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The Influences Of System Affiliation, Size, And Location On Bioterrorism Preparedness Among Florida Hospitals

Kourtney Scharoun
University of Central Florida

THE INFLUENCES OF SYSTEM AFFILIATION, SIZE, AND LOCATION ON BIOTERRORISM PREPAREDNESS AMONG FLORIDA HOSPITALS

by:

KOURTNEY SCHAROUN
B.S., University of Central Florida, 1999
M.S.H.S. University of Central Florida, 2002

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ABSTRACT

In the event of a bioterrorist attack, emergency departments are considered the first line of response for all acute levels of care. This study focused on hospital emergency departments in Florida and the activities, policies, and procedures involved in preparing for a bioterrorist attack. Hospital size, location, and system affiliation were related to attaining these levels, and their impact was assessed.

Through a cross-sectional survey design, the physical properties of the 77 hospitals (i.e. facilities, equipment, communication systems, etc.), and the social characteristics of the organizations (managerial functions including: planning, training, financial, and environmental characteristics) were examined. One-way analysis of variance and t-tests revealed that bed size was a significant predictor of mean levels of preparedness. In addition, although more hospitals are conducting training activities, a disconnect between plans and communications of said plans still exists along with many deficiencies still needing to be corrected. Study limitations are discussed and important policy implications are presented. Suggestions for improving preparedness levels and implementing new policies include: conducting training exercises, developing community ties and mutual aid agreements, and using information technology with detection of an event and communication of the information garnered from these efforts.

This dissertation is dedicated to my parents Michael and Cheryl Scharoun and my grandparents David and Helen Shaheen, without whose support both emotionally and financially I could not have completed this endeavor. It is also dedicated to my fiancé, Ismael Nieves, for all of his support and love throughout this process. Heartfelt thanks are also owed to my committee, for their encouragement and frank advice given to me throughout the program.

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CHAPTER 1: INTRODUCTION

A holiday shopping season is in full swing. Shoppers are milling around the new local mall, excited that the holidays are here. Tourists from around the world mingle with local shoppers. They are wrapped up in their own shopping lists, trying to figure out what to get for their family and friends. Holiday music can be heard through the three dimensional sound system, adding to the excitement of the start of the holiday season.

Through all of the hustle and bustle, no one notices a nondescript man carries a large shopping bag. He looks around as he nears his destination- a crowded food court. Glancing to all sides of him, he takes out a device that appears to be a small thermostat box. But this seemingly ordinary box is much more than a thermostat box – it contains two vials of fluid attached to straw hoses, and connected to a micro-aerozolizer. He quickly attaches the box to a wall, flips the timer switch, and hurriedly leaves the building. In a matter of minutes, millions of particles will spill out from the aerozolizer in the form of an odorless, undetected mist. No one will notice that they are inhaling these tiny particles as they shop for their families. No one will feel anything as the particles are absorbed by their unsuspecting bodies.

In this crowded mall full of holiday shoppers, no one is safe, and yet no one feels afraid. They are completely oblivious to the fact that a smallpox virus was just released into the air, silently infecting many in the crowd.

When the day is over, the shoppers will go their separate ways back to their normal lives. Some will go home locally, others will return to places in

Central Florida, and still others will return to places around the world. All are virtual strangers to each other, but carry a similar, but silent tie that binds them together – they are now carriers of the smallpox virus.

In the days and weeks to come, people present themselves to the emergency department with flu like symptoms – fevers, headaches, vomiting, and backaches. The doctors cringe at what they believe to be an early rush of the flu season virus. Many patients receive medication and are sent home to their families. No one suspects that they are dealing with a far more powerful and deadly virus. But as the cases mount, someone decides that something is amiss and calls in the Centers for Disease Control (CDC). Once the first case of smallpox is diagnosed, panic ensues as a desperate attempt is made to locate those who have been in contact with the disease, and determine where it came from. By this time, people all over the world have begun to show symptoms of the disease, and others are silent carriers to other family members and friends. The outbreak has begun and emergency departments around the world are scrambling to deal with a massive influx of patients – both those who are truly sick and the "worried well" (As adapted from Osterholm & Schwartz, 2001).

The previous scenario, while fictional, could prove to be all too realistic as the possibility of a bioterrorist attack becomes a better identified risk in America. One only needs to look to terrorist attacks such the 1995 Sarin Nerve Gas attacks in Tokyo or the October 2001 anthrax attacks (described below) in the United States to demonstrate the vulnerability that exists for exposure to such attacks.

For example, on March 20, 1995, unsuspecting Japanese citizens made their way to the Tokyo subway system. What awaited them was the vicious plot of Aum Shinrikyo to disrupt life and kill innocent people. It represented the most serious attack in modern history on Japanese soil by terrorists, and demonstrated the ease of smaller terrorist groups to engage in chemical warfare (Council on Foreign Relations, 2003). Members of the Aum Shinrikyo cult placed packages shaped like everyday items, filled with plastic bags full of chemicals on five separate trains within the Tokyo subway system (Olson, 1999). They then punctured the bags with the tips of umbrellas and quickly fled the trains, allowing the chemical to seep out of the bags and evaporate into the air, exposing thousands of people to Sarin Nerve gas (Council on Foreign Relations, 2003). In the end, the death toll stood at 12, with over 3,800 people injured and thousands more fearful (Olson, 1999).

The anthrax attacks in October of 2001 occurred on the heels of the September 11, 2001 tragedy, and exacerbated fears of a widespread bioterrorist attack in the United States. The first brush with anthrax occurred in Palm Beach County Florida when a sixty three year old male was hospitalized, subsequently diagnosed with inhalational anthrax, and eventually succumbed to the exposure three days after diagnosis (Trager, Wiersma, Rosenstein, Malecki, Shepard, & Raghunathan, 2002). A series of other brushes with anthrax followed through a succession of envelopes mailed through the United States Postal Service to various individuals in New York, Florida, and Washington DC (Hsu, Lukacs, Handzel, Hayslett, Harper, & Hales, 2002). Although no one individual or group claimed responsibility for the attacks, in the end,

twenty-two individuals were diagnosed with exposure to anthrax and five fatalities were recorded (Wikepedia, 2004).

As citizens of Central Florida, home to Walt Disney World and other theme parks, we are particularly vulnerable to a covert attack due to our prime location and propensity to support tourism. Should an attack of this magnitude occur here, the previous scenario could create a nightmare of the proportion outlined in the preamble to this chapter.

The question is, can our hospitals and their respective emergency departments (EDs) handle such an influx of patients? Could they quickly recognize the symptoms of small pox, anthrax, or any other biological weapon in time to contain a potential outbreak? According to Donald Henderson, former director of the Johns Hopkins Center for Civilian Biodefense, and current Chairman of the National Advisory Council on Public Health Preparedness, "the major problem is that there is really no public health 'system' for dealing with infectious disease in this country, but, rather, a fragmented pattern of activities" (2001, p.67).

To be successful, the health care community, along with other local, state, and national entities, must work in concert with each other. This study focused specifically on these hospital emergency departments and the activities, policies, and procedures involved in preparing for a bioterrorist attack. The purpose of this study was to quantify different levels of preparedness in hospital emergency departments (EDs), and compare them to other EDs in the state of Florida. Further, this researcher explored the role of hospital size (small vs. medium vs. large), location (urban vs. rural), and system affiliation (system vs. non-system) in attaining these levels, and evaluated their impact.

Additionally, this study was one of the first to quantify the levels of preparedness since the events of September 11, 2001 and assess its impact, if any, on the way Florida hospitals prepare for the possibility of a bioterrorist attack. It also provided a baseline assessment of the levels of preparedness among Florida hospitals. If and when a brush with bioterrorism occurs, the results of this study can be used to benchmark preparedness levels and compare them to levels of preparedness after an attack has actually occurred.

Prior to September 11 and the anthrax scare of October 2001, bioterrorism preparedness was not a high priority for healthcare organizations. However, the events of September 11, 2001 and October 4, 2001, helped to place a high priority on bioterrorism preparedness. "It has breached our sense of security and exposed our vulnerability, forcing the Federal government and the country's emergency services to take a long hard look at what could happen if an act of terrorism involving weapons of mass destruction were to occur in Anytown, USA" (Dittmar, 1998, p.66). Further still, a bioterrorist attack can potentially cripple a hospital emergency department if the proper protocols are not in place, possibly rendering a life saving organization useless.

Definitions

Although the definition of bioterrorism brings about different meanings for different people, Edlin defines it as, "the threat of mass destruction by weapons of biological origin such as bacteria, toxins, and viruses" (2001,p.30). A more thorough definition, as provided by the General Accounting Office (GAO) builds upon this and defines it as, "the intentional use of any microorganism, virus, infectious substance, or

biological product that may be engineered as a result of biotechnology, or any naturally occurring or bioengineered component of any such microorganism, virus, infectious substance, or biological product, to cause death, disease, or any other biological malfunction in a human, an animal, a plant, or another living organism in order to influence the conduct of the government or to intimidate or coerce a civilian population" (2000, p. # unavailable). Utilizing either definition, however, one can see the enormous potential threat that an attack of this nature poses.

Further, there are several key characteristics to consider in dealing with a bioterrorist attack that set it apart from previous disaster scenarios. They are listed as follows:

- "The onset of the incident may remain unknown for several days before symptoms appear,
- Even when symptoms appear, they may be distributed throughout the community's health system and not be recognized immediately by any one provider or practitioner,
- Once identified, the initial symptoms are likely to mirror those of the flu or the common cold so that the health system will have to care for both those infected and the "worried well,"
- Having gone undetected for several days or a week, some infectious agents may already be in their "second wave" before the first wave of casualties is identified,
- Public confidence in government officials and health care authorities may be undermined by the initial uncertainty about the cause of and treatment for the outbreak,
- Health care authorities and hospitals may want to restrict those infected to a limited number of hospitals but the public may seek care from a wide range of practitioners and institutions, and
- Health care workers may be reluctant to place themselves or family members at increased risk by reporting to work" (American Hospital Association, 2000, p.18).

Levels of Preparedness

Prior to the events of September 11, 2001, preparations for a bioterrorist attack "were moving at a snail's pace in most of the medical community" (Edlin, 2001, p.30). Johnson concurs adding that, "there are widespread concerns that the country and its hospitals aren't prepared for germ warfare attacks by terrorists" (2001, p.14). He also points to the fact that, "a few physicians have been trained to deal with biological and chemical attacks, but most are unprepared" (2001, p.15). In fact, one physician in charge of planning and training hospitals for bioterrorism estimated in 2000 that, "only 15 percent of hospitals have the equipment or training to properly decontaminate victims in the event of a bioterrorist attack" (Costello, 2000, p.5). A more recent report released by the group known as Trust for America's Health (TFAH) in late 2004 concurred with these notions. "It found that more than three years after 9/11 and the anthrax tragedies, we've only made baby steps toward better bioterrorism preparedness, rather than the giant leaps required to adequately protect the American people," said Lowell Weicker, Jr., TFAH Board President (Hearne, Segal, Earls, & Unruh, 2004, p.1)

Since September 11, 2001, a call to plan and prepare for a potential attack has been heard around the country, and has prompted hospitals and other healthcare facilities to evaluate their circumstance, and create or revamp plans of their own. According to Susan Pisano, the Vice President of communications for the American Association of Health Plans (AAHP), "a lot of emergency preparedness manuals and thinking prior to September 11th focused on natural disasters; however, after September

11, these assumptions had to change" (Krizner, 2002, p.28). The shift in preparedness has several major differences, the most important of which is the fact that emergency departments will often be called on as the first line of defenders (American Hospital Association, 2000). This shift is a critical issue for dealing with a bioterrorist attack due to the fact that in previous disasters, the traditional first responders were the "lights and sirens" type of responders – fire rescue, law enforcement, and emergency medical services (Henderson, 2001). In fact, it was not until the late 1990s that public health personnel and emergency department physicians were even recognized as the first line of defense in a bioterrorist attack (Henderson, 2001).

In the past, "the diverse initiatives taken by different agencies of the government were not well-coordinated, even within the agencies themselves, and many have been designed with little comprehension of what is implied for the civilian population when a biological weapon is used" (Henderson, 2001, p.66). To be truly prepared, a comprehensive effort must be undertaken in concert with all those involved. This involves cooperation among medical and public health professionals, emergency management officials, the military, government, and law enforcement (Centers for Disease Control, 2000).

Barriers to Planning and Preparedness

Monetary issues also remain central to the quest to better prepare the nation's healthcare facilities, and often can predict the levels of preparedness based upon a distribution of funds. The fight against bioterrorism received its first significant monetary gain in fiscal year 1999 due to the funds allocated to the Department of Health and

Human Services, and more specifically the Centers for Disease Control (CDC) (Henderson, 2001). These funds went toward readying the states for development of response and surveillance programs, to procuring stockpiles of antibiotics, for smallpox vaccines, and to establishing a national network of laboratories that were capable of diagnosing the organism or virus in question (Henderson, 2001). Unfortunately, at that time, the budgeted amount left little, if any, to train the new first responders, leaving a gap in the new policies and procedures (Henderson, 2001). However, since the events of September 11, the call for financial assistance to prepare our nation's hospitals has been heard, and in many cases answered. For example, in February 2002, the Department of Health and Human Services (DHHS) announced $20 million dollars in funding for a nationwide network of Centers for Health Preparedness, which linked academic and community health partners together to help fight the war on bioterrorism (Krizner, 2002). Additionally, DHHS asked for $518 million dollars to help prepare county hospitals for a bioterrorist attack for the 2003 fiscal year (Krizner, 2002). In 2004, the State of Florida was allocated a $25 million dollar grant to help hospitals around the state prepare for a bioterrorist attack (AP, 2004). However, even with these enormous contributions, there is still room for improvement and the need for an allocation of additional funds. In fact, Florida's Secretary of Health, John Agwunobi stated that, "Preparedness is an ongoing effort, you never really get to an end point" (AP, 2004, page unavailable).

Regardless of these issues, problems abound in the healthcare industry as it struggles to deal with everyday patient flow (Barbera, Macintyre, & DeAtley, 2001). "While the public and the political communities assume that healthcare systems are

adequately preparing for terrorism incidents that would generate catastrophic casualty loads, the medical community is struggling just to maintain its everyday capacity" (Barbera, Macintyre, & DeAtley, 2001, p.1). "While nearly 39 million people were uninsured for the entire year in 2000, it is estimated that approximately 45 million people will have no health insurance by the end of 2002" due to the economic events following the September 11th tragedies (Miller, 2001, p. i). Add these financial constraints with other financial issues, staffing concerns, and a lack of experience to fall back on, and the healthcare industry faces the daunting task of preparing for an attack that has never been experienced.

Compounding the problem, American citizens have come to expect healthcare to be provided without regard to any extraneous circumstances, such as a disaster scenario (Barbera, Macintyre, & DeAtley, 2001). "If hospitals became overwhelmed and were paralyzed by chaos, it would have serious implications for public morale and for the potential for containing an epidemic, let alone treating those who were already sick" (Henderson, 2001, p. 67; Karwa, Curie, & Kvetan, 2005;). Americans expect that hospital facilities will continue to function and provide care to individuals regardless of the situation, and will do so in a manner consistent with the laws and principles that govern healthcare. For example, regardless of the chaos and overcrowding that a bioterrorist attack can produce, the Emergency Medical Treatment and Active Labor Act (EMTALA) will still remain in effect. In essence, it provides that, "If any individual (whether or not eligible for Medicare benefits and regardless of ability to pay) comes by him or herself or with another person to the emergency department and a request is made on the individual's behalf for examination or treatment of a medical

condition by qualified medical personnel (as determined by the hospital in its rules and regulations), the hospital must provide for an appropriate Medical Screening Examination within the capability of the hospital's emergency department, including ancillary services routinely available to the emergency department" (EMTALA, 1996, page unavailable). Individuals will assume that this principle will hold true even in the case of a bioterrorist attack, which has the capability to overwhelm the hospital.

Sample planning guidelines

Until the recent past, disasters fit neatly into disaster plans, and the medical community was able to follow scripts formulated through previous experiences (Bullard, Strack, & Scharoun, 2002). "With biologic and chemical disasters arriving on the scene, multiple new scripts must be written, even subscripts for the different agents" (Bullard, Strack, & Scharoun, 2002, p. 66). While few have been developed through experience, many hospital disaster plans have taken shape through recommendations from government agencies such as the Centers for Disease Control, The American Hospital Association (AHA), and the Johns Hopkins Center for Civilian Biodefense Studies (CCBS). All point to the importance of several areas of focus including: preparedness and prevention, detection and surveillance, diagnosis and characterization of biological and chemical agents, response, and communication (AHA, 2000; CDC, 2000; Johns Hopkins, 2001). While most of the objectives deal with the issue of bioterrorism planning from a comprehensive level, many hospital's policies and procedures can be derived from the guidelines that have been set. Even if a hospital already has a disaster plan in effect, it is critical that a separate, detailed bioterrorism plan be added to

the organization as a stand-alone policy (Evans, 2002). It is also important to note that not only will health care facilities be dealing with the infected victims; they will also encounter the "worried well," who will also seek medical attention out of fear and panic (CDC, 2000; Karwa, Curie, and Kvetan, 2005). The ability to balance the needs of both groups will represent a key component of a successful plan.

Preparedness and prevention activities, in order to best serve and protect the public, must focus on the biological or chemical agents that could have the potential for the greatest impact on the health and security of the United States (CDC, 2000). For example, "Without special preparation at the local and state levels, a large-scale attack with variola virus, aerosolized anthrax spores, a nerve gas, or a food borne biological or chemical agent, could overwhelm the local, as well as, the national public health infrastructure" (CDC, 2000, p.12). In keeping with this focus area, the CDC suggests the following activities and goals to be undertaken by a hospital:

- Maintain a public health preparedness and response cooperative agreement that provides support to state health agencies who are working with local agencies in developing coordinated bioterrorism plans and protocol.
- Establish a national public health distance-learning system that provides biological and chemical terrorism preparedness training to health-care workers and to state and local public health workers.
- Disseminate public health guidelines and performance standards on biological and chemical terrorism preparedness planning for use by state and local health agencies (2000, p.12).

In addition, The Johns Hopkins Center for Civilian Biodefense suggests that hospitals:

- Review all relevant disaster response plans and assure appropriately designated staff are familiar with their content and strategies,
- Quantify pharmaceutical and antibiotic supplies, both at central and satellite locations and routinely update that list, and
- Assess routine staffing and emergency call-up plans to assure an adequate number of personnel (2001, page # unavailable).

Detection and surveillance is an equally critical piece of bioterrorism planning. It is crucial that emergency department personnel and other first line responders be able to delineate the symptoms of a biological or chemical agent from that of the common cold or flu (Scharoun, VanCaulil, & Liberman, 2002). "Early detection is essential for ensuring a prompt response to a biological or chemical attack, including the provision of prophylactic medicines, chemical antidotes, or vaccines" (CDC, 2000, p.9). As such, the CDC has formulated guidelines for this piece of the preparedness plan which include the following objectives:

- Strengthen state and local surveillance systems for illness and injury resulting from pathogens and chemical substances that are on CDC's critical agents list.
- Develop new algorithms and statistical methods for searching medical databases on a real-time basis for evidence of suspicious events.
- Establish criteria for investigating and evaluating suspicious clusters of human or animal disease or injury and triggers for notifying law enforcement of suspected acts of biological or chemical terrorism (2000, p.12).

It is also crucial, at this stage, to include the non-traditional, community-based healthcare providers that may care for other sub-populations, such as the indigent and uninsured (Scharoun, Van Caulil, & Liberman, 2002). "The population served by these providers is difficult to track and account for, a concern for controlling the impact and spread of a potential bioterrorist attack" (Scharoun, Van Caulil, & Liberman, 2002, p.

83). It is important not to discount these potential carriers, as they, too, can impact how a hospital emergency department deals with a bioterrorist outbreak.

Detection and surveillance go hand-in-hand with diagnosis and characterization of the agent used in planning for a bioterrorist attack. In this stage of planning, it is necessary for hospitals to identify the nearest laboratory that has the capabilities and authority to affirm a biological or chemical weapon diagnosis (CDC, 2000). Prompt detection can mean the difference between life and death depending upon the agent used, and can help stifle the spread of the virus if detected early. This is especially critical in the case of smallpox, as the disease rapidly and unknowingly can be spread from person to person, pitting family members and friends against each other as they become silent carriers (Scharoun, Van Caulil, & Liberman, 2002). Again, the CDC has guidelines and objectives set up for this stage of the process to aid hospitals in the process, which include:

- Establish a multilevel laboratory response network for bioterrorism that links public health agencies to advanced capacity facilities for the identification and reporting of critical biological agents.
- Establish regional chemical terrorism laboratories that will provide diagnostic capacity during terrorist attacks involving chemical agents.
- Establish a rapid-response and advanced technology laboratory within CDC to provide around-the-clock diagnostic support to bioterrorism response teams and expedite molecular characterization of critical biological agents (2000, p. 12).

Just as it is essential to quickly detect when a bioterrorist agent has been used, it is equally important to respond quickly. It is in this stage that the hospital's plans go into full effect, and the amount of training and planning done often predicts how well the hospital will perform when the drill becomes a reality. "A comprehensive public health

response to a biological or chemical terrorist event involves epidemiologic investigation, medical treatment and prophylaxis for affected persons, and the initiation of disease prevention or environmental decontamination measures" (CDC, 2000, p. 9). The hospital will play a crucial role in this stage, as they will be the first responders to such a situation. As such, the CDC's objectives at this stage suggest a broad response to aid hospitals that includes:

- Assisting state and local health agencies in organizing response capacities to rapidly deploy in the event of an overt attack or a suspicious outbreak that might be the result of a covert attack;
- Ensuring that procedures are in place for rapid mobilization of CDC terrorism response teams that will provide on-site assistance to local health workers, security agents, and law enforcement officers;
- Establishing a national pharmaceutical stockpile to provide medical supplies in the event of a terrorist attack that involves biological or chemical agents (2002, p.12).

Lastly, communication, is essential whether it be within departments of the hospital, or as part of a cohesive network in the community. Proper communication helps to streamline the process, avoid miscommunication and errors, calm the public's fears, and avoid mass hysteria. With a clear flow of information disseminated to the public, the impact of the worried well is lessened as the public become educated on the facts rather than myths and folklore (Scharoun, Van Caulil, & Liberman, 2002). With that in mind, the CDC has promoted the following objectives to help streamline communication within the hospitals, as well as to link the hospitals to the rest of the community. They include:

- Establishing a national electronic infrastructure to improve exchange of emergency health information among local, state, and federal health agencies;

- Implementing an emergency communication plan that ensures rapid dissemination of health information to the public during actual, threatened, or suspected acts of chemical or biological terrorism;
- Creating a website that disseminates bioterrorism preparedness and training information, as well as other bioterrorism – related preparedness information, to public health and health care workers and to the public (2000, p.13).

While the CDC's objectives for implementing a bioterrorist plan address the issue on a broad level, it remains necessary for hospitals to remember that they will play a key role in response to a bioterrorist attack. Though they will be the first line of defense, they are not the only players in this "game." "Therefore, hospital preparedness should expand from planning within the context of a single hospital organization to planning by the hospital to become part of a community-wide initiative to address mass casualties" (AHA, 2000, p.27).

Not only will hospitals deal with the first wave of victims; they will also have to attend to the needs of the neuroses of well persons, and other subsequent waves of patients as the attack progresses. "Hospitals, because of their emergency services and 24 hour 7 day operation, will be seen by the public as a vital resource for diagnosis, treatment, and follow-up for both physical and psychological care" (AHA, 2000,p.30). This sustained demand for services has the ability to catch the unprepared hospital off guard, and add chaos to an already chaotic event.

In response to this, agencies such as the CDC have strongly recommended that health care organizations engage in role playing activities or drills to simulate bioterrorist attacks. Jackie Turnbull, Director of Emergency Preparedness at McAlster (Oklahoma) Regional Health Center, knows firsthand the importance of employing bioterror drills. McAlster Regional used bioterror drills to put their plan into action and see where any

deficiencies lay. She stated that, “the drill showed us lots of ways to improve our plan, and that a bioterror attack is very different from the usual scenarios we plan for” (Bioterror drills, 2002). By implementing these drills, issues that may not have been thought of often come to light, allowing for changes to be made before the plan is actually implemented in the wake of a real attack.

All of the objectives and issues discussed point to the need for a comprehensive response to a bioterrorist attack. Without proper planning, the unthinkable disaster escalates in size and magnitude, and can potentially result in the loss of a number of innocent lives. It is for these reasons that further research on the issue is so critical. If the nation, and its respective sections are to be truly prepared for a bioterrorist attack, action needs to be taken immediately, and those actions checked regularly to ensure the efficacy of the preparedness efforts. Since there are no massive bioterrorist attacks to draw experience from, one can only participate in scenarios that attempt to demonstrate the enormity of the situation at hand.

Chapter Summary

This chapter has served to explain the importance of studying further bioterrorism in hospitals. It delved into the history of bioterrorism, as well as the definitions of bioterrorism and its defining characteristics. In addition, this chapter has addressed the barriers to planning for a bioterrorist attack, discussed levels of bioterrorism preparedness, and offered sample planning guidelines.

CHAPTER 2: SELECTED THEORETICAL PERSPECTIVES

Game Theory (1944)

Game theory, as fathered by mathematician John von Neumann, can be defined as a mathematical analysis of any situation that involves some type of conflict or social problem. The intent is to make the "optimal choice" while considering all given conditions, which, if done correctly, should lead to the desired outcome (von Neumann, 1944). Although the theory was originally intended as a mathematical theory for games, such as checkers or chess, as of late, linkages have been made to the social sciences (Shubik, 1982; von Neumann, 1944) "In game theory, the term game means a particular sort of conflict in which *n* of individuals or groups (known as players) participate" (Dauben, 2002, page #unavailable).

Application of Game Theory to Bioterrorism Planning Levels

Application of game theory to planning for a bioterrorist attack transforms the notion of planning for an attack into a "game". The "players" are all those involved in the process, including hospital ED's and their staff, public health, government, law enforcement, and emergency planning officials (Centers for Disease Control, 2000). The strategic "moves" that the hospital makes could be anything from the focus areas, including: preparedness and prevention; detection and surveillance; diagnosis and characterization of biological and chemical agents; response; and communication (AHA, 2000; CDC, 2000; Johns Hopkins, 2001). Each move is contingent on both the internal and external characteristics of the emergency department, including the size of the

facility, the location of the facility, it's linkages or affiliations with other organizations or entities, the current political environment, and the actions of other groups.

The literature is in agreement that those internal characteristics of the hospital, such as size and location, tend to "predict" how well the hospital can be prepared to deal with an attack and how well the hospital can adapt to a given set of circumstances as conditions warrant (Greenberg, Jurgens, & Gracely, 2002; Helget & Smith, 2002; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001). For example, "In general, respondents from urban hospitals reported higher levels of awareness of a bioterrorist attack equal to or higher than those reported by respondents from rural hospitals, and respondents from larger urban hospitals reported the greatest awareness" (Wetter, Daniell, & Treser, 2001, p.712). Similarly, a statistically significant correlation ($p<0.011$) was identified between higher patient volume in the emergency department and likeliness to have a written plan in place to deal with victims of a biological or chemical attack by Greenberg, Jurgens, & Gracely in 2002. Another study was conducted by Treat, et al. (2001) in the Federal Emergency Management Agency's (FEMA) region III, in an attempt to assess the levels of preparedness at hospitals within this region. This study pointed out strong associations between preparedness and location of a hospital, with particular focus on the association between higher levels of preparedness, albeit perceived in some instances, and those in urban locations (Treat, et al., 2001).

A fourth study, conducted in March 2001 by Helget and Smith, looked at the preparedness levels of hospitals, long term care facilities, and assisted living facilities in Nebraska. Although a response rate of only 14.6 percent was attained, the researchers felt that it was demonstrative of the Nebraska healthcare environment at

the time (Helget & Smith, 2002). The findings suggested that in March and April of 2001, only 49 percent of those surveyed believed that a bioterrorist attack was something that their community could encounter, although hospitals were more likely to recognize bioterrorism as a potential threat (Helget & Smith, 2002). The researchers believe that, contrary to their survey results, the number of organizations today believing that bioterrorism cannot touch them will have decreased, and a more mentally aware facility will replace earlier misguided inclinations (Helget & Smith, 2002). This points to the application of game theory to a conflict, and asserts that the issue or conflict needs to first be established, thus beginning the game and dictating potential "moves."

In furthering this aspect of game theory, a review of the literature since the events of September 11th, and the beginning of the anthrax attacks in October 2001 was in order. Prior to September 11th, preparations for a bioterrorist attack by hospitals across the United States were on the bottom of the list of priorities (Costelllo, 2000; Edlin, 2001; Johnson, 2001). No one deemed it important enough to spend a great deal of time or energy on a problem that belonged only to other countries. The prevailing wisdom was that it was a problem prevalent overseas; and in the United States it belonged only in a movie plotline (Johnson, 2001). However, since September 11, the literature suggests through small-scale surveys that this attitude has changed (Johnson, 2001). As early as one month prior to September 11, experts believed that American hospitals were unprepared for a bioterrorist attack; however, one month after the attacks, hospitals showed signs of progress in the quest to plan for bioterrorism (Johnson, 2001).

Causal Process

Using game theory, linkages can be made to demonstrate how size, location, and system affiliation, can affect the levels of preparedness for a bioterrorist attack. First, the concept of bioterrorism is recognized as a problem or potential conflict that needs to be solved. The hospital, along with other key participants, such as law enforcement, public health, and even the potential terrorists themselves, become participants in the "game." The characteristics of the hospital, such as size, system affiliation, and location impact the amount of information and the resources available to them, thus their "moves" become more educated and well thought out. This leads to higher levels of preparedness, and, in essence, a "victory" in the "game" or conflict.

The literature (Greenberg, Jurgens, & Gracely, 2002; Helget & Smith, 2002; Johnson, 2001; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001) is in agreement that certain characteristics of a hospital indicate higher levels of preparedness in the event of a bioterrorist attack. In addition, and as previously demonstrated, the rise in awareness of bioterrorism as a problem has also contributed to an increase in levels of preparedness (Johnson, 2001). All of these studies combine together to utilize game theory as a legitimate explanation for why these types of activities are occurring.

Environmental Jolt Theory

In 1990, Meyer, Brooks, and Goes, set out to explain the unexpected high intensity change that was observed during their field study of San Francisco Bay area hospitals. They found that change did not occur on a regular basis or in a continuous

manner; rather, it occurred in spurts and was often preceded by a relatively stable period followed by a “jolt”. In addition, “these periods of discontinuous change were posited to be a necessary condition in order to allow for innovation and opens up opportunities for entrepreneurs” (Friedman & Marghella, 2004, p.149). These spurts of change observed by Meyer et al (1990), gave birth to the theory now known as environmental jolt theory.

The application of an environmental jolt theory to the healthcare industry, and more specifically to a bioterrorist attack, lends credence to the notion of categorizing such an attack as an environmental jolt. This “jolt’s” impact, although never fully planned for, can be moderated based upon the corresponding healthcare organization’s preparedness levels. In addition, the presence of a healthcare system, rather than its freestanding counterparts, can impact the preparedness levels for a bioterrorist attack. It is also important to note, that while most are quick to characterize an environmental jolt as a negative event, it also has the potential to provide new opportunities for organizations, and can often lead to new course of action or strategies to deal with such a jolt in the future (Friedman & Marghella, 2004).

Applying this logic to healthcare systems and a bioterrorist attack, it becomes clear that the best defense against such a breakdown is proper planning and preparedness. However, whether a hospital is part of a large system, a small system, or is freestanding, the potential negative consequences of being faced with an environmental jolt remain present and must be addressed.

Application of Environmental Jolt Theory to Systems and Bioterrorism Planning Levels

Perhaps one of the best examples of how an environmental jolt can impact a system comes from the 1984 book, *Normal Accidents,* by Perrow. In it, Perrow examines the complexity of systems and the consequences of responding to an environmental jolt. He concluded that complex systems contain other subsystems that are highly interactive with one another. In addition, the various subsystems are so intertwined, that if one part of a system fails, a dramatic effect is likely to occur on a number of other parts of the system (Perrow, 1984).

In contrast, healthcare systems can have positive impacts on the organizations they are members of. According to Provan and Milward (2001), presence and participation in a system in an area such as healthcare reduces the potential downfalls of increased cooperation. Further, they assert that these potential downfalls of "reduced autonomy, shared resources, and increased dependence, are less likely to be seen as a threat to survival" to those in the healthcare arena, and can be seen as an advantage to participating in a system (2001, p. 416).

Similarly, Cueller and Gertler (2003), assert that the presence of a healthcare system in a local area can provide an organization with an array of potential benefits, including the increased ability to adapt to changes in the environment. For example, as part of a healthcare network, "hospitals can rationalize service delivery and coordinate care more effectively within a local area" (2003, p.80).

Charns (1997) also views the move towards system affiliation as a positive one for the healthcare industry. He asserts that the move towards system affiliation is one that produces an ability to provide higher quality community healthcare while sharing resources and risk in an uncertain and hyperturbulent healthcare environment. In addition, hospitals that are members of a healthcare system are afforded the advantages of economies of scale, increased access to capital for expansion, acquisition of technology, and renovations (1997).

This increase in resources available at lower costs allows the system to respond to an environmental jolt more efficiently. Edwards and Fraser (2001) further this idea and point to the flexibility and ability to respond quickly to an uncertain and rapidly changing healthcare environment as some of the advantages of a system or network. In addition, Bazzoli, Chan, Shortell, and D'Aunno (2000) state that healthcare systems are able to develop more focused strategies and achieve a greater unity of purpose through increased "access to financial capital; access to needed human capital; legal, management, and marketing expertise; information systems and technologies; and total quality management" (p. 240).

Causal Process

Using environmental jolt theory and the literature available on healthcare systems, linkages can be made to predict the ability of hospitals to respond to a bioterrorist attack based upon their membership in a healthcare system. An environmental jolt, such as a bioterrorist attack, is likely to occur at some point despite previous opinion that it is unlikely. Thus, when it occurs, the literature is in agreement

that advantages of a healthcare system are conducive to handle an environmental jolt, such as a bioterrorist attack, better than their free standing counterparts (Bazzoli, Chan, Shortell, & D'Aunno, 2000; Charns, 1997; Cueller & Gertler, 2003; Edwards & Fraser, 2001; Perrow, 1984; Provan & Milward, 2001; Friedman & Marghella, 2004). This in turn, leads to a better planned response and the corresponding higher levels of preparation, which leads to more potential lives saved.

Chapter Summary

This chapter served to discuss the theoretical underpinnings surrounding bioterrorism preparedness. Game Theory was offered as a possible explanation of how certain characteristics of hospital affect their overall levels of preparedness. This theory turned planning into a game, with the internal and external characteristics of the hospital affecting the strategic "moves" it makes. In addition, environmental jolt theory was explored as another means of explaining preparedness levels. Application of this theory suggested that a jolt (bioterrorist attack) can be handled better by a hospital that is part of a system, rather than its free standing counterparts. Both were discussed, applied specifically to bioterrorism planning, and causal processes offered for each.

CHAPTER 3: LITERATURE REVIEW

Several studies have been conducted in an attempt to quantify the level of preparedness of emergency departments around the country with respect to a bioterrorist attack (See Appendix B). The literature is in agreement that the types of activities needed to enable a hospital to effectively function in the event of a bioterrorist attack are being conducted on a sporadic basis, and few hospitals are truly prepared (Braun, Darcy, Divi, Robertson, and Fishbeck , 2004; GAO, 2003; Greenberg, Jurgens, & Gracely, 2002; Higgins, Wainright, Lu, and Carrico, 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001). Further, though many hospitals are strong in some areas, such as decontamination, few possess a comprehensive plan that will allow the facility to operate efficiently in the event of an attack. The literature was also in agreement that training was considered an effective means of preparing for a bioterrorist attack (Alder, Clark, White Jr., Talboys, and Mottice , 2004; Filoromo, Macrina, Pryor, Terndrup, and McNutt, 2003; Henning, Brennan, Hoegg, O'Rourke, Dyer, and Grace, 2004; Klein, Atas, and Collins, 2004).

In addition, despite an increased focus on preparing for bioterrorism since September 11, 2001, hospitals are still reporting that they are not prepared to deal with such an attack. In fact, a poll conducted at the healthcare cooperative group VHA, Inc.'s 2002 conference revealed that 70 percent of conference attendees felt that their hospital was not prepared to deal with bioterrorism ("Most hospital ERs", 2003). The Council on Public Health Preparedness concurred with this notion, finding that although hospitals are better prepared than in 2001, significant gaps exist in preparedness as the commitment level necessary to be truly prepared is difficult to attain (Tieman, 2002).

Conversely, the American College of Healthcare Executives (ACHE) also conducted a poll at their 2002 meeting and found that 69 percent of hospital chief executive officers (CEO's) believe that their hospital is a safer place since the 2001 terrorist attacks ("Vast majority," 2003). This poll however, does not rate the level of preparedness for the hospital, rather only whether or not they are more prepared since September 11, 2001.

Various studies have explored the effect of size and location on the levels of preparedness of a hospital emergency department and have come to these same conclusions. Most of these studies, albeit from different sections of the country, indicate a strong association between larger hospitals in urban areas and higher levels of bioterrorism preparedness (Greenberg, Jurgens, & Gracely, 2002; Higgins, Wainright, Lu, and Carrico, 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001). Although none of the studies focused on system membership as an indicator of levels of preparedness, this study took the conclusions of previous researchers in other areas and applied it to this variable.

Studies on Preparedness

A survey conducted in 1998 by Wetter, Daniell, and Treser focused on emergency department preparedness in the United States Public Health Service Region X (Alaska, Idaho, Oregon, and Washington). Utilizing the American Hospital Association's directory, the researchers identified all potential hospitals in the area with an emergency department, and sent a self-administered survey to the emergency department managers. The survey requested information on:

1) hospital and emergency department demographics; 2) respondent's awareness and opinions; 3) any planning, training, or role-playing that has taken place in the past 24 months; 4) any patient isolation and decontamination resources available, and 5) an inventory of treatment antidotes available.

Of the 224 eligible hospitals surveyed, 186 returned the surveys for a response rate of 83 percent (Wetter, Daniell, & Treser, 2001).

The researchers then examined the data garnered for statistical associations against the independent variables of location (urban vs. rural), emergency department annual census, and proximity to the United States army's chemical weapons depot in Umatilla, Oregon. It is important to note that the emergency department census was divided into low (< 5000 visits per year), medium (5000 –15000 per year), and large (> 15000 visits per year), and then combined low and medium into one category given that only two low census hospitals responded. Also, the researchers defined the proximity to the chemical weapons depot as being within a range of 35 miles or less from the depot. The data was then compiled and analyzed using Chi Square, or the Fischer exact test, to test for statistical significance, and by utilizing SPSS for Windows for the descriptive statistics (Wetter, Daniell, & Treser, 2001).

Of the respondents, 61percent of the hospitals were located in a rural area, the median emergency department size was 8 beds, and the median census number was 10,900 patients annually. Of those responding, 57.5 percent were aware of local or state plans to respond to a biological or chemical attack, and only 33.3 percent were aware of national domestic preparedness plans. "In general, respondents from urban hospitals reported higher levels of awareness equal to or higher than those reported by

respondents from rural hospitals, and respondents from larger urban hospitals reported the greatest awareness" (Wetter, Daniell, & Treser, 2001, p.712).

With respect to administrative plans and training schedules in place, again urban hospitals were shown to be more prepared. Overall, 80 percent of hospitals responding stated that they had plans in place for dealing with hazardous materials, yet only 16.7 percent had plans in place for biological weapons, and 11.8 percent had plans for chemical weapons. Consistent with previous results, urban hospitals (43.1 percent for chemical, and 37.5 percent for biological) were again more apt to have conducted training for a biological or chemical attack than a rural hospital (10.5 percent for chemical and 7.9 percent for biological) (Wetter, Daniell, & Treser, 2001).

The study also indicated that only 21 percent of all hospitals surveyed had an indoor emergency department area with an isolated ventilation system, shower, and water containment system. Additionally, "urban hospitals were more likely than rural hospitals to report having any such form of respiratory protective equipment (urban 40 percent; rural 14 percent)" (p.712). When asked about a hypothetical chemical and biological weapons attack, only 12 hospitals (6.5 percent) of 186 met the study definition for "minimum recommended" physical resource preparedness for a chemical attack (Wetter, Daniell, & Treser, 2001).

Based upon the statistics, the researchers concluded that, "the findings of this survey, while not surprising, are nonetheless disturbing: they indicate that hospital ED's generally are not prepared in an organized fashion to treat victims of incidents involving chemical or biological weapons" (p.714). Moreover, the researchers found that levels of preparedness were low in all areas surveyed, including awareness, plans and training,

physical resources, and medication inventories. Urban hospitals were overall better prepared than rural hospitals, and those in an urban area with a busier emergency department tended to be better prepared than an emergency department that served less patients (Wetter, Daniell, & Treser, 2001).

This study provides a snapshot of hospital emergency departments in the Northwest part of the United States. While the findings were consistent with other studies, it is especially important to note the findings on hospital location and size. As hypothesized by this researcher, larger, urban hospitals will have a higher level of preparedness than their smaller rural counterparts. It also points to the further need to study this issue in an effort to establish a more concerted response to such an attack. Although it provides an excellent body of information and statistics, it cannot be generalized to other areas of the country since it only captured the Northwest United States.

Another survey of hospital emergency departments in the greater Philadelphia area was conducted in 2000 by Greenberg, Jurgens, and Gracely (2002). It explored preparedness levels in the emergency departments in the event of a biological or chemical agent release. The study utilized information from the Federally mandated Domestic Preparedness Training Program, along with a set of criteria formulated by the researchers to set levels of preparedness. Based upon these criteria, the researchers set a benchmark for the minimum preparedness level, and assessed the responding hospital's preparedness levels against it (Greenberg, Jurgens, & Gracely, 2002).

The survey target area of Philadelphia, Chester, Bucks, Delaware, and Montgomery counties in Pennsylvania, and Camden County, New Jersey, was

idenitifed, and any hospital with an emergency department open to the general public within these counties was included in the study. The hospitals were identified through the Hospital Blue Book, a national hospital directory. The surveys were then mailed anonymously to the Emergency Physician Directors of 61 hospital emergency departments, using an identification code known only to the principal investigator. Of the 61 surveys mailed, 54 were returned representing an 88.5 percent response rate (Greenberg, Jurgens, & Gracely, 2002).

The instrument utilized was a 38-question survey that queried the directors on everything from pharmaceutical stockpiles to types of written plans in place. The data was then compiled and analyzed using SPSS to garner descriptive statistics. Of those responding, 66.7 percent had written polices in place that dealt specifically with the evaluation and treatment of a biologically or chemically exposed patient, while 24.2 percent indicated that there were no such plans in place, and 9.3 percent that they were unsure of the existence of such plans. Additionally, 70.4 percent had plans in place with specific protocol to deal with a biological or chemical weapon attack, while 18.5 percent indicated that there were no such protocols in place, and 11.1 percent were unsure if such plans were in existence. Further, the researchers found that 29.6 percent of the emergency departments had never participated in a disaster drill or scenario that dealt with exposure to biological or chemical weapons, and, again, 9.3 percent had no knowledge of whether or not their facility had ever taken part in such an activity. It is also interesting to note that the researchers found a statistically significant correlation ($p<0.01$) between higher patients volume in the emergency department and likeliness to

have a written plan in place to deal with victims of a biological or chemical attack (Greenberg, Jurgens, & Gracely, 2002).

As mentioned previously, the researchers developed a set of minimum criteria to establish a minimum level of preparedness for hospital emergency departments. The criteria used to formulate these levels was: 1) At least one emergency physician on staff who had completed formal training with respect to biological and chemical weapons; 2) Ability to decontaminate at least 10 patients per hour; 3) Written policies that addressed how to evaluate and treat biologically and chemically exposed patients; 4) Written cooperative agreements with local agencies that address biological and chemical weapons attacks; 5) Participation in a drill or exercise relating to chemical and biological weapons within the last 12 months; and 6) A self-characterized "adequate" supply of antidotes for the treatment of biological and chemical weapons. Based upon these criteria, the study found that fewer than two percent of all respondent hospitals had achieved this minimum level of preparedness (Greenberg, Jurgens, & Gracely, 2002).

Based upon these statistics, the researchers concluded that in the greater Philadelphia area, the level of preparedness of hospital emergency departments to evaluate and treat victims of a biological or chemical attack was at a low level. They also point to the implications of such a lack of preparedness, and assert a need to further quantify what constitutes preparedness for a biological or chemical attack (Greenberg, Jurgens, & Gracely, 2002).

This study demonstrated a snapshot of another area of the United States, and a need to further explore the issue of bioterrorism preparedness. It provided a starting point to quantify these levels of preparedness, and will aide in future research on the

subject. The responses garnered further support this researcher's hypotheses, by demonstrating the lack of preparedness for such an event, and touches on the size of the emergency department as having a statistically significant impact on the level of preparedness for a bioterrorist attack. Although the researchers did not look for significance in the area of location and system affiliation, they did set up a framework on which to test these variables.

A third study took a more qualitative approach to assessing the level of preparedness for hospitals in the event of a biological or chemical attack. A study was conducted by Treat, et al., (2001) in the Federal Emergency Management Agency's (FEMA) region III in an attempt to assess the levels of preparedness of hospitals within this region. The region was divided into 30 hospitals with West Virginia hospitals providing 11 interviews, Pennsylvania providing 10, Maryland five, Virginia three, and the District of Columbia one. Of the sample, 22 of the hospitals were in rural areas and eight were in urban areas. It is important to note that the researchers did not intend that the sample be statistically representative of the region. Instead, it represented a snapshot of activities, plans, and attitudes within the region (Treat, et al., 2001).

To assess the level of preparedness, the researchers conducted interviews that posed questions to the respondent's about perceived levels of hospital preparedness, decontamination issues, medical response capabilities, training issues, and other facility issues such as security. Of the responding sites, zero believed that their facility was fully prepared to handle a biological incident, 73.3 percent believed that their facility was not prepared at all, and 26.7 percent (all urban hospitals) believed that their facility was somewhat prepared. With regards to decontamination, 73.3 percent of facilities would

set up a single decontamination room to treat 1 victim at a time, 13 percent had a mobile decontamination station that could handle 10-15 patients at a time, and 13 pecent (all rural) reported no plans at all in place for decontamination (Treat, et al., 2001).

Additionally, biological and chemical weapons treatment plans were a part of hospital wide disaster plans at only 27 percent of the facilities. Further, 87 percent felt that their facility's emergency department could handle 10-50 casualties at one time, 10 percent (all urban) felt they could handle 50-100, and three percent (1 facility) felt that they could handle more than 500 casualties at one time (Treat, et al., 2001).

With respect to other areas of focus, all except one facility had plans in place to deal with an overflow of patients due to seasonal fluctuations, yet none reported any specific arrangements to deal with a mass casualty disaster. Further, with regard to pharmacy stockpiling, only the tetanus vaccine was stockpiled by any facility; however, one facility did report stockpiling Ciprofloxacin for possible anthrax exposure. Only 20 percent of the respondents had participated in a disaster drill or scenario that was aimed specifically at an attack of a biological or chemical nature. Lastly, all participants reported a need for further training on the issue, but they were unsure how to accomplish this due to various obstacles (Treat, et al., 2001).

Based upon the statistics complied, the researchers concluded that, "hospitals in this sample do not appear to be prepared to handle events involving WMD (weapons of mass destruction), especially in areas such as mass decontamination, mass medical response, awareness among health care professionals, health communications, and facility security" (Treat, et al. p. 562). Consistent with prior studies, the researchers also

suggested that further research be conducted to truly amass a statistically representative sample that can be generalized on a national level (Treat, et al., 2001).

Although this study was of a more qualitative nature, it still suggested strong support for this researcher's hypotheses. It noted a lack of preparedness that is consistent with those found in other studies of this nature, and identified too many potential issues to be researched with respect to preparedness for a biological or chemical attack. Additionally, the study pointed out strong associations between preparedness and location of a hospital, with particular focus on the association between higher levels of preparedness, albeit perceived in some instances, and those in urban locations.

A fourth study, conducted in March 2001 by Helget and Smith (2002), looked at the preparedness levels of hospitals, long term care facilities, and assisted living facilities in the Nebraska area. Although 900 surveys were mailed out to eligible facilities, only 131 were completed for a response rate of 14.6 percent. The majority of the responses came from long-term care facilities (43.5 percent), with hospitals (29 percent), and assisted living facilities (9.2 percent) rounding out the rest of the respondents. It is important to note, that although the response rate was rather low, the researcher's felt that they had adequately demonstrated a proportional membership of the Nebraska Infection Control Network, as well as the demographics of health care institutions in Nebraska (Helget & Smith, 2002).

The researchers utilized a brief six-question survey to capture the perceptions, and physical readiness of the facilities. The subject matter surveyed included perceptions about the respondent's facility and community preparedness levels, any

anticipated telecommunications problems, and who should be contacted in the case of a bioterrorist attack. The findings suggested that in March and April of 2001, only 49 percent of those surveyed believed that a bioterrorist attack was something that their community could encounter, although hospitals were more likely to recognize bioterrorism as a potential threat. Additionally, a resounding 98 percent stated that they did not feel as if they were adequately prepared for an attack of this nature (Helget & Smith, 2002).

When asked what the facilities would need to be prepared for a bioterrorism event, respondents were diverse in their answers. Of the 131 responding, 17 percent felt they needed internal policies and procedures, 16.5 percent needed community policies and procedures, 14.5 percent needed names of contacts, 13 percent needed medications, 13 percent protective equipment, 12 percent laboratory support, 10 percent communication devices, and four percent chose other. Additionally, although many respondents chose local law enforcement (20 percent), emergency services (11 percent), and the health department (9 percent), 30 percent responded that they were unsure whom to contact in the event of a bioterrorist event (Helget & Smith, 2002).

Again, it appears that Helget and Smith's research, while only a small sample of Nebraska healthcare facilities, demonstrates a lack of preparedness for a bioterrorist attack. They identified a number of weak areas in the organizations surveyed, yet point to a perceived difference in attitude post September 11th. The researchers believe that today, contrary to their survey results, the number of organizations that believe that bioterrorism cannot touch them will have decreased and a more mentally aware facility will be present (Helget & Smith, 2002).

Although the researcher did not look for statistical significance between location, size, or system affiliation, this study does provide a baseline of information in assessing attitudes and preparedness activities that have taken place around the country. Again, this is only a small sample in the Nebraska area, but it points to the larger question of how other areas feel about bioterrorism, and how other parts of the United States are faring in the move toward better preparedness.

Keim, Pesik, and Twum-Danso (2003) took a slightly different approach to measuring terrorism preparedness in hospitals as they examined chemical terrorism preparedness in both 1996 and 2000. They assessed the ability of a hospital to deal with mass casualties as a result a chemical terrorist attack. They further examined the role of increased funding for bioterrorism preparedness allocated during this time period to assess its impact, if any, on planning activities (Keim, Pesik, and Twum-Danso, 2003).

The researchers surveyed 21 hospitals in an unidentified major metropolitan area of the United States both in 1996 and again in 2000. 9 of the 21 hospitals surveyed were university affiliated, and the mean annual emergency department census was 39,290. The survey looked at area such as: stockpiles of antidotes for chemical exposure, decontamination equipment availability, levels of worker protection established, and staff training procedures. In 1996, the response rate per question varied from 52-96 percent per question, whereas in 2000, a response rate of 100 percent was garnered (Keim, Pesik, and Twum-Danso, 2003).

Overall, in both years surveyed, hospitals were unprepared to deal with a chemical terrorist attack. For example, only 10 of the 21 (47 percent) of hospitals in

1996 had a complete decontamination system available for use in 1996. This number increased only by 1 (52 percent) in 2000. In addition, hospitals did not have an adequate supply of antidotes on hand to deal with a nerve agent release in 1996, and in 2000, only 1 hospital had an adequate supply (Keim, Pesik, and Twum-Danso, 2003).

The researchers also pointed to a strong need for continuing education on clinical toxicology and aspects of proper decontamination. In addition, they suggested a need for training and education on stockpiling antidotes based upon location and perceived risk of an attack. Consistent with previous studies, they advocated a need for collaborative planning with other local entities as an effective way of preparation. Overall, they found that preparedness was lacking in all areas despite increased risk of attack and allocation of funding to prepare. Much like other studies, they too advocated further preparations and research into the matter (Keim, Pesik, and Twum-Danso, 2003).

A 2003 survey of American hospitals conducted by the General Accounting Office (GAO) in 2002 revealed a healthcare system that was making strides in the war on bioterrorism, but still had room for improvement. In it, the GAO surveyed 1,482 urban hospitals (73 percent response rate) from across the United States. Most hospitals were privately owned not for profit (72 percent). The survey addresses issues such as: planning and preparedness activities, training of staff, and capacity to respond to a bioterrorist attack.

The findings suggested that while more hospitals were preparing in the form of written plans for a bioterrorist attack, inadequacies in training and simulations exercise, as well as a lack of the proper equipment needed for a bioterrorist attack were found.

Most specifically, of the 89 Florida hospitals that responded, 90.4 percent had a written bioterrorism plan in place in 2002. In addition, 75.8 percent of Florida hospitals had mutual aid agreements in place with other hospitals, 49.8 percent had aid agreements with the city, 64.5 percent with the county, 39.3 percent with the state, and 34.7 with regional organizations. These findings were consistent with previous studies done both pre and post September 11, 2001 (GAO, 2003).

Higgins, Wainright, Lu, and Carrico (2004) conducted a study assessing hospital preparedness levels for both short and long term hospitals in Kentucky. The study, conducted from July 2002 to February 2003, sought to quantify levels of preparedness and assess which, if any, variables affected these levels. All short and long term hospitals in hospitals in Kentucky (118) were surveyed on a modified version of the Mass Casualty Disaster Plan Checklist developed by the Association of Professionals in Infection Control and Epidemiology (APIC). Additionally, a brief supplemental survey was added courtesy of the Agency for Healthcare Quality and Research (AHRQ) in August of 2002, adding questions regarding surge capacity and adequacy of emergency plans. Of the 118 hospitals surveyed, 116 returned completed at least 1 of the surveys for a response rate of 98 percent (Higgins, et al., 2004).

The findings suggested that 99 percent of hospitals surveyed had disaster plans in place and that 95 percent had disaster planning committees in place. However, only 73 percent reported that these disaster plans specifically addressed incidents involving bioterrorism. Organizations that conducted annual disaster exercises comprised 96 percent of the respondents, with 90 percent of those critiquing the activity and sharing the information with participants. Additionally, better than 90 percent of respondents

had collaborative agreements in place with other area agencies such as law enforcement, emergency management, fire rescue services, and health departments (Higgins, et al., 2004).

Although emergency plans were in place in the majority of hospitals, the specific areas addressed by each yielded some deficiencies in planning. For example, specification of areas to close due to staffing shortages were only addressed in 26 percent of the plans, how to incorporate and manage volunteers was addressed in 35 percent of the plans, and although 78 percent could lock down the facility, only 56 percent had actually tested this capability. Pharmaceutical planning and allocation was also cited as a weakness in planning. Only 43 percent reported having a plan in place for prophylaxis of staff, 34 percent reported plans in place for first responders, and only 20 percent reported plans for prophylaxis of caregiver's families (Higgins, et al., 2004).

Overall, hospitals in Kentucky appeared to be on the right track for preparations for a bioterrorist event since the events of September 11, 2001. Respondents reported spending over 1.7 million dollars to increase preparedness efforts since the terrorist attacks. However, "the results suggest that more work needs to be done" (p. 331). A prime example of this lies in the regional discrepancies cited by the survey. Hospitals located within the Metropolitan Medical Response System (MMRS), which provides aide to major US cities, tended to have more advanced levels of preparedness than their non-MMRS counterparts. The researchers further suggest that this disparity should be addressed further to narrow the gap between MMRS and non-MMRS areas (Higgins, et al., 2004).

Although this study pointed to higher levels of preparedness overall for hospitals since the September 11, 2001 terrorist attacks, it also points to a need for further preparations. In keeping with previous literature prior to September 11, 2001, hospitals in urban areas tended to be better prepared than their rural counterparts. However, much like previously reviewed studies, it can not be generalized nationally, and the results must be carefully considered for their true impact since the period of study followed closely on the heels of increased awareness due to the 2001 terrorist attacks.

Braun, Darcy, Divi, Robertson, and Fishbeck (2004) conducted a national survey on the effect of pre-arranged community linkages on bioterrorism preparedness of a hospital. The study, conducted as a pre-test/post-test design both shortly before and after the terrorist attacks of September 11, 2001, surveyed hospitals scheduled for accreditation by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO). It is important to note however, that the same hospitals were not surveyed before and after the terrorist attacks (Braun, et al., 2004).

The final survey consisted of 51 questions that assessed the hospital's emergency management plans, the hospital's perception of community wide emergency plans, the hospital's perception of overall community relationships for disaster, and the hospital's demographic information. In 2001, 68 of 82 hospital's surveyed returned responses (82 percent) and 97 of 141 (68.8 percent) returned surveys in the 2002 mailing.

Although the study looked at 2 independent samples over time, the only significant demographic changes from the 2001 to the 2002 survey lay in ownership and geographic region. The 2002 sample included less for-profit hospitals and more from

the Mid to South Atlantic region (Delaware, DC, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia). The other questions regarding preparedness were then compiled and assessed for significance using Chi-square tests (Braun, et al., 2004).

In general, the greatest improvement was found in the presence of an emergency plan specific to bioterrorism from 2001 to 2002. In 2001, 47.1 percent of hospitals surveyed had such a plan in place whereas in 2002, 90.7 percent had a plan in place. Perception of collaboration also showed large gains as the percentage rose by 43.2 percent from 2001 to 2002. Additionally, when stratified for bed count and population size, the sample yielded no significance for existence of a plan both in the hospital or as part of the community. There was however significance in 2001 for perception of a community plan with respect to population size, as a community plan was more likely to be found in larger communities (Braun, et al., 2004).

Consistent with studies conducted prior to the terrorist attacks of September 11, 2001 (Greenberg, Jurgens, & Gracely, 2002; Helget & Smith, 2002; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001), few hospitals had emergency plans dedicated to bioterrorism preparedness. Following the terrorists attacks, this notion shifted dramatically as most hospitals began to formulate such plans in response to the brush with terrorism. In addition, training activities began to take place more frequently than prior to 2001, and community linkages were established as a way to collaboratively deal with such an event. Overall, planning activities demonstrated the greatest improvement, while training, electronic information sharing, and equipment issues showed the least amount of improvement (Braun, et al., 2004).

Although not intentionally meant to be nationally representative, the end sample size of 165 yielded a power estimate of 0.85 and a type 1 error alpha of 0.05, thus allowing for generalization to the nation at large. It is important to note, however, that despite this generalization, the time frame in which it was conducted may have skewed the results. The 2002 survey occurred closely following the 2001 terrorist attacks at a time when the focus dramatically shifted to bioterrorism preparedness. This dramatic shift may have been the reasoning behind the large gains in preparedness plans and activities. Nevertheless, the authors suggest that while this trend is positive, more research needs to be done, and many opportunities are available to improve planning efforts both within the hospitals and their respective communities. To be successful, collaboration amongst community entities must be formal and frequent in order to be truly prepared (Braun, et al., 2004).

Elin Gursky, a Senior Fellow for Biodefense and Public Health at the ANSER Institute for Homeland Security released a more current study of hospital bioterrorism preparedness in June of 2004. In it, Gursky points to the critical need of the nation's healthcare entities to be prepared in the event of a bioterrorist attack, and their subsequent insufficiencies in budgeting and training staff for such an attack. In addition, she points out that, "these deficits are even more acutely experienced by the nation's approximately 2,000 rural hospitals, which have a comparatively smaller repertoire of medical resources and unique vulnerabilities" (Gursky, 2004, p.1).

Gursky studied a total of five hospitals located in rural locations around the United States. She deliberately chose one hospital from each of the five geographic locations around the United States in order to have a representative from all areas, yet

did not intend the results to be a true representation of rural hospitals. She hoped the results could be used as a tool with which to better prepare hospitals for an attack. Each hospital took part in a two-day site visit, complete with meetings with key hospital personnel, as well as open-ended interviews to gather the requested information on the bioterrorism preparedness activities of the hospital. All study participants indicated an improvement in preparedness activities and overall levels of preparedness, but stated that more planning and preparedness activities needed to be undertaken. Additionally, they pointed to a promise for funding that had yet to arrive as a barrier to such improvements as most was going to larger cities rather than the smaller rural hospitals (Gursky, 2004).

Studies on Training

Training has often been cited as an excellent way to prepare and plan for disaster scenarios. Such training exercises, and consequent drills in which to test the knowledge gained have proven effective in planning for bioterrorist attacks (Alder, Clark, White Jr., Talboys, and Mottice , 2004; Filoromo, Macrina, Pryor, Terndrup, and McNutt, 2003; Henning, Brennan, Hoegg, O'Rourke, Dyer, and Grace, 2004; Klein, Atas, and Collins, 2004).

A study by Filoromo, Macrina, Pryor, Terndrup, and McNutt (2003) examined the impact of technological training on overall preparedness for a bioterrorist attack. More specifically, the researchers sought to assess the impact of a technologically based method aimed at educating clinicians in detection, diagnosis, treatment options, and infection control for a bioterrorist attack. Due to the intense time constraints and

pressures of work on hospital based clinicians, the use of computers and the World Wide Web was selected as a palatable medium for delivery of the curriculum (Filoromo, et al., 2003).

In keeping with this idea, a screensaver containing information about the Centers for Disease Control's (CDC) category A agents (those bioterrorism agents capable of mass casualties), along with prompts to access the World Wide Web were developed. "The screensavers, which rotate images and text, have striking visuals that serve as a billboard to persons working at or near the computer or merely passing by the monitor" (p. 512). The screensavers were then implemented on computers in the emergency department of the University of Alabama Birmingham, an urban medical center. From March to September 2001, emergency department medical student rotations were then pre and post tested on their respective knowledge of bioterrorism as assessed by modules contained on the web site (Filoromo, et al., 2003).

Pre and post emergency department rotations scores prior to installation of the screensaver program yielded a statistically significant difference ($p<.01$) in scores with 38.8 percent for pre rotation and 52.4 percent post rotation. Moreover, upon installation and exposure to the screensavers from the months of October thru December, the scores increased to 59.1 percent pre rotation and 75.8 percent post rotation. However, it is important to note that the post screensaver results may have been skewed due to the events of September 11, 2001 and the subsequent anthrax scare in October 2001 (Filoromo, et al., 2003).

Despite the mass media coverage following the terrorist attacks, the researchers concluded that this method of educational delivery was an effective alternative to other

costly and time-consuming methods. Therefore, they suggested further study into this method as an alternative to other forms of training (Filoromo, et al., 2003).

This study advocates the importance of training clinicians in already overburdened US emergency departments. It demonstrates the effectiveness of a medium as simple, and cost effective, as a screensaver program to disseminate information regarding bioterrorism to a broad range of individuals. Although the researchers did point to further research on the topic, the need for training is nonetheless indicated to prepare and train for a bioterrorist attack (Filoromo, et al., 2003).

Another study that sought to assess the importance of training was conducted by Henning, Brennan, Hoegg, O'Rourke, Dyer, and Grace (2004). The study utilized a fictionalized smallpox event at a large, urban health system in the Philadelphia area and included 39 employees from the 4 hospitals within the system. Participants represented a wide variety of departments including emergency medicine, administration, safety, and infection control among others. In addition, the 4 hospitals involved represented both large and small total bed sizes and number of employees (Henning, et al., 2004).

The exercise centered mainly on the earliest stages of the outbreak so as to assess how hospitals would deal with the initial detection and response before any other governmental agencies could provide assistance. As such, three distinct modules were presented to the participants, with each allotted time to react to the information presented, discuss department specific response questions, and formulate decisions regarding how each department should proceed. It is also important to note that despite

discussion or recommendations from each module, the proceeding module(s) did not change based upon feedback (Henning, et al, 2004).

Prior to beginning the exercise, a pre-exercise anonymous survey was completed that collected demographic information on participants and their respective hospitals, and asked them to rank a series of 8 objectives that participants hoped to gain from the exercise. In addition, the survey asked participants to assess their perceived level of preparedness for a bioterrorist attack for their individual departments. With 39 of the 50 invited employees participating (78 percent), the exercise was completed in 3 ½ hours. Following the exercise, a post-exercise survey was administered that revisited the same 8 objectives ranked in the pre-survey. Participants were asked to rate the degree to which the exercise aided them in preparing for a bioterrorist attack, as well as how effective the exercise was overall in helping them to prepare and build a base of knowledge (Henning, et al., 2004).

Fisher's exact test and chi-square were then utilized to test for comparisons, rates, and proportions of the data ascertained. The first module suggested that the groups addressed many areas of first response, but there was a clear lack of direction in who would be in charge of decision-making and the order in which to carry out the tasks mentioned. In module 2, confusion was noted in how to separate patients that were exposed to the smallpox virus and those who were not, as well as who, when, and where to administer vaccinations. Module 3 asked participants how they would react to the exercise if they could repeat the exercise. Participants pointed to a need for clear lines of communication, yet many cited the ability to communicate effectively as a critical weakness in preparations. Overall, of the 34 participants that responded to how

well prepared their department was, 24 percent thought they were poorly prepared, 9 percent thought they were well prepared, and 68 percent reported being moderately prepared (Henning, et al., 2004).

Moreover, participants overwhelmingly agreed (79 percent) that the exercise had increased their knowledge of preparing for an attack. In addition, 79 percent felt that the exercise was extremely or very useful in helping their respective departments to prepare for an attack and understand their role in the process. Only 3 percent reported it as marginally useful. Overall, despite the paucity of literature to support the use of training exercises for a bioterrorist attack, the researchers felt that in this case, the use of scenarios is not only an appealing alternative, but a necessary one to adequately prepare (Henning, et al., 2004).

Klein, Atas, and Collins (2004) also sought to assess the impact of training on bioterrorism preparedness through use of a role-playing scenario. Similar to the smallpox scenario conducted by Henning, et al., Klein, Atas, and Collins used a fictious release of smallpox in an urban/suburban hospitals located in an unidentified metropolitan area with an international boarder. Of the hospitals participating, 3 were large regional hospitals, 1 was a children's hospital, 1 an urgent care center (a facility that does not accept 9-1-1 EMS patients), and the remaining were considered community hospitals (Klein, Atas, and Collins, 2004).

The unannounced drill included 13 patients "infected" with the smallpox virus, all illustrating the same signs, symptoms, and prodromal history. The patients were transported by way of ambulance or the personal cars of drill observers and presented to the 12 hospitals involved. Endpoints of the drill were established from the beginning

as either: the expiration of drill time (8 hours), hospital lockdown upon identification of the virus on the patient, or a breach of drill protocol that might place the participants in harm's way (Klein, Atas, and Collins, 2004).

Of the 4 patients transported by ambulance, alarmingly, none were identified as possibly being infected with the smallpox virus. Only 54 percent (7 patients) were correctly identified as being possibly infected, thus activating the hospital's biological agent protocol. Of those diagnosed correctly, 71 percent (5 of 7 patients) were isolated and protocol followed. Moreover, only 2 hospitals contacted the local health department, so as to trigger further warning and communications to other agencies and local hospitals. The remaining 46 percent (6 patients) were incorrectly diagnosed, discharged, and sent home to their families, thus possibly causing further spread of the "infection" (Klein, Atas, and Collins, 2004).

Inconsistent with previous literature, it was the smaller hospitals that diagnosed the infected patents in a more timely fashion and initiated bioterrorism plans with greater ease and interest. Moreover, the smaller hospitals isolated the patients quicker, and initiated safety protocols including putting on protective equipment and contacting the proper authorities in a timely fashion. The larger hospitals in the drill seemed less eager to initiate bioterrorism plans, and discharged the patients quickly and with incorrect diagnoses (Klein, Atas, and Collins, 2004).

Overall, the findings suggest that despite a barrage of education on biological agents, hospital personnel are still unable to quickly identify a possible infection, and are either unaware of, or are hesitant to trigger the activation of policies to deal with such an event. As such, the researchers recommend further education and training of

hospital personnel to enable them to quickly identify and treat an infected patient. Further, they felt that the drill was successful in that it identified a number of deficiencies in bioterrorism planning and pointed to areas that still required improvement so that detection and treatment is done quickly and efficiently (Klein, Atas, and Collins, 2004).

Alder, Clark, White Jr., Talboys, and Mottice (2004) also delved into the area of the importance of training for a bioterrorist attack. They sought to ascertain the educational needs and preferences of Utah physicians with respect to bioterrorism education and training. Quota sampling was conducted based on location, specialty, and type of practice, yielding 30 physicians from both urban and rural areas, representing a variety of specialties. Physicians were grouped into primary care, emergency care, or specialty care for purposes of analysis (Alder, et al., 2004).

Participating physicians were then asked a series of question regarding the following: their perceived risk of a bioterrorist attack, what their roles are in detection and response, what their level of interest in training is, and lastly, their preferences for method of education. The semi-structured interviews were recorded and later transcribed to analyze and categorize responses (Alder et al., 2004).

With respect to perceived risk of a bioterrorist attack, all 3 physician groups felt that such an attack was unlikely, but nevertheless possible. They also felt that while a national bioterrorism attack was more likely than a local attack, the ramifications of a national attack might eventually trickle down locally. The ability to detect an infected case and respond was linked to the type of physician group. For example, primary care physicians felt that they were inadequately prepared to deal with a potentially infected case, whereas emergency physicians and specialists felt higher levels of confidence in

their ability to detect and respond. Emergency physicians felt that their confidence in quick detection and response could increase even higher if they had previous warning via alerts from health departments or other agencies (Alder et al., 2004).

Overall, the interest levels in training for bioterrorism were marred by constraints on time and competing demands from a variety of other issues facing physicians. Alarmingly, despite their admitted deficiencies and ability to quickly diagnosis and respond, none of those surveyed felt that training for bioterrorism was or should ever be their number 1 priority (Alder et al., 2004).

Lastly, the preferred method of education for bioterrorism training revealed a variety of different modes. The prevailing notion was that the training needed to be tailored to the specific audience and that it must be presented by what the trainees perceive as an expert. For example, emergency physicians felt that someone from the health department should conduct training, and that the trainers should remain sensitive to the competing demands and time constraints of an emergency physician. Further, they suggested that training be done via the World Wide Web, disaster drills, and other exercises that included in depth information on primary and secondary bioterrorism agents. In addition, all agreed that training should take place, but should be incorporated into existing training sessions, as time is a critical factor. Physicians also felt that training should be ongoing, and supplemented with readily available information as conditions warrant (i.e. an outbreak of SARS) (Alder et al., 2004).

Overall, although this study cannot be generalized to the nation as a whole, it provides a snapshot of physicians in Utah and their perceived needs for education and training. Some of the notions suggested with regard to methods of training and use of

experts may translate into other areas of the country, but not without further analysis. The premise of tailoring the method of education to the specific audience involved may increase attention and the likelihood of levels of learning, thus should be further explored as a method of effectively training physicians for a bioterrorist attack (Alder et al., 2004).

Study of Disaster

Lastly, a review of Gillespie et al. (1993) and their study on Partnerships for Community Preparedness is pertinent to the application of previous disaster research to bioterrorism research. Most specifically, the physical and social properties used in their research are of particular importance in assessing a hospital's level of bioterrorism preparedness.

Physical preparedness as designed by Gillespie et al., explored the importance and degree by which organizational preparedness plans emphasized certain elements of safety in an effort to reduce loss of life and damage to property. Social preparedness encompassed the planning, training, financial, and community subsets in an effort to ascertain the degree by which these factors influence levels of preparedness (1993).

Planning was used to demonstrate the level by which an organization's emphasize on disaster planning influenced their overall preparedness for a disaster. Planning, as defined by Gillespie et al., "is the degree to which organizations generally emphasize disaster planning to reduce the loss of life, injury and property damage" (1993, p.42). Next, Gillespie et al., discussed measurement of the training component of disaster preparedness. They defined training as, "the degree to which organizations

emphasize disaster training to reduce the loss of life, injury, and property damage" (1993, p.42). Utilizing, a summative scale, Gillespie et al., explored the degree to which organizations emphasize training through classroom lectures and discussion, staff meetings, simulations, drills, and sending staff to other organizations; training sessions that dealt with disaster in the community; exercises that deal with disaster in the community; planned future training sessions; planning exercises; exercise assessments; and training personnel. The remaining aspects of training were then scored on a 0-7 scale with 0 representing "no emphasis at all" or "no involvement", to 7, which indicated, "very strongly emphasized" to "extremely high involvement" (Gillespie, 1993).

Financial preparedness, or "the degree to which organizations emphasize the securing of funds for disaster services designed to reduce the loss of life, injury, and property damage," was measured next by Gillespie et al. (1993, p. 42). This aspect of disaster preparedness was measured on a summative scale that indicated the degree to which organizations are involved in budgeting for preparedness and have secured funds needed to implement their disaster plan. Again, the 0-7 point scale was used to measure the level of involvement with 0 representing "does not apply at all" to 7, representing "applies perfectly" (Gillespie et al., 1993).

Lastly under social preparedness, Gillespie et al. addressed the concept of community preparedness, or "the degree to which organizations emphasize community disaster education and community involvement to reduce the loss of life, injury, and property damage" (1993, p.43). This aspect utilized a summative scale to measure the degree that organizations: promote public awareness of disaster services (sponsor

community programs/special events, seek media coverage, distribute literature, etc.), educate the public about hazards, lobby to improve disaster response, explore new approaches to delivering disaster services, enjoy an excellent reputation for their disaster services, and have participated in disaster services (# of years offering services). Again, the 0-7 point scale was used for measurement purposes (Gillespie et al., 1993).

Although Gillespie et al., did not specifically measure levels of bioterrorism preparedness, linkages can be made from their general disaster research to bioterrorism research. Of particular importance from the Gillespie et al., study was the use of physical and social properties to compute an overall level of bioterrorism preparedness.

Chapter Summary

The literature is in agreement, that although some studies have been conducted to assess the level of preparedness for a bioterrorist attack, further research needs to be done (Braun, Darcy, Divi, Robertson, and Fishbeck , 2004; Greenberg, Jurgens, & Gracely, 2002; Higgins, Wainright, Lu, and Carrico, 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001). Although preparations and preparedness levels have increased, even after the 2001 terrorist attacks these hospitals still lack comprehensive plans to deal with a potential attack. Another recurrent theme throughout the literature is the importance of training. Studies have shown that training is an effective means of planning and preparing for a bioterrorist attack as they have the potential to illustrate deficiencies (Alder, Clark, White Jr., Talboys, and Mottice , 2004; Filoromo, Macrina, Pryor, Terndrup, and McNutt, 2003; Henning, Brennan, Hoegg, O'Rourke, Dyer, and Grace, 2004; Klein, Atas, and Collins, 2004).

A number of studies have specifically addressed the role of size and location of a hospital in the case of a bioterrorist attack. Although no studies currently have assessed the impact of system affiliation, extrapolations were made from theoretical applications to point to higher preparedness levels in system affiliated hospitals. Most of these studies, albeit from different sections of the country, indicate a strong association between larger hospitals in urban areas and higher levels of bioterrorism preparedness (Greenberg, Jurgens, & Gracely, 2002; Higgins, Wainright, Lu, and Carrico, 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell,

& Treser, 2001). The lone exception to this association was demonstrated in the 2004 Klein, Atas, and Collins study. They found smaller hospitals that diagnosed the "infected patients" from the drill in a more timely fashion and initiated bioterrorism plans with greater ease and interest than larger hospitals (Klein, Atas, and Collins, 2004).

Each referenced study provides a glimpse into other parts of the United States, and how these areas are preparing for a potential attack. However, only one can be generalized to the nation at large (GAO, 2003). It was the intent of this study to further explore these issues, and attempt to quantify the levels of preparedness in the state of Florida post September 11, 2001.

CHAPTER 4: METHODOLOGY

This chapter served to offer the research questions addressed along with the corresponding hypotheses. In addition, it discussed the research design, sampling techniques, and the corresponding sample drawn. It also addressed the development and administration of the survey including the IRB and informed consent procedures. Next, the definitions of key variables were offered and the scales of measurement explained. The chapter concludes with a discussion of the data analysis techniques employed.

Research Questions and Hypotheses

In keeping with the previous literature, and building on the previous studies conducted, the intent of the current study was three fold. As such, the following research questions were explored:

1) Does hospital size affect the preparedness level of a hospital in the event of a bioterrorist attack?
2) Does hospital location affect the preparedness level of a hospital in the event of a bioterrorist attack?
3) Does hospital system membership (system vs. non-system) affect the preparedness level of a hospital in the event of a bioterrorist attack?

Furthermore, in assessing these research questions and comparing them to the literature reviewed, the researcher formulated the following hypotheses:

H_{a1} = Levels of preparedness for a bioterrorist attack will be directly related to the bed size of hospital.

H_{o1} = There is no relationship between disaster preparedness of a hospital and the number of beds.

H_{a2} = There is a difference in level of preparedness of a hospital between those in urban and rural locations in the event of a bioterrorist attack.

H_{o2} = There is no difference in level of preparedness of a hospital between those in urban and rural locations in the event of a bioterrorist attack.

H_{a3} = There is a difference in level of preparedness of a hospital between those that are system affiliated and those that are non-system affiliated in the event of a bioterrorist attack.

H_{o3} = There is no difference in level of preparedness of a hospital between those that are system affiliated and those that are non-system affiliated in the event of a bioterrorist attack.

Research Design

This study employed an explanatory survey design to answer all three of the research questions. A cross sectional survey design was implemented to answer the research questions. In addition, based upon the previous literature and the above research questions, the following models were offered to assist in addressing the hypotheses to be tested:

Level of preparedness = a + b_1 size + error

Level of preparedness = a + b_1 location + error

Level of preparedness = a + b_1 system affiliation + error

Sample

In order to examine the levels of bioterrorism preparedness in hospitals in the State of Florida, and the effect of system membership, location, and size on those levels, a purposive non-probability sample was gathered. The acute care hospitals were selected from a 2003 directory search engine containing over 200 hospitals provided by the Florida Hospital Association of all hospitals in the State of Florida. In 2004, they were then cross referenced from a current listing of all Florida hospitals with emergency departments from the Florida College of Emergency Physicians to yield a total of 201 hospitals from which a sample was drawn (See Appendix B). The only attributes selected to determine the total number of acute care hospitals in Florida were "show hospitals and health systems" and "acute care" for organization type. Additionally, the hospitals were further stratified by total number of beds to determine

hospital size, and location in Florida to determine whether they reside in an urban or rural location. The demographics of this sample provided by the directory listing gave the researcher a starting point in collection of demographic information, but this sample gathering procedure was not inclusive of all the types of information the researcher wished to collect. Thus, the survey instrument began with such data collection questions in order to anonymously compile a demographic profile of the sample.

Additionally, all hospitals were surveyed anonymously to encourage responses with greater candor. The researcher coded the surveys numerically for tracking and accuracy purposes only, and only the researcher knew the codes. This served to minimize the bias factor in the responses received and encourage higher levels of survey participation.

Survey Development and Administration

As previously stated, a survey was utilized to address the research questions of the effect of system membership, location, and size of a hospital on the levels of preparedness for a bioterrorist attack. The survey assessed the areas of physical properties of the hospital (i.e. facilities, equipment, communication systems, etc.), as well as the social characteristics of the hospital (planning, training, financial, and community characteristics) (Gillespie, et al., 1993) (See Appendix C). These characteristics were adapted from the 1993 study performed by Gillespie et al., measuring organizational preparedness in a disaster, and followed the same measurement scales as created by the researchers.

The survey questions were adapted from a combination of the questions asked by the Gillespie et al. (1993), survey. However some of the extraneous verbiage in the questions was changed to reflect measurement of readiness for a bioterrorist attack. The more specific bioterrorism questions were adapted from several previous surveys of hospitals measuring actual preparedness, and perceptions of preparedness in the case of a bioterrorist attack (AHA, 2002; Booz-Allen & Hamilton, 2002). Questions were asked in the areas of: 1) general hospital characteristics (demographics); 2) types of disaster plans in place; 3) training of staff; 4) facility accommodations (i.e. equipment, space availability, etc.); 5) availability of supplies and pharmaceuticals; 6) security measures; 7) staffing; 8) budgeting; and 9) community relations/education (AHA, 2002; Booz-Allen & Hamilton, 2002; Gillespie et al., 1993). Actual survey questions may be found in Appendix C. Questions asking for specific information about the actions of the hospitals to prepare for a bioterrorist attack (i.e. training exercises), or information about equipment or supply inventories, used nominal or ordinal levels of measurement. All survey questions had options to choose from in order to categorize the responses, and assure ease of analyzing the data. Conversely, questions from the Gillespie et al. (1993) research used an ordinal approach to measurement as described in more depth below. The purpose of the inclusion of these questions was to assess the actual level of preparedness of the organization based on the responses to the survey.

Once developed, the survey was administered to attendees of the 2004 Florida Emergency Medicine Foundation's 25th Annual International Disaster Management Conference (February 5th-8th) and the 2004 Florida Emergency Medicine Foundation's Symposium By the Sea held August 5-8th. In addition, a mail survey was conducted in

an effort to further boost survey response rates. This survey also was administered in 2004 at the disaster management conference and included: “All persons and agencies involved with emergency preparedness, management and response...firefighters, EMS personnel, emergency managers, hospital administrators, physicians, nurses, DMAT personnel, disaster planning coordinators, medical facility administrators, law enforcement officials, search and rescue responders, civil preparedness officials, mass fatality responders, and others who play important roles in critical incidents” (Florida Emergency Medicine Foundation, 2004, no p#). Attendees at the Symposium By the Sea included emergency physicians from around the state of Florida.

Conference attendees who were either hospital administrators or managers of the emergency department were asked to complete the survey. Only one survey per facility was filled out so as not to skew the data on each facility based upon an uneven rate of responses. As each survey was completed, the survey was assigned a number that corresponded to the hospital name. This information was then used for tracking purposes only and was not used in analysis, nor was it disclosed to anyone other than the principal investigator.

IRB/Informed Consent Procedures

Approval to proceed with the research as indicated above was secured through an expedited review by the University of Central Florida’s Institutional Review Board. Permission was granted initially on February 3, 2004 and renewed January 10, 2005 (See Appendix D). In addition, addenda to the data collection method were filed and

approved on March 1, 2004 and August 2, 2004 to accommodate the survey mail and Symposium By the Sea conference collection.

Informed consent was accomplished through the following statement written at the top of the survey:

> "The completion of this anonymous survey constitutes informed consent to participate in this study. Each organization has been assigned a number for the purpose of tracking response rates and accuracy of results only – at no time will anyone other than the principal researcher know the origin of each survey. At any time, should you not wish to answer a question you may do so without penalty."

Variable definitions

This study utilized several different variables for analysis of preparedness in the event of a bioterrorist attack; each is defined and operationalized below (See Appendix E for full listing).

System Affiliation

"A system may be defined as an organized or complex whole: an assemblage or combination of things or parts forming a complex or unitary whole" (Cleland & King, 1983, p. 19). More specifically, a healthcare system is defined as two or more hospitals or other provider organizations resulting from horizontal, vertical, or virtual integration (Fottler & Malvey, 2003). In the healthcare arena, a system-affiliated hospital is one that is affiliated with other organizations (usually through a parent company) to provide a continuum of care (Ginter, Swayne, & Duncan, 1998).

In addition, hospitals may consolidate by way of mergers or acquisitions (Cueller & Gertler, 2003). As previously stated, hospitals may become part of a system through

horizontal integration, or integration by “creation of multi-hospital systems that provided similar acute care services in multiple locations” (Fottler, Scharoun, & Oetjen, 2004, p.13). They can also integrate vertically, through a merger of multiple organizations in an effort to provide a continuum of care that reaches beyond traditional acute are services (Fottler, Scharoun, & Oetjen, 2004). Most recently, hospitals have even consolidated through virtual integration, whereby the consolidation takes place via a contract (Fottler, Scharoun, & Oetjen, 2004).

Size

Size of the hospital was measured by the number of beds the hospital has available for patient care. For purposes of this study, size was categorized as a ratio level variable and was divided into four categories. The four categories were divided up into small (100 or less beds), medium (101-300 beds), large (over 301 beds), and extra large (over 501 beds).

Location

Whether a hospital was located in an urban or rural area represented location of the hospital. According to the 2000 United States Census, an urban area, or “cluster” is defined as “a densely settled area that has a census population of 2,500 to 49,999” (United States Census Bureau, 2002, no page # available). Conversly, a rural area is defined as, “all territory, population, and housing units located outside of urbanized areas and urban clusters” (United States Census, Bureau, 2002, no page # available). For purposes of measurement, location was categorized as a nominal level variable.

Levels of Preparedness

For purposes of this study, level of preparedness was measured on an ordinal level. Each variable was measured on a 0-7 point scale with responses ranging from 0, indicating “no emphasis at all” or “no involvement”, to 7, which indicated, “very strongly emphasized” to “extremely high involvement” unless otherwise noted (Gillespie, et al., 1993). In addition, a “don’t know” category was used to capture such responses. The categories within levels of preparedness utilized the following topics for measurement: 1) general hospital characteristics (demographics); 2) types of disaster plans in place; 3) training of staff; 4) facility accommodations (i.e. equipment, space availability, etc.); 5) availability of supplies and pharmaceuticals; 6) security measures; 7) staffing; 8) budgeting; and 9) community relations/education (AHA, 2002; Booz-Allen & Hamilton, 2002; Gillespie et al., 1993).

Scales of Measurement

To best measure the levels of preparedness within an organization, the researcher employed the measurement tool developed by Gillespie, et al. (1993). This measure of organizational preparedness was originally created to address organizational preparedness in the case of a “general” disaster, but can be used to explore the more specific bioterrorist attack scenario. Gillespie et al., “sought measures specific enough to guide the process of improving preparedness, but general enough to permit development of theory and comparative study” (1993, p.41). They used two main focus areas of study in an attempt to quantify levels of disaster preparedness

including physical preparedness and social preparedness, and then included an overarching category of overall disaster preparedness (Gillespie, et al., 1993).

Within the first focus area of physical preparedness, Gillespie, et al., sought to quantify the "degree to which organizational plans emphasize safety of physical facilities and objects to reduce the loss of life, injury, and property damage" (1993, p.42). Questions from this section were rated on a seven item summative scale that indicated the degree to which disaster plans emphasized hazard analysis, site analysis, building safety, the securing of heavy objects, the protection of vital records, and the testing of emergency communication systems. Items were then scored on a scale from 0, indicating "no emphasis at all" or "no involvement", to 7, which indicated, "very strongly emphasized" to "extremely high involvement" (Gillespie, et al., 1993).

Next, social preparedness was addressed and measured the different aspects of a disaster plan such as the internal planning, training, financial, and the external aspect of community preparedness. This measure was based on a twelve item summative scale to quantify the organization's emphasize on gathering knowledge, planning for disasters, updating disaster plans, and establishing disaster plan goals. All items were then rated on the same 7-point scale as above with 0 representing "no involvement" and 7 representing "extremely high involvement" (Gillespie, et al., 1993).

Most importantly, the overall disaster preparedness scale developed by Gillespie, et al., was used. It measures, "the degree to which an organization emphasizes safety of physical facilities and objects, community disaster planning, disaster training, community disaster education, and budgeting to reduce the loss of life, injury and property damage" (1993, p. 43). It used a twelve item summative scale and a 7-point

scale as above with 0 representing “does not apply” and 7 representing “applies perfectly.” The end result provides a manner in which to, “examine how the structure of interorganizational relations is related to organizational disaster preparedness” (Gillespie et al., 1993, p.43).

Data Analysis

Two types of data were examined. First, the demographic data was examined, and consequently the three main independent variables of system membership, size, and location were reviewed. Survey question responses were examined and correlations (using the bivariate statistical test Pearson’s r) were computed for each independent variable against the dependent variable of preparedness.

Furthermore, survey questions were analyzed using independent sample t tests for the location and system affiliation variables, and ANOVA was used for bed size since the means of more than two variables were computed. The following equations were run:

1. Level of preparedness = $a + b_1$ size + error
2. Level of preparedness = $a + b_1$ location + error
3. Level of preparedness = $a + b_1$ system affiliation + error

The dependent variable for preparedness contained a subset of twelve characteristics that together comprised the overall level of preparedness for a bioterrorist attack. Although there were seventy-seven total responses, a number of surveys either did not respond to this question, or responded with “don’t know.” Since the there were so many that fell into this category it was excluded from the final

analysis. In addition, those surveys that had missing responses from the overall level of preparedness question were also excluded.

Each of the twelve characteristics were added together and divided by twelve for each hospital to yield a mean value that represented level of preparedness. Additionally, this variable and corresponding methodology was tested for its effectiveness by running a Cronbach Alpha. The Cronbach Alpha yielded a raw coefficient of .92 and a standardized coefficient of .93, thus illustrating that the chosen methodology of using the mean for the responses to yield an overall level of preparedness was an acceptable method.

However, in order to exhaust all other possibilities, and ensure the quality of the data analysis chosen, a principal component with varimax rotation factor analysis was performed. Out of the twelve possible factors, an eigenvalue over 1 was only found for 3 of the factors. More over, these factors accounted for seventy three percent of the total variance explained by each of the factors. These 3 distinct factors were found, and included:

Planning Factor = New approaches to deliver disaster services (Approach); Set of stable disaster services provided (Service); Staff/Volunteers are retrained (Retrain); Info flows up and down (Info); Maintaining high morale is important (Morale); and Establishing agreements with other organizations is important (Agree).

Staffing Factor = Staff productivity is emphasized (Product); Bioterrorism services evaluated (Serv); and Authority over bioterrorism services is clear (Auth).

Funding and Communications Factor = All funds needed are secured (Funds); Understanding unit cost is important (Cost); and Public relations/communications are important (Comm)

As such, each of the independent variables were run against the mean overall level of preparedness, as well as each of the factors yielded by the factor analysis.

Chapter Summary

This chapter offered the research questions addressed along with the corresponding hypotheses. In addition, it discussed the research design, sampling techniques, and the corresponding sample drawn. It also addressed the development and administration of the survey including the IRB and informed consent procedures. Next, the definitions of key variables were offered and the scales of measurement explained. The chapter concluded with a discussion of the data analysis techniques employed.

CHAPTER 5: RESULTS

This chapter will serve to report the data generated from the survey and the corresponding statistical analysis of the data as it relates to the research questions and hypotheses. Furthermore, the statistical analysis outlines the main variables used in the analysis, an overall profile of the sample, including response rates, a report of the Pearson R correlations for each of the independent variables against the dependent variable, the results of the ANOVA run for bed size, and the results for the t-tests run for location and system affiliation.

Profile of the Sample

Of the possible 201 hospitals surveyed, 77 organizations returned a survey to the researcher. This represented a response rate of 38.3 percent. Although the response rate was slightly lower than desired, the following information is offered as representing the logic behind this rate. First and foremost, the delicate and controversial nature of the topic is offered as a potential reason why hospitals chose not to participate in the study. Since bioterrorism preparedness is such a sensitive topic with great loss of life to be considered, many hospitals are reluctant to put themselves out on such a precarious whim. Moreover, regardless of the anonymity offered to the hospitals, many may have been reluctant to respond for fear of making their hospitals appear unprepared. Secondly, the already overcrowded hospital emergency departments are struggling just to maintain their everyday capacity, thus making it difficult to carve out the time necessary to complete the survey (Barbera, Macintyre, & DeAtley, 2001).

Descriptive Statistics

The most common personnel who completed the survey included Emergency Room (ER) physicians (33.8 percent) and Medical Directors (23.4 percent), followed by a compilation of other persons such as Chief Medical Officer, Advanced Registered Nurse Practitioner (ARNP), Disaster Chairperson, Safety Director, and Chairman of the Emergency Department (See Table 1).

Table 1
Job Title of Survey Participants

Job Title	*Frequency*	*Percentage*
ARNP	2	2.6
Associate Residency Director	1	1.3
Assistant Clinical Professor of Emergency Medicine	1	1.3
Chairman Emergency Medicine	1	1.3
Chief Medical Officer	1	1.3
Dept. Chair	1	1.3
Director of Critical Care	1	1.3
Dir. Emergency Services	1	1.3
Disaster Chairperson	1	1.3
ER Director	2	2.6
ER Physician	26	33.8
ER Resident	5	6.5
Environmental Specialist	1	1.3
Fellow	1	1.3
Medical Director	18	23.4
Medical Officer	1	1.3
Org. Preparedness Specialist	1	1.3
Registered Nurse (RN)	1	1.3
Safety Director	7	9.1
Safety Specialist	1	1.3
Other	3	3.9
Totals	77	100.0

In addition, the independent variables of system affiliation, location, and bed size were ascertained. Of the 77 responses, 59 (76.6 percent) came from hospitals in urban locations, 13 (16.9 percent) from rural locations, and 5 (6.5 percent) chose not respond to the question. Bed size was broken down into four categories with 12 hospitals (15.6 percent) representing those with 100 or less beds, 26 hospitals (33.8 percent) with 101-300 beds, 21 hospitals (27.3 percent) with 301-500 beds, and 18 hospitals (23.4 percent) with over 501 beds. System affiliation yielded 52 hospitals (67.5 percent) that

were affiliated with a system, 24 (31.2 percent) that were not part of a system, and 1 (1.3 percent) with no response marked (See Table 2).

Table 2
Dependent Variable Frequencies

Variable Name	*Variable Category*	*Frequency*	*Percentage*
Location			
	Urban	59	76.6
	Rural	13	16.9
	No response	5	6.5
	Total	77	100.0
Bed Size			
	100 or Less Beds	12	15.6
	101-300 Beds	26	33.8
	301-500 Beds	21	27.3
	Over 501 beds	18	23.4
	Total	77	100.0
System Affiliation			
	System	52	67.5
	Non-System	24	31.2
	No Response	1	1.3
	Total	77	100.0

The independent variable of overall level of preparedness was also run for frequencies and yielded the following results for both the mean level of preparedness and the factor analysis components. For the overall mean category, “somewhat high” represented 27 of the hospitals surveyed (35.1 percent), followed closely by “moderate application” with 18 hospitals (23.4 percent), and a variation of other responses that comprised smaller individual percentages of the total responses. Planning from the

factor analysis yielded a similar result with “moderate application” representing 20 hospitals (26 percent), “somewhat high application” representing 17 hospitals (22.1 percent), “high application” representing 15 hospitals (19.5 percent) and the other responses that together comprised the rest of the totals.

The staffing factor also stayed in line with the previous runs and returned a result of “moderate application” representing 21 hospitals (27.3 percent), “somewhat high application” representing 13 hospitals (16.9 percent), “high application” representing 13 hospitals (16.9 percent), along with the other responses that together comprised the rest of the 77 responses. Lastly, the funding and communications factor demonstrated 2 of the same front running responses with “somewhat high application” representing 13 hospitals (16.9 percent), “moderate application” with 9 hospitals (11.7 percent), and saw the of addition of “somewhat low application” from 11 hospitals (14.3 percent).

In addition, it is important to note that “don’t know” was selected by 16 hospitals (20.8 percent) for the mean overall level, 14 hospitals (18.2 percent) for the planning factor, 15 hospitals (19.5 percent) for the staffing factor, and 26 hospitals (33.8 percent) for the funding and communications factor (See Table 3).

The results suggest the possibility that the self reported levels of preparedness fall in the mid ranges of the preparedness scale. For example, for the overall preparedness level, almost 59 percent felt that their hospitals ranked a four or a five out of seven on the scale of preparedness. This suggests that while hospitals may be better prepared than in the recent past, there is still room for improvement. Accordingly, the need to achieve higher levels of preparedness is consistent with the findings reported in a review of bioterrorism literature (Braun, et al., 2004; Greenberg, Jurgens,

& Gracely, 2002; Higgins, et al., 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001). Each of these studies reported a need to further address the issue of preparedness in an effort to attain higher levels of preparedness. The findings of this study concur with this notion as the need for improvement is noted.

Of equal importance is the penchant of respondents to select "don't know" for many parts of the overall preparedness question. The results of this question also suggest a disconnect in the presence of a written plan and communication of the details of the plan to employees. Evans (2002) suggested that the presence of a separate, detailed bioterrorism plan is crucial to preparedness. However, communication of the components of the plan is of equal importance to be successful (Murphy, 2004). Without communication, this could lead to chaos in the event of a bioterrorist attack, as employees may not be aware of the policies set forth in the disaster plan, nor their roles in enacting it (Bazzoli, et al., 2000; Braun, et al., 2004; Charns, 1997; Cueller & Gertler, 2003; Edwards & Fraser, 2001; Friedman & Marghella, 2004; GAO, 2003; Greenberg, Jurgens, & Gracely, 2002; Helget & Smith, 2002; Higgins, et al., 2004; Keim, Pesik, and Twum-Danso, 2003; Perrow, 1984; Provan & Milward, 2001; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001).

von Neumann's (1944) game theory also supports this disconnect as the internal characteristics of the hospital (i.e. presence of a written plan and communication of such) are thought to predict the "moves" a hospital makes. These moves translate into the hospital's level of preparedness, and may explain why only average levels of preparedness exist in Florida hospitals.

Table 3
Independent Variable Frequencies

Variable Name	*Variable Category*	*Frequency*	*Percentage*
Level of Preparedness			
	Does Not Apply	1	1.3
	Very Low Application	1	1.3
	Low Application	2	2.6
	Somewhat Low App.	2	2.6
	Moderate Application	18	23.4
	Somewhat High App.	27	35.1
	High Application	7	9.1
	Applies Perfectly	7	9.1
	Don't Know	16	20.8
	Total	77	100.0
Planning Factor			
	Does Not Apply	2	2.6
	Very Low Application	2	2.6
	Low Application	1	1.3
	Somewhat Low App.	5	6.5
	Moderate Application	20	26.0
	Somewhat High Application	17	22.1
	High Application	15	19.5
	Applies Perfectly	1	1.3
	Don't Know	14	18.2
	Total	77	100.0
Staffing Factor			
	Does Not Apply	1	1.3
	Very Low Application	3	3.9
	Low Application	1	1.3
	Somewhat Low App.	8	10.4
	Moderate Application	21	27.3
	Somewhat High App.	13	16.9
	High Application	13	16.9
	Applies Perfectly	1	1.3
	Don't Know	15	19.5
	Total	77	100.0
Funding and Communications Factor			
	Does Not Apply	5	6.5
	Very Low Application	3	3.9
	Low Application	5	6.5
	Somewhat Low App.	11	14.3
	Moderate Application	9	11.7
	Somewhat High Application	13	16.9
	High Application	2	2.6
	Applies Perfectly	3	3.9
	Don't Know	26	33.8
	Total	77	100.0

Demographic Information for the Sample

A look at the demographics of the sample revealed a snapshot of the hospitals surveyed in this study. System affiliation returned a majority (51.9 percent) that were part of a horizontally integrated system and 19.5 percent that were part of a vertically integrated system. Community hospitals comprised 63.6 percent of the hospitals surveyed, followed by teaching hospitals (20.8 percent), and specialty hospitals (10.4 percent). A slight majority (50.6 percent) of hospitals surveyed represented not for profit hospitals, followed closely by 37.7 percent of hospitals that enjoyed a for profit status. 50.6 percent of hospitals surveyed had over 701 full time employees, followed by 101-300 employees and 501-700 employees comprising 13 percent each of the total respectively (See Table 4).

Next, data was ascertained with regards to the presence of a written bioterrorism plan. Close to 91 percent of respondents stated that their organization had a written bioterrorism plan in place. Of those, the majority (50.6 percent) of those plans are updated on a yearly basis and 35.1 percent did not know when, if ever, they were updated. When asked how may years the plan covered, no clear majority was ascertained. Instead, the highest category represented those that did not respond to the question at all (33.8 percent). Similar responses were garnered when asked who was responsible for the plan within the organization. 28.6 percent of respondents chose “don’t know”, followed by a variation of other response categories (See Table 4).

Table 4

Demographic Profile of Sample

Variable Name	*Variable Category*	*Frequency*	*Percentage*
System Type			
	Horizontal	40	51.9
	Vertical	15	19.5
	No Response	22	28.6
Hospital Type			
	Teaching	16	20.8
	Community	49	63.6
	Specialty	8	10.4
	Other	1	1.3
	No Response	3	3.9
Ownership Type			
	For profit	29	37.7
	Not for Profit	39	50.6
	Government/Tax Distributed	7	9.1
	No Response	2	2.6
# of Full Time Employees			
	0-100	5	6.5
	101-300	10	13.0
	301-500	9	11.7
	501-700	10	13.0
	Over 701	39	50.6
	No Response	4	5.2
Written Plan for Bioterrorism			
	Yes	70	90.9
	No	5	6.5
	No Response	2	2.6
When Plan Updated			
	Every Month	2	2.6
	Every 6 Months	5	6.5
	Yearly	39	50.6
	Other	3	3.9
	Don't Know	27	35.1
	No Response	1	1.3
# of Years Covered by Plan			
	1 Year	20	26.0
	2 Years	16	20.8
	3 Years	14	18.2
	4 Years	1	1.3
	No Response	26	33.8
Who Responsible for Plan			
	CEO	4	5.2
	1 Level Below CEO	13	16.9
	2 Levels Below CEO	16	20.8
	3 Levels Below CEO	6	7.8
	Other	16	20.8
	Don't Know	22	28.6

Lastly, questions regarding training within the organization were asked. A majority (72.7 percent) of hospitals stated that training activities took place in their hospitals. Of those hospitals that train employees, 39.9 percent reported training activities take place every 0-3 months. Personnel that are 2 levels below the CEO were most often in charge of training activities within the hospital, yet 27.3 percent of respondents did not know who was in charge. Finally, 66.2 percent of hospitals update their bioterrorism plans based upon lessons learned from training exercises conducted (See Table 5).

Table 5
Demographics of Training Activities of Sample

Variable Name	*Variable Category*	*Frequency*	*Percentage*
Is training Conducted?			
	Yes	56	72.7
	No	12	15.6
	Don't Know	9	11.7
How Often Does Training Take Place?			
	0-3 Months	30	39.9
	4-6 Months	13	16.9
	7-9 Months	5	6.5
	10-12 Months	6	7.8
	Over 1 Year	1	1.3
	Don't Know	7	9.1
	No Response	15	19.5
Who is in Charge of Training?			
	CEO	1	1.3
	1 Level Below CEO	11	14.3
	2 Levels Below CEO	19	24.7
	3 Levels Below CEO	8	10.4
	Other	16	20.8
	Don't Know	21	27.3
	No Response	1	1.3
Is Plan Updated Based on Training?			
	Yes	51	66.2
	No	3	3.9
	Don't Know	22	28.6
	No Response	1	1.3

Pearson R correlations were also run for the independent and dependent variables. Of those run, bed size and location were correlated at the $p<.01$ level with each other. In addition, the physical properties and social properties mean component variables were dropped from the analysis because of a high correlation with the overall level of preparedness variable (See Table 6).

Table 6
Correlations for Independent and Dependent Variables

		Location	*Bed Size*	*System*	*Physical Total*	*Social Total*	*Overall*
Location							
	Pearson Correlation	1	-.49 **	.05	.13	.01	.00
	Sig. (2 tailed)		.00	.70	.26	.92	1.0
	N	72	72	71	72	72	72
Bed Size							
	Pearson Correlation	-.49**	1	.04	.10	.14	.13
	Sig. (2 tailed)	.00		.73	.40	.22	.26
	N	72	77	76	76	77	77
System							
	Pearson Correlation	.05	.04	1	.09	-.09	-.16
	Sig. (2 tailed)	.70	.73		.47	.47	.18
	N	71	76	76	75	76	76
Physical Total							
	Pearson Correlation	.13	.10	.09	1	.50**	.52**
	Sig. (2 tailed)	.26	.40	.47		.00	.00
	N	72	76	75	76	77	77
Social Total							
	Pearson Correlation	.01	.14	-.09	.50**	1	.80**
	Sig. (2 tailed)	.92	.22	.46	.00		.00
	N	72	77	76	76	77	77
Overall							
	Pearson Correlation	.00	.13	-.16			1
	Sig. (2 tailed)	1.0	.26	.17			
	N	72	77	76			77

** Correlation is significant at the .01 level (2-tailed)

From the data analyzed thus far, the following possibilities are noted regarding future considerations for bioterrorism preparedness. Despite the presence of a written plan for bioterrorism response in 91 percent of hospitals, deficiencies still exist in preparedness. For example, 51 percent of hospitals update their bioterrorism plan

yearly, yet 35 percent of respondents did not know when or if their plans were updated. In addition, 29 percent did not know who was in charge of updating the aforementioned plans. This lack of knowledge of the plans suggests that despite the presence of a plan, many employees are unaware of the contents of the plan or their role in executing it. Application of game theory to this notion suggests that these hospitals will enjoy lower levels of preparedness as a result of this weakness (von Neumann, 1944).

In addition, training on the uniqueness of bioterrorism and subsequent execution of a plan in the event of an attack is of importance (Alder, et al., 2004; Filoromo, et al., 2003; Henning, et al., 2004; Klein, Atas, and Collins, 2004). The findings suggest that positive strides are being made in the use of training exercises in Florida hospitals. For example, nearly 73 percent of hospitals employ training exercises as a means to prepare for a bioterrorist attack. Additionally, 66 percent of those that train on a regular basis use the results of the exercises to update the current bioterrorism plans based upon lessons learned. This is a positive step as previous studies have shown that organizations that train on a regular basis are able to pinpoint weaknesses and correct them before an actual attack occurs (Alder, et al., 2004; Filoromo, et al., 2003; Henning, et al., 2004; Klein, Atas, and Collins, 2004).

Analysis of Level of Preparedness vs. Bed Size

Research Question: Does hospital size affect the preparedness level of a hospital in the event of a bioterrorist attack?

Hypotheses:

H_a = Levels of preparedness for a bioterrorist attack will be directly related to the bed size of hospital.

H_o = There is no relationship between disaster preparedness of a hospital and the number of beds.

The first analysis looked for statistical significance between the bed size of a hospital and the subsequent overall level of preparedness. A one-way analysis of variance (ANOVA) was run first with the mean overall level of preparedness and then three more times with each of the factors yielded from the factor analysis. The mean overall level of preparedness returned a statistically significant difference ($F_{3,73} = 3.71$, $p<.05$) between hospitals of varying bed sizes. These results are consistent with past studies conducted on the effect of hospital size on overall levels of preparedness, as the literature was in agreement that hospital size does affect levels of preparedness (Greenberg, Jurgens, & Gracely, 2002; Gursky, 2004; Higgins, Wainright, Lu, and Carrico, 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001).

In addition, the overall levels of preparedness ranged form 4.6- 6.0 out of 7 for all hospitals involved in the study when compared to bed size (See Table 7). However,

the model only explained 13 percent of the variation in level of preparedness amongst hospitals of differing bed sizes.

Table 7
Mean Levels of Preparedness as Run With By Bed Size

Variable Category	*Mean*	*Standard Deviation*	*N*
100 or Less Beds	4.58	1.62	12
101-300 Beds	5.77	1.61	26
301-500 Beds	4.57	1.69	21
Over 501 Beds	6.00	1.85	18
Total	5.31	1.78	77

* Means range on a scale of 0-7 with 0= Does not apply and 7 = Applies perfectly

The analysis for level of preparedness using the planning factor did not return a statistically significant difference ($F_{3,59} = 1.49$, $p>.05$) between hospitals of varying bed sizes. In addition, this model explained 4 percent of the variation in level of preparedness based on bed size of the hospital. The staffing factor analysis produced similar results and did not return a statistically significant difference ($F_{3,58} = 1.14$, $p>.05$) between hospitals and their respective bed sizes. Moreover, this model only explained six percent of the variation in level of preparedness based upon bed size. The last analysis using the funding and communications factor also did not produce a statistically significant difference ($F_{3,47} = 1.64$, $p>.05$) in level of preparedness between hospitals of varying bed sizes. In keeping with the previous factor models, this model explained three percent of the variation in level of preparedness for hospitals based upon their respective bed size.

Analysis of Level of Preparedness vs. Location

Research Question: Does hospital location affect the preparedness level of a hospital in the event of a bioterrorist attack?

Hypotheses:

H_a = There is a difference in level of preparedness of a hospital between those in urban and rural locations in the event of a bioterrorist attack.

H_o = There is no difference in level of preparedness of a hospital between those in urban and rural locations in the event of a bioterrorist attack.

The next analysis was run to test for a difference in location of the hospital with respect to their overall level of preparedness for a bioterrorist attack. Results of the effect of bed size on overall preparedness levels suggested that size of the hospital did in fact affect a hospital's level of preparedness for a bioterrorist attack. These findings were consistent with previous literature that suggested size of the hospital as a significant predictor of levels of preparedness (Greenberg, Jurgens, & Gracely, 2002; Gursky, 2004; Higgins, Wainright, Lu, and Carrico, 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001). Additionally, if location of Florida hospitals does in fact predict levels of preparedness, findings from the aforementioned past studies would be confirmed for the location variable as well as size.

A t-test was run first using the mean for the overall level of preparedness, as well as three additional times with each of the factors drawn from the factor analysis of the level of preparedness question. The mean overall level of preparedness produced no

statistically significant difference (t = -.01, df=70, p > .05) in level of preparedness between those hospitals that are located in an urban area versus those located in a rural area. In addition, those hospitals located in an urban area (mean = 5.31, s.d.=1.74) and hospitals located in a rural area (mean=5.31, s.d=2.14) both returned similar mean levels of preparedness. However, since the null was accepted, these means do not contribute significantly to the model.

The analysis for location versus level of preparedness from the factor analysis variables for level of preparedness returned similar results. The planning factor for level of preparedness of an organization produced no statistically significant difference (t=1.90, df=57, p>.05) in hospitals in urban and rural areas. Additionally, urban hospitals (mean=4.54, s.d=1.32) had a higher level of preparedness than that of their rural counterparts (mean=3.57, s.d=1.82). However, since the t-test did not produce a significant result, the null hypothesis has been accepted.

The staffing factor was then run, and again yielded no statistically significant difference (t=1.13, df=56, p>.05) in level of preparedness between hospitals in urban and rural locations. In keeping with the previous results, again the urban hospitals (mean=4.31, s.d=1.37) had a higher level of preparedness than their rural counterparts (mean=3.70, s.d=1.95). However, as done previously, these results were not considered to be significant, thus again accepting the null.

The funding and communications factor was run in the same manner as the previous factors and returned a similar result. There was no statistically significant difference (t=1.05, df=45, p>.05) between overall level of preparedness and hospitals in urban and rural locations. Moreover, the hospitals in urban locations (mean=3.29,

s.d=1.83) reported higher overall levels of preparedness than their rural counterparts (mean=2.56, s.d.=1.61). As before however, these results were also discarded and the researcher accepted the null.

Analysis of Level of Preparedness vs. System Affiliation

Research Question: Does hospital system membership (system vs. non-system) affect the preparedness level of a hospital in the event of a bioterrorist attack?

Hypotheses:

H_a = There is a difference in level of preparedness of a hospital between those that are system affiliated and those that are non-system affiliated in the event of a bioterrorist attack.

H_o = There is no difference in level of preparedness of a hospital between those that are system affiliated and those that are non-system affiliated in the event of a bioterrorist attack.

The last analysis looked for a difference in overall level of preparedness between those hospitals that were part of a system and those that were not system affiliated. Previous literature supported the use of size and location of the hospital in predicting levels of preparedness for a bioterrorist attack (Greenberg, Jurgens, & Gracely, 2002; Gursky, 2004; Higgins, Wainright, Lu, and Carrico, 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001).

Although a paucity of literature exists to support the use of system affiliation as a significant predictor, application of theory to this variable may help to explain the

existence of such a relationship. For example, extrapolations from Meyer, Brooks, and Goes's (1990) environmental jolt theory suggested that a system affiliated hospital would be better prepared than their non-system affiliated counterparts. Application of this theory would suggest that those Florida hospitals that are part of a system would be better prepared as a result of the benefits of system membership (Bazzoli, Chan, Shortell, & D'Aunno, 2000; Charns, 1997; Cueller & Gertler, 2003; Edwards & Fraser, 2001; Perrow, 1984; Provan & Milward, 2001; Friedman & Marghella, 2004). These benefits could include: economies of scale, increased access to capital for expansion, acquisition of technology, and renovations (Charns, 1997). Cueller and Gertler (2003) concur with this idea, and assert a system's increased ability to adapt to changes in the environment as yet another potential advantage of systems.

The first run used the mean variable for overall preparedness and found no statistically significant difference ($t=1.36$, $df=74$, $p>.05$) in the level of preparedness whether or not a hospital was part of a system. Those that were affiliated with a system (mean=5.46, s.d.=1.59) did however return a higher mean level of preparedness than their non-system affiliated counterparts (mean=4.88, s.d.=2.07).

The next run included the variables of system affiliation and the planning factor from the factor analysis. Unlike previous runs however, the level of preparedness ($t=2.30$, $df=60$, $P<.05$) demonstrated a statistically significant difference in hospitals based upon affiliation with a system. Moreover, those hospitals that belonged to a system (mean= 4.62, s.d.=1.28) reported higher levels of preparedness than those hospitals that did not belong to a system (mean=3.77, s.d.=1.47).

The next analysis was performed using the staffing factor against system affiliation, and returned results that were consistent with the majority of the previous runs. There was no statistically significant difference ($t= 1.01$, $df=60$, $p>.05$) in level of preparedness and a hospital's affiliation with a system. Yet again, system membership (mean=4.40, s.d.=1.28) appeared to produce higher levels of preparedness than those not affiliated with a system (mean=4.00, s.d.= 1.82), but were disregarded due to the lack of statistical significance.

The last t-test was run by using system affiliation and the funding and communications factor to ascertain significance in level of preparedness. Much like the planning factor analysis, there was a statistically significant difference ($t=2.62$, $df=49$, $p<. 05$) in level of preparedness and affiliation with a system. In addition, those that were affiliated with a system (mean=3.74, s.d.= 2.42) reported higher levels of preparedness than those hospitals not affiliated with a system (mean=2.42, s.d.=1.82).

Discussion of Results

This study specifically looked at what impact location, bed size, and system affiliation of a hospital had on the overall level of preparedness for bioterrorist attacks. Previous research and theoretical applications (Bazzoli, et al., 2000; Braun, et al., 2004; Charns, 1997; Cueller & Gertler, 2003; Edwards & Fraser, 2001; Friedman & Marghella, 2004; Greenberg, Jurgens, & Gracely, 2002; Helget & Smith, 2002; Higgins, et al., 2004; Keim, Pesik, and Twum-Danso, 2003; Perrow, 1984; Provan & Milward, 2001; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001) suggested that a larger, system affiliated hospital located in an urban area was more likely to enjoy higher levels of preparedness than that of their smaller, non-system affiliated rural counterparts. Although no statistically significant difference was found in this study for hospitals with regards to their system affiliation or location, bed size was found to be a significant predictor of preparedness in a hospitals ability to deal with a bioterrorist attack ($F_{3,73} = 3.71$, $p<.05$).

Although bed size was suggested as a predictor in preparedness levels, it is not meant to be an exhaustive predictor of hospital preparedness. Instead, these results should be looked upon as a snapshot of the healthcare industry in Florida today and used as a benchmark to help further prepare our healthcare system for the possibility of a bioterrorist attack. In addition, the absences of a statistically significant relationship for location and system affiliation subsequently have important ramifications for the healthcare industry despite its acceptance of the null hypotheses.

Previous literature supported the use of size and location to as a means to predict the level of preparedness for a hospital for a bioterrorist attack (Greenberg, Jurgens, & Gracely, 2002; Gursky, 2004; Higgins, Wainright, Lu, and Carrico, 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001). While size of the hospital confirmed the findings of previous literature, the use of location as a predictor was disproved for the sample used. In addition, despite the dearth of literature examining the role of system affiliation as a predictor of preparedness, application of theory was used to formulate hypotheses regarding system affiliation.

Meyer, Brooks, and Goes's (1990) environmental jolt theory was offered as the best way to predict the significance of system affiliation in levels of preparedness. Application of this theory suggested that the benefits of system membership would lead to higher levels of preparedness (Bazzoli, Chan, Shortell, & D'Aunno, 2000; Charns, 1997; Cueller & Gertler, 2003; Edwards & Fraser, 2001; Perrow, 1984; Provan & Milward, 2001; Friedman & Marghella, 2004). Although application of this theory did not yield a statistically significant relationship, further research exploring this potential relationship is suggested.

Analysis of Level of Preparedness vs. Bed Size

Research Question: Does hospital size affect the preparedness level of a hospital in the event of a bioterrorist attack?

Hypotheses:

H_a = Levels of preparedness for a bioterrorist attack will be directly related to the bed size of hospital.

H_o = There is no relationship between disaster preparedness of a hospital and the number of beds.

When using the mean level of preparedness, the data supports the use of bed size as a statistically significant predictor of preparedness in a hospital, thus rejecting the null hypothesis. This confirms the findings of previous literature that suggested bed size as a significant predictor of level of preparedness (Greenberg, Jurgens, & Gracely, 2002; Gursky, 2004; Higgins, Wainright, Lu, and Carrico, 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001). In addition, the application of game theory to bed size also confirms the variable as a significant predictor of preparedness (von Neumann, 1944). Using game theory, the size of the hospital will create distinct levels of preparedness based upon their respective size since it will affect the strategic "moves" it makes in the "game." In essence, the internal characteristic of size impacts preparedness in that size may affect the amount of resources available, the number of staff, or surge capacity to handle a bioterrorist attack.

Consequently, when combining application of previous studies and theoretical underpinnings, this study suggests that bed size has an effect on the mean level of preparedness of a hospital in the event of a bioterrorist attack. Nonetheless, it is important to note that because of the use of bed size as a fixed factor, the results cannot be generalized back to the general population.

Analysis of Level of Preparedness vs. Location

Research Question: Does hospital location affect the preparedness level of a hospital in the event of a bioterrorist attack?

Hypotheses:

H_a = There is a difference in level of preparedness of a hospital between those in urban and rural locations in the event of a bioterrorist attack.

H_o = There is no difference in level of preparedness of a hospital between those in urban and rural locations in the event of a bioterrorist attack.

Again, when using the mean level of preparedness, the data suggests that there is no difference in level of preparedness of a hospital between those in urban and rural locations in the event of a bioterrorist attack, thus the null hypothesis is accepted. Although previous studies have supported the difference in preparedness levels based on location (Braun, et al., 2004; Greenberg, Jurgens, & Gracely, 2002; Higgins, et al., 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001), it was not a strong enough predictor in the Florida hospitals surveyed to warrant suggesting it as a statistically significant predictor.

Similarly, application of theory in an attempt to predict the effect of location on preparedness also was disproved. For example, application of game theory suggested that an urban hospital would enjoy higher levels of preparedness than their rural counterparts due to availability of funding and resources available (Meyer, Brooks, and Goes, 1990). These resources may be increased availability and supply of equipment, pharmaceuticals, staff, and a myriad of mutual aid agreements amongst other community entities that enable urban hospitals to be better prepared. In addition, the perceived risk of an attack was likely to be higher in an urban area, thus the routing of funds to such areas would be more likely. However, based upon study findings, location has no effect on preparedness levels of hospitals in Florida.

Analysis of Level of Preparedness vs. System Affiliation

Research Question: Does hospital system membership (system vs. non-system) affect the preparedness level of a hospital in the event of a bioterrorist attack?

Hypotheses:

H_a = There is a difference in level of preparedness of a hospital between those that are system affiliated and those that are non-system affiliated in the event of a bioterrorist attack.

H_o = There is no difference in level of preparedness of a hospital between those that are system affiliated and those that are non-system affiliated in the event of a bioterrorist attack.

Thus far, application of theory and previous literature confirmed the notion that size of the hospital effects level of preparedness and disproved the notion that location has an impact on preparedness. The last research question delves into the previously unexplored area of impact of system affiliation. As such, the mean level of preparedness was used to ascertain the effect of system affiliation on preparedness of a hospital. No difference in level of preparedness of a hospital between those that are system affiliated and those that are non-system affiliated in the event of a bioterrorist attack was found, thus the null hypothesis was accepted.

Despite the extrapolations made from theory and previous literature, (Bazzoli, et al., 2000; Braun, et al., 2004; Charns, 1997; Cueller & Gertler, 2003; Edwards & Fraser, 2001; Friedman & Marghella, 2004; Greenberg, Jurgens, & Gracely, 2002; Helget & Smith, 2002; Higgins, et al., 2004; Keim, Pesik, and Twum-Danso, 2003; Perrow, 1984; Provan & Milward, 2001; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001), system affiliation failed to be a statistically significant predictor of level of preparedness for a hospital. Meyer, Brooks, and Goes's (1990) environmental jolt theory was used to posit that hospitals that were members of a system would enjoy higher levels of preparedness than their non-system affiliated counterparts. This was due in part to the perceived benefits of economies of scale, increased access to capital for expansion, acquisition of technology, and renovations (Charns, 1997). However, despite the presence of these perceived benefits, no effect of system affiliation was determined.

Further Considerations

Regardless of the significance, or lack of, found in this study, other startling data was garnered from the surveys collected which was in keeping with information obtained from previously conducted surveys from both pre and post September 11, 2001. The TFAH's study released in late December of 2004 confirms the idea that although preparedness activities are taking place more often than before September 11, 2001, there is nonetheless room for a great deal of improvement (Hearne, Segal, Earls, & Unruh, 2004). Studies such as the TFAH's, as well as others, pointed to a lack of preparedness within the healthcare industry. They also showed a need for more activities involving widespread planning and preparedness in order to be ready for the inevitable attack (Braun, et al., 2004; Greenberg, Jurgens, & Gracely, 2002; Higgins, et al., 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001). This study confirmed these same notions, which indicated a lack of preparedness across the board, despite the strides made in preparedness activities post September 11, 2001.

Perhaps one of the most startling illustrations of this lack of preparedness came in the form of the number of survey responses marked "don't know." For example, in question sixteen of the survey, which measured the overall level of preparedness, between fourteen (18.2 percent) and twenty six (33.8 percent) of those hospitals surveyed, marked "don't know" as their chosen response for at least part of the question. The implication drawn from the number of hospitals surveyed that answered "don't know" for many of the questions demonstrates a disconnect between many

individuals within the hospitals and the policies and procedures, if any, that are in place to deal with such an event. A review of the previous literature (Braun, et al., 2004; Greenberg, Jurgens, & Gracely, 2002; Higgins, et al., 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001), both pre and post September 11, 2001 further illustrates this disconnect, and points to a need for further planning and policies to be put forth so that America's hospitals can deal with the inevitable bioterrorist attack.

In keeping with these results, some clear policy implications can be drawn. For example, the need for monetary assistance that is distributed in an equitable manner to those hospitals in Florida that are in need of such assistance is critical. Previous distributions often favored the larger urban hospitals and left the smaller rural hospitals to fend for themselves (Gursky, 2004). These monetary contributions will allow these hospitals to engage in training exercises that simulate an attack, procure the necessary equipment needed, and develop separate plans designed specifically for a bioterrorist attack. Although monetary gains have been made for hospitals in the war on bioterrorism, the funding that has come through for the hospitals as of late is not enough, and often does not trickle down to all of the hospitals that are in need of monetary assistance (Krizner, 2002; AP, 2004). Without such assistance, the already financially burdened healthcare industry will not be able to effectively plan for bioterrorism, as other more critical and pertinent needs will have to be addressed first. In short, the monetary assistance will allow them to deal with bioterrorism in a more proactive manner, rather than a reactive manner after the attack occurs.

Traditionally, acts of terrorism have been dealt with by the more conventional emergency response entities of law enforcement and fire rescue services (Henderson, 2001). A bioterrorist attack caused this paradigm to shift, and placed the nation's hospitals on the first line of defense to deal with bioterrorism (American Hospital Association, 2002). This paradigm shift is why it is crucial for the healthcare industry to plan and prepare as best they can for the inevitable bioterrorist attack. Although no one can be sure how, when, or where a bioterrorist attack will occur, higher levels of planning should translate into a more efficiently implemented disaster plan and a reduction in potential loss of life.

Chapter Summary

This chapter served to report the data garnered from the survey and the corresponding statistical analysis of the data as it relates to the research questions and hypotheses. Previous studies conducted in other parts of the United States, as well as theory, suggest the idea that a larger, urban, system affiliated hospital will be better prepared than their smaller, rural, non-system affiliated counterparts. Consequently, the findings of this study concurred with past studies only on the effect of bed size on preparedness.

Although a statistically significant relationship for levels of preparedness was only found in bed size, the implications are still important. For example, although location and system affiliation did not prove to be significant predictors of level of preparedness, other information was ascertained from the results. For example, although there are more hospitals with written plans in place, and more hospitals that are conducting training activities, a disconnect between plans and communications of these plans still exists. Even with these improvements in overall preparedness level, almost 59 percent felt that their hospitals ranked a four or a five out of seven on the scale of preparedness. This suggests that while hospitals may be better prepared than in the recent past, there is still room for improvement.

In addition, as previous literature suggests, although planning has improved, there are still many deficiencies to correct. Implications of this need to plan further, the disconnect illustrated within Florida hospitals, and suggestions for improving preparedness efforts will be discussed further in the next chapter.

CHAPTER 6: CONCLUSIONS

This chapter has compiled results garnered from this study, along with recommendations from previously conducted research, to provide a framework of hospital bioterrorism procedures which would allow them to effectively prepare for a potential attack. Clear planning and policy implications were drawn in order to assist hospitals in preparing for an attack. In addition, this chapter addressed the contributions to the literature on bioterrorism, strengths and weaknesses of the study, and concludes with recommendations for future research.

Contributions to the Literature

This study contributes to the growing body of literature on bioterrorism preparedness. It specifically contributes a study conducted entirely post September 11, 2001 in early 2004. Most studies conducted immediately following the 2001 terrorist attacks cited increased preparedness may have been due to increased awareness following the tragedy (Alder, et al., 2004; Braun, et al., 2004; GAO, 2003; Gursky, 2004;Henning, et al., 2004; Higgins, et al., 2004; Klein, Atas, and Collins, 2004). Even though many hospitals still believe a bioterrorist attack is unlikely, caution must be exercised as bioterrorism can affect any area at any time (Bartlett, 2001; Karwa, Curie, and Kvetan, 2005; Tieman, 2002). To assume that bioterrorism cannot and will not affect the world, as we know it is imprudent; as such a lackadaisical attitude can spell tragedy for an unprepared hospital.

Although there have been an increased number of studies surrounding bioterrorism preparedness, most have centered on the effects of location, size, and types of training conducted (Alder, et al., 2004; Filoromo, et al., 2003; Greenberg, Jurgens, & Gracely, 2002; Helget & Smith, 2002; Henning, et al., 2004; Klein, Atas, and Collins, 2004; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001). Conversely, none have looked at the effect of system affiliation on levels of preparedness. This study examined the role of location, size, and system affiliation on levels of preparedness, thus contributing to both the body of literature already published, as well a new contribution for system affiliation.

Previous studies, which examined the role of size and location, suggested that larger urban hospitals were more prepared for a bioterrorist attack than their smaller rural counterparts (Greenberg, Jurgens, & Gracely, 2002; Gursky, 2004; Higgins, Wainright, Lu, and Carrico, 2004; Keim, Pesik, and Twum-Danso, 2003; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001). For example, Higgins, et al., (2004) examined levels of preparedness in Kentucky hospitals. They found that hospitals located within the Metropolitan Medical Response System (MMRS) tended to have more advanced levels of preparedness than their non-MMRS counterparts (Higgins, et al., 2004). In addition, Gursky's 2004 study of hospitals pointed to overall unprepared hospitals, and cited stronger deficiencies in preparedness in smaller rural hospitals. The lone dissenting opinion in the literature belonged to Klein, Atas, and Collins (2004). They found that in a mock drill, smaller hospitals diagnosed the infected patents in a more timely fashion and initiated bioterrorism plans with greater ease and interest than their larger counterparts (Klein, Atas, and Collins, 2004).

Consistent with previous literature, this study supports the idea that larger hospitals are more prepared than their smaller counterparts. However, it does not support the use of location or system affiliation as a predictor of preparedness levels. Despite the lack of statistical significance for location and system affiliation, the findings still suggest an overall need to improve levels of preparedness, which was a common thread throughout all of the previously reviewed literature.

This study also made theoretical contributions to a subject not traditionally thought of in terms of theoretical implications. Unlike most areas of healthcare, a paucity of theory devoted to bioterrorism exists. As such, an application of theory from other fields was used in to attempt to explain why some hospitals are more prepared than others. Extrapolations were made from game theory (von Neumann, 1944) and environmental jolt theory (Meyer, Brooks, and Goes, 1990) in an effort to identify those characteristics of a hospital that most significantly contributed to their overall level of preparedness.

Consequently, the findings of this study support the use of game theory as a predictor of the characteristics necessary to predict levels of preparedness in hospitals. Using this theory, it was posited that larger, urban, system affiliated hospitals would be better prepared than their counterparts due to the opportunities, equipment, and staff available for use in a disaster situation. It was further posited that hospitals located in larger urban areas were more likely to be a target, thus should be better prepared as a result of this increased risk for a bioterrorist event. Although the findings of this study only supported the use of bed size as a predictor of level of preparedness, game theory is nonetheless offered as a plausible theory to apply to bioterrorism planning. In fact, of

the two theories explored, game theory is offered as the best option for explanation of hospital bioterrorism preparedness levels.

Additionally, environmental jolt theory was found to be a less effective predictor of levels of bioterrorism preparedness. This theory was originally posited as a basis for predicting system affiliated hospitals would be better prepared than their non-system affiliated counterparts. Previous research concluded that the advantages of a healthcare system are conducive to handle an environmental jolt, such as a bioterrorist attack, better than their free standing counterparts (Bazzoli, Chan, Shortell, & D'Aunno, 2000; Charns, 1997; Cueller & Gertler, 2003; Edwards & Fraser, 2001; Perrow, 1984; Provan & Milward, 2001; Friedman & Marghella, 2004). In fact, application of Cueller and Gertler's (2003) research suggested that systems would be better prepared due to the increased ability to adapt to changes in the environment. Charns (1997) concluded with this idea and further asserted the advantages of systems to include: economies of scale, increased access to capital for expansion, acquisition of technology, and renovations. Despite these theoretical underpinnings, system affiliation was not found to be a significant contributor to preparedness levels. This downplayed the use of environmental jolt theory in an effort to explain the effect of system affiliation on preparedness levels.

In addition, one of the most startling issues uncovered in hospitals surveyed was the respondent's lack of knowledge concerning bioterrorism protocols and procedures. Despite the fact that 91 percent of hospitals surveyed had bioterrorism plans in place, knowledge of such plans was sporadic. This is best illustrated by the question measuring overall preparedness components. In this question, between 18.2 percent

and 33.8 percent of those hospitals surveyed, marked “don’t know” as their chosen response for at least part of the question. This points to disconnect between planned policies and procedures, and relay of such information to all hospital staff. This ignorance of bioterrorism plans stems from a lapse in communication between departments and could lead to chaos in the event of an attack. The literature supports this finding that despite improvements in planning, deficiencies such as this lack of communication still exist (Bazzoli, et al., 2000; Braun, et al., 2004; Charns, 1997; Cueller & Gertler, 2003; Edwards & Fraser, 2001; Friedman & Marghella, 2004; GAO, 2003; Greenberg, Jurgens, & Gracely, 2002; Helget & Smith, 2002; Higgins, et al., 2004; Keim, Pesik, and Twum-Danso, 2003; Perrow, 1984; Provan & Milward, 2001; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001).

As such, training is suggested to uncover such deficiencies and assist in correcting them before an attack occurs. Previous literature suggests that at least some form of training is beneficial in preparing for a bioterrorist attack (Alder, et al., 2004; Filoromo, et al., 2003; Henning, et al., 2004; Klein, Atas, and Collins, 2004). While there is some disagreement on what types of training are paramount, all agree that said training needs to happen regularly and must be individually tailored to the hospital’s needs.

Of the hospitals surveyed in this study, 72.7 percent reported training activities took place in their hospitals. Nearly 40 percent of hospitals reported training occurs every 0-3 months, followed by 17 percent, which train every 4-6 months. In addition, 66.2 percent of hospitals updated their bioterrorism plans based upon lessons learned from training exercises. Although 29 percent of those surveyed indicated they had no

knowledge if plans were updated as a result of training, the outcomes suggest improvements have recently been made. This also suggests a positive trend in Florida hospitals, as the respondents seem to understand the importance of training. As such, findings concur with the literature that training is an important part of planning for a bioterrorist attack, and are being carried out in Florida hospitals (Alder, et al., 2004; Filoromo, et al., 2003; Henning, et al., 2004; Klein, Atas, and Collins, 2004).

Policy Implications/Recommendations for Preparing

A review of previous literature (Bazzoli, et al., 2000; Braun, et al., 2004; Charns, 1997; Cueller & Gertler, 2003; Edwards & Fraser, 2001; Friedman & Marghella, 2004; GAO, 2003; Greenberg, Jurgens, & Gracely, 2002; Helget & Smith, 2002; Higgins, et al., 2004; Keim, Pesik, and Twum-Danso, 2003; Perrow, 1984; Provan & Milward, 2001; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001) demonstrates despite a heightened awareness following the terrorist attacks of 2001, much work is still needed for America's hospital's to be truly prepared. In fact, when examining the overall preparedness level, almost 59 percent felt that their hospitals ranked a four or a five out of seven on the scale of preparedness. This suggests that while hospitals may be better prepared than in the recent past, there is still room for improvement. This concurs with suggestions from previous studies to further address the issue of preparedness in an effort to attain higher levels.

However, despite the mid to high self-reported levels of preparedness in the respondent's hospitals, a discrepancy exists when the results reported a high percentage of respondent's who chose "don't know" for many of the survey questions.

This discrepancy could exist as a result of the variety of respondents that took part in the survey rather than a uniform response from individuals who perform the same duties each hospital (i.e. all medical directors). Therefore, it is posited that this discrepancy may be a result of the survey reaching unintended recipients who did not have full knowledge of bioterrorism planning in the hospital. This lack of knowledge could include the aforementioned stricter JCAHO regulations for bioterrorism planning. However, despite this, a lack of communication of the plan to employees of all levels is still troubling. As such, it is suggested that the breakdown in communication be addressed in the form of education and training regardless of the role the individual plays in the hospital.

In fact, immediately following the 2001 attacks, bioterrorism planning was deemed a priority. This prioritization, as of late, has decreased in urgency and intensity for hospitals (Murphy, 2004). This decrease in priority level has resulted in a sense of complacency due to the perceived belief that an attack is unlikely (Bartlett, 2001; Karwa, Curie, and Kvetan, 2005; Tieman, 2002).

As such, several focus areas are suggested as a means to effectively prepare for a bioterrorist attack. They include: promotion of community involvement and communication, education and training of staff, improvements in informational technology, and acquisition of equipment specific to the demands of a bioterrorist attack (Murphy, 2004). These focus areas build upon the sample planning guidelines discussed previously and address more specific aspects of planning and preparedness. The previous areas of focus included the overarching categories of: preparedness and prevention, detection and surveillance, diagnosis and characterization of biological and

chemical agents, response, and communication (AHA, 2000; CDC, 2000; Johns Hopkins, 2001).

In addition, von Neumann's (1944) game theory and Meyer, Brooks, and Goes's (1990) environmental jolt theory point to a need to explore such focus areas as a means of preparation. Application of game theory to planning for a bioterrorist attack transforms the notion of planning for an attack into a "game". In addition, the strategic "moves" that hospitals make could be anything from the focus areas and are often predicated by the internal and external characteristics of the hospital (AHA, 2000; CDC, 2000; Johns Hopkins, 2001; Murphy, 2004). These characteristics can include everything from size and location of the hospital to the linkages or affiliations it has with other community organizations. In this particular study, it is clear that the only characteristic affecting the hospital's "moves" is bed size. Although system affiliation and location are still certainly important, their lack of statistical significance downplays their worth in this study.

Meyer, Brooks, and Goes's (1990) environmental jolt theory also points to the importance of planning for an attack. The application of an environmental jolt theory to the healthcare industry, and more specifically to a bioterrorist attack, categorizes such an attack as an environmental jolt. This "jolt's" impact, although never fully planned for, can be moderated based upon the corresponding healthcare organization's preparedness levels. This includes their level of commitment to the focus areas suggested as helpful planning tools.

In this case, the jolt to the healthcare industry is represented by a bioterrorist attack. How well prepared the hospital is helps to determine how well the event is

handled and allows for minimization of chaos. In addition, the commitment to training displayed by survey participants shows a commitment to preparation, thus helping to lessen a potential jolt's impact. Although application of environmental jolt theory suggested that a hospital that is part of a system will be better prepared, results of this study disprove this notion. Instead, as the results suggest, system affiliation has no impact on how well prepared a hospital is.

At the foundation of preparing for bioterrorism, it is critical that a separate, detailed bioterrorism plan be added to the organization as a stand-alone policy (Evans, 2002). Simply utilizing current disaster plans, which do not specifically address bioterrorism, is an unacceptable means of preparation. The difficulty in this task lies in the unpredictable nature of bioterrorism and the high costs of implementing and maintaining a separate bioterrorism plan (Murphy, 2004). Compounding the situation is the fact the medical community was previously able to follow scripts formulated through prior experiences; however, the lack of experience for a bioterrorist attack renders this method useless (Bullard, Strack, & Scharoun, 2002).

Moreover, accreditation by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) requires a disaster plan on file before the hospital's Joint Commission survey, yet many plans are thrown together last minute ("Terrorist attacks," 2001). Prior to September 11, 2001, JCAHO had emergency plans in place for all of its hospitals (Aldridge & Launt, 2004). However, in 2001, they amended their standards to include an "all hazards" approach to disaster preparedness, which allowed chemical and biological forms of terrorism to be considered disasters (Aldridge & Launt, 2004). Effective January 1, 2002, JCAHO implemented two standards to prepare for a disaster.

They included the presence of an emergency plan and the regular conduction of drills to test the emergency plan (JCAHO, 2002). These standards are still in place as of the 2004 update, but have continued to evolve as more is learned about bioterrorism preparedness.

The presence of an emergency management plan was established as standard EC.1.4. This standard ensures that the plan addresses the four phases of emergency management: mitigation, preparedness, response, and recovery. In addition, the plan must provide for the orientation and education of plan components to all staff involved in the emergency management process. Components of the training should include: delineation of each person's role in the plan, how to recognize the different typed of emergencies, the skills necessary to perform their respective duties, the backup communication system to be utilized in case of emergency, and the supplies and equipment necessary for all emergency types. The standard also provides for an annual review of the organization's hazard vulnerability analysis and of the plan itself (JCAHO, 2002).

Standard EC.2.9.1 provided for the implementation of drills in an effort to test the emergency management plan in place. This standard established guidelines that called for the bi-annual occurrence of drills no less than four months and no more than eight months apart. In addition JCAHO requires that the testing include the following:

a. "For organizations that offer emergency services or are designated as disaster receiving stations, at least one drill yearly that includes an influx of volunteer or simulated individuals.
b. Participation in at least one community-wide practice drill yearly (where applicable) relevant to the priority emergencies identified by the organization's hazard vulnerability analysis, that assesses communication, coordination, and

the effectiveness of the organization's and community's command structures" (JCAHO, 2002, p# unavailable).

It is important to note that a tabletop exercise performed in the organization does not qualify as an emergency management drill.

The aforementioned standards, although still in place for the 2004 update, have been revised and expounded on to create a broader more detailed response to bioterrorism. The following are the current standards for 2004 that apply to bioterrorism preparedness:

- "EC.1: The hospital plans for a safe, accessible, effective, and efficient environment consistent with its mission, services, law, and regulations
- EC.1.10: The hospital manages safety risks (includes planning for worker and hospital environmental safety)
- EC2.10: The hospital identifies and manages its security risks.
- EC.3.10: The hospital identifies and manages its hazardous materials and waste risks.
- EC.4.10: The hospital addresses emergency management.
- EC.6.10: The hospital manages medical equipment risks.
- HR.2.20: staff members, licensed independent practitioners, students, and volunteers, as appropriate, can describe or demonstrate their roles and responsibilities, based on specific job duties or responsibilities, relative to safety.
- EC.2.9: The hospital conducts emergency drills regularly.
- EC.4.20: The hospital conducts regularly to test emergency management.
- EC.8.10: The hospital establishes and maintains an appropriate environment.
- EC.9.10: The hospital monitors conditions in the environment.
- EC.9.20: The hospital analyzes identified environment issues and develops recommendations for resolving them" (JCAHO, 2004, CX 26-28.)

Although these standards are in place by JCAHO, there is increasing concern these plans could not be implemented effectively in the case of a real disaster (Henning, et al., 2004; "Terrorist attacks," 2001). In addition, the high percentage of survey respondents who did not appear to be aware of these standards, suggests that the presence of an emergency plan and communication of its components is not being done on a large scale. While many of the staff may know of the plan and its components, all

staff may not be privy to this information, thus illustrating the disconnect. As such, further staff education and training is suggested to improve knowledge of the plan and its components to employees of all levels.

Other ways to improve emergency plans were suggested by Cameron Bruce, a healthcare consultant from California. He suggests plans should be concise, yet practical as he offers the following list as the pinnacle weak points of bioterrorism plans:

> 1. “Not based on flexible incident command system
> 2. Do not contain enough multidisciplinary input
> 3. Do not consider enough probable scenarios, i.e., no hazard vulnerability analysis
> 4. Lack essential response information, such as checklists, flowcharts, and data
> 5. Lack overview of communications backup systems
> 6. Do not contain adaptable forms for managing information
> 7. Do not adequately address backup supplies -- locations, amounts, and vendor agreements
> 8. Have not undergone a review by local authorities
> 9. Lack alarm points signaling that critical supplies are running low
> 10. Do not include rapid troubleshooting tools for responding to problems such as water failure
> 11. Have not undergone adequate drilling or testing of the plan and its components
> 12. Have not undergone continuous improvement of the plan based on drill results” (“Terrorist attacks,” 2001, p. 154).

In keeping with these weaknesses, an important component of a bioterrorism plan is its provisions for community involvement (Braun, et al., 2004; CDC, 2000; Karwa, Curie, and Kvetan, 2005; Murphy, 2004; Greenberg and Hendrickson, 2003). Strong linkages with other community agencies such as fire rescue, law enforcement, emergency management agencies, public health departments and local governments are essential to overall preparedness and discourage duplication of services (Braun, et al., 2004). Moreover, the CDC recommends hospitals should, “maintain a public health

preparedness and response cooperative agreement that provides support to state health agencies who are working with local agencies in developing coordinated bioterrorism plans and protocol" (2000, p.12).

Additionally, a concerted effort amongst all community organizations will assist in curtailing and containing public hysteria (Murphy, 2004). This includes aiding hospitals in dealing with a mass influx of the "worried well," which will seek medical attention out of fear and panic (CDC, 2000; Karwa, Curie, and Kvetan, 2005). Establishing a clear delineation of responsibilities also allows for an integrated community response rather than a fragmented one (Braun et al., 2004).

In accordance with the importance of community involvement, hospitals must consider what their individual surge capacity is (Karwa, Curie, and Kvetan, 2005). Although traditionally thought of as the maximum numbers of patients that can be handled, surge capacity also involves the number of staff, supplies, and equipment a hospital possesses (Karwa, Curie, and Kvetan, 2005; Murphy, 2004). Mutual aid agreements can help to expand a hospital's surge capacity by sharing resources such as these to those that need it most (Murphy, 2004).

Since emergency rooms are often going to be the first line of defense against bioterrorism, it is imperative all staff receives training specific to their role in the hospital (Greenberg and Hendrickson, 2003; Murphy, 2004). Although there is little experiential knowledge regarding the "best" methods of training, there is little dissent concerning its importance (Henning, et al., 2004). In fact, the literature is in agreement that training is an essential component of bioterrorism preparedness (Alder, et al., 2004; Filoromo, et al., 2003; Henning, et al., 2004; Klein, Atas, and Collins, 2004).

Accordingly, several key points should be addressed when planning training exercises for bioterrorism. Initially, it is recommended each hospital have access to a core group of experts available to train on issues such as: decontamination, infectious diseases, medical toxicology, and use of protective equipment (Greenberg and Hendrickson, 2003). It is equally important experts hired by hospitals be credible sources of knowledge as deemed by their audience, as sensitivity to the needs and demands of life in each department is critical (Alder, et al., 2004).

While there is some debate over the best methods of training, a one-size fit all approach should definitely be avoided (Alder, et al., 2004; Greenberg and Hendrickson, 2003). It is important to tailor the training program to the individual needs of the hospital and it's staff (Alder, et al., 2004). In addition, time constraints and competing demands are often cited as roadblocks to additional training (Alder, et al., 2004; Filoromo, et al., 2003). To overcome these issues, it is sometimes necessary to think outside the box. For example, Filoromo et al. (2003), designed a clinician based screensaver and website containing important bioterrorism information. Access to these screensavers/websites is readily available in hospital emergency departments. This method was found to not only be an efficient use of time, but is an economical option for disseminating and updating staff on the most current bioterrorism information (Filoromo, et al., 2003).

Still other methods of training can be used in a hospital. Alder et al. (2004), suggested that web based exercises like the Filomoro et al. screensaver exercise could be useful along with disaster drills, and other exercises that included comprehensive bioterrorism information. Henning et al. (2004) used role-playing exercises through use

of scenario presentations to encourage discussion on how to handle such an event and pinpoint deficiencies. Klein, Atas, and Collins (2004) touted the use of unannounced drills as a means to train staff and again look for any deficiencies in preparations. Each exercise was effective for the organization they were tested in, but needed to be tailor fit to the individual needs of each hospital for maximum effectiveness.

Improvements in information technology (IT) and communications are also significant in preparing for a bioterrorist attack. Information technology and communications go hand in hand as information technology is a vital part of effective communication both within the hospital and to other community organizations (Murphy, 2004). Pre-established communication channels are also important to allow for rapid dissemination of bioterrorist or suspected bioterrorist attacks (Greenberg and Hendrickson, 2003). Information technology can also be used to track unusual clusters of symptoms that can be similar to exposure to a bioterrorist agent (Murphy, 2004). This is crucial as, “early detection is essential for ensuring a prompt response to a biological or chemical attack, including the provision of prophylactic medicines, chemical antidotes, or vaccines” (CDC, 2000, p.9).

One method that melds information technology together with communications is the use of the Health Alert network. The Health Alert Network is an electronic database that stores email addresses and fax numbers to key agencies in an area. If there is a need to disseminate information about a possible attack, an alert is issued to health departments, hospitals, local governments, and other agencies through this system. This method allows for quick transmission of information to a large group of entities

since time is such a critical issue in such cases (M'ikanatha, Lautenbach, Kunselman, Julian, Southwell, Allswede, Rankin, and Aber, 2003).

Additional preferred methods of communication are the World Wide Web and medical journals (M'ikanatha, et al., 2003; Murphy, 2004). The Web, which also encompasses the use of information technology, is another excellent way to disseminate information quickly to a large number of people (M'ikanatha, et al., 2003). In addition, it can be rapidly updated as information changes, or becomes available.

Information Technology can also be used as referenced above in the training exercises. The use of online educational programs would not be possible without the proper information technology to support it (Murphy, 2004). Moreover, in addition to training, information technology can be used to aid hospitals in distributing and tracking vaccinations should the need arise (US Newswire, 2003).

Lastly, procuring the proper equipment specific to the demands a bioterrorist attack creates is also a critical part of planning. In order to treat victims of a bioterrorist attack, it is sometimes necessary to have large quantities of medications and specialized equipment readily available for use (Murphy, 2004). Although the hospital itself may not be able to keep such large quantities of medicine or equipment on hand, a community stockpile or mutual aid agreements may be used to procure the proper supplies (Karwa, Currie, and Kvetan, 2005).

Recommendations for necessary supplies vary from apparatus as simple as charts to aid in symptom recognition, to decontamination suits and gear (Greenberg and Hendrickson, 2003). Personal protective equipment, ventilators, decontamination shower units, isolation/quarantine beds, and pharmaceutical supplies are all suggested

supplies to have on hand (Murphy, 2004). Again, resource sharing is critical as most equipment is expensive and can be used collectively for greater efficiency.

Additionally, although not a tangible piece of equipment, qualified personnel are also an important resource to have available (Murphy, 2004). A pool of additional physicians, nurses, emergency medical technicians, public health professionals, and other staff should be available in case of a surge of patients (Karwa, Currie, and Kvetan, 2005). Staffing agreements with other hospitals, organizations within the community, or surrounding areas are an inexpensive way to ensure the proper number of employees could potentially be available to handle a mass influx of patients (Murphy, 2004).

Discussion of Study Strengths and Limitations

Study Strengths

The current study built upon the work done previously by other researchers and shares the view that although low levels of bioterrorism preparedness were found, that further research is warranted (Bazzoli, et al., 2000; Braun, et al. 2004; Charns, 1997; Cueller & Gertler, 2003; Edwards & Fraser, 2001; Friedman & Marghella, 2004; GAO, 2003; Greenberg, Jurgens, & Gracely, 2002; Helget & Smith, 2002; Higgins,et al., 2004; Keim, Pesik, and Twum-Danso, 2003; Perrow, 1984; Provan & Milward, 2001; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001). Caution should be used when generalizing these findings to other parts of the country as it only assessed hospitals in the state of Florida.

September 11, 2001 was a turning point in the war on bioterrorism. It raised awareness levels, and brought the issue of bioterrorism to the forefront of debate. Its

impact, while not yet fully quantified in terms of hospital preparedness, is an important factor to consider when researching this topic. In fact, its impact may never truly be quantified until an actual attack occurs.

This study was one of the first to quantify the levels of preparedness since the events of September 11th in the State of Florida and assess its impact, if any, on the way a hospital prepares for the inevitable bioterrorist attack. In addition, unlike studies conducted immediately following the events of September 11, 2001, this study was conducted in early 2004. This lapse in time between the terrorist attacks and the survey period, allowed for the immediate rush to prepare to settle, and assess the true levels of preparedness. This helped to eliminate the initial reactive spike in awareness of preparedness levels that followed the 2001 attacks. In short, it allowed for a better measurement of preparedness as the events of 2001 became more of a memory and a sense of complacency slowly returned.

Additionally, this study provided a baseline assessment of the levels of preparedness for Florida hospitals. When the inevitable brush with bioterrorism occurs, the results of this study can then be used to benchmark preparedness levels and compare them to levels of preparedness after an actual attack has occurred.

Weaknesses/Limitations

The researcher suggests four principle limitations to the study which are the willingness to respond to the survey and consequent low response rate, the variety of individuals that responded to the survey, the candor of the information garnered from the surveys, and the tendency of Florida hospitals to be system affiliated, thus leaving a small sample of non-system affiliated hospitals for study.

First and foremost, given the sensitive nature of the topic, and the often overwhelming pace at which hospitals operate, the survey response rate was a bit lower than normal research standards would indicate. Normally, at least a fifty percent response rate is desired to have a viable research project. However, due to the historically low response rate of hospitals in answering surveys, especially one with such a sensitive topic, the research was conducted using the thirty eight percent response rate. This was done in an effort to create a baseline measurement for further research.

Previous research supports using lower response rates as other hospital surveys returned lower than normal response rates as well. For example, a 2003 study on the smallpox vaccinations for emergency medical providers returned a 43 percent response rate (Everett, Coffinn, Zaoutis, Halpern, and Strom, 2003). This rate was low due to the sensitive nature of the topic as well as the time constraints placed upon hospital personnel.

In addition, despite addressing the survey to the medical directors of the emergency department, a variety of individuals responded to the survey in lieu of the director. For example, only eighteen ED directors responded, whereas twenty-six ER physicians, seven safety directors, and an assortment of other individuals responded to the survey. This may have been due to the time constraints of the directors, thus the survey was passed along to other individuals for completion. In today's already overcrowded emergency departments, time is of essence; therefore a survey such as this may be deemed a low priority and handled as such.

For future research, several suggestions are offered to boost the response rates and insure that the correct individual answers the survey. One method offered is to conduct interviews with a designated person at each hospital who fulfills the same role at each hospital surveyed (i.e. ED medical director). In this case, interviews would have been conducted with the medical directors of the emergency department, thus ensuring a uniform response rate from individuals who perform similar job functions at each hospital. Additionally, this will help to boost response rate as face to face interviews negates the possibility of passing the survey off to another individual or not participating at all.

Another suggested method of improving response rate and ensuring uniformity of the roles of the respondents is to conduct focus groups. This will also allow for a better response rate as a captive audience can answer all survey questions in person. This will again, allow the researcher to ensure that the targeted respondent is indeed the person actually giving his or her respective hospital's information requested.

Next, the candor of the responses was of concern. Given that many questions on the survey require the respondent to self assess his or her hospital's readiness for a bioterrorist attack, a certain degree of bias could be introduced into the responses. There also may be a tendency to over exaggerate the true readiness of the hospital in an attempt to portray a hospital that is in control and capable of handling such an event. While there is no way to ascertain whether or not the responses have been exaggerated, the researcher will attempt to alleviate this problem by keeping self assessment questions to a minimum, and focus on more quantifiable questions such as the presence of a plan, training activities, etc.

At the time of the study, there were 201 acute care hospitals in the State of Florida (Florida College of Emergency Physicians, 2004). Of those, the majority are affiliated with a system, leaving only a relatively small number of hospitals in the sample as non-system affiliated. Although clearly the system affiliated hospitals outnumber the non-system affiliated, conclusions still can be drawn regarding the affect of system affiliation on the levels of preparedness. However, despite any conclusions drawn, caution must be exercised in generalizing this information to a larger sample such as all hospitals in the United States.

Future Research

This study served to quantify the levels of preparedness for a bioterrorist attack in Florida's acute care hospitals. As of late, there has been a boom in the literature regarding bioterrorism. This study will add to the growing body of literature surrounding the topic. Since there have been no major experiences with bioterrorism, research studies such as this are the only means available to assess levels of preparedness. In addition, studies such as this can help to identify deficiencies in planning so that corrections can be made before an attack occurs.

Although only capturing a snapshot of one area of the United States, it serves as starting point for future research in this area. Most importantly, the findings serve as a baseline measurement for hospital preparedness in Florida's hospitals before an actual attack has occurred. Further study of this issue will enable hospitals to learn more about bioterrorism and how their respective hospitals can prepare.

For example, further research on this issue could focus on the training activities taking place in Florida hospitals. The findings suggested that training is taking place, and that approximately two thirds of hospitals incorporated training results into their plans. While this is a positive step towards preparedness, future research may look into what types of training are taking place and if there are any underlying characteristics of hospitals that cause training to occur more than in others.

Another area of future research may delve into the presence of written plans and its impact on preparedness. This can be done through studying role playing exercises and ascertaining their impact. This can help to measure the worth and effectiveness of

the written plan as it is carried out in the exercise, as well as the worth of the exercise itself.

Another possible area of future research could lie in exploring the impact of other factors on overall preparedness levels. While most of the literature (Bazzoli, et al., 2000; Braun, et al. 2004; Charns, 1997; Cueller & Gertler, 2003; Edwards & Fraser, 2001; Friedman & Marghella, 2004; GAO, 2003; Greenberg, Jurgens, & Gracely, 2002; Helget & Smith, 2002; Higgins,et al., 2004; Keim, Pesik, and Twum-Danso, 2003; Perrow, 1984; Provan & Milward, 2001; Treat, et al., 2001; Wetter, Daniell, & Treser, 2001) has explored the effect of size, location, and training, other variables such as ownership type, community partnerships, and mutual aid agreements can be explored.

As of late, the literature is beginning to explore the use of mutual aid agreements as a means to prepare for a bioterrorist attack (Braun, et al., 2004; CDC, 2000; Karwa, Curie, and Kvetan, 2005; Murphy, 2004; Greenberg and Hendrickson, 2003). Possible future research could look at the impact of such agreements on bioterrorism preparedness, and assess the its worth on overall planning activities.

Although system affiliation was not found to be a statistically significant predictor of preparedness levels, future research could also shed light on this variable. As previously discussed, the tendency of Florida hospitals to be system affiliated left a small percentage of non-system affiliated hospitals to study. Forthcoming research could look more specifically at only non-system affiliated hospitals and see what characteristics impact their preparedness levels.

In addition, although past research indicated a relationship between preparedness levels and location of a hospital, this study found no such relationship.

Other research could re-explore this characteristic and look for significance, and if still none is found, look for the underlying reasons why.

The uniqueness of the situation has left many to wonder if the planning being done will be successful when an actual attack occurs. However, when the inevitable occurs, future research can use this study to assess levels of preparedness before and after the attack, and measure the impact of experiencing the situation on the levels of preparedness the hospitals operate at. While it is the hope of the researcher that such an attack never comes to fruition, it is better to be prepared than to assume that it will never happen.

Overall, it is also the intention of this researcher to continue studying bioterrorism, as it is an area of great importance to the healthcare industry. It is the hope that further research be conducted on a larger scale so that it may be generalized to hospitals across the nation. Armed with the information that studies like these can provide, the nation's hospitals can be prepared for a bioterrorist attack should it occur.

Chapter Summary

This chapter melded together the findings of the study with previous research and theoretical underpinnings. It explored the contributions the study made to the literature, along with implications for policy. It also suggested some planning activities that can help to create a more effective and efficient bioterrorism plan. In addition, it explored the strengths and weaknesses of the study, along with suggesting areas of future research to be explored at a later date.

APPENDIX A: SUMMARY OF LITERTAURE REVIEWED

Authors	*Area Studied*	*Date*	*Independent Variable(s)*	*Dependent variable(s)*	*Significant Findings*
Wetter, Daniell, & Treser	US Public Health Service Region X (Alaska, Idaho, Oregon, & Washington)	1998	❑ Location ❑ ED annual census ❑ Proximity to US Army's chemical weapons depot	❑ Preparedness	Indicate that hospital ED's generally are not prepared in an organized fashion to treat victims of incidents involving chemical or biological weapons" (p.714).
Greenberg, Jurgens & Gracely	Greater Philadelphia area	2000	❑ At least 1 emergency physician on staff who had completed formal training with respect to biological and chemical weapons, ❑ Ability to decontaminate at least 10 patients per hour, ❑ Written policies that addressed how to evaluate and treat biologically and chemically exposed patients, ❑ Written cooperative agreements with local agencies that address biological and chemical weapons attacks, ❑ Participation in a drill or exercise relating to chemical and biological weapons within the last 12 months, and ❑ A self characterized "adequate" supply of antidotes for the treatment of biological and chemical weapons.	❑ Preparedness	Found that fewer than 2% of all respondent hospitals had achieved this minimum level of preparedness (as set by independent variable benchmarks)

Treat, Williams, Furbee, Manley, Russell, & Stamper	FEMA Region III (West Virginia, Pennsylvania, Maryland, Virginia, & DC)	2001	❑	Qualitative/ no discernable independent variables	❑	Preparedness	"Hospitals in this sample do not appear to be prepared to handle WMD (weapons of mass destruction) events, especially in areas such as mass decontamination, mass medical response, awareness among health care professionals, health communications, and facility security (p. 562)."
Helget & Smith	Nebraska	2001	❑	None – just 6-question survey to capture the perceptions, and physical readiness of the facilities.	❑	Preparedness	98% stated that they did not feel as if they were adequately prepared for an attack of this nature
Keim, Pesik, and Twum-Danso	21 hospitals in an unidentified major metropolitan area of the United States	2003	❑ ❑ ❑ ❑	Stockpiles of antidotes for chemical exposure Decontamination equipment availability Levels of worker protection established Staff training procedures	❑	Preparedness	Hospitals were unprepared to deal with a chemical terrorist attack
General Accounting Office (GAO)	Urban hospitals across the US	2003	❑ ❑ ❑	Planning and preparedness activities Training of staff Capacity to respond to a bioterrorist attack	❑	Preparedness	More hospitals were preparing in the form of written plans for a bioterrorist attack, but inadequacies in training and

					equipment exist
Higgins, Wainright, Lu, and Carrico	Kentucky short and long term hospitals	2004	❑ Disaster plans in place ❑ Training exercises used ❑ Sharing of Info on training ❑ Collaborative agreements in place	❑ Preparedness	Emergency plans were in place in the majority of hospitals, but some deficiencies in planning
Braun, Darcy, Divi, Robertson, and Fishbeck	Hospitals scheduled for accreditation by (JCAHO)	2004	❑ Emergency management plans ❑ Hospital's perception of community wide emergency plans ❑ Hospital's perception of overall community relationships for disaster ❑ Demographic information	❑ Preparedness	More plans in place and training taking place on a wider scale/ suggests more research be done
Gursky	Rural hospitals	2004	❑ Preparedness activities ❑ Planning for disaster	❑ Preparedness	An improvement in preparedness activities and overall levels of preparedness/ $$ not going to rural areas

Training Studies						
Filoromo, Macrina, Pryor, Terndrup, and McNutt	Emergency department of the University of Alabama Birmingham	2003	❑ ED rotation (before and after) ❑ Screensaver usage ❑ World Wide Web usage ❑ Overall technology training	❑	Preparedness	Scores increased post rotation after use of screensavers and the web
Henning, Brennan, Hoegg, O'Rourke, Dyer, and Grace	Philadelphia area	2004	❑ Scenario modules presented and feedback ascertained (no clear variables)	❑	Preparedness	Addressed the situation but with mass confusion/ scenarios useful in training
Klein, Atas, and Collins	Unidentified metropolitan area with an international boarder	2004	❑ Identification of exposure ❑ Implementation of disaster plan ❑ Protocol initiated ❑ Communication ❑ Use of drills	❑	Preparedness	Overall most unable to identify smallpox, but smaller hospitals were better and quicker to respond and implement plans
Alder, Clark, White Jr., Talboys, and Mottice	Utah	2004	❑ Educational needs ❑ Educational preferences ❑ Specialty ❑ Location ❑ Type of practice	❑	Preparedness	Training is necessary although a low perceived risk of attack/ needs to be individually tailored to physician audience

APPENDIX B: SAMPLE LIST

Hospital Name	Address	City/State	Ownership	Parent System	County	Beds
Shands at AGH	801 S.W. 2nd Ave	Gainesville, FL 32601-6298	Private/Not-For-Profit	Shands HealthCare	Alachua	367
All Children's Hospital	801-6th St S.	St. Petersburg, FL 33701	Private/Not-For-Profit	All Children's Health System	Pinellas	216
North Ridge Medical Center	5757 N. Dixie Hwy	Ft. Lauderdale, FL 33334	Private/Investor-Owned	Tenet HealthSystem	Broward	395
Palm Beach Gardens Medical Ctr.	3360 Burns Rd	Palm Beach Gardens, FL 33410-4331	Private/Investor-Owned	Tenet HealthSystem	Palm Beach	204
Palmetto General Hospital	2001 W. 68th St	Hialeah, FL 33016-1898	Private/Investor-Owned	Tenet HealthSystem	Dade	360
Aventura Hospital & Medical Center	20900 Biscayne Blvd.	Aventura, FL 33180-1407	Private/Investor-Owned	HCA East Florida Division	Dade	407
Baptist Hospital, Inc.	1000 W. Moreno St	Pensacola, FL 32501	Private/Not-For-Profit	Baptist Health Care, Inc.	Escambia	492
Baptist Hospital of Miami, Inc.	8900 N. Kendall Drive	Miami, FL 33176-2197	Private/Not-For-Profit	Baptist Health South Florida	Dade	551
Baptist Medical Center	800 Prudential Drive	Jacksonville, FL 32207-8244	Private/Not-For-Profit	Baptist Health	Duval	403
Baptist Medical Center Beaches	1350 13th Ave S.	Jacksonville Beach, FL 32250	Private/Not-For-Profit	Baptist Health	Duval	90
Bartow Memorial Hospital	1239 E. Main Street	Bartow, FL 33830	Private/Investor-Owned	LifePoint Hospitals, Inc.	Polk	56
Bascom Palmer Eye Institute/Anne Bates	900 N.W. 17th Street	Miami, FL 33157	Private/Not-For-Profit		Dade	100
Bay Medical Center	615 N. Bonita Avenue	Panama City, FL 32401	Government/County		Bay	353
Bayfront Medical Center	701 6th Street South	St. Petersburg, FL 33701-4814	Private/Not-For-Profit	Bayfront Health System	Pinellas	502
Bethesda Healthcare System	2815 S. Seacrest Blvd.	Boynton Beach, FL 33437	Private/Not-For-Profit		Palm Beach	362
Boca Raton Community Hospital	800 Meadows Road	Boca Raton, FL 33486-2386	Private/Not-For-Profit		Palm Beach	394
Bon Secours-St. Joseph Hospital	2500 Harbor Blvd.	Port Charlotte, FL 33952-5396	Private/Not-For-Profit	Bon Secours Health System, Inc.	Charlotte	212
Shands at Starke	922 E. Call St	Starke, FL 32091	Private/Not-For-Profit	Shands HealthCare	Bradford	49

Brandon Regional Hospital	119 Oakfield Drive	Brandon, FL 33511	Private/Investor-Owned	HCA West Florida Division	Hillsborough	255
Brooksville Regional Hospital	55 Ponce De Leon Blvd	Brooksville, FL 34601	Private/Investor-Owned	Hernando HMA, Inc.	Hernando	91
Broward General Medical Center	1600 S. Andrews Avenue	Ft. Lauderdale, FL 33316-2591	Government/Hospital District	North Broward Hospital District	Broward	744
Calhoun-Liberty Hospital, Inc.	20370 NE Burns Ave.	Blountstown, FL 32424	Private/Investor-Owned	DasSee Community Health Systems	Calhoun	36
Campbellton-Graceville Hospital	5429 College Drive	Graceville, FL 32440	Government/Hospital District		Jackson	49
Cape Canaveral Hospital	701 W. Cocoa Beach Cswy	Cocoa Beach, FL 32931	Private/Not-For-Profit	Health First, Inc.	Brevard	150
Cape Coral Hospital	636 Del Prado Blvd.	Cape Coral, FL 33990	Private/Not-For-Profit	Lee Memorial Health System	Lee	281
Cedars Medical Center	1400 N.W. 12th Avenue	Miami, FL 33136	Private/Investor-Owned	HCA East Florida Division	Dade	560
Citrus Memorial Hospital	502 W. Highland Blvd.	Inverness, FL 34452	Private/Not-For-Profit		Citrus	171
Kindred Hospital North Florida	801 Oak St	Green Cove Springs, FL 32043-0808	Private/Investor-Owned	Kindred Healthcare	Clay	60
Cleveland Clinic Hospital	3100 Weston Rd.	Weston, FL 33331-3602	Private/Investor-Owned	Tenet HealthSystem	Broward	150
Coral Gables Hospital	3100 Douglas Road	Coral Gables, FL 33134	Private/Investor-Owned	Tenet HealthSystem	Dade	273
Coral Springs Medical Center	3000 Coral Hills Drive	Coral Springs, FL 33065-4108	Government/Hospital District	North Broward Hospital District	Broward	200
Pasco Regional Medical Center	13100 Fort King Rd	Dade City, FL 33525-5294	Private/Investor-Owned	Health Management Associates	Pasco	120
Jackson South Community Hospital	9333 S.W. 152nd Street	Miami, FL 33157-1824	Government/Public Health Trust	Jackson Health System	Dade	199
Delray Medical Center	5352 Linton Blvd.	Delray Beach, FL 33484	Private/Investor-Owned	Tenet HealthSystem	Palm Beach	307
DeSoto Memorial Hospital, Inc	900 N. Robert Avenue	Arcadia, FL 34266-2180	Private/Not-For-Profit	Triad Hospitals, Inc.	Desoto	82
Doctors' Memorial Hospital, Inc.	407 E. Ash Street	Perry, FL 32347-2104	Private/Not-For-Profit		Taylor	48
Kindred Hospital Hollywood	1859 Van Buren St	Hollywood, FL 33020	Private/Investor-Owned	Kindred Healthcare	Broward	124
Doctors Memorial Hospital	401 E. Byrd Avenue	Bonifay, FL 32425	Private/Investor-Owned	Community Health Systems, Inc.	Holmes	34

Miami Jewish Home and Hospital	5200 N.E. 2nd Avenue	Miami, FL 33137	Private/Not-For-Profit		Dade	32
East Pasco Medical Center	7050 Gall Blvd.	Zephyrhills, FL 33541	Private/Not-For-Profit	Adventist Health System	Pasco	154
Lehigh Regional Medical Center	1500 Lee Blvd.	Lehigh Acres, FL 33936-4897	Private/Investor-Owned	Health Management Associates	Lee	88
Baker Community Hospital & Health Ctr.	159 N. 3rd St	Macclenny, FL 32063-2196	Government		Baker	25
Edward White Hospital	2323 9th Avenue, North	St. Petersburg, FL 33733-2018	Private/Investor-Owned	HCA West Florida Division	Pinellas	167
George E. Weems Memorial Hospital	135 Avenue G	Apalachicola, FL 32320	Private/Investor-Owned	DasSee Community Health Systems	Franklin	29
Englewood Community Hospital, Inc.	700 Medical Blvd.	Englewood, FL 34223	Private/Investor-Owned	HCA West Florida Division	Sarasota	100
Fawcett Memorial Hospital, Inc.	21298 Olean Blvd.	Port Charlotte, FL 33949	Private/Investor-Owned	HCA West Florida Division	Charlotte	238
Bert Fish Medical Center	401 Palmetto St	New Smyrna Beach, FL 32168	Government/Hospital District	Halifax Fish Community Health	Volusia	116
Fishermen's Hospital	3301 Overseas Hwy	Marathon, FL 33050	Private/Investor-Owned	Health Management Associates	Monroe	58
Flagler Hospital, Inc.	400 Health Park Blvd.	St. Augustine, FL 32086-5779	Private/Not-For-Profit	Flagler Health Care System, Inc.	St Johns	274
Florida Hospital Orlando	601 E. Rollins Street	Orlando, FL 32803-1287	Private/Not-For-Profit	Adventist Health System	Orange	902
Florida Hospital Waterman	201 N. Eustis St	Eustis, FL 32726	Private/Not-For-Profit	Adventist Health System	Lake	182
Florida Medical Center	5000 W. Oakland Park Blvd	Ft. Lauderdale, FL 33313	Private/Investor-Owned	Tenet HealthSystem	Broward	459
Fort Walton Beach Medical Center	1000 Mar-Walt Dr	Ft. Walton Beach, FL 32547-6795	Private/Investor-Owned	HCA North Florida Division	Okaloosa	247
Gadsden Community Hospital	US Highway 90 East	Quincy, FL 32351	Private/Investor-Owned	DasSee Community Health Systems	Gadsden	51
Glades General Hospital	1201 S. Main St	Belle Glade, FL 33430	Private/Investor-Owned	Province Healthcare Corporation	Palm Beach	73
Good Samaritan Medical Center	1309 N. Flagler Dr	West Palm Beach, FL 33401	Private/Investor-Owned	Tenet HealthSystem	Palm Beach	341
Baptist Hospital, Inc. d/b/a/ Gulf Breeze Hospital	1110 Gulf Breeze Pky	Gulf Breeze, FL 32561	Private/Not-For-Profit	Baptist Health Care, Inc.	Santa Rosa	60

Gulf Coast Hospital	13681 Doctor's Way	Ft. Myers, FL 33912	Private/Investor-Owned	HCA West Florida Division	Lee	120
Gulf Pines Hospital	102 20th St	Port St. Joe, FL 32456	Private/Investor-Owned	Marquis Management Group	Gulf	45
H. Lee Moffitt Cancer Ctr/Rsrch Inst	12902 Magnolia Dr	Tampa, FL 33612-9497	Private/Not-For-Profit		Hillsborough	162
Halifax Medical Center	303 N. Clyde Morris Blvd	Daytona Beach, FL 32114	Government/Tax District	Halifax Fish Community Health	Volusia	734
Trinity Community Hospital	506 N.W. 4th St	Jasper, FL 32052	Private/Investor-Owned	Trinity Health System	Hamilton	42
Regional Medical Center Bayonet Point	14000 Fivay Rd	Hudson, FL 34667	Private/Investor-Owned	HCA West Florida Division	Pasco	290
Central Florida Regional Hospital	1401 W. Seminole Blvd.	Sanford, FL 32771	Private/Investor-Owned	HCA North Florida Division	Seminole	226
Doctors Hospital of Sarasota	5731 Bee Ridge Road	Sarasota, FL 34233	Private/Investor-Owned	HCA West Florida Division	Sarasota	168
Gulf Coast Medical Center	449 W. 23rd St	Panama City, FL 32405	Private/Investor-Owned	HCA North Florida Division	Bay	176
Blake Medical Center	2020-59th Street, W.	Bradenton, FL 34209	Private/Investor-Owned	HCA West Florida Division	Manatee	383
Lawnwood Regional Medical Center	1700 S. 23rd St	Ft. Pierce, FL 34950	Private/Investor-Owned	HCA East Florida Division	St Lucie	305
Ocala Regional Medical Center	1431 S.W. 1st Ave	Ocala, FL 34474	Private/Investor-Owned	HCA North Florida Division	Marion	230
Largo Medical Center	201 14th St S.W.	Largo, FL 33770	Private/Investor-Owned	HCA West Florida Division	Pinellas	256
St. Lucie Medical Center	1800 S.E. Tiffany Avenue	Port St. Lucie, FL 34952-7595	Private/Investor-Owned	HCA East Florida Division	St Lucie	150
Community Hospital	5637 Marine Parkway	New Port Richey, FL 34652	Private/Investor-Owned	HCA West Florida Division	Pasco	401
North Florida Regional Medical Center	6500 W. Newberry Rd	Gainesville, FL 32605	Private/Investor-Owned	HCA North Florida Division	Alachua	278
Northwest Medical Center	2801 N. State Rd 7	Margate, FL 33063-9002	Private/Investor-Owned	HCA East Florida Division	Broward	175
Oak Hill Hospital	11375 Cortez Blvd	Brooksville, FL 34613	Private/Investor-Owned	HCA West Florida Division	Hernando	204
Putnam Community Medical Center	Highway 20 West	Palatka, FL 32177	Private/Investor-Owned	LifePoint Hospitals, Inc.	Putnam	141
Raulerson Hospital	1796 Hwy 441 N.	Okeechobee, FL 34972	Private/Investor-Owned	HCA East Florida Division	Okeechobee	101

Tallahassee Community Hospital	2626 Capital Medical Blvd	Tallahassee, FL 32308-4402	Private/Investor-Owned	HCA North Florida Division	Leon	180
Twin Cities Hospital	2190 Highway 85 North	Niceville, FL 32578	Private/Investor-Owned	HCA North Florida Division	Okaloosa	65
West Florida Hospital	8383 N. Davis Hwy	Pensacola, FL 32514	Private/Investor-Owned	HCA North Florida Division	Escambia	493
Health Central	10000 W. Colonial Dr	Ocoee, FL 34761	Government/Hospital Authority		Orange	141
HealthSouth Doctors' Hospital	5000 University Dr	Coral Gables, FL 33146	Private/Investor-Owned	HealthSouth Corporation	Dade	285
Larkin Community Hospital	7031 S.W. 62nd Ave	South Miami, FL 33143-4781	Private/Investor-Owned	Oracle Health Systems, Inc.	Dade	122
Heart of Florida Regional Medical Center	40100 Highway 27	Davenport, FL 33837-5906	Private/Investor-Owned	Health Management Associates	Polk	75
Helen Ellis Memorial Hospital	1395 S. Pinellas Ave	Tarpon Springs, FL 34689-3524	Private/Not-For-Profit	University Community Health	Pinellas	168
Hendry Regional Medical Center	500 W. Sugarland Hwy	Clewiston, FL 33440-3597	Government/Hospital Authority	Triad Hospitals, Inc.	Hendry	66
Hialeah Hospital	651 E. 25th St	Hialeah, FL 33013-3878	Private/Investor-Owned	Tenet HealthSystem	Dade	378
Highlands Regional Medical Center	3600 S. Highlands Ave	Sebring, FL 33870-5495	Private/Investor-Owned	Health Management Associates	Highlands	126
Hollywood Medical Center	3600 Washington St	Hollywood, FL 33021-8216	Private/Investor-Owned	Tenet HealthSystem	Broward	324
Holmes Regional Medical Center	1350 S. Hickory St	Melbourne, FL 32901-3276	Private/Not-For-Profit	Health First, Inc.	Brevard	468
Holy Cross Hospital, Inc.	4725 N. Federal Hwy	Ft. Lauderdale, FL 33308	Private/Not-For-Profit	Catholic Health East	Broward	577
Imperial Point Medical Center	6401 N. Federal Hwy	Ft. Lauderdale, FL 33308-1405	Government/Hospital District	North Broward Hospital District	Broward	204
Indian River Memorial Hospital	1000 36th St	Vero Beach, FL 32960-4810	Government		Indian River	335
Jackson Hospital	4250 Hospital Dr	Marianna, FL 32446-1939	Government/Hospital District	Triad Hospitals, Inc.	Jackson	100
Jackson Memorial Hospital	1611 N.W. 12th Ave	Miami, FL 33136-1017	Government/Public Health Trust	Jackson Health System	Dade	1392
Jay Hospital	221 S. Alabama St	Jay, FL 32565-1070	Private/Not-For-Profit	Baptist Health Care, Inc.	Santa Rosa	55

JFK Medical Center	5301 S. Congress Ave	Atlantis, FL 33462	Private/Investor-Owned	HCA East Florida Division	Palm Beach	387
Jupiter Medical Center	1210 S. Old Dixie Hwy	Jupiter, FL 33458-7299	Private/Not-For-Profit	Brim, Inc.	Palm Beach	156
Kendall Medical Center	11750 Bird Rd	Miami, FL 33175	Private/Investor-Owned	HCA East Florida Division	Dade	412
Lake City Medical Center	1050 North Commerce Blvd.	Lake City, FL 32055	Private/Investor-Owned	HCA North Florida Division	Columbia	75
Shands at Lake Shore	560 E. Franklin St	Lake City, FL 32055-3000	Private/Not-For-Profit	Shands HealthCare	Columbia	99
Lakeland Regional Medical Center	1324 Lakeland Hills Blvd	Lakeland, FL 33805	Private/Not-For-Profit		Polk	851
Leesburg Regional Medical Center	600 E. Dixie Ave	Leesburg, FL 34748	Private/Not-For-Profit	Orlando Regional Healthcare	Lake	294
Lower Florida Keys Health System	5900 College Rd	Key West, FL 33040	Private/Investor-Owned	Health Management Associates	Monroe	118
Orlando Regional Lucerne Hospital	818 S. Main Lane	Orlando, FL 32801	Private/Not-For-Profit	Orlando Regional Healthcare	Orange	267
Madison County Memorial Hospital	201 E. Marion St	Madison, FL 32340	Private/Not-For-Profit		Madison	42
Manatee Memorial Hospital	206 Second Street, E.	Bradenton, FL 34208	Private/Investor-Owned	Universal Health Services, Inc.	Manatee	491
Mariners Hospital	91500 Overseas Highway	Tavernier, FL 33070	Private/Not-For-Profit	Baptist Health South Florida	Monroe	42
Martin Memorial Medical Center	300 Hospital Avenue	Stuart, FL 34994	Private/Not-For-Profit	Martin Memorial Health Systems, Inc.	Martin	236
Mease Hospital/Countryside	3231 McMullen Booth Rd	Safety Harbor, FL 34695-1098	Private/Not-For-Profit	BayCare Health System	Pinellas	144
Mease Hospital/Dunedin	601 Main St	Dunedin, FL 34698	Private/Not-For-Profit	BayCare Health System	Pinellas	234
Charlotte Regional Medical Center	809 E. Marion Avenue	Punta Gorda, FL 33950	Private/Investor-Owned	Health Management Associates	Charlotte	208
Memorial Hospital of Tampa	2901 Swann Ave	Tampa, FL 33609-4057	Private/Investor-Owned	Iasis Healthcare	Hillsborough	174
Florida Hospital - Flagler	60 Memorial Medical Pkwy.	Palm Coast, FL 32164	Private/Not-For-Profit	Adventist Health System	Flagler	81
Memorial Regional Hospital	3501 Johnson St	Hollywood, FL 33021-5487	Government/Tax District	Memorial Healthcare System	Broward	684
Florida Hospital - Memorial Division	875 Sterthaus Ave	Ormond Beach, FL 32174-5197	Private/Not-For-Profit	Adventist Health System	Volusia	205

Memorial Hospital Jacksonville	3625 University Blvd S.	Jacksonville, FL 32216	Private/Investor-Owned	HCA North Florida Division	Duval	353
Mercy Hospital	3663 S. Miami Ave	Miami, FL 33133-4237	Private/Not-For-Profit	Catholic Health East	Dade	512
Miami Children's Hospital	3100 S.W. 62nd Ave	Miami, FL 33155-3009	Private/Not-For-Profit		Dade	268
Mount Sinai Med Ctr & Miami Heart Inst.	4701 Meridian Ave	Miami Beach, FL 33140-2910	Private/Not-For-Profit	Mount Sinai Health System	Dade	258
Morton Plant Hospital	323 Jeffords St	Clearwater, FL 34616	Private/Not-For-Profit	BayCare Health System	Pinellas	687
Mount Sinai Medical Center	4300 Alton Rd	Miami Beach, FL 33140-2849	Private/Not-For-Profit	Mount Sinai Health System	Dade	701
Munroe Regional Medical Center	131 S.W. 15th Street	Ocala, FL 34474	Private/Not-For-Profit	Munroe Regional Health System, Inc.	Marion	323
Naples Community Hospital, Inc.	350 7th St N.	Naples, FL 34102	Private/Not-For-Profit	NCH Healthcare System	Collier	408
Baptist Medical Center Nassau	1250 S. 18th Street	Fernandina Beach, FL 32034-3098	Private/Not-For-Profit	Baptist Health	Nassau	54
Nature Coast Regional Health Network	125 SW 7th St.	Williston, FL 32696-2040	Private/Investor-Owned	Cypress Health Systems	Levy	40
North Bay Hospital	6600 Madison St	New Port Richey, FL 34652	Private/Not-For-Profit	BayCare Health System	Pasco	122
North Broward Medical Center	201 E. Sample Rd	Pompano Beach, FL 33064	Government/Hospital District	North Broward Hospital District	Broward	409
North Okaloosa Medical Center	151 Redstone Ave S.E.	Crestview, FL 32539	Private/Investor-Owned	Community Health Systems, Inc.	Okaloosa	110
North Shore Medical Center	1100 N.W. 95th St	Miami, FL 33150-2098	Private/Investor-Owned	Tenet HealthSystem	Dade	357
Northside Hospital and Heart Institute	6000 49th St	St. Petersburg, FL 33709-2140	Private/Investor-Owned	HCA West Florida Division	Pinellas	288
Northwest Florida Community Hospital	1360 Brickyard Rd	Chipley, FL 32428	Government/County		Washington	81
Orange Park Medical Center	2001 Kingsley Ave	Orange Park, FL 32073	Private/Investor-Owned	HCA North Florida Division	Clay	219
Orlando Regional Medical Center	1414 Kuhl Ave	Orlando, FL 32806-2093	Private/Not-For-Profit	Orlando Regional Healthcare	Orange	517

Osceola Regional Medical Center	700 W. Oak St.	Kissimmee, FL 34741	Private/Investor-Owned	HCA North Florida Division	Osceola	171
Columbia Hospital	2201 45th Street	West Palm Beach, FL 33407-2069	Private/Investor-Owned	HCA East Florida Division	Palm Beach	250
Palm Springs General Hospital	1475 W. 49th St	Hialeah, FL 33012-3222	Private/Investor-Owned		Dade	247
Palms of Pasadena Hospital	1501 Pasadena Ave S.	St. Petersburg, FL 33707-3717	Private/Investor-Owned	Iasis Healthcare	Pinellas	307
Palms West Hospital	13001 Southern Blvd.	Loxahatchee, FL 33470	Private/Investor-Owned	HCA East Florida Division	Palm Beach	117
Pan American Hospital	5959 N.W. 7th St	Miami, FL 33144	Private/Not-For-Profit		Dade	146
Parkway Regional Medical Center	160 N.W. 170th St	North Miami Beach, FL 33169-5521	Private/Investor-Owned	Tenet HealthSystem	Dade	382
Parrish Medical Center	951-4 N. Washington Ave.	Titusville, FL 32796-2194	Government/Tax District		Brevard	210
Memorial Hospital Pembroke	7800 Sheridan Street	Pembroke Pines, FL 33024	Government/Hospital District	Memorial Healthcare System	Broward	301
Memorial Hospital-Peninsula	264 S. Atlantic Avenue	Ormond Beach, FL 32176-8192	Private/Not-For-Profit	Adventist Health System	Volusia	119
Plantation General Hospital	401 N.W. 42nd Ave	Plantation, FL 33317	Private/Investor-Owned	HCA East Florida Division	Broward	264
Lake Butler Hospital/Hand Surgery Center	850 E. Main St	Lake Butler, FL 32054	Private/Investor-Owned		Union	27
Sacred Heart Hospital of Pensacola	5151 N. 9th Ave	Pensacola, FL 32504	Private/Not-For-Profit	Ascension Health	Escambia	431
Santa Rosa Medical Center	1450 Berryhill Rd	Milton, FL 32570	Private/Investor-Owned	Health Management Associates	Santa Rosa	129
Sarasota Memorial Hospital	1700 S. Tamiami Trail	Sarasota, FL 34239-3555	Government/Hospital Authority		Sarasota	742
Sebastian River Medical Center	13695 U.S. Hwy 1	Sebastian, FL 32958-3230	Private/Investor-Owned	Health Management Associates	Indian River	129
Seven Rivers Community Hospital	6201 N. Suncoast Blvd	Crystal River, FL 34428	Private/Investor-Owned	Tenet HealthSystem	Citrus	128
Shands at the University of Florida	1600 SW Archer Rd.	Gainesville, FL 32610-0326	Private/Not-For-Profit	Shands HealthCare	Alachua	570
Homestead Hospital	160 N.W. 13th St	Homestead, FL 33030-4299	Private/Not-For-Profit	Baptist Health South Florida	Dade	120

South Bay Hospital	4016 State Rd 674	Sun City Center, FL 33573-5298	Private/Investor-Owned	HCA West Florida Division	Hillsborough	112
South Florida Baptist Hospital	301 N. Alexander St	Plant City, FL 33566	Private/Not-For-Profit	BayCare Health System	Hillsborough	147
South Lake Hospital, Inc.	1099 Citrus Tower Blvd.	Clermont, FL 34711	Private/Not-For-Profit	Orlando Regional Healthcare	Lake	68
South Miami Hospital	6200 S.W. 73rd St	Miami, FL 33143-4901	Private/Not-For-Profit	Baptist Health South Florida	Dade	445
Orlando Regional South Seminole Hospital	555 W. State Rd 434	Longwood, FL 32752	Private/Not-For-Profit	Orlando Regional Healthcare	Seminole	206
South Shore Hospital/Medical Center	630 Alton Rd	Miami Beach, FL 33139-5502	Private/Not-For-Profit		Dade	196
Southwest Florida Regional Medical Center	2727 Winkler Ave	Ft. Myers, FL 33901-9396	Private/Investor-Owned	HCA West Florida Division	Lee	400
Specialty Hospital Jacksonville	4901 Richard St	Jacksonville, FL 32207	Private/Investor-Owned	HCA North Florida Division	Duval	107
Spring Hill Regional Hospital	10461 Quality Drive	Spring Hill, FL 34609	Private/Investor-Owned	Hernando HMA, Inc.	Hernando	75
St. Anthony's Hospital, Inc.	1200 7th Ave N.	St. Petersburg, FL 33705	Private/Not-For-Profit	BayCare Health System	Pinellas	405
Orlando Regional St. Cloud Hospital	2906 17th St	St. Cloud, FL 34769-6099	Private/Not-For-Profit	Orlando Regional Healthcare	Osceola	84
St. Joseph's Hospital, Inc.	3001 W. Dr. M.L. King Jr. Blvd	Tampa, FL 33607	Private/Not-For-Profit	BayCare Health System	Hillsborough	559
St. Luke's Hospital	4201 Belfort Rd	Jacksonville, FL 32216-5898	Private/Not-For-Profit		Duval	289
St. Mary's Medical Center	901 45th St	West Palm Beach, FL 33407	Private/Investor-Owned	Tenet HealthSystem	Palm Beach	460
St. Petersburg General Hospital	6500 38th Ave N.	St. Petersburg, FL 33710	Private/Investor-Owned	HCA West Florida Division	Pinellas	219
St. Vincent's Medical Center	1800 Barrs St	Jacksonville, FL 32204-4704	Private/Not-For-Profit	Ascension Health	Duval	528
Sun Coast Hospital	2025 Indian Rocks Rd	Largo, FL 33774	Private/Not-For-Profit	University Community Health	Pinellas	300
Shands at Live Oak	1100 S.W. 11th St	Live Oak, FL 32060	Private/Not-For-Profit	Shands HealthCare	Suwannee	15
Tallahassee Memorial Hospital	1300 Miccosukee Rd	Tallahassee, FL 32308-5093	Private/Not-For-Profit	Tallahassee Memorial HealthCare	Leon	770
Tampa General Hospital	2 Columbia Drive	Tampa, FL 33606	Private/Not-For-Profit	Florida Health Sciences Center, Inc.	Hillsborough	877
Town & Country Hospital	6001 Webb Rd	Tampa, FL 33615	Private/Investor-Owned	Iasis Healthcare	Hillsborough	201

Kindred Hospital Central Tampa	4801 N. Howard Ave	Tampa, FL 33603	Private/Investor-Owned	Kindred Healthcare	Hillsborough	102
UCH-Medical Center	3100 E. Fletcher Ave	Tampa, FL 33613-4688	Private/Not-For-Profit	University Community Health	Hillsborough	431
UCH-Carrollwood	7171 N. Dale Mabry Hwy	Tampa, FL 33614-2670	Private/Not-For-Profit	University Community Health	Hillsborough	120
University Hospital & Medical Center	7201 N. University Dr	Tamarac, FL 33321-3011	Private/Investor-Owned	HCA East Florida Division	Broward	257
Shands Jacksonville Medical Center	655 W. 8th St	Jacksonville, FL 32209-6597	Private/Not-For-Profit	Shands HealthCare	Duval	760
University of Miami Hospital/Clinics	1475 N.W. 12th Ave	Miami, FL 33136-1002	Private/Not-For-Profit		Dade	40
Kindred Hospital South Florida/Coral Gables	5190 S.W. 8th St	Coral Gables, FL 33134-2495	Private/Investor-Owned	Kindred Healthcare	Dade	53
Kindred Hospital Ft. Lauderdale	1516 E. Las Olas Blvd	Ft. Lauderdale, FL 33301-2346	Private/Investor-Owned	Kindred Healthcare	Broward	64
Kindred Hospital Tampa	4555 S. Manhattan Ave	Tampa, FL 33611	Private/Investor-Owned	Kindred Healthcare	Hillsborough	73
Bon Secours-Venice Healthcare	540 The Rialto	Venice, FL 34285	Private/Not-For-Profit	Bon Secours Health System, Inc.	Sarasota	342
Florida Hospital Heartland Med. Ctr.	4200 Sun 'n Lake Blvd.	Sebring, FL 33871-9400	Private/Not-For-Profit	Adventist Health System	Highlands	111
Healthmark Regional Medical Center	4413 US Highway 331 South	DeFuniak Springs, FL 32433	Private/Investor-Owned	Healthmark Corporation	Walton	50
Wellington Regional Medical Center	10101 Forest Hill Blvd	West Palm Beach, FL 33414	Private/Investor-Owned	Universal Health Services, Inc.	Palm Beach	120
West Boca Medical Center	21644 State Rd 7	Boca Raton, FL 33428-1842	Private/Investor-Owned	Tenet HealthSystem	Palm Beach	185
Florida Hospital Deland	701 W. Plymouth Ave.	Deland, FL 32720	Private/Not-For-Profit	Adventist Health System	Volusia	156
Westchester General Hospital	2500 S.W. 75th Avenue	Miami, FL 33155-2895	Private/Investor-Owned		Dade	100
Westside Regional Medical Center	8201 W. Broward Blvd	Plantation, FL 33324-2701	Private/Investor-Owned	HCA East Florida Division	Broward	204
Winter Haven Hospital	200 Avenue F, NE	Winter Haven, FL 33881	Private/Not-For-Profit	Mid-Florida Medical Services	Polk	496
Florida Hospital Winter Park	200 N. Lakemont Ave	Winter Pk, FL 32792	Private/Not-For-Profit	Adventist Health System	Orange	297

Wuesthoff Health Systems, Inc.	110 Longwood Ave	Rockledge, FL 32955	Private/Not-For-Profit		Brevard	295
Kindred Hospital Bay Area/St. Petersburg	3030 6th Street S.	St. Petersburg, FL 33705-3720	Private/Investor-Owned	Kindred Healthcare	Pinellas	60
Lee Memorial Hospital	2776 Cleveland Avenue	Ft. Myers, FL 33901	Government/Hospital Authority	Lee Memorial Health System	Lee	427
Arnold Palmer Hosp for Children & Women	92 West Miller Street	Orlando, FL 32806	Private/Not-For-Profit	Orlando Regional Healthcare	Orange	281
Florida Hospital East Orlando	7727 Lake Underhill Drive	Orlando, FL 32822	Private/Not-For-Profit	Adventist Health System	Orange	108
Florida Hospital Kissimmee	2450 N. Orange Blossom Tr.	Kissimmee, FL 34744	Private/Not-For-Profit	Adventist Health System	Osceola	40
Florida Hospital Altamonte	601 E. Altamonte Drive	Altamonte Springs, FL 32701-4878	Private/Not-For-Profit	Adventist Health System	Seminole	278
Florida Hospital Apopka	201 N. Park Avenue	Apopka, FL 32703-9964	Private/Not-For-Profit	Adventist Health System	Orange	50
Health System Florida Keys and DePoo	1200 Kennedy Dr	Key West, FL 33040	Private/Investor-Owned	Health Management Associates	Monroe	49
Florida Hospital Lake Placid	1210 U.S. Hwy 27 N.	Lake Placid, FL 33852-9436	Private/Not-For-Profit	Adventist Health System	Highlands	50
Lake Wales Medical Centers	410 S. 11th St	Lake Wales, FL 33853-4256	Private/Not-For-Profit	Mid-Florida Medical Services	Polk	154
Lee Memorial Health System (Health Park)	9981 Health Park Cir	Ft. Myers, FL 33908	Government/Hospital Authority	Lee Memorial Health System	Lee	220
Martin Memorial Hospital South	2100 S.E. Salerno Rd	Stuart, FL 34997-6503	Private/Not-For-Profit	Martin Memorial Health Systems, Inc.	Martin	100
Memorial Hospital West	703 N. Flamingo Rd	Pembroke Pines, FL 33028	Government/Hospital District	Memorial Healthcare System	Broward	184
North Collier Hospital	11190 Health Park Blvd	Naples, FL 33941	Private/Not-For-Profit	NCH Healthcare System	Collier	98
Palm Bay Community Hospital	1425 Malabar Rd N.E.	Palm Bay, FL 32907	Private/Not-For-Profit	Health First, Inc.	Brevard	60
Orlando Regional Sand Lake Hospital	9400 Turkey Lake Rd	Orlando, FL 32819	Private/Not-For-Profit	Orlando Regional Healthcare	Orange	153
St. Joseph's Women's Hospital	3030 W. Dr. M.L. King Jr. Blvd	Tampa, FL 33607-6394	Private/Not-For-Profit	BayCare Health System	Hillsborough	192
Florida Hospital Wauchula	533 W. Carlton St	Wauchula,33873	Private/Not-For-Profit	Adventist Health System	Hardee	25

Wolfson Children's Hospital	800 Prudential Dr	Jacksonville, FL 32207	Private/Not-For-Profit	Baptist Health	Duval	180
Jackson North Maternity Center	14701 N.W. 27th Ave	Opalocka, FL 33054	Government/Public Health Trust	Jackson Health System	Dade	60
Regency Medical Center	101 S.E. Avenue O	Winter Haven, FL 33880-9854	Private/Not-For-Profit	Mid-Florida Medical Services	Polk	61
Florida Hospital Fish Memorial	1055 Saxon Blvd	Orange City, FL 32763	Private/Not-For-Profit	Adventist Health System	Volusia	97
Tampa Children's Hospital	3001 W. Dr. M.L. King Jr. Blvd.	Tampa, FL 33607	Private/Not-For-Profit	BayCare Health System	Hillsborough	132
Florida Hospital Celebration Health	400 Celebration Place	Celebration, FL 34747	Private/Not-For-Profit	Adventist Health System	Osceola	60
Cleveland Clinic	6101 Pine Ridge Rd.	Naples, FL 34119-3900	Private/Not-For-Profit		Collier	70
The Villages Regional Hospital	1451 El Camino Real	The Villages, FL 32159	Private/Not-For-Profit	Orlando Regional Healthcare	Sumter	60

APPENDIX C BIOTERRORISM PREPAREDNESS SURVEY

The completion of this anonymous survey constitutes informed consent to participate in this study. Each organization has been assigned a number for the purpose of tracking response rates and accuracy of results only – at no time will anyone other than the principal researcher know the origin of each survey. At any time, should you not wish to answer a question you may do so without penalty. Thank you for your time.

1) Location: ____ Urban ____ Rural

2) # of beds: ____ 100 or less beds ____ 101-300 beds ____ Over 301 beds

3) Is your hospital part of a system? ____ Yes (go to question 3a) ____ No (go to question 4)

3a) If yes, what type of system?

____ Horizontal (multiple locations of same type of facility)
____ Vertical (multiple organizations beyond only acute care services)
____ Virtual (consolidation only by way of contracting)

4) Operation status: ____ For-profit ____ Not-for-profit

5) # Of full time employees: ___ 0-50 ___ 51-100 ___ 101-150 ___ 151-200 ___ Over 200

6) Does your organization have a written plan for bioterrorism response? ___ Yes ___ No

6a) If, yes, when does it get updated? ___ Every month ___ Every 6 months ___ Yearly

___ Other (please specify) _____

7) Number of years covered by the bioterrorism plan? ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 or more

8) Who is responsible for updating the bioterrorism response plan?

____ CEO
____ Person directly under the CEO
____ Person 2 levels under CEO
____ Person 3 levels under CEO
____ Other, please specify _____

9) Does your organization conduct training specific to the characteristics of a bioterrorist attack? ___ Yes ___ No ___ Don't know

9a) If yes, when was the last training provided?

___ 0- 3 months
___ 4-6 months
___ 7-9 months
___ 10 – 12 months
___ Over 1 year

10) What type(s) of bioterrorism training is (are) used in your organization?

____ Classroom lecture/discussion
____ Drills
____ Outside training
____ None

11) Who is in charge of bioterrorism preparedness training?

____ CEO
____ Person directly under the CEO
____ Person 2 levels under CEO
____ Person 3 levels under CEO
____ Other, please specify _____

12) Does your organization update its bioterrorism plan based on lessons learned from training/exercises held? ____ Yes ____ No

13) To what extent does your organization's internal bioterrorism response plan emphasize the following components?

	No emphasis							Very Strong emphasis	
a. Hazard analysis	0	1	2	3	4	5	6	7	DK
b. Site analysis	0	1	2	3	4	5	6	7	DK
c. Building safety	0	1	2	3	4	5	6	7	DK
d. Securing heavy objects	0	1	2	3	4	5	6	7	DK
e. Protecting vital records	0	1	2	3	4	5	6	7	DK
f. Evacuating personnel	0	1	2	3	4	5	6	7	DK
g. Notifying families	0	1	2	3	4	5	6	7	DK

14) Please rate your organization's bioterrorism involvement on each of the following preparedness activities:

	No involvement						Extremely high		
a. Gathering knowledge	0	1	2	3	4	5	6	7	DK
b. Planning for disasters	0	1	2	3	4	5	6	7	DK
c. Updating disaster plans	0	1	2	3	4	5	6	7	DK
d. Plan exercises	0	1	2	3	4	5	6	7	DK
e. Exercise assessments	0	1	2	3	4	5	6	7	DK
f. Budgeting	0	1	2	3	4	5	6	7	DK
g. Stockpiling for response	0	1	2	3	4	5	6	7	DK
h. Training personnel	0	1	2	3	4	5	6	7	DK
i. Testing communications	0	1	2	3	4	5	6	7	DK
j. Working with other orgs	0	1	2	3	4	5	6	7	DK
k. Educating the public	0	1	2	3	4	5	6	7	DK
l. Lobbying to improve bioterrorism response	0	1	2	3	4	5	6	7	DK

15) Listed below are organizational characteristics. How well does each one apply to bioterrorism disaster services in your organization?

	Does not apply							Applies perfectly	
a. New approaches to deliver disaster services are explored	0	1	2	3	4	5	6	7	DK
b. Staff productivity is emphasized	0	1	2	3	4	5	6	7	DK
c. A set of stable disaster services are provided	0	1	2	3	4	5	6	7	DK
d. Staff/volunteers are retrained	0	1	2	3	4	5	6	7	DK
e. All funds needed are secured	0	1	2	3	4	5	6	7	DK
f. Understanding unit cost of disaster services is important	0	1	2	3	4	5	6	7	DK
g. Information flows up and down at all levels	0	1	2	3	4	5	6	7	DK
h. Maintaining high morale is important	0	1	2	3	4	5	6	7	DK
i. Est. agreements w/other organizations is important	0	1	2	3	4	5	6	7	DK
j. Bioterrorism services evaluated	0	1	2	3	4	5	6	7	DK
k. Authority over bioterrorism services is clear	0	1	2	3	4	5	6	7	DK

APPENDIX D: IRB APPROVAL FORM

Revised 12/04

THE UNIVERSITY OF CENTRAL FLORIDA
INSTITUTIONAL REVIEW BOARD (IRB)

IRB Committee Approval Form

PRINCIPAL INVESTIGATOR(S): Kourtney Scharoun **IRB #: 05-2292**

PROJECT TITLE: The Influences of System Affiliation, Size, and Location on Bioterrorism Preparedness among Florida Hospitals

[ ] New project submission

[X] Continuing review of # 1679

Chair

[X] Expedited Approval
Dated: 1/10/2005
Cite how qualifies for expedited review: #7

[ ] Exempt
Dated: _____
Cite how qualifies for exempt status: _____

[X] Expiration
Date: 1/9/2006

IRB Co-Chairs:

Signed: _____
Dr. Sophia Dziegielewski

Signed: _____
Dr. Jacqueline Byers

[ ] Waiver of documentation of consent approved
[ ] Waiver of consent approved

NOTES FROM IRB CHAIR (IF APPLICABLE): Survey with less than minimal risk.

APPENDIX E: VARIABLE DEFINITIONS

Variable Classification	Variable Name	Definition	Scale	Level of measurement
Dependent Variable	Level of Preparedness	"The degree to which organizations emphasize safety of physical facilities and objects, community disaster planning, disaster training, community disaster education, and budgeting to help reduce the loss of life, injury, and property damage" (Gillespie, et al, 1993, p.43).	0-7 scale 0 = "no emphasis at all" or "no involvement" 7="very strongly emphasized" to "extremely high involvement"	Ordinal
Independent variable	System Affiliation	One that is affiliated with other organizations (usually through a parent company) to provide a continuum of care (Ginter, Swayne, & Duncan, 1998).	0 = Non system 1= System	Nominal
Independent variable	Location	Area in which the hospital is located shall measure location of the hospital (www.census.gov, 2003).	Rural = 0 Urban = 1	Nominal
Independent variable	Size	The number of beds the hospital has available for patient care assuming a census of zero.	Small (100 or less beds) = 0 Medium (101-300 beds) = 1 Large (over 301 beds) = 2	Nominal

Independent variable	Physical preparedness	"The degree to which organizational plans emphasize: ❑ Hazard analysis ❑ Site analysis ❑ Building safety ❑ The securing of heavy objects ❑ The protection of vital records ❑ The testing of emergency communication systems" (Gillespie, et al, 1993, p.42).	0-7 scale 0 = "no emphasis at all" or "no involvement" 7="very strongly emphasized" to "extremely high involvement"	Ordinal
Independent Variable	Social preparedness	❑ Planning: "the degree to which organizations generally emphasize disaster planning to reduce the loss of life, injury, and property damage" ❑ Training: "the degree to which organizations generally emphasize disaster training to reduce the loss of life, injury, and property damage" ❑ Financial: "the degree to which organizations generally emphasize the securing of funds for disaster services designed to reduce the loss of life, injury, and property damage" ❑ Community: "the degree to which organizations generally emphasize community disaster education to reduce the loss of life, injury, and property damage" (Gillespie, et al, 1993, p.42-43).	0-7 scale 0 = "no emphasis at all" or "no involvement" 7="very strongly emphasized" to "extremely high involvement"	Ordinal

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