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Assessing the Ability to Handle an Influenza Pandemic

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CERTIFICATION STATEMENT

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

Signed: _____

Abstract

The problem is that Miami Township is a densely populated community and an Influenza Pandemic could cripple the operations of the Division of Fire and EMS because there is no policy in place to ensure the continued operations of the Division as well as the safety of the employees. The purpose of the research is to identify the threat to the Division from an Influenza Pandemic and determine how to continue to provide services while keeping the employees safe. Descriptive research was used to answer the following research questions. What are the potential problems to the community as well as the Division if there is an influenza pandemic? What resources are available to assist the Division in preparing for an outbreak? What type of equipment is available to protect first responders before, during, and after an outbreak? What will be the expected impact on the Divisions ability to respond to emergencies? How can the Division expect its employees to function in the capacity of an emergency responder when their families, as well as their own lives, may be in danger?

The internet was used extensively since the information needed to be as up to date as possible and an internal survey was also used to provide answers to the research questions. The results showed that Miami Township is not in a good position to remain in operation if a pandemic was to occur. Furthermore, it is recommended that an extensive plan be developed and implemented to sustain emergency services to the Township.

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Assessing the ability to handle an Influenza Pandemic

Introduction

The fire service has started to make preparations for the next great danger that the men and women in the emergency services will have to face. That danger is an Influenza Pandemic. It is unlike any other disaster that the fire service has faced because when the pandemic hits it will hit hard, spread fast, affect the entire country, and be around for months. It will sweep across the cities of America at an alarming speed and infect the population without prejudice (Britt, 2006). There will be no quick fixes and infrastructures will slow down or even grind to a halt. There is a belief that those living in a populated area could expect to have a drastic reduction in work force and a potential for significant loss of life (Evans, 2005).

The problem is that Miami Township is a densely populated community and an Influenza Pandemic could cripple the operations of the Division of Fire and EMS because there is no policy in place to ensure the continued operations of the Division as well as the safety of the employees.

The purpose of the research is to identify the threat to the Division from an Influenza Pandemic and determine how to continue to provide services while keeping the employees safe.

Descriptive research was used to answer the following research questions:

1. What are the potential problems to the community as well as the Division if there is an influenza pandemic?
2. What resources are available to assist the Division in preparing for an outbreak?
3. What type of equipment is available to protect first responders before, during and after an outbreak?

4. What will be the expected impact on the Division's ability to respond to emergencies?
5. How can the Division expect its employees to function in the capacity of an emergency responder when their families as well as their own lives may be in danger?

Background and Significance

The Miami Township Division of Fire and EMS is currently a full service combination fire department that provides fire, emergency medical, and fire prevention to approximately 27,000 residents. The Division operates out of four stations, three of which are staffed 24 hours a day while the fourth is staffed sporadically. Two paid-on-call members also respond to this firehouse when needed. The Division will respond to approximately 4,000 calls for service in 2006 with roughly 3,000 of those being EMS related. Mutual aid as well as automatic mutual aid (AMAR) is relied on when Township equipment is not available.

The current staffing of the Division consists of approximately 70 personnel. The personnel are broken down into 33 career firefighters, 32 part-time firefighters, two paid-on-call firefighters, and three administrative staff. 30 career firefighters work a 24/48 hour schedule while the Fire Chief, Deputy Chief of Operations, and the Lieutenant in charge of the Inspection/Prevention Bureau work a 42.5 hour week. The Division runs three shifts with a minimum manning of 11 per day. The majority of the part-time firefighters work a 24 hour shift every sixth day and those that can not work under that schedule are assigned a 24 hour shift based on need of the Division and their availability. The State of Ohio also requires townships to follow a rule that maintains a part-time employee may not exceed 1,500 hours in a year or the employer is required to provide the benefits that the full-time employees receive.

Miami Township is located just south of Dayton, Ohio in Montgomery County. It is approximately 23 square miles and surrounds the City of Miamisburg, Moraine, and West Carrollton on three sides. The shape of the Township is essentially a “U”. The Township is very diverse in the aspect that it is composed of urban/suburban and rural. The Township is a large retail hub for the county and does have some manufacturing along with agriculture. It is estimated that during business hours the population can grow to exceed 60,000 and even higher during the holiday season.

It is no longer a question of if, but when, will the next Influenza Pandemic occur. It is virtually impossible to accurately predict when the next pandemic will occur, but history has proven that a future pandemic is unavoidable. Influenza Pandemics are regular events and they occur around three times a century.

Over the last 400 years 12 Influenza Pandemics have been recorded, but every hundred years the world experiences one that is catastrophic. The last one happened in 1918 and it killed more than 20 million people world wide (see table 1) (Carey, 2005). A pandemic usually happens in three waves, each lasting roughly three to six weeks (Combined Health District of Montgomery County, 2006)

Table 1

<i>20th Century Influenza Pandemic Human Deaths</i>		
Year	Worldwide Deaths	United States Deaths
1918	20-40 Million	500,000
1957	1-2 Million	70,000
1968	700,000	34,000

Note. From Combined Health District of Montgomery County (2006, September 6). Pandemic influenza preparedness and response plan.

To help explain how a pandemic will spread through the population and effect emergency services it will be beneficial to understand the basics of Influenza. Influenza is nothing more than a virus. A virus lacks the ability to reproduce on its own and can not survive outside of a living organism. The virus, once inside the living organism, takes over the cell and uses it to reproduce. The virus continues to reproduce inside the cell until it ruptures out of the host cell. Then the new viruses move onto other healthy cells and the cycle continues (Freudenrich, n.d.).

Seasonal flu usually follows seasonal patterns and usually occurs in the winter. Healthy adults are usually not at risk for complications and have already developed some immunity from past exposures. The elderly, very young and those with underlying medical conditions are more susceptible to complications. In the United States there is an average of 36,000 deaths a year from seasonal flu usually caused by complications from pneumonia along with 200,000 hospitalizations (Combined Health District of Montgomery County, 2006). The symptoms of the flu are fever, cough, runny nose, and muscle pain. There is little impact on the everyday operations of the community in respect to commerce and day to day business. Hospitals and EMS providers have little trouble in meeting the publics demand for service and there is adequate supplies of vaccine available (The Ohio Department of Health, 2006).

A pandemic flu outbreak is a rare occasion, but does occur on average three times a century with two of them being minor and one major in scale. Healthy people are at the same risk as those at high risk during seasonal flu. Hospitals and EMS providers will become overwhelmed by the increase in patients due to those not normally affected now needing treatment. The symptoms will be the same as seasonal flu, but more severe and with greater

complications. The world and local economy will suffer because of the lack of people that will be able to report to work. The pandemic will be world wide and not isolated to one area. There will be mass cancellations of events as well as closings of public assemblies like schools and stores (The Ohio Department of Health, 2006).

There are three types of Influenza viruses. They are A, B, and C. Type A infects people, pigs, horses, birds and other animals. Wild birds are natural hosts for the A type virus. It is this type that will mutate and could cause a pandemic. Type B usually only occurs in humans and have been the cause of epidemics, not pandemics. Type C causes respiratory illness that is mild and is not associated with a pandemic or epidemic (Carey, 2005). The most recent strain that has caused world wide concern is the H5N1 or “Avian Bird Flu”, which is of the Type A class.

The H5N1 virus was originally isolated in 1996 in a farmed goose. In 1997 the virus was reported in poultry at wet markets in Hong Kong. There were 18 cases of human infection with 6 deaths, but the virus remained isolated. Then in December of 2003 the virus was detected in tigers and leopards who had died after eating chicken that had been identified to be carrying the H5N1 virus at zoo in Thailand. Also that same December the virus was discovered in Korea and two months later in Vietnam. This confirmed the virus was no longer isolated to one area (World Health Organization [WHO], 2006).

The lethality of the virus is what makes the world health authorities so concerned (Woodson, 2005, p. 6). As of September 28, 2006 there have been 251 human cases with 148 deaths (World Health Organization [WHO], 2006). This equates to almost 60% of those infected have died. Although at this time most infections can be contributed to direct contact with birds, there are a few people that have been thought to contract the virus from close contact with relatives that were currently infected. Knowing how lethal the H5N1 virus is, close attention is

being paid to monitor the efficiency of human to human transmission from mutation or gene swapping by the virus. If the virus mutates and the ability to move from person to person is obtained it will signify the start of a pandemic (Woodson, p.6).

The latest estimates are that if a pandemic occurs employers should anticipate a 40% reduction in the work force (Wiersch & Russell, 2006). This coupled with the increase requests for services by the Division along with the potential number of deaths makes it imperative that the Miami Township Division of Fire and EMS has a policy in place to ensure the continued operations of the Division as well as the safety of the employees.

Knowing how fast a flu pandemic could strike and the ability for the virus to travel around the globe, along with the health risks to firefighters supports the research of this topic based on two of the United States Fire Administration operational objectives. Those two objectives are: to promote within communities a comprehensive, multi-hazard risk reduction plan led by the fire service organization; and to respond appropriately in a timely manner to emerging issues (United States Fire Administration [USFA], 2003, II-2).

The thought of an influenza pandemic to some may be unimaginable, but there is evidence that would confirm that we are on the brink of a major event. There is also a direct correlation between the problem identified and The Executive Development Course of the Executive Fire Officer Program. One of the Executive Development course goals is to provide the executive fire officer with an opportunity to use research to solve real-world problems in their work environments (United States Fire Administration [USFA], 2006, p. SM 12-4).

An influenza pandemic is a real world problem that will affect each and every human being on the face of the earth and put an incredible strain on the emergency services community. The research into this topic will give the Miami Township Division of Fire and EMS, along with

other emergency services in the area, the ability to recognize the deficiencies that they have in responding to this type of crisis as well as to give direction on how to plan for such an event.

Literature Review

1. What are the potential problems to the community as well as the Division if there is an influenza pandemic?

Current prevention of influenza is based on vaccination of the public, but one of the problems that the public will face is the lack of an appropriate amount of vaccine (Rooker, 2005). The flu vaccine is created from a method by which a fertilized chicken egg is injected with the virus. The viral particles are then separated from the egg. It takes 6 to 8 months to create a batch of vaccine. The world capacity of vaccine is approximately 300 million doses. This will only protect approximately 5% of the world's population, which exceeds 6.6 billion (Woodson, 2005). There are also only 4.5 million doses of vaccine in the United States and more than 10 million firefighter and EMS personnel (Rooker, p. 30).

The other problem to this equation is that the flu virus is always changing. In March 2005, Sanofi Pasteur, the French vaccine manufacture, released the first vaccine to protect against the H5N1 virus. The virus proved to be far more virulent and the doses needed to combat the virus were much higher. This equates to less vaccine available to public. The other side of the coin is that the virus is always mutating and vaccine makers are unable to identify what the virus will look like when a pandemic emerges. This will virtually mean that there will be no vaccine available to the public during the first wave (Woodson, 2005).

Hospital and healthcare services will be overwhelmed. Healthcare workers will also become ill and die at a rate the same as or higher than the general public due to their frequency of exposures (Osterholm, 2005).

It is anticipated that the first victims of the flu will receive quality care because resources, such as ventilators, will be available, but they will soon be exhausted. Once the pandemic is in full swing the hospitals will soon run out of supplies and room. The general public will be forced to care for themselves (Woodson, 2005). Dealing with the high mortality will also place a strain on local coroners and funeral homes. The likely hood that space will run out to store the bodies is a reality (Evans, 2005, p. 26).

The Combined Health District of Montgomery County compiled information from the Centers for Disease Control and was able to run a statistical scenario to determine the effects of a pandemic on Montgomery County. Table 2 shows the effects of the last three pandemics on the United States and the anticipated outcome for Montgomery County.

Table 2

Estimated Human Health Consequences Associated with Pandemic Influenza scenarios in the United States

Human Health Consequences	1957 & 1968-like Scenario		1918-like Scenario	
	United States	Mont.Co.	United States	Mont. Co
Illness	90 million	162,000	90 million	162,000
Outpatient Care	45 million	81,000	45 million	81,000
Hospitalization	865,000	1,557	9.9 million	17,820
ICU care	128,750	232	1.485 million	2,673
Mechanical ventilation	64,875	117	745,500	1,342

Table 2 (*continued*)

Deaths	209,000	376	1.903 million	3,425
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Note. From Combined Health District of Montgomery County (2006, September 6). Pandemic influenza preparedness and response plan.

The increased absenteeism in the work force will also be a reality. It is estimated that 40% of the work force will be at home sick or caring for sick family members (Wiersch & Russell, 2006). The reduction in labor will then have a trickle down effect in the fact that essential services like fire, EMS, water, electricity, and the delivery of goods, including food, will be either delayed or shut down entirely (Woodson, 2005). A public quarantine might be instituted, which would only compound the problem (Evans, 2005).

2. What resources are available to assist the Division in preparing for an outbreak?

Research provided a number of resources that are available to assist departments in preparing for an influenza pandemic. The International Association of Firefighters (IAFF) has published an informational bulletin for emergency responders when dealing with an influenza pandemic. It is a complete document dedicated to educating the first responder on the dangers of influenza. The document covers all aspects starting with what influenza is, the history of pandemics, how it is transmitted, the treatments available, what the first responder needs to do to protect themselves, and ending with what is being done globally. The document goes into great detail to discuss the personal protective equipment that is available and stresses proper hygiene (International Association of Firefighters [IAFF], 2006). The document also contains a list of links that can be accessed to find out more information on the internet.

The National Fire Protection Association (NFPA) is an organization that develops consensus standards for the fire service. The documents that they publish are the benchmarks that many fire departments strive to achieve. The one document that will undoubtedly be useful to the preparation of planning for an influenza pandemic is NFPA 1581. NFPA 1581 sets the standards for an infectious control program. The standard details how a program is to be set-up by describing the different sections like training and risk management (National Fire Protection Association [NFPA], 2005).

The governmental website pandemicflu.gov proved to be loaded with helpful information. It provides up to date information on the progress of the flu virus, in particular the H5N1 strain. It monitors and reports current outbreaks, global activities, current research being done, general information on the flu virus as well as an extensive list of questions and answers. The site details planning strategies for state and local authorities along with individual preparations and healthcare facilities. The web site also provides links to other sites like the World Health Organization that may prove useful to those seeking more information (U.S. Department of Health and Human Services, 2006).

The World Health Organization (WHO) is one of the leaders in monitoring potential outbreaks of deadly diseases around the world and influenza outbreaks are no exception. The World Health Organization published a document that is intended to help with the containment and rapid response to a pandemic influenza outbreak. The document is more focused on the National and global scale, but some of the material within the publication could prove useful. The document describes how to recognize, investigate, and report early signs of a potential influenza pandemic. It outlines a measure of reducing transmission and the use of the antiviral stockpile (World Health Organization [WHO], 2006).

The Combined Health District of Montgomery County recently released a response plan for an influenza pandemic. The document, describes the history of influenza and phases of a pandemic. It states the purpose of the plan, which is to outline public health preparedness prior to a pandemic, describes the roles and responsibilities for key response partners during a pandemic, and how public health interventions will be implemented by the Combined Health District of Montgomery County during a pandemic (Combined Health District of Montgomery County, 2006, p.7). The document also describes in detail the concept of operations in regard to command and coordination, mitigation, communication, public education, epidemiological surveillance, vaccinations, isolation, quarantine, and social distancing. It describes how the government as well as the health care system will continue to operate(Combined Health District of Montgomery County).

3. What type of equipment is available to protect first responders before, during and after an outbreak?

The Ohio Department of Health published a document to help prevent the flu and other illnesses. They state that establishing good health habits now will help to fight off the flu as well as other illnesses (The Ohio Department of Health, 2006). They target some of the basic things. They stress hand washing and the proper procedures to washing. The procedures include how long to wash, when to wash, and not to share a towel with others, but to use a paper towel or air dry instead. They also suggest if an area to wash is not available then to use an alcohol-based sanitizer. The other area that they talk about is that of a healthy diet. They recommend a balanced diet with lots of vegetables and whole grain products. Drink plenty of water and limit the intake of salt, sugar, and alcohol. Exercise regularly and get plenty of rest. Try to not rub

ones eyes, nose or mouth and try to avoid those people that appear or are sick as much as possible. They also recommend a three foot distance be obtained from those that are sick or show signs of an infection. The last recommendation that is given is to remain at home, away from others if signs and symptoms of an influenza infection are present (The Ohio Department of Health, 2006; Barishansky & O'Connor, 2005, 57).

Proper vaccinations are also recommended to help protect against the flu virus. Oseltamivir or better known as Tamiflu is one of two anti-viral drugs. Tamiflu does not prevent the infection of the virus, but helps to prevent the infected cells from mutating and infecting other healthy cells. For Tamiflu to be effective it must be administered before exposure happens or immediately after an exposure is suspected. It is also recommend that Tamiflu be taken in conjunction with Relenza which is the second anti-viral drug. Relenza is taken through inhalation. The combination of the two drugs gives the best chance in preventing the flu virus from expanding (Rooker, 2005, p.30).

One tool that the responders can use to help identify if they are at risk is thermometer. One way to gauge if the person could have the flu is if their temperature is over 100.4°F and they have either a sore throat, cough or shortness of breath (Russo, 2006, p.52)

Proper use of personal protective equipment is also a must in helping to protect the individual from contracting the influenza virus. The proper equipment includes the use of gloves, gowns, and masks with eye protection. Once used these items should either be properly cleaned or discarded in a fashion as with any other biological waste (Barishansky & O'Connor, 2005, p. 57).

Gloves help to eliminate cross contamination from one person to another. Gloves have been shown to reduce contamination of patients and health care providers by 70-80%. It is also

imperative that gloves be changed after each patient along with using an alcohol-based antiseptic rub. The IAFF also recommends that the gloves used meet and are certified to NFPA 1999 specifications (IAFF, 2006, p.12).

The IAFF suggests that eye protection meet or exceed the NFPA 1999 standard on Protective Clothing for Emergency Medical Operations. It is suggested that eye protection be worn anytime bodily fluids may be splashed and it must be worn when the emergency responder is within six feet of the person being cared for. Someone with a cough would be enough for the emergency crew to don the eye protection. Also, regular glasses alone are not enough protection from fluids and gowns certified to NFPA 1999 need to be worn as well (IAFF, 2006, p.13).

The respiratory tract of the emergency responder needs to be protected at all costs because the influenza virus settles in the upper respiratory tract once inside the host. The IAFF list the different types of respirators available starting with the minimum level of protection. They suggest that if a disposable respirator is to be used then at a minimum a P-100 should be used to protect the responders. The “P” rating means that it is strongly resistant (oil proof) or is used for unknown conditions. The respirator that has a 100 rating after the “P” qualifies that respirator to be able to filter out 99.97% of the particles that could harm the responder. The highest level of protection that the responder could have would be to use a powered air purifying respirator (PAPR) with a high efficiency particulate air filters (HEPA) as well as full face piece. The disposable respirators only filter out particles and not vapor or gases (IAFF, 2006). Another added precaution to take is to place a non-rebreather mask or a surgical mask on the patient (Barishansky & O'Connor, 2005, p.57)

4. What will be the expected impact on the Divisions ability to respond to emergencies?

It is projected that approximately 40% of the workforce will be absent (Combined Health District of Montgomery County, 2006, p.10; Wiersch & Russell, 2006). If these estimates are accurate then Miami Township Division of Fire and EMS will be truly hampered as will the rest of the counties emergency services. A loss of 40% of the work force would drastically reduce the ability to handle calls within the district as well as support mutual aid requests. Currently the minimum staffing for a 24 hour period is 11 personnel per Miami Township Division of Fire and EMS Chief David B. Fulmer (personal communication March 2005).

Reliance on mutual aid will become strained or non existent. As of October 1, 2006 the Miami Township Division of Fire and EMS has requested EMS mutual aid 160 times and for fire or other emergencies 158 times for a total of 318 times. The EMS mutual aid requests are made when the Division is unable to respond due to a lack of available EMS resources. The Division has also been requested by other agencies for mutual aid 168 times in which 114 of those were for EMS related incidents (Miami Township Division of Fire and EMS, 2006).

5. How can the Division expect its employees to function in the capacity of an emergency responder when their families as well as their own lives may be in danger?

There is limited to no information on how the Division can expect its' employees to function in the midst of an influenza pandemic. According to Katherine West a survey of 100 physicians was conducted in which it was discovered that 80% said that they would care for sick patients and 40% said that they would work even if their own health was at risk (West, 2006). During the 1918 influenza pandemic 25% of all emergency responders did not show up to work.

There was an overwhelming fear of contracting the disease and then passing it on to family members (West, 2006).

In summary, the literature review revealed a copious amount of information. Most of the information that was discovered revolved around planning for the next pandemic as well as how to protect the general public and the emergency responder. There was pertinent information that detailed what type of equipment is available to protect the responder and what problems in general can be anticipated. The research also showed that there is very little information on what individual departments can anticipate as far as how the individual employee will function and how the department can expect to operate.

There are checklists that have been published that range from the individual citizen to those that help a department plan and prepare for a pandemic. The information that was gathered came from a host of references. The information was obtained from internet sites, trade magazines, and departmental statistics as well as county, state, and federal preparedness plans.

Procedures

Data and information was gathered for the research project in basically two manners. There was an extensive literature review along with an internal survey of the Miami Township Division of Fire and EMS.

The start of the research began at the National Fire Academy's Learning Resource Center and its LRC online card catalog. The catalog was searched for references to influenza pandemics and pandemics in general. The search produced limited results. The material that was discovered was from recent periodicals.

The research was then directed toward the internet. With influenza pandemics being such a hot topic as of late there was no shortage of information. Numerous search engines were used

as were specific websites. Current documents from the World Health Organization, The Center for Disease Control, and the IAFF were all located online. Medical journals pertaining to the H5N1 virus were also available. The Department of Health and Human Services website pandemicflu.gov proved to have an unlimited amount of information as did the Ohio Department of Health. Historical data on past influenza pandemics was also gathered from various websites and trade journals.

Local information was gathered from the Combined Health District of Montgomery County, The Greater Miami Valley EMS Council, and the Miami Township Division of Fire and EMS internal statistics.

Due to a lack of information available online to help determine how the Division could expect its employees to function in the capacity of an emergency responder when their families as well as their own lives may be in danger an internal survey was created. An eight question survey was developed and written in a manner in which the employer would have an understanding in how the employees were going to act if a pandemic were to occur (see Appendix A). The survey was distributed to all front line staff within the Division, which totaled 65 people. The line staff which encompasses 35 part-time, 28 full-time, and two part-paid firefighters were selected because they are the people that have to interact with the public on a day to day basis and their exposure level would be the greatest.

Limitations

The information on how to prevent, prepare, and handle an influenza pandemic is a very new subject as is the statistical data that is available. The data is constantly changing and being updated. The Combined Health District of Montgomery County's plan is already being revised at this time and the second revision is due out in the next few months. What was discovered is

that this is not an isolated occurrence, but is happening at both the state and federal levels as well. It is anticipated that these are living documents and will continue to evolve as time goes on and new research becomes available.

The survey also provided some limitations to the project. With employees being absent from work, only a portion of the population returned the survey.

Definitions

Epidemic: An outbreak that spreads widely and affects many people within a region or population within a defined time period.

Flu: Infection or illness due to influenza virus. It is often used to refer to common colds or even gastrointestinal illnesses.

Infectious: Capable of transmitting an infectious agent from one person to another.

Influenza: A highly contagious seasonal respiratory illness caused by the influenza virus. It is characterized by fever, chills, sore throat, nasal congestion, cough, exhaustion, and severe muscle aches.

Mutation: A relatively permanent change in the genetic material.

Pandemic: Widely spread epidemic. Usually refers to the global spread of disease.

Prevention: Taking measures for anticipation, prevention, detection, and early treatment of disease.

Quarantine: A restraint on the activities of persons or the transport of goods that is designed to prevent the spread of disease.

Resistance: The ability of microbial strains or pathogens to withstand effects of antimicrobial agents.

Vaccination: The administration of vaccine in order to induce an immune response for future protection against the infectious agent of interest.

Vaccine: A substance that can stimulate the immune system to protect against an infectious organism of interest at a future point in time.

Virus: A group of infectious parasites that is typically much smaller than bacteria and characterized by the inability to reproduce outside of a living host cell. (IAFF, 2006)

Results

1. What are the potential problems to the community as well as the Division if there is an influenza pandemic?

The current prevention revolves around the vaccination of the public. There is a definite feeling that when an influenza pandemic arrives there will not be a sufficient amount of vaccine available to administer to the population (Rooker, 2005). The world capacity at the current time is 300 million doses and the population is 6.6 billion. This would only allow 5% of the population to be inoculated (Woodson, 2005). Those that are authorized to receive the vaccination first are the ones most susceptible to infection like the young and old, but health care workers as well. Currently in the United States there are 4.5 million doses of vaccine and over 10 million firefighter/EMS personnel (Rooker, 2005).

The other worry is that even though there is a vaccine in production now it is anticipated that it will have no effect on the influenza virus that causes the pandemic. The reason is that the influenza virus would have mutated and until the manufactures of the vaccine know what the virus looks like a vaccine can not be developed. The current H5N1 virus has also proved to be tougher to fight off with the regular amount of vaccine and a larger than normal dose is needed to combat the virus (Woodson, 2005).

Once the pandemic is in full operation the effects on the economy, health systems, and the general day to day operations of the population will be turned upside down. There will be approximately 40% of the work force that will be absent from their jobs from either personal illness, family illness, fear of contracting the flu and death (Wiersch & Russell, 2006). This will then have a trickle down effect. Employers will have to rely on the employees that are left to make up the difference, which will be virtually impossible, because there still will be the same needs for goods and services with an increase for demand on the health care industry. Hospitals will be quickly overcrowded and the number of patients will overwhelm the already short staff. EMS agencies will not be able to provide a speedy service because of increased call volume. This will lead to people going untreated and possibly succumbing to the virus. Morgues and funeral homes will also be overcrowded and the problem of proper storage of bodies will be a huge issue. Lastly there could be large amounts of power outages and lack of water because of the absenteeism at those facilities and the delivery of the fuel like coal to operate them (Wiersch & Russell; Woodson, 2005).

2. What resources are available to assist the Division in preparing for an outbreak?

The literature review provided a number of resources that are available to assist departments in preparing for an influenza pandemic. The U.S. Department of Health and Human Services web site pandemicflu.gov proved to be one of the best sites available to obtain up to date and accurate information on the tracking of current and new influenza viruses. It details plans for how to prepare for a pandemic at all levels including the individual citizen (U.S. Department of Health and Human Services, 2006).

The World Health Organization (WHO) is undoubtedly one of the leaders in monitoring potential outbreaks of not only influenza, but other deadly diseases. The WHO has published a document that teaches agencies how to recognize, investigate, and report the early signs of a pandemic from influenza. The WHO is also more of a global watch dog and the reports that it does post are more focused on national and global responses (WHO, 2006).

The IAFF was found to be a great resource for preparing for an influenza pandemic. The IAFF has a document specifically tailored to local entities. The publication covers all aspects of the influenza virus from what it is to how to protect the employee. The IAFF provides a check list that the municipality can follow to make the process easy (see appendix B). They also provide links to other agencies that can assist in the preparation of the pandemic and the one that will be used extensively is the NFPA document 1581. NFPA 1581 sets the standards for an infectious control program (IAFF, 2006; NFPA, 2005).

The last document that will be used extensively by the Miami Township Division of Fire and EMS will be the Combined Health District of Montgomery County's response plan for an influenza pandemic. This document is going to be crucial to the operation of the Division because it is going to be what all the departments and health care facilities in the immediate area will be following. The plan outlines the roles and responsibilities for those responding during a pandemic and how public health interventions will be implemented. The lays out who will be in command of coordinating, educating the public, administering vaccinations and managing quarantines (Combined Health District of Montgomery County, 2006).

3. What type of equipment is available to protect first responders before, during and after an outbreak?

The first piece of equipment that is available to help protect first responders is the responder themselves. By establishing good health habits it will help their bodies be better prepared to fight off a virus attack. Start by washing properly. By using a plenty of soap and scrubbing their hands for set amount of time the responder drastically reduces the chances of obtaining the virus. The next health habit is to drink plenty of water and eliminate or at least limit the intake of salt, sugar, and alcohol. A balanced diet is important and to try and remember to keep at least a three foot separation from those individuals that are suspected of being sick (Barishansky & O'Connor, 2005; The Ohio Department of Health, 2006).

Early vaccinations are next line of defense for responders. It is encouraged that all health care workers receive annual flu shots to help reduce the spread of the virus as is the proper use of personal protective equipment. Gloves, gowns, and masks with eye protection are a necessity and if they are unable to be decontaminated they should be discarded (Barishansky & O'Connor, 2005). Gloves and gowns help to reduce the cross contamination of diseases from person to person. It has been shown that by wearing gloves properly there has been a decrease of 70-80% of cross contamination from patient to responder and vice versa (IAFF, 2006).

Protection of the eyes is also crucial because the eyes are one way in which bodily fluids that contain the influenza virus can be absorb. It is recommended that approved eye protection, not normal eye glasses be worn any time bodily fluids are present and if a cough is the only symptom present (IAFF, 2006).

The respiratory tract is the next part of the body that requires protection. Since the influenza virus resides in the respiratory system protect that route of exposure is imperative.

There are numerous choices of respirators available to the responder. They range from half masks to fully encapsulated respirators that protect the eyes as well. The IAFF (2006) recommends that if a disposable mask is to be used then it should have at least a rating of P-100. That ensures that the responder will be protected from 99.97% of the particles that could infect the rescuer. The highest level of protection is a fully encapsulated mask that prevents transmission of the virus through the eyes, nose, and mouth. To obtain this level of protection the responder can wear a self contained breathing apparatus, which is usually not practical in an EMS environment or a powered air purifying respirator (PAPR) with a HEPA filter (IAFF, 2006).

Once the responder is out in the public it is important that they are able to identify the signs and symptoms of the flu. One of the tools that can be used is a thermometer. If the patient has a temperature over 100.4 °F and exhibits a soar throat, cough or shortness of breath then the patient should be considered contagious for the influenza virus (Russo, 2006). If the patient is exhibiting those symptoms with a cough it is encouraged that a mask be placed onto the patient. The mask could be a non-rebreather or some form of a disposable mask (Barishansky & O'Connor, 2005).

4. What will be the expected impact on the Divisions ability to respond to emergencies?

If projections are correct then the Township will lose 40% of its work force to illness, family illness, death or the refusal to come to work because of fear of becoming infected with the influenza virus (Combined Health District of Montgomery County, 2006; Wiersch & Russell, 2006). The Division currently staffs a 24 hour shift with no less than 11 personnel which are a combination of career and part-time. Under normal operating conditions the Division uses

mutual aid from other communities when it is unable to respond. So far in 2006, a total of 318 requests for assistance have been made. The Division has also been requested by other municipalities 168 times (Miami Township Division of Fire and EMS, 2006). Once the pandemic occurs calls for service will increase exponentially for not only Miami Township, but the surrounding communities that Division relies on for mutual aid. The Division will have difficulty in handling the volume of calls for service.

5. How can the Division expect its employees to function in the capacity of an emergency responder when their families as well as their own lives may be in danger?

A recent survey was taken from 100 physicians to find out how they would react or perform their duties during an influenza pandemic. It was discovered that 80% would care for sick patients and 40% would continue to work even though their own health might be in danger (West, 2006).

During the last great pandemic that occurred in 1918 it was discovered that 25% of all police and fire personnel did not respond to work. It was determined that they elected to remain at home for fear of contracting the virus and then passing it on to other family members (West, 2006).

To try and determine how the Miami Township Division of Fire and EMS personnel might react and perform during an influenza pandemic a survey was created (see appendix A). The survey consisted of eight questions that referenced not only full-time staff, but part-time as well. 63 surveys were issued and 37 responded, accounting for 59% of the line employees. The lack of return was due to vacations, illness, and other absences that could not be avoided due to the time frame for collecting data. The results of the survey are based on the 59% return and are listed in Table 3.

Table 3

Employee Survey Results			
Questions	Yes	No	N/A
If an influenza pandemic occurred, would you continue to report to duty?	92%	8%	0%
If overtime was available would you call in for it?	62%	19%	19%
If mandatory overtime was instituted, would you report for duty?	84%	3%	13%
If you are a part-time employee and you were ordered in, would you report for duty even if you were still required to go to your full-time job?	27%	43%	30%
If you work part-time for another municipality would you be willing to terminate that employment to work extra for Miami Township?	51%	35%	14%
A pandemic could last three to six weeks and have at least three waves. Would you be willing to stay at the firehouse under quarantine conditions until the pandemic was over?	68%	32%	0%
If a patient was suspected to have the flu, would you continue to treat the person even though there was a chance for you or your partner to be infected?	97%	3%	0%
Will you adhere to all policies referencing personal protective equipment and decontamination procedures even if full SCBA is required on all calls?	97%	3%	0%

Based on how public employees reacted in 1918 with 25% not reporting to duty it is encouraging to see that over 90% of the Division's employees would still report. In fact the

whole survey suggests that there is a loyalty to the job and helping people. One area that does stand out is that 3% answered they would not adhere to all policies referencing personal protective equipment and decontamination procedures.

Discussion

After looking at the literature review and the results of the survey it is obvious that an influenza pandemic will eventually occur. History has a way of repeating itself and the statistics prove this to be true. This research project helped to bring to light that there needs to be substantial planning on the part of Miami Township Division of Fire and EMS to protect its employees as well ensure that emergency services continue. At the current time the Division lacks the resources and is not prepared to handle such an event.

In 1918, 25% of the emergency workers did not report to duty because of fear of contracting the virus and or giving it to their families (West, 2006). The internal survey showed that the Division can expect to have at least 92% of the employees report to duty. The survey also showed a staggering 97% of the Divisions employees would continue to treat patients. A survey conducted by another agency showed that out of a hundred physicians only 80% would continue to treat patients (West, 2006). Having that amount of providers still willing to report to duty is encouraging because the calls for service are only going to increase and the more personnel that that are available the easier it will be to handle.

If statistics are accurate the Division can expect to lose 40% of its work force from either illness or death (Wiersch & Russell, 2006). If that happens, the Division will drop from 70 employees to 42. According to the survey only 27% of the part-time staff would not report to their full-time jobs and help out the Division. A 40% anticipated loss of the 27% that would report to duty all the time, would leave only 18 part-time firefighters to draw from on a full-time

basis. A 40% reduction in full-time staff would leave the division with 20 career firefighters. That would give the Division a total of 38 employees to respond to calls. That would barely allow the Division to continue to maintain three shifts of 11 personnel 24 hours a day. The Division under normal operating conditions already has requested mutual aid 318 and responded 168 times to surrounding communities. With that said mutual aid can not be counted on because if the Township is affected then the surrounding communities will be as well. The ability to respond to their own emergencies will be taxed and they will not be able to give support to other communities let alone the Township.

All the literature that was researched recommends the first line of defense is that of prevention. Basic personal hygiene, a good diet, exercise, and receiving current flu shots is just the beginning (Rooker, 2005; The Ohio Department of Health, 2006). It is believed that there is a chance of vaccine shortage because there is only 300 million doses for the entire world and the population exceeds 6.6 billion. When a pandemic does occur there will not be a vaccine available to fight that particular strain for 6 to 8 months because it takes that long just to develop one (Woodson, 2005).

Another step in preventing the transmission of the virus to be able to identify it. It is recommended that a patient with a temperature of 100.4 °F along with a sore throat, cough or shortness of breath be considered and treated as if contagious with the influenza virus (Russo, 2006). A mask placed on the patient should also be considered.

There are countless recommendations for the use of personal protective equipment. This is to include gloves, gowns, masks, eye, and respiratory protection. The IAFF recommends that the equipment be certified to all NFPA standards (IAFF, 2006). The use of respiratory equipment that uses a full face shield is also highly recommended. The virus sets up shop in the

respiratory tract where it attacks the health cells. By preventing the virus access to the routes that lead to the respiratory system increases the chances of not contracting the virus very high. The internal survey did show a disturbing sign and that is that 3% of the employees stated that they would not wear full self contained breathing apparatus if it is required by the Division.

Another preventative measure is that of quarantine. For the general public this could mean that certain areas are off limits or even people being restricted from leaving their homes. When asked if the employees would be willing to adhere to a quarantine in which they lived at the firehouses during the duration of the pandemic only 68% said that they would. This could cause the employees to be exposed to the virus outside of the controlled environment of the firehouse and essentially take the chance of infecting the other employees when they return or even passing the virus onto their families.

If the population is not prepared for a pandemic the results to the community would be devastating. There is the anticipation of possible losses of essential services like electric, water, and food. Goods will not be able to be transported and communities could become isolated. This coupled with loss of staff and the increase in call volume could prove devastating for the Division. It is apparent that the Miami Township Division of Fire and EMS must begin to prepare for the inevitable pandemic.

Recommendations

This research project has shown that the Miami Township Division of Fire and EMS needs to be proactive instead of reactive when it comes to the inevitable arrival of an influenza pandemic. After studying the literature review and the internal survey the following recommendations are being made to help the Division prepare for a possible pandemic.

1. Develop a comprehensive plan that models the checklist provided by the IAFF and also follow the guidelines set forth by the Combined Health District of Montgomery County.
2. Expand on the Division's current infectious control policy. Ensure that it meets or exceeds all of NFPA 1581 which sets the standards for an infectious control program as well as provide training to all employees on to how to protect themselves and their families. Also educate the employee on how to recognize the signs and symptoms of the flu.
3. Provide all employees with up to date flu shots.
4. Ensure that there is an adequate amount of personal protective equipment for the duration of the pandemic. This is to include gowns, gloves, masks, and eye protection that all meet or exceed the NFPA standard.
5. Respiratory protection is going to be the most crucial and it is encouraged that all personnel that may have a chance to be in contact with an infected person have a minimum of a P-100 respirator based on the recommendations of the IAFF and the rest of literature review.
6. Start to stockpile food and water to handle enough meals for the duration of the pandemic.
7. Develop a plan to house the employees if a quarantine is issued. This will include decontamination areas as well as places of refuge so that off duty crews do not mix with the crews that are actively responding to calls. A plan will also need to be developed to assist the employee's families who will remain at home so that they will be taken care of in regards to food, water, and medical care.

8. Meet with the Miami Township Board of Trustees to go over the threat of an influenza pandemic as well as the plan to ensure that services are continued. Also, request that in the event that a pandemic occurs they make provisions to offer the part-time staff more hours than the 1500 hour rule allows.
9. Meet with IAFF Local 2951 to discuss any contractual problems that may result and to come up with a solution to those problems that both parties can agree on.
10. Continue to be proactive by participating on local committees at the county and regional arenas.

A recommendation to future readers of this research project is to continue to be as proactive as possible. The research on the topic of influenza pandemics is constantly changing. Constantly refer to governmental web sites as well as local health departments because they will have the most current information. Lastly, do not reinvent the wheel when it comes to preparing for a pandemic. Model the plan after those that are in existence and make modifications that are needed for a problem that is unique to an individual department.

All the research points to an inevitable pandemic hitting the globe in the near future. It is not a question of if, but when. The best defense in surviving such an event is to be prepared!

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Appendix A

Influenza Pandemic Survey

- 1) If an influenza pandemic occurred, would you continue to report to duty?
 Yes No
- 2) If overtime was available would you call in for it?
 Yes No N/A
- 3) If mandatory overtime was instituted, would you report for duty?
 Yes No N/A
- 4) If you are a part-time employee and you were ordered in, would you report for duty even if you were still required to go to your full-time job?
 Yes No
- 5) If you work part-time for another municipality would you be willing to terminate that employment to work extra for Miami Township?
 Yes No
- 6) A pandemic could last three to six weeks and have at least three waves. Would you be willing to stay at the firehouse under quarantine conditions until the pandemic was over?
 Yes No
- 7) If a patient was suspected to have the flu, would you continue to treat the person even though there was a chance for you or your partner to be infected?
 Yes No
- 8) Will you adhere to all policies referencing personal protective equipment and decontamination procedures even if full SCBA is required on all calls?
 Yes No

Appendix B

Pandemic influenza checklist



IAFF Influenza Pandemic Checklist

Done	In Progress	Not Started	I. Planning Logistics
			Establish an Incident Management System that meets NFPA 1561, <i>Standard on Emergency Services Incident Management System</i> , including written Standard Operating Procedures (SOP) and Mitigation Plan.
			Identify and define roles and responsibilities of the Incident Commander who will coordinate the emergency response and the response teams (NFPA 1500, chapter 8.1).
			Inter-Agency Cooperation: Establish relationships with community public health department and other emergency management groups. Define functional roles and responsibilities of internal and external agencies, organizations, departments, and individuals, and establish lines of authority.
			Communications Plan: Establish systems and procedures (how, how often, when, what, and to whom will the information be disseminated) and articulate resource requirements.
			Set up authorities, triggers, and procedures for activating and terminating the response plan.
			Develop and plan for scenarios likely to result in an increase or decrease in demand for your services during a pandemic (e.g. search and rescue, assist with quarantine, etc). Define potential roles outside of your usual duties (i.e. assisting healthcare facilities in mobilizing patients from one location to a quarantine location or other unusual activities).
			Determine training and define needs for training (NFPA 1600, 5.12).
			Implement an exercise/drill to test your plan, and revise periodically.
			Develop a disaster recovery plan.

Appendix B (continued)

Done	In Progress	Not Started	II. Infection Control
			Ensure adoption of an infection control program that meets the requirements of NFPA 1581, Standard on Fire Department Infection Control Program.
			Ensure the fire department has a written infection control policy statement defining the department's mission in limiting the exposure of members to infectious diseases during the performance of their assigned duties and while in the fire station living environment.
			Ensure the fire department has an experienced individual within the department designated as the infection control officer.
			Ensure availability of all flu vaccines.
			Ensure the training and education is a component of the infection control program and includes proper selection and use of personal protective equipment, standard operating procedures for safe work practices in infection control, proper methods of disposal of contaminated articles and medical waste cleaning and decontamination, exposure management, and medical follow-up.
			Ensure the fire department implements and enforces hand and skin washing practices and decontamination procedures.
			Establish and provide fit testing and skill training on all respirator types used to prevent exposures.
Done	In Progress	Not Started	III. Inventory Checklist
			Community: Develop an understanding of the local community dynamics, available resources, and how they may shift during a pandemic – size and distribution of population, number and location of health facilities, quarantine sites, transportation issues, large spaces that could be transformed into healthcare or shelter facility, etc.
			Resources: Identify requirements during surge capacity (i.e. during a pandemic) – PPE, medical gloves, P-100 respirators, vaccines, emergency supplies for potential shelter-in-place at worksite, etc.
			Establish funding sources for planning process and for surge capacity.

Appendix B (continued)

Done	In Progress	Not Started	IV. Impact on Staff
			Determine impact on staff – absenteeism due to illness or attending to ill family member or afraid to come into work, and develop Contingency Plan for such an event.
			Determine potential safety issues and plan for prevention
			Train and prepare ancillary workforce (e.g. contractors, non-first responders, support staff)
			Encourage and track vaccination history (annual influenza, HepB, HepA, Td, etc.).
			Evaluate staff access to, and availability of, healthcare services during a pandemic. Services should include mental health and social services.
			Establish policies for restricting travel and preventing influenza spread at the worksite. Encourage proper hygiene practice and universal precautions.
Done	In Progress	Not Started	V. Resource Allocation
			Education: Disseminate Influenza Pandemic Information.
			Utilize information developed by IAFF and other materials on pandemic from WHO, CDC and PHAC.
			Communication Channel: establish two-way information flow.
			Disseminate information frequently to all staff to prevent misinformation or fears based on rumors. Establish a dedicated staff member who is responsible for disseminating information. Staff must also be able to easily provide feedback to designated staff member on what they are facing, including those issues experienced in the field.
			Establish funding for training sessions.

FARMERSVILLE														0	0
														0	0
FRANKLIN	1		1	2										2	4
														0	2
GERMANTOWN				2										1	3
														3	1
JEFFERSON TWP	1	1	1											2	1
														2	0
KETTERING														0	1
														0	0
MIAMISBURG						1								0	14
	5	5	2	4	4	9								34	56
MORaine	2	4	3	7	3	2								18	28
	4	7	2	2	4									19	30
NEW LEBANON	1													1	0
														0	0
WASHINGTON TWP		10	1	10		4								5	74
	1	6	8	3	2	1								33	27
WEST CARROLLTON	1	5		5		2								2	27
	2	3	3	2	1									12	12
MONTHLY TOTALS	22	47	24	40	18	22	0	0	0	0	0	0		54	158
ANNUAL RUNNING TOTAL	126	256	150	296	168	318	168	318	168	318	168	318		114	160
														168	318