey to the question “Using your evaluation tool, what would be the definition of high-quality EMS dispatching?”

Table 19 - Responses Directed at Polk County Central Dispatch

Classification	Responses
Dispatcher	NO RESPONSES IN THIS CATEGORY
Requester	Call was handled appropriately with professional attitude and enough resources to handle the incident. Accurate "diagnosis" of chief complaint and all necessary information given to responding agencies.
	Calm, and helpful
	a system that decreases errors in response, gains accurate patient data, team approach to delivery of care and not push it off to "its protocol"
	unknown
	Obtaining information quickly and getting it to responding ambulance
	Consistent and appropriate response by EMS. Dispatch relay as much information that they have to EMS in a concise manner, or as well as can be reasonably expected given what is report to Dispatch.
Responder	Proportional to patient outcomes
	Short call processing time, Right Ambulance, Right call, clear instruction, relating to what, where and sending the right resources need for the response
	Being dispatched quickly with accuracy of where you are going and what the call is for.
	Using this tool, high-quality EMS dispatching would be promptly addressing the issues submitted with an acceptable resolution and time frame or an acceptable reasoning for not being able to resolve the issue.
	Accurate and timely information in the correct order.
	logical dispatching of units in order.
	Knowledge of job responsibilities, Ability to use tools available (FleetEyes, CAD), Ability to use resource management correctly
	Understanding different entities roles when responding, attitude, professionalism, consistency
	Timely dispatches that all units are notified at the same time and the dispatchers are respectful to crews responding and give adequate information
	A hospital/ ambulance dispatch.eave county dispatch for law and fire.
	Call processed and dispatched per goals
	A tool that would create outcomes focused on "true customer service to those they dispatch" would be the definition of high-quality I would prefer to see.
	able to utilize the tools given to them and to be adaptive in meeting the needs of ems.

Table 20 - Responses Directed at Hickory County Sheriff

Classification	Responses
Dispatcher	NO RESPONSES IN THIS CATEGORY
Requester	A computer generated tool
	phone
	Telephone
	Respecting everyone
	quick response and good communication makes for a smooth transfer.
	Continuous learning
Responder	High-quality EMS dispatching is often having to multi task throughout any given shift. It is knowing your local area by geographic layout. It is knowing the local people which adds a deepened vested interest to dispatching the needed resources appropriately. Tools such as the latest & greatest technology has to offer, takes funding. Locally the smaller EMS dispatching, they have no funding to allow for this training or these tools. Medical - fire - law enforcement request all have a different needs. The lack of funding to be able to hire, properly train &/or (even for that matter) have an appropriate building, which allowed for the amount of people required to do this challenging and amazing work, is often unavailable. The more communication avenues available, the more need for universal high-quality EMS dispatching depends on funding. Having mandated funding that will finance & support the needs of smaller communities would be beneficial to all.
	EMD , better training and knowledge of running a Dispatch center.

Table 21 - Responses Directed at Cedar County Sheriff

Classification	Responses
Dispatcher	Decreased time between dispatch and on scene
	BETTER WORKERS
	the amount of time taken to dispatch units and the amount of information obtained. customer service given to the caller by the dispatcher
	To have as little mistakes as possible
	Knowledge
Requester	Following the EMD rules and regulations
	Knowledge and precision
	Knowledge, prioritization of calls, again dealing with triage information
	Prompt arrival and response times.
	.
	NA
	Positive and dedicated
	Knowledge based on EMT training.
Responder	proper training and knowledge and supervision
	It requires both emd triage of calls, AND quality radio work with the ambulance crews. the dispatcher has to be able to manage their resources while multi-tasking. In the end, the Dispatcher has to want to be a dispatcher, and has to WANT to dispatch ambulances.
	Dispatchers trained to current protocols and training having dispatch go to training every couple of months
	High-quality dispatching is managing of all dispatch between call taking and dispatching those involved in the call in a quality timely manne.

Table 22 - Responses Directed at St Clair County Sheriff

Classification	Responses
Dispatcher	NO RESPONSES IN THIS CATEGORY
Requester	Response times compared to national databases that were above the 75th percentile.
	When EMS dispatch is being called, being at tentative to patient care is most important whether EMS or dispatch believes otherwise.
	quick response time, remain calm, ability to read a map.
	PERSON ON OTHER END, NOT SO SHORT AND RUSHED
	Timely response to information given to EMS.
Responder	Benchmarking data points and comparing to national standards for EMS Dispatching