

An Analysis of Call-Processing Times for Bellbrook's Communication Center

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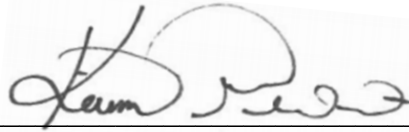
Bellbrook Fire Department, Bellbrook, Ohio

*Appendices Not Included. Please visit the Learning Resource Center on the Web at <http://www.lrc.dhs.gov/> to learn how to obtain this report in its entirety through Interlibrary Loan.*

**CERTIFICATION STATEMENT**

I hereby certify that this paper constitutes my own project, 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: \_\_\_\_\_

A handwritten signature in black ink, appearing to read "Hamza", is written over a horizontal line. The signature is stylized with a large loop at the beginning and a series of connected loops for the rest of the name.

Date: March 19, 2017

### Abstract

When seconds count, effective emergency medical dispatch services are crucial for ensuring that residents receive lifesaving emergency services as quickly as possible. The problem is that the Bellbrook Fire Department has not evaluated the ProQA (its EMD software package) in regard to emergency medical dispatch. Thus, the purpose of this research is to evaluate ProQA in relation to emergency medical dispatch. The evaluative research method was used to gather information about six questions: (a) what are ProQA's advantages/disadvantages; (b) how do Bellbrook's call-processing times compare to national standards and local communication centers; (c) is the incident information collected through ProQA useful to responding emergency personnel; (d) are there alternative ways to collect and disseminate information to emergency personnel; (e) have EMD delays impacted Bellbrook's residents; and (f) what are residents' expectations when placing emergency calls. Data was collected through surveys as well as a comparison study of call-processing times at the Hamilton County Communications Center (HCCC), which uses NICEInform for dispatching emergency medical calls. Data analysis determined that the average EMD call-processing times within Greene County Central (GCC), Bellbrook's communication center, was 93 seconds. This represented a 55% (33-second) increase in call-processing time compared to other communication centers surveyed, including HCCC. Additionally, GCC is only meeting national standards 21.3% of the time. Given that this higher response time could impact emergency responders' ability to save lives, the following recommendations were established to address this issue: (a) establish a meeting with the communications director to discuss his or her concerns, expectations, and ideas about other ways to dispatch emergency calls; (b) explore changing the protocol for receiving vital information and institute pre-notification tones to alert

emergency crews; and (c) explore what issues are correctable under the current system as well as issues only correctable by changing dispatching procedural protocol.

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The problem is that the Bellbrook Fire Department has not evaluated ProQA, its emergency medical dispatch (EMD) software, with regard to emergency medical dispatch. The purpose of this research was to evaluate ProQA in relation to emergency medical dispatch. In particular, the objective was to determine whether ProQA delays the dispatch of emergency calls to responding units and, if so, to identify those delays. This research also aimed to provide recommendations for correcting any delays in order to provide those calling 9-1-1 with quicker responses to their emergency incidents.

I applied the evaluative research method to answer the following questions:

1. What are the advantages/disadvantages of using ProQA software to dispatch emergency personnel?
2. How do the call-processing times of Bellbrook's communication center, Greene County Central (GCC), compare to national standards and other local communication centers that use different EMD software?
3. Is the incident information received through ProQA useful to emergency personnel responding to an incident?
4. Are there alternative ways to collect and disseminate information to emergency personnel that will improve call-processing times within the communication center?
5. Have dispatching delays impacted Bellbrook's residents during emergency incidents?
6. What are Bellbrook's residents' expectations when placing emergency calls to 9-1-1?

### **Background and Significance**

In 2012, Bellbrook's communication center closed and dispatching services were contracted out and moved to the Xenia Greene County Central Communications Center. The center serves as the Public Safety Answering Point (PSAP) for 9-1-1 callers needing public safety services in Xenia and Greene counties. The communication center serves approximately 70,000 residents and provides dispatching services to 20 agencies and three universities located in Greene County, Ohio. The center is staffed with 20 communications operators who are under the supervision of the communications director and the communications technical director. There are a minimum of four operators on duty in the center at all times ready to receive, process, and dispatch the approximately 12,000 fire/EMS 9-1-1 calls received each year.

Before this change occurred, fire department administrators had not noticed any significant delays in dispatching emergency calls. However, beginning in 2015, administrators began tracking to a greater degree the overall time it took for emergency personnel to arrive to scenes. Two parts previously omitted from their records were the PSAP to dispatch times and the times down to the second.

A data-driven analysis of ProQA's effectiveness, particularly whether its use delays response times to emergency incidents has not been performed. Thus, this study is of significance to organizational leaders, the residents of Bellbrook who use 9-1-1 during emergency incidents, and the communications director of GCC for four reasons:

- It will provide data that can help determine whether GCC protocols for processing, prioritizing, and notifying responding units is being used effectively.

- It can help Bellbrook meet the National Fire Protection Association's time requirements for dispatching emergency calls as well as its standard for ensuring the best overall outcomes and survivability of emergency incidents.
- It can help Bellbrook meet residents' expectation of receiving the best possible service.
- It can improve public safety because it has been statistically proven that, during an emergency incident, every second counts.

The research directly corresponds with the components of the Executive Leadership (EL) course because it addresses and assesses an adaptive leadership challenge through systematic thinking. In addition, the Executive Leadership Student Manual (2015) stated the following:

Every system is composed of subsystems that shape the way people function within them and how they handle the adaptive pressures that occur. Three system elements Heifetz et al. identify as useful entry points into viewing an adaptive challenge that affects you are structures, culture and default responses. (SM, 3–8)

In this regard, the research's findings will be adaptive because they will require changes in systems and subsystems across organizational boundaries.

Furthermore, the research supported the United States Fire Administration's (USFA, 2015) second goal, which is to "promote response, local planning, and preparedness for all hazards" (p. 11). One of the key initiatives of this goal is to "provide programs and training to improve local planning, preparedness, and decision-making through the use of modern data and information analytics" (p.11). To accomplish this goal and key initiative, all agencies concerned with emergency response mitigation must accurately gather and analyze data to provide recommendations that lead to changes that benefit the public. This research will help the

Bellbrook Fire Department and Greene County Central collect and analyze data concerning ProQA and make recommendations that will benefit the public.

### **Literature Review**

The literature review is organized to address the research questions as they appear in the introduction. A review of the literature for the first research question about the advantages/disadvantages of using ProQA software to dispatch emergency incidents revealed that the disadvantages of emergency dispatch systems can be minimized if the system is tailored to the needs of specific agencies. According to Clawson and Dernocoeur (2016a),

ProQA is a computerized version of the chief complaint protocols. The computerized model provides the following benefits: it saves time; provides easy-to-generate EMD performance and medical case statistics for quality improvement, medical study, protection from liability, and resource planning; and it is widely used throughout many of the communication centers in the United States. (p. 3.7)

ProQA utilizes the same priority components as the EMD protocols but in the form of a computer software program. EMD is a unified system used to dispatch appropriate aid to medical emergencies; it includes systematized caller interrogation and pre-arrival instructions. Jeff Clawson developed these protocols when he worked as an emergency medical technician and dispatcher prior to attending medical school (from 1976 to 1979). He designed a set of standardized protocols to triage patients via the telephone and thus improve the emergency response system. Cards were first alphabetized by chief complaint that included key questions to ask a caller, pre-arrival instructions, and dispatch priorities. After many revisions, these simple cards have evolved into the Medical Priority Dispatch System (METCOM 9-1-1, 2016), more notably known through interchangeable terminology and throughout this research as EMD.

Today, EMD still starts with a dispatcher asking a caller key questions. These questions allow the dispatcher to categorize a call by chief complaint and set a determinant level—ranging from *alpha* (minor) to *echo* (immediately life threatening)—that describes the severity of a patient’s condition. Some systems also use the determinant *omega*, which may denote a referral to another service. The key questioning allows for a communication dispatcher to receive a determinant code for dispatching emergency apparatus. A dispatch determinant code is made up of three pieces of information, which is expressed in a number-letter-number format. These codes then allow emergency medical systems to determine the appropriate response mode (i.e., routine with traffic flow or “lights and sirens”) and resources to be assigned to the event. Following key questioning and the dispatch of emergency personnel, EMD along with ProQA allows for specific pre-arrival instructions to be given to a caller. Instructions include critical lifesaving information, such as cardiopulmonary resuscitation (CPR) or instructions on how to administer epinephrine, a reversal agent given to someone having an anaphylactic reaction from a food or insect allergy.

Dispatch centers around North America are increasingly using some form of Medical Priority Dispatch System protocol when handling public safety requests for service, but some wonder if that protocol has become too stringent and whether it takes too much time to process these kind of calls. From its inception, some found the protocol to be too stringent, this in turn has made it controversial and a widely-debated topic. Today, the controversy remains because of the lack of quantitative and qualitative data to support claims of the protocol’s efficacy. In part, the controversy surrounding this topic comes from the notion that a one-size-fits-all protocol-based dispatching strategy simply does not work. Scott (2003) supported this idea when he stated the following:

One of the keys in developing a protocol is to use one that makes sense for a given department, depending on its location, number of field units, area topography and more. In this manner, more public safety organizations are developing customized protocol options in-house. (p. 1)

Patty Maher, the EMD Program Manager for the Association of Public Safety Communications Officials (APCO) agreed with Scott when she stated that “the questions that work for one department may not for another” (as cited in Scott, 2003, p. 1). She also said, “We believe (managers) need to look at what their own needs are, so it makes it tough for us to make recommendations” (as cited in Scott, 2003, p. 1).

Robert Martin, the Executive Director of the National Association of Emergency Dispatchers (NAED) expanded on Scott and Maher’s idea when he said that “agencies have a responsibility to not only measure the results of a protocol system but to find out if it is being used properly.” He also said that “when handled properly, constructive feedback will only improve an agency’s response capabilities and the level of education of its dispatchers” (as cited in Scott, 2003, p.1). Martin went on to say that emergency dispatchers should receive at least an hour of on-the-job-training per month, whether through classroom education or by attending seminars, conferences, software training, and so on.

Although there are certainly advantages and disadvantages of using the protocol-based software ProQA, it is ultimately up to each communications director and those who use the system to define what works for their specific needs. It is also their responsibility to redefine how the process is undertaken to deliver service in a way that makes sense, provides reliable information, and does not unnecessarily delay emergency personnel responding to an incident.

A review of the literature regarding this research question provided three important takeaways. First, it provided an understanding of how EMD was developed and ProQA's relationship to this system. Second, it dispelled the notion that a stringent, standardized protocol can meet the needs of all departments, given that they have different locations, number of units, topographies, budgets, citizen demographics, and so on. Third, it revealed a lack of quantitative and qualitative research on the effectiveness or ineffectiveness of a standardized protocol, particularly with regard to whether it is too stringent and increases call time.

This information influenced the study in two ways. One, it helped the researcher develop survey questions about ProQA that yielded meaningful information about call-processing times and effective use of ProQA. Two, it provided the opportunity to add to the body of knowledge about the effectiveness of EMD protocol.

An examination of the literature concerning the second research question—how GCC's call-processing times compare to national standards and the times of other local communication centers that use the same or different EMD protocol-based software—revealed that properly trained personnel can dispatch emergency medical incidents within standardized and accepted amounts of time using protocol-based software.

According to Clawson and Dernocoeur (2016a), the Emergency Medical Services Authority in Tulsa/Oklahoma City analyzed nearly 22,000 calls over a two-year period. Calls were categorized by the determinant codes, *omega* through *echo*. The results showed that the highest-level of priority calls (*echo*) took 37 seconds on average to process (that is, from the time of case entry to the dispatch of emergency personnel). The longest processing time, on average 59 seconds, occurred for calls categorized as *alpha*. The average call-processing time for all 22,000 calls was 53 seconds.

Other studies show similar results. For example, the Metropolitan Ambulance Service in Melbourne, Australia carried out an 18-month study of more than 237,000 calls. They were categorized into the same determinant codes as the Tulsa/Oklahoma City study. The study determined that the shortest call-processing time of 33 seconds occurred for echo-level priority calls. The longest time of 46 seconds occurred for alpha-level calls. The average processing time for all calls was 39 seconds (Clawson and Dernocoeur, 2016a).

NFPA (2016) also addressed call-processing times for communication centers. In addition, the organization set standards to address every sequential event of an emergency response. The NFPA 1221 (2016) recommends a standard amount of time it should take emergency personnel to respond to a location from the moment a 9-1-1 call is answered. It defines call-processing time as the “time interval from when the fire communication center acknowledges the alarm to when response information begins to be transmitted via voice or electronic means to emergency response facilities and units” (p. 11). Section 4.1.2.3.3 of the standard provides the following recommendations of attainment: “calls should be dispatched within 64 seconds 90% of the time, and within 106 seconds 95% of the time” (p. 11). Although the NFPA only sets recommendations that are largely unenforceable, many fire departments strive to meet its standards whenever possible. Moreover, some organizations incorporate NFPA recommendations in their local ordinances or policies, thereby making them an enforceable requirement.

In contrast to NFPA, the Center for Public Safety Excellence (CPSE) recommends that fire service agencies meet a strict standard of 60 seconds for call-processing times on EMS incidents according to the medical urgency of the patient (see Kinsley, 2009). This recommendation, which was derived from the NFPA standard, is a best practice that fire service

agencies can use to measure performance. Although the CPSE urges jurisdictions to set their own performance standards, the “Standards of Response Coverage” document used to create resource development makes the 60-second call-processing time a standard (Kinsley, 2009).

Similar to EMD protocol, there are many controversial and debated points of view about setting standardized call-processing times. Crawford and Dernocoeur (2016c) commented on this topic in *Principals of Emergency Medical Dispatch*. He argued that “the ‘time’ issue is always mentioned as a reason why using ‘scripted’ fixed set of questions ‘just can’t work’ in dispatch. Structured call taking ‘takes too much time.’ While this notion is still wide-spread, it just isn’t true” (p. 1.14).

Crawford does agree that “the 60-second time interval should be used as a goal or objective to strive for in most situations” (p. 1.22). He concluded that “in most cases, the tiny bit of time used to ‘get it right’ is insignificant to the total time or even the actual outcome” (p. 1.14).

A review of the literature regarding this research question revealed that properly trained personnel can dispatch emergency medical incidents within a standardized amount of time using protocol-based software. It also provided average call-processing times from emergency services agencies and standard call-processing times from leading authorities on the subject.

This data influenced the study in two ways. First, it pointed out the importance of dispatchers’ level of training and comfort-level with using an EMD protocol like ProQA. This allowed the researcher to create survey questions that collected this information from respondents. Second, it helped the researcher develop more exact survey questions about call-processing times including goals for call-processing times, actual call-processing times, and quality assurance regarding call processing times.

A review of the literature concerning the third research question—whether ProQA yielded incident information that is useful to emergency personnel responding to the incident—determined that it can be useful because scene safety for emergency responders is critically important when entering an unknown situation. The situations that personnel enter, even for the most routine of emergencies, have recently become problematic. For example, in early December 2016, multiple shots were fired at two ambulance workers in Selma, Alabama while they were responding to a suspicious emergency call. The driver and a paramedic answered a call expecting to check a patient's blood pressure, and when they arrived someone fired seven or eight shots at them (Dunigan, 2016).

The number of such events is increasing for first responders who rely on dispatchers for information. Gasaway (2013) made the following point:

The dispatcher is the first person to gather clues and cues about an emergency. An experienced, well-trained dispatcher is able to gather a lot of high-quality, vitally important information that can help first responders form an early understanding of what they will be facing upon arrival at the emergency. (p. 1)

The most critical information that a communicator obtains at the beginning of any incident is the location/address, caller's telephone/callback number and name, and nature of the emergency. In most situations, the nature of the emergency is enough to cue a communicator to a potential safety hazard or an unsafe scene for emergency responders. For example, on a "Stab/Gunshot/Penetrating Trauma Protocol," the second question asks the caller if an assailant (attacker) is still nearby. Additionally, the nature of a call will likely prompt the dispatcher to consider that the scene may be unsafe for emergency responders.

Agencies can evaluate whether the additional information that ProQA provides is important. As previously mentioned, Scott (2003) pointed out the importance of individualized EMD protocols:

One of the keys in developing a protocol is to use one that makes sense for a given department, depending on its location, number of field units, area topography and more. In this manner, more public safety organizations are developing customized protocol options in-house. (p. 1)

This question will be formally addressed in the Results section of this research project based on surveys of those who use the information received by ProQA to determine its usefulness and how departments utilizing GCC respond to emergencies based upon that information.

A review of the literature regarding this research question determined that the incident information gathered during emergency calls can be useful in alerting emergency responders to potentially dangerous situations. It also suggested that departments should determine whether information other than the location/address of the emergency, caller's telephone/call-back number and name, and nature of the emergency is useful when responding to emergency calls. This information influenced the study in two ways. First, it helped the researcher develop survey questions that gathered information about the usefulness of additional incident information. Second, it enabled the researcher to collect data about the accuracy of pre-arrival information.

An examination of the literature concerning the fourth research question—about alternative ways to collect and disseminate information to emergency personnel that might result in improved call-processing times—found that “departments tend to follow a generally-accepted EMD format (Crawford and Dernocoeur, 2016). “Position papers from influential organizations

and other supportive documents of the principals of EMD have solidified its place in the evaluation of EMS” (p. 1.2).

Although widely accepted and used by an increasing number of communication centers, the delivery format of emergency call information varies from one organization to another. For example, the structured protocol for dispatching an emergency medical incident using ProQA is sequenced in the following format:

1. Case Entry. Case entry involves verifying the location and callback number for an incident and then determining a patient’s age, status of consciousness, status of breathing, and chief complaint.
2. Key Questioning. During key questioning, the communicator selects the appropriate protocol (determined from the chief complaint). The key questions are equivalent to the field responder’s secondary survey. They provide one with a more orderly and detailed view of a patient so that pre-hospital care is appropriate and in keeping with the severity of the injury or illness.
3. Determinant Code and Dispatching. ProQA takes the information obtained through case entry and the key questions and automatically determines the appropriate dispatch determinant code. The dispatcher’s task is to dispatch the response configuration (emergency vehicles and mode of response) assigned to the code.

In an effort to reduce overall response time to an emergency incident without compromising the responding unit’s safety, Nancy Caroline (2010) suggested an alternative method for dispatching an emergency calls in her textbook, *Emergency Care in the Streets*:

When the EMD has obtained the address of the emergency, the telephone number of the call, and the apparent problem, the EMD should ask the caller to wait on the line. The

EMD must then decide, assuming the call is a medical emergency within the service's jurisdiction, which crew(s) and vehicle(s) will be dispatched. That decision will be governed by the nature, location of the call and the location of the various units at the time. Once the ambulance is dispatched, the EMD may return to the telephone to obtain the rest of the information needed once emergency personnel are en route to the incident.

(p. 16.14)

A review of the literature regarding this research question discovered that communication centers tend to adhere to a generally-accepted EMD format but that variations exist. This finding influenced the researcher to collect data about the types of EMD procedures that communication centers use. This data can help fill gaps in the knowledge base about EMD protocols and their effectiveness.

A review of the literature concerning the fifth research question—whether dispatching delays have impacted Bellbrook's residents during emergency incidents—yielded no findings because no research of this nature has been conducted with this population. Therefore, the following review pertains to a related matter: the importance of time and patient outcomes.

It is often said that “every second counts” when dealing with emergencies. What exactly does this statement mean? In terms of fire emergencies, a fire can double in size every minute. Therefore, modern firefighting tactics require a big initial response to “hit it hard and fast,” according to Boston Fire Commissioner Joe Finn (as cited in Costello, 2014, p. 1). In terms of medical emergencies, paramedics must defibrillate someone in cardiac arrest within a few minutes if a patient is to have any chance of survival. In fact, the American Heart Association (AHA, 2013) determined that the chance of survival decreases by 7% to 10% for every minute that passes following a sudden cardiac arrest. Furthermore, Costello (2014) cited two studies

about the consequences of delayed responses on patient survivability. A 2008 study from North Carolina found that response times under five minutes' lead to fewer deaths, and a 2012 study from Utah found an 8% increase in fatalities within one day of a delayed response. So, an extra 30-second delay can truly put a life in danger.

Thomas Blackwell, Professor of Emergency Medicine at the University of South Carolina, has decades of experience as an EMS leader and researcher. He is one of the most quoted experts on EMS response times. He analyzes response times by focusing specifically on the early response-time interval (i.e., the time between the onset of the chief complaint and the dispatch of emergency services). He stated this is preferable for several reasons: (a) in serious medical emergencies, the first few minutes have the most critical impact on patient outcomes; (b) emergency responders cannot be dispatched until an accurate location and understanding of the emergency are established; and (c) professional first aid instructions are not provided before an accurate location and understanding of the emergency are established (Blackwell, 2015). Blackwell's (2015) research and analysis, which is referred to as RapidSOS, focuses on the first response-time interval with the goal of reducing the time between onset of the chief complaint and 9-1-1 dispatch. RapidSOS's role in providing key data early in the process reduces opportunities for wasted time later on in the call flow. His research led to the following conclusion:

An analysis of the multiple steps during the process of a 9-1-1 call leads to a reduction in time. Consequently, appropriate treatment and emergency services can be provided more quickly, whether these services are in the form of instructions over the phone to bystanders or dispatch of the appropriate response unit. Ultimately, the overall response

time is reduced, but most importantly, the initial critical minutes between the onset of the incident and its treatment are also reduced. (p. 9)

Clawson and Dernocoeur (2016c) argued that “protocol ‘question clutters’ and ‘early senders’ do their systems a big disfavor by shortcutting these accuracy and completeness-of-information safe-guards, just to save a few meaningless seconds.” They concluded that “hurrying in dispatch is about as smart as hurrying in bomb defusing” (p. 1.14)

A review of the literature regarding this research question determined that no study has been conducted to determine Bellbrook residents’ experiences with the 9-1-1 communication center. This finding influenced the researcher to administer a survey to residents who used the system within a 12-month period. This data will help fill a gap in knowledge about residents’ experiences with 9-1-1 centers regarding support from dispatchers, receipt of pre-arrival instructions, and call-processing times, as well as their perceptions about the 9-1-1 call centers. It will also help substantiate the advantages and disadvantages of the ProQA software.

A review of literature concerning the sixth research question about Bellbrook residents’ expectations when placing emergency calls to 9-1-1 led to information about each stage of an emergency response, acceptable standards, and the general public’s expectations when placing 9-1-1 calls during emergencies. Bellbrook residents’ specific expectations will be discussed in the Results and Discussion sections of this paper.

Most people do not spend a lot of time thinking about first responders until they need one. When waiting for someone to get to their emergency incidents, seconds can feel more like minutes. Therefore, general public perception would favor response times that are as effective and efficient as possible. For reasons like this and to ensure the greatest chance of patient survivability, it is important that each stage of the response be broken down and evaluated on an

ongoing basis. Table 1 consists of the NFPA (2016) standards pertaining to each stage of the emergency response sequence.

Table 1

*NFPA Alarm Handling Requirements (NFPA, 2016, 4.1.2.3.3)*

| Interval                     | Description of interval                                                                                                                                              | Time elapse                                                   |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| <i>Alarm Answering Time</i>  | The time interval that begins when the alarm is received at the communication center and ends when the alarm is acknowledged at the communication center.            | 15 seconds 95% of the time<br>40 seconds 99% of the time      |
| <i>Alarm Processing Time</i> | The time interval from when the alarm is acknowledged at the communication center until response information begins to be transmitted via voice or electronic means. | 64 seconds 90% of the time<br>106 seconds 95% of the time     |
| <i>Turnout Time</i>          | The time interval that begins when the ERFs and ERUs notification process begins by an audible alarm and ends at the beginning point of travel time.                 | 60 seconds for EMS incidents<br>90 seconds for fire incidents |
| <i>Travel Time</i>           | The time interval that begins when a unit is en route to an emergency incident and ends when the unit arrives at the scene.                                          | 240 seconds or less                                           |
| <i>Total Response Time</i>   | The time interval from the receipt of the alarm at the primary public safety answering point (PSAP) to the time that the first unit arrives at the incident.         | 7 minutes 95% of the time<br>9 minutes 99% of the time        |

*Note.* Adapted from “Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems,” NFPA 1221. NFPA, 2016. Copyright 2016 by NFPA.

When one considers the fact that EMS turnout time can be as much as 60 seconds, some departments initiate a pre-alert signal or tone to notify crews that a dispatcher is receiving information from an incoming call. A pre-alert system allows crews to begin preparing for an emergency response. Meanwhile, the communication center is gathering all the information to notify the crews to the specifics of the emergency. The Westport Fire Department in Westport,

Massachusetts realized that providing timely, accurate information is critical during emergencies. Westport Fire Chief Legendre said, “That is why we are very critical of dispatch systems that spend way too much time asking non-critical questions prior to alerting fire and EMS companies. To us, it’s simple—get the basic questions and then get the tones out” (Goldfeder, 2014, p. 1). Simply put, pre-alerting enables dispatch call takers to send basic information to first responders so they can begin preparing for an emergency response before departure from the station even begins.

A review of the literature regarding this research question determined that the general public would favor the most effective and efficient call-processing times possible, but further research on this topic is needed. This finding influenced the researcher to administer a survey to Bellbrook’s residents who used the 9-1-1 system within a 12-month period to gather data about their expectations of the system. This data will help fill a gap in knowledge about residents’ expectations of 9-1-1 call centers. It will also help substantiate the advantages and disadvantages of the ProQA software.

This literature review has shown that time is a critical factor during an emergency incident and that organizations should continually evaluate each event sequence to ensure that emergency service is being delivered effectively and efficiently to the public to maximize situational outcomes. The research should be promoted to upper management because it touches on legal, cultural, political, and social issues as well as the general health of the public. This initiative defines a technical problem that organizations such as the Bellbrook Fire Department need to address to ensure that delays in dispatching emergency personnel do not cause undue harm to the general public.

The literature review influenced this project in several ways. First, it evaluated ProQA's advantages/disadvantages. Second, it established time standards for every event sequence during an emergency incident response. Third, it discussed alternative ways to collect and disseminate emergency information and how this information pertains to the response mode of emergency responders. Fourth, it took into account multiple, unbiased opinions and quantified data from experts working specifically on this topic. Fifth, it solidified the need for departments to evaluate and provide changes in protocol when necessary to reduce emergency response times and ensure the safety of those responding. Lastly, it shows that reducing emergency response times can maximize patient survivability.

### **Procedures**

Using an evaluative research method, I generated the following procedures to answer the six research questions within this report. Four surveys were drafted and distributed to gather information pertaining to each of the research questions. The surveys are titled as follows: Greene County Central Personnel Survey, Other Agency Dispatch Center Survey, Department Personnel Using Greene County Central Survey, and Bellbrook Resident Survey. They can be found in appendices A, B, C, and D, respectively.

These surveys were not used to specifically answer only one of the individual research questions, rather each survey contained several questions seeking information for multiple research questions. For this reason, I felt that explaining the methodology of how the surveys were distributed first, followed by how each of the questions within the surveys contributed specifically to each of the research questions, would make the logic of the research paper more comprehensible. In addition to the distributed surveys, two data-driven studies were completed to evaluate call-processing times between GCC, which uses ProQA, and Hamilton County

Communication Center (HCCC) in Hamilton County, Ohio, which uses NICEInform for dispatching emergency medical calls. Each of these studies and their methodologies will be explained in the following section.

### **Survey 1: Greene County Central Personnel Survey**

The Greene County Personnel Survey was designed to determine (a) respondents' experiences as public safety communicators; (b) respondents' initial training and ongoing continual education requirements; (c) respondents' level of satisfaction with using ProQA; (d) organizational makeup; (e) whether the communication center had an established protocol or requirements for call-processing times; and (f) whether the communication center conducted periodic quality assurance reviews. Information collected from the survey was used to answer research question 1.

I took the following steps to implement the Greene County Central Personnel Survey. First, I created the survey to gather information from the employees within our communication center who utilize the ProQA program. Bellbrook's fire chief reviewed the survey questions. He approved the original draft, so no modifications were needed. Following the chief's approval, I contacted GCC Communication Director Mindy Lane to seek her assistance in the distribution and return of the surveys. The survey was then mailed to the communications center via the United States Postal Service (USPS) on December 23, 2016. To ensure that every employee who wanted to participate in the study could and based on Director Lane's recommendation, 20 copies of the survey were mailed. A prepaid return envelope was included with each survey. Respondents were asked to complete and return the surveys no later than January 13, 2017.

**Survey 2: Other Agency Dispatch Center Survey**

The Other Agency Dispatch Center Survey was designed to ask many of the same questions as the Greene County Personnel Survey. It was created to compare GCC's protocol to other communications centers on the following measures: (a) communications center operations, (b) initial training time and continuous education of call center employees, (c) average call-processing times, and (d) type of programs used to dispatch emergency calls. The intent was to find a correlation that would explain why dispatch delays occurred within GCC. Information collected within this survey was used to answer research questions 1, 2, and 4.

I took the following steps to implement the Other Agency Dispatch Center Survey. First, I created the survey to gather information from other communications centers throughout the United States. The fire chief reviewed the survey questions. He approved the original draft, so no modifications were needed. Following the chief's approval, I compiled a list of 200 communications centers throughout the United States. I gathered this information by searching the Internet. Although centers were randomly selected, I wanted to make sure that I received enough responses to ensure that the data represented a diverse sampling of communications centers throughout the United States.

Distribution of the survey began on October 6, 2016 via USPS. I also provided each respondent with a postage-paid return envelope. In the cover letter, respondents were asked to return the surveys by November 6, 2016.

**Survey 3: Department Personnel Using Greene County Central Survey**

The Department Personnel Using Greene County Central Survey was designed to determine (a) department makeup, (b) personnel's expectations of the communications center, (c) departmental protocol and how information is received through the ProQA changes protocol,

(d) familiarity and satisfaction with ProQA, and (e) accuracy and usefulness of the information received by ProQA. The overall intent of the survey was to determine if ProQA's dispatch determinant codes influence the department's response to emergency calls. Information collected in this survey was used to answer research questions 3 and 6.

I took the following steps to implement the Department Personnel Using Greene County Central Survey. First, I created the survey to gather information from the first responders who receive dispatch information from the communications center. The fire chief reviewed the survey questions. He approved the original draft, so no modifications were needed. Following the chief's approval, I contacted all the fire chiefs within Greene County who use Greene County Central (GCC) as their communications center. Table 2 lists the departments and chiefs contacted for this report. All departments participated in the survey.

Distribution of the survey began on October 6, 2016 via USPS. I also provided each respondent with a postage-paid return envelope. In the cover letter, respondents were asked to return the surveys by November 6, 2016.

Table 2

*Greene County Departments' Participation in Survey*

| <i>Department Name</i>        | <i>Chief Name</i> | <i>Address City, State, Zip</i>             | <i>Phone Number</i> | <i>Mailed Out</i> |
|-------------------------------|-------------------|---------------------------------------------|---------------------|-------------------|
| <i>Jefferson Township</i>     | Luke Brubaker     | P.O. Box 354<br>Bowersville, OH 45307       | 453-2571            | 25                |
| <i>Cedarville Township</i>    | Kyle Miller       | 19 South St.<br>Cedarville, OH, 45314       | 766-5851            | 50                |
| <i>Miami Township</i>         | Colin Altman      | 225 Corry St.<br>Yellow Springs, OH 45387   | 767-7842            | 40                |
| <i>New Jasper Township</i>    | Doug McDaniel     | 3121 Jasper Rd.<br>Xenia, OH 45385          | 374-7440            | 25                |
| <i>Silvercreek Township</i>   | Chief Payton      | 28 E Xenia St.<br>Jamestown, OH 45335       | 675-4841            | 40                |
| <i>Spring Valley Township</i> | Marvin Moeller    | 2547 US Route 42<br>Spring Valley, OH 45370 | 271-5534            | 25                |
| <i>Sugarcreek Township</i>    | Jeffrey Leaming   | 4398 Clys Rd.<br>Dayton, OH 45459           | 848-7344            | 50                |
| <i>Xenia City</i>             | Kenneth Riggsby   | 225 E Main St.<br>Xenia, OH 45385           | 347-1702            | 40                |
| <i>Xenia Township</i>         | Dean Fox          | 8 Brush Row Rd.<br>Xenia, OH 45385          | 372-7857            | 30                |
| <i>Cedarville College</i>     | Debra McDonald    | 251 N Main St.<br>Cedarville, OH 45314      | 766-7862            | 15                |
| <i>Bellbrook City</i>         | Chief Neidhard    | 35 North West St<br>Bellbrook, OH 45305     | 848-3272            | 30                |

**Survey 4: Bellbrook Resident Survey**

The Bellbrook Resident Survey was designed to determine (a) respondents' resident status, how they made contact with the communications center, and the reason for their contact; (b) whether they experienced any problems with contacting GCC or with the processing of their calls; (c) how their calls were handled; (d) their expectations of how long it should have taken to

process their emergencies and how long it should have taken emergency personnel to respond to their locations; and (e) their levels of satisfaction with how quickly their emergencies were expedited. The overall intent of the survey was to determine Bellbrook's residents' expectations of GCC and ascertain if they experienced any problems that may have contributed to a delay in receiving help. Information collected in this survey was used to answer research questions 5 and 6.

I took the following steps to implement the Bellbrook Resident Survey. First, I created the survey to gather information from the residents of Bellbrook who had contacted 9-1-1 or the communications center within the past 12 months. The fire chief reviewed the survey questions. He approved the original draft, so no modifications were needed. Following the chief's approval, I made a public information request to receive a list of the addresses that emergency personnel responded to. This request was for all incident dates between November 1, 2015 and November 1, 2016. Repeated incident addresses were removed.

Distribution of the survey began on December 6, 2016 via USPS. I also provided each respondent with a postage-paid return envelope. In the cover letter, respondents were asked to return the survey by January 6, 2017.

To answer the first research question regarding the advantages/disadvantages of using ProQA software to dispatch emergency incidents, a better understanding of how 9-1-1 call centers and ProQA operate was needed. This was mainly accomplished through the literature review, specifically by determining what others believed were the advantages/disadvantages of ProQA.

In addition to data gathered during the literature review, I used several questions in the Greene County Personnel Survey. The survey included the following questions:

1. How comfortable are you with using ProQA?
2. Rate your level of satisfaction with Greene County Central's use of ProQA.
3. How much does it cost (annually) for your communication center to use ProQA?

To answer the second research question regarding how GCC call-processing times compare to the national standards and other local communication centers that use different EMD software, two data-driven studies were conducted. The first study was an analysis that compared GCC's call-processing times to those at other communications centers. These studies, which are located in Appendices I and J, will be discussed further in the Results section of this paper. The second study used two surveys to gather information pertaining to the second research question.

The intent of the comparison study was to analyze whether ProQA contributed to a delay in dispatching emergency medical personnel. In addition to receiving a report of call-processing times from the communications centers, I wanted to conduct a real-time study by listening to recorded calls from the time dispatchers made first contact with each caller until information was transmitted to emergency personnel.

Hamilton County Communications Center (HCCC) was selected for the comparison study. Andrew Knapp, Communications Director for HCCC, was contacted on December 5, 2017. He indicated that radio transmission was interfaced with the 9-1-1 recordings, and he invited me to his facility to conduct the study on January 11, 2017. The study was completed that evening, and I compiled the results. Random samples of 150 9-1-1 calls from each communications center were analyzed. This accounted for nearly one-fourth of all EMS calls placed to the Bellbrook Fire Department annually.

To further expand on this research question, I used questions contained from (a) the Other Agency Dispatch Center Survey and (b) the Greene County Central Personnel Survey. To

gather data about respondents' experiences as emergency dispatchers, both surveys asked the following question: How long have you been an emergency dispatcher?

I used the second section of both surveys to determine respondents' initial and annual training requirements for using their communications centers' software. I posed the following questions:

1. How many hours of initial training as a dispatcher did you receive before using your current dispatch software?
2. How many hours of continued training are required each year with regard to the use of your dispatching software?
3. Do you believe that you have received an adequate level of training to allow you to perform your duties?

I used the third section to determine other agencies' level of satisfaction and overall comfort level with their communications software programs. The following questions were asked:

1. Rate your level of satisfaction with your communication center's use of the current software?
2. What is your comfort level with using your dispatching software?

The fourth section of both surveys was used to determine respondents' (a) time requirements for processing emergency calls, (b) protocol for handling emergency calls, and (c) communication center-conducted quality assurance reviews. The following questions were asked:

1. Does your communication center have a directive or a goal as to the length of time in which an emergency call must be processed and dispatched to the appropriate department?
2. Do you know the average time it takes your communication center to dispatch a call from the time the 9-1-1 call was received? If so, what is the time?
3. If a call is determined by your communication center to be a non-emergency, does your communication center transfer the call to a phone nurse to assist the caller with finding medical attention elsewhere?
4. Does your communication center provide pre-arrival instructions to a caller?
5. Does your communication center remain on the line with a caller until emergency personnel arrive?
6. Does your communication center conduct periodic quality assurance reviews of call-processing times?

The last section of the survey was used to determine the overall makeup of the communications centers. The following questions were asked:

1. How many departments/stations does your communication center dispatch for?
2. How many emergency medical/fire calls does your communication center dispatch each year (please do not include police details)?

To answer the third research question regarding whether the incident information received by using ProQA is useful to emergency personnel responding to the incident, I used questions contained within the Department Personnel Using Greene County Central Survey.

The first section of the survey was used to gather respondents' positions within the organization and the overall makeup of the department. The following questions were asked:

1. Please indicate the rank or position you currently hold in your organization.
2. In 2015, how many emergency medical/fire dispatches did your organization receive for service?

The second section of the survey was used to gather respondents' expectations of GCC.

The following questions were asked:

1. What do you consider to be a reasonable amount of time for Greene County Central to process and dispatch an emergency call?
2. Do you feel that there is a delay in dispatching emergency calls from the communication center?

The third part of the survey was used to gather respondents' familiarity and satisfaction with GCC's use of ProQA. The following questions were asked:

1. How familiar are you with how ProQA works?
2. Rate your level of satisfaction with Greene County Central's use of ProQA.

The next section was used to gather respondents' departmental protocols and how information received by the ProQA changes protocols. The following questions were asked:

1. Does your department respond to a dispatch as either an emergency or a non-emergency based on the dispatch code (i.e., alpha, bravo, Charlie, echo) obtained from the communication center?
2. If a call received by GCC is determined by ProQA to be a non-emergency, does your department allow for GCC to direct the call to a non-emergency agency or a phone nurse?

3. Depending upon ProQA's prioritization of an emergency call as requiring either advanced life support (ALS) or basic life support (BLS), does your department send a corresponding ambulance staffed with ALS or BLS personnel to the incident?

The last section was used to determine whether respondents believed that the information received by ProQA was useful when responding to emergency incidents and whether the information received accurately reflects the scene they arrive at. The following questions were asked:

1. Beside critical information such as the address, the nature of the call, or existence of a potential threat to responders, how useful or important is the information gathered by ProQA to you when responding to the incident?
2. Is the pre-arrival information concerning the patient condition or the emergency incident accurate compared to what you find upon arrival at the emergency incident site?

To answer the fourth research question regarding alternative ways to collect and disseminate information to emergency personnel to improve call-processing times, I mainly used the survey findings and the literature review to determine how other communications centers handle and process emergency medical calls. In addition to this research, which can be found in the literature review section of this report, I used several questions contained within the Other Agency Dispatch Center Survey including the following:

1. Does your department utilize some sort of EMD? If yes, which one?
2. What is the annual cost to your communication center for the utilization of your dispatching software?

To answer the fifth research question regarding whether dispatching delays have impacted Bellbrook's residents during an emergency incident, I used questions contained within the Bellbrook Resident Survey.

The first section of the survey was used to gather respondents' resident status, how they contacted the communications center, and the reason for their contact. The following questions were asked:

1. Are you the individual who contacted the 9-1-1 communication center? If you were not, and there is a possibility for that individual to complete this survey, please allow them to do so.
2. Are you a resident of the City of Bellbrook?
3. For what reason did you contact the emergency communication center?
4. How did you contact the communication center?

The next section of the survey was used to determine whether respondents experienced any problems contacting the communications center. The following questions were asked:

1. Did you have any problems contacting the 9-1-1 communication center?
2. Did the call taker process your information quickly and send immediate help to your emergency?

The last section of this survey was used to gather respondents' views on how the dispatchers handled and processed their emergency calls. The following questions were asked:

1. Did the communication dispatcher remain on the line with you until help arrived?
2. Did the communication dispatcher provide information (pre-arrival instructions) to you to help with the emergency incident until help arrived?

To answer the sixth research question regarding Bellbrook residents' expectations when placing an emergency call to 9-1-1, I used questions contained within the Bellbrook Resident Survey.

The last section of the survey asked four questions to determine both residents' expectations of the communication dispatcher and their expectations regarding the time it took for emergency personnel to arrive at their incidents. The following questions were asked:

1. What do you believe to be a reasonable time for the dispatcher to process information and to prioritize and dispatch personnel to an emergency incident?
2. What do you believe to be a reasonable time for trained personnel to arrive at an emergency site after a medical call was placed?
3. How satisfied were you with the total time it took for the personnel to arrive at your emergency incident site?
4. How satisfied were you with the time it took the communication center to process your call and dispatch personnel to your emergency site?

I experienced several limitations when conducting research on this topic, particularly with the call-processing comparison study. One limitation occurred because of the method GCC uses to record emergency incidents. The system that records emergency calls does not integrate radio traffic and emergency notification signals known as tones. It is critical that the time stamp of an emergency call indicates when the signal is sent to emergency responders. This information may vary and is subject to human error. Often there is a lag in the time the information is transmitted and the time stamp logged by a dispatcher. When compiling data, it is important that the time stamps are accurate. Furthermore, manual time measurements should be gathered to ensure the accuracy of this information. Because of this limitation, I only received a printed

report of call-processing times for GCC. I received this information from Communications Director Mindy Lane on December 14, 2016. Director Lane stated during a phone conversation that the information contained within the report was “very accurate” and could be included in this study (M. Lane, personal communication, December 21, 2016).

Another limitation was specific to the third research question. When evaluating the responding departments’ personnel about department policy and how policy dictated emergency response based upon the determinant codes received from ProQA (i.e., emergency vs. non-emergency response or responding with BLS or ALS units), I noticed that responses from personnel within the same department were inconsistent. This limited my ability to obtain a true understanding of the departments’ policies. It is possible that the inconsistency of responses may be attributed to the fact that respondents misunderstood the question. Nonetheless, it would have been more appropriate to gain the answer by directly reviewing departmental policy or obtaining this information from the chief of the department.

## **Results**

Using an evaluative research method, I gathered data to answer each of the six research questions. The data was obtained primarily from three sources that included (a) a time comparison study of call-processing times, (b) literature analysis, and (c) surveys. The surveys were used to gather data from (a) GCC personnel, (b) other agency communications centers, (c) department personnel who use GCC, and (d) Bellbrook’s residents.

As for GCC personnel, 6 of the 20 surveys mailed were completed and returned, which accounts for 30% of the surveys.

As for other communications centers, 200 surveys were mailed directly to the communication director at each center. Of the 200 mailed surveys, 77 (39%) were completed and returned.

As for the department personnel using GCC, 370 surveys were mailed directly to the chief of the department. Each member regardless of rank was invited to participate in the survey. Of the 370 mailed surveys, 160 (43%) were completed and returned.

As for Bellbrook's residents, 287 surveys were mailed directly to the received incident addresses. Individual caller information was not provided due to the Health Insurance Portability and Accountability Act of 1996 (HIPAA). Of the 287 mailed surveys, 82 (29%) were completed and returned.

The answer distributions for all surveys are recorded in appendices E, F, G, and H. The results corresponding to each research question are discussed below.

#### **Research Question 1 (Greene County Central Personnel Survey)**

Questions 4, 5, and 6 of the GCC personnel survey addressed the advantages and disadvantages of using ProQA to dispatch emergency personnel. For example, 83% of respondents reported that they believed they had received adequate training on the program. Additionally, 100% of respondents reported that they felt either very comfortable or somewhat comfortable with ProQA. However, 67% of respondents reported that they were somewhat or very unsatisfied with the program itself. One respondent explained as a secondary note to this question:

Using this particular ProQA system really slows down response times. Calls should be dispatched within 90 seconds, but several of the cases (example: seizures) can take a few

minutes before it will assign a “BLS” or “ALS” call-type, when we could’ve dispatched it much quicker without it.

### **Research Question 2 (GCC/HCCC Comparison Study and Other Agency Dispatch Center Survey)**

Research question 2 called for a comparison of GCC’s call processing times with HCCC, a communications center in another Ohio county, and communications centers throughout the country. Data from the 150 calls that were analyzed showed that GCC prioritization and processing of emergency medical calls took on average 93 seconds. The agency only met NFPA 1221’s (2016) recommendation of “64 seconds 90% of the time” 21.3% of the time. Furthermore, NFPA recommends that calls should be processed within 106 seconds 95% of the time, but GCC processed calls within 106 seconds only 70.6% of the time. The longest processing time was 240 seconds and the shortest was 11 seconds.

Data from the 150 calls analyzed through HCCC showed that the agency took 58 seconds on average to prioritize and process emergency medical calls. It met the NFPA standard of 64 seconds 84% of the time. Additionally, HCCC met the 106-second standard 93.3% of the time. The longest call-processing time was 207 seconds whereas the shortest time was 21 seconds.

A side-by-side comparison of the two communications centers found that HCCC, which uses NICEInform, prioritized and dispatched calls 35 seconds faster than GCC does using ProQA. Thus, HCCC met the NFPA 1221 standard (64 seconds 90% of the time) nearly 60% more often than GCC. GCC’s slower call-processing times resulted in a 23% decrease in meeting the standard of 106 seconds 95% of the time.

Respondents from other agencies reported that their average call-processing times for emergency medical calls was 60 seconds, which is 30 seconds quicker than the 90-second average that GCC respondents reported.

### **Research Question 3 (Department Personnel Using GCC)**

Results for research question 3 regarding the usefulness of incident information emergency responders received through ProQA derived from questions 11 and 12 of the Department Personnel Using GCC Survey. Respondents were asked whether they felt the information received by ProQA was useful when responding to an emergency incident and whether the information received was accurate to the scenes they arrive at. Results showed that 65% of respondents felt that the information received by ProQA was somewhat useful/important or very useful/important. In comparison, 35% indicated that this information was somewhat not useful/important or not useful/important at all. Lastly, 67% felt the information received from ProQA was somewhat or very accurate compared to what they find upon arriving at the scene.

### **Research Question 4 (Other Agency Dispatch Center Survey)**

Results for research question 4 regarding alternative ways to collect and disseminate information to emergency personnel were derived from question 2 of the Other Agency Dispatch Center Survey, which asked respondents which EMD software their communications centers used. Table 3 lists the top three utilized software programs along with the agencies that use them. Table 4 provides call-processing times by communications centers that use Priority Dispatch (the most commonly used EMD software).

Table 3

*Alternative EMD Programs Reported by Surveyed Communication Agencies*

| <b>Priority Dispatch</b>                                     | <b>PowerPhone</b>                                    | <b>Apco 9-1-1 Advisors</b>                                     |
|--------------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------|
| - Elko Central Dispatch                                      | - Kalkaska Central Dispatch                          | - Centre County 9-1-1                                          |
| - Ramsey County ECC                                          | - Boyd County 9-1-1                                  | - South Sound 9-1-1                                            |
| - Weber 9-1-1                                                | - Jackson County 9-1-1 Comm.                         | - Kame Communications                                          |
| - Allegam County Central                                     | - Kabell County 9-1-1                                | - Monroe County Control                                        |
| - Johnson County EMC                                         | - Dickenson County Central                           | - Genesee County 9-1-1                                         |
| - Venengo County Dept.                                       | - Allona County                                      | - Chippewa County Central                                      |
| - Citra County SO                                            | - Torrance County Dispatch                           |                                                                |
| - Tampa Fire Rescue                                          | - Montgomery County 9-1-1                            |                                                                |
| - Cumberland County                                          |                                                      |                                                                |
| - Livingston County 9-1-1                                    |                                                      |                                                                |
| - McPherson County                                           |                                                      |                                                                |
| - Lapeer County Central                                      |                                                      |                                                                |
| - Barry County Central                                       |                                                      |                                                                |
| - Ogemaw County Central                                      |                                                      |                                                                |
| - Manistee County 9-1-1                                      |                                                      |                                                                |
| - Sanilac County Central                                     |                                                      |                                                                |
| - Tipon County                                               |                                                      |                                                                |
| - Meceola Central                                            |                                                      |                                                                |
| - Laeotte County 9-1-1                                       |                                                      |                                                                |
| - Union County Comm.                                         |                                                      |                                                                |
| - Monroe County Central                                      |                                                      |                                                                |
| - Shascom 9-1-1                                              |                                                      |                                                                |
| Average Cost Reported of<br>Priority Dispatch<br>\$12,129.00 | Average Cost Reported of<br>PowerPhone<br>\$8,902.00 | Average Cost Reported of<br>Apco 9-1-1 Advisors<br>\$14,390.00 |

Table 4

*Call-Processing Times by Communication Centers Reporting Priority Dispatch as Their EMD Software*

| Communication Center       | Call-Processing Times        |
|----------------------------|------------------------------|
| - Weber 9-1-1              | - 27 Seconds                 |
| - Johnson County EMC       | - 57 Seconds                 |
| - Venengo County Dept.     | - 90 Seconds                 |
| - Tampa Fire Rescue        | - 90 Seconds                 |
| - Cumberland County        | - 90 Seconds                 |
| - Livingston County 9-1-1  | - 90 Seconds                 |
| - McPherson County         | - 55 Seconds                 |
| - Barry County Central     | - 30 Seconds                 |
| - Ogemaw County Central    | - 45 Seconds                 |
| - Manistee County 9-1-1    | - 40 Seconds                 |
| - Tipon County             | - 38 Seconds                 |
| - Meceola Central          | - 43 Seconds                 |
| - Union County Comm.       | - 65 Seconds                 |
| - Monroe County Central    | - 90 Seconds                 |
| - Shascom 9-1-1            | - 60 Seconds                 |
| - Leelanaw County Dispatch | - 96 Seconds                 |
|                            | Average Call-Processing Time |
|                            | 62 Seconds                   |

#### **Research Question 5 (Bellbrook Resident Survey)**

Results for research questions regarding Bellbrook's resident's experiences during emergency calls to GCC were derived from several questions in the Bellbrook Resident Survey. Questions 1, 2, and 3 gathered respondents' resident status, how they made contact with the communications center, and the reason for their contact. Respondents who indicated that they (a) were not the individual who contacted 9-1-1, (b) were not a resident of Bellbrook, (c) contacted the communications center for a non-emergency incident, or (d) made contact through a monitoring company or from the request of a police officer were excluded from the reported results for the remainder of the survey questions. Their answers were excluded for the following

reasons: (a) only individuals who placed 9-1-1 calls could provide first-hand evaluation of the communications center and overall emergency response; (b) because the study is related to the impact on Bellbrook's residents, non-residents were excluded to provide the most accurate results; and (c) reports of non-emergency incidents do not receive the same level of urgency from dispatchers.

Questions 5 and 8 asked respondents whether they encountered any problems contacting GCC or with the dispatchers processing their calls. Approximately 96% of respondents indicated that they had no problems contacting the communications center. The remaining 4% reported that their calls were transferred to another PSAP. Additionally, 94% of respondents indicated that their information and emergencies were processed quickly. Only a very small percentage of respondents reported problems with their calls. Approximately 1% reported that the dispatcher could not find their location, 3% stated that they had to repeat their information several times, and 3% thought the dispatcher asked too many questions.

Questions 6 and 7 asked respondents how dispatchers handled and processed their emergency calls. Fifty-seven percent reported that the communication dispatcher remained on the line until help arrived. Slightly more than two-thirds (67%) of respondents were given pre-arrival instructions.

#### **Research Question 6 (Bellbrook Resident Survey)**

Results for research question 6 regarding Bellbrook's residents' expectations when placing 9-1-1 calls were derived from questions 9 through 12 of the Bellbrook Resident Survey. Questions 9 and 12 asked respondents about their time expectations and overall satisfaction with GCC's prioritization and processing of their emergency incidents. Time was important to 91% of responding residents who indicated that calls through the communications center should be

prioritized and processed within 60 seconds or less. However, 97% of respondents were either somewhat or very satisfied with the amount of time it took dispatchers to send incident information to emergency personnel.

Questions 10 and 11 asked respondents about their expectations regarding the time it took for emergency personnel to arrive at their incidents. Seventy-five percent of respondents indicated that it should take emergency personnel 7 minutes or less to arrive at their emergency incidents. Furthermore, 96% of respondents reported that emergency help should arrive within 9 minutes after their contact with 9-1-1. These results closely compare to NFPA 1221's (2016) standard that the overall emergency response should be completed within 9 minutes 95% of the time.

### **Questions About Related Topics**

In addition to results for the six research questions, the surveys provided results for related topics, including professional qualifications of personnel who use EMD software, their level of training, and their experiences with using EMD software; call center directives regarding call-processing times; EMD protocols; and the structures of communication centers.

Several questions from both the Other Agency Dispatch Center Survey and the Greene County Central Personnel Survey captured respondents' experience with ProQA and their initial and continuing education training on the software. Most respondents from GCC (83%) had less than five years of experience as a public safety communicator. Approximately, 83% of GCC respondents received less than 40 hours of training, with half of those receiving less than 25 hours. In contrast, 50% of respondents at other dispatch centers received more than 40 hours of initial training with 40% of those receiving more than 60 hours. All of GCC respondents received more than 10 hours of continual education training each year whereas roughly 50% of

respondents at other communications centers received more than 10 hours of continual education per year.

Roughly 92% of respondents at other agencies felt either somewhat or very comfortable using their communications centers' EMD software compared to 100% of GCC respondents. Ninety-two percent of them were also either somewhat or very satisfied with their programs while 67% of GCC respondents reported these levels of satisfaction. Ninety-six percent of other agency respondents reported that they believed they received adequate training to allow them to perform their duties compared to 83% of GCC personnel.

About 50% of respondents at other communications centers had directives of 60 seconds or less for processing and dispatching emergency calls; however, 32% reported that they had no directives. In comparison, 100% of GCC respondents reported a requirement that was more than 60 seconds.

One-hundred percent of GCC personnel reported that the communications center conducts periodic quality assurance review, compared to 87% of personnel at other communications centers.

Only 6% of communications centers had the option to transfer emergency calls to a phone nurse if they were determined to be non-emergencies. One of ProQA's features is to determine if calls are non-emergencies. In such cases, 100% of GCC respondents reported that they do not make referrals to an outside agency to assist callers with finding medical attention elsewhere.

Almost 100% of personnel at other communications centers surveyed and at GCC provided pre-arrival instructions to callers. Additionally, both communications centers reported

similar findings that they will, if warranted, remain on the line with a caller until emergency personnel arrive on a scene.

Results comparing the overall makeup of other communications centers with GCC determined that the average annual software cost for other communications centers was \$16,500. No GCC respondents reported an annual cost for ProQA. GCC provided dispatching services to 11 departments and dispatched 14 stations. On average, other communications centers provided dispatching services to 15 departments and dispatched 23 stations.

The Department Personnel Using Green County Central Survey provided information about emergency services personnel's positions and perceptions about GCC operations as well as their departments' protocols.

Questions 1 and 2 asked respondents to indicate their positions within the department and the number of medical/fire details their departments respond to. Two-thirds of respondents indicated that they held the position of firefighter within their organization. Sixty-seven percent of respondents had yearly details under 1,000; 18% had more than 1,000 but less than 2,500; and 14% responded to more than 5,000 calls per year.

Questions 3 and 8 asked respondents about their expectations of the communications center, what they felt to be a reasonable amount of time for dispatchers to process emergency calls, and whether they felt there were delays in dispatching calls. Ninety-seven percent of respondents expected that a call should be processed in under 60 seconds. Furthermore, 61% of them felt that GCC had delays in processing calls.

Questions 5 and 6 asked respondents about their familiarity and satisfaction with GCC's use of ProQA. Of the returned surveys, 59% of respondents were either somewhat familiar or

very familiar with how ProQA works. Fifty-nine percent stated that they were either somewhat satisfied or very satisfied with the program.

Questions 7, 9, and 10 gathered information about respondents' departmental protocols and how information received by ProQA changes protocols. Results showed that 56% of departments do not change their response modes of emergency or non-emergency based upon the determinant code. Furthermore, 71% of responding departments do not change their protocols to send either an ALS or a BLS ambulance to an emergency based upon priority dispatching. Lastly, nearly all (97%) of responding departments' protocols will not allow GCC to transfer emergency calls to be handled by a non-emergency agency.

### **Discussion**

The purpose of this research was to evaluate ProQA in relation to emergency medical dispatch, particularly whether it causes delays in transmitting 9-1-1 calls to responding units. This information is particularly important for providing the most efficient and effective emergency response to the residents of Bellbrook. Additionally, it is important that every entity involved in the emergency response sequence be held accountable to standards of service derived from data-driven studies; this is especially important when time can literally be the difference between life and death. Studies like the one conducted in North Carolina in 2008 found that fewer deaths occurred when response times were under 5 minutes (Costello, 2014).

Finally, an evaluation of all stages of the emergency response sequence may lead to a reduction in the overall time it takes for emergency personnel to arrive and facilitate a successful incident outcome.

I collected data that organizational leaders who use GCC can examine, evaluate, and use to make recommendations that can maximize the overall process of emergency response within

their organizations. I used this data along with a literature review to determine (a) the advantages/disadvantages of using ProQA software to dispatch emergency incidents; (b) how GCC's call-processing times compare to national standards and other local communications centers that use different EMD software; (c) whether the incident information received using ProQA is useful to emergency personnel who respond to incidents; (d) alternative ways to collect and disseminate information to emergency personnel that result in an improvement of call-processing times; (e) whether dispatching delays have impacted Bellbrook residents during emergency incidents; and (f) residents' expectations when placing emergency calls to 9-1-1.

Responses to the first research question regarding the advantages/disadvantages of using ProQA software to dispatch emergency incidents yielded many advantages. For example, ProQA allows emergency communicators to rapidly process caller information using the nationally accepted and utilized priority dispatch flowchart developed by Clawson (Clawson & Dernocoeur, 2016). The software processes the inputted information, quickly directs the user to the correct chief complaint through key questioning, and produces a determinant code that allows communicators to dispatch the appropriate personnel and apparatus to the emergency incident. It provides protection from liability (Clawson & Dernocoeur, 2016) and provides callers with emergency instructions as well as pre-arrival instructions. Scott (2003) pointed out that one of the keys to developing an effective EMD protocol is to tailor it to the department, depending on factors such as location, area topography, and number of field units. Ultimately, the right system should work well for the end user. However, results from the Greene County Dispatch (GCC) Personnel Survey showed that 67% of the employees who use ProQA are not satisfied with its performance. One respondent offered an additional comment that may explain their dissatisfaction: "when we don't use ProQA, we can dispatch calls quickly. When we do use

ProQA, the time it takes is much longer. ProQA frustrates us and it frustrates the caller”. This observation agrees with industry experts who question whether protocol-based software programs like ProQA have become too stringent and take too much time to process calls. Furthermore, respondents’ frustration with the software could suggest that the program does not adequately fit GCC’s operations and structure, which corroborates Scott’s (2003) theory.

The implication of these results is that although ProQA provides users such as GCC a tool that aids in the processing of caller information, further evaluation and review of the current communications protocol should be explored to create a process that fits the needs of the organizations that contract with GCC as their PSAP. This would greatly benefit the residents of Bellbrook because it would (a) decrease response times, (b) increase survivability, and (c) improve situational outcomes.

Responses to the second research question, regarding how GCC’s call-processing times compare to national standards and other local communications centers using the same or different EMD protocol-based computer software, revealed that the average call-processing times within GCC is 93 seconds. This was considerably longer than HCCC’s (Hamilton County Communication Center) average time of 58 seconds. Additionally, other communications centers surveyed reported an average time of 60 seconds. Average call-processing times from HCCC and other communications centers reflect the standards set by NFPA 1221 (2016), section 4.1.2.3.3, which recommends calls be completed within 64 seconds 90% of the time and within 106 seconds 95% of the time. GCC meets these standards only 21.3% of the time for the 64-second requirement and 70.6% of the time for 106-second requirement. Additionally, studies conducted by the Emergency Medical Service Authority as well as the Metropolitan Ambulance Service

found that regardless of the determinant priority code (alpha–omega), the processing of emergency calls can be completed under 60 seconds (Clawson & Dernocoeur, 2016a, p. 1.15).

Results from other communications centers that have directives or goals regarding the length of time an emergency call must be processed and dispatched to the appropriate department indicated that 75% of them reported a goal of 60 seconds or less, whereas 0% of respondents from GCC reported a similar goal. The 60-second goal agrees with the Center for Public Safety Excellence (CPSE) (Kinsley, 2009) and the NFPA (2016), who urge agencies to set 60 to 64 seconds as a standard for call-processing times. In contrast, Crawford (2016) theorized that 60 seconds is not always possible. He agreed that “the 60-second time interval should be used as a goal or objective to strive for in most situations” (p. 1.22).

The implication of these results is that organizational leaders as well as the GCC’s communications director should review the performance indicators and set targets for each of them to be measured during periodic quality assurance reviews. These targets should be based upon their needs and expectations as well as service industry standards for dispatching emergency medical personnel. It is clear that achieving 60 seconds for call-processing times is possible. Therefore, a further understanding of why GCC’s call-processing times are longer must be gained.

Data pertaining to the third research question regarding whether the incident information received by using ProQA is useful to emergency personnel responding to the incident, indicates that 65% of respondents thought the information received by ProQA was somewhat useful or very useful and 35% thought it was somewhat not important or not important at all. Moreover, 67% thought this information was somewhat or very accurate when compared to the emergencies they found when they arrived on the scene. These findings support Gasaway’s (2016) idea that

accurate and thorough incident information helps first responders gain an early understanding of conditions at incident sites before arrival. The fact that roughly one-third of respondents did not find the information that useful or accurate could suggest that the quality of incident information needs improvement to help ensure the safety of responding units (Dunigan, 2016).

The literature review for the fourth research question, regarding alternative ways that communications centers can collect and disseminate information to emergency personnel to improve call-processing times, revealed several alternatives that communications centers such as GCC can use. The pre-alert tone is one of the most popular methods that a large number of communications centers use. It informs companies that incoming calls are being processed. This pre-notification tone allows for two processes of the emergency response sequence to be performed simultaneously. This method—obtaining only essential information such as name, location, and nature of emergency first, then alerting personnel before returning to key questioning to obtain a determinant code—allows emergency response personnel to begin the necessary preparations before engaging in the emergency response (Caroline, 2010; Goldfeder, 2014).

Table 3 of this report lists EMD programs that other communications centers use. Priority Dispatch was the program most commonly used. ProQA's protocol-based software utilizes Priority Dispatch's systematic case entry, key questioning, and determinant codes to dispatch emergency personnel. The fact that Priority Dispatch was the top-reported protocol-based software among the surveyed communications centers supports Crawford's (2016) position that "the industry's use of EMD tends to follow a generally accepted format and through influential organizations and other supportive documents has solidified its place as an accepted protocol to dispatch emergency medical incidents" (p. 1.2).

Table 4 shows the call-processing times of communications centers that use Priority Dispatch. It also shows average call-processing times to determine whether the program itself could be contributing to dispatch delays. The results showed that communications centers that use Priority Dispatch had an average call-processing time of 62 seconds. Half of the call-processing times were less than 60 seconds.

Studies from the Emergency Medical Services Authority, Tulsa/Oklahoma City that analyzed nearly 22,000 calls over a two-year period and the Metropolitan Ambulance Service in Melbourne, Australia that conducted an 18-month study of more than 237,000 calls found that call-processing times under 60 seconds can be achieved (Clawson & Dernocoeur, 2016b). These findings are similar to the call-processing times of the surveyed communications center that used Priority Dispatch.

The implication of these findings is that ProQA may not be responsible for the delay in dispatching emergency medical calls within GCC. However, because the Other Communication Center Survey failed to ask respondents the sequence in which emergency calls were processed, this research cannot rule out the possibility that reduced call-processing times from the use of Priority Dispatch are due to the agencies' use of the common pre-alert notification approach previously discussed.

In regard to the fifth research question about whether dispatching delays have impacted Bellbrook's residents during an emergency incident, 96% of respondents indicated that they had no problems contacting the communications center. The remaining 4% indicated that their calls were transferred to another PSAP, which is understandable considering the significant increase in today's cell phone use. Additionally, 94% indicated that the communications center processed their calls quickly. Lastly, 57% of respondents indicated that a dispatcher remained on the line

with them, and 67% reported that a dispatcher provided them with pre-arrival instructions. Because it is not always applicable or necessary to remain on the line with callers or to provide them with pre-arrival instructions, it is understandable that the results of the last two questions would not show 100% compliance. Furthermore, most respondents reported that they were satisfied with the amount of time it took emergency personnel to arrive at their locations.

Although a large percentage of respondents reported that they experienced no negative impact from their calls to the communications centers, findings from the literature review show that “every second counts” when dispatching and responding to emergency calls, particularly for patient outcomes (American Heart Association, 2013; Blackwell, 2015; Costello, 2014).

These results imply that dispatching delays within GCC have not impacted Bellbrook residents. However, delays in GCC’s call-processing times could have a negative impact on patient outcomes at some point. Therefore, addressing this problem is paramount.

Data regarding the sixth research question about Bellbrook’s residents’ expectations when placing emergency calls to 9-1-1 determined that, whereas almost all respondents (97%) were either somewhat or very satisfied with the time it took the communications center to process their emergency calls, 91% of them agreed with the NFPA’s (2016) and CPSE’s (2009) standard that emergency calls should be processed within 60 seconds. Given that GCC only meets that standard 21.3% of the time, this report can conclude that the time expectations of Bellbrook’s residents who use 9-1-1 are not being met. In addition to call-processing time expectations, respondents were asked to provide their overall time expectations for emergency crews to arrive at their reported incidents. These results indicated that 96% of respondents expect the overall arrival of emergency personnel to be 9 minutes or less. Again, the expectations of

Bellbrook's residents agree with the NFPA's (2016) recommendation that the specific time of 9 minutes should be obtained 95% of the time.

Although this report does not specifically address time requirements from the standpoint of emergency responders, the knowledge gained from these questions may be used in future research to ensure that the first responders of the Bellbrook Fire Department are meeting the expectations of Bellbrook residents.

The implications from these results show that a review of dispatching procedures as well as alternative methods for dispatching emergency calls may need future exploration. Although there have been no reported incidents of dispatching delays resulting in unnecessary harm or liability, the fact remains that call-processing times are not meeting the expectations of Bellbrook's residents or of the departments that GCC serves. Additionally, improved call-processing times and overall response times would strengthen public safety and reduce the likelihood that delays may contribute to the loss of life.

The studies examined in the literature review and the data collected from both the surveys as well as the comparison study of GCC's and HCCC's call-processing times indicate a definite need to re-evaluate the current process of dispatching emergency calls and make the necessary and appropriate changes to accommodate the needs of organizations that use GCC as their PSAP. Even though this study did not reveal any evidence that Bellbrook residents have suffered harm due to delays in call-processing times, this does not negate the fact that residents deserve the most efficient delivery of emergency services possible. Thus, this research project can assist organizational leaders in making the necessary changes to improve the overall process of dispatching emergency calls.

### **Recommendations**

In this applied research project, I determined that an evaluation of ProQA in relation to emergency medical dispatch at Bellbrook's communications center, Green County Central (GCC), is warranted—particularly as it relates to delays in call-processing times.

I used findings from literature analysis and original data collected through a comparative analysis of call-processing times at GCC and HCCC. I also collected information from other communications centers regarding their operations and call-processing times, collected data from department personnel using GCC as their PSAP, and recorded Bellbrook's residents' expectations when placing calls for emergency services. From this research, I developed four recommendations that could potentially lead to more efficient use of ProQA, a reduction the overall time it takes GCC to process and prioritize emergency incidents, and improved response times and delivery of emergency services for Bellbrook residents.

#### **Recommendation 1**

The Bellbrook Fire Department along with organizational leaders who use GCC as their departments' PSAP should establish an informational meeting with the center's communications director to discuss their concerns and expectations as well as additional ways to dispatch emergency calls with the expectation of improving the services that GCC provides.

#### **Recommendation 2**

This study points to the fact that GCC is not meeting the standard call-processing times compared to industry standards, data collected from other communications centers, and the time comparison study with HCCC. An analysis of HCCC's call processing times showed that the agency was able to meet the NFPA standard of 64 seconds 84% of the time. In comparison, GCC met that standard only 21.3% of the time. Therefore, in an effort to better serve the residents of

Bellbrook along with other residents within GCC's service areas, the communications center should explore the possibility of changing the protocol to one that obtains vital information such as addresses, call-back numbers, and the nature of incidents and then uses pre-notification tones to alert emergency crews to prepare for incoming calls for service. This practice, which is commonly used among other communications centers, would result in two events of the emergency response sequence being performed simultaneously.

### **Recommendation 3**

Because a limitation on collecting real-time data occurred within GCC's communications center, it is recommended that a larger study be conducted to affirm the results contained within this report. Human error can be associated with significant time delays; therefore, further data should be gathered with oversight of organizational leaders to clearly estimate the center's call-processing times.

### **Recommendation 4**

After verifying that emergency calls within the communications center are being delayed, another study may be necessary to explore why call-processing times are not meeting the national standards set forth by NFPA and CPSE. This study may reveal issues in dispatching emergency calls that may be correctable in addition to issues that can only be corrected by changing dispatching procedural protocol.

In conclusion, the information contained within this report is important to many stakeholders. This study can be viewed as a first step in improving how ProQA operates, particularly as it relates to call-processing times. Therefore, the information within this report should be shared with Bellbrook's city manager and those departments that use GCC as their PSAP.

With input from all involved entities and the recommendations from this report, leaders should begin to actively evaluate what changes are necessary to reduce call-processing times and improve the overall time it takes emergency personnel to arrive and mitigate emergency incidents. The ultimate goal should be to improve public safety and meet the expectations of those dialing 9-1-1.

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