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Policy Expectations and Care-Provider Perceptions for Hospital Emergency Preparedness

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Maintaining preparedness for a disaster is a patient and provider safety issue that is often not a priority for hospital planning; however, the inability to implement and evaluate disaster/emergency preparedness programs may render hospitals and the overall healthcare system fragile and dysfunctional amidst such crises. Priorities such as emergency-department overcrowding and lack of funding emerge daily and contribute to the inability of hospitals to respond appropriately to unexpected events. This study was conducted with the aim to assess the correlation between disaster/emergency preparedness and related problems, policy, and politics. A cross-sectional survey design was used to determine whether problems, policy, and politics perceived by Tennessee acute-care hospital nurses predicted the disaster/emergency preparedness of their hospitals. A multiple linear regression model was applied to assess the effects of disaster/emergency problems, policy, and politics on disaster/emergency preparedness. A regression equation was created with respect to problems, policy, and politics predictor variables with age, gender, education, and location used as confounding variables. The results of the study revealed that policy ($\beta = 0.41$, $p = .01$) and politics ($\beta = 0.26$, $p = .02$) were related to disasters/emergencies, and these two significant variables can be used to predict disaster preparedness. In summary, disaster/emergency policy and politics predict preparedness within healthcare settings, including hospitals. These findings are suggestive of the urgent need for social change to require, develop, and implement a statewide hospital and overall standardized healthcare disaster/emergency-preparedness system with surveillance and monitoring for indicators of occurrence.

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Chapter 1: Introduction to the Study

Overview

The terrorist attacks of September 11, 2001 (9/11), coupled with subsequent anthrax threats, underscored the inadequacy of U.S. emergency-response capabilities. In 2005, Hurricanes Katrina and Rita further accentuated the substandard nature of domestic preparedness for effective emergency response across the nation. Such disasters and attacks are catalysts for a chain of reactive activities designed to enhance emergency-response capabilities (Duley, 2005). In 2008, the U.S. Department of Homeland Security (U.S. DHS; 2008) devised a national response framework to guide the development of a national *all-hazards* emergency-response system. An entire section outlined a response framework for public-health and medical services. However, a substantial functional gap exists between federal mandates and actual hospital preparedness (Cherry & Trainer, 2008).

The 2009 and 2010 influenza epidemics overwhelmed emergency departments (EDs) across the United States. Thousands of individuals sought treatment from an already overburdened system, demonstrating that the problem of surge capacity had yet to be resolved with an effective method of enhancing ED capabilities to manage the large influx of patients. With the added outbreaks of highly fatal viruses, such as Ebola, the paramount importance of EDs prepared for nearly any eventuality became clear. Hospital size, facility capabilities, and medical specialties vary considerably; however, several characteristics pose consistent themes. These include increased overcrowding, boarding

of admitted patients within the EDs, ED closures, and nursing-staff shortages (Kellerman, 2006).

Derlet, Richards, and Kravitz (2001) conducted a quantitative study inclusive of a comprehensive literature review. These researchers found no consensus as to a definition of ED overcrowding nor any specific numeric threshold to scientifically quantify such conditions. Research has indicated that overcrowding equates to a demand for emergency care exceeding the ability of emergency-response providers and ED resources (Derlet et al., 2001). The demand impedes the provision of care within a reasonable amount of time and forces caregivers to work within environments too pressured to provide quality care. These circumstances are reported daily by many EDs in the United States (Derlet et al.,2001). Consequently, effectively managing disasters may be beyond the existing capabilities of these pivotal emergency-care facilities.

Background of the Study

Prior to 1978, the U.S. Congress attempted to meet the need for national emergency preparedness primarily by applying fragmented strategies void of a unified structure or defined approach. Domestic preparedness hinged on ad hoc legislative action often motivated by policy designed to garner funding (Federal Emergency Management Agency [FEMA], 2010). The first disaster legislation on record was the Congressional Act of 1803 (as cited in FEMA, 2010), which allocated assistance to a New Hampshire town devastated by fire. Over subsequent years, several agencies were created or delegated the responsibility of administering disaster relief. These agencies ranged from the Reconstruction Finance Corporation, commissioned in 1932 following an earthquake,

to myriad civil-defense agencies including the Department of Agriculture. Most of these organizations served in a reactive capacity lacking a coordinated agenda.

The Disaster Relief Act of 1974 (as cited in Bechtel, Betz, Deppe, Gels, & Haley, 2004) required a presidential declaration and provided limited resources for disaster aid. However, as transportation, nuclear-regulation, and natural-hazard concerns increased, more than 100 agencies became involved at some level in disaster management, which complicated the management and oversight of responsibilities. In 1978, the FEMA was created to adhere to Executive Order 12148 with the objective of coordinating all disaster-relief efforts. The Agency was accountable for both disaster relief and civil defense. In 2003, the FEMA was absorbed by the U.S. DHS. Founded by President Bush in 2001, this department was designed by combining several federal agencies to coordinate multiple functions such as law enforcement, disaster preparedness and response, border control, and civil defense.

Inclusion of Health Care

The U.S. DHS, along with the U.S. Department of Health and Human Services (U.S. DHHS), supported hospital preparedness and the sequencing of disaster-preparedness funding (as cited in Bechtel et al., 2004). The Health Resources and Services Administration (HRSA) was the "arm" of the U.S. DHHS charged with providing resources to medically underserved populations. This organization was also responsible for advancing the preparedness of U.S. hospitals, particularly by enhancing their capacity to manage public-health emergencies including bioterrorism through the provision of guidance and financial resources.

In 2006, the management of funding for emergency preparedness was moved to the Office of the Assistant Secretary of Preparedness and Recovery, another agency within the U.S. DHHS. The management of emergency services and health funding remains under the auspice of the Office of the Assistant Secretary of Preparedness and Recovery while the HRSA now manages funding for fire and law-enforcement preparedness. A noteworthy change is that the funds formerly managed by the HRSA were earmarked for medical response and primarily directed toward hospitals, while funding under the authority of the Office of the Assistant Secretary of Preparedness and Recovery is allocated to a broader recipient base to supplement state and local initiatives supporting hospitals and health systems during public-health emergencies. Drawbacks are the increase in lack of funding, regardless of the growth in recipients, as well as the decrease in funding allocated to hospital preparedness (National Association of Public Hospitals and Health Systems, 2007).

The economic condition of many hospitals has also dramatically declined, limiting their ability to support programs that do not generate revenue. This phenomenon has continued, even in light of recent policy shifts such as those introduced by implementation of the Patient Protection and Affordable Care Act (2010). This Act created a new challenge for U.S. hospitals tasked with accommodating approximately 30 million Americans becoming healthcare consumers who were formerly uninsured. Additionally, new health-coverage schemes compressed networks and limited higher cost healthcare providers, forcing many organizations to reduce their rates to remain

competitive. This shift in insurance strategy is forcing independent, free-standing hospitals and providers to consolidate; merge; or be acquired by larger, more competitive organizations.

Many Americans rely upon their employers to supply healthcare benefits that cease when their employment ends. The employed are also impacted because economic crises force many employers to reduce healthcare benefits or structure plans with employee copayments that are costly and often unaffordable for workers. The result is yet another increase in underinsured individuals and newly insured patients seeking care in EDs. The billing for these high-cost services often goes unpaid.

With the introduction of The Patient Protection and Affordable Care Act of 2010, a greater number of Americans now have healthcare coverage in the form of Medicaid (as cited in the American College of Emergency Physicians [ACEP], 2014). However, this insurance covers less of the cost of services and, due to a shortage of primary-care providers, newly insured individuals continue to seek care in EDs. The result is increased service consumption coupled with low or absent compensation. This contributes to declining operating margins. When combined with the high cost of maintaining technology to support ever-increasing standards of care, the declining consumption of revenue-generating services, such as surgery, and the low reimbursement rates of Medicare and Medicaid, a significant financial shortfall characterizes the overall healthcare environment (Kiselev, 2010).

The economic struggles of hospitals force tough strategic decisions related to the manner in which funds are allocated. Funding is channeled to programs with the greatest

return on investment and generation of revenue. Meanwhile, costly, and infrequently used programs, such as disaster preparedness, are relegated to a lesser position of need than revenue-generating operations. Therefore, disaster preparedness often receives solely the support needed to satisfy minimum regulatory standards.

In January of 2001, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) added preparedness for chemical- and biological-agent exposure to the existing requirement for emergency preparedness (as cited in Toner et al., 2009). This was one of the first initiatives outlining and defining a specific standard of hospital emergency preparedness. In 2004, the Commission introduced standards for ED overcrowding that focused on enhancing patient throughput (JCAHO, 2004a). A preliminary set of standards for emergency-management planning was outlined, dictating that such planning must be adequate for effective response to multiple types of events with escalating, flexible capabilities for the management of infection control and disaster response (JCAHO, 2006b). As noted earlier, the U.S. DHS (2008) developed a national response framework to guide the development of a national all-hazards emergency-response system. Each plan calls for conducting a hazard analysis and establishing structure for disaster/emergency care.

Governmental Funding for Healthcare Preparedness

Prior to 9/11, the U.S. DHHS budget allocated less than 2% toward healthcare preparedness, with a small fraction of this allocation directed to hospital personnel (as cited in De-Lorenzo, 2007). Following the anthrax attacks of 2001, funding for health preparedness began to improve with a grant of $135 million awarded February 15, 2001

for healthcare preparedness. Funding gradually increased, peaking at $515 million in 2003 and 2004. However, in 2006, funding declined with only $350 million of a $3.8 billion healthcare preparedness budget earmarked for public-health flu preparedness. Complicating this funding decline, a change in homeland-security philosophy emerged in 2006, shifting the burden of healthcare preparedness to local communities and hospitals in the form of a national strategy for pandemic flu. With millions of patients contracting avian flu in 2009, only $362 million was budgeted for healthcare preparedness (Toner et al., 2009).

Federal grant programs for disaster preparedness have been a positive asset in aiding hospital preparedness; however, such funding is a small proportion of the resources necessary to establish and maintain all-hazards preparedness. Toner et al. (2009) estimated the cost of preparing a 164-bed hospital for pandemic flu at $1 million, with an annual maintenance cost of $200,000. Flu preparedness is one small component of all-hazards preparedness. Preparing for natural disasters that bring large numbers of trauma patients to hospital facilities involves the inclusion of chemical, biological, radiological, and nuclear preparedness, in addition to knowledge surrounding improvised explosives, all of which introduce unique needs. Such needs require varied resources, specific training, and sophisticated facility capabilities such as decontamination, isolation, and personal protective equipment. The average related federal grant is between $5,000 and $10,000 per hospital facility, which is woefully inadequate to institute and maintain disaster preparedness, as supported by the Toner et al. estimate.

Additional Challenges

Concurrent with the described preparedness issues, EDs encounter daily difficulties from operating beyond capacity. Consequences have included throughput obstructions from an inadequate number of available beds or staff to manage the volume of patients requiring admission. This has led to the boarding of admitted patients within the ED, which has, in turn, resulted in an inability to accommodate patients needing emergency care. This, in turn, introduces ambulance diversion to other facilities. ED patient loads have increased dramatically since 1992 with a 32% annual increase in ER visits (ACEP, 2009). Further compounding the problem, 7% of hospital EDs have closed (ACEP, 2009).

ED overcrowding emerged during the 1980s. Incidence was initially isolated to hospitals located within urban areas (Derlet & Richards, 2000). To date, ED overcrowding has become a national problem due to the decreasing number of available inpatient beds as well as a changing pattern of ED use by the general public. With the financial need to improve efficiencies, inpatient beds have been reduced to correlate to average daily census. Therefore, Gallagher and Lynn (1990) attributed the decreasing number of inpatient beds to the shift in care provision to the outpatient setting and improved case management resulting in shorter lengths of stay. This elimination of unused beds and related resources has dramatically thwarted the ability of many hospitals to manage the influx of patients during disasters.

Burt and McCaig (2001) found through quantitative study that patient acuity, as well as the complexity of their health conditions, have increased with longevity. Derlet

and Richards (2000) described a change in the pattern surrounding ED use. As noted earlier, the number of underinsured across the United States has served to increase the use of EDs as providers of primary care to avoid office visits with primary-care physicians requiring payment at the time of services.

Hospital EDs are required to assess and treat, if needed, all patients presenting to their care facilities. This provision was included in the Emergency Medical Treatment and Active Labor Act (EMTALA) of 1985, which was created to protect the rights of indigent patients pursuing emergency care. The legislation was a reaction to the practice of patient "dumping," which is hospitals or hospital-based doctors refusing to treat uninsured patients with no other means of payment for care services. The EMTALA dictated that all Medicare-participating hospitals must provide a medical-screening exam and treatment to stabilize any emergency medical condition in all patients presenting to the ED (Moy, 2011). Until there is a system in place for universal health care, the ED will be the only milieu guaranteeing access to all patients for care. The EMTALA forces this scenario without encouraging consumers to be responsible for their health care. Due to the nature of the care provided by EDs, using these facilities for primary care creates adverse issues such as fragmented care from loss of the treatment-plan follow through that would routinely occur with a primary-care provider (ACEP, 2009).

As noted earlier, no clear consensus exists as to a definition of ED overcrowding. However, Derlet et al. (2001) established a set of elements toward such definition. They included (a) all ED beds filled for more than 6 hours per day, (b) patients admitted to a hospital and boarded in the ED for more than 6 hours per day due to the unavailability of

inpatient beds, and (c) EDs unable to manage new arrivals and hence forced to close or divert ambulances to other facilities. The impact of these elements alone or in combination creates gridlock in a process that is designed for continuous throughput.

The ACEP (2009) issued a national report card on the state of emergency medicine. The report was designed to address the realities of the ED, which includes its dual role as the provider of emergency care in crisis situations and as the safety net for individuals with no other point of access for medical care. It expanded upon the earlier version, drawing from data of the most up-to-date sources to assess five dimensions of ED care. Based upon 116 metrics, the following five dimensions were weighted to obtain a grade for each state and the District of Columbia, as well as the United States as a whole: (a) access to emergency care (30%), (b) quality and patient-safety environment (20%), (c) medical-liability environment (20%), (d) public health and injury prevention (15%), and (e) disaster preparedness. The overall grade for the nation was C–, with access to emergency care scoring a D–. The ACEP concluded that the needs of the growing and aging U.S. population far exceed the number of existing hospital EDs. The problem is exacerbated by the shortage of nurses and physicians, as well as the low number of primary-care and specialty providers.

The report-card category of disaster preparedness is new to the ACEP (2009) reporting structure. It was added to capture the disaster-planning initiatives that are collectively becoming an integral facet of the emergency-care culture. The grade in this category was a C+. The ACEP task force collected state-specific data. This dimension targets the following four major areas essential to an effective medical response to a

disaster: (a) state coordination, (b) hospital capacity, (c) availability of trained staff, and (d) funding.

The ACEP report confirmed the position that federal funding for disaster preparedness is inadequate (as cited in Cherry & Trainer, 2008). To compensate for this inadequacy, high-ranking states heavily invested state and local funds in systems and infrastructure that enable prompt and efficient response. Also noted by the ACEP, higher performing states receive high per capita federal funding for disaster response. The sites within these states have formal all-hazards medical-response protocols or Emergency Support Function #8 plans in place, which are coordinated with emergency medical services (EMS) and hospital personnel, among other enhancing factors. The ACEP perceived the U.S. grade of C+ as a reflection of the lack of critical funding to augment medical providers, as well as the lack of consistent direction by the federal government despite the efforts invested in disaster preparedness by many states. The College made eight recommendations for improving emergency care and called for emergency-care professionals, government officials, and private citizens to be made aware of its state-specific report card and become active in supporting emergency-preparedness efforts.

In summary, many of the factors revealed thus far allude to policy decisions that have negatively impacted the disaster-response capabilities of many hospitals. Consequently, future expectations must include a stronger focus on overall preparedness through the provision of enhanced training initiatives, planning for increased capacity, and improved allocation of available resources. ED capacity is recognized as a critical component of disaster/emergency response; however, within many hospitals, it is not

given the support and priority to enable development of the necessary response capabilities. Additionally, hospital preparedness, which is a key component of first response in disasters, is not given the support, priority, and guidance from federal agencies that is necessary to result in the allocation of funding and other resources (Cherry & Trainer, 2008).

Problem Statement

Many U.S. hospitals are challenged with limited resources, stressed capacities, and overcrowding on a daily basis. Federal expectations for hospitals are to have all-hazards preparation in place, enabling effective response to a variety of natural and man-made disasters. Such response includes facilities, resources, and staff (Kellerman, 2006). Many hospitals lack adequate equipment, resources, and training to provide a safe and effective response to a mass casualty or hazardous-material exposure. This may negatively affect the victims of a disaster if staff members are unprepared or lack the resources to appropriately respond. However, the federal government has been providing various levels of funding and support to the hospitals and public-health departments of the country and, although great progress has been made in emergency preparedness, emphasis wans when other priorities dominate (Duley, 2005).

The authorities and the management of U.S. healthcare centers are responsible for the performance of relief and disaster teams at the time of an emergency. However, if these authorities fail, for whatever reason, to prepare response teams properly and effectively for disasters, patient care suffers (National Association of Public Hospitals and Health Systems, 2008). Prompt and successful emergency services are therefore

reliant upon hospital authorities providing proper training and education to employees. The proper treatment of disaster victims is a pivotal facet of such training (Niska & Shimizu, 2011).

Established disaster plans are critical to support response teams in their efforts to provide medical emergency support to victims. It is also essential for hospitals to be prepared for any emergency rescue operation that will require the availability of necessary medicine, medical equipment, and treatment facilities specific to the disaster response (Kellerman, 2006). Put simply, it is essential to reduce existing gaps between the expectations of the federal government regarding disaster preparedness and the actual preparedness of hospitals. This will contribute to improved EMS in times of disaster, thereby providing a higher level of medical treatment to victims and, in turn, contributing to rapid patient recovery and saved lives (Niska & Shimizu, 2011).

Purpose of the Study

The purpose of the current research was to examine the gap between effective hospital emergency preparedness and the related awareness and perceptions of healthcare providers. Toward this end, statistics related to emergency-room preparedness have been analyzed, and the perceptions of nurse leaders regarding the state of readiness within their specific departments have been collected and examined. Federal expectations surrounding hospital preparedness were compared to related survey responses from first-line ED caregivers. The findings of this study reflect the variance in the extent of preparedness between hospitals and emphasize the level of awareness among providers compared to preparedness expectations.

Events since 2001 have increased public awareness of the threat of disaster, man-made or natural, and the need for a competent, adequate, and flexible emergency-response framework (Katz & Levi, 2008). The findings of this study expand the existing body of knowledge surrounding the gap between preparedness and related expectations. The current research may further provide an awareness of the current status of hospitals and holds the potential to alter the perceptions of stakeholders and stimulate further attention to the problem under study. The findings may provide greater understanding as to why interest in the development of policy related to hospital emergency preparedness has waned, as well as offer an avenue toward increasing needed attention (Kingdon, 2011).

To support the purpose of this study, I applied a quantitative research method with the intent to analyze various factors such as the availability of facilities and resources; preparedness policy, training, and education; and the perception of emergency-response capabilities within U.S. hospitals. I conducted a survey with a sample of ED nurse managers of Tennessee acute-care hospitals and correlated hypotheses to the research questions in order to gain a clearer understanding of whether the healthcare institutions of this particular region have met necessary standards for emergency preparedness. The survey consisted of 73 questions and was distributed to acute-care institutions with a dedicated ED within the state of Tennessee (see Appendix A). I analyzed the responses using statistical tools and techniques to arrive at reliable and valid conclusions. The principal objective was to understand how prepared participating hospitals were in

responding to certain emergencies that could realistically occur within the country such as natural disasters and terrorist attacks (Niska & Shimizu, 2011).

It is essential for the hospitals of any country to prepare for all hazards and emergencies that could potentially occur from natural disasters or other incidents. Prompt response is required, and it is essential for hospitals to minimize loss of life. U.S. hospitals play a major role in the provision of such services to disaster-affected patients (Duley, 2005). Continuous preparation is therefore critical, along with maintaining all of the necessary facilities and resources that may be required for community support and relief work. Hospitals must provide proper training and education to employees and healthcare professionals so they can easily respond to unexpected situations while effectively continuing routine emergency operations. The government also plays a major role in the provision of sufficient funding and other support for these hospital initiatives, assuring the necessary resources (National Association of Public Hospitals and Health Systems, 2008). However, a gap exists between the expectations of the federal government regarding disaster preparedness and the actual preparedness of hospitals. By examining participating acute-care hospitals within the state of Tennessee, this study contributes to closing this gap.

Research Questions and Hypotheses

It is important to establish clear goals from the onset of the research process. Research questions form an integral facet of any study because they serve as a guide for the research that will ultimately contribute substantively to the body of existing knowledge surrounding the topic of study. As noted earlier, the current state of hospital

preparedness within the United States was examined in the current research. The research questions were answered via a comprehensive review of existing literature within this field of study, along with an analysis of real-time perceptions and attitudes surrounding this critical topic so integral to the very health and safety of the American population.

With consideration to Kingdon's (2003) theory on streams of the policy process—problems, policy, and politics—the following three research questions and corresponding hypotheses were central to this study:

1. How do perceptions of resource, training, and budgetary problems relate to the emergency preparedness of EDs across the state of Tennessee?

   Null Hypothesis 1 states that hospital EDs within the state of Tennessee are not prepared to manage mass disaster incidents. Alternative Hypothesis 1 states that hospital EDs within the state of Tennessee are prepared to manage mass disaster incidents.
2. How do perceptions of federal, state, and hospital policy and plans relate to the emergency preparedness of EDs across the state of Tennessee?

   Null Hypothesis 2 states that first-line ED managers do not possess sufficient knowledge and awareness of emergency preparedness and related public-policy expectations. Alternative Hypothesis 2 states that first-line ED managers possess sufficient knowledge and awareness of emergency preparedness and related public-policy expectations.
3. How do perceptions of external and internal organizational politics relate to the emergency preparedness of EDs across the state of Tennessee?

Null Hypothesis 3 states that first-line ED care providers do not have positive perceptions of the available resources, capabilities, and training within their hospitals to manage a mass disaster. Alternative Hypothesis 3 states that first-line ED care providers have positive perceptions of the available resources, capabilities, and training within their hospitals to manage a mass disaster.

The stated research questions were answered with a quantitative approach. This methodology was the most beneficial for the study because the data compared were finite and represented information and specific factors related to emergency preparedness. The factors included, but were not limited to, a clear understanding of related requirements, resource availability, and level of training. A published questionnaire served as the foundation for a survey designed specifically for this study and was administered to access quantitative data on the actual preparedness and awareness of a national response framework. Closed-ended questions facilitated the collection of data, enabling a clearer understanding of provider perceptions of emergency preparedness (see Appendix A).

The dependent variable in the current study was emergency preparedness. The first set of independent variables were problem streams (i.e., resources, training, infrastructure, budget, and recent mass-casualty events; Bascetta, 2010; De-Lorenzo, 2007; Hsu et al., 2006; Kingdon, 2011; Kiselev, 2010; Niska & Shimizu, 2011). The second set of independent variables were policy streams (i.e., knowledge of federal policy, knowledge of state and local policy, the development of hospital policy, and the availability of disaster plans). The third set of independent variables were politics streams (i.e., media relations, notable leadership actions, and recent mass-casualty events). A

final independent variable was the location of the respective hospitals, in terms of urban, suburban, or rural, in order to further define the participating facilities (see McLellan, 1998). This research was cross cultural through the selection of multiple hospitals.

Theoretical Foundation

The theoretical framework for the current study was Kingdon's (2003) multiple streams theory, which provides a dynamic systems perspective for explaining why some issues command attention generating action by policy makers while others are largely ignored or neglected. The Kingdon model consists of three streams—problems, policy, and politics. Kingdon has used the term *policy window* to denote a brief window of opportunity for taking action on a given initiative. The greater the degree of convergence between problems, policy, and politics, the higher the probability of policy makers and leaders acting on an issue. An *agenda* refers to a list of issues or problems that gain the attention of government officials and others close to them at a specific point in time.

Kingdon (2003) acknowledged myriad negative conditions within problem streams. Some problems are projected to center stage while others stagnate. Whether a problem rises to the forefront and remains a focus of attention or whether it is eventually overshadowed or simply languishes is contingent upon both objective data and the intensity of interest the problem provokes. Kingdon coined the term *policy entrepreneurs* to describe those who actively strive to gain the attention and support of government officials in order to gain their commitment to act upon issues espoused by entrepreneurs, which are then recognized as problems and added to the government agenda.

The policy stream consists of ideas and proposals that are distributed for discussion within networks composed of a range of actors including lobbyists, administrators, academics, researchers, consultants, bureaucrats, journalists, and other media figures, as well as congressional staff (Kingdon, 2003). Policy entrepreneurs are adept at discerning the opening of a policy window and championing their ideas at that pivotal juncture. The practical viability of a proposal, as well as the degree to which it is congruent with the values of the policy actors, are key factors of the policy stream. The policy stream can essentially be defined by the ability to sell ideas rather than generate ideas.

The third stream of politics is driven by three influential forces the national mood, campaigns by special-interest groups, and the ideological leanings of policy makers. These forces are all highly dynamic in nature. The national mood can change dramatically at any time, and elections produce change in the ideologies of policy makers. Kingdon (2003) argued that while pressure groups have the capacity to thwart, modify, or support proposals, they have less power to influence agendas than to synthesize the national mood toward the prediction of elections. The Kingdon model addresses the forces that change the status of problems over time, as well as those that propel problems to the forefront.

Kingdon's (2003) study involving four waves of interviews conducted from 1976 through 1979 explored two focal issues—health care and transportation. High- visibility healthcare issues included national health insurance, Medicare, Medicaid, and hospital cost containment, which were, ironically, issues again in the forefront during 2013.

Disaster/Emergency planning gained prominence with the terrorist attacks of 9/11 and the subsequent anthrax threats. These events underscored the critical role of public health amid emergencies and served as a collective springboard for actions toward improving the capacity of public health and for healthcare facilities to respond during crises (Centers for Disease Control [CDC] & Prevention, 2008; Toner et al., 2009). In 2005, Hurricane Katrina further highlighted the need for improving disaster/emergency preparedness (Adams & Canclini, 2008; ACEP, 2006; JCAHO, 2006b; Rodriguez & Aguirre, 2006; Taylor, 2007). The threat of pandemic influenza provided further momentum for medical emergency preparedness (Hoffman & Nannini, 2008; Levy, 2009; Lotstein et al., 2008; Phillips & Worthington, 2009; Rust et al., 2009).

Knowlton et al. (2009) conducted a quantitative study on the 2006 California heat wave and predicted that intense heat waves would have a powerful impact on morbidity and are expected to increase with global warming. This presented another consequent need for emergency planning. Most recently, the Joplin, Missouri tornado, Hurricane Sandy, and the Boston Marathon bombing brought further awareness to the ongoing need for disaster preparedness. Hospital emergency preparedness straddles two broad issues that are continually in the public eye—healthcare reform and national security. Katz and Levi (2008) argued that public-health emergency preparedness (PHEP) must be an integral facet of the discourse on healthcare reform. The Pandemic and All-Hazards Preparedness Act of 2006 mandated the development of a national emergency-response plan (as cited in Bascetta, 2010); however, there is a sizable gap between this federal mandate and actual preparedness (Cherry & Trainer, 2008). The Kingdon (2003) model

offers a useful framework for illuminating the factors involved in raising awareness of the gap between policy and practice related to hospital emergency preparedness. Consequently, the construct is central to the attention and action of policy makers.

Kingdon's (2003) theory can effectively explain the progression and momentum in policy development; however, further study of organizational behavior informed this current research. The work of Lewin (1951) is important in understanding how change happens, particularly in light of the many factors that drive change, including the external environment. Conversely, there are counterforces that restrain change and, within organizations, push to maintain the status quo. This is relative to the current research because sudden and catastrophic acts of terrorism, mega storms, and pandemics require, among other things, the heightened skills, equipment, and education that will meet the needs of supporting organizations. However, these occurrences are random and infrequent, and continuous preparedness is costly and labor intensive. Consequently, all facets of the driving forces must be considered to increase understanding surrounding organizational behavior as it relates to emergency preparedness. The review of literature conducted for this study further expands upon these forces, as well as obstacles to preparedness.

Nature of the Study

The research method selected for this study was quantitative in nature, employing a regression model to analyze the relationship between factors affecting hospital emergency preparedness. This is consistent with the methodology used in the majority of the research reviewed for this study. Data collection involved a questionnaire. This

provided the opportunity to assess the level of preparedness within participating hospitals and the current state of their EDs in relation to the availability of resources, staff training, and related personnel perceptions. The survey facilitated the collection of data pertaining to the frequency of ambulance diversion and the capability to flex capacity (see Appendix A). The survey questions were designed to also collect data related to provider awareness of government expectations surrounding preparedness, as well as their perceptions of the ability of their employer hospitals to respond to disasters. The intent behind the current study was to highlight the disparity between hospital preparedness and the awareness of care providers regarding expectations related to the variables of available resources, staff training, and related personnel perceptions. The research clarifies existing problems, potential solutions, and suggested policy improvements. The study contributes to the creation of an environment conducive to the introduction of effective policy into the political stream.

Definitions

Definitions of healthcare terms are dynamic, obscure, and vary for many reasons, including regional terminology, environmental variables, and regulatory expectations. Healthcare terminology is often derived from observation of the state of wellness, illness, or injury. Similar to any language, the jargon of the healthcare industry evolved to enhance communication. Within the subculture of emergency medicine, due to the urgency and criticality of many circumstances, a dialect or language has emerged that is specific to meeting the communicative needs within this field. With consideration to

these facts, the following definitions are important to add clarity to the content of the current study.

Ambulance diversion: A situation in which a hospital has declared that it does not or will not have the necessary capacity or capability to accept additional patients from prehospital emergency medical transports. Diversion may be for a specific category or type of patient (e.g., trauma, neurosurgery, inpatient, ED, no CT capability, etc.) or global, as may occur with total hospital saturation or an internal disaster. (ACEP, 2002, p. 10).

American College of Emergency Physicians (ACEP): The first and largest professional organization of emergency-medicine physicians within the United States.

Disaster: "A situation in which the number of patients presenting to a medical facility within a given period exceeds the ability of the hospital to provide care without external assistance" (Krajewski, Sztajnkrycer, & Baez, 2005, p. 2).

Emergency Department (ED): The Centers for Medicare and Medicaid Services defined an ED as

> any on or off campus [*sic*] hospital campus [*sic*] department or facility that meets one of the following criteria: 1) it is licensed by the state as an emergency room or department; 2) it is held out to the public (by name, signs, advertising, or other means) as a place that provides care for emergency medical conditions on a [*sic*] urgent basis without requiring a scheduled appointment; or 3) based on a representative sample of patient visits during the previous year, the department or facility provides at least one-third [*sic*] of all its outpatient visits for treating

> emergency conditions on an urgent basis without requiring a scheduled appointment. (Spigel, 2003, p. 1)

ED overcrowding: There is no one generally accepted definition of ED overcrowding. Common perspectives from the literature summarize overcrowding as a situation where the demand for emergency care exceeds the ability of the care providers and resources of the respective ED. Thus, care cannot be provided to all presenting patients within a reasonable amount of time, causing an environment for caregivers within which they are too pressured to provide quality care. Derlet et al. (2001) outlined the following indicators of ED overcrowding: (a) all ED beds filled more than 6 hours per day, (b) admitted patients boarded within the ED due to the unavailability of inpatient beds for more than 6 hours per day, and (c) EDs unable to manage new arrivals and hence forced to close or divert ambulances to other facilities.

Emergency Medical Treatment and Active Labor Act (EMTALA) of 1985: A section of the Consolidated Omnibus Reconciliation Act of 1986, which governs how a patient may be refused treatment or transferred from one hospital to another while in an unstable medical condition (as cited in Moy, 2011).

Emergency Support Function # 6: According to the FEMA (2008), "A provision of the Disaster Relief Plan that supports mass care, emergency assistance, housing, and human services when local, tribal, and state response and recovery needs exceed their capabilities" (p. 1).

Federal Emergency Management Agency (FEMA): An agency of the U.S. DHS that is primarily responsible for coordinating disaster-response efforts within the United States (FEMA, 2004).

Hospital-Incident Command System (HICS): A system developed in 1991 by a consortium sponsored by the EMS Authority of California to integrate the tenets of the National Incident Management System into a structured system. This system can be adapted to scale in order to serve as a foundational management structure for hospital incident management (Baker, Smiley, & Schoenthal, 2014).

Joint Commission on Accreditation of Healthcare Organizations (JCAHO): A private, not-for-profit agency providing accreditation to healthcare organizations (Miller-Keane & O'Toole, 2003).

National Incident Management System: According to the FEMA (2016), "A system developed by the U.S. DHS to provide a standardized systematic approach to incident management that is designed to provide an integrated comprehensive response" (p. 1).

National response framework: A guide to how the nation conducts all-hazards response. It is built upon scalable, flexible, and adaptable coordinating structures to align key roles and responsibilities across the country, linking all levels of government, nongovernmental organizations, and the private sector. It is intended to capture specific authorities and best practices for managing incidents ranging from serious but purely local to large-scale terrorist attacks or catastrophic natural disasters (U.S. DHS, 2008, p. i).

Policy stream: Ideas and proposals distributed for discussion in networks composed of a range of actors, including lobbyists, administrators, academics, researchers, consultants, bureaucrats, journalists, and other media figures, as well as congressional staff (Kingdon, 2003).

Policy window: According to Kingdon (2003), "The opportunity to launch proposals or solutions into the political stream" (p. 166).

Political stream: Driven by three influential forces—the national mood, the campaigns of special-interest groups, and the ideological leanings of policy makers. These forces are all highly dynamic in nature. The national mood can change dramatically at any time, and elections produce change in the ideologies of policy makers (Kingdon, 2003).

Preparedness: An array of intentional, significant, and decisive tasks and actions essential to define, construct, build, sustain, and support the operational capabilities of a hospital to avert, shield against, react, and recover from disaster situations (FEMA, 2004).

Problems: According to Kingdon (2003), "Conditions that [cause] people [to] become convinced that something should be done to change it [*sic*]" (p. 104).

Public policy making: According to Kingdon (1989), a set of processes, which include at least (a) the setting of the agenda, (b) the specifications of alternatives from which a choice is to be made, (c) an authoritative choice among those specified alternatives, as in a legislative vote or a presidential decision, and (d) the implementation of the decision (p. 104).

Rural: A location outside a suburban area that may be sparsely populated. A rural area is generally unincorporated; an example would be an agricultural area where homes are far apart and separated by large parcels of land (McLellan, 1998).

Suburban: An area that is adjacent or surrounding the center of an urban area or city. The suburban area is often a residential area with single-family homes (McLellan, 1998).

Surge capacity: According to a government report entitled *Bioterrorism and Health System Preparedness* (2007), "A healthcare system's ability to expand quickly to meet an increased demand for medical care in the event of bioterrorism or other large-scale public health emergencies" (p. 2).

U.S. Department of Health and Human Services (U.S. DHHS): The principal agency for protecting the health of all Americans and providing essential human services (U.S. DHHS, 2008).

Urban: An area characterized as the center of an incorporated community or municipality with a population of 2,500 or greater (McLellan, 1998).

Assumptions

I am a healthcare professional with many years of experience in the administration of a variety of hospitals with proven clinical expertise in the specialty of emergency medicine and trauma within both rural and urban settings. For purposes of the current study, I made the assumption that EDs are not fully prepared to manage all hazards. I also assumed that the ED nurse manager or director is the most knowledgeable individual within the hospital to relate the state of preparedness within their respective

facility due to the scope and exposure of their roles. Additionally, I assumed that public-policy expectations exist for emergency preparedness and that providers of emergency care are aware of such expectations. This study was also conducted under the assumption that the participating EDs had the resources, policies, training, and other capabilities in place to effectively respond to disasters and that the primary providers of emergency care had confidence in these capabilities.

Scope, Delimitations, and Limitations

The research problem of interest in the current study was the gap between the expectation of all-hazards preparation and the actual level of preparedness within U.S. hospitals. The ability of a sample of hospitals to respond to a disaster was assessed. More specifically, I compared resources such as space, staff, supplies, communication capabilities, decontamination facilities, flex capacity, and the availability of protective equipment. Additionally, I explored the research problem from the perspectives of nursing leaders and their awareness of government expectations, their related education, and their ability to manage a disaster within their EDs.

The population sample of this study included the nurse leaders (i.e., managers of Tennessee hospitals) who provide emergency services. This ensured a range between small, rural, and critical-access hospitals, as well as between major metropolitan and academic research hospitals. The term *all-hazards,* when used within the context of preparedness, implies that a hospital will have the resources and capabilities to manage all hazards or any type of disaster that could occur within its service area. An example would be a chemical spill. There may be no chemical plant located within a community;

however, it may be highly probable that a tractor-trailer truck carrying a toxic pesticide could travel through the community and become involved in a motor-vehicle collision releasing hazardous chemicals. Without the appropriate training, antidotes, protective equipment, and decontamination facilities, the outcome could be fatal to both community members and hospital staff. However, in times of overcrowding, low reimbursements, and hospital closures, disaster preparedness is forced to a low priority by more pressing needs.

Kingdon (2011) specified a window of time when public interest allows a topic to be moved forward due to a current public agenda that applies to the respective problem. With disaster preparedness, that window is immediately following an event or disaster. Each time a disaster of scale occurs, the window opens and advances in preparedness are accomplished; however, as soon as the community begins to return to normal, that window closes, and resources dissipate. Disasters are not isolated to any one location. Although particular locales have higher probabilities of experiencing a disaster, the expectation of all-hazards preparedness applies to all hospitals that support an ED. Therefore, the potential to generalize the findings of this research exists. It is therefore recommended that similar study be conducted in other geographical areas to validate the findings.

The following limitations were expected in the current study:

1. The research was limited to EDs within the state of Tennessee; hence, the findings may be subject to some form of undetected bias that is not representative of all EDs across the United States.

2. Variability may exist in the background of the designated emergency-preparedness officer at a participating hospital. In some cases, it is a clinical employee, such as the ED nurse manager, and in other cases, it is a nonclinical employee such as the director of security.
3. Answers to survey questions generally reflect the comprehension, experience, and view of the respondents. Varying degrees of knowledge, including lack of direct knowledge, may lead to distortion of the research problem and responses that do not accurately represent the true data.
4. The intentional misrepresentation of data provided by respondents cannot be controlled (e.g., some hospitals may be reluctant to disclose their true state of preparedness).

Significance of the Study and State of the Field and Theory

The significance of the current study includes the potential for the findings to demonstrate that, although the standard of hospital disaster preparedness has improved since the terrorist attacks of 9/11 and Hurricane Katrina, it is still not fail-proof. Preparedness, in many cases, still does not meet the expectations outlined in the national response framework (U.S. DHS, 2008). Unexpected natural or man-made disasters have become a reality across the United States. In light of this realization, it is of interest to many stakeholders to know the disaster-management capabilities of hospitals, including the preparation and resources enabling their effective response to large-scale disasters.

In this study, I compared the expectations outlined in the national response framework to the reality of compliance within a sample of EDs in the United States. The

implications of the findings led to recommendations of a minimum standard of preparedness for public policy and the resources needed to adhere to the recommendations. The results of this research can benefit healthcare providers and policy makers, as well as the community at large, as the actual level of disaster-response capabilities become known. The findings may contribute to the overall state of hospital emergency preparedness by going beyond simply identifying gaps in capabilities and available resources. The survey questions were designed to glean the perceptions of department leaders as to the state of preparedness within their facilities. It is these leaders who will be expected to deliver care during a disaster. The findings provide valuable insight into hospital capabilities from the perspectives of the end users.

Practice and Social Change

The significance of the current study to practice is the glaring reality that a disaster—natural or manmade—can occur at any time within any community. To best meet the needs of community citizens, a minimum, sustainable standard of preparedness must be in place that is consistently supported, resourced, reviewed, and updated. A solid action plan with ready resources will provide a safety net in the form of provider and community confidence. Attempting to assemble supplies and train staff at the time of a disaster serve only to increase the inevitable damage and loss of life.

The objective behind this research was to elicit positive social change in the form of creating increased awareness as Americans are exposed to, and become increasingly concerned about, manmade or natural disasters. The problem is exemplified with the past threat of the Ebola virus. The threat, as well as the comprehensive resources required to

isolate and treat victims, were shared with the American public. The reality was that the resources needed to screen and isolate even one Ebola patient would stress the capabilities of most community hospitals. This was a concerning realization when Americans had complete confidence in community resources to manage such a disaster.

This study contributes to social change by increasing the understanding of the actual state of preparedness, as well as identifying gaps causing shortfalls when preparedness is compared with expectations. With this knowledge, recommendations can be made to develop standards of preparedness that will bridge these gaps; create greater and more accurate awareness; and support the development of standardized, comprehensive emergency-preparedness systems. The ideal system will be better prepared to handle all hazards and large-scale events. This study serves as a tool in support of the development of public policy enabling an effective and sustainable system of preparedness.

Summary and Transition

The provided background of the research problem included a snapshot of the progression of government involvement in disaster/emergency preparedness from 1803 to date. Following the events of 9/11, voluminous activities surrounding emergency preparedness ensued including government funding for public-health preparedness. The relationship to the condition of EDs in the United States has been described in terms of ED closures, patient boarding, overcrowding, and ambulance diversions. Daily occurrences within many such facilities increase concern regarding the capability of hospital EDs to manage disasters. The purpose of this study was to examine the gap

between effective hospital emergency preparedness and the related awareness and perceptions of healthcare providers. The findings may spur renewed interest in emergency-preparedness policy and create opportunities for positive policy change (see Kingdon, 2011).

Chapter 2 provides a description and summary of past research related to emergency preparedness. The selected articles and documents were chosen due to their relationship and pertinence to the research problem and content that could potentially lead to answering the research questions. The review of literature includes, but is not limited to, the state of EDs within the United States, hospital emergency preparedness, ED use and overcrowding, and surge capacity.

Chapter 2: Literature Review

Introduction

This review of existing literature pertinent to the current topic of study is provided to build upon the background introduced on hospital emergency preparedness within the United States. The review addresses the historical evolution of disaster preparedness within this country (Altevogt, Stroud, Hanson, Hanfling, & Gostin, 2009), the expectations of regulatory agencies on emergency preparedness (EMTALA of 1985; Moy, 2011), and funding sources (De-Lorenzo, 2007; Toner et al., 2009). Literature is also reviewed that addresses recommendations related to ED capabilities and impediments to accomplishing effective disaster preparedness (see Derlet & Richards, 2000; Duley, 2005). A comprehensive discussion of the theoretical construct forming the basis for this current study is presented. This discussion leads to evidence of a structural and systematic process by which EDs can be better prepared for states of disaster such as acts of terrorism or unforeseen natural disasters.

Literature Search Strategy

The majority of the literature reviewed for this current study related to emergency preparedness and its various components. In the practice of emergency medical care, as well as disaster preparedness, multiple components contribute to the state of preparedness. They include, but are not limited to, the availability of resources, staff training, procedures, and hospital capacity. Caring for sick or injured individuals is complex and requires a variety of commonly recognized supplies such as dressings and medicines; however, foundational basics are also important such as a safe, clean space for

care that is thermally controlled, private, and well lit. Adequate numbers of appropriately trained and skilled staff are essential to manage large numbers of patients who are critically ill or injured.

The largest body of staff who care for patients in a disaster situation at a hospital are nurses. Contrary to common perceptions external to the healthcare field, a nurse cannot be placed into any situation or function. Nurses are specialists, and ED nurses are even more highly specialized, with a set of skills unique to the type of care they deliver and the environment within which they work. Technology also varies from one specialty to another. Health care has evolved dramatically and is highly dependent upon computerized processes to aid with every facet of care from registering patients to advanced diagnostics. In this review of related literature, I examine publications focused on topics such as the needed surge capacity to meet the influx of a large number of patients in a system that is already overcrowded (Adams, 2009; Kelen et al., 2006). Ambulance diversion to alternative locations is also addressed (JCAHO, 2006b), and research centered in the need for specialty training and methods for mobilizing additional staff is reviewed (Bascetta, 2010; Schultz & Stratton, 2007).

Relationships and interoperability between community agencies, such as local health departments, are topics of discussion throughout existing literature (Braun et al., 2006). Emphasis is clearly on communication and conducting multiagency drills and exercises to identify weaknesses and create vital opportunities to correct them during the planning phase rather than during an actual event. The expectation is that all hospitals will be prepared at all times for all hazards. As has been exposed within existing

literature (ACEP, 2006, 2009), this is far from the case in many organizations. Such preparation is costly, and many hospitals across the country are experiencing financial constraints, forcing the prioritization of resource allocation. The likely decision is to direct available resources to the patients at hand, with minimal provision for potentialities such as emergency preparedness.

Both primary and secondary sources were located for this literature review through a variety of resources. The online library at Walden University served as the primary means of gaining access to relevant information related to the topic; however, local libraries were used as needed. Internet search engines were also accessed; literature was drawn from PubMed and the following EBSCO databases: Academic Search Premier, MasterFILE Premier, PsycINFO, PsycARTICLES, and MEDLINE.

Keywords used for the literature search in this study included—either individually or in conjunction—*care, communication, community, emergency, disaster, emergency department, health, hospitals, nurses, nursing, physicians, planning, policy, preparedness, readiness, response, resources, surge capacity, training,* and *medicine.* This was followed by a search under additional topics as pertinent areas of interest emerged. Sources were catalogued by completing an in-depth bibliographical list that also incorporated secondary searches through the online library at Walden University, various websites describing EDs within major hospitals throughout Tennessee, and other publications focused on the area of emergency preparedness.

Hospital Emergency Preparedness

Historically, disaster preparedness has focused on the provision of food, shelter,

and financial resources to displaced individuals and repairing damage to the physical infrastructure following a disaster. However, preparedness is much broader and dependent upon the availability of resources; the training of responders; the organizational, regional, and federal infrastructure; and the respective budget or finances (Bascetta, 2010; De-Lorenzo, 2007; Hsu et al., 2006; Kingdon, 2011; Kiselev, 2010; Niska & Shimizu, 2011; Toner et al., 2009). Minimal attention has been given to healthcare needs beyond first aid and field triage. Issues related to expanding hospital-surge capacity and coordinating healthcare and first-response networks in the aftermath of disaster were largely perceived as irrelevant within the United States throughout the majority of the 20th Century. Prior to 2009, the emergency-preparedness standards of the Joint Commission (2009) related primarily to physical-plant threats such as floods, fire, and loss of electrical power. Such threats were placed in the same category as safety, security, and infection control. Preparedness for multiple casualties typically centered on the response of individual EDs.

During the late 1980s and 1990s, awareness of chemical and biological weapons, as well as the threat of their use in terrorist attacks, drew concurrent attention to the need for hospital disaster planning (Toner et al., 2009). Over the same decade, the 1993 terrorist attack on the World Trade Center and the bombing of the Alfred P. Murrah Building in Oklahoma City in 1995, along with a series of natural disasters including Hurricane Andrew in 1992 and two earthquakes in California (i.e., Loma Prieta in 1989 and Northridge in 1994), further heightened awareness of the critical importance of hospital emergency preparedness. However, it was not until the attacks on the World

Trade Center and the Pentagon on 9/11 that serious inadequacies in the existing emergency-response system were clearly exposed. Problems with communication, data management, patient tracking, staffing, supplies, and overcrowding were rampant. Bellevue Hospital, the premier Level I trauma center in New York, was plagued with these issues. The New York University Downtown Hospital lost utility services and had water pressure reduced to dangerous levels (Phillips & Worthington, 2009).

In 2002, the U.S. DHHS established the Hospital Preparedness Program (HPP) with the aim of enhancing the capacity of hospitals and other healthcare systems to prepare for, and respond to, public-health emergencies, including bioterrorist attacks, natural disasters, and pandemic influenza (Toner et al., 2009). Top priorities currently include bolstering the capabilities of hospitals in domains such as interoperable communication systems, personnel management, bed tracking, fatality-management planning, and hospital-evaluation planning. Earlier priorities included expanding bed and staffing surge capacity, decontamination capabilities, isolation capacity, pharmaceutical supplies, education, and training exercises and drills.

In 2007, the U.S. DHHS commissioned a comprehensive 2-year project evaluating hospital preparedness from the inception of the HPP in 2002 through mid-2007 (as cited in Toner et al., 2009). In addition to assessing the changes through that period, the findings were applied to the development of tools and strategies for future evaluation. Toner et al. (2009) presented evaluation data based upon the 2008 descriptive framework that emerged from their study. This framework is a conceptual model of preparedness for mass-casualty events, formed by local and regional healthcare systems

delineating the essential components of hospital disaster preparedness. The evaluation report was drawn from in-depth interviews with 133 health officials and hospital clinicians representing 50 states, the largest cities in the nation, and major U.S. territories, along with analyses of relevant literature, government reports, and HPP program assessments.

The findings of the U.S. DHHS project indicated significant improvements in the disaster preparedness of individual hospitals since launch of the HPP (as cited in Toner et al., 2009). The improvements included more detailed and comprehensive disaster plans; coordinated efforts with community agencies in some locations; more formal disaster-training protocols; stockpiling of emergency supplies, resources, and equipment; and more frequent, higher quality drills. One of the most important improvements was the emergence of healthcare coalitions involving networking and other forms of collaboration between hospitals, public-health departments, and emergency management and response officials. One such coalition is the Bethesda Hospital Emergency Partnership Plan introduced in 2004 (Phillips & Worthington, 2009). This involves three adjacent hospitals within the Washington, DC area—the National Naval Medical Center; the National Institutes of Health Clinical Center; and Suburban Hospital, a nonprofit community facility. The emergency response of hospitals to the 9/11 attack on the Pentagon was severely inadequate (Toner et al., 2009). The Bethesda Hospital Partnership Plan is considered a model program and efforts are currently underway to adapt it to other localities (Phillips & Worthington, 2009).

The evaluation report commissioned by the U.S. DHHS demonstrated that U.S. hospital emergency preparedness remains in a preliminary phase with ample room for improvement (as cited in Toner et al., 2009). The establishment of standards and protocols for accommodating mass casualties represents an unprecedented departure from conventional healthcare practices and poses complex clinical, legal, and ethical challenges. Toner et al. (2009) noted that this daunting task requires leadership and direction at national, state, and local levels. The Institute of Medicine (IOM) recently issued guidelines for establishing crisis standards of medical care for implementation during disaster situations (as cited in Altevogt et al., 2009). The evaluation report revealed that the most effective metrics for quantifying the degree of hospital preparedness rely upon clearly defined indicators and were not unduly cumbersome to implement (Toner et al., 2009). Some of the most useful metrics included numerical surge capacity and capability targets, staff training, and staff performance during exercises and real-life events.

The evaluation report commissioned by the U.S. DHHS recommended the use of JCAHO standards for emergency management in conjunction with the HPP guidelines because the two publications overlap (as cited in Toner et al., 2009). The JCAHO (2006a) outlined a preliminary set of standards for emergency-management planning, infection control, and disaster response in 2006. These standards were subsequently refined and expanded during 2008 (as cited in Soloff, 2008). The revised emergency-management standards were derived from 5 years of detailed investigation by JCAHO into the range of natural and artificial disasters that have affected healthcare organizations, including the

terrorist attacks of 9/11, hurricanes, floods, and extensive utility outages. Based upon this research, JCAHO concluded that planning for a single event is deeply inadequate and healthcare organizations "should be able to demonstrate sufficient flexibility to respond effectively to combinations of escalating events" (p. 3).

One highly recommended technique for enhancing and maintaining emergency preparedness is performing a thorough gap analysis as part of the emergency-management program of the respective organization (*Emergency Preparedness*, 2010). A complete gap analysis includes the following four steps:

1. Identifying planning scenarios including the expected number of casualties for each scenario.
2. Developing requirements.
3. Charting existing resources and capabilities.
4. Identifying the gap between existing resources and capabilities and the total requirements needed for each planning scenario, as well as advancing the plan forward to the next-highest support agency.

Veterans Administration Medical Centers perform gap analyses to bolster their capabilities in serving veterans and local communities during emergencies.

One of the conclusions of the evaluation report commissioned by the U.S. DHHS is the need for sustained and increased HPP funding (Toner et al., 2009). Toner et al. (2009) acknowledged that significant declines in funding levels would likely delay or hinder progress in hospital preparedness and indefinitely set back the ability of the United States to effectively manage mass casualties in the aftermath of catastrophic emergencies.

These researchers also noted that hospitals are investing their own material resources in emergency preparedness but cannot be expected to independently build upon and improve their capabilities without external funding. The critical importance of sustained funding is continually reiterated throughout related literature (Bascetta, 2010; Cherry & Trainer, 2008; *Is the Medical Community Ready*, 2010).

The State of Emergency Medicine

In 2006, the ACEP issued the first national report card on the state of emergency medicine. The national grade was a C– (ACEP, 2006). Many deficiencies included lack of resources, particularly a lack of access to resources. Three years later, the 2009 report card issued the same C– grade (ACEP, 2009). This report was designed to address the realities of the dual role of EDs as providers of emergency care in crisis situations and the safety net for individuals with no other point of access to medical care. The report built upon the 2006 version, drawing data from the most current sources to assess ED care on five dimensions. Based upon 116 metrics, the following five dimensions were weighted to obtain a grade for each state and the District of Columbia, as well as the United States as a whole: (a) access to emergency care (30%), (b) the quality and patient-safety environment (20%), (c) the medical-liability environment (20%), (d) public health and injury prevention (15%), and (e) disaster preparedness (15%).

The ACEP (2009) perceived the results of the described 2009 report card as troubling. The scores of individual states ranged from a B for Massachusetts to a D– for Arkansas. Of the five categories, the United States earned the lowest score on the most vital aspect of emergency management—access to care, scoring a dismal D– for this

category. The overall conclusion is that the needs of a growing and aging U.S. population far exceed the number of existing hospital EDs. The ACEP task force emphasized that this dimension of the report card encompasses the most important aspects of emergency care.

The United States earned a grade of C+ on the dimension of quality and patient-safety environment on the ACEP 2009 report card. The ACEP task force found that the states varied tremendously on this measure. Notably, states that earned high grades in this dimension typically had sufficiently funded EMS systems with protocols designed to provide a quick response during life-threatening conditions. These states also tended to monitor quality measures, track negative events, and utilize electronic medical records to a greater degree than other states.

The United States received a C– on the ACEP 2009 report card in the category of medical-liability environment, another area of wide variability among states. Data conducive to objective evaluation were difficult to obtain on this measure. The nation earned a C on public health and injury prevention. The task force noted that preventable injuries and illnesses remain key contributors to unnecessary morbidity, mortality, and disability. In spite of empirically sound, cost-efficient strategies for public-health promotion, the United States lagged behind other developed nations in reducing morbidity and mortality.

Disaster preparedness was a new dimension for the 2009 edition of the ACEP report card. It was added to capture the disaster-planning initiatives that were becoming more tightly woven into the emergency-care system. The United States scored a C+ in

this category. The task force obtained some of the state-specific data on this dimension through a comprehensive survey of the states and District of Columbia because the information was not yet available on a federal level. This dimension targets four major areas essential to an effective medical-disaster response—state coordination, hospital capacity, availability of trained staff, and funding. These aspects of disaster preparedness continue to evolve (Bascetta, 2010; Braun et. al., 2006; Cherry & Trainer, 2008; Toner et al., 2009).

The ACEP report card confirmed the rampant criticism that federal funding for disaster preparedness was inadequate (as cited in Cherry & Trainer, 2008). The College noted that a scant 4% of U.S. DHS funding is devoted to emergency medical-system preparedness (ACEP, 2009). To compensate, many states have invested heavily in systems and infrastructures enabling a rapid and effective response to natural or artificial disasters. High-performing states typically have high per capita federal funding for disaster response. They also have formal all-hazards medical-response protocols or Emergency Support Function #8 plans, which are typically shared with EMS and key hospital personnel. These states have fairly high numbers of nurses and doctors registered in an emergency system for advanced credentialing of volunteer health professionals, have created effective communication and notification systems, and hold drills and training consistent with JCAHO standards (JCAHO, 2006a; Soloff, 2008).

The ACEP (2009) deemed the U.S. grade of C+ a reflection of inadequate funding for the critical need of frontline medical providers, as well as an absence of consistent direction by the federal government despite efforts invested in emergency care by many

states. Based upon their findings, the ACEP presented the following eight recommendations for improving the state of emergency care:

1. Establish stronger EDs as part of national healthcare reform.
2. Reduce ED boarding and hospital crowding.
3. Pass the Access to EMS Act of 2009.
4. Enact state and federal reforms for medical liability.
5. Channel a greater proportion of federal funding and support into disaster preparedness focused on emergency medical preparedness and response.
6. Expand support for the U.S. healthcare safety net.
7. Create mechanisms for bolstering the coordination of emergency services.
8. Increase the utilization of systems, standards, and information technology to monitor and improve the patient-safety environment.

The ACEP concluded that the national emergency healthcare system is in grim condition, calling upon emergency-care professionals, government officials, and private citizens to scrutinize the report card of the respective states with the goal of identifying problem areas and actively supporting endeavors to improve the system.

Emergency Department Overcrowding

One of the top priorities of the JCAHO (2004a) for improving emergency capabilities is establishing standards for emergency-room care. ED overcrowding standards were introduced in the Leadership chapter of the 2004 *Hospital Accreditation Manual* published by the Commission (JCAHO, 2004b). Tantamount to this factor is the issue of adequate resources. In the case of emergency preparedness, resources encompass

far more than medical supplies and extend into appropriate space, equipment, and human resources such as qualified medical staff. ED overcrowding gained initial attention during the 1980s and awareness increased over the following decade (ACEP, 2006, 2008, 2009; Kellerman, 2006). Impediments to alleviating the situation included lack of a clear definition in terms of what constitutes overcrowding and inadequate understanding of its causes. Ambulance diversion is a common practice for addressing overcrowded EDs; however, this is, ultimately, an ineffective solution.

Cherry and Trainer (2008) explicitly posited that EDs serve the dual purpose of acting as the primary point of access for universal health care and as the critical safety net for emergency medical care. A report by the IOM (2006) found that the demand for emergency care escalated by 26% between 1993 and 2003; however, during the same time period, both the number of EDs and the number of hospital beds declined. Patients admitted to the hospital were frequently boarded within the ED until an inpatient bed was available, which was for 48 hours or longer due to hospital-wide overcrowding. In 2003, ambulances were diverted at an average of once every minute, often resulting in patients being transferred to facilities with less-than-optimal care for their needs.

The ACEP (2008) task force reported that hospital EDs have not adapted to major changes that have occurred since the 1990s. With the exception of hospitals that have undertaken strategic efforts to alleviate crowding, most continue to staff their EDs in the same way these departments were staffed during the 1960s (i.e., Monday through Friday; business hours; with limited staffing on evenings, nights, and weekends). This practice is severely outdated with the present role of the ED, which is to serve as the universal

access point for medical care. Consequently, this is a key contributing factor to the problem of ED capacity. The task force also found that, despite having the ability to predict ED crowding, the majority of hospitals fail to anticipate and prepare for the probable volume of patient admissions the following day. An antiquated structure is implicated that perpetuates ED crowding and compromises patient safety and care.

The ACEP (2008) task force outlined several high-impact solutions to address the conditions that perpetuate ED overcrowding. The first was to move emergency patients out of the ED to inpatient areas including hallways and conference rooms when necessary. The second recommended solution was coordinating the discharge of hospital patients before noon, a practice that has been found to significantly ease patient flow. The third solution was coordinating schedules for elective-surgery patients. Other potential solutions include bedside registration of patients, creating "fast track" units, creating observation units, establishing a physician-triage process, and canceling elective surgeries. However, each of these potential solutions presents drawbacks such as additional costs or the potential for the strategy to ease ED overcrowding but result in impediments to patient flow in other areas of the hospital.

The most effective strategy for easing ED overcrowding actually addresses the overall issue of emergency care by establishing a coordinated regional system that operates under national standards (IOM, 2006). The IOM (2006), as well as other sources, have emphasized that hospitals have been slow to capitalize on information technologies for managing patient care. Electronic medical records are essential for ensuring that patients undergoing treatment for cancer or other serious conditions

continue to receive appropriate treatment during a disaster (Tariman, 2007). Communication systems are a major weakness in emergency preparedness (IOM, 2006; JCAHO, 2006b; Soloff, 2008). Poor communication between EDs, EMS, and trauma centers results in problematic management flow (IOM, 2006). The lack of coordinated communication networks leaves some EDs severely overcrowded while others are empty.

A shortage of health professionals is implicated as a key factor in ED overcrowding (ACEP, 2009; Kellerman, 2006). Shortages exist in both ED nurses and physicians; however, primary care and various specialties also experience shortfalls. The number of trauma cases increased between 1990 and 2002 while the number of neurosurgeons declined (IOM, 2006). Kellerman (2006) argued that addressing the shortages of ED physicians and nurses should be a top priority for government funding. ED personnel have affirmed the severity of the shortages and the vital importance of giving precedence to staffing issues. According to the ACEP (2009), one ED physician declared, "Our hospital emergency departments are feeling the impact of hospital crises, nursing shortages, and physician shortages that are leading to boarding across the entire state and affect every hospital from the smallest rural hospital to the largest tertiary facility" (p. 3). Shortages seem to affect both large and small hospitals.

The IOM (2006) views government funding as essential to improving pediatric emergency care. Neither EDs nor EMS are equipped to provide adequate care for pediatric patients. Children account for 27% of ED visits, while only 6% of U.S. EDs are equipped for pediatric emergencies. This becomes especially critical during disasters when children are more vulnerable to conditions such as dehydration. Following

Hurricane Katrina, children were especially susceptible to gastrointestinal problems (JCAHO, 2006b). Yet, the unique needs of this population have been largely overlooked in disaster planning.

The annual survey of the American Hospital Association (2010) revealed that, in 2010, the EDs of nearly half of all urban and teaching hospitals were at or over capacity. The average for all hospitals is 38% capacity. Nearly one quarter (22%) of all hospitals reported experiencing time on diversion status within the year preceding the survey. The highest diversion rates were reported for urban (45%) and teaching (38%) hospitals. The major cause for the ED diversion was an inadequate number of staffed critical-care beds (42%), followed by ED overcrowding (27%).

On the opposite end of the spectrum, roughly half (49%) of the hospitals surveyed by the AHA (2010) reported improvements in hospital diversion over the year preceding the 2010 survey, while only 11% reported higher rates of diversion. Many hospitals concurrently found it increasingly difficult to maintain on-call physician coverage within the ED. The IOM (2006) cited this as a serious problem. Half of the hospitals surveyed pay physicians for on-call ED coverage, and the same proportion reported increased expenditures in this area (AHA, 2010). A comparable proportion of the responding hospitals had increased their number of staff physicians, the most common strategy employed to expand ED coverage.

Emergency care can no longer be viewed as the province of individual EDs. The general consensus of both government agencies and professional organizations is that a

coordinated and accountable system of emergency care is necessary. Achieving this requires federal funding and support.

Early warning systems. Early warning systems are an integral resource component of a coordinated strategic approach to disaster/emergency response planning. Hoot and Aronsky (2006) described an early warning system as having two essential features—a clearly defined crisis period and a mechanism for predicting crises. These researchers defined a crisis period as a range of time when ambulance diversion is employed to deal with ED overcrowding. At their medical center, ambulance diversion was permitted when the situation met one of the following three criteria that was not expected to abate within 1 hour: (a) all critical-care ED beds are occupied, patients are waiting in hallways, and at least 10 patients are waiting for care; (b) the acuity level places an additional number of patients at risk; and (c) all monitored ED beds are full.

Hoot and Aronsky (2006) tested two conceptual models of ED overcrowding that reliably predicted the described overcrowding 1 hour in advance. One model is the ED work index, which was derived from the expert opinions of ED staff and aligned with the perceptions of nurses and physicians regarding crowding. The second model—the National ED Overcrowding Scale—is a linear-regression model that links five operational variables with the extent of crowding as appraised by doctors and nurses.

Following their logistical-regression comparison of multiple early warning systems, Hoot and Aronsky (2006) noted that the extra hour of advance warning allows hospitals to initiate ambulance diversion with very few false alarms. The advance notice provides hospital staff and administrators an opportunity to take action before the quality

of patient care is compromised. Potential courses of action include contacting reserve personnel, opening auxiliary treatment bays, freeing hospital beds, or deferring care for low-risk patients. The key advantage is that "administrators can be proactive, rather than merely reactive, in the face of an overcrowding crisis" (p. 342). Hoot and Aronsky emphasized that an early warning system is intended to alleviate ED overcrowding in routine situations and does not address mass-casualty events. Nevertheless, the potential responses to an early warning alert are applicable to a surge situation within the context of a coordinated disaster-response network.

Expanding surge capacity. Historically, the study of surge capacity was primarily the province of military medicine, emergency medicine, and public health (Adams, 2009). Adams (2009) noted that there remains no conclusive definition of surge capacity. Using concept analysis, she undertook a literature search using the keyword *surge capacity.* A conceptual analysis produced the 4 Ss—staff, "stuff," structure, and systems. Staff encompasses personnel, stuff refers to supplies and equipment, structure denotes the physical facilities, and systems refers to integrated management policy and processes. The 4 Ss can be considered the defining attributes or characteristics of surge capacity, based upon their prevalence within that context.

Adams (2009) posited that it may be simpler to define surge capacity in terms of what it is *not* rather than what it *is.* Specifically, surge capacity is not static and does not represent routine operations or care. Based upon the described conceptual analysis, Adams defined surge capacity as "the ability to obtain adequate staff, supplies, . . . equipment, structures and systems to provide sufficient care to meet immediate needs of

an influx of patients following a large-scale incident or disaster" (p. 1). Adams called for further study to refine the definition according to the type of event generating the surge and the perspectives of different stakeholder groups including patients and evacuees. The more specific the definition of surge capacity, the more conducive it is to facilitate the establishment of objective measurements.

Hospital care under surge conditions. Kelen et al. (2006) explored the concept of reverse triage; namely, the identification of hospital patients who could be safely discharged in order to accommodate a surge of patients with serious acute-care needs following a mass-casualty event. In the military, reverse triage refers to treating soldiers with less serious injuries first so they can more rapidly return to battle. Its application to civilian patient care is unusual but could be a viable option for expanding surge capacity. The Kelen et al. quantitative research was conducted for the purpose of developing a classification system for evaluating the suitability of hospital patients as candidates for early discharge, according to their "risk tolerance of a consequential medical event as a result of discharge" (p. 1984).

The initial phase of the Kelen et al. (2006) study consisted of the following three key steps:

1. Conceptualizing the dispositional classification system.
2. Developing operational definitions of *consequential medical events* and *critical interventions.*
3. Calculating risk estimates based upon a multidisciplinary expert panel.

The expert panel was composed of 27 practicing clinicians (i.e., physicians, nurses, and a nurse practitioner) and 12 nonclinicians or nonpracticing clinicians representing a broad array of related disciplines (i.e., disaster management, homeland security, disaster and military triage, risk management, public health, and hospital administration). The panelists participated in a warfare-analysis exercise and were asked to develop responses to questions involving the creation of the disposition classification system. Those with clinical experience were asked to rate on a scale of 1 through 10 the probability of withdrawing or withholding a critical intervention and the medical consequences.

The Kelen et al. (2006) panel members unanimously endorsed a five-category disposition classification system. For patients within the minimum-risk group, the upper limit for risk tolerance in the event of early discharge was 4%. In the next-lowest risk category, the upper limit was approximately 12%, followed by 33% for the moderate-risk category. The upper limit for the high-risk category was 60%, and for very high-risk patients was between 95% or 100%. The panelists also developed a list of 28 critical interventions with a probability of resulting in a consequential medical event if discontinued. The impact of discontinuing the interventions was ranked between 3 and 10 on a 10-point scale. Kelen et al. noted that the level of risk tolerance the panelists derived for the two lowest risk categories are lower than the actual risk of adverse events for discharged hospital patients, which has been reported as high as 19% in the first 3 weeks following discharge. The development of the disposition classification system was the first stage of the project, which is designed to produce and validate clinical criteria for making real-time decisions for early discharge in response to a patient surge.

A task force on mass critical care developed a framework for providing emergency mass critical care (EMCC) in response to a surge event (Rubinson et al., 2008). Although the creation of the task force was "triggered" by the potential for a serious influenza pandemic, the framework can be adapted across crisis situations. The task force outlined several broad recommendations. They proposed that all hospitals with an intensive-care unit prepare to provide EMCC in a coordinated effort with regional-hospital planning. The task force strongly advocated for the development of healthcare coalitions. They also recommended the rigorous application of metrics including the development of precise benchmarks for mass-casualty surge capacity.

The task force on mass critical care also recommended that hospitals with intensive-care units plan and prepare for the provision of EMCC on a daily basis during the response period for a patient population at least triple the typical capacity for an intensive-care unit (Rubinson et al., 2008). They also suggested that hospitals prepare to provide EMCC for 10 consecutive days without the need for external medical assistance and offered suggestions for adapting specific critical-care procedures. The EMCC framework is consistent with the IOM (2006) standards of care during crisis (Altevogt et al., 2009).

Disaster-response hospitals. In the wake of Hurricanes Katrina and Rita, several alternate health facilities, ranging from a veterinary hospital to an empty retail store, were established as surge hospitals (JCAHO, 2006b). The "Katrina Clinic" was set up in Reliant Arena, next to the Houston Astrodome, by the Harris County Hospital District. It was operated and staffed in collaboration with medical doctors and faculty from Baylor

College of Medicine and other medical volunteers from the area. A call for medical volunteers elicited 2,700 responses. With dedicated staff and donated supplies and equipment, the facility rapidly expanded, processing more than 10,000 patients over 15 days. Acutely ill patients were sent to local hospitals. Most clinic treatment was for chronic conditions such as diabetes, high blood pressure, and asthma. Treatment unique to the situation included the provision of thousands of immunizations and treating gastrointestinal infections eventually identified as the Norwalk virus. A second clinic opened at the George R. Brown Convention Center where more than 9,000 additional patients were processed. Katrina Clinic operated for weeks at a cost of $4.1 million and, after the clinic closed, it became a Red Cross center for the provision of first aid to evacuees.

The Dallas Convention Center and the basketball arena and field house at Louisiana State University, Baton Rouge served as additional sites for surge hospitals in the wake of Hurricane Katrina (JCAHO, 2006b). The convention center was established as a medical command center by physicians, students, and employees from the University of Texas Southwestern Medical Center in preparation for evacuees. Staffed entirely by local medical volunteers, the facility provided urgent and chronic care and treated patients from hotels and other shelters, in addition to those sheltered at the Dallas Convention Center. Rinnert (as cited in JCAHO, 2006b), a practicing physician and assistant professor of emergency medicine at University of Texas, commented that using a space such as a convention center as a surge hospital had two major advantages—the space (a) could easily be segmented, as needed; and (b) was air-conditioned throughout.

The disadvantages were the bare appearance, harsh lighting, and lack of shower facilities. Overall, however, the convention center was a satisfactory setting for a surge hospital.

The university site was deemed less satisfactory (JCAHO, 2006b). Although the facility attracted numerous student volunteers, as well as medical staff, the presence of the surge facility posed a disturbance to student life that was complicated by the concern over the potential for disease transmission. The primary problem was that, unlike a convention center or similar facility that is conducive to multiple uses, maintaining normal university life while providing disaster relief presented two essentially incompatible functions. The empty department store was the most unlikely venue for a surge hospital; however, the building had been purchased by Louisiana State University and was scheduled to be torn down in order to build new clinics for the university medical center. While the location made the space an excellent site for emergency management, medical staffing, and supply storage, the facility itself presented numerous logistical challenges. The largest problem was setting up communication channels in the aftermath of Hurricane Katrina. According to interviewees, the primary contributor to successful operation of the facility was the powerful spirit of volunteerism displayed by the workers and suppliers.

The best setting for a surge facility in the aftermath of Hurricane Katrina proved to be the large-animal hospital at the College of Veterinary Medicine and Biomedical Sciences at Texas A&M University (JCAHO, 2006b). The state-of-the-art facility was equipped for medical purposes and, after the animals were transferred and the facility sterilized, the site served as a shelter and specialized care center for patients with critical

medical needs. In a collaborative effort with St. Joseph's Hospital, the area's largest medical facility, representatives from the CDC and Prevention, the FEMA, and the Public-Health Service, under the direction of a physician from the Texas A&M University System Health Science Center and Center staff, the facility housed 650 people and served the medical needs of more than 1,000. The effort was organized so that St. Joseph's Hospital never extended beyond 80% occupancy, allowing for a high standard of care.

Zane et al. (2008) examined the use of "shuttered" hospitals—specifically, closed or former hospitals—as surge facilities in response to a mass-casualty event. A major advantage of the veterinary hospital was that its infrastructure was designed for medical needs (JCAHO, 2006b). Zane et al. proposed the use of shuttered, or partially shuttered, hospitals, noting that, although some communities have contemplated such use, no feasibility studies had been conducted. The investigators focused on two recently closed, acute-care hospitals within the Boston area, selected on the basis of the following five key criteria:

1. The building was safe for occupation.
2. The former hospital had some daytime function and hence maintained its life, safety, and emergency building systems.
3. The former hospital could halt its current function and be available within 3 to 7 days of a patient surge.
4. The building owners and management were willing to cooperate with the research project.

5. The site was in proximity to Boston, allowing the rapid transport of patients from the most concentrated population areas and the largest hospitals.

A team of experts created a checklist for detailed evaluation of each of the described potential sites in terms of pertinent services; specifically, emergency medicine, surgery, patient-care units, nursing, food preparation, security, materials management, a morgue, utilities, and fire safety (Zane et al., 2008). The team was presented with two scenarios on which to gauge the suitability of the two facilities. In the first scenario, the surge facility would accommodate inpatients who were stable or had lower acute-care needs and who were transferred from an acute-care hospital serving high-risk patients. In the second scenario, the surge facility would be transformed into an isolation or quarantine hospital for treating patients who were victims of a biological bioterrorist act or of pandemic influenza or other infectious disease but who had not been admitted to an intensive-care unit.

The experts participating in the Zane et al. (2008) study deemed both of the examined shuttered hospitals feasible sites for a surge facility but cautioned that responding to a mass-casualty surge would demand a considerable degree of advance planning and preparation. They stated that collaboration between the planners and state and local officials required clear delineation of the responsibility for planning the surge facility and initiating its operation. Zane et al. advanced that the most practical and efficient strategy for operating a surge hospital is likely to be a satellite facility of a large community hospital or tertiary medical center. In the absence of a tertiary medical center or hospital willing to engage in that type of arrangement, Zane et al. suggested that a

county health department might be a viable partner. These researchers regard staffing the surge hospital as the most urgent need. Bascetta (2010) noted that the state medical registries are designed to address the need for healthcare personnel. Zane et al. acknowledged that their study did not address the costs or reimbursement arrangements involved in opening and operating shuttered hospitals as surge facilities but added that this would typically be discussed among the agencies considering the endeavor.

Resources

Community emergency preparedness. Braun et al. (2006) considered strong relationships between hospitals and the community as pivotal to emergency preparedness. Traditionally, hospitals isolated from community networks are considered "possibly the weakest link in emergency responses" (p. 799). To gain insight into the degree of hospital integration into community planning, Braun et al. conducted a quantitative study to assess the links between hospitals and their respective communities, as well as the factors underlying the degree of hospital integration. Data were drawn from a random sample of 575 medical-surgical hospitals. The questionnaire items were derived from a technical expert panel due to the lack of a predefined model or guidelines for determining factors relevant to understanding hospital-community relationships.

Braun et al. (2006) assessed four dimensions of hospital integration: (a) the community and emergency planning process; (b) the community emergency-operations plan; (c) the established response capability; and (d) the ongoing processes of surveillance, reporting, and laboratory identification. Considerable variation was evident. No single professional group nor discipline was consistently entrusted with responsibility

for hospital preparedness, posing a challenge for community groups attempting to discern the appropriate hospital liaison. Many of the communities failed to capitalize on key stakeholders, such as volunteer organizations and local media, and some communities had no established communication protocols for times of crisis. The absence of community plans for expanding hospital-surge capacity, in terms of supplies, equipment, pharmaceuticals, and isolation, was not unusual.

Braun et al. (2006) reported far more variation in preparedness among small, rural hospitals than in large, urban hospitals. Small facilities were comparable on performance measures and had a greater amount of support and assistance. Rural communities struggle to establish response networks and are typically in urgent need of additional government funding (*Is the Medical Community Ready,* 2010). The two measures resulting in the greatest degree of integration were participation in community-wide exercises and drills (88.2%) and undertaking threat and vulnerability analyses in collaboration with community responders (82.2%).

A majority of the hospitals participating in the Braun et al. (2006) study had community plans addressing their potential need for additional equipment and supplies (57.3%), addressing decontamination-capacity issues (73%), and reflecting a direct link to the Health Alert Network (54.4%). The establishment of 24-hour, 7 days per week access to a real voice from the public-health department was the only measure resulting in less than one half of the participating hospitals (40%). The findings of the Braun et al. research made a significant contribution to the body of related existing knowledge by demonstrating that, while progress has been made in creating collaborative community

response networks, the IOM (2006) vision of a coordinated, regionalized, and accountable emergency-response system remains rather elusive.

Nurses have historically played a central role in responding to health emergencies and disasters (Adams, 2009; Gebbie & Qureshi, 2006; Nasrabadi, Naji, Mirzabeigi, & Dadbahs, 2007). In the wake of Hurricane Katrina, nursing and medical students were among the volunteers staffing surge hospitals (JCAHO, 2006b). Adams and Canclini (2008) described a participatory action-research project that emerged from the involvement of students and faculty from the Texas Christian University Harris College of Nursing and Health Sciences in caring for survivors of Hurricane Katrina. Community-health nursing students collaborated with community members to develop a list of priorities that would form the basis for a community disaster-preparedness health-education program.

Adams and Canclini (2008) envisioned the described action-research project that followed Hurricane Katrina as a model for future programs and applicable to a wide range of settings and diverse populations. These researchers advocated for collaborative partnerships between universities and organizations such as local Red Cross chapters, community emergency-response teams, and public-health departments. Teaching hospitals, colleges, and universities that educate health professionals are valuable partners within the realm of emergency-response preparedness. Graduates emerging from related programs are equipped with knowledge, skills, and competencies required for disaster preparedness. Awareness of the vital importance of emergency preparedness has led to the delineation of core competencies for health professionals and other hospital staff

responding to mass-casualty events (Gebbie & Qureshi, 2006; Hsu et al., 2006; Polivka et al., 2008).

Emergency resource management. Gas-pipeline failures are rare occurrences; however, the potential consequences of such events are devastating and include brain damage and loss of life (Weller, Merry, Warman, & Robinson, 2007). The incident that motivated a study conducted by Weller et al. (2007) was a construction accident. A contractor drilled through a pipeline within a hospital in New South Wales, Australia, setting off oxygen-failure alarms, which resulted in a rush for cylinder oxygen. The nurse manager was rapidly inundated with calls for oxygen from the wards, which created disorganized competition for oxygen cylinders between critical-care units. Although no patients suffered harm, the incident disclosed a number of weaknesses and raised awareness of the potential for damage in the event of a power failure or other crisis.

As a prelude to the development of formal protocols, such as operating-room guidelines for responding to critical incidents involving technical malfunctions of anesthesia equipment, Weller et al. (2007) assessed the responses of 20 anesthetists to a simulated oxygen-failure event. The participants were informed they would be anesthetizing an emergency patient (i.e., a young female victim of a motor-vehicle accident who required 70% oxygen concentration). They could not assume that the operating room had already been used the same day, they would be assigned an assistant, and they were instructed to act as they would in a real-life situation. During the simulation, a whistle sounded, signifying failure of the oxygen pipeline, and the participants were informed by phone that damage from construction work had cut off the

oxygen supply to the entire hospital. The surgeon was scheduled to operate for several hours. After 15 minutes, a second phone call informed the participants that the damage had been fixed and the oxygen flow was restored.

Following the Weller et al. (2007) simulation, questionnaires were administered to the participants and interviews were conducted. While noting that all of the participating anesthetists preserved the immediate safety of the patients, Weller et al. observed several key areas requiring improvement. The participants failed to conserve the oxygen supply, which would have serious implications in a real disaster, and used the gas from the repaired pipeline without a prior check for readiness. Several anesthetists were aware of the need to conserve oxygen but did not know specific techniques for effectuating its conservation. Weller et al. noted that the implications of their study go beyond the specifics of anesthesia management. They advocated for use of a high-fidelity, human-patient simulator for evaluating the responses of hospital personnel to a vast range of critical equipment or infrastructure incidents, targeting common management errors, and assessing new management protocols. Such simulation exercises effectively identify areas requiring further education and training, with the overall goal of improving hospital-wide capacity to effectively respond to critical events.

Personnel

Credentialing volunteers. Fifteen of the 20 states sampled by Bascetta (2010) within a government accounting office reported building an electronic registry of medical volunteers. Credentialing patient care providers is a complex process that presents a major obstacle to the quick expansion of hospital staff (Schultz & Stratton, 2007).

Hospitals have the task of credentialing clinicians prior to assigning patient-care privileges and, especially in the case of physicians, the process can take months to complete. Clinicians not credentialed at a particular facility are not permitted to care for patients, regardless of whether they are credentialed at nearby hospitals. However, when a facility has a disaster plan in place and urgent care needs cannot be met, the JCAHO (2006a) permits a hospital to grant emergency credentialing/disaster privileges to individual volunteers. For physicians, the minimum requirement is a medical license and a photo ID, which allows permission for 72 hours of practice. This period can be extended, if needed, although additional information from the temporarily credentialed professional is typically required.

The cumbersome credentialing process contributed to staff shortages at several New York hospitals following the attack of 9/11. The problem was compounded by the failed communication systems that precluded the hospitals from contacting sources that could have provided verification of the licenses of medical volunteers (Schultz & Stratton, 2007). Although there are federally endorsed sources of volunteers, such as the Medical Reserve Corps, the Public Health Service Commissioned Corps, and the National Disaster Medical System and its attached Disaster Medical Assistance Teams, the standards for membership in these organizations are lower than the standards set by many hospitals. This results in some administrators reluctant to rely upon members. There are additional sources of medical volunteers; however, Schultz and Stratton (2007) noted drawbacks with the majority of these organizations. These researchers proposed the alternative of a hospital-based database of healthcare providers located within the region.

Each hospital currently creates its own database of physicians, nurses, behavioral-health professionals, and technical and support staff. The majority of hospitals already keep this type of information; however, it is typically dispersed across different departments rather than maintained within a single location. To preserve privacy, the only information listed is what would be available in a phone directory, with no home address or state Web site.

Standardized software would render a database simple, cost efficient, and accessible during any disaster/emergency-response situation. A disadvantage is the database would be limited solely to clinicians with hospital privileges and would not include important practitioners such as veterinarians, psychologists, and dentists. However, there are databases for virtually all professional groups that could be integrated into a hospital database such as that proposed by Schultz and Stratton (2007). Over time, emergency-preparedness efforts have generated many promising and innovative ideas. A particular advantage of the described database is that it would capitalize on the use of information technology for emergency-response preparedness, which is essential for building coordinated networks and surmounting the flawed communication that impeded efficient response in past disaster events.

Psychosocial preparedness. In a disaster, the victims are not the only individuals to suffer psychological trauma. In the wake of a crisis, law-enforcement agents, firefighters, emergency medical providers, and medical and nursing staff are all subject to psychosocial stressors. The sources can widely vary to include exposure to tragic and disfiguring injuries to victims that may be friends or relatives, personal wellness

concerns, or worry over loved ones who may be in danger. In high-stress situations, maintaining the stability of skilled staff during such events, as well as in the aftermath, is essential to reducing the risk of posttraumatic stress disorder.

Truscott (2009) emphasized that healthcare facilities must incorporate psychosocial preparedness into pandemic influenza preparedness. Treating patients with infectious diseases carries the possible risk of care-provider infection, which the clinician could also transmit to his or her family. Additional concerns include ethical dilemmas involving the role of a healthcare provider in making difficult triage decisions between a spouse or parent; stigmatization resulting from possibly spreading a virus; expectations of maintaining a high level of care when performing unfamiliar activities; potentially preferential treatment in the administration of vaccines or antiviral drugs; physical isolation such as individual or group quarantine; escalating demands coupled with inadequate surge capacity; and the exposure to infection resulting in the death of patients, colleagues, and relatives, spurring concurrent grief and fear of personal mortality.

Providing psychosocial support to healthcare professionals includes all of the components of pandemic preparedness along with measures for maintaining a supportive environment. Such support involves training staff in behavioral-health issues such as stress management; coping skills; resilience; and dealing with grief, anger, and exhaustion (Truscott, 2009). Both Truscott (2009) and Poutanen (2010) emphasized the importance of integrating self-care into pandemic preparedness. Incorporating nonmedical professionals into a hospital database, as recommended by Schultz and Stratton (2007), would ensure that hospitals have access to behavioral mental-health

professionals who can provide psychoeducational interventions for hospital staff dealing with an infectious-disease pandemic.

Training

Pandemic infectious-disease preparedness. Health professionals involved in responding to scenarios involving severe acute respiratory syndrome learned lessons they immediately applied when the H1N1 pandemic emerged. This knowledge was further honed with a subsequent Ebola outbreak and will continue to evolve as future pandemics introduce new data. Poutanen (2010) outlined needed components of an effective preparedness plan, which included a detailed communication plan; preparation for biosafety; preparation for a surge in laboratory testing; tracking metrics in real time; maintaining psychosocial support; documenting a formalized preparedness plan; ensuring the capacity to introduce new tests on short notice; and maximizing the use of bar codes, interfaces, and electronic reporting.

As in all emergency-preparedness efforts, nurses play a pivotal role in pandemic preparedness. Hoffman and Nannini (2008) called for advanced-practice nurses to become involved in planning, surveillance, and reporting in response to pandemic influenza. Chan and Wong (2007) view public-health nurses as especially well-suited for educating community members on issues related to personal and environmental hygiene. They also view nurses educated in infection control as ideal trainers for other health professionals.

Rust et al. (2009) noted that certain populations are disproportionately affected during an influenza pandemic; notably, the poor, ethnic and racial minorities, individuals

with limited English proficiency, those with mental or physical disabilities, the uninsured, and all residents of underserved communities. These researchers emphasized the necessity for expanding surge capacity throughout the primary-care safety net in order to meet the needs of vulnerable populations without overwhelming hospital EDs. The agencies and organizations comprising this safety net include federally qualified health centers (e.g., community health centers, public-housing clinics, homeless health centers, and migrant health centers); rural health clinics; public-health outpatient clinics; local public-health departments; free clinics and volunteer clinics; and hospital EDs.

Rust et al. (2009) provided several recommendations for bolstering the capability of the primary-care safety net to prepare for, and respond to, pandemic influenza. The first step is undertaking a safety needs assessment within all counties and parishes across the United States. Second, these researchers recommended virtual "stress tests," utilizing modeling techniques to assess local safety-net capacity. Increasing such capacity and building safety-net organizations within communities lacking an existing safety net or with sufficient capacity are two essential steps. Additional steps include integrating primary-care safety-net providers into pandemic-influenza plans and resource allocation, cultivating a culturally representative health and mental-health workforce, hiring and training culturally and linguistically relevant healthcare workers, developing direct mechanisms and a logistical infrastructure for delivering pharmaceuticals and other resources and supplies, creating active programs and partnerships between the primary-care safety net and local health departments, and establishing benchmarks for preparedness.

Public health nursing competencies. Hsu et. al. (2006) created a competency model for training hospital staff in emergency preparedness for application with all personnel. Numerous sets of emergency-preparedness competencies are described on the Internet, from hospital staff and public-health workers responding to bioterrorism to the initial stages of clinician assessment and management (Gebbie & Qureshi, 2006). Polivka et al. (2008) organized a Delphi panel to develop a set of disaster-preparedness competencies for public-health nurses expected to be on the front lines in response to a mass-casualty event.

The IOM (1988) called for general public-health competencies, which were eventually developed and followed by other competency models such as disaster-preparedness competencies for public-health workers and educational competencies for registered nurses that were related to mass-casualty events. Polivka et al. (2008) sought to build upon these models through a three-round Delphi study conducted by e-mail. The expert panel included public-health nurses, directors of nursing from local health departments, state nursing leaders, and national nursing-preparedness experts.

The Polivka et al. (2008) panelists identified 25 emergency-preparedness competencies for public-health nurses. These competencies were categorized according to the three phases of emergency response—preparedness, response, and recovery. Preparedness competencies concentrate on personal preparedness—understanding disaster-preparedness terms, concepts, and roles, as well as personal familiarization with the disaster plan of the health department, communication equipment, and the role of the public-health nurse during a mass-casualty event. Response competencies center on rapid

needs assessment, outbreak investigation and surveillance, public-health triage, risk communication, and various technical skills. Recovery competencies encompass debriefing, engagement in disaster-plan modification, and coordinating efforts to effectively manage the psychosocial and public-health impact of a disaster event.

The emergency-preparedness competencies identified by Polivka et al. (2008) are applicable for public-health nurses employed within any setting and offer a framework for structuring education and training. These researchers noted that proper education and training is essential to empowering public-health nurses with the requisite skills and competencies. A team from the Ohio Public Health Leadership Institute created a uniquely blended learning program based upon adult learning principles to help public-health nurses master identified competencies.

Quality improvement. The realm of emergency preparedness is evolving with the emergence of new epidemics and a barrage of natural disasters. Lotstein et al. (2008) noted the widespread use of quality-improvement (QI) techniques within the healthcare sector, especially in the aftermath of IOM (1988) reports documenting the prevalence of medical errors and other compromises to safe, quality patient care. Improved safety and cost effectiveness are two positive outcomes resulting from the improvement of QI efforts. Some efforts have promoted QI within the realm of public health but with minimal application to the issue of PHEP. Lotstein et al. developed an innovative collaborative-learning tool known as Promoting Emergency Preparedness and Readiness for Pandemic Influenza (i.e., PREPARE for PI).

The Lotstein et al. (2008) pilot project was conducted with teams of three or four individuals sent by five state and local health departments that had demonstrated excellence or were interested in greater learning surrounding QI methods. The teams were expected to physically attend three meetings or "learning sessions" and subsequently undertake improvement efforts within their respective agencies (p. w330). The multifaceted sessions involved presentations by external experts, team planning and sharing activities, and discussions of QI topics and the PREPARE for PI PHEP framework. The framework outlines five key preparedness activities that, if effectively performed, work to achieve the desired outcomes of "minimized morbidity, mortality, and social disruption in the event of an influenza pandemic" (p. w331). The five preparedness activities are surveillance, case investigation, command and control, risk communication, and disease control and treatment.

The Lotstein et al. (2008) QI model consists of four elements—aims and goals, performance measures, strategies and ideas for change, and adoption of the method and cycles of the quality model known as the Plan-Do-Study-Act (PDSA). The PDSA cycles are based upon the notion that the most effective path toward sustainable improvement is through multiple incremental and initially small changes, as opposed to the "blanket" implementation of a complete, predesigned program. Each team participating in the Lotstein et al. study chose improvement aims within the realm of operational-performance measures aligned with the priorities of their respective agencies. The teams subsequently implemented process mapping, which is a basic QI tool for portraying key inputs, improvement targets, and desired outcomes to create personal process maps of

their specific goals. They were encouraged to incorporate their improvement efforts into the daily operations of their agencies.

Lotstein et al. (2008) described 9 months of QI activities performed by the teams participating in their study. These researchers presented several examples illustrating how the teams applied the techniques to the areas of command and control, disease control and treatment, and risk communication. Within the realm of command and control, the Genesee County Health Department in Michigan was exemplified. Management of this facility sought to improve the capacity of the organization to rapidly mobilize staff in response to an emergency. They focused their tests on two performance measures (a) whether 100% of staff could respond to an alert within 90 minutes (i.e., the process goal); and (b) how the mode of communication affected performance. In the first e-mail test, only 50% of nonabsent staff responded within the specified time; 25% did not respond at all. Changes to the e-mail instructions produced substantial improvements—83% response within 90 minutes and only 5% not responding. Although the rapid response rate fell short of the target of 100%, the tests provided baseline data for future improvements and demonstrated the utility of the PDSA cycle for QI.

The realm of disease control and treatment covers activities such as effectively promoting community migration, conducting rapid triage, and expanding the surge capacity of the respective medical system (Lotstein et al., 2008). The Georgia Division of Public Health devised a triage and decision-support phone line staffed by nurses for the purpose of advising patients who did not require face-to-face evaluation during a pandemic. The team effort began with forging a relationship with a local hospital to learn

more about its strategies for directing a triage line and creating a collaborative effort for its staffing. PDSA cycles focused on identifying which nurses could most effectively respond to callers with a wide range of symptoms by testing nurses with different backgrounds and exposing them to various call scenarios. Public-health nurses filling front-line positions proved to be the most efficient and capable. The data derived from the PDSA cycles presented the participating public-health department with realistic estimates of the staffing and resource requirements that would enable the call line to effectively manage a large volume of calls. Another advantage was the team successfully engaged the support of nurses who had initially been skeptical of the triage line.

To illustrate application of the QI model within the realm of risk communication, Lotstein et al. (2008) exemplified the Baltimore City Health Department that tested the effectiveness of different messages and modes of communication for a back-to-school vaccination campaign. Parental input revealed that sending letters home with children was far more effective than a citywide advertising campaign. Of the total parent sample, 63% brought their children to the vaccination clinics in response to their letters as sources of information, compared to only 10% who cited the ads as their source of information. While the health-department team acknowledged that the letter campaign might not be effective in some emergency situations, they learned how to gauge the effectiveness of communication techniques. As additional benefits, the team credited PREPARE for PI with helping the city achieve school-vaccination targets, improve communication with the public, and improve teamwork within the department.

PREPARE for PI is a flexible framework with a sound foundation developed from successful QI initiatives within various health sectors. Lotstein et al. (2008) noted a degree of initial skepticism from two opposite sides. On one end of the spectrum was public-health personnel who had never worked in emergency preparedness and were reluctant to do so until they observed how PREPARE for PI enabled them to improve high-priority areas and illuminate PHEP processes and outcomes. On the other end of the spectrum was emergency-preparedness personnel who initially questioned fusing preparedness activities with routine public-health activities. This population was ultimately impressed by how effectively PREPARE for PI helped team members gather high-priority performance data for PHEP activities. Lotstein et al. staunchly advocated for future efforts to synthesize QI methods into public health. Their cases studies indicated that the application of QI techniques is highly promising for enhancing emergency preparedness.

Evaluation methods. Arboleda, Abraham, and Lubitz (2007) opined that the traditional checklists and questionnaires used as a basis for drawing emergency plans are inadequate for evaluating emergency preparedness in the case of major natural disasters or deliberate attacks. Both of these scenarios demand a strong internal infrastructure and linkages with other systems and community organizations. These researchers presented a dynamic simulation model for use as a tool for assessing the degree of vulnerability of a healthcare facility in the face of disaster. Degree of vulnerability is defined as “the impact created by the disaster event on the operation of the facility in comparison with normal operations” (p. 303). The focus is on maintaining an adequate flow of resources. The

model is not designed to pinpoint precise values, such as the level of patients or resources on a given unit, but rather, to provide trend data on the factors under examination.

The dynamic simulation model developed by Arboleda et al. (2007) is drawn from an earlier model developed by Barbera and McIntyre that offers a "systematic approach for a community to use in developing its own medical response capability" (as cited in Arboleda et al., 2007, p. 303). Encompassing services and activities that are requisite for the care of incoming patients, the model divides the key service realms into three categories of prehospital care, medical care, and general emergency response. Each category is charted in terms of internal capabilities, external systems, types of flow, and participants. The systems dynamics within healthcare networks is a complex interplay involving health systems, clinical systems, care delivery, prevention, and epidemiology. The simulation model includes a number of endogenous variables (e.g., number of beds available on each unit, available medical staff, medication inventory, average patient stay, length of shift, and fatigue effects), as well as exogenous variables (e.g., patient-arrival rates, EMS, utilities, transportation, and number of walk-ins).

Applying the dynamic simulation model, Arboleda et al. (2007) presented a case analysis of a large, midwestern community teaching hospital. The scenario was the impact of an earthquake on the level of facility occupancy and patient flow, with damage sustained to the water and power supply of the city, as well as to the roads near the hospital, thereby diminishing these commodities and affecting the flow of patients within the hospital. Comparisons of the disaster scenario with another scenario in which no damage was sustained allowed the researchers to calculate and quantify the potential

effects of a disaster. The analysis focused on potential approaches to alleviating the resulting problems—both stock and flow related—which could be synthesized to increase the flow of patients during the first few hours of the disaster response. Arboleda et al. view the model as a potentially useful tool for aiding hospital administrators as they devise disaster-preparedness plans.

Collander et al. (2008) conducted a qualitative study of hospital personnel that demonstrated the effectiveness of practicing for disaster situations in terms of improving the capability of staff members to perform well in the face of a real disaster. In reality, few hospitals provide adequate, if any, training for disaster events. Collander et al. noted the minimal evidence existing on the effectiveness of training strategies such as skills-training sessions, field exercises, lectures, and "tabletop sessions," as well as the lack of definitive guidelines for training healthcare staff in disaster preparedness. These researchers acknowledged that each individual training modality has strengths and limitations. To compensate for the drawbacks of implementing a single training method, a large urban hospital within Washington, DC created a multimodality program known as Hospital Disaster Life Support for educating and training hospital staff in disaster preparedness.

Knowledge assessment. The Hospital Disaster Life Support program is based upon the seven core competencies for training healthcare workers in disaster training, which were delineated by Hsu et al. (2006). These researchers endeavored to develop an evidence-based competency model for training healthcare workers. They noted that the lack of standards and guidelines for training multidisciplinary healthcare staff represented

a glaring gap between the rhetoric of disaster preparedness and the actual manner in which such training is performed. To develop their model, Hsu et al. conducted an extensive literature review, analyzing the findings on existing competencies and training courses. They subsequently synthesized the information into a set of cross-cutting competencies and target objectives. They used the term cross-cutting to denote related but distinct groups of healthcare and hospital staff including first-receiver nurses and physicians, other first-receiver staff, non–first-receiver nurses and physicians, critical-event leadership, technical staff, and administrative staff.

A panel of 12 nationally recognized experts—drawn from hospitals, academic centers, professional organizations, and government agencies—convened for the modified Hsu et al. (2006) Delphi study. The purpose of the research was to clarify and refine the designated competencies and target objectives. The process yielded seven core competencies and 21 terminal objectives. The seven competencies are (a) recognize a potential critical event and implement initial action, (b) apply the principles of critical-event management, (c) demonstrate critical-event safety principles, (d) understand the institutional emergency-operations plan, (e) demonstrate effective critical-event communications, (f) understand the incident command system and personal role within that system, and (g) demonstrate the knowledge and skills needed to fulfill that role during a critical event. Each of the core competencies was matched with a detailed set of terminal objectives.

Hsu et al. (2006) advanced that an advantage of using a competency model for structuring disaster-response education and training is that the model details specific

skills and capabilities and can be flexibly adapted to the training needs of various groups of hospital personnel. Given the pivotal role of multidisciplinary teamwork in critical-event preparedness and response, Hsu et al. view a framework based upon cross-cutting competencies as superior to separate competencies for each population group. From a theoretical perspective, the competencies are derived from principles common to all healthcare workers.

Prior to delivering the earlier-described program known as Hospital Disaster Life Support, Collander et al. (2008) conducted an online pretest to assess participant knowledge of hospital disaster preparedness via a survey of 23 items drawn from the Hsu et al. (2006) seven core competencies. The Collander et al. evaluation was based upon 10 courses delivered over a 15-month period. The participants included 40 nurses; 11 doctors; 23 administrators or directors; and 10 other staff members that included emergency medical technicians, nonclinical support staff, and protective-services staff. The course was arranged into the following eight units: hospital-incident command structure, protecting staff and facility, biological mass-casualty incident (MCI), conventional MCI and hospital response, radiological MCI and hospital response, chemical MCI and hospital response, pediatric elements of a MCI, and system restoration and recovery.

The mean score at the onset of the Collander et al. (2008) study was 69.1, with no significant differences in scores between the various personnel groups. Upon completion of the course, the mean posttest score was 89.5, which indicated an impressive improvement. All the study groups demonstrated significant increases. The course

elicited favorable responses from the participants who viewed the training as relevant, educational, and well organized. The participants also expressed confidence in their ability to apply new knowledge. The weakest aspect of the training, according to the respondent feedback, was the simulated hospital environment. However, Collander et al. attributed this to a need for certain minor alterations to the original training facility, adding that, on the basis of the participant feedback, the course should be moved to a more conducive learning environment. As Hsu et al. (2006) intended, the competency model proved to be a valuable framework for structuring disaster-preparedness training, and Collander et al. created an effective, positively perceived program for hospital personnel.

Bartley, Fisher, and Stella (2007) explored the effectiveness of an instructional video depicting footage from a disaster drill for educating medical registrars (i.e., residents) on a hospital disaster plan. The participating hospital is a large teaching facility within Victoria, Australia that had successfully combined lectures with disaster drills to educate senior nursing and medical staff on the disaster plan as part of a hospital-wide QI initiative. However, the time- and labor-intensive training was considered impractical for educating successive rotations of junior medical staff because their hectic schedules and competing demands precluded high rates of attendance. The 15-minute video, entitled *Bombs, Bush-Fires and Big Bungles—are you Ready for the Next big one?* was deemed to be a convenient, effective, and cost-efficient way of delivering training. Footage was taken from a simulated mass-casualty event created by officers of the local State Emergency Service. The video depicted a serious train accident after which patients were

triaged in the ED; given appropriate treatment; and admitted or discharged, as needed. All facets of disaster planning were detailed including the triage and management of nondisaster patients. The video was designed to provoke critical thinking among the viewers as to their roles in a disaster event.

The survey used in the Bartley et al. (2007) research to evaluate senior-staff training was adapted for a video study. The instrument is composed of 11 questions assessing factual knowledge of the disaster plan and three questions assessing participant perceptions of their personal preparedness to play a role in the disaster plan. The survey questions include generic principles and international standards for disaster management, as well as knowledge specific to the hospital and local resources. The registrars were drawn from the specialties of emergency, anesthesia, intensive care, general medical, general surgical, and orthopedic medicine on the premise that these disciplines hold the greatest probability of future involvement in a disaster-management situation. A total of 39 registrars completed the survey, which was conducted 2 weeks after they viewed the video.

The instructional video shown to participants of the Bartley et al. (2007) study effectively boosted the factual knowledge of the sample in terms of the hospital disaster plan. Their response to the self-assessment questions indicated that the video successfully stimulated independent thinking and discussion on disaster planning. Bartley et al. noted that few participants earned passing scores on the pretest survey. Senior nursing and medical staff exhibited a low level of knowledge on the disaster plan prior to their training. The brevity of the video provided ease of use as an instructional tool; however,

Bartley et al. acknowledged the difficulty of compressing all pertinent details into the 15-minute format. Nevertheless, the video engaged participants with limited time and the group-viewing format successfully prompted ideas and discussion.

Summerhill et al. (2008) deemed it essential to incorporate biodefense and disaster preparedness into the educational programs of all medical specialties. These researchers reported that, apart from emergency medicine, few programs include training in these areas. Yet, in the event of a bioterrorist attack or natural disaster, patients are likely to present in various medical settings, not solely the ED. Concurring with Weller et al. (2007), Summerhill et al. view high-fidelity human simulation to be an excellent tool for preparing health professionals for emergency situations. Their specific focus was the development of a disaster-preparedness training curriculum to be integrated into internal-medicine education. The pilot study was conducted with all 30 residents attending the internal-medicine residency program at the Memorial Hospital of Rhode Island and Warren Alpert Medical School of Brown University. Ten participants from each of the three years of postgraduate training. A group of 30 residents from the same program who were never exposed to the disaster-preparedness curriculum served as a control group. The participants were retested 1-year post-training.

The disaster-preparedness curriculum was composed of four 1-hour didactic sessions accompanied by a manual and three real-time clinical simulations (Summerhill et al., 2008). The lectures and manual covered the following six topics: (a) general risk assessment; (b) specific threats including naturally occurring infectious diseases and biological, chemical, and radiological attacks; (c) indications for, and proper use of,

personal protective equipment; (d) public-health infrastructure and reporting protocols; (e) the role of physicians in a public-health emergency; and (f) the psychological effects of disasters. For the 4-hour simulation training, Summerhill et al. (2008) developed the disaster-preparedness curriculum for their pilot study with scripts depicting three scenarios—a case of smallpox, inhalational tularemia, and exposure to the toxic chemical agent known as sarin.

In all three scenarios presented by Summerhill et al. (2008), the participants were expected to recognize the signs and symptoms, make appropriate diagnoses, and perform proper procedures. Communication and teamwork skills were practiced and assessed in all three simulations. All the residents were active participants in one scenario and observed the other two simulations through a one-way mirror. All were given instructions and "hands-on" training on personal protective equipment and decontamination procedures. All the training sessions were videotaped and followed by a debriefing session led by a faculty member. Review of the taped sessions included constructive feedback and subjective appraisals.

A total of 22 participants in the Summerhill et al. (2008) pilot study completed an objective test immediately following the course and 25 completed the 1-year follow-up test. The course participants significantly outperformed the control group on objective knowledge at the end of the course, with test scores of 66.8% and 50%, respectively. One year after the course, however, the mean score of the participants dropped to 55.7%, which was not significantly higher than the control group. Concurrently, the control group demonstrated a nonsignificant increase in knowledge based upon their

postgraduate year. With respect to the simulations, however, the course participants demonstrated significant improvements in the specific topics addressed by the course. They also reported improvements in their teamwork skills and their confidence in carrying out critical-care activities and procedures. Summerhill et al. noted that the residents had extremely favorable perceptions of the disaster-preparedness course. These researchers strongly recommended active learning strategies and high-fidelity human simulation for teaching disaster preparedness.

Well-defined emergency-preparedness systems may have a significant impact on the success of an incident response. Standardization has long been a focus of systems such as the National Incident Management System, which is an approach to a multiagency coordinated response during a disaster. Along the same pattern, and more specific to hospitals, is the internationally recognized HICS, which evolved from a multiagency emergency-management plan known as the Incident Command System. This System was devised by the Firefighting Resources of California Organized for Potential Emergencies and has become widely accepted as the hallmark of hospital-incident management systems. Although the system has been adopted by many U.S. hospitals, minimal research exists on implementation and success of the model specifically.

Schoenthal (2015) conducted a case study focused on identifying the components of a successful HICS implementation. Three hospitals within Palo Alto, California participated in the study. Schoenthal reported that the participating hospitals had a mature, well-practiced HICS. The article cited an average of 29.6 HICS activations per year over the preceding 5 years, which were reviewed to identify common factors. An

extensive review of the after-action reports from a major activation following the crash of the airliner Asiana was subsequently conducted. The success factors were compared with the identified factors and revealed that the presence of a fully supported system, with planning, training, and exercises that coordinate with those of community partners, supported the hypothesis. This conclusion was reached because the previously identified factors led to a successful response to a significant incident.

Public Policy Expectations

The largest challenge in expanding surge capacity is the development of altered standards of care. The IOM (2006) Committee on Guidance for Establishing Standards of Care for use in Disaster Situations was charged with the task of developing guidelines for assisting state and local public-health departments and healthcare organizations in establishing and implementing standards of care in disaster-response situations with scarce resources (Altevogt et al., 2009). The IOM is a branch of the National Academies of Sciences, Engineering, and Medicine that was commissioned by a Congressional Charter issued by President Lincoln in 1863. The Institute is responsible for providing the government, as well as the general public, with evidence by which they can base informed decisions on the provision of health care. The IOM emphasized that "ethical norms in medical care do not change during disasters—healthcare [*sic*] professionals are always obligated to provide the best care they reasonably can under given circumstances" (p. 2). The IOM Committee used the term *crisis standards of care* to denote the level of health and medical care that could pragmatically be delivered in response to a catastrophic event.

The IOM defined *crisis standards of care* as a substantial change in usual healthcare operations and the level of care it is possible to deliver, which is made necessary by a pervasive or catastrophic disaster (as cited in Altevogt et al., 2009, p. 3). This change in the level of care delivered is justified by specific circumstances and is formally declared by a state government, recognizing that crisis operations will be in effect for a sustained period. This formal declaration allows for legal and regulatory oversight and protections for healthcare workers in allocating and deploying scarce resources and adopting alternate care-facility operations. To ensure against a compromise in ethical standards, the components of crisis standards of care are fairness; equitable processes (i.e., encompassing transparency, consistency, proportionality, and accountability); community and provider engagement; education; communication; and the rule of law (i.e., the authority to empower needed and appropriate actions and interventions in responding to emergencies in order to promote implementation adhering to laws that support the standards and create suitable incentives). The committee calls upon the states to devise and implement consistent crisis standards-of-care protocols within the state and in partnership with bordering states, as well as in collaboration with public- and private-sector partners.

Theoretical Foundation

Kingdon (2011) advanced that the structure of American political institutions generally works to encourage a fragmented approach toward governance. This is a phenomenon that is truly unique to the United States, as espoused by Kingdon. The healthcare industry, while not a form of national government, is unique in that it is

governed by certain foundational principles. The theoretical framework for the current study draws upon the Kingdon research to analyze the problem of deficient ED preparedness, arrive at solutions, and subsequently restructure the entire governance of hospitals to implement the solutions. The Kingdon study was therefore reviewed with a focus on the policy and politics surrounding the effective management of EDs and their ability to improve their preparedness for incidents of mass disaster.

In the first decade of the 21st century, a succession of events, including terrorist attacks, natural disasters, threats of pandemic influenza, and extreme temperatures, drew attention to the need for improvement in healthcare emergency and disaster preparedness. Following a quantitative study on emergency preparedness, the IOM (2006) strongly criticized the public-health infrastructure on numerous related measures. These measures included reliance on outmoded systems, technologies, and procedures; insufficient training of public-health personnel; absence of real-time surveillance and epidemiological systems; fragmented and inefficient communication networks; inadequate domestic preparedness and emergency-response capabilities; and communities lacking access to vital public-health services (CDC & Prevention, 2008).

The described problems escalated over time before gaining mass public attention due to the crises generated during the summer of 2005 by Hurricane Katrina and, subsequently, Hurricane Rita. The JCAHO (2006b) noted that these natural disasters demonstrated that preparedness at the state and local levels is critical to a successful response in the immediate aftermath (i.e., 12–48 hours) of such disaster scenarios. The ongoing need for preparedness was again emphasized by the devastation of Hurricane

Sandy. The potential for an influenza epidemic also prompted initiatives to expand and enhance the emergency-response capacity of public health, first response, and community agencies (Bascetta, 2010; CDC & Prevention, 2008; Hoffman & Nannini, 2008; Levy, 2009; Phillips & Worthington, 2009; Rust et al., 2009). Epidemic preparedness returned to the forefront when the first Ebola patient presented within the United States and the country was found woefully unprepared.

The events of terrorism and natural disasters since 2001 have increased awareness among the American public of these ongoing threats and the consequent need for a strong and cohesive emergency-health architecture (Katz & Levi, 2008). The U.S. DHS (2008) created a national-response framework to guide the development of a national all-hazards emergency-response system. Section #8 of the response framework covers public health and medical services. Under the Pandemic and All Hazards Preparedness Act of 2006, the states are responsible for the creation and integration of emergency-preparedness plans that are coordinated with regional and local jurisdictions (as cited in Bascetta, 2010). The secretary of the U.S. DHHS is the lead official for all public-health and medical emergency-response efforts, and the U.S. DHS and U.S. DHHS are charged with joint responsibility for supporting these efforts. Further assistance is to be provided by the Department of Defense and the Department of Veterans Affairs including coordination between civilian and military hospitals in response to a mass emergency.

Despite elaborate policy plans, a clear dichotomy exists between federal mandates for community disaster/emergency preparedness and federal funding for such efforts at the national, regional, and local levels (Cherry & Trainer, 2008). Hospitals vary

considerably in the extent they are prepared to handle emergency situations (Braun et al., 2006). In general, urban hospitals (i.e., those with prior disaster-management experience) have a greater degree of preparedness. Rural hospitals suffer from staff and resource shortages, and small and midsized hospitals often have no specific emergency-management personnel or related budgets in place (*Is the Medical Community Ready,* 2010). Exacerbating the problem, many rural areas do not have county police, fire, nor EMS and are thus highly dependent upon volunteers to carry out emergency-response activities.

The U.S. Government Accountability Office (as cited in Bascetta, 2010) determined that, to respond to a mass-casualty event, healthcare systems need surge capability (i.e., the ability to provide adequate care for large numbers of patients with atypical or uniquely specialized medical needs). The provision of this type of care demands scarce resources and is administered in venues such as surge hospitals or other conventional medical settings. After conducting literature reviews and interviews with experts and professional associations, investigators of the U.S. Government Accountability Office targeted the following four essential components of emergency preparedness in the face of a mass-casualty event (as cited in Bascetta, 2010):

1. Expanding hospital capacity including beds, workforce, supplies, and equipment.
2. Locating and operating alternate sites for the provision of medical care.
3. Registering and credentialing volunteer medical professionals.

4. Planning alternate standards of care with the goal of saving as many lives as possible.

The U.S. Government Accountability Office (as cited in Bascetta, 2010) investigated the extent of emergency preparedness within 20 states and found that most of the states demonstrated substantial progress on the first three essential components of emergency preparedness; however, only seven states had any plans in place for alternate standards of care in the event of mass casualties. All 20 states were in the process of establishing bed-reporting systems and most were working with military and Veterans Administration hospitals to extend hospital capacity. Eighteen of the states were locating alternate care facilities and 15 were creating registries of medical volunteers. State officials disclosed a number of challenges involved in addressing the four components of emergency preparedness. In this current literature review, I examine issues related to expanding hospital emergency and disaster preparedness. The review is presented in a manner that corresponds with the Kingdon (2011) theory of policy development, which consists of three independent streams—problems, politics, and policy. Related problems are outlined with an initial historical background of hospital emergency preparedness and subsequent discussion regarding the state of emergency medicine and ED overcrowding.

The Kingdon (2011) theory contends that the policy process moves in phases. Progression moves from the initial focus on the problems to the political stream. This is the process where the potential policy is defined as a worthy target for improvement or resolution. In the case of emergency-preparedness policy, this process tends to follow an event or disaster, with progression to decision-making processes where various ideas and

possible problem resolutions are explored and tested for viability. Recommendations are discussed within various forums and accepted or rejected based upon anticipated stakeholder response. At any point in the process, a potential policy may stall for numerous reasons such as funding, competing priorities, or loss of interest.

Summary and Conclusions

Traditional emergency-response protocols are focused on the capacity of individual hospitals. Recognition of the need for a comprehensive, nationwide emergency-response system grew during the 1990s. However, it was not until a succession of natural and intentional mass-casualty events—most notably, the terrorist attacks of 9/11 and Hurricane Katrina—that efforts to create an emergency-response infrastructure with federal support for state, regional, and local initiatives were generated (Bascetta., 2010; Toner et al., 2009). The ACEP (2006, 2009) revealed tremendous variation in the emergency preparedness of independent states, and the United States overall barely earned a passing grade. Hospital data drawn by the AHA (2010) indicate that the EDs of approximately one half of all urban hospitals are strained to capacity. Concurrently, large urban hospitals are better prepared than small, rural medical facilities for surge capacity (Braun et al., 2006). A series of reports show wide variation in preparedness, regardless of whether the unit of analysis is the individual hospital or the community, region, or state (ACEP, 2006, 2009).

The prevalence of Delphi studies by researchers who called upon expert panels to identify competencies for emergency preparedness or devise relevant questionnaire items highlight the relative novelty of the topic of disaster/emergency preparedness. The ACEP

(2009) contributed to this volume of research. Innovative approaches were explored such as the use of simulation (Arboleda et al., 2007; Summerhill et al., 2008); using shuttered hospitals as surge facilities (Zane et al., 2008); and the development of a risk classification for early patient discharge from hospitals (Kelen et al., 2006). Despite these research efforts, significant gaps exist between the rhetoric of emergency preparedness and the extent to which healthcare facilities and state and community agencies are actually prepared for a disaster event.

Katz and Levi (2008) argued that emergency preparedness should be an integral element of the discourse on healthcare reform. In this intense and heated debate, emergency preparedness has been eclipsed by issues to which the public have an emotional attachment such as costs, insurance, and Medicare ironically, the same issues that dominated health care when Kingdon (1995) conducted his original study. It is possible that the policy window for moving emergency preparedness to the forefront has closed with the lapse of time since Hurricane Katrina. On the other hand, emergency preparedness spans two important issues—healthcare reform and national security which provides leverage to supporters working to generate attention and action. The design of the current study is described along with the research methodology. The origin and characteristics of the data-collection tool are provided. As is the rationale behind the study population and sample size. The planned methods for collecting, organizing, and analyzing data are described.

Chapter 3 provides an overview of the methods applied in the research. The study design, instrumentation, target and sample population, sampling procedures, and data-

collection and data-analysis procedures are described in detail. The data collected are analyzed with the goal of providing a clearer understanding of the requirements and current state of hospital-emergency preparedness, as well as to increase recognition of the challenges encountered by U.S. hospitals as they work to sustain preparedness.

Chapter 3: Research Method

Overview

The purpose of the current quantitative research was to examine the gap between effective hospital emergency preparedness and the related awareness and perceptions of healthcare providers. Toward this end, I examined emergency-preparedness policy, expectations, and availability; the adequacy of facilities and resources including education and training; and perceptions of emergency risk. The hypotheses formed for each of the three research questions assisted in explaining whether regional hospitals, such as the acute-care institutions within the state of Tennessee, meet the requirements or standards of emergency preparedness. The findings revealed how widely such preparedness varies among hospitals, as does the level of core-provider awareness of expectations surrounding emergency preparedness.

Research Questions and Hypotheses

The following research questions and corresponding hypotheses guided this study:

1. How do perceptions of resource, training, and budgetary problems relate to the emergency preparedness of EDs across the state of Tennessee?

   Null Hypothesis 1 states that hospital EDs within the state of Tennessee are not prepared to manage mass disaster incidents. Alternative Hypothesis 1 states that hospital EDs within the state of Tennessee are prepared to manage mass disaster incidents.

2. How do perceptions of federal, state, and hospital policy and plans relate to the emergency preparedness of EDs across the state of Tennessee?

   Null Hypothesis 2 states that first-line ED managers do not possess sufficient knowledge and awareness of emergency preparedness and related public-policy expectations. Alternative Hypothesis 2 states that first-line ED managers possess sufficient knowledge and awareness of emergency preparedness and related public-policy expectations.

3. How do perceptions of external and internal organizational politics relate to the emergency preparedness of EDs across the state of Tennessee?

   Null Hypothesis 3 states that first-line ED care providers do not have positive perceptions of the available resources, capabilities, and training within their hospitals to manage a mass disaster. Alternative Hypothesis 3 states that first-line ED care providers have positive perceptions of the available resources, capabilities, and training within their hospitals to manage a mass disaster.

The research questions were answered using a quantitative approach. Quantitative methodology was the most beneficial for this study because the data compared were finite and represented information and specific factors related to emergency preparedness including, but not limited to, the understanding of requirements, resource availability, and training adequacy. A published questionnaire was used as the foundation for creating the survey tool. The instrument facilitated access to quantitative data related to the actual preparedness and awareness of the national response framework. Additional closed-ended questions resulted in a clearer understanding of the perceptions

of care providers in terms of emergency preparedness (see Appendix A).

The dependent variable in the current study was emergency preparedness. The first independent variables comprised the problems stream in relation to the application of Kingdon's theoretical framework (2003) and refer to resources, training, infrastructure, and budget, as well as recent mass-casualty events. The second independent variable was the policy stream, which relates to knowledge of federal policy, state, and local policy; the development of hospital policy; and the availability of disaster plans. The third independent variable was the politics stream, which refers to media relations, notable leadership actions, and recent mass-casualty events. Another independent variable was hospital location, in terms of urban, suburban, or rural, in order to further define the participating medical facilities. The research was cross-cultural in nature through the selection of multiple hospitals within various geographical areas.

Research Design and Rationale

As noted earlier, the approach for this study was based upon a quantitative model. A cross-sectional, nonexperimental research design facilitated the examination of emergency preparedness within multiple acute-care hospitals across the state of Tennessee. This design is a snapshot of outcome and response as well as of exposed predictor variables among a population. Data collection was effectuated via an online questionnaire using industry-recognized technology. The survey instrument was composed of 73 closed-ended questions intended to gather data on variables pertaining to emergency preparedness. Emergency preparedness, as the outcome, was assessed at different levels of exposure, including perception, training, education, resources, and

facilities (see Appendix A). This design was efficient, given that follow-up is unnecessary in the assessment and causality was not assumed (see Holmes, 2009).

The primary components of quantitative research provide a focused perspective related to each theme at the foundation of the respective study. In the current research, the data collected reflected the means by which participants perceived certain actions of, and attitudes toward, hospital preparedness. A cross-sectional design, also termed *survey design,* is commonly used in behavioral-sciences study when data are collected at a single point in time from a representative subset of a larger population (Babbie, 2007; Fowler, 2009). A survey method is effective in describing and establishing a relationship between the variables at the time a survey is administered (Babbie, 2007).

The benefit of using a cross-sectional design is that it allows the development of pertinent information without a prolonged collection period. This was the aim in the current study, accomplished by establishing a relationship between awareness of preparedness expectations, actual levels of preparedness, and provider perceptions. With this goal, a cross-sectional design with a self-administered online survey was indicated. Self-administered surveys are now commonly completed online because they generally result in an increased rate of participation due to the decreased burden of time placed upon respondents. Cost is a primary consideration and online surveys minimize researcher expense while increasing the likelihood of a sufficient rate of participation.

Generalization of the results in this study to the targeted population, namely, EDs in the United States, was a consideration. Validity was established with a homogeneous group. The characteristics of the expected study group in this research (i.e., ED managers

within hospitals across the state of Tennessee) vary little from ED managers within other regions of the United States. Knowledge, response capabilities, and ED operations run parallel.

Setting and Sample

Criteria for participation in the current study included affiliation with an acute-care hospital. This description fit approximately 4,000 hospitals within the United States (ACEP, 2002), which would have resulted in a prohibitive sample size due to time and cost restrictions. Consequently, and to avoid a sampling error, the sample frame for the study was a representative subset of the target population, which consisted of ED managers of all acute-care hospitals within the state of Tennessee (see McNabb, 2002). A list of potential hospital participants was derived from the *Tennessee Hospital Guide* (2016). As noted earlier, participants were employed as hospital ED managers or directors for a minimum of 1 year at the onset of the study and had a fluent command of the English language. ED managers of all acute-care hospitals within the state of Tennessee were asked to participate in the research.

A questionnaire was e-mailed to potential participants, which tends to have a lower response rate than surveys administered on a one-on-one basis (see McNabb, 2002). Due to the statistically poor response rate, the targeted sample size for this study was adjusted for a 25% attrition rate, implying a response rate of 75%. By adjusting for this attrition, the response rate was expected to provide adequate power to support the needed rigor. With a sufficient sample size, the data were expected to reveal common

themes, enabling me to either prove or disprove the study hypotheses (see Leedy & Ormond, 2010).

Determining the appropriate sample sizes and power estimations for survey studies with cross-sectional, nonexperimental research designs presents many challenges, particularly when the condition is very rare or is influenced by geographic clustering. Estimates of sample size with prevalence or cross-sectional studies is a function of expected prevalence and precision for a given level of confidence, which is indicated by the *z* statistic. Consequently, selection of the appropriate values for these variables is not always straightforward, but rather, based upon assumptions including effect size (i.e., delta), standard deviation, statistical power, and Type I error tolerance as sampling variability (i.e., random error).

With a simple linear regression model in testing the hypotheses on disaster preparedness and problems, policy, and politics, the following parameters were used: (a) Type I error tolerance of 1% (99% confidence interval [CI]), rejecting a true null hypothesis; (b) statistical power of 80.7% (1-beta)—the Type II error tolerance—implying failure to reject a true null hypothesis; and (c) effect size of 0.2% (20%; sample size of 42). To determine the adequate sample size in assessing the difference in the *t* value and *F* variance in the multiple regression model, the following parameters were used: (a) Type I error tolerance of 1% (99% CI), rejecting a true null hypothesis; (b) statistical power of 80% (1-beta)—the Type II error tolerance—implying the failure to reject a true null hypothesis; and (c) effect size of 0.2 (20%; a sample size of 59). Situations exist wherein these assumptions are not met, presenting specific challenges

with respect to external validity or generalizability of the study findings. These situations include, but are not limited to, smaller population sizes in relation to the sample sizes, sampling technique, or missing data. In this research, the estimated sample size was based upon the study hypotheses derived from the research questions.

Research Question 1 was as follows: How do perceptions of resource, training, and budgetary problems relate to the emergency preparedness of EDs across the state of Tennessee? Null Hypothesis 1 stated that hospital EDs within the State of Tennessee are not prepared to manage mass disaster incidents. Alternative Hypothesis 1 stated that hospital EDs within the State of Tennessee are prepared to manage mass disaster incidents.

To determine adequate sample size, the hypotheses correlating to Research Question 1 were tested, and the effect size was 0.2 (20%), Type I error tolerance was 1%, and Type II error tolerance was 0.20, which collectively imply 80% power. With these parameters, coupled with a response rate of 75% (i.e., a 25% attrition or nonresponse rate), the sample size to determine a statistically significant difference in knowledge surrounding disaster preparedness, if such knowledge existed among the respondents, was 108 participants (see Figure 1). However, assuming a delta of 0.2 (20%) with the same attrition rate (25%), the sample size required to determine the difference in knowledge of disaster preparedness among the study sample of the study, with a Wald Test comparing one proportion to a reference value, was 59 participants (see Figure 2). Research Question 2 was as follows: How do perceptions of federal, state, and hospital policy and plans relate to the emergency preparedness of EDs across the state of

Tennessee? Null Hypothesis 2 stated that first-line ED managers do not possess sufficient knowledge and awareness of emergency preparedness and related public-policy expectations. Alternative Hypothesis 2 stated that first-line ED managers possess sufficient knowledge and awareness of emergency preparedness and related public-policy expectations.

Power 1 proportion 0.50-0.65, test (Wald) continuity

Performing iteration

Estimated sample size for a one-sample proportion test

Wald *z* test

H_0: $p = p0$ versus Ha: $p! = p0$

Study parameters:

alpha = .0500

power = 0.8000

delta = 0.1500

$p0$ = 0.5000

pa = 0.6500

Estimated sample size:

N = 86

Disp 0.25*86

21.5

Figure 1. Illustration of sample-size estimation. Estimate found by comparing one proportion to the reference value found with a Wald test (i.e., effect size: δ = 0.15). While the estimated sample size utilized individual ID effect size of 0.15, the multivariable model with three IDs compensated for multiple comparison with an additional sample of 22 participants.

Estimated sample size for a one-sample proportion test

Wald *z* test

H_0: $p = p0$ versus Ha: $p != p0$

Study parameters:

alpha = .0500

power = 0.8000

delta = 0.2000

$p0$ = 0.5000

pa = 0.7000

Estimated sample size:

N = 47

Disp 0.25*47

11.75

Figure 2. Illustration of sample-size estimation. The sample size estimation is illustrated by comparing one proportion to the reference value found with a Wald test (i.e., effect size δ: = 0.20).

To determine adequate sample size, the independent variables, namely problem, policy, and politics related to disaster/emergency preparedness and the dependent variable mainly disaster and emergency preparedness were assessed the effect size was 0.2 (20%), Type I error tolerance was 1%, and Type II error tolerance was 0.20, which collectively imply 80% power. With these parameters, coupled with a response rate of 75% (i.e., a 25% attrition or nonresponse rate), the sample size to determine a statistically significant difference in knowledge surrounding disaster preparedness, if such knowledge existed among the respondents, is 108 participants (see Figure 1). However, assuming a delta of 0.15 (15%) with the same attrition rate (25%), the sample size required to determine the difference in knowledge of disaster preparedness among the study sample of the proposed research, with a Wald Test comparing one proportion to a reference value, was 59 participants (see Figure 2). Since the overall assessment involved multiple in the multivariable linear regression model with the three IVs, the attrition rate compensation of 12 participants was applied to the sample size, implying n=47+12=59.

Research Question 3 asked, “How do perceptions of external and internal organizational politics relate to the emergency preparedness of EDs across the state of Tennessee?” Null Hypothesis 3 stated that first-line ED care providers do not have positive perceptions of the available resources, capabilities, and training within their hospitals to manage a mass disaster. Alternative Hypothesis 3 stated that first-line ED care providers have positive perceptions of the available resources, capabilities, and training within their hospitals to manage a mass disaster.

To determine adequate sample size, the hypotheses correlating to Research

Question 3 were tested; the effect size was 0.2 (20%), Type I error tolerance was 1%, and Type II error tolerance was 0.20, which collectively imply 80% power. With these parameters, coupled with a response rate of 75% (i.e., a 25% attrition or nonresponse rate), the sample size to determine a statistically significant difference in knowledge surrounding disaster preparedness, if such knowledge exists among the respondents, is 108 participants (see Figure 1). However, assuming a delta of 0.15 (15%) with the same attrition rate (25%), the sample size required to determine the difference in knowledge of disaster preparedness among the study sample of the proposed research, with a Wald Test comparing one proportion to a reference value, is 59 participants (see Figure 2).

Instrumentation

The Disaster Preparedness: Acute Care Hospital Survey administered in the current study was adapted to fit the particular scope of the research. Permission was granted directly from the author of the original tool (Kaji, Langford, & Lewis, 2008; see Appendix B). Survey items related to perceptions of emergency preparedness were pretested following development. The instrument is composed of 73 questions, each of which was formulated to correlate with a research question and presented with a Likert-type scale allowing respondents to select their nearest answers (see Table 1 & Appendix A). An estimated 66% of the questions in the original survey had been validated. Items related to perception were developed to complement prevalidated questions on other aspects of the survey. The majority of the variables in the current study will be measured on a nominal scale with a range of 1 to 10.

Data Collection

Upon acceptance of the proposal for this study and permission from the Walden University Dissertation Committee, an e-mail was sent to introduce me as the researcher to the primary contacts within the selected hospitals. These contacts are the Chief Nursing Officers of the organizations. The e-mail included a request that the surveys and related survey participation information be forwarded to all ED nurse managers or ED nurse leaders within their organizations. The list of acute-care hospitals was obtained from the *Tennessee Hospital Guide* (2016). The cover letter of the e-mailed packet also described the purpose of the study, estimated time to complete study (30-minutes), and a consent form was included. A link was provided to the online survey.

Table 1

Alignment Between Research Questions and Survey Questions

Variable type	Variables	Survey questions	Research question(s)
Dependent variable: Emergency preparedness	Resource assessment	12	1, 2, 3
	Training assessment	13	
	Infrastructure assessment	18	
	Budget assessment	30, 32	
Independent variable: Problems stream	Resources	6, 8, 10, 11, 15, 16, 20, 22, 24, 27, 34, 37, 38, 39, 42, 43, 44, 46, 47, 48, 49, 51, 52, 53, 54, 55, 57, 61, 66, 67, 68, 69	1
	Training	4, 28, 40, 41, 56	1
	Infrastructure	23, 30, 58, 59, 60, 64, 65	1
	Budget	45, 46	1
Independent variable: Policy stream	Knowledge of federal policy	5, 26	2
	Knowledge of state and local policy	17	2
	Development of hospital policy	9	2
	Plans available	19, 21, 25, 29, 31, 35, 63	2
Independent variable: Politics stream (Kingdon, 2011)	Influence of events	50	3
	Media relations	23	3
	Notable leadership actions	62	3
	Recent mass-casualty event	70	3

Mailed surveys can result in a particularly low response rate (Dillman, Smyth, & Christian, 2009). In this study, to increase the rate of response, a strategic set of reminders were distributed. Three weeks following the initial e-mail, a second distribution of the survey was sent to the primary contacts expressing thanks for those who had already submitted the surveys and requesting completion from those yet to submit the instrument. This second mailing included a brief, friendly cover letter again requesting participation and return of the survey and repeating the link to the online survey. The data-collection phase of the study was terminated 2 weeks following this second mailing.

In the preliminary questionnaire, Survey Questions 18, 29, 30, 36, 47, and 48 addressed the dependent variable of disaster preparedness. The independent variables of problems, policy, and politics were also represented within the survey questions. Questions 45, 55, 56, 64, and 65 relate to the independent variable of problems. Questions 19, 60, 63, and 26 relate to the independent variable of policy, while Survey Questions 26, 50, and 62 address the independent variable of politics.

To control for potential discrete or categorical variable, this model was applicable: Disaster preparedness = Constant (β_0) + β_1 (problem) + β_2 (policy) + β_3(politics) + β_4 (sex) + β_5(age) + β_6(education) + β_7 (Healthcare system location) + error. However, if the main independent variable remained insignificant, it was not included in the final model as applicable to problem related to disaster and emergency preparedness as a predictor of disaster and emergency preparedness.

Data Analysis

The primary purpose of the statistical analysis is to quantify variation in the research data, which may derive from a natural phenomenon (i.e., biologic and social variability) or measurement or observation error. This process commences with descriptive statistics, termed *exploratory analysis* or *summary statistics*, and terminates with inferential statistics, implying estimation, a Confidence Interval (CI) method, and hypothesis testing. The basic rationale for hypothesis testing with either a critical or *p* value method is to generalize the findings from the sample data (i.e., statistics) to the target population (i.e., the parameter). In effect, the inferential statistics with hypothesis testing utilizes the null and alternative hypotheses in the process of inference. The *p* value is used as evidence against the null hypothesis, given the preset Type I error tolerance level, usually .05 (5%) in univariable mode, or the Bonferroni method for multiple comparison, as well as a .01 (1%) Type 1 error tolerance multivariable analysis or model (Holmes & Opara, 2014; McNabb, 2002).

Descriptive Statistics

The survey responses in this research were analyzed with a qualitative scale of response measurement, implying dichotomous questions for gender (A = Male, B = Female), and categorical questions for age-group (A = 21–30, B = 31–40, C = 41–50, D = 51–60, E = 61–70). Additionally, a Likert/ordinal scale (A = strongly disagree, B = disagree, C = neutral, D = agree, E = strongly agree) and a binary scale (A = yes, B = no) was used to measure knowledge of organizational policy and disaster preparedness. Because none of the variables in the survey instrument were measured on a quantitative

scale, the data in this study do not assume the shape and dispersion in the probability distribution. Consequently, frequency and percentages as proportion were used to describe or summarize the data (Holmes & Opara, 2014). With this exploratory analysis, the inferential statistics that fit these data did not assume normality or equality of variance, as required in parametric testing, but will be based on *z* distribution (i.e., test of proportion), as an approximation of a standard normal curve (i.e., the standardized normal).

Inferential Statistics

Hypothesis testing. There is no assumption of linearity or linear relationship between the response and independent variables of this study. The relationship, independence, or association between the intendent and response variables were examined using the chi-square statistic, comparing the observed to the expected frequency counts or coefficient matrix that assumes linearity and normality, depending upon the test.

Correlation coefficient and chi-square. The correlation-coefficient analysis was used to assess the relationship between the independent variable statistics (McNabb, 2002). Because there was no normality assumption, the Spearman correlation-coefficient analysis, which is a nonparametric model, was used. This analysis generates the correlation-covariance matrix for the Spearman Rho and the significance level, adjusting multiple comparisons with the Bonferroni correction (Holmes & Opara, 2014).

The Spearman correlation coefficient is comparable to the parametric model of Pearson, where the null hypothesis is the correlation coefficient $r = 0.0$, implying there is

no correlation between the independent and dependent variables in the coefficient matrix. The null hypothesis is rejected if p is < .05, implying strong evidence against this hypothesis. A correlation of 0.1–0.3, 0.4–0.7, and 0.8–1.0 is indicative of a direct and positive mild, moderate, and strong correlation, respectively. A moderate correlation such as 0.5 is indicative of collinearity and suggests removal of such independent variables from the model for regression (Field, 2009).

Chi-square statistics, although not necessarily required, are used to examine the association or independence between the dependent and independent variables in the described context, and validation was performed through Spearman correlation-coefficient analysis. The chi-square model generates the chi-square value, the degree of freedom, and the probability value for statistically significant independence. Relative to the Spearman correlation coefficient, the higher the chi-square value, the lower the p value and likelihood of a statistically significant independence (Holmes & Opara, 2014).

Linear regression (simple and multiple) model. A linear regression model was used to examine the relationship or association between disaster/emergency preparedness as a dependent variable (Y), policy expectations (x1), knowledge of disaster-management policy and plans (x2), organizational policy (x3), and major adverse/traumatic events (x4). Simply, these models assessed whether or not problem related to emergency or disaster preparedness, policy and politics could be used to predict disaster or emergency preparedness in a healthcare system setting. These models are adequate given that the dependent variable of disaster preparedness is measured on a continuous scale while the independent variables are measured on mixed scales; namely, continuous ordinal, binary,

dichotomous, and categorical (Holmes & Opara, 2014). The linear regression for disaster preparedness is β0 + β1(problem) + β2(policy) + β3(politics).

The aim of applying this multivariable model was to allow simultaneous examination of the four predictor variables, controlling for age, gender, ED-manager experience, type of hospital (i.e., private or public), and geographic locale (i.e., county, city, rural, urban, or metropolitan; Babbie, 2007). This allowed for an adjusted association through noncausal assessment (i.e., cross-sectional design) of the state of emergency preparedness within EDs across Tennessee. Therefore, due to the potential for confounding, the final model is Disaster Preparedness = β_0 + β_1(Problem) + β_2(policy) + β_3(Politics) + (confounding variables). Where β_0 is the constant, the intercept on the y axis and β1, β2, and β3 are the slopes representing problem, policy, and politics, respectively. These are the functions or exposure effects of disaster preparedness and balance or control for age, gender, and geographic locale (urban vs. rural). Since problem related to disaster preparedness as a predictor of disaster preparedness was not significant at the multivariable level analysis without confounding, this variable was excluded as a predictor of disaster preparedness in the final model that adjusted for the potential cofounding.

Confidence level. All tests were two-tailed with .05 (5%) as the significance level for univariable models or analyses. A 99% CI was used for the controlled or adjusted model (i.e., multivariable). STATA statistical software, Version 15.0, was employed for the entire analysis.

Validity and Reliability

Babbie (2007) contended that Web-based surveys have statistically significant results that are congruous with other survey methods. No unique challenges or limitations emerged in this current study to argue against this point. As noted earlier, the Disaster Preparedness: Acute Care Hospital Survey is a modified version of the Disaster Preparedness Survey developed by Kaji et al. (2008). With permission, the Kaji et al. instrument was modified by adding questions designed to gain respondent perspectives on the level of preparedness within their respective hospitals, as well as their awareness of public-policy expectations related to emergency preparedness (see Appendix B). The content of the original Kaji et al. survey items was minimally altered to fit Likert-type ranking and eliminate regionally specific terminology.

The target population of the current research runs parallel to that of the Kaji et al. study group. The majority of questions within the modified instrument relate to actuality or facts that were readily available to respondents within a clinical setting. Questions related to perceptions were presented with a Likert-type response scale. The consistency of questions within the survey instrument was measured via a Cronbach's-alpha test, which has been discussed in detail.

Ethical Procedures

The current research was conducted with strict observance to requirements of the Walden University Institutional Review Board. The approval number for this study is 01-02-18-0110078, which expires December 31, 2019. The ED nurse managers of all acute-care hospitals across the state of Tennessee were invited by e-mail to participate in the

study. The message included my contact information as the researcher and that of the dissertation chair and the Walden University Institutional Review Board. Survey participation was strictly voluntary. There was no disclosure risk of participant identification, which was assured within the recruitment letter. No individuals nor agencies involved in the study were identified. All precautions were taken to conduct the research in a moral and ethical manner, which included anonymity of all participants and their employing institutions. Any hard copies of the completed study surveys will be maintained for 5 years following publication of the research within a locked, fireproof box in my home. Upon conclusion of the 5-year period, the instruments will be destroyed by shredding or incineration.

Summary

The research design for this study has been described in detail, which is cross-sectional and nonexperimental in nature. The purpose of the research was to examine the gap between effective hospital emergency preparedness and the related awareness and perceptions of healthcare providers. A comprehensive, pretested, and piloted questionnaire facilitated data collection related to expectations (i.e., resources/facilities, education/training, and policy) and perceptions of risk. A quantitative method involving hypothesis testing was applied in the examination of emergency preparedness with respect to existing policy and its implementation, resources and facilities, education and training, and the perception of emergency-preparedness risk.

Chapter 4: Results

Overview

Researchers have suggested that disaster preparedness is a critical component to the ability of hospitals to successfully provide the safety net expected by the general public (Bechtel et al., 2004; Braun et al., 2006; Cherry & Trainer, 2008; Nissa & Shimizu, 2011). Hospitals, and particularly EDs, are expected to be at a constant state of readiness 24/7 to render care to victims of any type of hazard. Using commonly identified tenets of preparedness, I examined awareness of emergency-preparedness policy; expectations and availability; the adequacy of facilities, resources, education, and training; and perceptions of emergency risk. I explored these factors through quantitative measurement to gain knowledge surrounding the disaster preparedness of a sample representing ED nurse leaders (i.e., directors and managers) within the State of Tennessee. The purpose of this study was to examine the gap between effective hospital emergency preparedness and the related awareness and perceptions of healthcare providers.

Data were collected from ED nurse leaders to determine their awareness of disaster-preparedness expectations, levels of preparedness, and perceptions of preparedness. The following research questions guided this study:

1. How do perceptions of resource, training, and budgetary problems relate to the emergency preparedness of EDs across the state of Tennessee?
2. How do perceptions of federal, state, and hospital policy and plans relate to the emergency preparedness of EDs across the state of Tennessee?

3. How do perceptions of external and internal organizational politics relate to the emergency preparedness of EDs across the state of Tennessee?

The Disaster Preparedness: Acute Care Survey facilitated collection of data appropriate to answering the research questions.

The study survey was a web-based, self-administered tool. The instrument was employed to measure emergency preparedness, which was the dependent variable of this research. The first independent variables comprised the problems stream (i.e., resources, training, infrastructure, and budget), as well as recent mass-casualty events. Policy stream was the second independent variable and related to knowledge of federal policy as well as state and local development of hospital policy and the availability of disaster plans. The third independent variable was the politics stream, which addressed media relations, notable leadership actions, and recent mass-casualty events. Another independent variable was hospital location in terms of urban, suburban, or rural, which added another factor potentially influencing disaster preparedness.

The Disaster Preparedness: Acute Care Hospital Survey is a slightly modified version of the Disaster Preparedness Survey developed by Kaji et al. (2008) for Johns Hopkins under contract with the Agency for Healthcare Research and Quality. The author of the Disaster Preparedness Survey granted me permission to use the survey tool in this current study. The tool had been previously tested for reliability and was noted to have a high degree of internal reliability. Variability in the interrater reliability was also noted. Items related to perception were developed to complement the prevalidated questions on other aspects of the survey. Study participants were asked to answer questions pertaining

to their awareness of policy expectations for disaster preparedness as well as their perceptions on the level of preparedness they perceived within their organizations.

Data Demographics

The reported data reflect the survey results on hospital and overall healthcare-system disaster/emergency problems, as well as the policy and politics related to disaster/emergency preparedness within the state of Tennessee. The findings depict the study characteristics such as participant demographics; features of the healthcare or hospital system, including geographic locale; construct validity (i.e., Cronbach's alpha); the correlation coefficient; the simple linear prediction of disaster/emergency preparedness, given (a) the problems, (b) the policy, and (c) politics; and the multivariable prediction of disaster/emergency preparedness, adjusting for gender, age, education, and geographic locale of the healthcare or hospital system, as well as public-policy cognizance. Table 1 displays the characteristics of the survey participants, which concurrently portray a cross-sectional nonexperimental, epidemiologic study design aimed at assessing the predictive effects of disaster/emergency problems, policy, and politics, as they relate to disaster preparedness within the hospitals and overall healthcare systems of the state of Tennessee. The table specifically reports participant gender, age, education, disaster-preparedness experience, geographic locale (i.e., urban vs. rural), and access to disaster-preparedness resources.

Table 2 demonstrates the frequency and percentages of study participants by sociodemographic, namely, education, age, and gender. The overall sample is comprised of 51 participants, 27.4% of whom are male (n = 14, 95% CI, 16.7–41.7) and 72.5% of

whom are female (*n* = 51, 95% CI, 58.3–83.3). The age group distribution of the participants indicated the lowest frequencies for both the youngest respondents (21–30 years, *n* = 3, 5.9%) and the oldest (61–70 years, *n* = 6, 11.8%). The highest frequency was observed in the age group of 41 to 50 (*n* = 15, 29.4%, 95% CI, 18.3–43.7), followed by the 31 to 40 age group (*n* = 14, 27.4%, 95% CI, 16.7–41.7). The highest frequency of participants was found to be among those with a bachelor's degree (*n* = 24, 47.1%, 95% CI, 33.56–61.1), followed by a master's degree (*n* = 21, 41.2%, 95% CI, 28.2–55.5). The lowest response rate was observed among participants with doctorates (*n* = 2, 3.9%, 95% CI, 0.90–15.0).

Table 2

Characteristics of Survey Participants on Predictors of Disaster/Emergency Preparedness

Variable	Number of participants (n = 51)	Percentage of total	95% CI
Academic degree			
Associate	4	7.8	2.9–19.7
Bachelor's	24	47.1	33.5–61.1
Master's	21	41.2	28.2–55.5
Doctorate	2	3.9	0.9–15.0
Age-group			
21–30	3	5.9	1.8–17.3
31–40	14	27.4	16.7–41.7
41–50	15	29.4	18.2–43.7
51–60	13	25.5	15.1–39.6
> 60	6	11.8	5.2–15.0
Gender			
Male	14	27.5	16.7–41.7
Female	37	72.5	58.3–83.3

Note. The 95% CI indicates the 5% margin of error with the lower and upper confidence limits. CI = confidence interval.

Disaster Preparedness Training

With respect to knowledge of public policy related to emergency preparedness, an estimated 27 participants reported awareness (52.9%, 95% CI, 38.9–66.5). Table 3 presents the distribution of survey respondents by training, drill-practice frequency, and disaster-response participation. With regard to specific training in emergency preparedness, an estimated 38 participants reported acquiring such training from their affiliated institutions (74.5%, 95% CI, 61.6–84.9). Concerning drill or practice exercise with multiagency frequency, 31 respondents reported such participation on an annual basis (60.8%, 95% CI, 46.4–73.5). However, 12 respondents reported never participating in such drills (23.5%, 95% CI, 13.6–37.5). With respect to disaster-response

participation, 30 respondents reported such involvement (58.8%, 95% CI, 44.5–71.8), while 20 indicated no experience with disaster response (39.2%, 95% CI, 26.5–53.6).

Table 3

Characteristics of Survey Participants on Predictors of Policy Awareness Related to Disaster/Emergency Preparedness

Variable	Number of participants (n = 51)	Percentage of total	95% CI
Specific emergency training			
Yes	38	74.5	60.4–84.9
No	13	25.5	15.1–39.6
Knowledge of public policy			
Yes	27	52.9	38.9–66.5
No	24	47.1	33.5–61.1
Number of licensed hospital beds			
0–10	9	17.6	9.2–31.1
11–25	20	39.2	26.5–53.6
26–50	12	23.5	13.6–37.5
> 50	10	19.6	10.6–33.3
Hospital location			
Rural	24	47.1	33.5–61.1
Suburban	13	25.5	15.1–39.6
Urban	13	27.4	16.7–41.7

Note. The 95% CI indicates the 5% margin of error with the lower and upper confidence limits. CI = confidence interval.

Resources

Table 4 illustrates the survey results related to healthcare systems and hospital resources for disaster preparedness. Regarding the employment of an in-house radiation safety officer available during a radiological event, 18 participants affirmed the existence of this position within their affiliated institutions (35.3%, 95% CI, 23.1–49.7), while 23 reported no such position (45.1%, 95% CI, 31.2–59.7). Concerning the availability of

contamination showers or stalls within the hospital facilitates, 33 participants reported one to two stalls in their hospital facilities (64.1%, 95% CI, 50.3–76.9). The absence of negative-pressure rooms was reported by 16 (31.45%) of the participants, while 15 (29.4%) reported 1 to 10 negative-pressure rooms. The remaining 12 participants reported 11 to 20 negative-pressure rooms. With respect to the number of licensed hospital beds in the respondents' employing facilities, the majority of the participants (n = 20) reported the availability of 51 to 150 licensed beds (56.9%, 95% CI, 26.5–53.6). The balance of the sample reported 151 to 299 licensed beds (n = 12, 23.5%, 95% CI, 13.6–37.5).

Table 4

Survey Responses Related to Institutional Resources for Disaster/Emergency Preparedness

Variable	Number of participants (*n* = 51)	Percentage of total	95% CI
Negative-pressure isolation rooms			
None	16	31.4	19.9–45.7
1–10	15	29.4	18.2–43.7
11–20	12	23.5	13.6–37.5
21	6	11.8	5.2–24.3
Don't know	2	3.9	0.9–15.0
Employee assistance program			
Yes	50	98.0	86.6–99.7
No	–	–	–
Don't know	1	2.0	0.2–13.4
Mandatory disaster-preparedness education			
Yes	30	58.8	44.5–71.8
No	18	35.3	23.1–49.7
Don't know	3	5.9	2.0–17.3
Disaster-response participation			
Yes	30	58.8	44.4–71.8
No	20	39.2	26.5–53.6
Don't know	1	2.0	0.2–13.4
Patients treated during latest episode			
None	9	18.4	9.6–32.2
< 5	6	12.2	5.4–25.3
5–10	9	18.4	9.6–32.2
> 10	15	30.6	19.0–45.3
Don't know	10	20.4	11.1–41.7

Note. The 95% CI indicates the 5% margin of error with the lower and upper confidence limits. Dashes represent no data. CI = confidence interval.

Concerning the geographic locale of the hospitals employing the respondents, in terms of urban versus rural, and disaster preparedness, the majority of the study participants reported rural locations (*n* = 24, 47.1%, 33.5–61.1). Hospitals within suburban (25.5%, 95% CI, 15.1–39.6) and urban (27.4%, 95% CI, 16.9–41.7) areas were comparable. Regarding the contact numbers of the Tennessee State Health Department and the Local County Health Department, there was no difference in the number of participants acknowledging number availability; 25 affirmed the availability of the contact numbers (49.0%, 95% CI, 35.2–62.9) and 24 participants negated their availability (47.1%, 95% CI, 33.5–61.1).

Construct Validity of Variables

Tables C1 through C4 within Appendix C present the dependent variable of disaster/emergency preparedness with the independent variables of problems, policy, and politics, the latter of which are also predictors in the linear modeling. Survey responses related to the dependent variable of disaster preparedness and the three main independent variables were collected using a response scale of 1 to 10, which was later transformed into proportion using the central tendency theorem for variable scale transformation. Responses to six survey questions were combined to comprise the dependent-variable construct. Similarly, the independent variable, collectively comprised of the related problems, policy, and politics, follows a similar transformation and construct. These variables were tested for construct validity using the Cronbach's alpha.

Table C1 illustrates the number of items comprising the dependent variable, as well as the item test correlation; average interitem correlation (i.e., covariance); and the

alpha (See Appendix D). The test scale, which is the mean (i.e., the standardized item for the average interitem correlation) represents the covariance estimated at 0.67, while the alpha coefficient or Cronbach's alpha was 0.92, implying a strong correlation. Table C2 demonstrates the number of items comprising the disaster/emergency problems as the collective independent variable, as well as the item test correlation; the average interitem correlation (i.e., covariance); and the alpha. The test scale, which is the mean (i.e., the standardized item for the average interitem correlation) represents the covariance estimated at 0.80, while the alpha coefficient or Cronbach's alpha was 0.95, implying a strong or high correlation.

Table C3 depicts the number of items comprising disaster/emergency policy as the collective independent variable, as well as the item test correlation; the average interitem correlation (i.e., covariance); and the alpha. The test scale, which is the mean (i.e., the standardized item for the average interitem correlation) represents the covariance estimated at 0.76, while the alpha coefficient or Cronbach's alpha was 0.93, implying a strong correlation. Table C4 indicates the number of items collectively comprising the disaster/emergency politics as the independent variable, as well as the item test correlation; average interitem correlation (i.e., covariance); and alpha. The test scale, which is the mean (i.e., the standardized item for the average interitem correlation) represents the covariance estimated at 0.43, while the alpha coefficient or Cronbach's alpha was 0.69, implying a moderate correlation.

Correlation Between Disaster/Emergency Preparedness, Problems, Policy, and Politics

Table C5 illustrates a correlation matrix for the correlation between emergency preparedness and disaster independent or predictor variables. A direct, positive, and high or strong correlation exists between disaster/ emergency preparedness as the dependent variable and the independent variable of disaster/emergency-preparedness problems (r = 0.92, $p < .001$). Similarly, a direct, positive, and high correlation was observed between the dependent variable and the independent variable of disaster/emergency-preparedness policy (r = 0.94, $p < .001$). Additionally, a direct, positive, and high correlation was observed between the dependent variable and the independent variable of disaster/emergency-preparedness politics (r = 0.88, $p < .001$; see Appendix D, Table C5).

Multiple Linear Relationships

The multiple linear regression model examined simultaneously the three predictors or explanatory variables such as the problem, policy, and politics in predicting disaster/emergency preparedness. Confounding variables such as age, sex, education and geographic location of the healthcare or hospital settings are also shown. Table 5 presents the multiple linear regression results.

Table 5

Multiple Linear Predictors of Disaster/Emergency Preparedness in Tennessee Hospitals

Variables	β	*t*	*F(df)*	*SE*	aR^2	99% CI	*p*
Model	0.22		41.6(1,37)		0.91		< .001
Problems	0.20	1.34		0.15		–0.21–0.60	0.19
Policy	0.41	2.94		0.14		.03–0.79	.01
Politics	0.26	2.34		0.11		–0.41–0.56	.02
Gender							
Male	–	–		–		–	–
Female	–.09	–0.88		0.10		–0.37–.019	0.38
Age-group							
21–30	–	–		–		–	–
31–40	–0.22	–1.05		0.21		–0.81–0.36	0.30
41–50	–0.43	–1.85		0.23		–1.05–0.20	.07
51–60	–0.21	–1.00		0.22		–0.80–0.37	0.33
61–70	–0.43	–1.64		0.26		–1.15–0.28	0.11
Academic degree							
Associate	–	–		–		–	–
Bachelor's	0.33	1.71		0.19		–0.19–0.84	.09
Master's	0.46	2.27		0.20		–.09–1.01	.03
Doctorate	0.12	0.38		0.30		–0.71–0.94	0.70
Healthcare-system location							
Rural	–	–		–		–	–
Suburban	0.11	0.88		0.12		–0.23–0.44	.03
Urban	0.28	2.22		0.13		–.06–0.62	0.70

Note. Adjusted for categorical variables within the model; namely, education, gender, age, and hospital/healthcare system Tennessee location (i.e., urban, rural, or suburban). Dashed rows represent no data. β = beta coefficient; *t* = the predictor value indicative of the significance; *F* = the ratio between the variance; *df* = number of ways sample can vary; *SE* = standard error; aR^2 = adjusted coefficient of determination, implying the variation in disaster/emergency preparedness due to the combined effect of the continuous and categorical independent variables within the model; CI = confidence

interval; *p* = probability.

The R^2 of 0.91 shows that 91% of the variation in disaster/emergency preparedness is explained by the model. The overall multiple linear regression equation was then obtained using only the significant variables at $p < .05$:

Disaster and emergency preparedness (Y) = -0.22 + 0.26(politics) + 0.41(policy) + 0.46 (Masters) + 0.11 (Suburban) + E.

Basically, for 1 unit change or increase in politics, there was a 0.26 change in disaster preparedness, while for 1 unit change in policy, there was 0.41 change is disaster preparedness in the model while controlling for other significant confounding variables.

Model Fitness

The model fitness requires the test for residual besides the regression result such as slope coefficient, p-values and R^2. The model fitness requires the assessment of the residuals, implying the examination of how poorly the model utilized in the prediction of disaster /emergency preparedness by policy and politics represents these data. Basically, residuals represent the leftover of the disaster preparedness dependent variable after fitting policy and politics and controlling for the potential confounders in the data. Therefore, the residual explains or indicates the unexplained pattern in the fitted model. This fitness test enables the assessment of the liner regression assumption as well, such as normality assumption.

Figure 3, illustrates the standardized normality probability plot, implying sensitivity to non-normality the lower (tail) and upper end (tail) of the data, indicative of normality in the spread of the data. Figure 4 demonstrates the plots of the quantiles

dependent variables and independent variables (politics, policies) against quantiles of a normal distribution. Relative to figure 3, the standardized normality probability plot, the quantile plot is indicative of a slight deviation from normal at the lower and upper tail of the plot. In effect there seems to be a minor and trivial deviation from normality, implying that the observed residuals are close to a normal distribution, and hence model fitness.

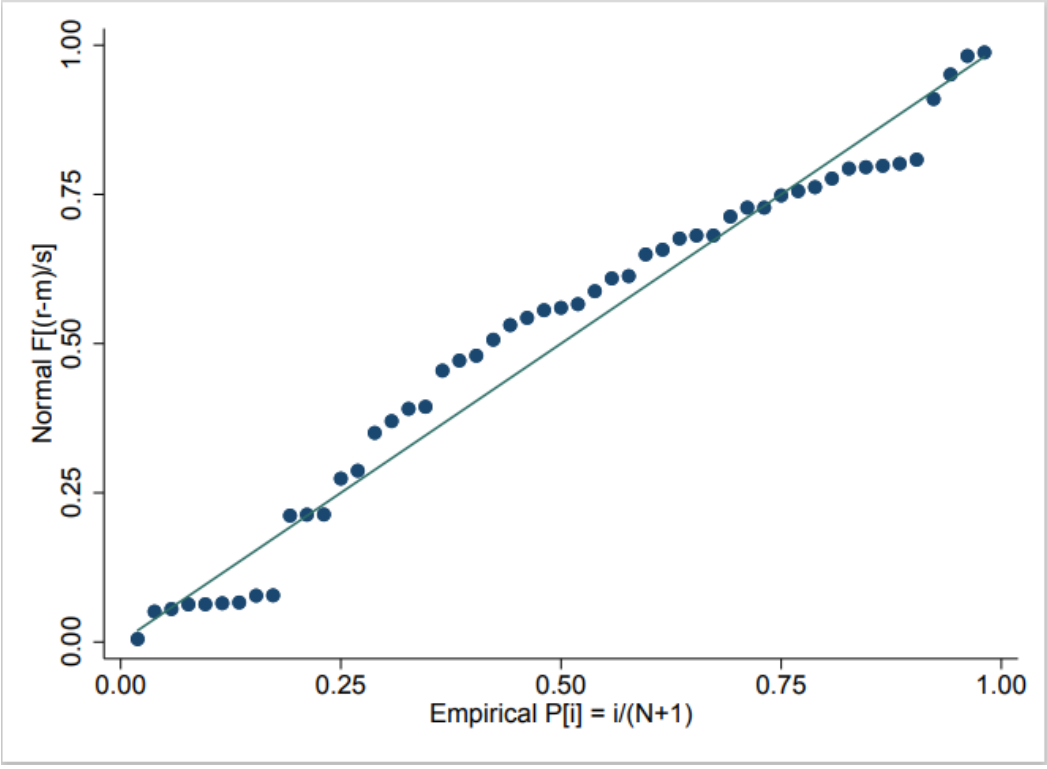

Figure 3. Standardized normal probability plot for residuals on Disaster Preparedness dependent (DV) and independent variables (IV) (policy and politics).

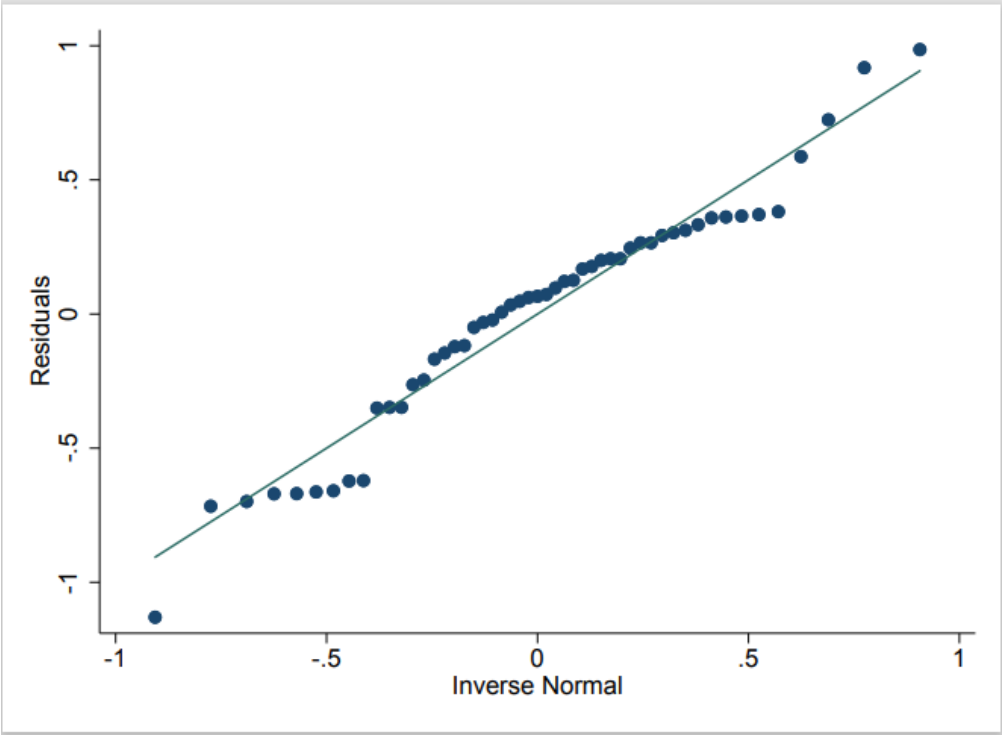

Figure 4. Quantile plot of the DV and IVs against the quantiles of normal distribution.

Summary

The following research questions guided this study:

1. How do perceptions of resource, training, and budgetary problems relate to the emergency preparedness of EDs across the state of Tennessee?
2. How do perceptions of federal, state, and hospital policy and plans relate to the emergency preparedness of EDs across the state of Tennessee?
3. How do perceptions of external and internal organizational politics relate to the emergency preparedness of EDs across the state of Tennessee?

These questions were answered using linear regression modeling with analytics

performed through STATA statistical software (version 15.0). A significant correlation was observed, implying that policy and politics could be used to predict disaster /emergency preparedness in the state of Tennessee. The overall findings with the independent variables, after accounting for socio-demographics the confounders, indicate moderate to strong relationships among two predictor independent variables and the dependent variable. Specifically, policy and politics could be used to predict disaster and emergency preparedness in the state of Tennessee. The problem IV was not significant. The findings are indicative of the opportunity to improve basic disaster/emergency preparedness in TN. The results also indicate a gap between an awareness of public policy regarding such preparedness and associated expectations. In Chapter 5, the interpretation of the findings is expanded and the implications for social change are outlined. Recommendations for action and further study are also provided.

Chapter 5: Discussion, Conclusions, and Recommendations

Overview

The purpose of this research was to examine the gap between effective hospital emergency preparedness and the related awareness and perceptions of healthcare providers. Specifically, I assessed the exposure effect of the problem and related policy and politics in disaster preparedness within healthcare systems, including hospital settings.

In this study, I aimed to examine the implications of the perceived disaster problem, policy, and politics. A cross-sectional design was used to gather data from participants in healthcare settings and hospitals in the state of Tennessee. The questions reflected the participants' sociodemographic, available resources for disaster preparedness, as well as the main independent variables, namely problem, policy, and politics and the dependent variable, namely disaster and emergency preparedness.

I compared federal expectations surrounding hospital preparedness to expectations drawn from surveys in this study from first line ED caregivers. The analyses were based upon a multiple linear regression model. The model indicated that there is a significant relationship among politics and policy variables with disaster/emergency preparedness. Most importantly, my findings suggest that politics and policies can be used to predict disaster preparedness in Tennessee hospitals and the state healthcare system.

In testing the hypotheses of this study, I collected data to determine the gap between hospital emergency preparedness and the related awareness and perceptions of

healthcare providers. The research questions were answered through responses to the Disaster Preparedness: Acute-Care Hospital Survey (Kaji et al., 2008), administered to Tennessee ED nurse leaders (i.e., directors or managers; $N = 108$) as a sample of the ED target population. The survey was a 73-question tool that was adapted to fit the particular scope of this current research with the permission of the author (see Appendix B). The overall sample in this research consisted of 51 participants, which represents a 47.2% response rate—an adequate sample based upon sample size and power estimations, as well as the common sample-size estimate of 10 to 15 responses per variable (see Field, 2009).

The variables used in this study were based upon information gained from the literature review. The dependent variable is emergency preparedness, while the independent variables were specified as the problems stream, policy stream, and politics stream. These variables are described along with the study methodology, reflecting the matrix involved in the construct of their roles as independent and response variables. These constructs were examined for validity and assessed in correlation with the covariance matrix for use in the regression models. The analysis tools, rationale, and assumptions are detailed along with the results.

Interpretation of the Findings

The descriptive assessment of the study demographics characterizes the sample in terms of gender, age, education, and geographic locale. A cross-sectional, nonexperimental design was applied in the study. The majority of the participants were female (72.5%), while the highest frequency by age group were 41 to 50 years of age

(29.4%) and 31 to 40 years of age (27.4%). The majority of the participants had earned either a Bachelor's (47.1%) or Master's (41.2%) degree as their highest educational attainment. Although no demographics for ED nurse leaders could be located, a survey conducted in 2019 on a sample of emergency, trauma, and transport nurses by Schumaker, Taylor, and McGonigle found 78.8% of ED nurses to be female, with an average age of 43.6 years. The educational demographic in my study was somewhat different, with 60.4% possessing a Bachelor's and 16.3% a Master's degree. The difference in educational preparation can be explained by the fact that many leadership positions in nursing require a master's degree to qualify, while this sample was staff nurses.

Disaster-preparedness training was also reported, as was drill-practice experience and disaster-response involvement. The majority of the respondents (74.5%) affirmed participation in a specific form of disaster-preparedness training, while an estimated 60.8% reported participation in annual practice exercises or drills with multiagency participation within their Tennessee healthcare institutions. In addition, an estimated 58.8% of the participants reported participating in a disaster response.

Overall, the participant responses to disaster-preparedness training, participation in drill or practice exercise, and actual involvement in disaster/emergency events illustrated an above-average awareness within the state of Tennessee based upon the study sample. However, no data are available from previous assessments of the Tennessee healthcare system and hospitals of disaster preparedness to affirm or negate the conclusions drawn from the current study survey. Applying Kingdon's (2003) theory

of a small window of opportunity for each policy to move forward, the knowledge without effective action to promote preparedness may indicate that the window of opportunity was missed and another competing priority surpassed disaster preparedness. This lack of existing research presents opportunities for further study to facilitate effective policy development and to some extent may also explain the insufficiencies and gaps found in the current status of Tennessee hospitals and the overall healthcare system with regard to disaster preparedness.

In this study, I described the Tennessee healthcare system and available hospital resources for disaster/emergency response. Regarding in-house radiation safety officers, 35.3% participants reported such a resource, while 45.1% reported one to two decontamination showers or stalls within their facilities. The availability of negative-pressure isolation rooms within their facilities or institutions was indicated by 31.4% of the survey respondents. The resources required for a healthcare system to provide an effective disaster/emergency response were found to be below average within the institutions of this study sample. Despite the lack of comparable data, the findings in this study clearly demonstrate gaps and resources too limited to meet the requirements for effective disaster/emergency preparedness. The study results suggest the need for a comprehensive statewide, ongoing evaluation of available resources for disaster/ emergency response within the Tennessee healthcare system, including hospital settings. Developing and maintaining a Tennessee state healthcare emergency and disaster surveillance and monitoring system could potentially lead to dramatic improvements.

Research Question 1

Research Question 1 was as follows: How do perceptions of resource, training, and budgetary problems relate to the emergency preparedness of EDs across the state of Tennessee? Application of a multiple linear regression model showed that the problem variable was not significant.

Research Question 2

Research Question 2 was as follows: How do perceptions of federal, state, and hospital policy and plans relate to the emergency preparedness of EDs across the state of Tennessee? Specifically, for a unit change or increase in perceived politics, a 0.54 increase in disaster/emergency preparedness within the Tennessee healthcare setting, including hospitals, must be evident. Practically, the more often disaster/emergency policy is perceived and reported, the better prepared the healthcare system, including hospitals, is in addressing hospital emergencies and disasters. A correlation between policy and emergency/disaster preparedness was observed, implying a direct correlation. The perceived polices on disaster preparedness enhances the preparedness of the healthcare institutions in addressing emergency and disaster. Specifically, based on the regression equation, policy could be used to predict disaster or emergency preparedness, implying that for 1 unit increase in policy, there was a 0.41 increase in disaster and emergency preparedness perception units in the state of Tennessee healthcare system. The more likely the disaster/emergency policy is perceived or known to be in place, the better prepared the healthcare system, including hospitals, is in addressing hospital emergencies and disasters. This finding is supported by previous literature (see Cliff et

al., 2009), implying a direct correlation between perceived or known policy related to disaster/emergency response and related preparedness. The findings are indicative of the need to develop, implement, and evaluate policy on disaster/emergency preparedness within the Tennessee healthcare system, including hospitals, for enhanced preparedness and capabilities to effectively respond to disasters and emergencies.

Research Question 3

Research Question 3 was as follows: How do perceptions of external and internal organizational politics relate to the emergency preparedness of EDs across the state of Tennessee? With a 1-unit change or increase in perceived politics, a 0.26 increase in disaster/emergency preparedness perception units is indicated within the Tennessee healthcare system, including hospitals. This finding corresponds with Kingdon's (2011) theory of politics because sudden and catastrophic acts of terrorism, mega storms, and pandemics require, among other things, the heightened skills, equipment, and education that will meet the needs of supporting organizations. These occurrences are random and infrequent, and continuous preparedness is costly and labor intensive. Consequently, all facets of the driving forces must be considered to increase understanding surrounding organizational behavior as it relates to emergency preparedness. Practically, the more often disaster/emergency politics are perceived and reported, the better prepared the healthcare system, including hospitals, is in addressing hospital emergencies and disasters. This finding is supported by previous literature (see Cliff et al., 2009), implying a direct correlation between perceived politics related to disaster/emergency response and related preparedness. The findings are suggestive of the need to examine the implication

of politics in disaster/emergency preparedness and within the Tennessee healthcare system, including hospitals, for enhanced preparedness and the capabilities necessary for effective disaster/emergency response.

There were three independent or predictor variables used to address hospital emergency and disaster preparedness, namely problem, policy and politics, implying the prediction of emergency and disaster preparedness as dependent or response variable, given these predictor variables. This model showed a significant correlation of these predictors separately in a simple linear model, but in the multiple linear model, the problem was not significant. However, although insignificant, there was a prediction of emergency and disaster preparedness, given a perceived emergency and disaster preparedness problem in this sample. Specifically, the problem related to emergency and disaster preparedness could not be significantly used in this sample to predict emergency and disaster preparedness. Because random error quantification is used in hypothesis testing, it is possible that the observed insignificant prediction of hospital emergency and disaster preparedness may be due to the marginalized sample size in the multiple linear regression mode as a result of multiple comparison. Absence of evidence does not always imply evidence of absence.

Because a single variable such as policy, which is significant in predicting hospital emergency and disaster preparedness in this multiple linear modeling, does not completely explain the observed the correlation, categorical variables such as education and urbanity had a role as explanatory model. Education and/or the geographic locale of the hospital setting as urbanity influenced the predictive effect of policy and politics as

multiple predictors in hospital emergency and disaster preparedness. This multivariable or multiple regression model is indicative of the significance of a Master's degree and suburban location of the healthcare system in the combined predictive effect of policy and politics on hospital emergency and disaster preparedness. Specifically, the perception of healthcare or health system emergency and disaster preparedness is influenced in this sample by graduate education, namely a Master's degree and the suburban location of the hospital or healthcare system.

Limitations

Despite the strength of this research in identifying the needs of, and resources in, hospitals and healthcare systems toward addressing disaster preparedness, limitations exist. First, as a cross-sectional design, the findings and their applications may be influenced by unmeasurable and residual confounding factors. However, it is highly unlikely that the correlation between the dependent variable (i.e., disaster preparedness); the independent variables (i.e., the problems, policy, and politics); and the predictability of disaster preparedness by these variables is driven solely by these applications and confounding factors. Regardless of how sophisticated a statistical software is to control for confounding factors, residual factors persist (Holmes, 2009). Additionally, the multivariable modeling in this study might be underpowered, given the requirement to increase the sample size during the multiple-comparison phase of model specification and analysis to avoid a Type I error rejecting a true null hypothesis. In effect the observed inability of disaster and emergency related problem in predicting disaster preparedness may be explained in part by the limited statistical power of the study.

Implications and Social Change

The findings of this study contribute to social change by increasing understanding of the actual state of preparedness perceived by ED nurse leaders within the state of Tennessee. Identified gaps in this study namely policy and politics cause a shortfall when preparedness is compared with expectations. The community at large expects that the local hospital can manage any medical emergency and has no reason to believe otherwise until actually faced with a disaster and systems are tested. Disaster preparedness is a timely and relevant concern due to ongoing and, in some cases, unmitigable risk. Disaster preparedness is innovative and interdisciplinary. Risks are variable and can have distinct differences based upon many factors such as region, industry, and population density.

Implications to social change also include heightened awareness of policy requirements, coupled with a standardized framework of inter-operational response principles in a state of constant readiness. The quality and effectiveness of response in a disaster situation can reduce the negative impact on communities and lives. A standardized approach that holds to the tenets of all-hazards preparedness will leave no question as to the capabilities of each hospital.

In this study, I identified the wide variation in levels of disaster/emergency preparedness among the hospitals that participated in the research. Not only in the perception of preparedness, but also in the actual availability of resources, the provision of training, and the availability and content of policy. There are opportunities for creating social change by improving the overall awareness of federal, state, and hospital policy, as well as the associated expectations for hospital disaster preparedness. Similarly, with the

enhancement of such awareness, perceptions of disaster preparedness can be influenced in a positive manner.

With the knowledge gained from this study, recommendations can be made to develop standards of preparation that will "bridge" the described gaps; create greater and more accurate awareness; and support the development of standardized, comprehensive emergency-preparedness systems. The ideal system will be better prepared to handle all hazards and large-scale events. This research will serve as a tool in support of the development of public policy that will enable an effective and sustainable system of preparedness.

Future Research

In this study, I examined training, resources, experience, and drill and practice exercise, as they relate to disaster preparedness as an exploratory or descriptive component. The response from the statistically powered sample, although generalizable to the targeted population, indicates a need for further studies to include statewide hospitals in rural, urban, and suburban areas. Additionally, given restricted resources for disaster/emergency preparedness, annual assessment of hospital capabilities in addressing such preparedness is required.

Considerations for further study include the following aspects of the surveillance and monitoring of hospital-emergency and disaster preparedness and response:

1. Number and level of trained radiation-safety staff within hospitals, monitored depending upon the volume of care and number of patients served by the healthcare system.

2. Incidence and cumulative incidence of nosocomial infections and available clinical guidelines in management and prevention including care-provider handwashing.
3. The perceptions of chief executive officers and the board of directors surrounding the need for capacity development in hospitals and healthcare-system disaster/emergency preparedness.
4. Assessment of disaster/emergency preparedness, implementation, and evaluation.

Overall, the current study is suggestive of a rigorous and continuous assessment of training, education, and resources addressing hospital-emergency and disaster preparedness. With such studies guiding future research, insufficiencies will be addressed, and gaps will be narrowed within the state of Tennessee, thus improving hospital disaster preparedness via published recommendations and updated requirements meeting the national standard of care.

Recommendations

The findings of this study emerged through analysis of existing knowledge and perceptions of the problems, policy, and politics associated with hospital-emergency and disaster preparedness on the pathway toward enhancing disaster preparedness and response within the Tennessee healthcare system including hospitals. These facilities are underequipped when it comes to resources such as decontamination showers, negative-pressure isolation rooms, and radiation-safety officers, especially within rural areas. Consistent with the Kingdon's (2003) theory of a window of opportunity to create

interest in needed policy, the information gained from this research can be used as a catalyst in creating awareness of the need for policy development.

The Tennessee healthcare system, including hospitals, is also limited with respect to specific emergency training programs, mandatory disaster-preparedness education requirements, quarterly multiagency drill or practice-exercise exposure, and the state/local health-department contact and communication process. These observations and the identified insufficiencies in disaster/emergency preparedness, as reported by the study sample, are suggestive of an immediate need to establish a state of Tennessee healthcare-system disaster/emergency-preparedness surveillance and monitoring system.

The overarching objective behind this study was to assess the impact or effect on the Tennessee healthcare system, including hospitals, of problems, policy, and politics related to disaster/emergency preparedness and response. Due to the sample size and characteristics, further study is needed with (a) a larger sample stratified or blocked according to geographic population size, comparing urban, suburban, and rural locales, as well as the number of hospitals within these geographical areas; (b) hospital executive directors and boards of directors; and (c) needs assessments from the state department of health and the local health department on disaster/emergency training for Tennessee healthcare systems including hospitals. First, since the current study size is not large enough as initially anticipated, increasing the sample size will result in increase in the power of the study as well as reliable generalizability. Secondly, the inclusion of a hospital executive will allow for subpopulation analysis and a more reliable findings in terms of reliability. Thirdly, in order for TN to implement policy in disaster emergency

preparedness, the inclusion of the state health department in the survey allows for a more reliable inference for policy change in disaster preparedness. The availability of reliable and accurate data will result in intervention mapping conducive to consistent gap narrowing in the knowledge, skills, and resources required for surveillance and monitoring of hospital-emergency and disaster preparedness and response.

Conclusions

Self-report surveys can introduce information, selection, and misclassification biases into the correlation between disaster preparedness and independent variables such as the problems, policy, and politics associated with disasters/emergencies involving the healthcare system including hospitals. Self-reported responses have a tendency to introduce an estimated 20% observation bias within collected data (Smith & Noble, 2014). However, it is highly unlikely that the nexus between the response or dependent variable and the independent or predictor variables in this study is driven solely by such bias. This implies the accuracy and internal and external validity in the application of these findings to healthcare systems including hospitals for the development of disaster-preparedness policy and guidelines and their implementation and evaluation. While confounding factors are not bias, they result in a bias estimate between the independent variable; the predictor or explanatory variables (i.e., the problems, policy, and politics); and the dependent, response, or outcome variable (i.e., disaster preparedness). Notwithstanding this potential in data modeling, it is unlikely that the observed point estimates in the correlation and the linear regression applied in this study are driven solely by these unmeasured confounding factors inherent to the survey data.

In summary, the disaster preparedness of the Tennessee healthcare system, including hospitals, directly correlates with the problems, policy, and politics associated with disaster/emergency preparedness. Significantly, policy, and politics related to the disaster/emergency preparedness of the healthcare system, including hospitals, are predictive of disaster response after controlling for potentially confounding factors. These findings are suggestive of the need for the state of Tennessee to address the issues impacting hospital disaster preparedness in an effective manner through the creation of a Tennessee healthcare system disaster/emergency-preparedness surveillance and monitoring system.

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Appendix A: Study Survey

DISASTER PREPAREDNESS: ACUTE-CARE HOSPITAL SURVEY

BY: Kathleen Hirsch, RN, MSN, MBA

Length of time as an emergency-department (ED) nurse manager: _____

Please circle the most accurate response:

1. Gender
    A. Male
    B. Female

2. Age
    A. 21–30
    B. 31–40
    C. 41–50
    D. 51–60

E. 61–70

3. Academic Degree

   A. Associate

   B. Bachelor's Degree

   C. Master's Degree

   D. Doctorate

4. Have you had any specific training in emergency preparedness?

   A. Yes

   B. No

5. Do you know of any public policy that dictates the emergency preparedness of your institution?

   A. Yes

   B. No

ORGANIZATIONAL INFORMATION

Please circle the most accurate response:

6. What is the number of licensed beds within your hospital?

A. < 50

B. 51–150

C. 150–299

D. 300+

7. How would you describe the area where your hospital is located?

A. Rural (i.e., outside a suburban area with a generally a low population)

B. Suburban (i.e., adjacent to or surrounding the center of an urban area)

C. Urban (i.e., the center of an incorporated community or municipality with a population of 2,500 or greater)

8. How many miles travel is it to the nearest hospital?

A. 0–10

B. 11–25

C. 26–50

D. 50+

9. When was the last time the disaster plan of your institution was updated or revised?

A. Within the last 2 years

B. More than 2 years ago

C. Never

D. Do not know

10. Is the contact number for the Tennessee Department of Health and the local County Department of Health posted in a readily accessible location within the emergency department?

    A. Yes

    B. No

    C. Don't know

11. What methods are available during a disaster for staff to communicate with other departments internally and also outside the facility?

    A. Pager

    B. Cell phone

    C. Walkie-talkie

    D. Intercom

    E. High band/Low band/EMS radio

    F. HAM radio

    G. Other: _____

12. How would you rate the capability of staff trained in the decontamination process?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

E. Very good

13. How would you rate the level of personal protective equipment available within your institution, with self-contained breathing apparatus and a fully encapsulated chemical-protection suit as the highest rating, and mask, gown, gloves, and shoe covers as the lowest rating?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

14. How many decontamination showers or stalls are available within your facility?

    A. 1–2

    B. 3–6

    C. 7+

    D. None

    E. Don’t know

15. Does your institution employ an in-house, radiation-safety officer who would be available during a radiological event?

    A. Yes

B. No

C. Don’t know

16. How many days of generic (i.e., nonpharmaceutical) supplies are maintained on your site?

A. Less than 3

B. 3+

C. Don’t know

17. How often does your hospital have a drill or practice disaster exercise with multiagency participation (e.g., with emergency medical services, fire and rescue, hazmat team, law enforcement, Department of Health, and/or other hospitals)?

A. Quarterly or more frequently

B. Annually

C. Every other year

D. Never

18. When a disaster drill is conducted, how would you rate the critique or grade of the drill by external observers?

A. Very poor

B. Poor

C. Neutral

D. Good

E. Very Good

19. How would you rate the formal mechanism or policy to "trigger" activation of the disaster plan of your institution?

A. Very poor

B. Poor

C. Neutral

D. Good

E. Very good

20. Which of the following constitutes the primary reason for ED overcrowding within your institution?

A. Increased ED patient volume

B. Lack of sufficient inpatient beds

C. Lack of nursing staff

D. Lack of primary-care services

E. Other

F. Don't know

21. Does your institution have a plan in place for mass fatalities?

A. Strongly disagree

B. Disagree

C. Neither agree nor disagree

D. Agree

E. Strongly agree

22. How many negative-pressure isolation beds do you have within your institution?

A. 1–2

B. 3–5

C. 6–10

D. 11–15

E. 16+

23. Does your organization have a designated media-relations officer who can act as a single point of information release in case of a disaster?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

    E. Strongly agree

24. Are there engineers available within your institution to assess whether your facility is safe for occupation in the event of a disaster?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

    E. Strongly agree

25. In case of a disaster, does your institution have a “lock-down” policy in place, mandating that all entrances and exits are secured?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

E. Strongly agree

26. Are there are any government requirements that direct hospital disaster preparedness?

A. Strongly disagree

B. Disagree

C. Neither agree nor disagree

D. Agree

E. Strongly agree

27. Does your institution offer an Employee Assistance Program or other programs to treat posttraumatic stress and provide grief counselling to employees?

A. Yes

B. No

C. Don’t know

28. Does your institution require mandatory education on disaster preparedness?

A. Yes

B. No

C. Don’t know

29. How would you rate the disaster plan of your institution?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

30. How would you rate the ability of your institution to utilize the Hospital Emergency Incident Command System?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

31. How would you rate the emergency-staff call-back plan of your institution?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

32. How would you rate collaboration between your institution and the city or community disaster/emergency committee?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

33. How would you rate the special agreement or process your institution has in place with vendors to obtain medical supplies during a disaster?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

34. How would you rate the chemical-spill or decontamination team of your institution?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

35. How would you rate the plans and procedures your institution has in place for the evacuation of patients and personnel in case of a disaster?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

36. How would you rate the ability of your institution to isolate or segregate decontamination services from other patient areas?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

37. How would you rate the ability of your institution to treat multiple patients exposed to a nerve agent, with consideration to the amount of atropine, pralidoxime, or duodote available?

    A. Very poor

    B. Poor

    C. Neutral

D. Good

E. Very good

38. How would you rate the ability of your institution to treat multiple patients with cyanide exposure, with consideration to the number of cyanide kits the hospital has available?

A. Very poor

B. Poor

C. Neutral

D. Good

E. Very good

39. How would you rate the ability of your institution to assess radiological contamination with a Geiger counter or other means?

A. Very poor

B. Poor

C. Neutral

D. Good

E. Very good

40. How would you rate the level of disaster-preparedness training of residents, hospitalists, and/or house officers within your institution?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

41. How would you rate the level of training received by the ED staff of your institution on biological weapons?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

42. How would you rate the stockpile of antibiotics maintained by your institution for disaster use?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

E. Very good

43. How would you rate the stockpile of pharmaceuticals set aside within your institution to treat staff and families during a disaster?

A. Very poor

B. Poor

C. Neutral

D. Good

E. Very good

44. How would you rate the ability of your institution to track fluctuations in the patient census, patient complaints, and diagnoses (i.e., surveillance)?

A. Very poor

B. Poor

C. Neutral

D. Good

E. Very good

45. How would you rate the ability of your institution to increase capacity during a disaster (i.e., number of staffed beds in excess of routine operating capacity that could be opened to increase disaster capacity)?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

46. How would you rate the ability of your institution to reallocate or increase resources during a disaster (e.g., cancel elective procedures or discharge inpatients early) to make additional rooms available for inpatient use?

    A. Very poor

    B. Poor

    C. Neutral

    D. Good

    E. Very good

47. How well do you think your institution is prepared to provide support to staff and healthcare providers in the event of a large-scale disaster?

    A. Very poor

    B. Poor

C. Neutral

D. Good

E. Very good

48. How would you rate the ability of your institution to identify and manage victims of bioterrorism?

A. Very poor

B. Poor

C. Neutral

D. Good

E. Very good

49. What level of risk do you perceive exists for your acute-care hospital if faced with a future disaster incident?

A. Very low

B. Poor

C. Neither low nor high

D. High

E. Very high

50. Are changes in the disaster policy of your institution driven by major events across the country?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

    E. Strongly agree

51. Do you feel your institution is adequately equipped to function during a disaster emergency involving a radiologic attack?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

    E. Strongly agree

52. Is your institution adequately equipped to function during a disaster emergency involving a nuclear attack?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

E. Strongly agree

53. Do you feel your institution is adequately equipped to function during a disaster emergency involving a biological-weapons attack?

A. Strongly disagree

B. Disagree

C. Neither agree or disagree

D. Agree

E. Strongly agree

54. Is your institution adequately equipped to function during a disaster emergency involving a chemical-weapons attack?

A. Strongly disagree

B. Disagree

C. Neither agree or disagree

D. Agree

E. Strongly agree

55. Is your organization adequately equipped to function during an emergency involving a natural disaster (e.g., hurricane, tornado, flood, or earthquake)?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

    E. Strongly agree

56. Are you and other staff within your institution adequately trained to deal with disaster outbreaks in your acute-care hospital?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

    E. Strongly agree

57. Since 9/11, is your institution more prepared for a disaster incident?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

    E. Strongly agree

58. As a healthcare worker, do you have confidence that your institution will protect you during a disaster?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

    E. Strongly agree

59. As a healthcare worker, do you view your community or institution as at risk for a disaster incident?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

    E. Strongly agree

60. Does your institution have adequate programs and policies in place to respond to a large-scale disaster?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

    E. Strongly agree

61. Do you view the risk of a disaster incident as serious and with the propensity to adversely impact staff and patients?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

    E. Strongly agree

62. As an ED manager or hospital executive, do you understand the responsibilities of the hospital management team regarding disaster preparedness?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

E. Strongly agree

63. Overall, do you view your institution as having strong disaster-preparedness policy in place and performing well in this area?

A. Strongly disagree

B. Disagree

C. Neither agree nor disagree

D. Agree

E. Strongly agree

64. Overall, do you view your institution as equipped and prepared to respond to a disaster in general (e.g., bioterrorism or natural, chemical, radiographic, or nuclear)?

A. Strongly disagree

B. Disagree

C. Neither agree nor disagree

D. Agree

E. Strongly agree

65. Overall, do you view your institution as prepared to provide support to staff and other healthcare providers during a large-scale disaster?

    A. Strongly disagree

    B. Disagree

    C. Neither agree nor disagree

    D. Agree

    E. Strongly agree

66. When your hospital is experiencing a shortage in nurse staffing within the ED, how often do you close some areas of the ED to maintain a nurse-patient ratio of 1:4?

    A. Never

    B. Rarely

    C. Sometimes

    D. Often

    E. Always

67. How many times per month does your hospital reach 100% operational capacity?

    A. Never

    B. Rarely

    C. Sometimes

    D. Often

    E. Always

68. How often does your hospital divert ambulance traffic to other facilities?

    A. Never

    B. Rarely

    C. Sometimes

    D. Often

    E. Always

69. Does your hospital use agency nurses to expand nursing staff when necessary?

    A. Never

    B. Rarely

    C. Sometimes

    D. Often

    E. Always

70. When was the last time a disaster plan was initiated at your institution?

    A. Within the last 2 years

    B. More than 2 years ago

    C. Never

71. Have you ever participated in a disaster response?

    A. Yes

    B. No

    C. Don’t know

72. How many disaster responses have you participated in while working at your current healthcare facility?

    A. One

    B. Two

    C. More than two?

    D. Don’t know

    E. None

73. How many patients were treated during the largest disaster episode in which you participated?

    A. None

    B. < 5

    C . 5–10

    D. > 10

    E. Don’t know

Appendix B: Survey Permission

January 17, 2012

Dear Dr. Kaji,

I communicated with you previously regarding the Disaster Preparedness Survey you developed. I am a Ph.D. student at Walden University, majoring in public policy. I am also the Vice President and Chief Nursing Officer of a large metropolitan hospital within Nashville, Tennessee.

I plan to conduct a study for my doctoral program on hospital emergency preparedness, related policy expectations, and care-provider perceptions of readiness. Emergency-department nurse managers will be sampled from all acute-care hospitals across the state of Tennessee. I have conducted an extensive literature review that included your work. Additionally, I have reviewed several survey tools and found your instrument best suited to the needs and purpose of my study. It has the appropriate foundation and a range that covers the topic without undue complexity.

I would like to ask for your permission to use the Disaster Preparedness Survey in my study. Modification would involve a few added questions regarding perception and policy expectations, as well as changes to any questions specific to the South Bay Area. I look forward to your response and welcome any questions you may have regarding my proposed study.

Thank you for your consideration.

Kathleen Hirsch

Doctoral Candidate, Walden University

Hirsch, Kathie

From: Kaji, Amy <AKaji@emedharbor.edu>
Sent: Tuesday, January 17, 2012 2:37 PM
To: Hirsch, Kathie
Subject: RE: request to use, Disaster Preparedness Survey

Ms. Hirsch,
That's fine, but please cite it as a reference.
Thanks,
Amy

From: Hirsch, Kathie [mailto:kathie.hirsch@baptisthospital.com]
Sent: Tuesday, January 17, 2012 12:24 PM
To: Kaji, Amy
Subject: request to use, Disaster Preparedness Survey

See attachment

From: Executive Offices [mailto:connersan@bethomes.org]
Sent: Tuesday, January 17, 2012 2:14 PM
To: Hirsch, Kathie
Subject: Attached Image

Appendix C: Constructs and Correlation Matrix

Constructs

Table C1

Correlation and Covariance of Variables in Disaster/Emergency Preparedness

Survey item	Sample size	Item test correlation	Average interitem correlation	Alpha
18	50	0.66	0.77	0.94
19	51	0.95	0.62	0.89
21	49	0.88	0.65	0.90
30	51	0.86	0.66	0.91
34	50	0.87	0.66	0.91
56	51	0.88	0.65	0.90

Note. The test scale is the mean or standardized item. The average interitem correlation denotes the additive scale and represents the covariance (0.67), while 0.92 is the alpha coefficient for the test scale based upon all variables within disaster/emergency preparedness.

Table C2

Correlation and Covariance of Variables in the Problems Construct of Disaster/Emergency Preparedness

Survey item	Sample size	Item test correlation	Average interitem correlation	Alpha
45	51	0.87	0.84	0.95
51	50	0.90	0.81	0.95
56	50	0.95	0.77	0.93
63	50	0.92	0.80	0.94
64	51	0.95	0.78	0.93

Note. The test scale is the mean or the standardized item. The average interitem correlation denotes the additive scale and represents the covariance (0.80), while 0.95 is the alpha coefficient for the test scale based upon all variables within the construct of the problems as the independent variable within the linear regression model.

Table C3

Correlation and Covariance of Variables in the Construct of Policy Related to Disaster/Emergency Preparedness

Survey item	Sample size	Item test correlation	Average interitem correlation	Alpha
19	51	0.90	0.77	0.91
26	51	0.86	0.81	0.93
60	51	0.93	0.73	0.90
63	51	0.93	0.73	0.89

Note. The test scale is the mean or standardized item. The average interitem correlation denotes the additive scale and represents the covariance (0.76), while 0.93 is the alpha coefficient for the test scale based upon all variables within the construct of policy as the independent variable within the linear regression model.

Table C4

Correlation and Covariance of Variables in the Politics Construct Related to Disaster/Emergency Preparedness

Survey item	Sample size	Item test correlation	Average interitem correlation	Alpha
23	50	0.88	0.19	0.32
50	51	0.63	0.89	0.89
63	50	0.85	0.28	0.44

Note. The test scale is the mean or standardized item. The average interitem correlation denotes the additive scale and represents the covariance (0.43), while 0.69 is the alpha coefficient for the test scale based upon all variables within the construct of politics as the independent variable within the linear regression model.

Correlation Matrix

Table C5

Correlation Matrix on Disaster/Emergency Preparedness, Policy, Problems, and Politics

Variable	*Disaster preparedness (DP)*	*DP Policy*	*DP Problems*	*DP Politics*
	r(p)	*r(p)*	*r(p)*	*r(p)*
Disaster/Emergency preparedness	1.00	0.94 (< .001)	0.92 (< .001)	0.88 (< .001)
DP Policy	0.94 (< .001)	1.00	0.94 (< .001)	0.85 (< .001)
DP Problems	0.92 (< .001)	0.94 (< .001)	1.00	0.89 (< .001)
DP Politics	0.88 (< .001)	0.85 (< .001)	0.89 (< .001)	1.00

Note. The correlation coefficient was adjusted for multiple comparison using the Bonferroni correction for Type I error inflation of the adjustment model. DP = disaster/emergency preparedness, *r* = Pearson correlation coefficient; *p* = type I error tolerance as probability value was set at .05.