

# PHARMACISTS IN DISASTERS

by

JOSEPH HEATH FORD

(Under the Direction of Matthew Perri, III)

## ABSTRACT

Objective: Catastrophic disasters have almost become normative in American culture. Violent natural disasters, human systems failures such as automobile or industrial accidents, and acts of terrorism bring salient focus to preparedness efforts, particularly in the pharmacy community, where pharmacist role delineation has been a subject of discussion since the 1990 practice shift introduced by Hepler and Strand. Although practice reports describe how pharmacists have responded to disaster, no report to date has inferred characteristics regarding pharmacists' roles and disasters. Thus, the purpose of this research is to infer characteristics regarding pharmacists' roles and disasters using the peer-reviewed pharmacy literature, a medium of information providing valued insight into the current state of pharmacy practice in disasters.

Methods: In order to characterize pharmacists' roles and disasters, this research seeks to determine significant differences in proportions of role categories in the pharmacy literature, differences in the proportion of pharmacists' roles and disasters across pharmacy journals, factors that significantly explain roles pharmacists adopt in

disasters, and how roles and disasters differ across time periods. A quantitative content analytic technique was used to quantify the occurrence of words and phrases related to pharmacists' roles and disasters. Roles were classified using the Setlak classification scheme, which includes descriptors such as pharmaceutical supply, patient management, policy coordination, and response integration. Disasters were similarly categorized using schemes consistent with current practice.

Results: Chi-square analyses reveal significant differences in the weighted counts of roles, roles categorized by journal, and CBRN disasters categorized by journal. Results also show that pharmacists' roles in disasters have not changed significantly since the 1960s. Pharmaceutical supply remains the pharmacists' preferred role while patient management and response integration roles decrease in context of common, forecastable, and geographically widespread disasters. Policy coordination roles, however, significantly increase in context of nuclear terrorism planning.

Conclusions: Data suggest that pharmacists may be prepared to respond to hurricanes and biologic and chemical disasters in pharmaceutical supply and patient management roles. However, pharmacists' adoption of non-pharmaceutical supply roles may represent a paradigm shift problem in non-traditional role acceptability. The possibility of manpower shortages in future disasters may force a change in pharmacists' approach to disaster management.

INDEX WORDS: Disaster management, Pharmacists, Content analysis

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## DEDICATION

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## TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS .....	v
LIST OF TABLES .....	x
LIST OF FIGURES .....	xi
CHAPTER	
1 INTRODUCTION AND LITERATURE REVIEW .....	1
Rationale .....	3
Roles in the Pharmacy Literature .....	5
Disasters in the Pharmacy Literature .....	14
References .....	18
2 CONCEPTUAL FRAMEWORK AND HYPOTHESIS .....	25
Journals and Pharmacists' Roles .....	25
Disasters and Pharmacists' Roles .....	26
Time and Pharmacists' Roles .....	26

	Research Questions and Hypotheses .....	27
	References .....	29
3	RESEARCH METHODOLOGY .....	30
	Design and Sample .....	30
	Measurements and Instrumentation .....	31
	Data Analysis .....	32
	References .....	34
4	PHARMACISTS' ROLES IN POST-SEPTEMBER 11 <sup>TH</sup>	
	DISASTERS: A CONTENT ANALYSIS OF THE	
	PHARMACY LITERATURE .....	35
	Introduction and Purpose Statement .....	37
	Methods .....	40
	Design and Sample .....	42
	Measurements and Instrumentation .....	43
	Data Analysis .....	43
	Results .....	44
	Discussion .....	45

	Limitations .....	49
	Conclusion .....	50
	References .....	59
5	EVALUATING PEER-REVIEWED PHARMACY	
	LITERATURE TO EXPLAIN ROLES PHARMACISTS	
	ASSUME IN DISASTERS: A QUANTITATIVE CONTENT	
	ANALYTIC APPROACH .....	64
	Introduction .....	66
	Methods .....	69
	Results .....	71
	Discussion .....	74
	Conclusion .....	78
	Appendix .....	80
	References .....	89
6	CONCLUSIONS .....	96

## LIST OF TABLES

	Page
Table 1: Disasters in the Pharmacy Literature .....	14
Table 2: Disaster Classification Scheme .....	52
Table 3: Chronologic Order of and Article Reference for Disasters Appearing in the Pharmacy Literature .....	53
Table 4: Classification of Pharmacists Disaster Roles .....	94

## LIST OF FIGURES

	Page
Figure 1: Weighted Counts of Roles Reported in the Pharmacy Literature .....	56
Figure 2: Roles Categorized According to Journals .....	56
Figure 3: Natural Disasters Categorized According to Journal .....	57
Figure 4: Chemical, Biological, Radiological, and Nuclear (CBRN) Disasters Categorized According to Journal .....	57
Figure 5: Total Percentages of Pharmacist Disaster Role References in the Pharmacy Literature .....	95
Figure 6: Total Percentages of Disaster References in Pharmacy Literature .....	95

## CHAPTER ONE

### INTRODUCTION AND LITERATURE REVIEW

The United States faces a fifty percent chance of experiencing a major terrorist attack within the next eight years (Goffman, 2009). Cold War era chemical, biologic, and nuclear weapons caches leftover from the former Soviet Union, including the scientists responsible for their manufacture, are unaccounted for (Bell and Dallas, 2007) and have been highly sought after by terrorist and criminal organizations (Boureston and Mahaffey, 2003). These factors combined with the unpredictability of violent natural disasters make an effective medical response critical for the continuity of American civilization. However, if an already strained healthcare system is severely impacted by debilitating disasters, the effects could be devastating (Bell and Dallas, 2007).

The role of the pharmacist in disaster preparedness and response has become increasingly important since the terrorist attacks on the World Trade Center and Pentagon. Pharmacists have traditionally managed the nation's drug supply by dispensing prescription medications to patients. While this role continues as the mainstay of most pharmacy practices, pharmacists' skills have developed well beyond those traditionally described (Hogue, 2009). Austin and colleagues (2007), for example, note that in times of crisis community pharmacists become crucial to maintaining public

healthcare services and assume responsibilities beyond their scope of practice. Older research, including Braucher's description (1966) of pharmacist roles in relief efforts after a simulated nuclear detonation, are particularly relevant to a post-September 11th era and validate the importance of pharmacist participation in disaster preparedness and response, especially when few health care providers are expected to survive the initial events.

The disaster preparedness genre in pharmacy literature has developed significantly since September 11, 2001. Multiple reports describe the utility of traditional and expanded activities of pharmacy practice in a variety of natural and man-made disasters, with the pool of published articles continuing to increase (Austin et al, 2007; Bratberg, 2005; Chan, 2004; Chin et al, 2004; Cohen, 2003; Guadette et al, 2002; Grabenstein, 2002; Haffer et al, 2002; Hogue et al, 2009; Massoomi, 2005; Pincock et al, 2011; Setlak, 2004; Terriff & Newton, 2008) . As Cohen (2003) notes, however, little attention has been given to characterizing the roles of pharmacists in disasters even though the importance of pharmacists' involvement is widely acknowledged. In fact, no disaster-related analysis to date has been published that infers characteristics regarding pharmacists' roles in disasters. As a result, some activities will be understated, the pharmacy response to disasters will be less well developed, continuing education and training opportunities will be missed, and the capability of terrorists to do harm may be increased.

## **Rationale**

Having an understanding of the range of activities that have been reported in the pharmacy literature and a knowledge of which ideas have received lesser or greater attention would allow for an inferential assessment of how pharmacists have defined their roles in disasters. Pincock (2011) notes that pharmacists' activities may be defined for them if they do not proactively develop their own roles in disasters. Similarly, if pharmacists wait to be asked to participate in disaster response activities, one pharmacist offered, "it will never happen" (Traynor, 2005).

The pharmacy response to disasters will be less well developed and ill-defined without an analysis of current reports. Coleman (2011) notes in a recent editorial that even though society has insufficient resources to meet every disaster contingency, careful planning and resource allocation can bring the greatest good to the greatest number of people. A careful look at the types of roles documented and their relative frequency will clarify the pharmacy disaster response and help achieve the greatest good for the greatest number.

Education and training opportunities will be missed. Remediation may be achieved when activities that may have previously been unidentified are clarified and examined. The State of Georgia, for example, recently provided disaster preparedness training to approximately eight thousand pharmacists as part of a continuing education requirement for state licensure. Training opportunities missed previously may be offered in the future.



Ultimately, the capability of terrorists to do harm may be increased if pharmacists' roles in disasters are not well understood. Many disaster plans include allocating pharmacy resources. Few if any plans, however, mention specific activities that pharmacists might be able to perform (Traynor, 2007). Much of an effective medical response to a disaster depends on careful resource allocation (Coleman, 2011). By characterizing pharmacists' roles in published reports, pharmacists will be optimally utilized to mount an effective medical response.

Pharmacists' possession of a specialized body of drug knowledge makes them a unique segment of the healthcare professions. According to major themes advocated by the profession, their primary contribution to society is to ensure the proper use of medications (ASHP, 2011) and to be primarily concerned with the welfare of humanity and relief of suffering (AACP, 2008). With the advent of the pharmaceutical care paradigm developed by Hepler and Strand (1991), pharmacists, especially those that work in health systems and clinics, have assumed more patient-oriented roles in their daily activities, stepping outside the boundaries of dispensing labs and actively participating as a member of the healthcare team. Some of these activities include counseling patients regarding the adverse effects, desired outcomes, and duration of use of medications, dosing and monitoring oral and intravenous medications, providing pharmacotherapy or parenteral nutrition consults to prescribers, and monitoring patients for drug-related issues. Practice activities appear to embrace the ideals of ensuring proper use of medications and mitigating human suffering.

Disaster preparedness and response is a specific domain in which pharmacists can provide valuable expertise to mitigate human suffering and promote appropriate

medication use. Although resource-depleting disasters present scenarios where pharmacists assume tasks traditionally belonging to other disciplines (Austin et al., 2007), these scenarios have not been sufficiently elucidated in the literature. However, many reports demonstrate how pharmacists have replicated their ordinary activities to meet extraordinary needs of disaster victims and healthcare responders. When considering the reports describing how pharmacists have responded to disasters, some questions arise: Which roles have the most literature support, and are these roles influenced by the journals that report them, natural disasters or terrorism, and the dates in which the roles appear in literature?

### **Roles in the Pharmacy Literature**

A broad range of pharmacist functions in disaster preparedness and response is described by numerous reports in the pharmacy literature and will be organized according to a scheme described by Setlak (2004): response integration, patient management, pharmaceutical supply, and policy coordination.

**Response integration.** An important consideration is the shortage of manpower during a disaster and the need for medical personnel, particularly pharmacists, to be pre-trained to perform an array of duties assumed by other disciplines; “the greater training and guidance he receives prior to a disaster, the greater an asset he will be to other medical personnel” (APhA, 1966). Such roles include providing basic cardiac life support (BCLS) and cardiopulmonary resuscitation (CPR) (Levy et al, 1987), functioning as a “house doctor” in fallout shelters in the absence of a physician (Schwerman, 1967),

offering medical aid and assisting medical personnel in front-line response activities (APhA, 1966). A more recent report of hands-on activities include Gaudette's (2002) account of pharmacists who, with minimum training and effort, assisted in CPR, trauma management, and triage at the World Trade Center site during the medical response to the September 11, 2001 attacks in New York City. Sagraves (1995) similarly records pharmacists as providers of emotional support to victims' families after the bombing of the Alfred P. Murrah Federal Building in Oklahoma City. One example of the importance of emotional support shows how the psychological stress of graphic television replays of the collapsing World Trade Center towers manifested as chest tightness and worsening of asthma symptoms in a 10-year boy whose asthma symptoms were previously controlled (Chan, 2004). Particularly illustrative of frontline responsibilities is the Austin et al. (2007) exploratory analysis of community pharmacy practice in time of civil crisis. Among several key themes identified from interviews of study participants is the notion that retail pharmacies become frontline healthcare facilities in times of civil unrest. During the sudden acute respiratory syndrome (SARS) epidemic in 2003 that closed many hospitals, emergency clinics, and medical offices in Toronto, Canada, pharmacies that remained open for business became the city's healthcare centers and pharmacists the primary care providers. Among the authors' conclusions is that in times of crisis, pharmacists begin to assume duties beyond their traditional scope of practice and would do well to cross-train with allied health professionals before an event occurred to maximize role flexibility (Austin et al., 2007). In a news article noting vital roles performed by pharmacists in response to Hurricane Katrina, pharmacist Jay Schauben adds, "Pharmacists are not getting involved in disaster

preparedness and response because they don't understand their role in a first-responder position.” He suggests that pharmacists should be prepared to do more than dispense and counsel, highlighting the necessity of expanding pharmacists' skills in emergency response practices (Young, 2005).

**Patient management.** Pharmacists also assume a number of therapeutic and outcomes management roles during disasters. Pharmacists as toxicology consultants and poison specialists manage poisonings and drug overdoses by identifying offending substances and providing antidotal and therapeutic management information to physicians (Levy et al, 1987; Traynor, 2008). Montello and Ames (1999) define the role of therapeutic selection as “assessing a patient's pharmaceutical requirements and selecting the appropriate therapy” during an emergency. Specifically, pharmacists would obtain a detailed patient history, determine the patient's general medical condition before and after the disaster and the potential for patient education, and document physician approval or unauthorized (non-approved) refills or therapeutic substitutions. Traynor (2008) also note the roles of therapeutic interchange advice, toxicology and poison management, and management of drug side effects among pharmacists' primary responsibilities during disaster. Nolin et al (2006) suggest pharmacists as providers of drug information regarding dosages of nerve agent antidotes for pediatric patients, while Grabenstein (2002) describes providing public drug information and education in response to the “human factor,” that is, to allay fear, panic, horror, anger, withdrawal, or other emotional responses to calamity.

A major component of managing therapeutic outcomes involves the basic and widely recognized role of distributing or dispensing medications. Pharmacists dispensing

from the Strategic National Stockpile (SNS) or any local or state pharmaceutical cache would be responsible for helping set-up dispensing sites, staffing the dispensing sites, and counseling patients about their medications (Young, 2003; Nolin, 2006; Massoomi, 2005; Young, 2004). Pharmacists would also be needed to look for trends in drug use and manage drug cache inventories (Thompson, 2010). Military reserve pharmacists similarly assume these functions when deployed for duty (Young, 2003). Two dramatic accounts of the effects of Hurricane Iniki in 1993 describe pharmacists improvising distribution efforts due to lack of electricity by handwriting prescription labels for patients, documenting activities for insurance reimbursement (since claims could not be processed electronically), and delivering medications to hallways of hospital beds due to blown windows and water damage in patient rooms (Miller, 1993; Merges 1993). An interesting account of pharmacists duties during the anthrax attacks in October 2001 show how pharmacists are integral in the development and implementation of a mass anthrax prophylaxis clinic as they provided logistical support by repackaging and relabeling bulk medications for dispensing, and dispensed antibiotics to people at risk for developing anthrax-related complications (Haffer et al, 2001).

**Pharmaceutical supply.** Pharmacists similarly have important roles in medication inventory, and coordinating drug transportation and drug wholesaler support. The ASHP statement on the role of health-system pharmacists in emergency preparedness suggests that pharmacy directors should “ensure that the pharmaceutical components of the institution’s emergency plans are coordinated with the overall local preparedness plans involving other institutions, community pharmacies, and wholesalers, as well as coordinated with federal, regional and state plans” (ASHP, 2003). The

document also suggests that directors ensure that the appropriate pharmaceuticals and quantities of pharmaceuticals are in stock at the institution (ASHP, 2003). Guynn (1990) records considerations for hospital pharmacists in wake of the effects of the September 1989 hurricane Hugo. One important aspect of disaster preparedness and response Guynn (1990) emphasizes is that “outside assistance becomes problematic in that those outside the immediate area may be unaware of the extent of destruction and casualties, and they may not be able to provide any assistance due to disruption of entry routes into the area.” Although Guynn (1990) does not specify whether emergency plans were developed prior to the event, one may presume, considering the number of questions presented for pharmacy administrators to address before facing an emergency, that some measure of planning was in place to either develop emergency operations or reaffirm existing emergency structures, such as transportation to and within the hospital and other considerations. Pharmacists’ efforts to deliver medications in a snowstorm in the Spokane, Washington area necessitated using snowmobile teams to deliver medications to homebound residents (Traynor, 2008; Terriff and Newton, 2008). Another health system, in response to a mass casualty event involving a plane crash, utilized the services of National Guard and state patrol members to fly needed pharmaceuticals from a distant wholesaler to the facility (Carda et al., 1989). Not surprisingly, the authors of the report noted the importance of planning and testing issues including inventory and transportation before a mass casualty event (Carda et al, 1989).

**Policy coordination.** According to pharmacist John Grabenstein, “planning has its own inherent value and is a form of deterrence, and deterrence is always the best defense” (Grabenstein, 2002). Pharmacists participating in policy development

contribute significantly to disaster preparedness and response efforts. State pharmacists in Alabama, for instance, were able write and fill prescriptions for a 30-day supply of routine, non-narcotic medications for Hurricane Katrina victims as a result of state policy changes (Traynor, 2007). Terriff and Tee (2001) describe citywide preparations for bioterrorism through the efforts of a cadre of pharmacists drafting and implementing policies that specify antidote doses, documenting citywide pharmaceutical supplies, and providing recommendations for administering vaccines and medications. Massoomi (2005) similarly describes the tasks charged to the disaster response planning committee including recruiting volunteers, creating a job description for pharmacy section leaders, integrating local, state, and federal pharmaceutical caches, coordinating with health districts to assist in drug distribution, acting as a liaison with Strategic National Stockpile (SNS) personnel, and educating other professionals in the use of chemical, biologic, and nuclear agent countermeasures.

Under an all-hazards approach to disaster management, generic plans can also be made to cover most contingencies, including various types of natural disasters. Medical response plans for a nuclear detonation may be the exception, where scenes of total devastation, disabling loss of medical personnel, and disrupted infrastructure create conditions that may be strikingly different from other disasters. An important consideration is whether the community can provide sufficient antibiotic prophylaxis to counter biologic threats without requiring additional medication from the SNS (APhA, 2002). Cohen (2003) describes the organization of a Pharmacy Emergency Response Team (PERT) at a large metropolitan hospital whose mission is to “maintain, prepare, mobilize, distribute, and track [the hospital’s] stockpile and provide targeted

pharmaceutical care intelligence needed to assist in the detection and mitigation of victims exposed to CBRN [chemical, biological, radiological, and nuclear] agents.”

Although normal pharmacy activities would continue in the event of a disaster involving CBRN agents, the PERT, directed by the pharmacy administrator, drug information specialist, and emergency department pharmacist, would provide the hospital pharmacy response to CBRN disasters by delegating responsibilities to clinical pharmacists who would assume duties on a hospital wide scale that are normally undertaken, on a simpler level, by emergency department clinical pharmacists.

**Role categorization.** Pharmacists’ roles in disasters have been categorized in at least three reports in the pharmacy literature (Chin et al, 2004; Setlak, 2004; Pincock, 2011). Pincock and colleagues present a disaster-readiness model to better prepare pharmacists and disasters plans for future contingencies. The model includes two categories of pharmacist activities, clinical and other, that are further subdivided into specific pharmacy specialties considered best to perform assigned duties. Clinical roles include activities that would be assumed by an ambulatory care readiness pharmacist and a pharmacotherapy or critical care readiness pharmacist. These roles are summarized as primarily involving the provision of pharmaceutical care for patients with moderate chronic and acute conditions (ambulatory care) or patients with severe conditions (pharmacotherapy or critical care specialist). The “other” category involves logistical support and activities including traditional duties like medication procurement, storage, inventory, distribution, and dispensing. The pharmacists proposed to assume these duties include a pharmacist readiness logistician, a weapons of mass destruction/pandemic readiness pharmacist, and a pharmacist readiness manager. The model proposed



qualifying pharmacists to serve in these proposed capacities through proficiency evaluations that would rate pharmacists as novice (low skill), knowledgeable (intermediate skill), or proficient (high skill).

Descriptions by Chin et al (2004) are noteworthy for the identification of five categories of pharmacy functions: drug information, direct patient care, pharmacy operations, collaboration and communication, and personnel management. Drug information role is, intuitively, the provision of drug information to all stakeholders through the development of drug use guidelines and dosing charts. Although providing direct patient care is not clearly defined, excepting comments regarding monitoring the effect of drug therapies, one may assume from the tenor of the article that drug counseling or obtaining medication histories could be included in this category. Collaboration and communication with key medical personnel participating in disaster response is vital to accomplishing tasks efficiently. Developing drug distribution systems appropriate for the disaster response effort summarizes the idea of pharmacy operations, and managing personnel can be accomplished through staff education, redeployment, and creative handling of new situations.

The descriptions of pharmacist duties are an invaluable addition to the pharmacy disaster genre; however, the realities of inadequate numbers of pharmacists participating in disaster preparedness and response activities coupled with the nationwide shortage of pharmacists and the low percentage of board certified specialty pharmacists, make the use of this model somewhat impractical. Pre-event training opportunities, especially in areas that are not traditionally assumed by pharmacists, are especially important to enhance the skills of pharmacy volunteers. Proficiency evaluations may be warranted

when learning extra-discipline skills traditionally belonging to physicians, nurses, laboratory technicians, or respiratory therapists, for instance.

In terms of broad inclusivity in characterizing and explaining pharmacists' roles in disasters, perhaps the best categorization of pharmacists' functions is set forth by Setlak (2004), who identifies four main types of functions: response integration, patient management, pharmaceutical supply, and policy coordination. Response integration describes pharmacists integrating into the casualty response by triaging patients alongside physicians and nurses, administering first aid and cardiopulmonary resuscitation as experience and training allow. Patient management, the second category, stems from the pharmaceutical care paradigm and involves patient-centered approaches to managing medication therapy outcomes. Pharmacists would become involved in monitoring patient outcomes after administration of medical countermeasures and would communicate with patients and the public about therapies used to counter specific terrorist threats. Pharmaceutical supply, the third category, describes the logistics of providing medications to large numbers of patients. Dispensing site layout, and medication procurement, repackaging, distribution, and control are roles included in this category. The last category describes the need for pharmacists to help coordinate public disaster management policy to eliminate duplicate therapies included in emergency formularies, streamline paperwork to avoid duplicative forms, and generally apply drug expertise in decision-making.

## Disasters in the Pharmacy Literature

Numerous references to disasters have appeared in the pharmacy literature since the early 1960s. Disasters will be classified as two types: natural disasters and terrorism. The natural disasters classification includes tornadoes, fires, earthquakes, floods, or any manmade accident such as a plane, train, or automobile crash. Terrorism includes chemical, biological, radiological, or nuclear terrorism or use of any violent means to intimidate or coerce, especially for political purposes (US House of Representatives, 2012). Table 1 displays the chronologic order of the disasters appearing in pharmacy journal articles.

The disaster genre of pharmacy literature beginning in the early 1960s to the 1980s exclusively reflects responses to natural disasters. The 1980s begin to reference terrorism, with the quantity of literature citations growing substantially in the 1990s. While the 2000s are dominated primarily by articles citing natural disasters, the two main acts of terrorism frequently referenced by articles in the pharmacy literature are the September 11, 2001 attacks on the World Trade Center and Pentagon as well as the October 2001 anthrax attacks in Washington, D.C., Florida, New Jersey, and New York. Particularly noteworthy is the prevalence of terrorism reports from 1993 to 2001, with natural disasters dominating literature before and after this period.

Table 1. Disasters in the pharmacy literature.

Year	Month	Event	Reference
1963	October	Coliseum explosion in Indianapolis	Schwerman, 1967
1965	November	Amory explosion in Iowa	Schwerman, 1967
1966	March	Tornado in Jackson, Mississippi	Schwerman, 1967
1966	March	Train collision in Montana	Schwerman, 1967
1966	April	Tornado in Florida	Schwerman, 1967

1979	N/A	Anthrax release from Sverdlovsk, USSR	Grabenstein, 2002 Idemyor, 2002
1984	N/A	<i>Salmonella typhimurium</i> release in food stocks in Dalles, Oregon	APhA, 2000 Terriff & Tee, 2001 Grabenstein, 2002
1987	N/A	Chemical spill of 55% hydrogen peroxide, a highly combustive liquid, from the ruptured tank of an overturned tractor trailer on an interstate highway near Detroit	Levy, 1987
1989	July	Crash of United Airlines flight 232 at Sioux Gateway Airport, Sioux City, Iowa	Carda, 1989 Gaudette, 2002
1989	September	Hurricane Hugo	Guynn, 1990
1989	November	Tornado in Huntsville, Alabama	Cramer, 1990 Gaudette 2002
1990	N/A	Aum Shinrikyo anthrax and botulinum toxin attacks	Grabenstein, 2002
1991	January	Operation Desert Storm begins	Gaudette, 2002 Robinson, 2003 Young, 2003
1991	N/A	Conflict in Yugoslavia	Bussieres, 2000
1992	August	Hurricane Andrew	Young, 2005
1992	September	Hurricane Iniki	Merges, 1993 Miller, 1993
1992	N/A	Siege of Sarajevo	Bussieres, 2000
1992	N/A	Conflict in Bosnia-Herzegovina	Bussieres, 2000
1993	N/A	World Trade Center bombing, New York City	Grabenstein, 2002
1995	N/A	Tokyo subway sarin attack	APhA, 2000 Burda & Sigg, 2001 Terriff & Tee, 2001 Grabenstein, 2002 Idemyor, 2002 Cohen, 2003
1995	April	Alfred P. Murrah Federal Building bombing, Oklahoma City, Oklahoma	Sagraves, 1995 Gaudette, 2002 Grabenstein, 2002
1996	N/A	Atlanta Olympic Games bombing	Gaudette, 2002
1996	November	Crash of Ethiopian Airlines Boeing 767 in Indian Ocean	Berod & Chan-ou-Teung, 1997
1997	N/A	Anthrax hoax at B'nai B'rith headquarters in Washington, D.C.	Grabenstein, 2002
1998	N/A	Israel distributes an unknown antibiotic to citizenry in response to Iraq SCUD missile threat from U.S. and coalition partners	Grabenstein, 2002

		“saber rattling”	
1999	February	Letters containing anthrax delivered to a dental clinic	Terriff & Tee, 2001
2001	September	World Trade Center, Pentagon attacked, plane downed in Pennsylvania believed to be flying toward White House	Gaudette, 2002 Idemyor, 2002 ASHP, 2003 Cohen, 2003 Pedersen, 2003 Young, 2003 Setlak, 2004 Young, 2004 Young, 2005 Sternbach & Lander, 2006 Austin, 2007 Feret & Bratberg, 2008 Lee et al, 2009 Bhavsar, 2010
2001	October	Anthrax attacks in Washington, D.C., Florida, New Jersey, and New York	Burda & Sigg, 2001 Gaudette, 2002 Haffer, 2002 Idemyor, 2002 ASHP, 2003 Cohen, 2003 Young, 2003 Pedersen, 2003 Setlak, 2004 Sternbach & Lander, 2006 Terriff & Newton, 2008 Lee et al, 2009 Bhavsar, 2010
2001	November	Operation Enduring Freedom	Young, 2003
2002	N/A	SARS outbreak in China	Chin, 2004
2003	March	SARS outbreak in Toronto, Canada	Chin, 2004 Austin, 2007
2004	N/A	Electrical grid failure, North American eastern seaboard	Austin, 2007
2005	August	Hurricane Katrina	Bratberg, 2005 Traynor, 2007 Feret & Bratberg, 2008 Traynor, 2008

			Thompson, 2010
2005	September	Hurricane Rita	Young, 2005 Traynor, 2008
2008	February	Snowstorm in Spokane, Washington	Terriff & Newton, 2008 Traynor, 2008
2008	July	Hurricane Dolly	Lynx, 2009
2008	September	Hurricane Ike	Lynx, 2009
2008	N/S	Tornado and flooding in Iowa	Terriff & Newton, 2008
2009	N/A	H1N1 outbreak	Bhavsar, 2010

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## CHAPTER TWO

### CONCEPTUAL FRAMEWORK AND HYPOTHESES

#### **Journals and Pharmacists' Roles**

The disaster preparedness and response genre in the pharmacy literature continues to develop. Many roles pharmacists are capable of assuming are described, but what remains unclear is if certain roles have been given significantly more attention in the literature than others. One would assume that traditional, routine roles such as dispensing medications and counseling patients would be two that should be well developed in the pharmacy literature, but roles that could be categorized as response integration – namely patient-centered, hands-on functions such as providing direct aid to casualties at the site of disaster – may not be as proportionately represented. There may likely appear unequal representation of pharmacists' roles in the pharmacy literature.

Journals may also report certain types of pharmacy roles. For example, the American Pharmacists Association is a major advocate of pharmacists as immunization providers and devotes a portion of their journal and professional website to help pharmacists attain this certification and maintain immunization practice standards. It is not clear, however, if the Journal of the American Pharmacists Association reports immunization practices as a disaster response function more than other pharmacy

journals. Similarly, the American Journal of Health-System Pharmacy may also limit their reports of role descriptions to those that would most likely interest hospital pharmacists (e.g., developing medication guides, managing emergency formularies, providing poison information services, etc.). Thus, pharmacy journals may show certain biases toward particular disaster preparedness and response functions.

### **Disasters and Pharmacists' Roles**

Terrorism and natural disasters in pharmacy literature may also influence the types of roles that have been reported. The threat of widespread disaster that could be potentiated by the detonation of a small nuclear device, widespread bioterrorism, or the collapse of multiple city skyscrapers may necessitate different role descriptions that would be required in response to a tornado, fire, earthquake, or hurricane, for instance. The functions required of pharmacists may be explained by the type of disaster reported. Roles reported in literature, therefore, may reflect the types of disasters that have occurred.

### **Time and Pharmacists' Roles**

Pharmacists' roles in disaster may also be associated with the dates the roles were described. Table 1 illustrates the cyclical pattern of reports of natural disasters in the 1960s through the 1980s, terrorism in the 1990s and early part of 2000, and natural disasters again in the latter part of the 2000s. That the 1990s may also be a significant

turning point for the introduction of different types of pharmacy roles may be associated with the introduction of the pharmaceutical care paradigm by Hepler and Strand (1990).

## **Research Questions and Hypotheses**

Although it has been shown that disaster-related articles are typically published in medical journals within the first 6 months following a highly publicized event, studies examining long-term health impacts, for example, continue to be published even decades after the initial incident (Smith et al., 2009), suggesting that the impact of a disaster is as important to publishing priority as the immediacy of the event. Assuming that (1) the impact and immediacy of disasters contribute equally to the publishing priority of disaster-related articles and (2) that the disaster genre of peer-reviewed pharmacy literature reflects the current state of pharmacy disaster practice, this research will determine how pharmacists are expected to contribute to disaster management. Six questions and sets of hypotheses are presented below:

Question 1. Are role categories equally proportioned in the pharmacy literature?

- Ho1: All role categories are equally proportioned in the pharmacy literature.
- Ha1: All role categories are not equally proportioned in the pharmacy literature.

Question 2. Do journals significantly differ in the proportion of role categories reported?

- Ho2: Journals do not significantly differ in the proportion of role categories reported.



- Ha2: Journals will significantly differ in the proportion of role categories reported.

Question 3. Do journals significantly differ in the proportion of reported natural and CBRN disasters?

- Ho3: Disasters are independent of pharmacy journals.
- Ha3: Disasters are not independent of pharmacy journals.

Question 4. Do disasters referenced in the pharmacy literature significantly explain pharmacists' disaster roles?

- Ho4: Disasters referenced in the pharmacy literature do not significantly explain pharmacists' disaster roles.
- Ha4: Disasters referenced in the pharmacy literature significantly explain pharmacists' disaster roles.

Question 5. Do significant differences exist in pharmacists' disaster roles when stratified by time?

- Ho5: Significant differences do not exist between role categories when stratified by time.
- Ha5: Significant differences exist between role categories when stratified by time.

Question 6. Do significant differences exist in disasters when stratified by time?

- Ho6: Significant differences do not exist in disasters when stratified by time.
- Ha6: Significant differences exist in disasters when stratified by time.

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## CHAPTER THREE

### RESEARCH METHODOLOGY

#### **Design and Sample**

The nature of explaining and characterizing pharmacists' roles in disaster preparedness and response as reported in the pharmacy literature necessitates an examination of available journal articles. Content analysis, a method of "transforming qualitative material into quantitative data and consisting primarily of coding and tabulating occurrences of certain forms of content that are being communicated" (Rubin & Babbie, 2011), offers the appropriate unobtrusive study design to measure the occurrences of pharmacists' roles and the disasters referenced in the literature. Data will be collected initially to test the coding scheme, which will involve counting the occurrences of specific words or phrases that describe pharmacists' roles and disasters. Data coding will be performed solely by the investigator using Concordance<sup>®</sup> (Harvard University, Cambridge, Massachusetts), a web-based content analysis software.

The unit of observation will be the journal articles used in the study. Articles will be located using tertiary sources such as PubMed, Medline, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), International Pharmaceutical Abstracts (IPA), sociologic sources including sociINDEX and Social Work Abstracts, and the table

of contents of peer-reviewed pharmacy journals. Because peer-reviewed publications are the primary medium for showcasing front-line research, it is assumed that the current state of pharmacy disaster management can be elucidated from an analysis of peer-reviewed pharmacy publications.

## **Measurements and Instrumentation**

**Study One: Pharmacists' Roles in Post-September 11<sup>th</sup> Disasters: A Content Analysis of Pharmacy Literature.** Peer-reviewed pharmacy journals used in the study will be available electronically and will have published at least two articles about pharmacist disaster roles between September 11, 2001 and September 20, 2011. A two-article standard was considered sufficient to show a trend in how journals report various roles and disasters. Variables will be operationalized using the categorization scheme presented by Setlak (2004), and disasters will likewise encompass events classified according to groupings previously mentioned. Storms, a category used in the analysis and not previously defined, encompasses literature reports of rainstorms, windstorms, tropical storms, and snowstorms. Each item in the categories will be quantified, and the cumulative total will be ascribed to the associated category. The role and disaster categories will then be compared using descriptive and inferential statistical methods.

**Study Two: Evaluating Peer-Reviewed Pharmacy Literature to Explain Roles Pharmacists Assume in Disasters: A Quantitative Content Analytic Approach.** Study variables, such as pharmacist roles, disasters, and time period, will be operationalized according to the following schemes. Modified pharmacist role

descriptions will be based on those presented by Setlak (2004). Tornadoes, hurricanes, floods, fires, snow/ice, earthquakes, influenza and severe acute respiratory syndrome (SARS) outbreaks will be classified as natural disasters. Human systems failures will include crashes (automobile, airplane, and train), chemical spills, nuclear plant meltdown, and building collapse. Chemical, biological, radiological, nuclear, and explosive (CBRNE) disasters will encompass chemical and biologic terrorism, use of radiologic dispersal devices (RDD), nuclear terrorism, or use of improvised explosive devices (IED). In order to test for historical differences in the quantities of disaster and role references in peer-reviewed reports, articles will be sorted according to publication date and partitioned in three distinct periods: Cold War Era (1960 – December 1991) (I), Post-Cold War/Pre-Terrorism Era (January 01, 1992 – September 30, 2001) (II), and Terrorism Era (October 01, 2001 – Present) (III). Data collection will be performed solely by the investigator.

## **Data Analysis**

**Study One: Pharmacists' Roles in Post-September 11<sup>th</sup> Disasters: A Content Analysis of Pharmacy Literature.** Total counts from the categories will be used both to describe the data and find differences among the proportions of roles reported and journals reporting the roles. Chi-squared analyses will be used to determine if significant differences exist between the proportions of role categories and to determine if journals significantly differ in the proportion of role categories. Data will be analyzed for

statistical significance ( $\alpha = 0.05$ ) using Minitab (version 15; Minitab, Inc., State College, Pennsylvania).

**Study Two: Study Two: Evaluating Peer-Reviewed Pharmacy Literature to Explain Roles Pharmacists Assume in Disasters: A Quantitative Content Analytic Approach.** A regression model will be used to determine which disasters significantly explain roles assumed by pharmacists. Because count data typically does not conform to Gaussian distribution, several distribution models including Poisson, zero-inflated, hurdle, and gamma regression models will be compared using criteria that characterize data dispersion and model adequacy. Gamma distributions yield inaccurate regression models when dependent variables can be zero, and zero-inflated and hurdle models presuppose the presence of two data-generating processes, one generating zeros and another generating positive values. As data in this analysis do not meet assumptions regarding use of zero-inflated and hurdle models, only Poisson and negative-binomial models will be compared.

Differences in disasters and roles according to time period will be examined using the Kruskal-Wallis test, and, where differences exist, a follow-up multiple comparison procedure (Dunn's test) will be run using an online macro compatible with the statistics software (Elliott & Hynan, 2011). Statistical analysis will be performed using SAS (version 9.3, SAS Institute, Cary, North Carolina) and descriptive statistics, including counts and percentages, will be run using Microsoft Excel (2010, version 14, Microsoft Corp., Redmond, Washington).

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## CHAPTER FOUR

### PHARMACISTS' ROLES IN POST-SEPTEMBER 11<sup>TH</sup> DISASTERS: A CONTENT ANALYSIS OF PHARMACY LITERATURE <sup>1</sup>

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<sup>1</sup> Ford, H., von Waldner, T., and Perri, M. Accepted by *Journal of Pharmacy Practice*.  
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**Purpose:** To characterize the roles pharmacists have assumed in disasters and clarify the types of roles and disasters that may be less well documented in the pharmacy literature.

**Methods:** This research examines how balanced or equally proportioned role categories are in the pharmacy literature, if pharmacy journals differ in the proportion of role categories reported, and if journals significantly differ in the proportion of reported chemical, biological, radiological, nuclear (CBRN) and natural disasters. Data coding was performed solely by the lead author using Concordance (Harvard University, Cambridge, Massachusetts), a web-based content analysis software, and Minitab (version 15; Minitab, Inc.; State College, Pennsylvania) for descriptive and inferential statistical analysis. Pharmacy journals publishing at least two articles about pharmacist disaster roles from September 11, 2001 to September 30, 2011, were used in the study and were available electronically. **Results:** Chi-square analyses reveal significant differences in the weighted counts of roles, roles categorized by journal, and CBRN disasters categorized by journal. **Conclusions:** Data suggest that pharmacists may be prepared to respond to hurricanes and biologic and chemical disasters in pharmaceutical supply and patient management roles. Future research should highlight efforts to prepare health systems for the effects of nuclear, radiological, and chemical disasters.

**Keywords.** Disaster management, disaster preparedness, natural disasters, terrorism, pharmacist roles

## **Introduction and Purpose Statement**

The role of the pharmacist in disaster preparedness and response has become increasingly important since the terrorist attacks on the World Trade Center and Pentagon. Pharmacists have traditionally managed the nation's drug supply by dispensing prescription medications to patients presenting with a physician's order, but while this role continues as the mainstay of most pharmacy practices, pharmacists' skills have developed well beyond those traditionally described.<sup>1</sup> With the advent of the pharmaceutical care paradigm introduced by Hepler and Strand in the early 1990s, pharmacists have assumed more patient-oriented roles in their daily activities, moving beyond traditional dispensing duties and actively assuming the responsibilities of a primary care provider.<sup>2</sup> Some of these activities include counseling patients regarding medication use, managing oral and intravenous medications, consulting with prescribers regarding optimal pharmacotherapy and parenteral nutrition, and monitoring patients for drug-related problems.

Practice activities have embraced the ideals of ensuring proper use of medications and mitigating human suffering. Austin and colleagues, for example, note that in times of crisis, local pharmacies become crucial to maintaining public healthcare services, and pharmacists, the health professional group most accessible to the public, assume responsibilities beyond their traditional scope of practice.<sup>3</sup> Older research, including Braucher's description of pharmacist roles in relief efforts after a simulated nuclear detonation, are particularly relevant to a post-September 11th era and certify the importance of pharmacist participation in disaster preparedness and response, especially when few health care providers are expected to survive the initial events.<sup>4</sup>

Disaster preparedness and response is a specific domain in which pharmacists can provide valuable expertise to improve patient outcomes and promote appropriate medication use. Although resource-depleting disasters present scenarios where pharmacists assume tasks traditionally belonging to other disciplines, these scenarios have not been sufficiently elucidated in the literature.<sup>3</sup> Multiple reports describe the utility of traditional and expanded activities of pharmacy practice in a variety of natural and man-made disasters, with the pool of published articles continuing to increase.<sup>5-48</sup> As Cohen notes, however, little attention has been given to characterizing the roles of pharmacists in disasters even though the importance of pharmacists' involvement is widely acknowledged.<sup>5</sup> In fact, no report to date has been published that both characterizes the roles pharmacists have assumed in disasters and clarifies the types of roles that may be less well documented in pharmacy literature. Consequently, various roles may be understated, pharmacy response to disasters may be less well developed, and the capability of terrorists to do harm may ultimately be increased.

When considering the reports describing how pharmacists have responded to disasters, questions arise: which roles and disasters have the most literature support, and do journals show tendencies in reporting particular roles and disasters? One would assume that traditional, routine roles such as dispensing medications and counseling patients would be two that should be well developed in the pharmacy literature, but patient-centered, hands-on functions such as providing direct aid to casualties at the site of disaster may not be as proportionately represented. Pharmacists' roles in the pharmacy literature may be unequally distributed.

Journals may also significantly record more of specific types of pharmacy roles. For example, the American Pharmacists Association is a major advocate of pharmacists as immunization providers and devotes a portion of their journal and professional website to help pharmacists attain certification and maintain immunization practice standards. It is not clear, however, if the *Journal of the American Pharmacists Association* reports immunization practices as a disaster response function more than other pharmacy journals. Similarly, the *American Journal of Health-System Pharmacy* may also limit their reports of role descriptions to those that would most likely interest hospital pharmacists (e.g., developing medication guides, managing emergency formularies, providing poison information services, etc.). Pharmacy journals may show tendencies in reporting particular disaster preparedness and response functions and thus perceive certain events as more relevant than others. This could unexpectedly present unique challenges to the provision of pharmacy services if certain disasters are not adequately addressed in the literature.

Chemical, biologic, radiologic, nuclear (CBRN) and natural disasters reported in pharmacy literature may also be unequally proportioned. For example, widespread disasters caused by detonation of a small nuclear device, widespread bioterrorism, collapse of multiple city skyscrapers or due to natural causes may not be proportionately recorded in the literature and thus represent areas of pharmacy preparedness that are inadequately developed.

Thus, the purpose of this research is to describe pharmacists' disaster preparedness and response roles according to published reports in pharmacy literature and to clarify the types of disasters that have been reported. To this end, three primary questions will be

addressed. (1) How balanced or equally proportioned are role categories in the pharmacy literature? (2) Do journals significantly differ in the proportion of role categories reported? (3) Do journals significantly differ in the proportion of reported natural and CBRN disasters?

## **Methods**

**Role Categorization.** Pharmacists' roles in disasters have been categorized in at least three reports in the pharmacy literature.<sup>6-8</sup> Pincock and colleagues present a disaster-readiness model to better prepare pharmacists and disasters planners for future contingencies. A second categorization elucidated by Chin and colleagues is noteworthy for the identification of five categories of pharmacy functions: drug information, direct patient care, pharmacy operations, collaboration & communication, and personnel management. However, in terms of characterizing and explaining pharmacists' roles in disasters, perhaps the most carefully defined categorization of pharmacists' functions is set forth by Setlak, who identifies four main types: response integration, patient management, pharmaceutical supply, and policy coordination. Response integration describes pharmacists integrating into the casualty response by triaging patients alongside physicians and nurses and administering first aid and cardiopulmonary resuscitation as experience and training allow. Patient management, the second category, involves patient-centered approaches to managing medication therapy outcomes. Pharmaceutical supply, the third category, describes the logistics of providing medications to large numbers of patients, and the last category describes the need for pharmacists to help

coordinate disaster policy to eliminate duplicate therapies in emergency formularies, streamline paperwork to avoid duplicative forms, and generally apply drug expertise in decision-making.<sup>7</sup> This paper organizes the broad array of pharmacy literature reports of pharmacists' disaster functions according to the Setlak categorization.

**Disasters in the Pharmacy Literature.** Numerous references to disasters have appeared in the pharmacy literature since as early as the 1960s. Two classifications – natural disasters and terrorism – will be used to classify disaster types. Table 2 describes the disaster classification scheme used in this analysis. Natural disasters may include tornadoes, fires, earthquakes, floods, or any manmade accident. Terrorism includes chemical, biological, radiological, or nuclear terrorism or use of any “violent or threatening means to intimidate or coerce, especially for political purposes.”<sup>9</sup>

Table 3 displays the chronologic order of the disasters with journal articles that give reference. The disaster genre of pharmacy literature beginning in the early 1960s to the 1980s exclusively reflects responses to natural disasters. The 1980s begin to reference terrorism, with the quantity of literature citations growing substantially in the 1990s. While the 2000s are dominated primarily by articles citing natural disasters, the two main acts of terrorism frequently referenced by articles in the pharmacy literature are the September 11, 2001 attacks on the World Trade Center and Pentagon as well as the October 2001 anthrax attacks in Washington, D.C., Florida, New Jersey, and New York. Particularly noteworthy is the prevalence of terrorism reports from 1993 to 2001, with natural disasters dominating literature before and after this period.

## **Design and Sample**

The nature of explaining and characterizing pharmacists' roles in disaster preparedness and response as reported in the pharmacy literature necessitates an examination of available journal articles. Content analysis, a method of "transforming qualitative material into quantitative data and consisting primarily of coding and tabulating occurrences of certain forms of content," offers the appropriate unobtrusive study design to measure the occurrences of pharmacists' roles and the disasters referenced in the literature.<sup>10</sup> Data was collected initially to test the coding scheme, which involved counting the occurrences of specific words or phrases such as "consultant," "dispensing," "counseling," "distribution," "triage," "bioterrorism," "nuclear," "anthrax," "weapons of mass destruction (WMD)", "hurricane," or "tornado" that describe pharmacists' roles and disasters. Data coding was performed solely by the lead author using Concordance<sup>®</sup> (Harvard University, Cambridge, Massachusetts), a web-based content analysis software.

The units of analysis and observation are journal articles used in the study. Articles were located using tertiary sources such as PubMed, Medline, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), International Pharmaceutical Abstracts (IPA), sociological sources including sociINDEX and Social Work Abstracts, and the table of contents of peer-reviewed pharmacy journals. Because peer-reviewed publications are the primary medium for showcasing front-line research, it is assumed that the current state of pharmacy preparedness can be elucidated from an analysis of peer-reviewed pharmacy publications. As such, peer-reviewed pharmacy journals used in

the study were available electronically and published at least two articles about pharmacist disaster roles between September 11, 2001 and September 30, 2011.

An initial total of 103 journal articles were available for analysis. Of this pool of articles, 31 were published outside the pharmacy literature, 18 were published prior to September 11, 2001, 7 articles were unavailable electronically, 4 articles represented non-peer-reviewed literature, 4 were substantively unrelated to the topic of research, and 2 articles were published in a non-English language. Thus, a total of 37 articles were included in the final analysis.

### **Measurements and Instrumentation**

Variables were operationalized using the categorization scheme presented by Setlak, and disasters likewise encompassed events classified according to groupings previously mentioned.<sup>7</sup> Storms, a category used in the analysis and not previously defined, encompasses literature reports of rainstorms, windstorms, tropical storms, and snowstorms. Each item in the categories was quantified, and the cumulative total was ascribed to the associated category. The role and disaster categories were then compared using descriptive and inferential methods.

### **Data Analysis**

Totals from the categories were used both to describe the data and find differences among the proportions of roles reported and journals reporting the roles. Chi-



squared analyses were used to determine if significant differences exist between the proportions of role categories and to determine if journals significantly differ in the proportion of role categories reported. Data were analyzed for statistical significance ( $\alpha = 0.05$ ) using Minitab software (version 15; Minitab, Inc; State College, Pennsylvania).

## Results

With exception to response integration roles, only 4 of which were recorded in the article sample, weighted counts of pharmacy roles in all the journals show a decreasing trend in pharmacist role reports beginning with patient management and moving to the pharmaceutical supply and policy coordination categories (Figure 1). Chi-square goodness-of-fit analysis of the weighted counts suggest very significant differences between response integration, patient management, pharmaceutical supply, and policy coordination roles ( $p < 0.001$ ,  $X^2 = 71.59$ ).

Figure 2 shows pharmacy roles categorized according to journal. Data strongly suggest that role categories are proportioned unequally among the journals sampled ( $p = 0.002$ ,  $X^2 = 25.905$ ). Pharmaceutical supply responsibilities are predominant in the *American Journal of Health-System Pharmacy* but are emphasized to a lesser degree in other journals. Patient management roles, by contrast, are more frequently reported in the *Journal of the American Pharmacists Association*, *Annals of Pharmacotherapy*, and *Pharmacotherapy*. While policy coordination and response integration describe potential

roles for pharmacists in disasters, they are not emphasized to a great extent in the journal sample.

Differences in the weighted counts of natural disasters reported did not reach statistical significance ( $p = 0.358$ ,  $X^2 = 0.846$ ). Hurricanes are the predominant natural disaster recorded (Figure 3). Other natural disasters, including floods, earthquakes, and fires, were not recorded in the sample of articles. Biologic disasters also predominate among CBRN disasters (Figure 4) reported in the pharmacy journals, where evidence strongly suggests differences in the proportion of documented CBRN disasters ( $p < 0.001$ ,  $X^2 = 70.945$ ).

## **Discussion**

Pharmaceutical supply has been the primary focus of pharmacy services since the advent of mass-produced, standardized, and highly sophisticated pharmaceutical dosage forms and delivery systems. However, the dispensing paradigm of pharmacy service delivery began transitioning to a more patient-centered focus with the introduction of the pharmaceutical care model by Hepler and Strand.<sup>2</sup> Since that time, the profession has increasingly diversified to incorporate specialty practices in almost every area of medical science, including disaster preparedness.

That a substantial number of disaster role reports include non-supply activities is not surprising since disaster preparedness itself represents a pharmacy specialty practice. The plethora of patient management roles, in contrast to the comparatively minimal reports of policy coordination and response integration activities, may reflect the degree

to which pharmacists are currently employed. For example, most pharmacists may not be directly involved in routine triage and first-aid activities as emergency medical technicians, nurses, or physicians might be, and policy coordination may be less of a professional interest for those involved in patient management and pharmaceutical supply services. These lesser-documented non-traditional pharmacist activities, however, are supported by national pharmacy organizations such as the American Society of Health System Pharmacists (ASHP). The organization, for example, encourages pharmacist participation in disaster planning, particularly coordinating institutional pharmaceutical plans with private, local, state, and federal planners. It also recognizes the need for pharmacists to develop first aid, cardiopulmonary resuscitation (CPR), and basic cardiac life support (BCLS) skills to better integrate with medical responders.<sup>11</sup> This analysis, albeit a static, cross-sectional view of the current state of pharmacy's role in disasters, may reflect the beginning of a rising trend in those areas currently under-reported, namely in response integration and policy coordination.

While the comparatively high number of patient management reports in *Annals of Pharmacotherapy* and *Pharmacotherapy* are not unexpected given their clinical orientations, the differences observed in the pharmaceutical supply and patient management categories in the *American Journal of Health-System Pharmacy* and *Journal of the American Pharmacists Association* are more interesting. Because the journals represent two vast and related sectors of the profession – hospital and community pharmacy – it would not be surprising to find their role categories roughly equally distributed. For example, both journals represent issues concerning pharmaceutical supply and clinical management. However, the preponderance of reports in the *Journal*

*of the American Pharmacists Association* related to vaccinations and individual and group counseling may have tipped the proverbial balance toward a more clinical orientation.

Hurricanes, storms, and tornadoes are the most frequently reported natural disasters found in the pharmacy literature. This finding corresponds well with the types of disasters that led to Presidential Disaster Declarations between 1964 and 2007, approximately 67 percent of which were severe storms and hurricanes.<sup>12</sup> It is possible that the media attention given to Hurricanes Katrina and Rita may have affected the growth of practice reports describing pharmacy response in these types of natural disasters.

Chemical, biologic, radiologic, and nuclear threats have been given significant attention by the medical community since the September 11 attacks on the United States. Biologic terrorism has generally been the expected mode of attack for various reasons. For instance, casualties resulting from the release of kilogram of anthrax spores can approximate the number of casualties expected from a one kiloton nuclear blast. Biologic attacks are also insidious, require widespread patient care, and could result in extensive fatalities.<sup>13</sup>

Chemical disasters, too, are also anticipated even though, according to our data, the expectation is likely less than that of biologic disasters. The chlorine gas and methyl isocyanate releases in Graniteville, South Carolina, and Bhopal, India, respectively, provide prescient reminders of the need for preparation for catastrophic chemical events.

Nuclear and radiologic disasters, however, may represent the soft underbelly of disaster medicine. Our data shows that most of the articles sampled refer predominantly

to biologic and chemical disasters and infrequently to radiologic and nuclear disasters. The data corroborates well with statistics reported by the Council of State and Territorial Epidemiologists which indicate that as much as 85 percent of states have an insufficient capability to respond to a radiation incident. One important question that may be considered is, “why are there virtually no references in pharmacy literature to the health consequences of nuclear disaster?” It may, in part, be due to the notion that nuclear disasters are so terrible that nothing can be done.<sup>14</sup> It may also be due to the fact that a nuclear disaster has not occurred recently within the United States. Another interesting explanation holds that many in the medical and public health communities consider nuclear terrorism unlikely in comparison to chemical or biologic terrorism. However, as Dallas and Burkle discussed, this notion may reflect mass denial, where many “attempt to reject conscious knowledge of unacceptable events.”<sup>15</sup> When considering Iran’s unfaltering pursuit of nuclear weapons, the conventional understanding of Israel’s vast nuclear weapons capability, the failed state of North Korea which uses threats as its only diplomatic leverage, and the ubiquitous religious extremism in the Middle East, the likelihood of nuclear disaster in the coming years is much greater than the literature may indicate.<sup>15</sup> Fortunately, this neglect of nuclear and radiologic preparedness, which is also a significant concern of the medical community, is now being addressed in the hope that efforts will “greatly enhance our ability to mitigate this impact so that we can realistically think from a population perspective of mutually assured survival.”<sup>14</sup>

## **Limitations**

Peer-reviewed pharmacy literature is an important means of communicating key information to the profession. Non-peer-reviewed pharmacy literature, however, is also a significant method of communicating with both pharmacists and non-pharmacist readers. Although this analysis excluded this important source of information related to disasters, including articles of this type would enhance the robustness of the results.

Another particularly relevant limitation is the exclusion of non-electronically available journal articles. Seven articles were excluded for this reason that would otherwise have been an ample source of data.

Because pharmacy contributes substantially to public health practices, peer-reviewed and non-peer-reviewed public health journals are also another source of evidence for disaster-related pharmacist activities that would supplement the data used in this study.

Perhaps the most significant sources of information not used in this analysis are peer-reviewed and non-peer-reviewed journal articles published prior to September 11, 2001. The present study aimed to determine the current level of professional preparedness and thus limited the scope of articles to those published within the past decade. Lessons from history, however, should not be neglected, and further research should examine this source of information for guidance in future disaster-related planning.

Boolean-type functions available in the Concordance software package were not used to define relationships with words or groups of words; thus, the results may only

approximate the true number of references to pharmacist roles and disasters in the literature.

## **Conclusion**

Data suggest that pharmacists may be prepared to respond to hurricanes and biologic and chemical disasters in pharmaceutical supply and patient management roles. However, it also underscores the need for greater attentiveness to response integration and policy coordination responsibilities and readiness in nuclear and radiologic disaster preparedness as well.

The implications of the research may be far-reaching. As the pharmacy profession develops its various roles in disaster management, the entire medical response will benefit. Local, state, and federal planners will be able to allocate scarce human resources more effectively when the pharmacy response capabilities are well-developed. Ultimately, the ability of terrorists to disrupt society will decrease, and the response to natural disasters will be greatly augmented by the multiple proficiencies the profession continues to develop.

This analysis also reveals the liabilities of the profession's disaster capability, a vulnerability that could be exploited either intentionally through terrorism or unintentionally through natural events. The lack of recorded efforts in policy coordination and response integration activities may impede the development and execution of a robust pharmacy response. Pharmacy journals may consider encouraging

future practice reports and research papers highlighting these important roles as well as efforts to prepare health systems for the effects of nuclear and radiologic disasters.



## TABLES

Table 2. Disaster classification scheme

<b>Natural Disasters</b>
<b>Tornadoes</b>
<b>Fires</b>
<b>Earthquakes</b>
<b>Floods</b>
<b>Hurricanes</b>
<b>Storms</b> (Rainstorms, Windstorms, Tropical storms, Snowstorms)
<b>Manmade accidents*</b> (train, car, & plane crashes)
<b>Chemical, Biologic, Radiologic, Nuclear (CBRN) Disasters (Including Terrorism)</b>
<b>Chemical</b> (any chemical agent as well as bombs, explosions, and explosives)
<b>Biologic</b> (any biologic agent as well as pandemic influenza)
<b>Radiologic</b> (including “dirty bombs”)
<b>Nuclear</b>

\*Excludes CBRN disasters

Table 3. Chronologic order of and article reference for disasters appearing in the pharmacy literature

Year	Month	Event	Reference
1963	October	Coliseum explosion in Indianapolis	17
1965	November	Amory explosion in Iowa	17
1966	March	Tornado in Jackson, Mississippi	17
1966	March	Train collision in Montana	17
1966	April	Tornado in Florida	17
1979	N/A	Anthrax release from Sverdlovsk, USSR	23, 36
1984	N/A	<i>Salmonella typhmurium</i> release in Dalles, Oregon food stocks	13, 23, 35
1987	N/A	Chemical spill of 55% hydrogen peroxide from ruptured tank of an overturned tractor trailer near Detroit	16
1989	July	Crash of United Airlines flight 232 at Sioux Gateway Airport, Sioux City, Iowa	18, 33
1989	September	Hurricane Hugo	30
1989	November	Tornado in Huntsville, Alabama	18, 37
1990	N/A	Aum Shinrikyo anthrax and botulinum toxin attacks	23
1991	January	Operation Desert Storm begins	18, 26, 38

1991	N/A	Conflict in Yugoslavia	39
1992	August	Hurricane Andrew	21
1992	September	Hurricane Iniki	27, 37
1992	N/A	Siege of Sarajevo	39
1992	N/A	Conflict in Bosnia-Herzegovina	39
1993	N/A	World Trade Center bombing, New York City	23
1995	N/A	Tokyo subway sarin attack	5, 13, 23, 35, 36, 40
1995	April	Alfred P. Murrah Federal Building bombing, Oklahoma City, Oklahoma	18, 19, 23
1996	N/A	Atlanta Olympic Games bombing	18
1996	November	Crash of Ethiopian Airlines Boeing 767 in Indian Ocean	41
1997	N/A	Anthrax hoax at B'nai B'rith headquarters in Washington, D.C.	23
1998	N/A	Israel distributes an unknown antibiotic to citizenry in response to Iraq SCUD missile threat	23
1999	February	Letters containing anthrax delivered to a dental clinic	35
2001	September	World Trade Center, Pentagon attacked, plane downed in Pennsylvania believed to be flying	3, 5, 7, 11, 18, 19, 24, 26, 36, 42, 43, 44, 45, 46

		toward White House	
2001	October	Anthrax attacks in Washington, D.C., Florida, New Jersey, and New York	5, 7, 11, 18, 26, 29, 32, 36, 40, 42, 43, 45, 46
2001	November	Operation Enduring Freedom	26
2002	N/A	SARS outbreak in China	6
2003	March	SARS outbreak in Toronto, Canada	3, 6
2004	N/A	Electrical grid failure, North American eastern seaboard	3
2005	August	Hurricane Katrina	25, 31, 34, 44, 47, 48
2005	September	Hurricane Rita	21, 31
2008	February	Snowstorm in Spokane, Washington	31, 32
2008	July	Hurricane Dolly	49
2008	September	Hurricane Ike	49
2008	N/S	Tornado and flooding in Iowa	32
2009	N/A	H1N1 outbreak	46

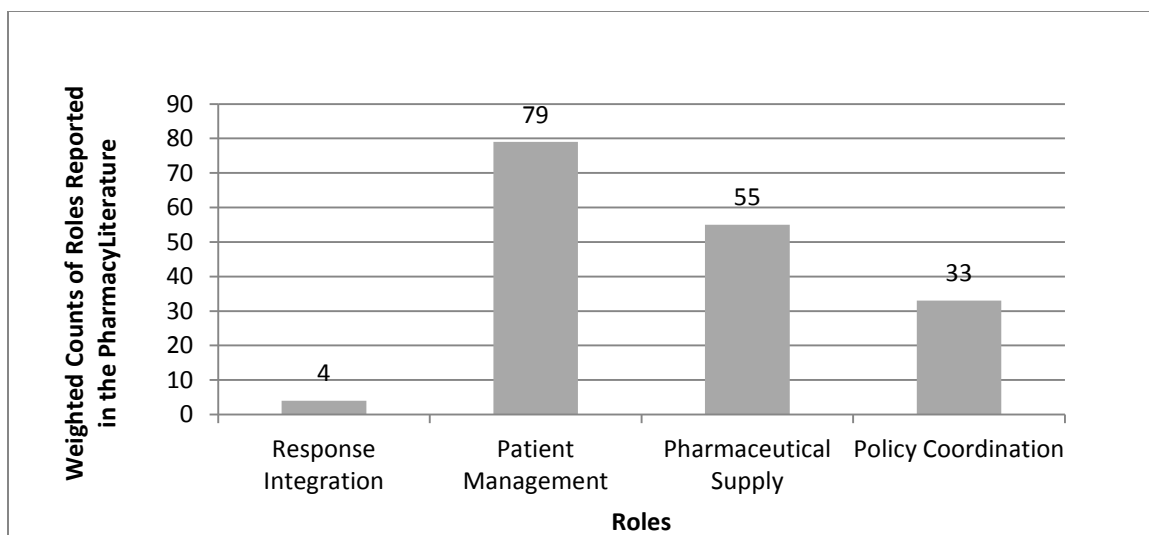


Figure 1. Weighted counts of roles reported in the pharmacy literature.

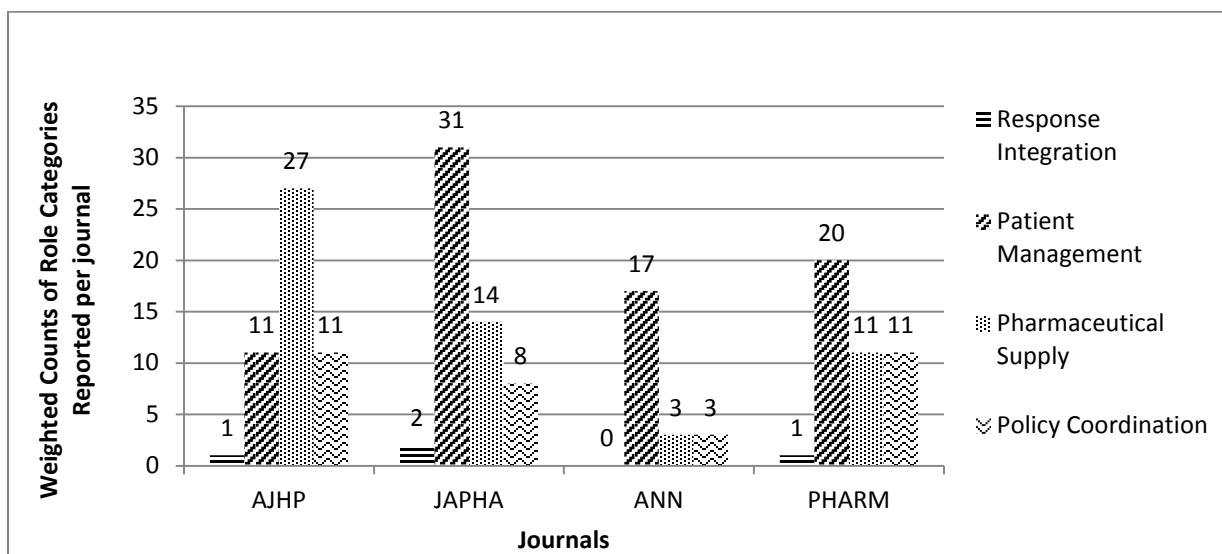


Figure 2. Roles categorized according to journals. American Journal of Health-System Pharmacy (AJHP), Journal of the American Pharmacists Association (JAPHA), Annals of Pharmacotherapy (ANN), and Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy (PHARM).

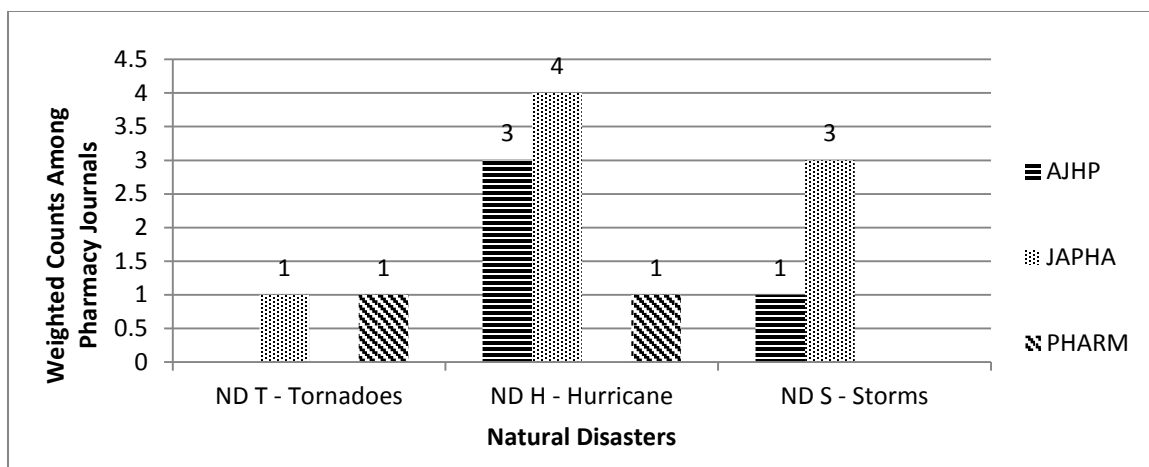


Figure 3. Natural disasters categorized according to journal. American Journal of Health-System Pharmacy (AJHP), Journal of the American Pharmacists Association (JAPHA), and Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy (PHARM).

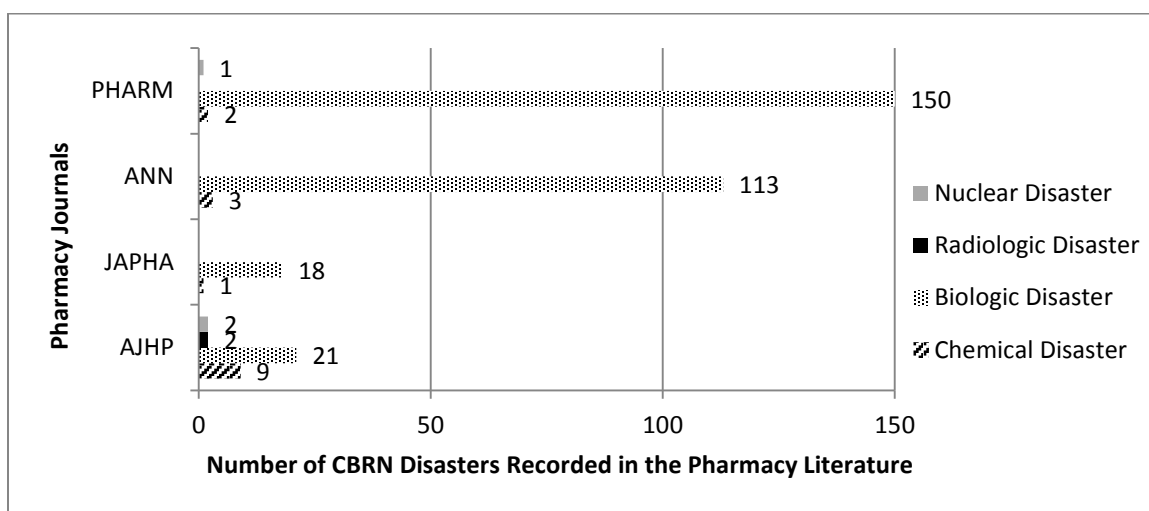


Figure 4. Chemical, biological, radiological, and nuclear (CBRN) disasters categorized according to journal. American Journal of Health-System Pharmacy (AJHP), Journal of the American Pharmacists Association (JAPHA), Annals of Pharmacotherapy (ANN),

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## CHAPTER FIVE

### EVALUATING PEER-REVIEWED PHARMACY LITERATURE TO EXPLAIN ROLES PHARMACISTS ASSUME IN DISASTERS: A QUANTITATIVE CONTENT ANALYTIC APPROACH <sup>2</sup>

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<sup>2</sup> Ford, H., Dallas, C., Harris, C. Submitted to *Disaster Medicine and Public Health Preparedness*, 05/30/13.

**Objective:** Numerous practice reports recommend roles pharmacists may adopt during disasters. Assuming peer-reviewed pharmacy literature adequately reflects the current state of pharmacy practice in disaster management, this study examines peer-reviewed literature for factors that explain roles pharmacists assume in disasters and differences in roles and disasters when stratified by time.

**Methods:** A quantitative content analysis technique was used to gather data consisting of words and phrases from peer-reviewed pharmacy literature regarding pharmacists' roles in disasters. Negative binomial regression and Kruskal-Wallis non-parametric models were applied to the data to determine factors that significantly explain roles pharmacists adopted in disasters and how roles and disasters differ according to time period.

**Results:** Pharmacists' roles in disasters have not changed significantly since the 1960s. Pharmaceutical supply remains the pharmacists' preferred role while patient management and response integration roles decrease in context of common, geographically widespread disasters. Policy coordination roles, however, significantly increase in context of nuclear terrorism planning.

**Conclusions:** Pharmacists adoption of non-pharmaceutical supply roles may represent a paradigm shift problem in non-traditional role acceptability. The possibility of manpower shortages in future disasters may force a change in pharmacists' approach to disaster management.

## Introduction

Disasters present unique challenges and opportunities to the medical community. Since the terrorist attacks of September 11, 2001, United States healthcare institutions have advanced in developing methods to allocate sufficient human resources to manage the demands associated with disasters.<sup>1-3</sup> Pharmacists represent a specific health resource uniquely positioned to render a general scope of health services in disasters. Since the publication of Hepler and Strand's pharmaceutical care paradigm, which signaled the profession's shift from product- to patient-centered orientation<sup>4</sup>, pharmacists' capacity for direct patient care has expanded in many ways, particularly in the context of disaster management.<sup>2, 5-7</sup>

Several categorization methods have been developed to characterize traditional and patient-oriented responsibilities in disasters.<sup>5, 6, 8</sup> One classification method identifies five categories of pharmacist disaster duties and involves developing drug use guidelines and dosing charts, establishing drug distribution systems, providing drug counseling, obtaining medication histories, communicating with key medical personnel, and handling new situations creatively.<sup>8</sup> Another method distributes disaster duties among various pharmacy specialty practices.<sup>6</sup> For example, clinical roles involve detecting and resolving drug-related problems<sup>4</sup> for patients with moderate or severe chronic and acute conditions (ambulatory care, pharmacotherapy, or critical care specialties).<sup>6</sup> Other roles include medication procurement, storage, inventory, distribution, logistics and management.<sup>6</sup>

Although the preceding categorization methods provide focused descriptions of disaster roles within a limited, pharmacy-centered framework, they exclude integrated duties that may be required of pharmacists in a broader, medical context. The most widely inclusive classification of pharmacists' functions (and the basis of the classification method used in this analysis) is set forth by Setlak, who identifies four general disaster duties: response integration, patient management, pharmaceutical supply, and policy coordination.<sup>5</sup> Response integration refers to pharmacists integrating into the casualty response by triaging patients alongside physicians and nurses, administering first aid and cardiopulmonary resuscitation. Patient management involves monitoring patient outcomes after administration of medical countermeasures and communicating with patients and the public about therapies used to counter various natural and man-made threats. Pharmaceutical supply concerns the coordination of the dispensing site layout, medication procurement, repackaging, distribution and control. Policy coordination corresponds to eliminating duplicate therapies included in emergency formularies, streamlining paperwork to avoid duplicative forms, and applying drug expertise in decision-making.<sup>5</sup>

As the pharmacy literature showcases examples of pharmacists proffering their medical skills in response to the needs of disaster victims, disaster-related practice reports can provide a framework to examine associations between pharmacists' roles and disasters. It has been shown that disaster-related articles are typically published within the first six months following a highly publicized event, with studies examining long-term health impacts published decades after the initial incident.<sup>9</sup> This suggests that the impact of the disaster is as important to publishing priority as the immediacy of the event.



Time also represents an important consideration when analyzing peer-reviewed disaster reports. Cold War Era (1950s – 1990s) disasters and disaster-related activities can differ in many respects from those of Post-Cold War/Pre-Terrorism (1990 – 2001) or Terrorism (2001 – Present) Eras. Nuclear disasters (i.e., mutually assured destruction or MAD) and response integration duties, for instance, may be emphasized more in Cold War Era literature than in other times. Anthrax, pandemic influenza, and terrorism threats, coupled with a patient management and policy coordination focus, may characterize the Terrorism Era more than past eras. While hurricanes may evoke pharmaceutical supply, policy coordination, and patient management roles in the current era, references to natural disasters (excluding the numerous references to Hurricanes Katrina and Rita) may not characterize a particular time period.

Available literature regarding pharmacists' involvement in disasters is primarily relegated to disaster-related practice reports and professional position statements. Few articles systematically analyze disaster-related issues, and no article to date has inferred the factors that might explain pharmacists' participation in disasters. Assuming that (1) the impact and immediacy of disasters contribute equally to the publishing priority of disaster-related articles and (2) disaster-related practice reports in peer-reviewed pharmacy literature serve as adequate markers of the profession's level of disaster preparedness, this analysis determines factors that significantly explain pharmacists' disaster roles and examines differences in roles and disasters when stratified by time.

## Methods

Content analysis is a method of quantifying the presence of certain words or phrases in written media and is thus a useful tool for evaluating literature reports of pharmacists' roles in disasters.<sup>10</sup> Accordingly, the units of observation are the individual articles from which observations are made, and the units of analysis are words or phrases within the articles that denote pharmacists' roles in various disasters.

A comprehensive literature search was conducted using PubMed, Medline, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), and International Pharmaceutical Abstracts (IPA) for articles in peer-reviewed pharmacy journals describing pharmacists' roles in disasters. Articles relating to disasters, published in the English language between 1960 and 2012, and available through library sources – a total of 98 peer-reviewed articles – were included in the analysis.

Study variables, such as pharmacist roles, disasters, and time period, were operationalized according to the following schemes. Modified pharmacist role descriptions were based on those presented by Setlak<sup>5</sup> and are shown in Table 1. Tornadoes, hurricanes, floods, fires, snow/ice, earthquakes, influenza and severe acute respiratory syndrome (SARS) outbreaks were classified as natural disasters. Human systems failures (HSF) included crashes (automobile, airplane, and train), chemical spills, nuclear plant meltdown, and building collapse. Chemical, biological, radiological, nuclear, and explosive (CBRNE) disasters encompassed chemical and biologic terrorism, use of radiologic dispersal devices (RDD), nuclear terrorism, or use of improvised explosive devices (IED). In order to test for historical differences in the quantities of

disaster and role references in peer-reviewed reports, articles were sorted according to publication date and partitioned in three distinct periods: Cold War Era (1960 – December 1991) (I), Post-Cold War/Pre-Terrorism Era (January 01, 1992 – September 30, 2001) (II), and Terrorism Era (October 01, 2001 – Present) (III). Data collection was performed solely by the lead author.

A negative binomial regression model was chosen to determine which disasters significantly explain roles assumed by pharmacists. Because count data typically does not conform to Gaussian distribution, several models including Poisson, zero-inflated, hurdle, and gamma regression models were compared using criteria that characterize data dispersion and model adequacy.<sup>11</sup> Gamma distributions yield inaccurate regression models when dependent variables can be zero, and zero-inflated and hurdle models presuppose the presence of two data-generating processes, one generating zeros and another generating positive values.<sup>11</sup> Data in this analysis did not meet these assumptions. As data was found to be over-dispersed (as indicated by mean and variance estimates), a negative binomial model was preferred over a Poisson model, which is less commonly applied with over-dispersed count data.<sup>11</sup> Thus, the negative binomial distribution was chosen for regression modeling.

The regression equation took the form:

$$\lambda_i = \exp(\beta x_i + \epsilon_i)$$

where  $\lambda_i$  is the estimate,  $\beta_i$  the coefficient, and  $\epsilon_i$  the error term. Negative binomial regression models the log of incident counts, with coefficients interpreted accordingly: for a one unit change in  $\lambda_i$ , the log of  $\beta_i$  is expected to change by the regression

coefficient.<sup>12</sup> Negative binomial regression also gives the option of interpreting the effects of independent variables on the dependent variable in terms of incident rate ratios (IRR), which represent the percentage increase or decrease in the dependent variable.<sup>12</sup> Since IRRs are interpreted more intuitively, IRRs will be used to describe the results of the regression analyses.

Differences in disasters and roles according to time period were examined using the nonparametric Kruskal-Wallis test, and a follow-up multiple comparison procedure (Dunn's test) was run using an online macro compatible with the statistics software.<sup>13</sup> Statistical analysis was performed using SAS<sup>14</sup> and descriptive statistics, including counts and percentages, were run using Microsoft Excel.<sup>15</sup>

## **Results**

Figure 5 shows the cumulative percentages of pharmacists' roles referenced in the pharmacy literature since the 1960s. Pharmaceutical supply predominates among role reports, with the percentage of era-specific pharmaceutical supply reports decreasing over time (56, 52, and 46 percent in Cold War (I), Post-Cold War/Pre-Terrorism (II), and Terrorism Eras (III), respectively). Significant differences in mean ranks of role categories, however, were not observed across eras ( $p = 0.169, 0.5831, 0.1684, 0.2953$  for patient management, response integration, policy coordination, and pharmaceutical supply, respectively).

Figure 6 shows the cumulative percentages of disasters referenced in the pharmacy literature since the 1960s, with references to bioterrorism, chemical terrorism,

hurricanes, and influenza outbreaks jointly comprising 73 percent of all disaster references. On a percentage basis, several disasters contribute substantially to reports published each era. Chemical spills, hurricane, and tornado reports comprise 27, 25, and 16 percent of disasters reported in the Cold War Era (I), respectively. While contributing little to the total percentages of Cold War Era (I) disasters, reports of nuclear terrorism comprise all CBRNE disasters reports. Bioterrorism, hurricane, and nuclear plant meltdown references occur most frequently during the Post-Cold War/Pre-Terrorism Era (II), comprising 39, 29, and 10 percent of disaster reports, respectively. Bioterrorism, influenza outbreaks, hurricanes, and chemical terrorism reports are among the most frequently occurring disasters in the Terrorism Era (III), accounting for 38, 16, 10, and 11 percent of disaster reports, respectively.

When stratified by era, significant differences in mean ranks of disasters were observed. Mean ranks of bioterrorism references strongly differ between both Terrorism (III) and Cold War Eras (I) and between Terrorism (III) and Post-Cold War/Pre-Terrorism (II) Eras ( $H = 21.6566$ , d.f. = 2,  $p < 0.0001$ ). Mean ranks of chemical terrorism references also strongly differ between Terrorism (III) and Cold War (I) Eras ( $H = 12.615$ , d.f. = 2,  $p = 0.0018$ ). Mean ranks of tornado references significantly differ between Cold War (I) and Post-Cold War/Pre-Terrorism (II) Eras ( $H = 8.1922$ , d.f. = 2,  $p = 0.0166$ ). Significant differences in mean ranks of building collapse references (which primarily refer to the collapse of the World Trade Center towers) occur between the Terrorism (III) and Post-Cold War/Pre-Terrorism (II) Eras ( $H = 7.4302$ , d.f. = 2,  $p = 0.0244$ ).

Results from regression modeling indicate that certain natural disasters may significantly explain pharmacists' assumption of disaster responsibilities. Tornado ( $p = 0.0403$ ) and hurricane ( $p = 0.0281$ ) references significantly explain pharmacists' assumption of patient management roles. Incident rate ratios for tornado and hurricane (0.86 and 0.97, respectively) indicate that for every tornado and hurricane reference, references to patient management roles decrease by 14 percent and 3 percent, respectively. Hurricane reports ( $IRR = 0.96$ ,  $p = 0.0138$ ) significantly explain pharmacists' assumption of response integration roles. Thus, for every one increase in hurricane references, references to response integration roles decrease by 4 percent. None of the natural disasters significantly explain pharmacists' assumption of policy coordination or pharmaceutical supply roles.

Chemical, biological, radiological, and nuclear (CBRNE) disasters were also found to significantly explain pharmacists' roles. Assumption of policy coordination roles was significantly explained by two categories of CBRNE disasters, particularly those due to use of radiologic dispersal devices (RDD) ( $IRR = 0.63$ ,  $p = 0.1015$ ) and nuclear terrorism ( $IRR = 2.1$ ,  $p = 0.0052$ ). Incident rate ratios indicate that for every one report increase in RDD, policy coordination references decrease by 37 percent. Conversely, for every one report increase in nuclear terrorism, policy coordination references increase 110 percent. Though RDD as a main effects explanatory variable did not reach statistical significance, RDD as a second-order variable and interaction term significantly contributed to the overall negative binomial regression model. Other CBRNE disasters did not significantly explain pharmacists' roles. Likewise, none of the HSF disasters significantly explained pharmacists' roles.

## Discussion

The significant increase in references to bioterrorism ( $p < 0.0001$ ), chemical terrorism ( $p = 0.0018$ ), and building collapse ( $p = 0.02$ ) is a very important aspect of the modern era considering the percentage of pharmaceutical supply roles has decreased only modestly since the 1960s, with no significant change in mean ranks of role reports occurring across eras. This suggests that pharmacists today continue to undertake similar tasks in disasters as their Cold War Era (I) and Post-Cold War/Pre-Terrorism (II) Era predecessors, reinforcing the popular image of pharmacists as suppliers and distributors of pharmaceuticals. Although the pharmaceutical care paradigm has exerted remarkable influence within the profession since its introduction in the early 1990s,<sup>4, 16</sup> reflecting the general increase in “non-traditional” roles for professions such as nursing and pharmacy, data indicate that pharmacists active in disaster management largely exhibit a product-focused practice orientation.

It is noteworthy that an important part of emergency medical response is ensuring patient access to both emergency and chronic medications.<sup>17</sup> This is a particularly vital task in a decade characterized by medication shortages, which continue to impede efforts to provide care for patients. Fulfilling the medication needs of additional numbers of patients presenting to healthcare facilities after disaster will be challenge requiring the expertise of professionals intimately familiar with the medication use process and pharmaceutical supply chain.

Although providing access to pharmaceuticals can represent a critical and challenging aspect to disaster management, defining disaster responsibilities only in

terms of pharmaceutical supply, particularly when disasters may require a non-traditional response, may limit pharmacists' effectiveness in disasters generally, including as a potential medical responder.<sup>18</sup> During the SARS crisis in Canada in 2004, community pharmacists served as primary care providers, some diagnosing and prescribing in the absence of physicians.<sup>7</sup> Interviews with pharmacists who maintained health system continuity by keeping their pharmacies open (while physician offices and emergency departments closed) revealed a common theme: non-traditional roles increase considerably, and pharmacists should cross-train with other health professionals (i.e., response integration) before disasters occur to better prepare the health system when human resources are scarce.<sup>7</sup> This cross-training could be helpful to improved outcomes. The utility of a pharmacist as a general medical provider was demonstrated in a recent report by Hogue *et al.*<sup>2</sup> Pharmacists in Birmingham, Alabama performed a variety of non-traditional roles after receiving a large influx of Hurricane Katrina evacuees.<sup>2</sup> In addition to meeting an increased demand for prescription medications, pharmacist volunteers assisted the medical officer in assessing the health needs of patients at evacuation shelters, triaged patients to healthcare services, treated minor injuries with over-the-counter (OTC) products, and served as the media contact for medication-related issues.<sup>2</sup> Another report describes pharmacists developing a medical countermeasures algorithm and treating patients using the algorithm in response to the anthrax attacks of 2001.<sup>19</sup>

Notwithstanding the professional interest in a product-based response, the modest decline in the percentage of pharmaceutical supply references from past eras may be indicative of a positive trend in pharmacists' assumption of non-traditional (i.e., patient



management, response integration, and policy coordination) roles. Pharmacists' involvement in both response integration and patient management decreases in the setting of hurricane disasters, suggesting that forecastable disasters allow time to prepare using a sufficient number of traditional medical resources. However, this finding may also suggest that pharmacists' provision of healthcare services in common and potentially debilitating disasters other than as a pharmaceutical supplier may represent a paradigm shift problem in non-traditional role acceptability. Participation in response integration and patient management roles reinforces pharmacists' usefulness as an essential healthcare provider and highlights the professional ethic of providing each patient the full measure of their medical ability.<sup>20</sup>

Pharmacists are also increasingly assuming policy coordination (planning) responsibilities in the context of pharmaceutical needs expected to result from nuclear detonation. The medical community, including the pharmacy profession, is becoming more alert to the lack of medical preparation for nuclear detonation.<sup>3</sup> This increased interest is occurring despite the fact that few nuclear or radiologic events have occurred to generate discussion within the academic literature, and most practitioners are unfamiliar with the medical sequelae of nuclear and radiologic events.<sup>21</sup> However, the dearth of nuclear and radiologic references could be attributed to a powerful reaction that serves to defend against unwanted or undesirable knowledge: denial.<sup>22</sup> Attention has been drawn to the pervasive denial within the medical community of the devastating health consequences of nuclear war, and data suggest that the pharmacy profession is no exception.<sup>22</sup>

While filling a vital gap in disaster response as an emergency medical provider during resource-intense disasters, pharmacists' adoption of disaster roles outside their traditionally accepted authority will likely present civil liability concerns to medical resource planners and practitioners themselves, particularly in the context of crisis standards of care. Crisis standards of care can be employed when the level of health care in usual circumstances is impossible to provide due to a catastrophic event.<sup>23</sup> Some states have approached the legal concerns of crisis standards of care creatively, deputizing physicians during emergencies for sovereign immunity legal protection, for example. This has generated ambiguity regarding physicians' chain of command, and healthcare institutions have been less accommodating toward healthcare provider deputation or federalization as solutions to emergency legal protection.<sup>23</sup> Other states, including Colorado, Montana, and Virginia, have directly addressed crisis standards of care by allowing the governor to declare blanket legal protection to emergency healthcare providers.<sup>23</sup> The State of Georgia provides immunity from civil liability to licensed healthcare providers who, in good faith and without remuneration, provide emergency services to victims.<sup>24</sup> State codes typically exempt healthcare workers from liability if compensation for services is not provided. If compensation is provided, the healthcare worker can be held responsible under malpractice statutes.<sup>25</sup>

Many states also have statutory provisions discouraging gross negligence and willful misconduct during emergency provision of healthcare services. Many argue, however, that providing emergency medical triage or rationing healthcare resources, both of which constitute difficult decisions regarding the disposition of patients and life-saving treatments, can be interpreted as constituting negligence or misconduct. The highly

publicized ethical and legal controversy surrounding the multiple deaths from intentional, palliative medication overdoses at a New Orleans hospital during Hurricane Katrina serves as a salient illustration.<sup>26</sup> It is believed that this fear restrains many healthcare providers from participating during emergencies, particularly when the legal environment can rapidly and drastically change.<sup>23</sup> It is reasonable to expect that this would extend to pharmacists, particularly when operating out of their traditionally accepted authority (i.e., dispensing medications).

## **Conclusion**

The insistence on a supply-based disaster response is an interesting professional characteristic considering the wide adoption of the paradigm shift introduced by Hepler and Strand in 1990<sup>4, 16</sup> and the significant surge in bioterrorism, building collapse, and chemical terrorism references in the modern era. Although a modest decrease in supply-based response was observed across time periods, a substantial thrust in non-traditional role acceptability may be demonstrated in the profession's assumption of policy coordination roles in preparation for nuclear disaster, one of the most highly destructive events.

Assuming that the disaster genre in peer-reviewed pharmacy literature reflects the current state of preparedness within the profession, this literature analysis suggests that, though the capacity for pharmacist participation in non-traditional response exists, pharmacists in general will continue in disaster-related activities as suppliers and distributors of necessary medical supplies. Nevertheless, it is expected that liability

problems currently affecting medical responders (e.g., physicians and nurses) will also impact pharmacists who choose to participate in disasters as comprehensive medical services providers.

Unforeseen future developments within the profession may force significant shifts in pharmacists' approach to disaster management. Nuclear disasters, which currently represent a small proportion of the pharmacy literature and are not typically expected to occur, appear to be gaining attention in allied health circles as the actual reality of the potential for a single nuclear event is steadily increasing. The concept of healthcare coalitions, which are support partnerships between health-related entities for effective resource allocation in overwhelming disasters, tacitly acknowledges the potential for significant role change.<sup>27</sup> As a healthcare segment capable of providing a wide range of services, pharmacists will be a key group to engage. In addition to the new attention being given to policy coordination in preparation for nuclear disaster, future medical response to disasters may demand more of pharmacists than pharmaceutical supply expertise, especially when far too few health professionals are available to assist with the medical needs of disaster victims.

## **Appendix: Articles Included in the Literature Analysis**

### **Cold War Era (1960 – December 1991) (I)**

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Table 4. Classification of pharmacists' disaster roles

<b>Patient Management</b>	<ul style="list-style-type: none"> <li>▪ Collaborate on medication management</li> <li>▪ Educate public about therapies</li> <li>▪ Act to prevent panic and fear</li> <li>▪ Discourage personal drug stockpiles</li> <li>▪ Monitor disease progression</li> <li>▪ Engage in one-on-one patient counseling</li> </ul>
<b>Response Integration</b>	<ul style="list-style-type: none"> <li>▪ Ensure proper deployment of drugs</li> <li>▪ Become well-informed about relevant topics</li> <li>▪ Develop and maintain first-aid skills</li> <li>▪ Assist in patient triage and cardiopulmonary resuscitation (CPR)</li> </ul>
<b>Pharmaceutical Supply</b>	<ul style="list-style-type: none"> <li>▪ Select therapies for stockpiles and inventories</li> <li>▪ Maintain effective system of distribution and control</li> <li>▪ Ensure proper packaging, storing, labeling, etc.</li> <li>▪ Compile patient records</li> </ul>
<b>Policy Coordination</b>	<ul style="list-style-type: none"> <li>▪ Develop guidelines for diagnosis and treatment of disease</li> <li>▪ Coordinate with state and local boards to avoid redundancy</li> <li>▪ Incorporate drug expertise in policy decisions at state and local level</li> </ul>

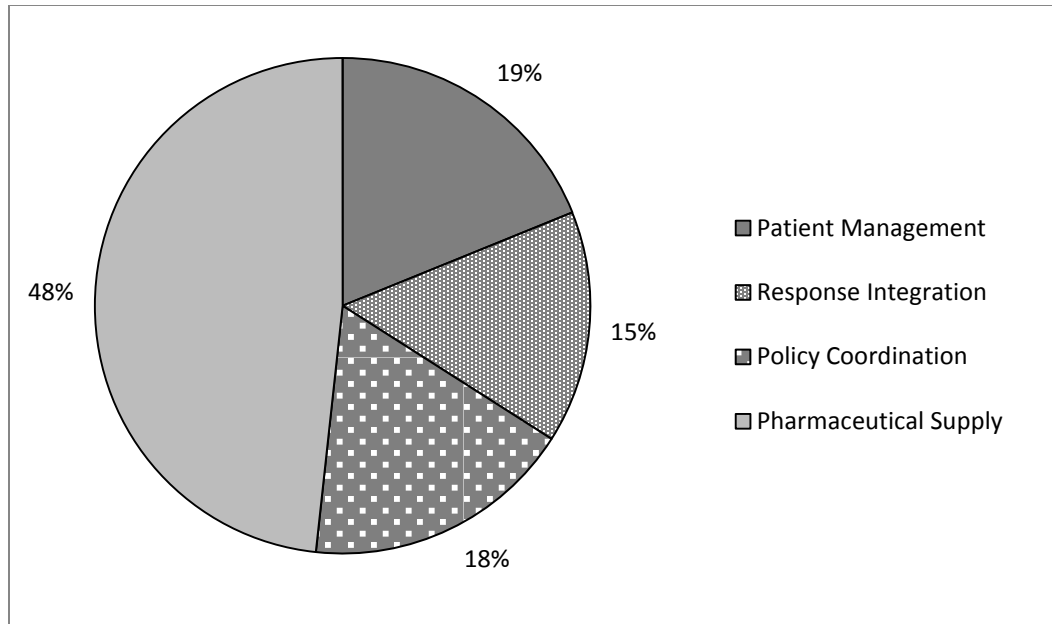


Figure 5. Total percentages of pharmacist disaster role references in pharmacy literature

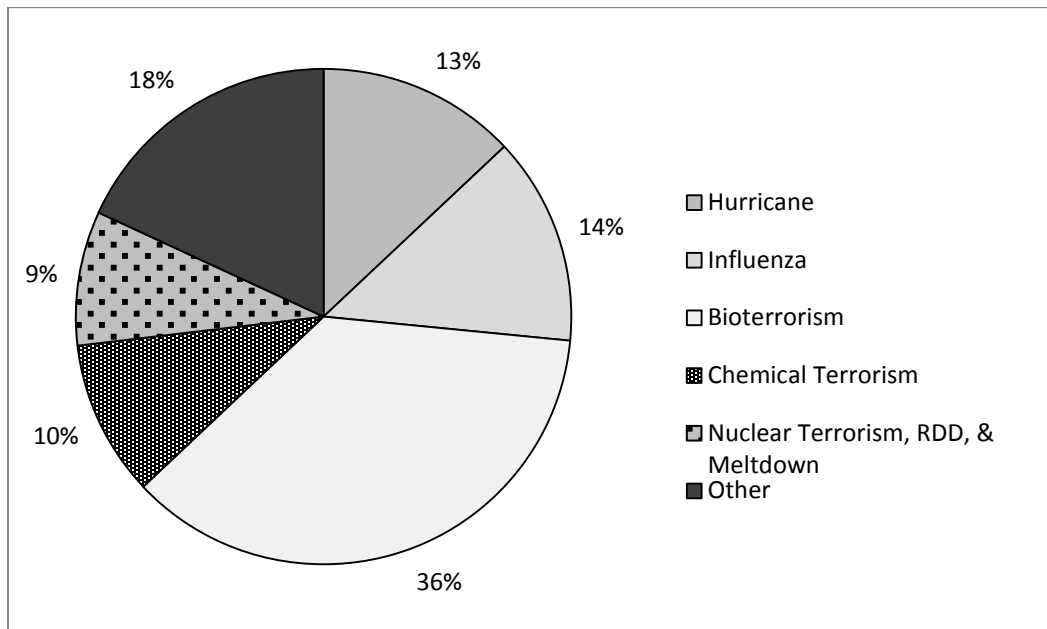


Figure 6. Total percentages of disaster references in pharmacy literature.

Included in the “Other” category are references to tornado (2 percent), improvised explosive device (IED) (1 percent), flood (2 percent), fire (1 percent), snow (1 percent), earthquake (1 percent), SARS (4 percent), chemical spill (2 percent), building collapse (3 percent), and accidental explosion (1 percent).

## CHAPTER 6

### CONCLUSIONS

The pharmacy disaster literature and disaster management capacity can only benefit with added scholarly contributions to the disaster genre. Particularly in the modern era, the literature is currently dominated by pharmaceutical supply reports from the American Journal of Health-System Pharmacists and patient management reports from journals including the Journal of the American Pharmacists Association, Annals of Pharmacotherapy, and Pharmacotherapy. Experiential anecdotes published in pharmacy journals during periods of high public interest have yielded important information regarding pharmacists' participation in disaster management. However, inferential analyses regarding pharmacists in disasters will be particularly useful to help prepare the profession to effectively assess their contributions and participate in disaster-related activities.

As expected, pharmacists show a strong historical tendency toward pharmaceutical supply roles. Pharmacists, however, can be expected to have major roles in disasters requiring effective use of limited medications supplies. While pharmacists remain the acknowledged experts in all medication-related concerns, involvement in other areas of disaster practice, particularly as policy coordinators and response

integrators, may become increasingly important as the changing landscape of medical practice may soon demand much more than the profession has ever provided. Even though nuclear events are widely perceived as an unlikely but highly destructive event, especially on American soil, pharmacists' involvement in planning for nuclear disasters may be particularly prudent since world politics are increasingly influenced by terrorist organizations and rogue dictatorships interested in perpetrating high profile destruction.