

Critical Infrastructure Protection in the National Capital Region

**Risk-Based Foundations for Resilience and
Sustainability**

**Final Report, Volume 5:
Health Services Sector**

September 2005

University Consortium for Infrastructure Protection

Managed by the
Critical Infrastructure Protection Program
School of Law
George Mason University

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Risk-Based Foundations for Resilience and Sustainability

Final Report, Volume 5: Health Services Sector

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September 2005

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– **Notice** –

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NCR HEALTH SERVICES SECTOR REPORT¹

Executive Summary

The National Capital Region (NCR) health services sector has more than 20,000 “points of service.” These include hospitals, nursing facilities, ambulatory clinics, pharmacies, laboratories, private professional offices, and a plethora of other kinds of organizations.

Normally, these mostly private-sector organizations are competitive yet, they focus on providing acute, chronic, and rehabilitative services and products to individuals and families. Less visible than these clinical care functions are the sector’s public health community population-directed functions.² Importantly, effective bio-defense at its core demands a sturdy public health infrastructure.

A catastrophe within the region swiftly changes the normal pattern. In fact, the “center of gravity” shifts from acute care provided by numerous private healthcare organizations and practitioners, to the regions’ under funded and loosely articulated public health elements.

The dominant meaning of risk reduction and management in the context of healthcare has been the avoidance of “medical errors” and management of liability. Including emergency preparedness and response adds an additional dimension of meaning and responsibility. Hence, new tools, methods, and training are required.

Developing a resilient health services sector prepared for a range of hazards requires finding new points of balance in the midst of countervailing pressures and contrasting operating values:

- Shifting from a preoccupation with acute care to building vital public health structures and resources.
- Tempering the climate of competition with values and benefits of collaboration.
- Balancing “open access” with the need for controlled access and protection.
- Breaking out of day-to-day “silos” and thinking “systems.”
- Mobilizing the political will to transcend jurisdictional constraints for the benefits of a regional perspective.

This study targets community organizations. It does not directly address the major academic health science centers and federal health sciences centers because these organizations have the skills and resources to pursue preparedness measures and related research. In contrast, most community healthcare organizations do not have the necessary funds or skill sets for these tasks.

The health service sector views its primary role as responding to catastrophic events rather than viewing itself as a target. Locations near high value targets, however, increase the potential of collateral damage. Only a minority believe that healthcare facilities are an attractive “soft target.” However, events in the Middle East provide precedent for terrorist attacks on American medical facilities, and murder or abduction of medical clinic personnel. Terrorists will strike where there is least resistance including humanitarian functions.

Because this sector is one of the region’s major employers, tens of thousands depend on the sector for jobs and economic security. Therefore, the economic role and contribution of this sector requires further study and understanding to assure community resilience.

The substantial redundancy and geographic dispersion of points of health services and of the workforce across the NCR serves as an advantage in a catastrophic event. In fact, while a specific incident may destroy some geographic health service resources, duplicate and redundant services exist adjacent to an area of loss.

The workforce is the sector's most critical asset because it possesses the skills to mitigate the mortality and morbidity of destructive events. Moreover, their numbers, geographic distribution, and range of skills can be leveraged to the benefit of the health of the region.

For these reasons, a vulnerability assessment/preparedness planning tool aimed at healthcare organization critical functions was developed for use in combination with the Kaiser Foundation threat assessment tool and the facilities directed FEMA Publication 246 utilized by the Veteran's Administration. (Kaiser and FEMA tools are referenced in Appendix A.)

Research and analysis of recent professional literature identify the health services workforce as ill prepared and untrained in the management of the anticipated list of biological, chemical and radiation threats.³ While the health services sector strives for "open access" and aims to remove barriers of entry, protection and barriers to entry are antithetical to the ethos of healthcare. Thus, a challenge is to strike a balance between open access and protection.

Although the rate of adopting information technology (IT) within the sector has been slow, it is accelerating despite fragmentation of its IT systems. For the immediate future, there is not the vulnerability of a single integrated dominant cyber system within the sector.

Traditionally, most healthcare organizations are private. Therefore, neutral and collaborative forums are needed to facilitate alignment of interests and resources between broad public health and those of the private sector.

Hospitals, clinics, and practitioner offices are themselves sources of materials useful in constructing biological and radiation weapons. These sources include, medical waste materials including blood, lab specimens, isotopes, and toxic chemicals. In many neighborhood medical office buildings, lab specimen collection boxes are set outside buildings for courier pickup.

The WMD threat places an added unfunded burden on health services organizations and professionals who are substantially funded from acute and chronic services revenues. Indeed, preparedness planning can be a significant expense. And much of the preparedness planning and mitigation is not directly related to day-to-day revenue producing activities of healthcare organizations. As a result, healthcare organizations have adopted "just-in-time" up stream supply chains. With a minimum inventory maintained at the site of service, these practices limit the length of time these organizations can operate without frequent re-supply.

Recommendations:

- *Develop a Public Health based "Command and Control" Capability:* The sector has no "command and control" utility. Attention in crisis is hospital-centric and ER focused, and does not provide the breadth of communication to both the full range of constituent community entities and to the intermediate and long term phases of recovery.
- *Bring Contiguous Regions into Preparedness Planning:* Regions adjacent to the NCR are important resources. These regions provide personnel, as well as, serve as evacuation sites for the NCR population. An increasing number of the NCR employed ESS and general healthcare

workforce is migrating to these regions for affordable housing. Facility-specific and government-level mutual support agreements need to be developed.

- *Harmonize Medical Service, Manpower, and Public Health Policies:* A systematic inventory and analysis of medical services and public health policies is needed to locate gaps and to harmonize policies across the NCR. This includes an analysis of state and federal policy including the military medical and National Guard policy articulation with civilian policies. Consistent policies and procedures are needed to clarify the liability of health professionals across the many jurisdictions of the NCR.
- *Develop Workforce NCR Database:* Healthcare professionals commute across the region crossing many jurisdictions traveling to and from work. Therefore, the development of a Geographic Information Systems (GIS) enabled database of service sites and workforce member locations with a 24/7 perspective is needed. A standardization of basic workforce credentialing and a database of proximate points of service to work and residence locations would aide region-wide preparedness planning.
- *Develop a Better Understanding of Workforce Behaviors and Policies:* Preparedness plans assume a normal participation of the workforce; although it is likely that the sector's workforce will behave as the population in general. Realistically, however, as many as a third of healthcare professionals may not report for duty in a crisis; and further complicating things, many "moonlight" and are part of the workforce at multiple institutions. Research is needed to address this critical vulnerability.
- *Expand the Roles of Health Professionals in Emergencies:* Many health professionals can, with little additional training, provide for basic and immediate care in the event of an emergency. The idea of an added emergency role for all licensed healthcare professions may be explored with a "public health" responsibility established as a condition of licensure.
- *Bring Commercial Broadcasters into Message and Communications Planning:* Commercial cable networks are the dominant source of information to healthcare organizations, and their inclusion in crisis communications planning will assist preparedness of these organizations and of the public.
- *Perfect Assessment and Preparedness Tools that Address Critical Functions:* Planning all-hazards vulnerabilities assessment and risk solutions will strengthen and harden the sector and facilitate its resilience, regardless of a specific threat event encountered. A field evaluation is recommended for the threats and facilities tools identified in this study, and of the new tool developed for assessing healthcare organization functions.⁴
- *Evaluate the Utilization of Neighborhood Shopping Centers in Preparedness Planning and Response:* Shopping centers are distributed and located based on demographics, and most contain an impressive array of healthcare professionals, services, and supplies. In addition, they have large parking areas that could be staging areas for water and emergency resources and other features that could be leveraged for a period of time to sustain a neighborhood. Coupled with "sheltering in place," these may serve as critical points of neighborhood support.
- *Built on the Experience and Expertise of Military Medicine in Rapid Response:* Planning for cooperation between civilian and military medicine may provide important insights and preparation strategies. This may include a definition of and standards for basic medical and public health services in the period of an emergency. The "safe mode" definition would provide a focus for and a public understanding of service strategies developed for emergencies.

- *Develop Training Resources that Leverage 21st Century Instructional Technologies:* The development of digitally formatted highly visual and interactive WMD instructional resources for health services professionals and for citizens.

Throughout this report are discussions of other, more tactical recommendations, and further amplification on several of the above recommendations.

1. Sector Background

1.1 Sector Profile

There are more than 20,000 “points of service” within the NCR. Maryland is home to the largest number, followed by Virginia and the District. Montgomery and Fairfax Counties account for approximately half of all resources. A “point of service” is defined as a distinct entry listed by name and address in a commercially available database. This section of the report provides descriptive data and analysis, condensed and summarized.

Two GIS software utilities were employed for this study. *Mapquest.com* is based on U.S. Postal Service CASS-certified addresses, roof-top latitude and longitude information, and location-based databases applications. *ESRI Business Analyst, 2003* is the second. The *ESRI* SIC codes are based on the 1987 Standard Industrial Classification codes.

A caveat in using two GIS utilities: variations in findings because of differences in classification systems and definitions; differences in the scope and boundaries of geographic analysis; and differences in the dates when the databases were constructed and updated.

Figure 1 depicts the geopolitical distribution of these NCR points of healthcare service. This includes a broad range of types of entities, e.g., offices, labs, clinics, hospitals, extended care, etc.

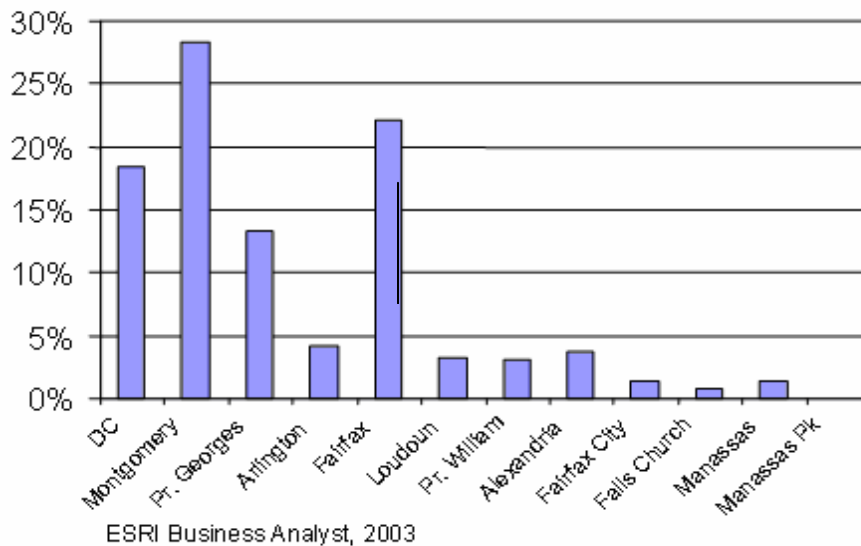


Figure 1: Distribution of Points of Service by Jurisdiction

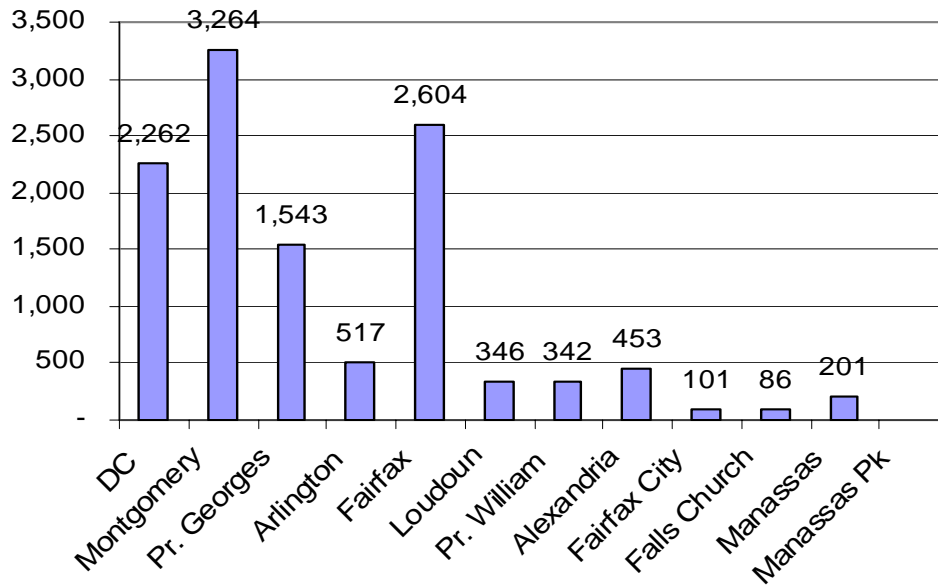
The NCR distribution of “points of service” slightly favors the District of Columbia and the Maryland counties as compared to the distribution of the region population. This pattern is consistent with the distribution of physicians within the NCR as depicted in Table 1.

	Percent of Population	Percent of Physicians
District	18	18.4
Maryland	41	41.6
Virginia	41	40.0

Table 1: Percent Distribution of Population and Physicians by State and District

Figure 2 includes the number of physicians in each county, incorporated city, and District of Columbia locations.

Number of Physicians



ESRI Business Analyst, 2003

Figure 2: Number of Physicians by Jurisdiction

Table 2 lists hospital facilities, number of licensed beds (2001), and location. The District has in aggregate the largest licensed bed capacity, but also has the largest number of aging hospital facilities.

Table 2: NCR Licensed Hospital Beds

Hospital	Beds	Hospital	Beds
<i>District of Columbia</i>		Loudon Hospital	80
Children's National Medical Center	188	North VA Comm. Hospital	164
Columbia Hospital for Women	131	Reston Hospital	127
D.C., General Hospital	184	Arlington Hospital	334
George Washington U Hospital	281	<i>Maryland</i>	
Georgetown University Hospital	351	PG General Hospital	467
Greater Southeast Hospital	238	Southern Maryland Hospital	358
Hadley Memorial Hospital	63	Doctors Hospital	250
Howard University Hospital	294	Laurel/Beltsville Hospital	179
National Rehabilitation Hospital		Ft. Washington	33
Providence Hospital	316	Holy Cross Hospital	422
Sibley Memorial Hospital	218	Suburban Hospital	338
Walter Reed Army Medical Center	250	Washington Adventist	300
Washington Hospital Center	812	Shady Grove Hospital	253
<i>Virginia</i>		Montgomery General	213

INOVA Fairfax	656	Calvert Hospital	141
INOVA Fair Oaks	151	Charles County CIVISTA	131
INOVA Mt Vernon	232	St. Mary's Hospital	122
INOVA Alexandria	339	Naval Medical Center	229
Potomac Hospital	153	Warren Magnuson Clinical Center	300
Prince William Hospital	170	Andrews AFB	

Licensed hospital beds 2001

	Licensed Hospital Beds Per capita
District	5.46
Maryland	1.82
Virginia	1.37

Table 3: Licensed Hospital Beds 1000 Population

Table 3 provides the state and District per capita distribution, based upon 2001 licensed hospital bed data: Major federal healthcare assets are located in the NCR although most are in Maryland. Each of these agencies has substantial presence, program elements, and administrative centers in numerous other U.S. locations.

Federal Agencies in NCR
Office of the Secretary HHS
Agency for Healthcare Research and Quality
Food and Drug Administration
Health Resources and Services Administration
National Institutes of Health
Substance Abuse and Mental Health Administration
Department of Veterans Affairs and Facilities

Table 4: Federal Agencies in NCR

Four major academic health centers (Table 5), that provide education, research, and direct patient care services in university-operated patient care facilities and in affiliated networks of community hospitals and clinics, are located in the NCR. Both Georgetown University and George Washington University share many of the same clinical training sites; whereas, Howard

University has a unique network of affiliations in the District’s southeast communities that assist the underserved and economically disadvantaged.

Academic Health Centers Located in NCR		
<i>Georgetown University Medical Center</i>		
<u>Programs</u>	<u>Affiliated Hospitals</u>	
Medicine	Georgetown University	Providence
Nursing	Columbia/Arlington	Sibley Memorial
Health Sciences	Fairfax	VA Medical Center
<i>The George Washington University</i>		
<u>Programs</u>	<u>Affiliated Hospitals</u>	
Medicine	GW University Hospital	Holy Cross
Nursing	Children’s National Med Center	Sibley Memorial
Public Health	Fairfax Hospital	VA Medical Center
Health Services		
<i>Howard University</i>		
<u>Programs</u>	<u>Affiliated Hospitals</u>	
Medicine	Howard University Hospital	
Dentistry	Greater Southeast Hospital	
Nursing	Norfolk Community Hospital	
Pharmacy	Providence Hospital	
Allied Health	VA Medical Center	
<i>Uniformed Services University of the Health Sciences</i>		
<u>Programs</u>	<u>Affiliated Hospitals</u>	
Medicine	Walter Reed Army Medical Hospital	
Nursing		
Graduate Studies		

Analysis by 50 mile radius from Washington, D.C., Center

Table 5: Academic Health Centers Located in NCR

A fifty mile radius extending from the center of Washington, D.C. (excluding Baltimore and Frederick, M.D.), has 57 hospitals, 47 ambulatory care, and 19 rehabilitation points of service. Table 6 shows the geographic distribution. Physician points of service and geographic distribution seem to be a reasonable measure of general workforce distribution. Within a 50 mile radius of Washington, D.C., (excluding Baltimore and Frederick, M.D.) there are 22,736 physician points of service.⁵

Yet, many individual physicians have multiple and distinct office addresses across the NCR; however, the number does not include physicians in government and military service located within this geographic area. Of this total, 8,106 are within 25 miles from the center of Washington, D.C. In addition, more than 14,000 physician points of service are 25 to 50 miles from city center. Figure 3 summarizes this geographic distribution.

Miles from D.C.	Hospital	Ambulatory Service	Rehabilitation Service
0 to 10	28	15	6
11 to 20	15	24	8
21 to 30	5	5	4
31 to 40	7	0	0
41 to 50	2	3	1
Total	57	47	19

Table 6: Facilities Geographic Distribution Measured from District Center⁶

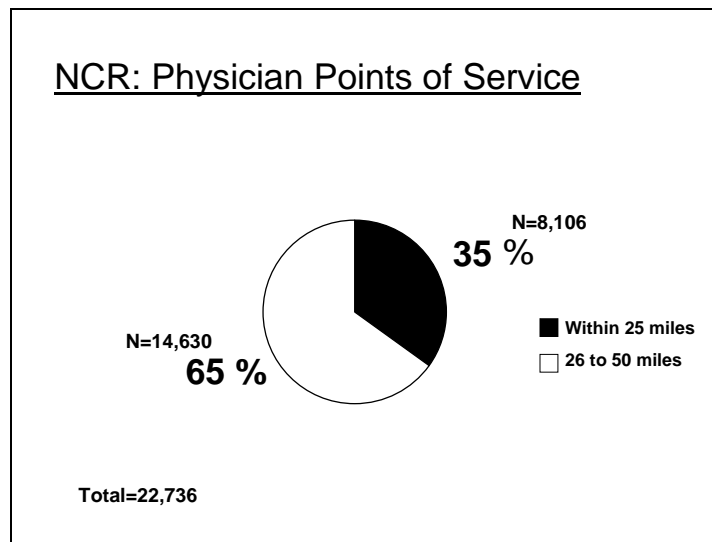


Figure 3: Physician Points of Service within 25 and 50 Mile Radius

The distribution of retail pharmacies displayed in Figure 4 offers another perspective of the geographic location and distribution of healthcare support services. Pharmacies have led the way in co-locating in neighborhood supermarkets and shopping centers; and the trend is accelerating for many other forms of healthcare services.

Innovation in facilities and settings is rampant in the acute market. Surgical centers, freestanding urgent care offices, imaging centers, laser centers, and other such services are mushrooming and are increasingly established in commercial shopping centers catering to consumer convenience. Consequently, healthcare functions are ubiquitous and penetrate the marketplace.

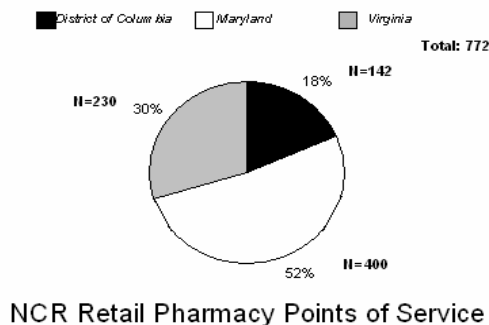


Figure 4: Retail Pharmacies within 50 Mile Radius

The per capita distribution of retail pharmacies is one per 3,967 for the District, one per 4,394 for Maryland, and one per 7,639 for Virginia. The *Strategic National Stockpile (SNS) Program*, managed jointly by Department of Homeland Security and Health and Human Services, is a repository of antibiotics, chemical antidotes, antitoxins, life-support medications, IV administration, airway maintenance supplies, and medical/surgical items. “Push packages” consisting of a broad array of these general supplies are designed for rapid delivery within 12 hours to the site of an attack. This stockpile is assembled to address a range of threats and is intended for the early hours of an event. These push packages are positioned in strategically located, secure warehouses ready for immediate deployment to a designated site within 12 hours of the federal decision to deploy SNS assets.

Significance of Health Services Sector for NCR Economy Healthcare is the largest infrastructure in the developed world, and its proportion of the economy is increasing rapidly as the demographics shifts to an aging population.⁷ Hence, this sector needs to be understood for its sheer economic dimensions. Although there is no precise data available to measure the economic dimensions of healthcare in the NCR, it is certainly a dominant and leading economic enterprise of the NCR. Loudon County, in an internal economic development study, estimates the annual healthcare revenue for the Washington, D.C., metropolitan area to be in the range of \$21 billion. By comparison, Loudon County, for the period of this study generated annual healthcare revenue of \$365 million.⁸

The direct and indirect economic impact of healthcare of the sector is enormous.⁹ The health sector not only contributes greatly to the health of the community, but also to the economic welfare and security of the community.

Given the absence of direct economic metrics for the NCR healthcare sector, an analog study is used to inform a regional perspective of the economic significance of healthcare for the region. In a study conducted in metropolitan Milwaukee, (including counties Milwaukee, Ozaukee, Racine, and Waukesha), on the regional economic impact of 24 hospitals, statistics and findings include:¹⁰

- Metro Milwaukee hospitals had 36,483 employees in 2001; spending by these employees in the local economy supported an additional 45,348 employees; and total area employment

attributable directly and indirectly to the hospitals was 81,831, which is equivalent to 9.5% of total 2001 employment in the four-county area.

- Hospital payrolls created about \$1.24 billion in gross income for hospital employees; disposable income spent and re-spent in the local economy generated another \$1.23 billion in incomes for other workers; direct and indirect incomes generated by hospitals created a total contribution of \$2.46 billion in personal income, which was 8% of the four-county gross income totals in 2001.

The conclusion justifiably reached is that healthcare is not only vital to the health of the region, but is vital to the region's economy. A similar study of the economic role of the health services sector is a recommended follow-on activity.

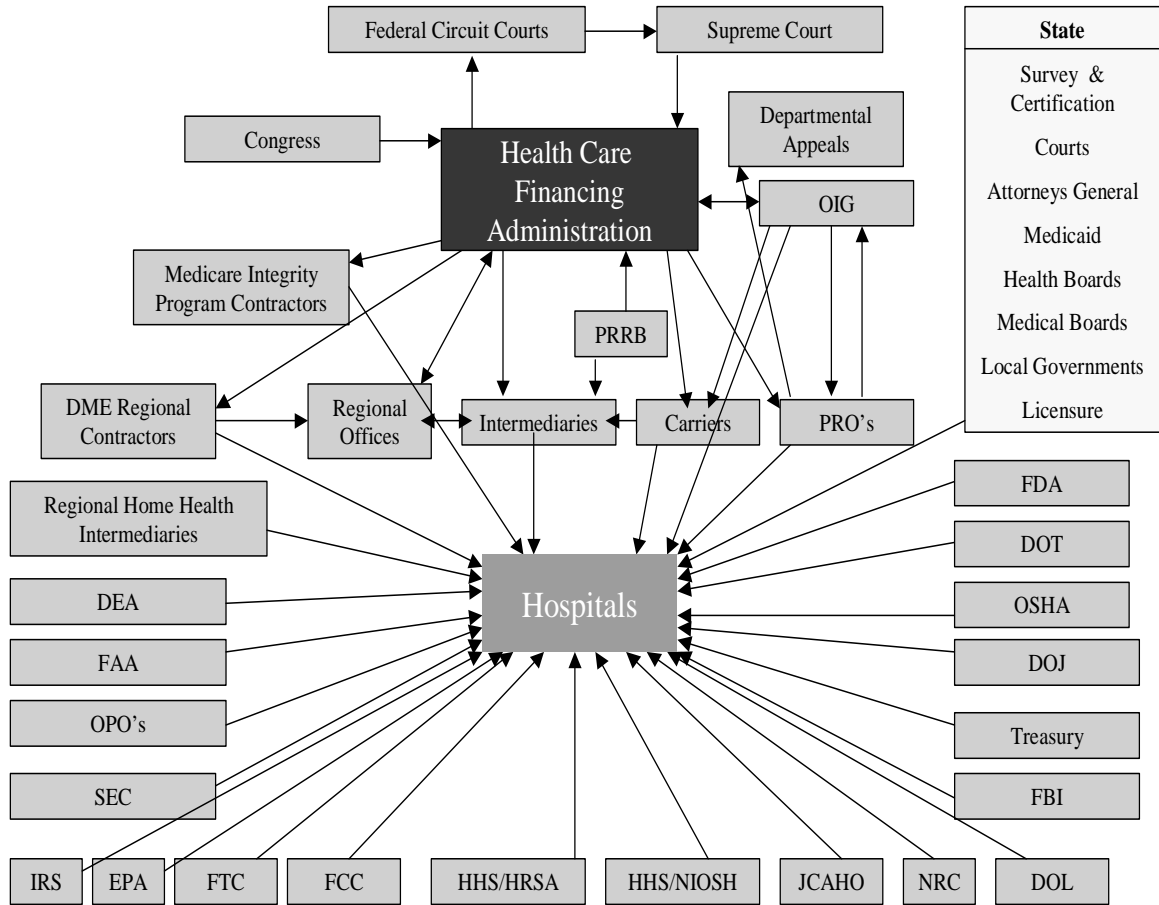
1.2 Review of Authorities

The health services sector is an open system of loosely articulating parts. Further, it is enmeshed in a tangle of local, state, and federal regulations. A typical health services organization, for example, fills out regular compliance reports and has a steady stream of licensing and surveillance/site inspection visits; and its professional workforce is subject to a spectrum of professional specialty and state board oversight.

This sector is experiencing a flood of emerging policy, generated by both state and federal legislation, as well as, voluntary accreditation agencies. Policy gaps, conflicts, and unintended consequences are numerous. Accordingly, many of the policies, standards, and regulatory requirements have substantial cost burdens and implications.

The illustration (Figure 5), prepared by the American Hospital Association, conveys the maze of authorities.

WHO REGULATES HOSPITALS



March 13, 2001

American Hospital Association

Figure 5: Authorities Regulating Hospitals

This regulation “maze” illustrated in Figure 5, is the dominant driver of standards compliance in health services organizations. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) is the nation’s predominant health care standard-setting and accrediting body. The commission is a not-for-profit, private sector entity founded in 1951; its mission is to improve the safety and quality of care provided to the public.

The JCAHO accredits approximately 18,000 health care organizations. These include a majority of hospitals in the United States. In addition, its accreditation programs provide quality oversight for home care agencies; ambulatory care centers, and offices whose services range from primary care to outpatient surgery; behavioral health care programs; nursing homes; hospices; assisted living residencies; clinical laboratories; and managed care entities.

In recent years, JCAHO has required health care organizations to address disaster preparedness standards. These initially focused on natural disasters such as tornadoes, floods, hurricanes and earthquakes; and on accidents such as power plant failures; chemical spills, and fire-related disasters.¹¹

Organizations are required to develop internal response plans and conduct periodic staff drills to determine that these plans actually work. In fact, a condition or standard for accreditation is that internal emergency response plans are developed and tested through periodic drills. During on-site surveys, surveyors review these plans as well as the results of the staff drills.¹²

Recent modifications were made to the commission's emergency preparedness standard.¹³ These require: a four phase plan that incorporates a community perspective and addresses mitigation, preparedness, response and recovery; an "all hazards" approach including an assessment of the relative potential of array of natural, accidental and malicious threats, and an assessment of healthcare organizations vulnerabilities in light of these threats; and participation in at least one practice drill.

This NCR health service sector project is responding to these requirements for more sophisticated planning and preparing by addressing the need for practical tools and methods that can be utilized by healthcare organizations. The expected outcome is to meet these standards and to address critical functions. More on these steps is discussed later in this report.

1.3 Mapping of Interdependencies

There is no existing satisfactory definition, characterization, or map that embraces the full scope of this sector. In short, its constituent parts are interdependent, and in turn, the sector itself has many critical interdependencies.

Water, power, communications, and transportation are vital to operations. Consequently, the sheer number and kinds of constituent elements of the "system" make construction of a practical schematic or map elusive. Moreover, upstream and sidestream relationships are relative to the perspective and type of healthcare organization under consideration; these combinations and permutations are too intricate to map clearly.

For this study, Table 7 was developed by the project team. It lists elements and groupings of sector relationships and interdependencies. The table has four major components, each populated by a complex set of elements.¹⁴

This complex web of upstream supply chains, with increasing "just-in-time" practices, make this sector vulnerable and incapable of standing alone for any significant period of time. Electricity, food, and water are essential for sustained operations. In particular, loss of water is catastrophic for healthcare. It is essential for surgery, sanitation and for drinking. Moreover, without water, dialysis facilities would be immediately out of service. While some hospitals have wells, others are considering the purchase of tanks for reserve water.

Nearly all facilities have for the capability to generate electricity for a brief period of time. Without a total loss of utilities, hospitals project self-sufficiency of about one week. And most will have a total failure if loss persists beyond a couple of days.

Interdependencies quickly surface in a broad array of vendor and supplier relationships. For instance, clean laundry and linens are a vital need; networking with reference and public health labs is essential to patient care and interdependencies with blood banks, reagents, and pharmaceuticals is critical. In short, the upstream dependencies are extensive and complex. Normal operations depend on relatively uninterrupted and predictable transportation and communication.

Workforce	Facilities	Public Health	Ancillaries
Physicians Emergency Infectious Diseases Trauma Specialists Plastic Surgeons Occupational Health Nurses Emergency Infection Control Public Health Epidemiologists Laboratory Scientists Microbiologist Toxicologist Radiation Specialists Pharmacists - Hospital Pharmacists – Community Administrative Allied Health Veterinarians\Animal Tech's Dietary Housekeeping Security	Tertiary Medical Centers Hospitals Clinics Surgicenters Urgent Care Centers Group Practice Offices Professional Offices Long term Care Facilities Treatment Centers Paramedic Stations Mobile Trauma Units Flight Units Pharmacies Distribution Facilities Medical Waste Management Laundry and Supplies Dietary Supply General Vendors Transportation services Local health related businesses Biomedical R&D Animal Facilities Mortuaries	Health Boards Clinics Home care Epidemiology Sanitation Inspection Licensing Relief & emergency services Nutrition Education Child & Mat. Health Social Services Laboratories Workmen-Comp. Blood banking Others Police Fire EMS Hazmat	Food Production Information Systems Power Water Communications Transportation Fuel Chemical Radiological Pharmaceutical Biotech NGOs Shipping Financial Management Insurance Civic Groups Professional Groups Faith based Groups Hotels Restaurants Medical Tourism's Spas Vendors Others

(NOTE: Elements incorporate the essential services of public health, which were developed in 1994 by representatives of ASTHO, NACCHO, the Institute of Medicine, the Association of Schools of Public Health, the public Health Foundation, the National Association of State Alcohol and Drug Abuse Directors, National Association of State Mental Health Program Directors, and the U.S. Public Health Service.¹⁵)

Table 7: Health Services Sector Schematic

2. State of Security Assessment

Following a series of interviews and consultations, focus groups were planned and implemented to gain a perspective of the sector’s “state of security.” Participants represented the District of Columbia, Maryland, and Virginia. Also represented were hospitals, nursing and rehabilitative facilities, ambulatory clinic services, and public health agencies. In addition, personnel with job specialties key to weapons of mass destruction also participated including administration, human resources, epidemiology, infection control, clinical laboratory specialties, nurse practitioners, emergency physicians, healthcare information systems specialists, and facilities and security management.

2.1 Focus Group Results

All participants were asked to rate, independently, their perception of the likelihood of another WMD attack in the region. See Figure 6 for the results. As indicated, consensus is that another attack is not a matter of “if,” but rather of “when.” However, over time, the sense of urgency decreases.

Many believe that the likelihood of future attacks is rated high primarily because of the “high value” on NCR targets. Although health services organizations are not considered by themselves the most likely terrorist targets, those near targets would constitute collateral damage. A greater concern is that healthcare organizations will be quickly overwhelmed by terrorist events.

Some participants see healthcare organizations as “soft targets” and, believe there is better way to demoralize and terrorize a community than to attack its health services.

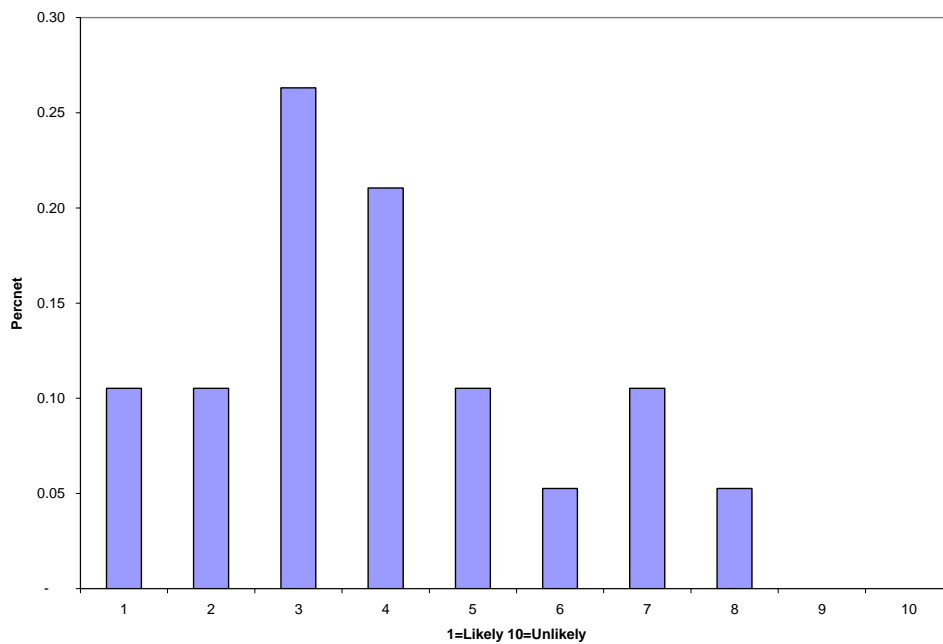


Figure 6: Rating Scale: a WMD attack in the NCR is--

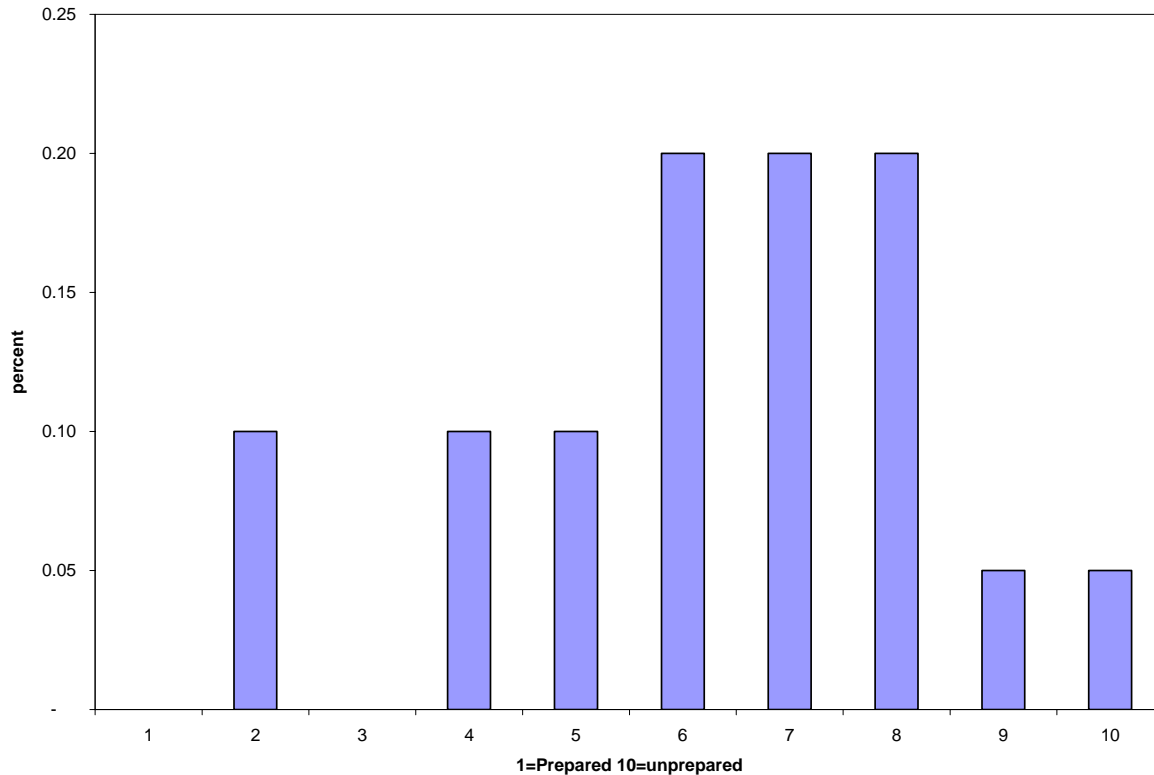


Figure 7: Rating Scale: if there is an attack, I am personally and professionally--

Next, participants were asked to rate, independently, how well they were prepared for attacks, both personally and professionally (see Figure 7). Those working in large hospitals and government public health agencies judged themselves better prepared than individuals working in settings such as nursing and ambulatory clinic facilities.

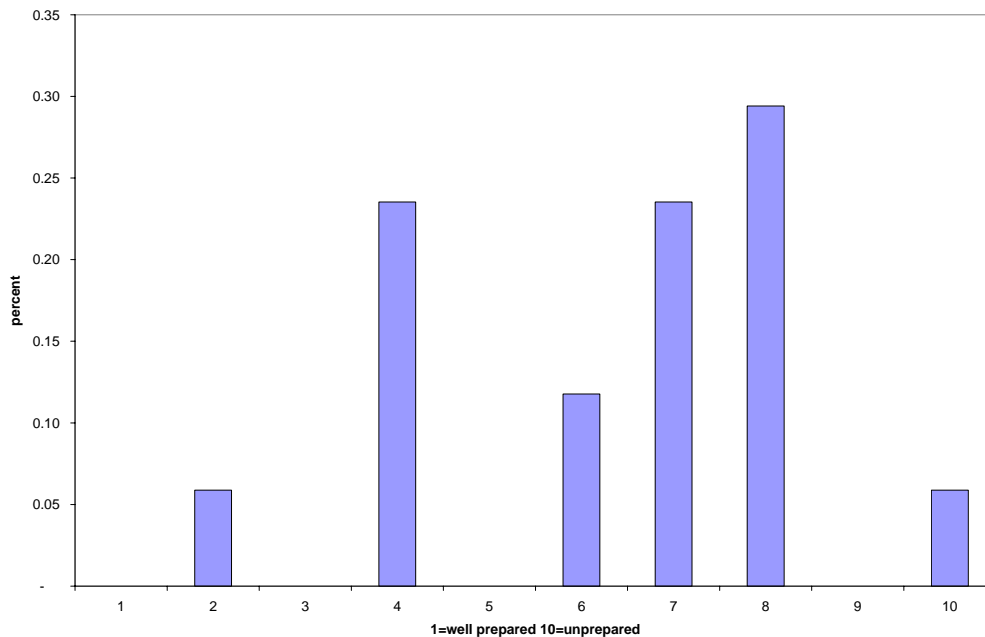


Figure 8: Rating Scale: How well is your organization prepared?

Participants were then asked to rate, independently, how well their organizations are prepared for attacks (see Figure 8). Again, hospitals were judged better prepared than other types of organizations. These findings are consistent with those of the General Accounting Office August 2003) report on hospital preparedness.¹⁶ Other focus group questions addressed familiarity with concepts of “critical infrastructure protection,” “vulnerability assessment” (Figures 9 and 10) and “risk management,” (Figure 11) as applied to hazards and threats.

Hospital professionals from the focus group indicate awareness of the basic concepts of critical infrastructure protection (CIP), vulnerability assessment (VA) and risk management (RM). Further, their knowledge of CIP was slightly more than with vulnerability assessments. It appears that the lines between vulnerability versus threat assessment were blurred. Moreover, professionals from facilities other than hospitals were even less familiar with the concepts and application of protection, vulnerability and assessments; although many were familiar with specific VA tools such as Kaiser and FEMA instruments. This perhaps infers that these tools are the most frequently used.

Risk management in the health services sector is historically related to reducing the impact of medical mistakes and managing the liability of accidents and malpractice. Hence, the application of risk management or mitigation to address vulnerabilities is a relatively new function and purpose. Exceptions, however, are those organizations that have experienced natural disasters.

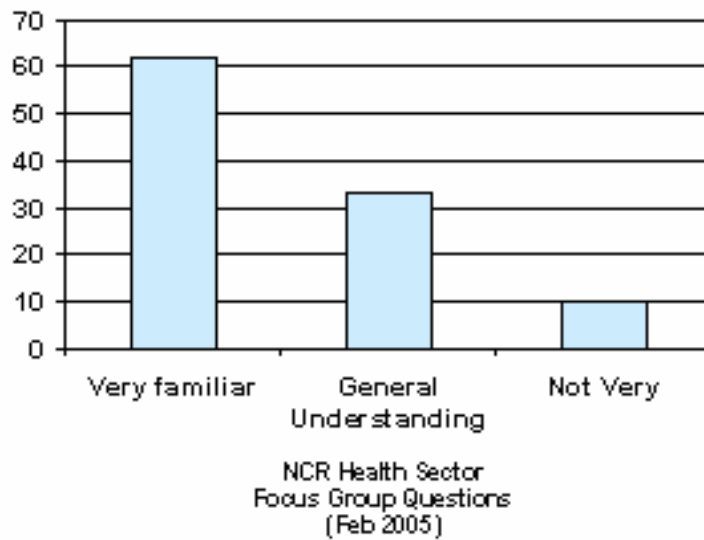


Figure 9: Familiarity with Critical Infrastructure Protection (%)

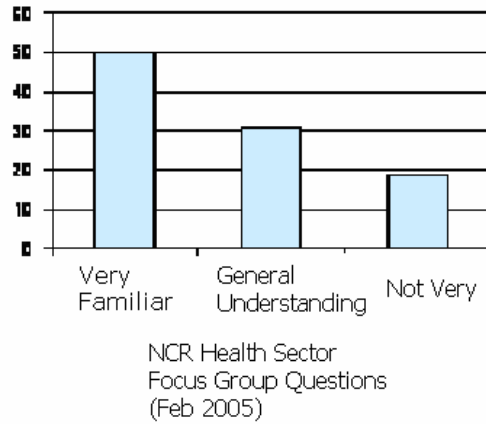


Figure 10: Familiarity with vulnerability assessment

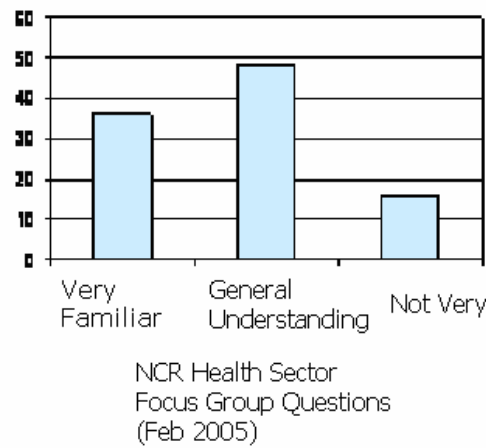


Figure 11: Familiarity with risk management applied to hazards and threats

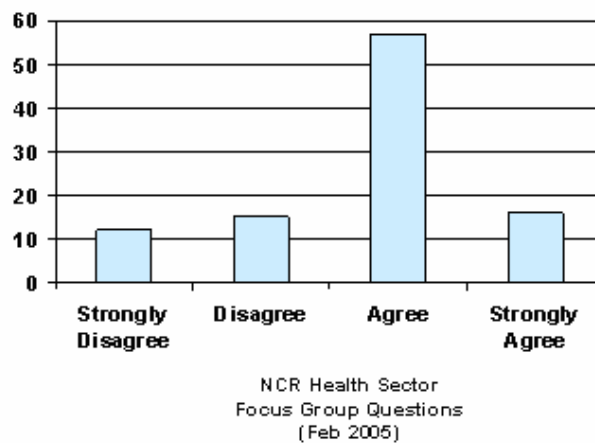


Figure 12: Organizations addressing infrastructure protection/preparedness

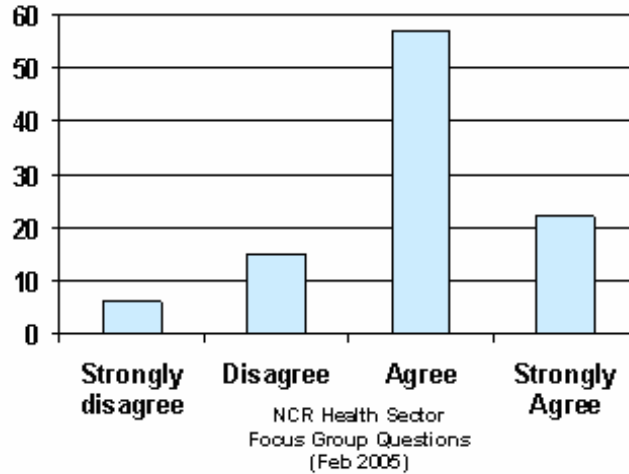


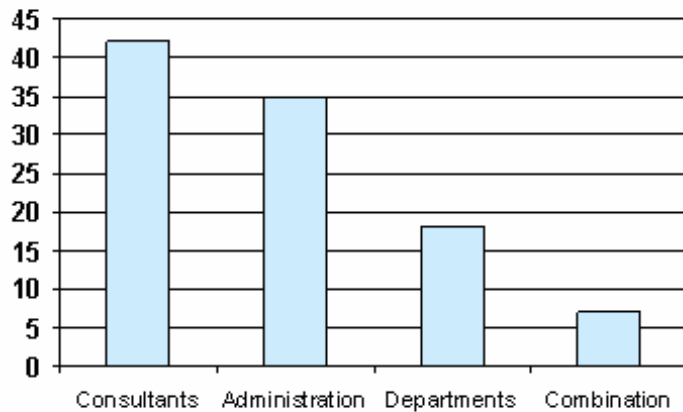
Figure 13: Organizations addressing preparedness planning

Beyond simply indicating recognition of the concepts, many report their organizations are addressing them in some fashion, though hospitals are further along than other facilities (See Figure 12). Focus group participants discussed preparedness planning as a condition of accreditation. Even though most have developed a plan for accreditation review, they view them as inadequate and untested (See Figure 13).

In most organizations, roles and responsibilities for in-house routine and emergency operations are established. Yet, the content of these responsibilities varies as a function of specific specialty or management responsibilities.

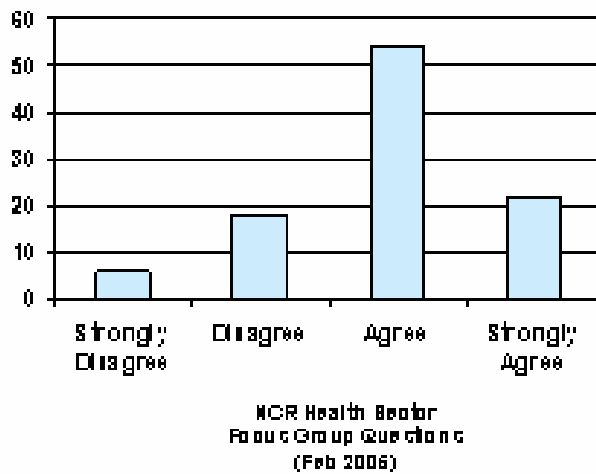
Disaster planning processes/vulnerability assessment activities are reported as being conducted mostly by external consultants and by upper level administration. Department units and middle managers considered themselves only marginally involved in these tasks (See Figure 14).

Most see their organizations having established criteria defining “critical” functions in the event of emergency (See Figure 15). Hospitals, led by experienced emergency departments, have an established base of experience in addressing emergency events presenting from the community. Critical elements of a response system are identified for the early and immediate phase of crisis planning. The problem presented by WMD’s of most concern is one of scale and scope.



**NCR Health Sector
Focus Group Questions
(Feb 2005)**

Figure 14: Organizations addressing vulnerability plans



**NCR Health Sector
Focus Group Questions
(Feb 2006)**

Figure 15: Organizations defining critical functions

Focus group participants rated threats listed on the Kaiser *Medical Center Hazard and Vulnerability Analysis*¹⁷ according to issues of most concern. Chronological rankings are:

1. Snow and Ice
2. Biological agent
3. Severe Storm and Chemical
4. Radiation
5. Epidemic
6. Bomb

7. Hurricane
8. Extreme Temperature
9. Tornado

In discussion, participants expressed concern that water, food, and air source contamination are other important threat possibilities. Similarly, disruption or destruction of information system is seen as a considerable threat. The following are the tools and resources used in vulnerability assessment and preparedness planning:

- Safety Committees
- Kaiser HVA Tool
- Military Board HVA Tool
- Virginia Department of Health Data
- JCAHO Documents
- Mitroff Vulnerability Model
- Landesman Vulnerability Model
- American Red Cross Analysis
- C.D.C., Website
- DHS Website
- FEMA Website
- MEMA Website (Maryland)

According to nursing facilities personnel, they use tools supplied by government health departments. On the other hand, most hospitals—that all have safety committees—mostly use the Kaiser tool. Hence, JACHO training and resources related to the accreditation process are important aids. Training is often conducted via Web sites.

The need for standards was expressed in focus group deliberations. Existing standards are frequently inconsistent such as recommended distance of parking from buildings. Interest was expressed in participating in developing and testing standards. The participants affirmed the primary “driver” for VA and preparedness planning is accreditation (See Figure 16). Accreditation is obligatory to participate in federal, state, and private care reimbursement systems.

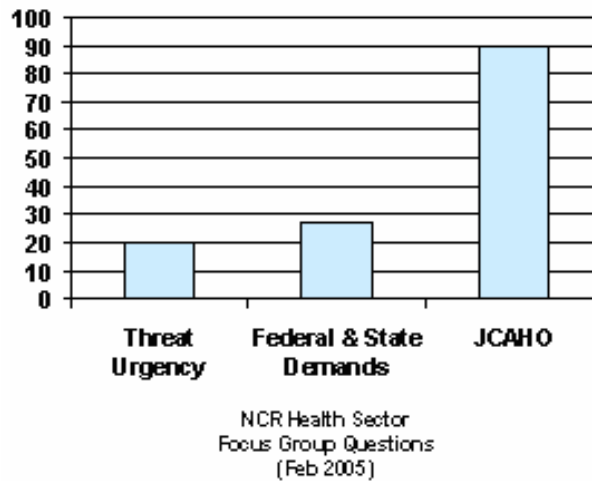


Figure 16: Motivation for vulnerability assessment and preparedness planning

As a summing up exercise, the focus group discussed their most practical concerns in the face of an attack. Responses include the most frequent threat concerns:

- Maintaining organizational self-sufficiency for a reasonable period of time, ranging from three to seven days.
- Losing water, food, and electricity.
- Handling the surge of casualties and “worried well.”
- Changing workforce behavior in the face of a major community-wide crisis.

Many hospitals are funded to purchase an array of emergency related equipment, but this is perceived to be without an overarching plan or priority. In contrast, smaller hospitals and healthcare organizations that may need funding the most do not have the staff, time or expertise to compete against others. To date, any grants are not perceived as related to risk management activities and planning, rather are for hardware and equipment. Funding, to sufficiently support vulnerability assessments and preparedness planning, is lacking. These views, consequently, are supported by congressional studies and newspaper accounts.

VA and RM activities have a primary relationship with community preparedness, but not directly to patient care. In fact, patient care reimbursement policy continues to become more rigorous to weed out charges not directly related to patient care. The net effect is that preparedness planning is viewed as yet another unfunded or under-funded mandate similar to uncompensated care.

Further, the funds that are available are viewed as not being invested collaboratively with a broad region perspective. Likewise, a consistent planning methodology with shared regional priorities has not been crafted. While many organizations have plans “on paper,” failure of individual organizations is predicted--some within a day or two of a crisis event and others if a crisis extends beyond a week.

Although, tabletop exercises and community drills appear to be the methods most used to test threat scenarios and response plans, many view them as having limited value. The perception is

that tests and drills may be artificial and will therefore not translate well to an actual community crisis. Also, drills focus on first-responder and EMS elements and do not embrace the scope of problems that may be encountered by the whole of the healthcare organization through all phases of recovery.

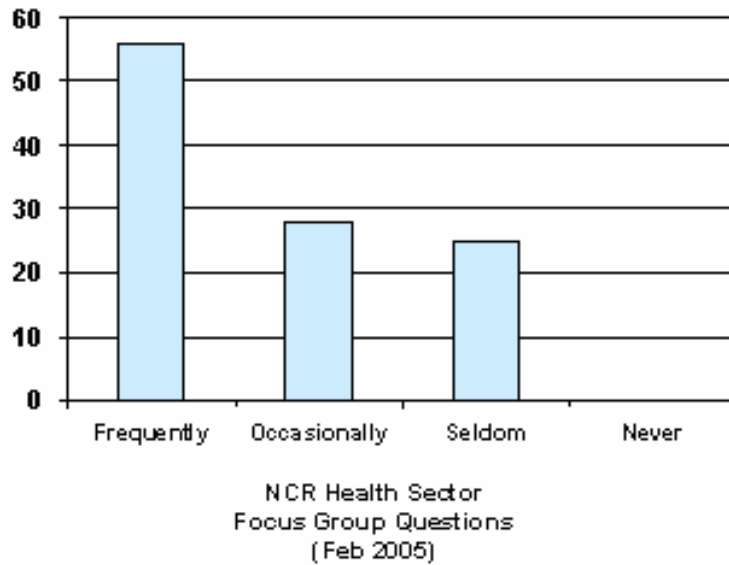


Figure 17: Organizations talking about failure and failure prevention.

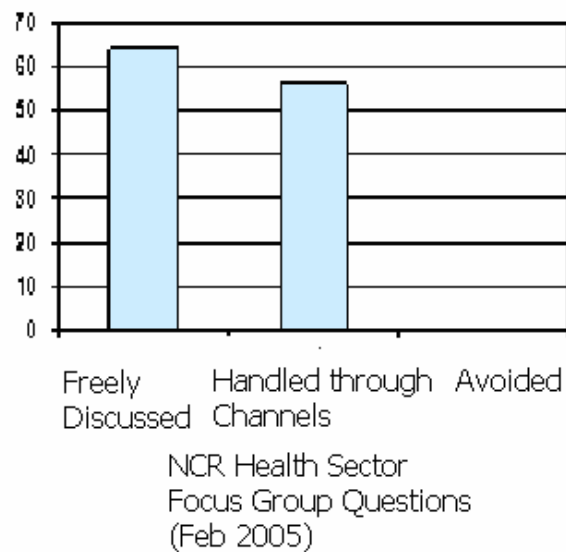


Figure 18: Organizations discovering mistakes, errors, or vulnerabilities

Healthcare professionals believe their organizations as open to discussing the possibility of failure and of methods for preventing failure (See Figure 17). In light of the national campaign to reduce medical errors, healthcare organizations are working to create environments where mistakes may be admitted and discussed. Hence, mistakes are likely to be freely discussed (See Figure 18). In addition, these organizations have created risk management policies, procedures, and processes for addressing errors.

WMD training is considered a top priority and primary need. Consequently, emergency department physicians and staff of larger hospitals, and hospital-wide systems, are spearheading WMD response planning and training post 9/11. A region-wide, Web-based training program was organized and implemented by a group of cooperating hospitals. These resources are available for all staff. Some hospitals have made them mandatory through brief training modules; PowerPoint presentations; voiceover, incorporating videos; and interactive quizzes that are submitted for continuing education units (CEU's). Those organizations without training initiatives are the non-hospital organizations.

A number of regulatory bodies exist on which the healthcare sector has critical interdependencies. In rank order, by the focus groups, these are:

1. Law Enforcement
2. C.D.C.
3. County Health Department and ESS
4. City Health Department
5. State Health Department

Fortunately, there is a sharp and strong perception of the need for collaboration See Figure 19). A growing vision is a neutral forum that focuses on VA and preparedness, that transcends jurisdictions, disciplines, organizations, and that also includes other interdependent infrastructure sectors. Some collaboration already exists informally along the lines of disciplines and specialties. And other examples of sharing resources and collaboration include the regional training curriculum shared by several hospitals, and the partnership between and among suburban hospitals in Maryland, the NIH Clinical Center, and Bethesda Naval Hospital.

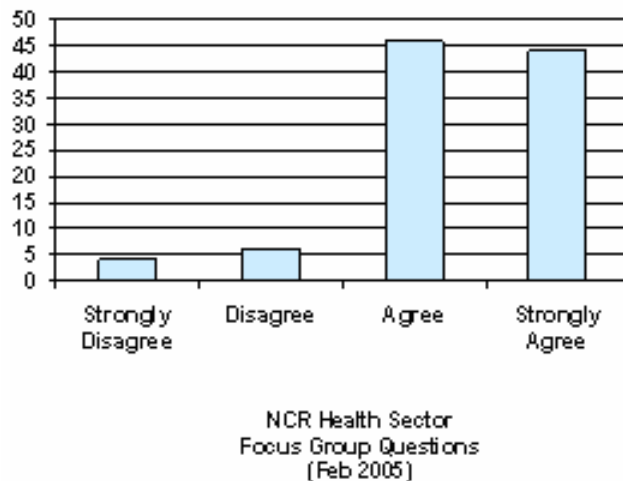


Figure 19: Organizations prepared to effective collaborate

3. Risk Reduction Programs and Processes

3.1 Recommended Programs

The development and design of a health services sector “command and control” utility model:

- A major sector level vulnerability is immediately apparent: the lack of a healthcare regional “command and control” function. The default in times of community crisis is the emergency services sector (ESS). The health services sector interface with ESS runs functionally through hospital emergency departments and their emergency physician contractors. Such an alignment of sectors and deployment of health service sector resources falls short of a full cognizance of sector needs and optimal utilization of healthcare resources. Hospital-based emergency services are the vital front-line. Further, these are the urgent assets during the first hours of response; however, the healthcare sector has numerous other resources that should be included, as soon as possible, to the mid- and later phases of response and recovery in order to assure maximum community resilience. A more public health-centered and less hospital ER centered approach is needed, with planning that extends into the mid- and later stages of restoring the health of the community.

The design and evaluation of a neighborhood modular sufficiency plan based upon commercial shopping patterns:

- Neighborhoods are the building blocks filled with relationships of the community. Conscious efforts to build and strengthen these basic blocks (or modules) are an essential step in achieving preparedness.
- The commercial nucleus and “21st Century Commons” for neighbors is the local shopping center.

Typically, these centers are the location for a spectrum of healthcare services:

- Pharmaceuticals
- Emergency
- Primary care
- Dental
- Rehabilitation
- Urgent
- Basic laboratory
- Basic radiology

A variety of trained healthcare providers work day to day at these locations:

- Paramedics, EMT’s
- Community Pharmacists
- Physicians
- Dentists
- Nurse Practitioners
- Physician Assistants
- Office Nurses

- Medical Assistances
- Rehabilitation
- Frequently, governmental emergency medical services are immediately adjacent. And in all cases, they are located near shopping centers. Exploration, evaluation and a formal “proof of concept” would require:
 1. Developing a complete technical description of the essential elements and features of a neighborhood shopping center centric preparedness module.
 2. Modeling for one county, via neighborhood grids as defined by shopping center health support elements.
 3. Modeling for one county the neighborhood dispersion of healthcare professionals.
 4. Developing and defining possible principles of organization—“command and control” features.
 5. Consulting and obtaining recommendations of basic infrastructure sector experts.
 6. Using expert panels to conduct a “*Strength-Weaknesses-Opportunities-Threats*” analysis of the neighborhood plan.
 7. Exploring tax and other incentives that would encourage business and professional participation.
 8. Developing recommendations for implementing a prototype for one county for its evaluation.

Develop a NCR regional healthcare professionals credentialing system:

- Standardization and interchangeability of healthcare personnel across all jurisdictions and organizations would make a significant contribution to preparedness. Such a database would identify a 24/7 perspective of the relative location and dispersion of personnel within the NCR. The idea is to “standardize” the workforce across the region in some manner. This would involve significant computerized database and policy reconciliation between and among jurisdictions. In addition, alternative assignments could be developed on a “closer to home” principle.

WMD Workforce 21st Century Training Digital Resources:

- Weapons of mass destruction were added to the list of potential threats to the health, welfare, and survival of our communities. The health services sector of the community is vital to minimizing deaths, mitigating injury, and to the resilience of our communities. The most critical asset of the health services sector is its professional workforce. Research and analysis of recent professional literature indicates that the health services workforce is unprepared and untrained in managing the anticipated list of biological, chemical and radiation threats.
- Traditional geographic class-room strategies are too expensive and would take years. Twenty-first Century visually driven communication and information technologies must be employed to deal with the scale of this challenge. This proposal asserts highly visual instructional resources expressed in digital formats (CD, DVD, Web based) that can be distributed for many different platforms and that can be used as stand-alone self study, to supplement numerous other bio-defense training programs, or as “instruction objects” to clip and insert into conventional class-room training.

Development of citizens-as-first responder training and information resources:

- New frontiers must be explored that move beyond printed materials and utilize more advanced media resources to communicate with the citizens. Communicating and understanding risks, and educating citizens in proper responses, *especially in the case of bioterrorism*, should be emphasized. An approach to bio-defense education and training could be to provide information on how to deal with public health emergencies and disasters without dwelling into the biological intricacies of bacterial and viral behavior. Information can be presented in a succinct fashion, categorizing the routes of infestation and means to protect against them. Wide- spread communication and training resources designed for utilizing 21st Century media and methods are essential to reaching the meaningful numbers disbursed over vast geographic areas.

3.2 Recommended Process Improvements

Field study of NCR-developed vulnerability assessment and risk reduction planning methods and tools: (Phase 2):

This study would be an implementation of the healthcare organization assessment tools and process developed in the current phase of the project, labeled “Phase I.” Phase 2 will be the “field test” of the concept and tools in healthcare organizations.

Risk reduction strategies flow logically from a correct identification and assessment of threats, weaknesses, and consequences. A factual and complete understanding of sector-level vulnerabilities must proceed from an accurate appreciation of the vulnerabilities of the organizations that populate the sector. Suggested is a “bottom up” approach of focusing efforts on assessing 10 community health services organizations. This is the most valid and rapid route to building a frame of reference for a penetrating assessment of sector or “systems” level reduction planning. (The Vulnerability Assessment/Risk Reduction Planning Tool may be reviewed in Appendix A).

A primary effort of Phase 1 was the evaluation and development of a process and tools to assist community-based healthcare organizations to improve vulnerability assessments and risk reduction preparedness planning. This effort was initiated after reviewing numerous open-access risk management systems.¹⁸ These reviews concluded that the development of a process and a new tool to assist in the assessment of critical functions was needed to complement available tools for threat assessment, and facilities and buildings vulnerabilities assessments. (The tool and a full description and discussion of the methodology employed to develop the proposed process and tool is presented in Appendix A.)

The process and tools identified and developed in Phase 1 will be applied in the field for a practical number of community hospitals and nursing facilities. The objectives are: 1) Establishing and analyzing (systematically) *patterns of vulnerabilities* across NCR health services organizations. The study will combine the application of the NCR tool along with the Kaiser Threat assessment tool, and the FEMA Publication 246 checklists. 2) Testing and refining the application of the vulnerabilities assessment/risk solutions preparedness planning *methodology and process of the tools* 3) Documenting common training and workforce policy needs and 4) Identifying common risk solutions that fall outside the scope and budget capabilities of health services organizations.

3.3 Regional Governance and Collaboration

In general, and certainly for the health services sector, the challenge of regional governance is a vexing problem with frustration on many fronts. Solving it solely for emergency preparedness and resiliency strategies is probably unrealistic. It is a much deeper and more complex issue. Therefore, “work around” solutions may be all that is achievable: yet, mobilizing for defense against a common threat does have enough appeal to mobilize and motivate community members.

Sector focus group participants perceive a constructive role for a NCR collaborative forum. Hence, a new neutral forum should be established to focus on risk management and preparedness that cuts across jurisdictions, disciplines and organizations, and facilitates communications and collaboration.

Some collaboration already exists. For instance, peer-to-peer relations were developed informally along the lines of disciplines and specialties. And Northern Virginia has organized a hospital alliance. Other examples of resource-sharing and collaboration include the regional training curriculum, shared by several hospitals; and the partnership between suburban hospitals in Maryland, NIH Clinical Center, and Bethesda Naval Hospital. Accordingly, other healthcare organizations can support other organizations and the sector during periods of crisis.

3.4 Addressing Dependencies

The health services sector demonstrates fundamental dependencies within the sector, and upon all other sectors. Intra-sector dependencies include multiple networks of supply chains, vendors, and professional practitioners. Laboratory reagents, medical isotopes, blood products, and laundry, are representative of the supplies consumed by the healthcare organization, yet inventories are suppressed in favor of “just-in-time” pipelines.

Food services and housekeeping are vended to outside contractors. Moreover, healthcare practitioners fan out across the region practicing in supporting operations of multiple organizations; and medical waste is managed by highly regulated haulers. Interruptions in these arrangements during crisis can bring, within a relatively short period, services to a halt and threaten the health of those served by the sector.

Dependency on other sectors is characteristic of the health service sector. For example, electricity and water are essential. Most hospitals with in-patient services have some capacity for short term electricity generation and some small store of water; however, most can operate no longer than 24 to 48 hours. On the other hand, nursing homes and other community based facilities have no ability to operate on their own. Also vital are transportation access and communications. Further, receivables and payables are predicated on a sophisticated set of relationships with the government and private insurers.

In particular, as discussed in an earlier part of this report, effective communication between the ESS and health services sector needs to be explored and developed. The health services sector, under the leadership of its public health constituents, can develop a response for the mid- and later phases of recovery.

It is essential that all points of intra- and inter-sector dependency be identified, for at these points, the sector and its constituents are vulnerable. To this end, organizations housing patients should strive for independent and self-sufficient operations. The targeted length of self-sufficient operations needs to be developed as a standard by the region.

3.5 *Measuring Effectiveness and Managing Continuous Improvement*

Measurement implies defined objectives and agreed upon benchmarks. To date, these have not been established for the region. Within the framework of this study, the following objectives are suggested and, if accomplished, could serve as benchmarks to measure preparations effectiveness:

- The development of a practical sector “command and control” mechanism with a sensible interface with emergency services sector and a merging and blending of the first-responder ability with a phased longer term perspective of the recovery process led by a strong and integrated public health competence. This includes developing redundant and interoperable communications links, procedures and establishing networks.
- Mutual arrangements established with contiguous regions’ governments and healthcare organizations that address evacuation, support services planning, and memorandums of understanding with backup facilities.
- The identification and elimination of policy gaps and significant harmonization of policies. Included is blending military and civilian emergency and recovery assets and workforce.
- Improved understanding of workforce behaviors that buttress practical plans for periods of crisis.
- Mechanisms, training and agreements in place for expanded emergency roles for a range of health professionals, regional credentialing endorsements of healthcare professionals, and region-wide database of healthcare professionals.
- Development of multidisciplinary “situation alert teams” within healthcare organizations who have: participated in threat and vulnerability assessments of facilities and functions; have risk management plans and actions; and who can lead self-sufficient operations for at least 48 hours.
- Professional and citizen expectations calibrated by training and mass media communications for medical and healthcare rendition in emergency conditions.
- Mapping of county and district neighborhood/shopping pattern grids or modules designed and evaluated for effectiveness and efficiency in supporting neighborhood sufficiency.
- A network of regionally scattered, shared-warehouse stockpile sites served by redundant transportation routes.

A program of continuous improvement will require significant regional participation and commitment to objectives, periodic assessment of success, and identification of barriers, to advance objectives. Thus, it would necessitate a regionally dedicated operations team to support and conduct studies, to provide “feedback” into the system in allocating resources and taking actions to stay on course toward achieving objectives.

4. Conclusion

The health services sector is in the early period of unfolding the realities of malicious threats. Many findings and recommendations were discussed in the Executive Summary and the subsequent report and will not be repeated here. These findings and recommendations offer direction for future actions and for further investigation.

There are, however, three underlying and fundamental challenges toward improving the preparedness of the NCR. Acting on any of these three has a value, with or without future attacks.

- *Effective Regional Collaboration and Governance:* Over the past four decades, there have been numerous efforts to improve the regionalization and integration of the health services delivery. These efforts include:
 - Regional medical programs
 - Comprehensive health planning
 - Area health education centers

These programs had varying degrees of success. But, those programs that have proved the most vexing are the ones that straddle geopolitical demarcations. Therefore, perfecting regional governance strategies in such demanding contexts will only help to improve progress in all sectors.

- *Strategic Planning for and Investment in a 21st Century Public Health Infrastructure:* A strategic plan and investments in a regional, robust public health infrastructure is essential. The threat of WMD's may be to the nation's healthcare system what "Sputnik" was to the space race--results could well be the advancement of inter- and intra-infrastructure collaboration among all critical sectors. More research, along with wise investments in identifying vulnerabilities and developing practical, effective, and efficient public health resources and response behaviors, will make a significant contribution to community health standards and competence whether or not there is another WMD attack. Historically, public health investments made momentous contributions to life, longevity, and quality.
- *New Models of 21st Century Population Medical and Healthcare:* A third area of future study is population-level, community-focused medical and health-care delivery. Such approaches capture the potential of information and communication technologies and follow in the wake of and with the momentum of commercial consumer trends and retail innovations. These stress greater consumer participation, decision-making and personal responsibility, and availability of discounted services, products, technical support, information, and "do-it-yourself" training. Such innovations may have significant implications for the soaring cost of healthcare.

APPENDIX A

Healthcare Organization Guided Vulnerabilities Assessment & Preparedness Planning

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NCR Project
Health Services Sector

May 2005

The following methodology and checklist have not yet been field-tested or validated, and no endorsement or approval by any private or government agency is implied.

Introduction

“9/11” raised the specter of new threats to the United States, its health services organizations and its citizens. An enormous web of health service organizations and professionals form one the community’s most essential infrastructures. Each organization within this web confronts a broad range of hazards---traditional natural disasters plus new threats of malicious terror.

Normally, individual health services organizations are focused internally and on immediate patient care responsibilities. However, in the face of community crisis, a broader and external public health role and synchronization with community-wide directed response is vital to the welfare and survival of the community, its institutions and its citizens.

This all- hazards tool is designed to be used to assist a healthcare organization in:

1. Developing an organization wide *all hazards* situational awareness focused on critical functions and policies.
2. Performing a comprehensive, systematic, and continuous exercise to identify and evaluate potential points of vulnerability as a foundation for then developing risk management solutions.

This tool is intended to be used along with other tools such as the *Kaiser Permanente Medical Center Hazard and Vulnerability Analysis* tool.¹⁹ The Kaiser tool is particularly useful in assessing an array of naturally occurring events, technologic events, human events, and hazmat events. It provides a practical method for estimating the risk of such events for a particular organizational setting. A second additional recommended tool is the *FEMA Reference manual to mitigate potential terrorist attacks against building (Publication 246)*. While it is intended audience for the architects and engineers and is building or facility focused, it is a good guide for the evaluation of facilities vulnerabilities.

The process steps presented are drawn from strategic planning methods. The functions focused vulnerabilities checklist is based on an analysis of a wide variety of assessment systems, from experience of health services organizations in coping with disasters, and items that reflect the concerns expressed in the literature contemplating the menace of weapons of mass destruction.

This guide is intended for a typical community health services organization or practice. A tertiary medical center with the typical range of academic affiliations possesses the skill sets and resources most community based organizations and practices do not. While most of the elements of the process and checklist comprising this guide can be found elsewhere, the goal is to bring all the tools in one place for ease of access and use.

The guide is designed as an instructional process for the “learning organization”. The premise is that the time devoted will not be wasted even if there is never an attack. An investment of effort by a team drawn from across an organization to study its vulnerabilities and develop plans to mitigate risks will strengthen and “harden” the organization and make it a more vital and resilient asset to the community.

- Part I. Presents a step-wise process for a team assessment to generate an agenda of prioritized list of vulnerabilities as a foundation for developing risk solutions

strategies. *The premise is that a comprehensive assessment of potential security gaps and weaknesses is the foundation for preparedness planning and more effective risk management. This is the focus of the tool.*

- Part II. Provides a guided assessment checklist of known points of vulnerability.

The goal of this tool is to provide a useful guide for vulnerability assessment/risk management that can be incorporated into the on-going activities of a healthcare organization and provide for a database for assuring effective preparedness planning. The tool will aide a healthcare organization in complying with the *JCAHO Emergency Management Standards*.

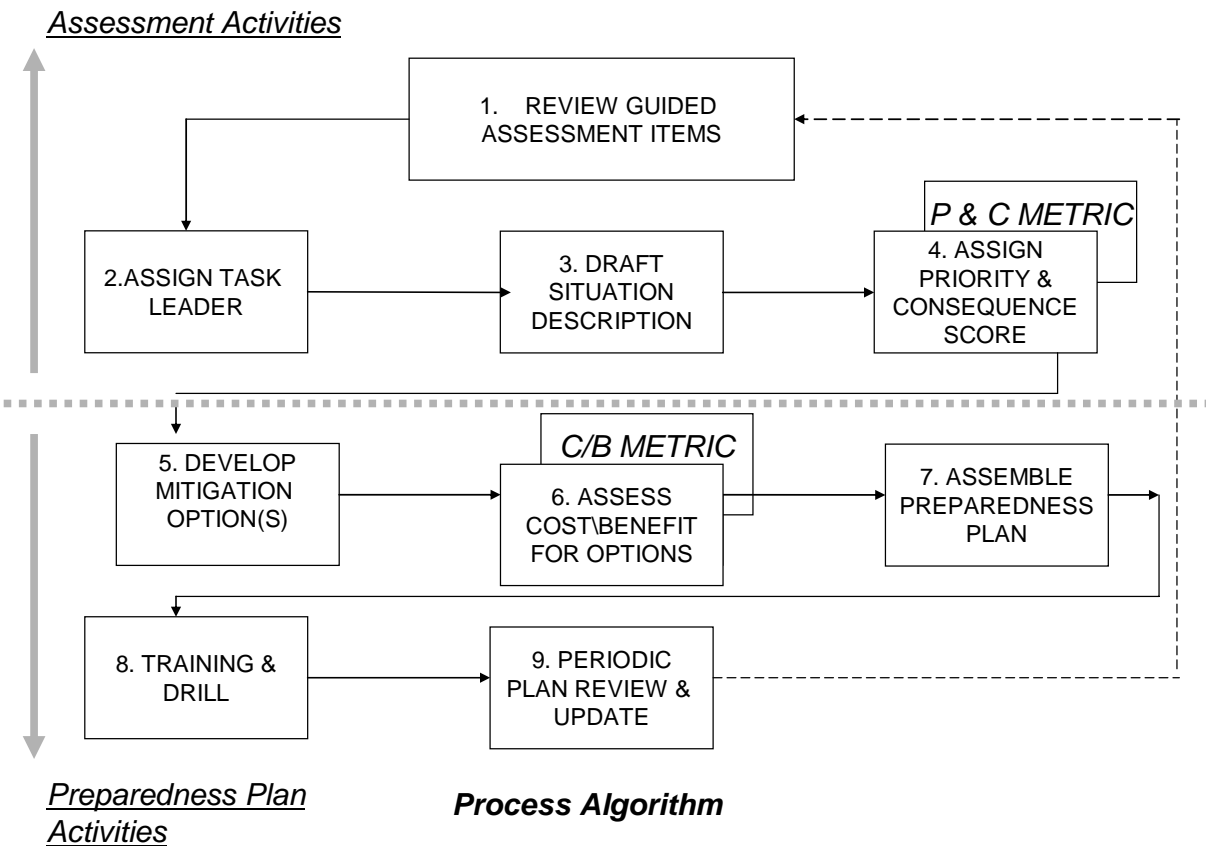
PART I. ORGANIZATION OF THE PROCESS

The role of a guided review of potential vulnerabilities is similar to the use of systematic checklist practices in aviation. These checklists are developed to encompass points critical to flight operations and include points of documented critical failure. A checklist is organized by major clusters of considerations. e.g., weather, planned route of flight, the airframe, the power plant, communications and navigation instruments, and crew status. The checklist items are intended as probes to trigger thought, preparation, and assure “situational awareness”. They give surety to careful and systematic deliberation and planning to mitigate untoward events and preparedness for such events should they occur.

The suggested VA/RM process for healthcare settings is also organized around major clusters, each populated by a series of specific items of concern. These clusters are:

- Workforce
- Facilities and Physical Security
- External Interdependencies
- Information Systems
- Administration

This is an overview of the process showing a number of sequential steps and the relationship of these steps. The top half of the schematic is related to assessment activities. The bottom half is related to planning and preparation activities. The logic underlying is that careful and comprehensive assessment is foundational to effective and efficient preparation and preparedness.



Step 1: Identifying and Building an Interdisciplinary Team:

A multidiscipline team is selected to develop and maintain an organization-wide “situational awareness”. The number of members on the team will depend on the size of the organization. A person from administration may be appointed to facilitate the team’s activities. Members for the team should be selected for their specific skills and areas of responsibilities related to a specific topic of analysis. Infection control and epidemiology, emergency care, security, risk management, infection control, clinical laboratory, radiology, education, public relations, human resources, information systems and facilities engineering are functions with particular relevance to assessing points of vulnerability, and developing mitigation plans. The idea is to draw upon all the resources and skill sets from across the organization. For some functional areas, and particularly in smaller organizations, it may be helpful and necessary to bring external expert consultants in for special assignments.

Step 2: Examining the 37 item guide and tasking team members:

In reviewing each item cluster, the key questions are; *Who in the organization has the best information? Who by training and experience has the required skill?* This individual should be assigned to lead the assessment of the item. The process itself is an active instructional experience for the team and builds a network of security and situational awareness. While consultants are frequently contracted to implement a vulnerability assessment, the vital

information developed does not reside within the active awareness of the organization’s staff. It too often leaves with the consultant.

Step 3: Describing and Documenting the Vulnerability

The assigned team members are tasked with the responsibility to describe concisely the organization’s vulnerability and document the current condition of the organization in regard to the vulnerability. These are to be brief descriptions and will subsequently be shared with the entire team for a broader discussion and refinement, and then into a database for preparedness planning.

Step 4: Ranking Priority and Consequence of the Vulnerability Based

After description and documentation, the team assesses and assigns a priority for each vulnerability, a ranking of “1” to “9”, with “1” being the highest priority category. The method of calculating and assigning the “priority” number is to evaluate both the degree of vulnerability of the item as well as the consequences of a failure. The matrix may be helpful in making this judgment.

Vulnerabilities Priorities Matrix

VULNERABILITY	CONSEQUENCES		
	HIGH	MEDIUM	LOW
HIGH	1	4	7
MEDIUM	2	5	8
LOW	3	6	9

Note: This step may be considered with threat assessment and threat probabilities estimations developed utilizing the Kaiser tool. Vulnerabilities may vary as a function of particular type of threat. This tool gives weight to WMD threats.

Step 5: Entering the ranking score on the Excel worksheet

The ranking scores are next entered for each of the 37 items on a formatted Excel worksheet. Such a spreadsheet is illustrated on page 65.

Step 6: The Rankings are sorted from “1” highest vulnerabilities to “9” lowest vulnerabilities

- Using the Excel spreadsheet sort feature:
1. Select the column with ranking scores
 2. Select “sort”
 3. Select “ascending”

This will automatically order the vulnerabilities from “1” through “9”.

This rank ordered priorities lists can provide an agenda and foundation for addressing and developing mitigation strategies and the preparedness plan.

Brief Discussion of Developing Risk Mitigation Solutions and Preparedness Plan

With the database of vulnerabilities priorities, it is suggested that again the team individuals be assigned the task of generating risk management options and mitigation plans for their area of expertise. These recommendations may then be presented, discussed and evaluated by the team.

When all plans are assembled for all priority items, the team initiates a study of the relative anticipated costs and benefits of each mitigation proposed solution. A simple tool provided to assist in reaching order of magnitude estimation.

Cost –Benefit Assessment Matrix

COST	BENEFIT		
	<i>HIGH</i>	<i>MEDIUM</i>	<i>LOW</i>
<i>LOW</i>	A	D	G
<i>MEDIUM</i>	B	E	H
<i>HIGH</i>	C	F	I

These cost-benefit scores can be added to the worksheet in a column adjoining the V/C ranking scores. The list of solutions can be sorted from the “low cost/high benefit” strategies to the “high cost/low benefit” strategies.

At this point the teams work and recommendations are recorded in a database and ready for submission to the administration for incorporation into the organization’ preparedness plan.

It is anticipated that many mitigation actions will require significant in service training.

Emergency scenarios and regional drills can test the plan and strategies. Further, the vulnerability assessment/preparedness planning process needs to become iterative regularly updating the assessment and the plan.

Part II: Guided Assessment Checklist of Known Points of Vulnerability

WORKFORCE

1. Review of employee and staff database:
Up-to-date list of all employees with phone\emergency contact information?
Vaccination records?
2. Examination of employment and staff policies and practices.
Background checks for potential employees before hiring?
Periodic criminal checks for existing employees?
Periodic checks of state licensing boards?
3. Review of policies and procedures for employees and staff called to military duty?
Legal rights of reservists and National Guard members?
Compensation/benefits for employees called to active duty?
4. Examination of employee policies and practices related to incidents
Compensation/benefits for employees who remain on the job during an incident?
Policy for employee who refuses to come to work during an incident?
Plan to transport personnel to and from work if roads and streets are closed?
Plan to mitigate the concern employees may have for their families' wellbeing?
Provisions for food, water and rest for employees?
Assistance to counsel employees and their families on life-crisis management?
Weapons at facilities policy?
Post traumatic stress assistance?
5. Assessment of employee, staff, vendor, contractor, and visitor identification systems
Photo-identification badges?
Biometric devices to control access to sensitive areas?
Periodic changes of keys and pass-codes?
6. Appraisal of employee protection plans and devices.
Communications equipment and protocol to rapidly report incidents?
Monitors for radiation, chemical or biological detection?
First-aid materials at worksites?
7. Analysis of employee and staff incident management training.
Personal preparation for coping with crisis
Handling a threat received in person, by phone, e-mail, mail or other means?
Procedures should an incident occur?
Whom to contact to report a threat or emergency?
Procedures for determining when and how to evacuate a building?
Employee training in security measures?
Training in emergency preparedness adopted plan?

First aid training?

8. Appraisal of WMD professional continuing education needs assessment and methods:

Public Health Policy and Law

Healthcare professionals from respective practice disciplines:

1. Understand the public health significance and impact,
2. Comprehend the pathogenesis,
3. Recognize the signs and symptoms, and
4. Know the treatment management of:
 - Water safety threads
 - Food safety threads
 - Anthrax
 - Botulism
 - Plague
 - Smallpox
 - Tularemia
 - Viral hemorrhagic fevers
 - Emerging infectious diseases
 - Ricin
 - Sarin
 - Commercial Chemicals
 - Radiation

Methods: Classroom/seminar training, self-study, computer based training, satellite/Web broad.C.ast, video tape/ CD/DVD?

FACILITIES AND PHYSICAL SECURITY

9. Considered the openness of the perimeter of your facility or campus? Are physical barriers warranted? Areas fenced and gated? Monitoring? Implications for handling mass casualties? Worried well?

10. Consider access to the campus, facilities and particular areas. Limited to employees and person with a valid reason for being there?

Employee and staff method of identification?

Guards required?

Are essential doors and windows locked? Are they of a necessary strength?

Evaluate your system of visitor control. Identification required? Escorted where necessary? Sign in and out?

11. Evaluate the method of campus and facility surveillance.

Are buildings alarmed?

Can intrusion be detected?

Emergency doors alarmed?

Site monitoring by Closed Circuit Television?

- Uninterruptible power source for alarms and monitoring?
 - Adequate night lighting?
 - Emergency lighting for evacuation?
 - Public address system or other warning system for incident notification?
 - Blocking of views by trees and scrubs?
12. Review of *Parking and Delivery Management*
 Is parking restricted to adequate distances from structures?
 Are delivery trucks and vans inspected?
 Designated areas for receiving and screening of mail/deliveries?
 13. Assessing *Hazardous Material Controls*
 Identification of hazards; isotopes, pathogens, and toxic chemicals?
 Tracking to account for all hazardous materials received, used, and disposed?
 Detection systems in place?
 Information available to employees or others responding to hazardous materials?
 14. Consideration of *short term back up* for:
 Water reserve? Cooling? For human consumption?
 Electricity?
 Fuel?
 Food in storage?
 15. Evaluation of *structural soundness and building(s) risk identification*.

INFORMATION SYSTEMS

16. Review of policies and procedures for governing *Internet access and use*.
Internal and external users access controls?
17. Implications of crisis for *HIPPA compliance*?
18. Emergency response plan for:
 Total loss of telephony?
 Total loss of radio?
 Total loss of Internet?
19. Protection screening for *network traffic*:
 Viruses?
 Attack?
20. Modem:
 Access to Wide area network (WAN)?
 Attached to end-user desk top systems: secure LAN?

21. Security architecture for external communications?
22. Vulnerability/penetration evaluations tests of network?
23. Local/backup power supply?
24. Supervisory control and data acquisition system (SCADA):
 Vulnerability\penetration tests of SCADA systems?
 Secure locations for the SCADA system components?
25. Periodic scheduled identification\backup critical applications\data off-site ?

EXTERNAL INTERDEPENDENCIES AND CONTIGUOUS GEOGRAPHIC RISKS:

26. Evaluation and management of *relationship with local Public Health authorities:*
 Contact names, phone numbers, and email addresses?
 Frequent and current communication and consultation?
 Laboratory findings protocols establish with public health labs?
 Current with CD.C. food and blood borne pathogen surveillance protocols?
 Familiarization with Public Health Crisis authorities?
 Familiarization with pharmaceuticals stockpile plan?
 Mutual aid agreements with other medical facilities
 ESS support agreements
 ESS response time
27. Evaluation and management of *relationships with Emergency Management Services:*
 Contact names, phone numbers, and email addresses?
 Police, Fire, and Transportation
 Frequent and current communications and consultation?
 Participation in regional response planning?
 Participation in regional and community drills?
 Participation in regional surge planning?
 Clear on crisis “chain of command”?
 Role of Emergency Department in regional response?
28. Evaluation and management of *relationships with essential utilities:*
 Water: Contact names, phone numbers, and email addresses?
 Recent consultation with utility?
 Electricity: Contact names, phone numbers, and email addresses?
 Recent consultation with utility?

29. Evaluation of proximity to high value targets and high risk facilities?
Proximity to high value terrorist target(s)?
Proximity to inflammable fuel storage and distribution facilities?
Proximity to chemical plants?
Proximity to transportation routes conveying hazardous materials?

ADMINISTRATION

30. Review of leadership in crisis planning:
Crisis “Chain of command” plan for the organization?
Crisis triage protocols and management systems prepared and approved?
Patient capacity status monitoring and management?
Contingency plan for role in mass prophylaxis?
Designated secure location for management team and “call center”?
31. Evaluation of emergency preparedness plans:
Addresses mass casualty incidents involving biological agents-- influenza epidemics, new emerging infections, or terrorist use of biological agents?
Coordinator designated to oversee all preparedness efforts
Credentialing procedures permit rapid recognition of credentialed staff from other facilities?
Problems staffing under normal patient loads?
Protocols for cancellation of elective surgeries given mass casualties? Early discharge?
Participation in regional surge planning?
Memorandum of Agreement with extended care facilities? Outlying hospitals?
Antibiotics cached; Doxycycline, Tetracycline, Ciprofloxin, Levaquin, Gentamicin, Tobramycin?
Critical Incident Stress Management?
Adequate morgue facility, staff, management policy in the event of mass fatalities?
Universal Precautions gear for personnel?
Decontamination capabilities?
Adequate supplies available from local or regional suppliers to be self sufficient for 48-hours?
Established and reviewed?
Distributed and communicated?
Tested for workability?
32. Assessment of Clinical laboratory capabilities:
In-patient laboratory staffed 24 hours a day, 7days a week?
Diagnostic capability: minimal identification? Identification, confirmation, and susceptibility testing? Advanced laboratory capacity with some molecular testing?
Biosafety level (BSL) capability of in-patient lab?
Protocols for the handling laboratory specimens in the event of a biological incident?

33. Appraisal of organizations *epidemiological and infectious disease detection and management capabilities*:
Effective epidemiological and infection control capabilities?
34. Consideration of assess to *Critical Business Documents* in the event of crisis:
Building drawings
Paper and electronic copies of emergency response information
Contact databases: (*see External, and Workforce items*)
Backup electronic files: (*see Information System items*)
35. Review of *Financial Preparation*:
Access to funds and investment records
Coordination with billing to assure continued operations
Maintenance of sufficient reserves to fund operations
Availability of contingency line-item for incident-response items
36. Evaluation of *communication systems and methods*:
Reliability evaluated for crisis periods?
“Call Center” designated, planned, and tested?
37. Assessment of *Patient and Media Communications* planning:
Planning for crisis messaging? Communicating to calm public?
Culturally and linguistically appropriate messages?
Boilerplate press releases and public notices for media
Designated and trained spokesperson
“Responding to Crisis” community\citizens education program

Vulnerability Assessment Worksheet

V/C Score

1. Employee and Staff Database
2. Employee and Staff Policies and Practices
3. Staff called to Military Duty
4. Employee policies related to incidents
5. Identification Systems
6. Employee protection
7. Incident management training
8. WMD education
9. Perimeter evaluation
10. Campus/facility access
11. Campus and facility surveillance
12. Parking and Delivery Management
13. Hazardous Materials control
14. Short term back up
15. Structural evaluation
16. Internet access and use
17. HIPPA compliance
18. Response plans for loss: telephony, radio, email
19. Protection screening for network traffic
20. Modem access and attached; WAN, LAN
21. Security architecture for external communications
22. Vulnerability/penetration evaluations tests of network
23. IT back up power supply
24. SCADA
25. Critical applications and data offsite backup
26. Relationship with local Public Health authorities
27. Relationships with Emergency Management Services
28. Relationships with essential utilities
29. Proximity to high value targets and high risk facilities
30. Crisis leadership planning
31. Preparedness plans
32. Clinical laboratories
33. Epidemiological and Infectious disease detection resources
34. Access to critical business documents
35. Financial preparation
36. Communication methods
37. Patient communication and Public media planning

Vulnerabilities Priorities Matrix

VULNERABILITY	CONSEQUENCES		
	HIGH	MEDIUM	LOW
HIGH	1	4	7
MEDIUM	2	5	8
LOW	3	6	9

Vulnerability Assessment Worksheet

NCR Health Service Sector
Project

V/C Score

1. Employee and Staff Database
2. Employee and Staff Policies and Practices
3. Staff called to Military Duty
4. Employee policies related to incidents
5. Identification Systems
6. Employee protection
7. Incident management training
8. WMD education
9. Perimeter evaluation
10. Campus/facility access
11. Campus and facility surveillance
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27. Relationships with Emergency Management Services
28. Relationships with essential utilities
29. Proximity to high value targets and high risk facilities
30. Crisis leadership planning
31. Preparedness plans

- 32. Clinical laboratories
- 33. Access to critical business documents
- 34. Financial preparation
- 35. Communication methods
- 36. Patient communication and Public media planning
- 37. Epidemiological and Infectious disease detection resources

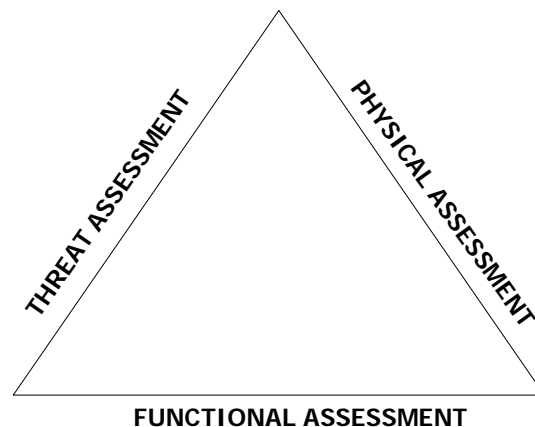
NCR HEALTH SERVICES SECTOR

Methodology and Discussion of the Development of the Vulnerability Assessment/Risk Reduction Process and Checklist Tool

Vulnerabilities assessment and risk reduction for health services organizations has three primary elements:

1. Assessing threats and gauging probabilities
2. Evaluating possible impacts of threat events on the physical plant, and
3. Appraisal of the impact on critical service functions.

In the case of critical health and medical services, resilience may depend more on protection of critical functions than specific facilities. A comprehensive all-hazards approach to vulnerability assessment therefore must address all three considerations.



A tool that has demonstrated its value for health services organizations in the *threat assessment* is *Medical Center Hazard and Vulnerability Analysis* developed by the Kaiser Permanente Foundation. It is being used extensively by many healthcare organizations and is part of JCAHO training activities. This tool provides a practical framework and equation for arriving at a metric to estimate the probability of known and historic threats. It guides a process of considering property, human, and business impacts of each threat type. It, also, outlines steps for a preparedness appraisal including both internal and external resources.

A practical approach to *evaluation of physical vulnerabilities* is provided by FEMA in *Reference manual to mitigate potential terrorist attacks against building (Publication 246)*. The intended audience for the publication is architects and engineers. Its purpose is to provide information to mitigate the potential effects of terrorists' attacks. Health services facilities are one of six board groups specifically addressed by the advice and direction provided. The publication stresses that the information is not mandatory and that not information is applicable to all buildings.

The first chapter of the FEMA Publication 246 specifically addresses methods of integrating threat/hazard/value asset and vulnerability assessment information. In turn, this information becomes the input for determining relative levels of risk. The logic is that those vulnerabilities that are identified as higher levels of risk require risk mitigation measures. The Chapter includes an assessment checklist that complies with best practices "based on current technologies and scientific research."²⁰ The checklist can be used to assess the vulnerabilities of existing buildings considering specific types of threats.

Given that a suitable tool for assessing critical health services organizations policies and functions was *not* found, a new tool has been developed by the NCR Health Service Sector team for the assessment of critical functions. The logic and specifications for the new tool are outlined:

1. Comprehensive across health services operations; emergency, laboratory, epidemiology and infection control, radiology, human resources, hazardous materials management, information systems, etc.
2. A process that sequentially focuses first on identifying and prioritizing a problems agenda before addressing solutions.
3. Frames as an education and training process.
4. Uses a process to develop within an organization a multidisciplinary "alert team" trained to maintain "situational awareness".
5. Gives emphasis to workforce and Public Health.
6. Address communications with water, power, communications, emergency management, and transportation supports.
7. Addresses JCAHO emergency standard for accreditation
8. Presents a non-technical "user-friendly" format.

Review of open-source Vulnerabilities Assessment/Preparedness Planning tools and Methods:

Existing methods and systems provide many important features and items that have been incorporated into the NCR Healthcare organization tool. Years of experience coping with an array of natural disasters has been instructive in developing approaches to vulnerability assessment, risk management, and to associated metrics. While every system has some relevance, no one system meets the criteria of this project.

The following lists open-access systems and tools reviewed and from which elements were drawn in the development of a new tool:

- Asset Based Vulnerability Checklist for Wastewater Utilities
Association of Metropolitan Sewerage Agencies*
- Vulnerability Assessment Framework Critical Infrastructure Assurance KPMG
Peat Marwick LLP*
- PART B - Perimeter Security Department of Defense*
- Security Self-Assessment Guide for Information Technology Systems
National Institute of Standards and Technology*
- Assessment and Strategy Development Tool Kit Department of Justice
- Reference Manual to Mitigate Terrorist Attacks against Buildings
Federal Emergency Management Agency
- Protecting Your Community's Assets: A Guide for Small Wastewater Systems
National Environmental Training Center for Small Communities
- A Guide to Highway Vulnerability Assessment for Critical Asset Identification and Protection. The American Association of State Highway, and Transportation Officials' Security Task Force
- Department Of Justice Standards for Protection of Federal Facilities (Appendix K) U.S. Department of Justice
- Vulnerability Assessment Fact sheet Environmental Protection Agency
- Navigation and Vessel Inspection Circular No. 05 03
United States Coast Guard
- Physical Security Assessment for Department Of Veterans Affairs Facilities
National Institute of Building Sciences*
- Security Guidelines for the Electricity Sector North American Electric Reliability Council
- Medical Center Hazard and Vulnerability Analysis Kaiser Foundation Health Plan, Inc.*
- Biological, Chemical, and Radiological Emergency Planning/Preparedness Capabilities" New York City Department of Health*
- Hospital Weapons of Mass Destruction Needs and Resource Assessment Survey
Marasco Newton Group Ltd.,*
- WMD Checklist Institute of Medicine*
- Preparing for Terrorism: Tools for Evaluating the Metropolitan Medical Response System American Hospital Association*

Existing systems and methods provide excellent guidance in the evaluation of facilities, levels of security (both physical and IT systems), and risk and threat assessment for the considerable

experience with natural disasters. However, the following are the general deficiencies of the existing methods and systems from a health services sector perspective:

1. Most have been developed without attention to malicious intentional bioterrorism threats or events. This has particular significance for the health services sector in protecting its workforce and bringing it to a high level of preparation to respond to WMD threats and events. Since 9/11 there are a growing number of valuable but limited tools emerging.
2. Much of the focus is weighted for attention to facilities, and more recently information technology systems and networks.
3. Workforce vulnerabilities are not addressed at a scope or depth necessary for the most critical health services infrastructure.
4. The critical interdependencies and interface between healthcare organizations and public health agencies and authorities and EMS is not addressed.
5. The tools that are emerging in the health services sector are predominately hospital centered.

“Thumbnail” reviews of several systems from the view point of the health services sector are provided in Appendix B.)

There are currently no existing federal security criteria that specifically meet the complex requirements of healthcare environments. Several related private sector associations have been developing security related criteria including:

- American Society of Hospital Engineers (ASHE)
- American Society for Industrial Security (ASIS)
- International Association for Healthcare Safety & Security (IAHSS).

Sector specific All Hazards concerns:

A systematic search and evaluation of the published healthcare sector literature was as important phase of the research. The purposes of this literature survey are:

1. To assure the study is aligned with and based upon the existing body of scholarly thought of the academic and professional community.
2. To identify, if any, comprehensive Vulnerability Assessment systems and methods specific to the healthcare sector.
3. To identify and list the spectrum of perceived specific threats addressed in the literature.
4. To identify the range of implied vulnerabilities inferred from the concerns and issues cited and elaborated in the literature.
5. Provide a guide for augmenting and enhancing the development of a sector specific vulnerability assessment process and guide.

Conventional literature search methods were employed. The primary framework and context for the search is the National Institutes of Health National Library of Medicine electronic resource

databases. Iterative and continuing searches were implemented using all key words combinations

The literature was reviewed back to the beginning of 1999. The search was continued until a substantial number of the repeated citations appeared regardless of search query terms and descriptors.

The search produced over two hundred citations. In summary:

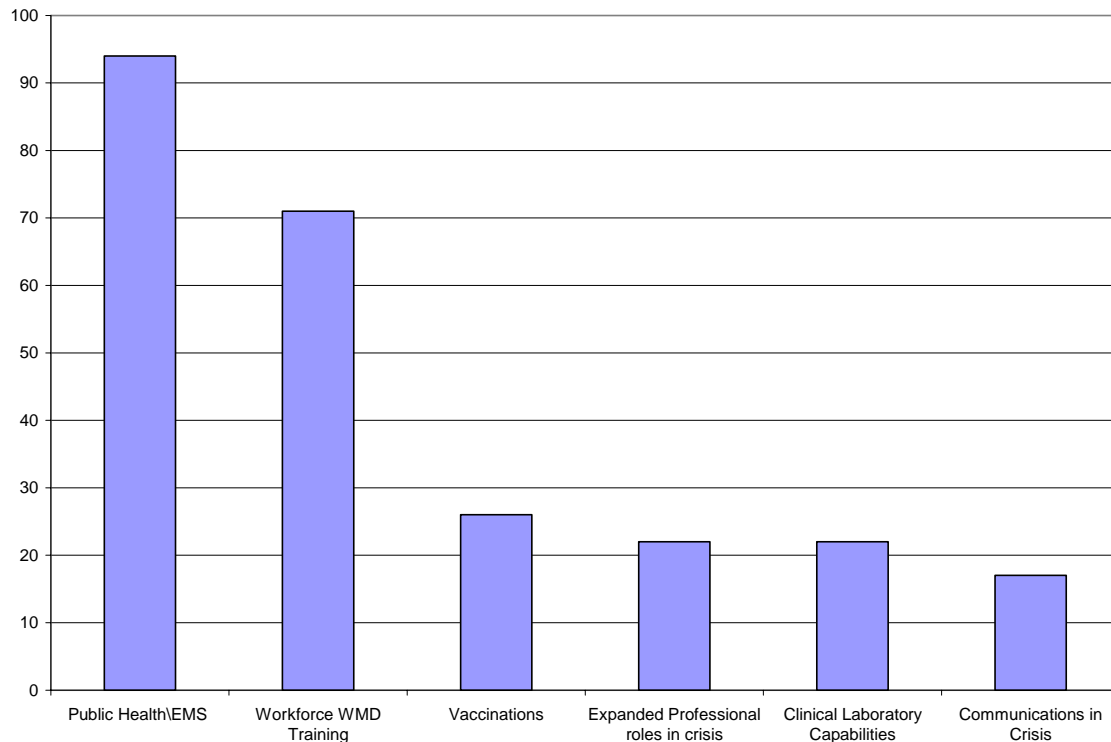
- The search did not find an existing comprehensive health services sector vulnerability assessment methodology.
- The search did reveal an extensive list of WMD related concerns as to both vulnerabilities and preparedness.

Chemical and nuclear threats are addressed as broad classes of threats. In contrast, the most specific consideration is devoted to specific biologic threats. Anthrax and smallpox account for the largest topic as reflected in number of publications. There is building concern for emerging infectious diseases and effective personal and public management. The following are the expressed in the literature as concerns in the context of bioterrorism threat possibilities:

Biological, Chemical, and Nuclear Threats Cited in Literature Search

Anthrax (<i>Bacillus anthracis</i>)	Tularemia (<i>Francisella tularensis</i>)
Smallpox (clinical variants)	Botulism (<i>Botulinum toxin</i> , <i>C.botulinum</i>)
Vaccinia	<i>Yersinia pestis</i>
Hemorrhagic fever viruses	<i>Rickettsiae prowazekii</i>
<i>R. rickettsii</i>	<i>Coxiella burnetii</i>
West Nile virus	SARS
Filoviruses	Hantaviruses (pulmonary syndrome)
Paramyxoviruses	Lyme disease
Legionnaire’s Disease	HIV
Avian influenza	Venezuelan equine encephalomyelitis
Sarin	Industrial Chemicals
Radiological	Nuclear
Prion disease agents	Newcastle disease
Pandemic influenza	Toxic shock syndrome
Ricin	
Food borne pathogens	Water borne pathogens
Emerging zoonotic diseases	Foreign Animal Disease (FAD)

The “collective mine” as reflected in the literature reveals a broad gamut of health services sector issues of concern. These are interpreted as implied or perceived vulnerabilities and provide a useful beginning point for evaluating gaps and weaknesses across this very complex sector. The graph following displays six major clusters of apprehension as evidenced in the literature. The graph tallies the number of articles directed to a topic.



Topic Frequency Addressed in Literature Search

The following briefly summarizes these foremost topics most frequently appearing in the literature.

Public Health, EMS, and Healthcare Organizations Relationships:

The interdependencies between and among Public Health, Emergency Management Services, and healthcare organizations in times of community crisis are recognized. However, apprehension is manifested as to the generally poor state of Public Health, and its relatively weak relationships with the predominately private acute and rehabilitative care focused mostly private service organizations.

Representative concerns expressed include:

- Visibility and credibility for public health
- Lack of clarity of chain of command, and, lack of defined procedures for granting and exercising authority
- Need for regional patient and healthcare capacity status management, i.e., surge planning for mass casualty;
- Lack of awareness of population factors generating vulnerabilities; population growth, aging population, misdistribution of population in disaster prone areas, urbanization, structural vulnerabilities

- Need for realistic triage protocols and management systems based on public health and epidemiologic requirements
- Links and shifting relationships between Emergency Medical Service Systems and Public Health Authorities
- Plans for special needs populations
- Need for real-time public health surveillance program linking local, state, and national health care
- Need for outbreak response planning
- Affordable biological agent detection systems
- Prioritization and distribution of scarce resources
- Awareness of long term health consequences of attacks, and
- Public awareness and comprehension of Public Health law.
- Policy and role of mass prophylaxis campaigns

Inadequate preparedness planning

Inadequate and insufficient equipment and ill prepared

Workforce Preparedness:

The workforce is unmistakably viewed as the sector's most critical asset and it is viewed as unprepared for WMD.²¹ A survey reported by the American Academy of Family Physicians, only one-quarter judge them prepared. Only one in six had received any training. Seventeen percent judged their medical communities prepared. In a similar study of nurse practitioners, only 20 percent reported confidence to provide care in bioterrorist situation. A sample of workforce related:

- Lack of understanding of workforce behaviors when confounded with mass attack event. Assuming workforce will report for duty
- Child care and family support concerns for attack event
- Adequacy of understanding of public health and population medicine
- Willingness to treat patients despite personal risks
- Scientific and clinical understanding of threat agents. Lack of training in diseases and toxidromes not commonly seen. Early empiric therapy, supportive and symptomatic care
- Decontamination, prevention of secondary exposure, and containment procedures
- Detection and management of post traumatic stress
- Need for education stressed in public health, infection control, infectious diseases, and toxins
- Traditional healthcare professional barriers to effective team behaviors
- Understanding of role and operation of National Pharmaceutical Stockpile
- Knowledge of public health law
- Awareness of food and water borne pathogens
- Understanding airborne pathogens
- Psychological and behavior reactions to bioterrorism

Vaccinations Policy and Planning:

Concern for and discussion of a wide variety of vaccination matters makes a frequent appearance in the literature. Anthrax and smallpox programs stimulated most of the discussion. The science and the policy related to vaccination programs are conflicted. There is a lack of a clear understanding among healthcare professionals as to both the risks and the benefits of vaccinations, particularly smallpox.

Exploration of Expanded Roles during Crisis Events:

Several authors voice support for numerous categories of healthcare professionals being trained and credentialed for expanded roles in the event of a community or regional crisis. Suggestions include: community pharmacists, public health nurse practitioners, veterinarians, community health workers, infectious disease specialists, clinical microbiologists, clinical epidemiologists, infection control professionals, toxicologists, and radiation healthcare professionals. Each has a particular expertise bearing upon some facet of WMD.

Clinical Laboratory and Surveillance Concerns:

The role of the healthcare organizations' clinical laboratory effectively linked with local, state, and national surveillance protocols and systems is viewed as an important line of defense. The literature contains a substantial discussion of this subject. A summary of concerns include:

- Adequacy of laboratory detection systems
- Adequacy of laboratory biosafety structures and protocols
- Sufficient recognition of role of clinical microbiologists, epidemiologists, of infection control
- Adequacy of local health department as the critical frontline of detection.
- Need for methods of rapid diagnosis
- Rapid epidemiological investigation of disease outbreak, timely recognition of outbreak and clusters
- Links, integration and reporting to state and national reference lab systems
- International surveillance networks
- Management of surge in number of environmental and human samples due to fear of bioterrorism
- Need for utilization of CD.C. Early Aberration Reporting System
- Vigilance for food and water borne pathogens
- Preparation for exotic and emerging zoonotic diseases

Communications concerns:

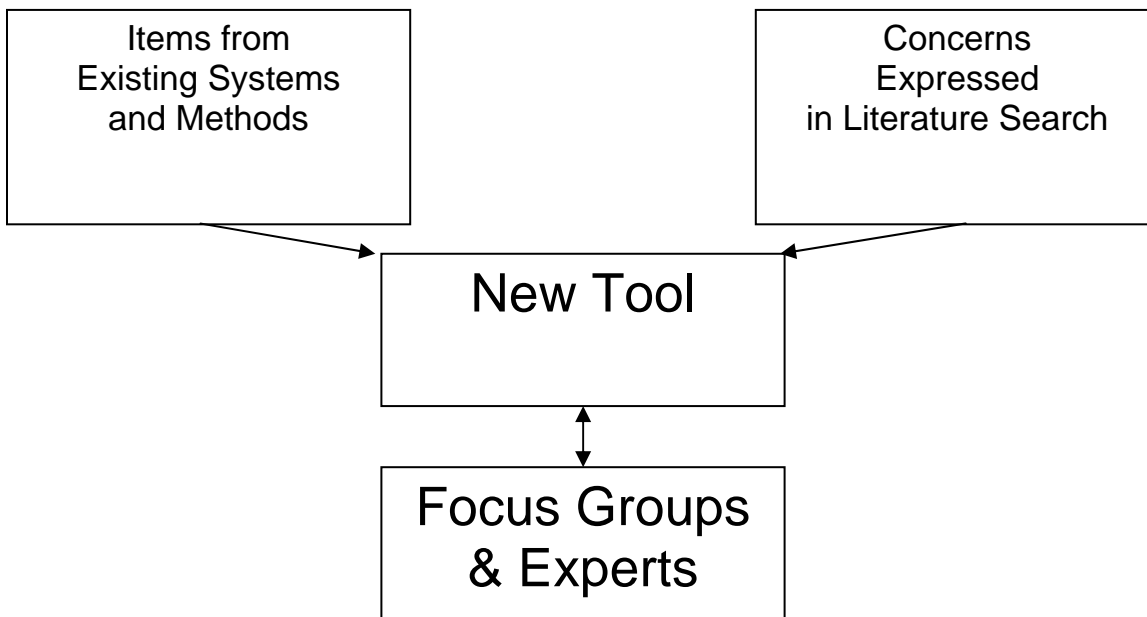
Interoperable redundant communications systems and procedures between and among: First responders, Hazmat, EMS, law (local, regional, national), health departments, local government, and statewide emergency management have a high level concern. Specific related issues include: concern for the reliability of various platforms, the need for redundancy, and need for designated "call center" and communications protocols.

Other concerns relate to communication messaging to a variety of target audiences. The concern is for the rational use of media shaping population behavior and the use of media as calming tool. There is recognition that the media is a tool for instructing the population. This communication entails:

- Risk communication management
- Culturally and linguistically appropriate messages
- Reliable technologies and channels
- Clear public guidance
- Ability to target messages
- Communicating coping with probabilities and uncertainties

Design and Development of the Healthcare Organization Tool

A new vulnerability assessment tool was designed and developed specifically for healthcare organizations. It provides a process guide and set of 37 items with questions probes. It can be practically implemented within specific healthcare organizations and settings.¹ The developed tool aims to integrate: (1) the “best practices” of existing systems. (2) Items of gleaned from the body of current research in healthcare. (3) The advice of the multidisciplinary NCR focus groups. And 4, Advice gained from acknowledged experts in the sector.



The NCR multidisciplinary focus groups included:

- Representation from the District of Columbia, Maryland, and Virginia.
- Representation of hospitals, nursing and rehabilitative facilities, ambulatory clinic services, and Public Health agencies. And,
- Representation from hospital and nursing facilities administration, human resources, epidemiology, infection control, clinical laboratory specialties, nurse practitioners,

¹ Note: The tool is targeted to community healthcare organizations and not to tertiary and academically affiliated centers. The premise is that such centers have the resources and professionals to address their unique circumstances.

emergency physicians, healthcare information systems specialists, and facilities and security management.

The primary recommendations were incorporated:

The Development of the NCR Healthcare Organization Vulnerabilities Assessment and Preparedness Planning Tool

The two components of the tool are:

1. A planning organized process consisting of a sequence of logical steps for implementing a vulnerability assessment in a healthcare setting. And,
2. A comprehensive checklist of potential vulnerabilities for consideration and preparedness planning regardless of sector or specific setting.

The process is derived from familiar strategic planning methods. A schematic is presented in the illustration that follows. The vulnerabilities checklists consolidate items from existing systems and those collected from the literature review.

APPENDIX B

Thumbnail Reviews of Open-access Vulnerability Assessment Systems

Security Self-Assessment Guide for Information Technology Systems
National Institute of Standards and Technology

Healthcare is basically an information-based activity. IT systems are ubiquitous in the sector. Information flow in healthcare is subject to significant regulations. The self-assessment questionnaire has relevance and utility for these activities. “Vulnerability assessment” (VA) is terminology derived particularly from IT practice.

Assessment and Strategy Development Tool Kit
Department of Justice Office for State and Local Domestic Preparedness Support

One part of the tool kit specifically addresses VA. “*Section 2*” provides a “Risk Assessment Process”. It lists and presents a variety of tools for “The Seven Vulnerability Assessment Factors”. These are:

1. Level of Visibility Criticality of Target Site,
2. Value of Target to Potential,
3. Threat Element
4. Potential Threat Element,
5. Access to the Target,
6. Threat of Hazard Potential for Collateral Mass Casualty, and
7. Site Population Capacity.

The potential direct value of this VA tool to healthcare sector is probably limited.

Reference Manual to Mitigate Terrorist Attacks against Buildings
FEMA

Chapter (1) addresses a broad array of topics including VA. As the title indicates, the content is *directed to buildings*. As healthcare activities for the most part occur within buildings, this is a useful document and contains important content.

The process presented follows a logical flow that is apparent and emerges across most of the examples reviewed:

- Identify critical assets and numbers of people
- Identify treats and hazards
- Define treats and hazards
- Determine threat levels
- Identify site and building systems issues
- Identify design issues again threats
- Determine level of protection necessary

Steps in identifying critical assets include:

- Identify buildings core functions and processes

- 1. Primary services
- 2. Critical activities
- 3. Employees and guests
- 4. Inputs required for building to operate
- Building analysis
 - 1. Critical components
 - 2. Critical IT
 - 3. Life safety systems and safe haven areas
 - 4. Security systems

The frame of reference and logic systems for conducting a building analysis has broad utility.

Protecting Your Community's Assets: A Guide for Small Wastewater Systems
National Environmental Training Center for Small Communities

The *Threat Assessment Checklist* and method of evaluating has utility as a model and for application. Vulnerability Assessment is set within the context of understanding “threat assessment.” A Threat Assessment method is provided that is summarized in the following steps:

- A. Frequency of Past Occurrences:
 - For single event, list date;
 - For multiple events, indicate the frequency over 1, 5 or 10 year periods.
- B. Probability of Future Occurrences:
 - 1 – Extremely unlikely
 - 2 – Not too likely
 - 3 – Somewhat likely
 - 4 – Likely
 - 5 – Very likely.
- C. Magnitude of Impact:
 - 1 – Little or no impact
 - 2 – Some impact
 - 3 – Medium impact
 - 4 – Significant impact
 - 5 – Major impact.

The list and enumeration of “natural” and “intentional” disasters assures a comprehensive consideration of the large range of possibilities to be measured in VA efforts.

Natural Disasters

- Floods (rivers, dams, snowmelt, low lying areas, streams, ocean, storms etc.)
- Landslide/Mudslide
- Thunderstorms and Lightning
- Tornado
- Hurricane / High Winds
- Winter Storms and Blizzards
- Freezing

Drought
Extreme Heat
Other Severe Weather
Forest or Brushfires
Earthquake
Avalanche
Volcanic Eruption

Intentional & Unintentional Acts

Equipment Failures
Lift Station Failure
Sewer Blockage
Transportation Accident
Construction Accident
Other Accident/Human Error
Energy Disruptions (fuel, lights, etc.)
Major Gas Line Break
Major Water Main Break
Criminal Acts
Strikes
Riots
Terrorist Attack
Obstructed Access to Facilities

Harmful Inputs to System

Hazardous Materials Release
High Strength Organic Material
Chemical Inputs
Radioactive Inputs

Communication System Failures

Communication Disruptions
Telephone Failure
Two-way Radio Failure
Cell Phone Failure
Telemetry Failure

Cyber Attacks and Failures

SCADA Failure/Disruption
Hackers
Loss of Sensitive Information Stored on Computer

A Guide to Highway Vulnerability Assessment for Critical Asset Identification and Protection.
The American Association of State Highway, and
Transportation Officials' Security Task Force

The VA process bears a resemblance to a general strategy that emerges across sectors. Three of these steps bear a direct relationship to VA.

- Step 1. Identification of critical assets.
- Step 2. The actual assessment of vulnerabilities. And
- Step 3. Assessing consequences.

The application is obviously to the highway system, but the VA *process* “landmarks” have relevance to the healthcare.

The discussion of the proper formation of a VA “Team” highlights the need to include skill sets and experience that spans the breadth and depth of a sector. The outline of responsibilities of the VA Team Leader is useful. The discussion of the time required for VA---*six months* ---and the phases of VA are useful. The identification of critical assets (infrastructure, facilities, equipment, personnel) is classified as a Pre-assessment activity. Direct “Assessment Phase” activities include assessment of; threats, vulnerabilities, and consequences. It vividly cautions that assessment is a continuous and iterative process.

The VA methods provide several techniques for rating relative levels and scoring strategies. These draw from the DOJ tools referenced in other documents in this review.

The appendices of the publication contain a variety of worksheets and scoring systems that could prove helpful with adaptation.

Department Of Justice Standards for Protection of Federal Facilities (Appendix K)

The idea of classifying facilities by Level (in this system, 1-5) as a general function of number of employees\clients has potential application. The document is facility focused. The issues and nuances of perimeter security and access are carefully covered. Systems of employee and guest identification are addressed. In short, this is a useful publication for many aspects that are common to operations of facilities. *Child day care* is specifically considered. Another important discussion covers “*intelligence sharing*”.

Recommended “minimum standards” tables may have utility for VA in the healthcare facilities.

Vulnerability Assessment Fact sheet

EPA

Although the document focus is water, this document has utility by providing a practical description and overview of the VA process. It is a helpful as a reference in drafting a practical definition and description of the VA process and of its major “landmarks”.

Navigation and Vessel Inspection Circular No. 05 03

USCG

This is a highly technical circular directed to a military command structure. Much of the circular would not have direct relevance for healthcare sector VA considerations. However, the “Facilities Security Plans (FSP)” could be adapted to structure a process and serve to provide a documentation of plans method.

Physical Security Assessment for Department Of Veterans Affairs Facilities
National Institute Of Building Sciences

(NOTE: The subsequent FEMA Publication 426, *Reference manual to mitigate potential terrorist attacks against buildings*, released in December 2003 is referenced and discussed in section II. Vulnerability Assessment of this report.)

This document addresses the Veterans Affairs facilities including hospitals and clinics. *Because the system includes healthcare facilities and operations needs to be carefully examined for broader applications to the healthcare sector.* However, the publication does not offer VA tools directly. The document is building or facility focused.

It outlines Vulnerability Assessment Drivers:

- Legislation
- Executive Directives
- New Nature of Threats
- Criticality of Facilities
- Continuity of Operations
- Vulnerability of Facilities

It sets forth Infrastructure assessment objectives

- Life Safety
- Asset Protection
- Continuity of Operations

It provides a useful definition of VA²²; “A vulnerability assessment is a process that identifies weaknesses in physical structures, personnel protection systems, processes, or other areas that may be exploited and suggests alternatives to eliminate or mitigate those weaknesses. The assessments are conducted by teams of experts skilled in such areas as engineering, intelligence, security, information systems, finance, and other disciplines.”

It identifies a three-phase process to assess the vulnerability of VA facilities:

Phase I. Define the criticality of VA facilities, referred to as the Minimum Critical Infrastructure (MCI)

Phase II. Identify vulnerabilities of VA’s critical facilities

Phase III. Assess and analyze vulnerable VA facilities and identify remedial actions

The following data is used to define the overall vulnerability of critical facilities in order to produce a ranked list for on-site physical assessments:

- Facility population
- Number of floors
- Number of acres
- Distance to fire station
- Power supply
- Mechanical equipment access
- Closed Circuit TVs
- Intrusion detection system

Barriers
External lighting
Armed officers
Adjacent threats
Parking

It identifies critical Veteran Affairs facilities as those facilities that must remain mission operational during periods of emergencies or national crisis and should function at significantly higher levels of protection than those provided by current federal or industry requirements.

Examples of those facilities include:

Acute Healthcare Facilities
Emergency Command Centers
Consolidated or unique VA Benefits Centers providing continuity of services
Unique VA Administrative Centers providing continuity of operations
National Cemeteries providing continuity of operations functions and national support
The Nation's Critical Infrastructure

The "Task Force" recommendations offer important insights that will broad application:

- Review Points of Vulnerability to ensure limited access, physical control, and surveillance of electrical, water and other utility distribution, boiler plant, hazardous materials and other vulnerable systems.
- Maximize Standoff Distance to allow for the accommodation of exterior protection strategies and mitigate adjacencies to non-VA properties that are potential targets of large-scale threats.
- Prevent Building Collapse by providing structural system continuity and redundancy among structural system components.
- Minimize Hazardous Flying Debris from Blast by providing for enhanced window and exterior wall components designed as an integrated system.
- Provide Effective Building Layout to minimize vulnerabilities and increase the use of protection strategies.

Although not specifically healthcare related, there are a number of recent security criteria developed by federal agencies cited that have bearing on vulnerability documentation. These include:

- General Services Administration Facilities Standards for the Public Building Service (November 2000)
- Interagency Security Committee (ISC) Security Design Criteria (28 May 2001)
- U.S. Army Corps of Engineers Protecting Buildings and Their Occupants From Airborne Hazards (October 2001)
- Department of Health and Human Services Guidance for Protecting Building Environments from Airborne Chemical, Biological or Radiological Attacks (May 2002)
- Department of Defense Minimum Antiterrorism Standards for Buildings (08 May 8 2002)

- National Capital Planning Commission’s National Capital Urban Design and Security Plan (July 2002)

There are currently no existing federal security criteria that specifically meet the complex requirements of healthcare environments. Several related private sector associations have been developing security related criteria including:

- American Society of Hospital Engineers (ASHE)
- American Society for Industrial Security (ASIS)
- International Association for Healthcare Safety & Security (IAHSS).

Security Guidelines for the Electricity Sector North American Electric Reliability Council

The publication provides an outline of a standard risk management process primarily used to assess vulnerabilities:

1. Identification of assets and loss impacts.
 - a. Determine the critical assets that require protection.
 - b. Identify possible undesirable events and their impacts.
 - c. Prioritize the assets based on consequence of loss.
2. Identification and analysis of vulnerabilities.
 - a. Identify potential vulnerabilities related to specific assets or undesirable events.
 - b. Identify existing countermeasures and their level of effectiveness in reducing vulnerabilities.
 - c. Estimate the degree of vulnerability relative to each asset.
3. Assessment of risk and the determination of priorities for the protection of critical assets.
 - a. Estimate the degree of impact relative to each critical asset.
 - b. Estimate the likelihood of an attack by a potential adversary.
 - c. Estimate the likelihood that a specific vulnerability will be exploited. This can be based on factors such as prior history or attacks on similar assets, intelligence, and warning from law enforcement agencies, consultant advice, the company’s own judgment, and additional factors.
 - d. Prioritize risks based on an integrated assessment.

Repeatedly highlighted for documentation are:

- Vulnerability and Threat Assessment
- Threat Response
- Continuity of Business Processes
- Communications
- Physical Security
- Cyber Security
- Employment Background Screening
- Protecting Potentially Sensitive Information

Appendix C: Bibliography

- AHRQ. (2002 Oct;9) IT/DSS can aid in bioterror response. *Healthcare Benchmarks Qual Improv.* (10):46-8.
- Alexander GC, Wynia MK. (2003 Sep-Oct) Ready and willing? Physicians' sense of preparedness for bioterrorism. *Health Aff (Millwood).* 22(5):189-97.
- Alonso R, Bouza E. (2003 May) [The role of the clinical microbiologist in bioterrorism] *Enferm Infecc Microbiol Clin.* 21 Suppl 2:90-4.
- American Hospital Association. Preparing for Terrorism: Tools for Evaluating the Metropolitan Medical Response System
- Anderson A, Eisold JF. (2002 Apr) Anthrax attack at the United States Capitol. Front line thoughts. *AAOHN J.* 50(4):170-3.
- Annas GJ. (2003 Mar-Apr) Smallpox vaccine: not worth the risk. *Hastings Cent Rep.* 33(2):6-
- Arnold JL. (2002 Jan-Mar) Disaster medicine in the 21st century: future hazards, vulnerabilities, and risk. *Prehospital Disaster Med.* 17(1):3-11.
- Ashford DA, Kaiser RM, Bales ME, Shutt K, Patrawalla A, McShan A, Tappero JW, Perkins BA, Dannenberg AL. (2003 May) Planning against biological terrorism: lessons from outbreak investigations. *Emerg Infect Dis.* 9(5):515-9.
- Asset Based Vulnerability Checklist for Wastewater Utilities© Association of Metropolitan Sewerage Agencies
- Atlas RM. (2002 Jan 30) Bioterrorism: from threat to reality. *Annu Rev Microbiol.* 56:167-85. Epub.
- Atlas RM. (1998) The medical threat of biological weapons. *Crit Rev Microbiol.* 24(3):157-68.
- Atlas R, Campbell P, Cozzarelli NR, Curfman G, Enquist L, Fink G, Flanagan A, Fletcher J, George E, Hammes G, Heyman D, Inglesby T, Kaplan S, Kennedy D, Krug J, Levinson R, Marcus E, Metzger H, Morse SS, O'Brien A, Onderdonk A, Poste G, Renault B, Rich R, Rosengard A, Salzberg S, Scanlan M, Shenk T, Tabor H, Varmus H, Wimmer E, Yamamoto K; Journal Editors and Authors Group (2003 Feb 20). Statement on the consideration of biodefence and biosecurity. *Nature.* ;421(6925):771. Epub 2003 Feb 15. Comment in: *Nature.* 2003 Mar 13;422(6928):113.
- Azad AF, Radulovic S. (2003 Jun) Pathogenic rickettsiae as bioterrorism agents. *Ann N Y Acad Sci.* 990:734-8.
- Babb J, Tosatto R, Hayslett J. (2002 Sep-Oct) Disaster planning and emergency preparedness: lessons learned. *J Am Pharm Assoc (Wash).* 42(5 Suppl 1):S50-1.

- Beaton RD, Johnson LC. (2002 Jul-Sep) Instrument development and evaluation of domestic preparedness training for first responders. *Prehospital Disaster Med.* 17(3):119-25.
- Beaten RD, Stevermer A, Wicklund J, Owens D, Boase J, Oberle MW. (2004 Jan-Feb) Evaluation of the Washington State National Pharmaceutical Stockpile dispensing exercise, part II--dispensary site worker findings. *J Public Health Manag Pract.* 10(1):77-85.
- Benjamin GC. (2003 Mar-Apr) Smallpox vaccination policy: Part II-Preparedness begins. *Physician Exec.* 29(2):61-3.
- Bentley JD. (2001) Hospital preparedness for bioterrorism. *Public Health Rep.* ;116 Suppl 2:36-9.
- Berkowitz B. (2002) Public health nursing practice: aftermath of September 11, 2001. *Online J Issues Nurs.* 7(3):5.
- Berlin B. (1999 Oct) Targeting bioterrorism. *N J Med.* 96(10):29-31.
- Berlin, Jr., R. B. and Schatz, B. R. (2003) *The evolution of healthcare infrastructure from physical centers to logical agreements* University of Illinois at Urbana-Champaign <http://www.canis.uiuc.edu>
- Bleich A, Kutz I. (2002 May) [Chemical and biological terrorism: psychological aspects, and guidelines for psychiatric preparedness] *Harefuah.* 141 Spec No:111-7, 118.
- Bogucki S, Weir S. Pulmonary manifestations of intentionally released chemical and biological agents. *Clin Chest Med.* 2002 Dec;23(4):777-94.
- Bond GF Jr. (2002 Sep-Oct) Anthrax scare in Buncombe County. A lesson in the basics of bioterrorism preparedness. *N C Med J.* 63(5):271-3.
- Branda JA, Ruoff K. (2002 Jun) Bioterrorism. Clinical recognition and primary management. *Am J Clin Pathol.* 117 Suppl:S116-23.
- Bravata DM, McDonald KM, Szeto H, Smith WM, Rydzak C, Owens DK. (2004 Mar-Apr) A conceptual framework for evaluating information technologies and decision support systems for bioterrorism preparedness and response. *Med Decis Making.* 24(2):192-206.
- Bresnitz EA. (2003 Jul-Aug) An epidemiologist's view of bioterrorism. Eddy A. Bresnitz, MD, MS, discusses state initiatives and preparedness. Interview by Leah Z. Ziskin. *N J Med.* 2003 Apr;100(4):12-9; quiz 19-22. Comment in: *N J Med.* 100(7-8):47; author reply 47.

- Burkle FM Jr. (2002 May) Mass casualty management of a large-scale bioterrorist event: an epidemiological approach that shapes triage decisions. *Emerg Med Clin North Am.* 20(2):409-36.
- Byrne D. (2001) Nov Bioterrorism: crime and opportunity. *Euro Surveill.* 6(11):157-8. Comment on: *Euro Surveill.* 2001 Nov;6(11):159-66. *Euro Surveill.* 2001 Nov;6(11):166-71. *Euro Surveill.* 2001 Nov;6(11):171-8.
- Campbell J. (2002 Winter) Bioterrorism: What? Why? and Who? *Clin Lab Sci.* 15(1):6-8.
- Carroll C, Balkrishnan R, Khanna V, Feldman S. (2003 Dec) Bioterrorism preparedness in the dermatology community. *Arch Dermatol.* 139(12):1657-8.
- Check E. (2004) Feb Labs urged to pre-empt bioterrorism threat. *Nature.* 26;427(6977):767.
- Chemical a Raber E, Hirabayashi JM, Mancieri SP, Jin AL, Folks KJ, Carlsen TM, Estacio P. . (2002 Apr) Biological agent incident response and decision process for civilian and public sector facilities. *Risk Anal*;22(2):195-202.
- Chemical-terrorism preparedness--public health laboratories found "unprepared and overwhelmed". (2003) Nov *J Environ Health.* 66(4):35-6.
- Chen FM, Hickner J, Fink KS, Galliher JM, Burstin H. (2002 Sep) On the front lines: family physicians' preparedness for bioterrorism. *J Fam Pract.* 51(9):745-50.
- Cherry JD. (2003 Jun) Risks to children of health care personnel receiving smallpox vaccination. *Pediatr Infect Dis J.* 22(6):574-5.
- Cherry CL, Kainer MA, Ruff TA. (2003 May-Jun) Biological weapons preparedness: the role of physicians. *Intern Med J.* 2003 May-Jun;33(5-6):242-53. Comment in: *Intern Med J* .33(5-6):213-4.
- Chess C, Celia J. (2002 Dec) Risk communication is a key to dealing effectively with bioterrorism. *Risk Anal.* 22(6):1039-40. Comment on: *Risk Anal.* 2002 Jun;22(3):403. *Risk Anal.* 2002 Jun;22(3):405-13
- Chomel BB. (2003 Summer) Control and prevention of emerging zoonoses. *J Vet Med Educ.* 30(2):145-7.
- Coico R, Kachur E, Lima V, Lipper S (2004 Apr) Guidelines for preclerkship bioterrorism curricula. *Acad Med.* 79(4):366-75.
- Coignard B; Members of the Eurosurveillance editorial board. (2001 Nov) Bioterrorism preparedness and response in European public health institutes. *Euro Surveill.* 6(11):159-66. Comment in: *Euro Surveill.* 2001 Nov;6(11):157-8.

Collie, Tim (February 26, 2004) Hospitals A Casualty Of Strife; Wounded Find Little Help After Supplies Are Cut Off, Doctors Flee. *Sun-Sentinel* (Fort Lauderdale, FL)

Covello VT, Peters RG, Wojtecki JG, Hyde RC. (2001 Jun) Risk communication, the West Nile virus epidemic, and bioterrorism: responding to the communication challenges posed by the intentional or unintentional release of a pathogen in an urban setting. *J Urban Health*. 78(2):382-91.

Crupi RS, Asnis DS, Lee CC, Santucci T, Marino MJ, Flanz BJ. (2003 Jan) Meeting the challenge of bioterrorism: lessons learned from West Nile virus and anthrax. *Am J Emerg Med*. 21(1):77-9.

Darden ML. (2002 Feb) Wake of September 11th attacks: implications for research, policy and practice. *J Natl Med Assoc*. 94(2):A24, A27-9.

Department of Defense PART B - Perimeter Security (DOD)

DesRoches P. (2003 Jun) Smallpox vaccination--implications for the occupational health professional. *AAOHN J*. 51(6):240-2.

Downs KE (2002 Jul). Training requirements and opportunities in planning responses to bioterrorism. *Am J Health Syst Pharm*. 15;59(14):1331-2.

Dworkin MS, Ma X, Golash RG. (2003 Apr) Fear of bioterrorism and implications for public health preparedness. *Emerg Infect Dis*. 9(4):503-5.

Duchin JS . (2004 Feb) Can preparedness for biological terrorism save us from pertussis? *Arch Pediatr Adolesc Med*158(2):106-7. Comment on: *Arch Pediatr Adolesc Med*. 2004 Feb;158(2):146-52.

Duff S.(2002 Aug 12) Better safe than sorry. Government gives D.C. hospital \$2.5 million for bioterrorism preparedness. *Mod Healthc*. 32(32):24-5

Everett WW, Zaoutis TL, Halpern SD, Strom BL, Coffin SE (2004 Apr) Prevent vaccination against smallpox: a survey of pediatric emergency health care providers. *Pediatr Infect Dis J*. 23(4):332-7.

Eysenbach G. (2003 Apr-Jun) SARS and population health technology. *J Med Internet Res*. 5(2):e14.

Fee E, Brown TM. (2001 May) Preemptive biopreparedness: can we learn anything from history? *Am J Public Health*. 91(5):721-6. Comment in: *Am J Public Health*. 2001 Dec;91(12):1917-9.

- Feldmann H, Czub M, Jones S, Dick D, Garbutt M, Grolla A, Artsob H. (2002 Oct) Emerging and re-emerging infectious diseases. *Med Microbiol Immunol (Berl)*. 191(2):63-74. Epub 2002 Sep 03.
- Ferguson NE, Steele L, Crawford CY, Huebner NL, Fonseca JC, Bonander JC, Kuehnert MJ. (2003 Jun 1) Bioterrorism web site resources for infectious disease clinicians and epidemiologists. *Clin Infect Dis*. 36(11):1458-73. Epub 2003 May 22.
- FEMA *Reference manual to mitigate potential terrorist attacks against buildings*. (December 2003) Federal Emergency Management Administration 426
- Ferguson NM, Keeling MJ, Edmunds WJ, Gani R, Grenfell BT, Anderson RM, Leach S. (2003 Oct 16) Planning for smallpox outbreaks. *Nature*. 425(6959):681-5.
- Filoromo C, Macrina D, Pryor E, Terndrup T, McNutt SD. (2003 Dec) An innovative approach to training hospital-based clinicians for bioterrorist attacks. *Am J Infect Control*. 31(8):511-4.
- Fine A, Layton M. (2001 Jan 15) Lessons from the West Nile viral encephalitis outbreak in New York City, 1999: implications for bioterrorism preparedness. *Clin Infect Dis*. 32(2):277-82.
- Flowers LK, Mothershead JL, Blackwell TH. (2002 May) Bioterrorism preparedness. II: The community and emergency medical services systems. *Emerg Med Clin North Am*. 20(2):457-76.
- Fraser CM. (2004 Jan) A genomics-based approach to biodefence preparedness. *Nat Rev Genet*. 5(1):23-33.
- Frist B. A time for preparedness. With funding on its way, hospitals need to get ready for bioterror attacks. *Mod Healthc*. 2002 Dec 23-30;32(51):19.
- Frist B. (2002 Nov-Dec) Public health and national security: the critical role of increased federal support. *Health Aff (Millwood)*. 21(6):117-30.
- Funk EA. (2000 Oct-Dec) Preparedness for a bioterrorism event in Alaska. Part 1: Detection and identification of a biologic event. *Alaska Med*. 42(4):101-13.
- Furlow B (2003 Nov-Dec) Biological, chemical and radiological terrorism. *Radiol Technol*. 75(2):91-107; quiz 108-10.
- Gallagher-Smith M, Kim J, Al-Bawardy R, Josko D. (2004 Winter) Francisella tularensis: possible agent in bioterrorism. *Clin Lab Sci*. 17(1):35-9.
- Gammelsaeter H, Ramstad JE, Rov AS, Walseth F, Paulsen AM. (2003 Nov) Risk analysis highly valued. *Health Estate*. 57(10):47.

- Garrett LC, Magruder C, Molgard CA. (2000 Jul) Taking the terror out of bioterrorism: planning for a bioterrorist event from a local perspective. *J Public Health Manag Pract.* 6(4):1-7.
- Gensheimer KF, Meltzer MI, Postema AS, Strikas RA. (2003 Dec) Influenza pandemic preparedness *Emerg Infect Dis.* 9(12):1645-8.
- Gostin LO, Sapsin JW, Teret SP, Burriss S, Mair JS, Hodge JG Jr, Vernick JS. (2002 Aug 7) The Model State Emergency Health Powers Act: planning for and response to bioterrorism and naturally occurring infectious diseases. *JAMA.* 288(5):622-8. Comment in: *JAMA.* 2002 Dec 4;288(21):2685-6; author reply 2686-7. *JAMA.* 2002 Dec 4;288(21):2686; author reply 2686-7.
- Grabenstein J, Downs K, Dotson D. (2000 Sep-Oct) Extraordinary infections: a focus on bioterrorism. *J Am Pharm Assoc (Wash).* 40(5 Suppl 1):S36-7.
- Grabenstein JD, Winkenwerder W Jr. (2003 Jun 25) US military smallpox vaccination program experience. *JAMA.* 289(24):3278-82. Comment in: *JAMA.* 2003 Jun 25;289(24):3306-8. *JAMA.* 2003 Oct 22;290(16):2123-4; author reply 2124.
- Grinnell Regional Medical Center (2004) Study Measures Economic Impact of Hospitals
- Gray GM, Ropeik DP. (2002 Nov-Dec) Dealing with the dangers of fear: the role of risk communication. *Health Aff (Millwood).* 21(6):106-16.
- Grayson ML. (2003 May-Jun) The difference between biological warfare and bioterrorism: Australia finally makes a start towards real preparedness for bioterrorism. *Intern Med J.* 2003 May-Jun;33(5-6):213-4. Comment on: *Intern Med J.* 33(5-6):242-53.
- Greene J. (2003 Apr) Inoculating for smallpox. *Hosp Health Netw.* 77(4):52-4, 56-7, 1.
- Greene J. (2003 May) To be or not to be vaccinated. The smallpox controversy plays out in California hospitals. *Trustee.* 56(5):14-7, 1.
- Greenberg MI, Hendrickson RG (2003 Jul) CIMERC; Drexel University Emergency Department Terrorism Preparedness Consensus Panel. Report of the CIMERC/Drexel University Emergency Department Terrorism Preparedness Consensus Panel. *Acad Emerg Med.* 10(7):783-8.
- Gwerder LJ, Beaton R, Daniell W. Bioterrorism. (2001 Nov) Implications for the occupational and environmental health nurse. *AAOHN J.* 49(11):512-8.
- Haas CN. (2002 Aug) The role of risk analysis in understanding bioterrorism. *Risk Anal.* 22(4):671-7.

- Haas CN. (2002 Apr) On the risk of mortality to primates exposed to anthrax spores. *Risk Anal.* 22(2):189-93. Comment in: *Risk Anal.* 2002 Dec;22(6):1035-6; author reply 1037.
- Hall MJ, Norwood AE, Ursano RJ, Fullerton CS. (2003) The psychological impacts of bioterrorism. *Biosecur Bioterror.* 1(2):139-44.
- Han MH, Zunt JR. Bioterrorism and the nervous system. *Curr Neurol Neurosci Rep.* 2003 Nov;3(6):476-82.
- Harrington, Caitlin (2004) Early Bioterror Response Plans Needed, Report Says *Congressional Quarterly* Homeland Security
- Hayward M. (2003 May) Management issues surrounding the United Kingdom health services' ability to deal effectively with major incidents involving bioterrorism. *J Nurs Manag.* 11(3):197-207.
- Henderson, D.A. (2003 Aug) Acting globally, thinking locally. *Mol Interv.* 3(5):242-7.
- Henning KJ, Brennan PJ, Hoegg C, O'Rourke E, Dyer BD, Grace TL (2004 Feb) Health system preparedness for bioterrorism: bringing the tabletop to the hospital. *Infect Control Hosp Epidemiol.* 25(2):146-55.
- HHS Fact Sheet: (April 28, 2004) Biodefense Preparedness: Record of Accomplishment DHHS
- Hom GG. (2003 Mar) Chemical, biological, and radiological weapons: implications for optometry and public health. *Optometry.* 2003 Feb;74(2):81-98. Comment in: *Optometry.* 74(3):141-2.
- Horton HH, Misrahi JJ, Matthews GW, Kocher PL. (2002 Summer) Critical biological agents: disease reporting as a tool for determining bioterrorism preparedness. *J Law Med Ethics* 30(2):262-6.
- Hupert N, Mushlin AI, Callahan MA. (2002 Sep-Oct) Modeling the public health response to bioterrorism: using discrete event simulation to design antibiotic distribution centers. *Med Decis Making.* 22(5 Suppl):S17-25.
- Hutwagner LC, Seeman GM, Treadwell T, McGehee JE, Bray DA. (2003) Applied IT for the CD.C.'s Bioterrorism Preparedness and Response Program. *Proc AMIA Symp.* 2003;;:871.
- Hutwagner L, Thompson W, Seeman GM, Treadwell T. (2003 Jun) The bioterrorism preparedness and response Early Aberration Reporting System (EARS). *J Urban Health.* 80(2 Suppl 1):i89-96.
- Hyams KC, Murphy FM, Wessely S. (2002 Apr) Responding to chemical, biological, or nuclear terrorism: the indirect and long-term health effects may present the greatest challenge. *J*

- Health Polit Policy Law*. 2002 Apr;27(2):273-91. Comment in: *J Health Polit Policy Law*. 27(2):241-2.
- Inglesby TV, Grossman R, O'Toole T. (2001 Feb 1) A plague on your city: observations from TOPOFF. *Clin Infect Dis*. 32(3):436-45. Epub 2001 Jan 29.
- Iowa Hospital Association (May 2004) Economic Impact of Health Sector
- Institute of Medicine. WMD Checklist
- Iseron KV, Pesik N. (2003 Fall) Ethical resource distribution after biological, chemical, or radiological terrorism. *Camb Q Healthc Ethics*. 12(4):455-65.
- Jacobs LM, Burns K, Lane V, Ross J. Bioterrorism preparedness. *Conn Med*. 2003 Feb;67(2):95-101.
- Jacobs LM, Burns KJ, Gross RI. (2003 Dec) Terrorism: a public health threat with a trauma system response. *J Trauma*. 55(6):1014-21.
- Jacobs LM, Emanuelson K, McKay C, Burns K. (2004 Jan) Bioterrorism preparedness--Part II. Smallpox vaccination in a hospital setting. *Conn Med*. 68(1):27-35.
- Jaeger CD. (2003 Nov) Chemical facility vulnerability assessment project. *J Hazard Mater*. 14;104(1-3):207-13.
- JCAHO Emergency Management Standards.
- JCAHO president calls for bioterror preparedness. (2001 Dec) *Hosp Peer Rev*. 26(12):165-6, 161.
- Josko D. (2004 Winter) Botulin toxin: a weapon in terrorism. *Clin Lab Sci*. 17(1):30-4.
- Kahan E, Fogelman Y, Kitai E, Vinker S. (2003 Aug) Patient and family physician preferences for care and communication in the eventuality of anthrax terrorism. *Fam Pract*. 20(4):441-2.
- Kahn LH. (2003 Jul-Aug) A prescription for change: the need for qualified physician leadership in public health. *Health Aff (Millwood)*. 22(4):241-8.
- Kaiser Foundation Health Plan, Inc. (2003) Medical Center Hazard and Vulnerability Analysis
- Kaplan EH, Craft DL, Wein LM. (2003 Sep) Analyzing bioterror response logistics: the case of smallpox. *Math Biosci*. 185(1):33-72.

- Katz L, Sagi R, Brenner B, Hurvitz A. (2002 May) [Smallpox--past, present and future] *Harefuah*. 141 Spec No:43-50, 121. Erratum in: *Harefuah*. 2003 Nov;142(11):801.
- Kemper AR, Davis MM. (2003 Aug) Under scrutiny: smallpox vaccine recommendations. *Expert Opin Pharmacother*. 4(8):1207-14.
- Kemper AR, Davis MM, Freed GL. (2002 Mar-Apr) Expected adverse events in a mass smallpox vaccination campaign. *Eff Clin Pract*. 2002 Mar-Apr;5(2):84-90. Comment in: *Eff Clin Pract*. 5(2):98-9.
- Khan AS, Swerdlow DL, Juranek DD. (2001 Jan-Feb) Precautions against biological and chemical terrorism directed at food and water supplies. *Public Health Rep*. 116(1):3-14.
- Kirkpatrick JS, Howard JM, Reed DA. (2002 Apr 8) Assessing homeland chemical hazards outside the military gates: industrial hazard threat assessments for department of defense installations. *Sci Total Environ*. 288(1-2):111-7.
- Klietmann WF, Ruoff KL. (2001 Apr) Bioterrorism: implications for the clinical microbiologist. *Clin Microbiol Rev*. 14(2):364-81.
- Knouss RF. National disaster medical system. (2001) *Public Health Rep*. 116 Suppl 2:49-52.
- Koplan J. (2001) CD.C.'s strategic plan for bioterrorism preparedness and response. *Public Health Rep*. 116 Suppl 2:9-16.
- Kozma CM. (2003 Feb) Can smallpox response teams use the experience of disease management programs? *Manag Care Interface*. 16(2):45-6.
- Krenzelo EP. (2001) The critical role of the Poison Center in the recognition, mitigation and management of biological and chemical terrorism. *Przegl Lek*. 58(4):177-81.
- Kun LG, Bray DA. (2002 Sep-Oct) Information infrastructure tools for bioterrorism preparedness. Building dual- or multiple-use infrastructures is the task at hand for state and local health departments. *IEEE Eng Med Biol Mag*. 21(5):69-85.
- Kunreuther H. (2002 Aug) Risk analysis and risk management in an uncertain world. *Risk Anal*. 22(4):655-64.
- Kwik G, Fitzgerald J, Inglesby TV, O'Toole T. (2003) Biosecurity: responsible stewardship of bioscience in an age of catastrophic terrorism. *Biosecur Bioterror*. 1(1):27-35.
- Lane JM, Goldstein J. (2003 Mar 18) Evaluation of 21st-century risks of smallpox vaccination and policy options. *Ann Intern Med*. 138(6):488-93. Comment in: *Ann Intern Med*. 2004 Jan 6;140(1):67; author reply 67.

- Levy-Bruhl D, Guerin N; Members of the Eurosurveillance editorial board. (2001 Nov) The use of smallpox virus as a biological weapon: the vaccination situation in France. *Euro Surveill.* 6(11):171-8. Comment in: *Euro Surveill.* 2001 Nov;6(11):157-8.
- Lichtveld M, Hodge JG Jr, Gebbie K, Thompson FE Jr, Loos DI. (2002 Fall) Preparedness on the frontline: what's law got to do with it? *J Law Med Ethics.* 30(3 Suppl):184-8.
- Lillibridge S. (2003 Jan-Mar) New developments in health and medical preparedness related to the threat of terrorism. *Prehosp Emerg Care.* 7(1):56-8.
- Lipowicz, Alice (Oct. 30, 2003) Anger Brews at FEMA's Shakeup of Training Center for Emergency Medical Personnel *Quarterly Homeland Security*
- Logan-Henfrey L. Mitigation of bioterrorist threats in the 21st century. *Ann N Y Acad Sci.* 916:121-33.
- Luper D.C.. (2000) Anthrax 2001--lessons learned: clinical laboratory and beyond. *Clin Lab Sci.* 2002 Summer;15(3):180-2.
- Maki DG. (2003 May) National preparedness for biological warfare and bioterrorism: smallpox and the ophthalmologist. *Arch Ophthalmol.* 121(5):710-1. Comment on: *Arch Ophthalmol.* 2003 May;121(5):715-9.
- Manassaram DM, Orr MF, Kaye WE. (2003 Apr-Jun) Counterterrorism planning using the Hazardous Substances Events Surveillance system. *Disaster Manag Response.* 1(2):35-40.
- Martin CO, Adams HP Jr. (2003 Jan) Neurological aspects of biological and chemical terrorism: a review for neurologists. *Arch Neurol.* 60(1):21-5.
- Matthews GW, Murphy AM, Lopez W, Orenstein WA. (2003 Winter) Workshop on smallpox legal preparedness: what have we learned from smallpox legal preparedness? *J Law Med Ethics.* 31(4 Suppl):39-40.
- Matthews GW, Benjamin G, Mills SP, Parmet W, Misrahi JJ. (2002 Fall) Legal preparedness for bioterrorism. *J Law Med Ethics.* 30(3 Suppl):52-6.
- Marasco Newton Group Ltd. Hospital Weapons of Mass Destruction Needs and Resource Assessment Survey
- Mason DJ. (2001 Dec) Anthrax and the voice of reason. *Am J Nurs.* 101(12):7.
- May T, Silverman RD. Should smallpox vaccine be made available to the general public? *Kennedy Inst Ethics J.* 2003 Jun;13(2):67-82.
- McFee RB. (2003 Dec) Lessons learned in bioterrorism can be applied to medical practice. *J Am Osteopath Assoc.* 103(12):574-5.

- McFee RB. (2002 Aug) Preparing for an era of weapons of mass destruction (WMD). Are we there yet? Why we should all be concerned. Part 1. *Vet Hum Toxicol.* 44(4):193-9.
- Mebane F, Temin S, Parvanta CF. (2003) Communicating anthrax in 2001: a comparison of CD.C. information and print media accounts. *J Health Commun.* ;8 Suppl 1:50-82; discussion 148-51.
- Mills-Senn P. (2003 Dec) Preparedness. Biodefense network *Hosp Health Netw.* 77(12):20, 22.
- Miller JM. (2001 Dec) Agents of bioterrorism. Preparing for bioterrorism at the community health care level. *Infect Dis Clin North Am.* 15(4):1127-56.
- Mondy C, Cardenas D, Avila M. (2003 Nov-Dec) The role of an advanced practice public health nurse in bioterrorism preparedness. *Public Health Nurs.* 20(6):422-31.
- Montgomery, Lori . (February 17, 2005) *D.C. has deal to build hospital.* Washington Post Metro Section page B2
- Morse A. (2002 Winter) Bioterrorism preparedness for local health departments. *J Community Health Nurs.* ;19(4):203-11.
- Morse SS. (2002 Oct) The vigilance defense. *Sci Am.* 287(4):88-9.
- Mortimer PP. (2003 May-Jun) Anticipating smallpox as a bioterrorist weapon. *Clin Med.* 3(3):255-9.
- Mothershead JL, Tonat K, Koenig KL. (2002 May) Bioterrorism preparedness. III: State and federal programs and response. *Emerg Med Clin North Am.* 20(2):477-500.
- Moulton AD, Gottfried RN, Goodman RA, Murphy AM, Rawson RD. What is public health legal preparedness? *J Law Med Ethics.* 31(4):672-83.
- National Association of County and City Health Officials (NACCHO). (2003 Winter) *Local Public Health Agency Infrastructure: A Chartbook.* October 2001.
- National Underwriter Life and Health. (18 August 2003) *Individual Health Leaders*
- New York City Department of Health. Biological, Chemical, and Radiological Emergency Planning/Preparedness Capabilities
- Nicas M, Hubbard A. (2003 Jan-Feb) A risk analysis approach to selecting respiratory protection against airborne pathogens used for bioterrorism. *AIHA J* (Fairfax, Va). 64(1):95-101.
- Noji EK. (2003 Nov) Creating a health care agenda for the Department of Homeland Security. *Manag Care.* 12(11 Suppl):7-12.

North American Electric Reliability Council. Security Guidelines for the Electricity Sector

Norwood AE, Holloway HC, Ursano RJ. (2001 Dec) Psychological effects of biological warfare. *Mil Med.* 166(12 Suppl):27-8.

Nunn S. (2002 Fall) The future of public health preparedness. *J Law Med Ethics.* 30(3 Suppl):202-9.

O'Connell KP, Menuet BC, Foster D. (2002 Aug) Issues in preparedness for biologic terrorism: a perspective for critical care nursing. *AACN Clin Issues.* 13(3):452-69.

O'Leary, Dennis. (October 10, 2001) Testimony before Subcommittee on Oversight And Investigations House Committee on Energy and Commerce.

Ozonoff D. (2002 Nov-Dec) Anthrax: the precautionary principle goes postal. *Public Health Rep.* 117(6):513-20.

Palmer, C., Siverts, E. & Sullivan, J. (1985). IMPLAN version 1.1: Analysis guide. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Land Management Planning Systems.

Partridge R, Alexander J, Lawrence T, Suner S. (2003 Apr) Medical counterbioterrorism: the response to provide anthrax prophylaxis to New York City US Postal Service employees. *Ann Emerg Med.* 41(4):441-6.

Perrone J, Henretig F, Sims M, Beers M, Grippi MA. (2003 Mar) A role for ipratropium in chemical terrorism preparedness. *Acad Emerg Med.* 10(3):290.

Pesik N, Gorman S, Williams WD. (2002 Mar) The National Pharmaceutical Stockpile Program: an overview and perspective for the Pacific Islands. *Pac Health Dialog.* 9(1):109-14.

Pesola GR, Dujar A, Wilson S. (2002 Mar) Emergency preparedness: the World Trade Center and Singapore airline disasters. *Acad Emerg Med.* 9(3):220-2.

Petersen JM. (2003 Feb) The front line of smallpox preparedness. *MLO Med Lab Obs.* 35(2):52

Phillips S. (2003 Nov) Setting research priorities for disaster preparedness: the role of AHRQ. *Manag Care.* 12(11 Suppl):16-8.

Phillips S, Burstin H, Dillard CD, Clancy CM. (2004 Feb) AHRQ's bioterrorism research portfolio: real linkages in real time. *Health Serv Res.* 39(1):xi-xv.

Physical Security Assessment for Department Of Veterans Affairs Facilities National Institute Of Building Sciences

- Poe BM. (2002 May 15) Expanding disaster preparedness to include bioterrorism. *Am J Health Syst Pharm.* 59(10):926-7.
- Poles L. (2002 May) [The Israeli medical response plan for an unusual biological event] *Harefuah.*141 Spec No:22-8, 123, 122.
- Redlener I, Markenson D (2004 Jan) Disaster and terrorism preparedness: what pediatricians need to know *Dis Mon.* 50(1):6-40.
- Ridge T. (2002 Summer) The critical role of hospitals involved in national bioterrorism preparedness. *J Healthc Prot Manage.* 18(2):39-48. 151. Richmond JY, Hill RH, Weyant RS, Nesby-O'Dell SL, Vinson PE. What's hot in animal biosafety? *ILAR J.* 2003;44(1):20-7.
- Richmond JY, Nesby-O'Dell S. (2003 Jan) Biosecurity for animal facilities and associated laboratories. *Lab Anim (NY).* 32(1):32-5.
- Rippen HE, Gursky E, Stoto MA. (2003) May 1 Importance of bioterrorism preparedness for family physicians. *Am Fam Physician.* 67(9):1877-8. Comment on: *Am Fam Physician.* 2003 May 1;67(9):1927-34.
- Rivera A. (2002 Mar) Assistance for emergency health. *Pac Health Dialog.* 9(1):134-40.
- Roberts B. (1998) Export controls and biological weapons: new roles, new challenges. *Crit Rev Microbiol.* 24(3):235-54.
- Roffey R, Lantorp K, Tegnell A, Elgh F. (2002 Aug) Biological weapons and bioterrorism preparedness: importance of public-health awareness and international cooperation. *Clin Microbiol Infect.* 8(8):522-8.
- Roffey R, Lantorp K, Tegnell A, Elgh F. (2001 Dec) [Update on biological weapons and bioterrorism. Important that health services pay attention to unusual events] *Lakartidningen.* 12;98(50):5746-8, 5751-2.
- Rose MA, Larrimore KL. (2002 Nov-Dec) Knowledge and awareness concerning chemical and biological terrorism: continuing education implications. *J Contin Educ Nurs.* 33(6):253-8.
- Rosen J, Grigg E, Lanier J, McGrath S, Lillibridge S, Sargent D, Koop CE. (2002 Sep-Oct) The future of command and control for disaster response. Utilizing information and virtual reality technology, the Cybercare system can link resources throughout the country for distributed yet coordinated command and control. *IEEE Eng Med Biol Mag.* 21(5):56-68.

- Rotz LD, Koo D, O'Carroll PW, Kellogg RB, Sage MJ, Lillibridge SR. (2000 Jul) Bioterrorism preparedness: planning for the future. *J Public Health Manag Pract.* 6(4):45-9.
- Ryder RW. (2002 Sep-Oct) The challenge of training a public health workforce in bioterrorism preparedness. *N C Med J.* 63(5):265-7.
- Salem H. (2003 Nov-Dec) Issues in chemical and biological terrorism *Int J Toxicol.* 22(6):465-71.
- Salmon CT, Park HS, Wrigley BJ. (2003) Optimistic bias and perceptions of bioterrorism in Michigan corporate *J Health Commun.* 8 Suppl 1:130-43.
- Sandman PM. (2003) Bioterrorism risk communication policy. *J Health Commun.* 8 Suppl 1:146-7; discussion 148-51.
- Sarpy SA, Chauvin SW, Anderson AC. 2003 (Nov-Dec) Evaluation of the effectiveness of the South Central Center for Public Health Preparedness training. *Public Health Rep.* 118(6):568-72.
- Salinsky E. (2002 Jun) Will the nation be ready for the next bioterrorism attack? Mending gaps in the public health infrastructure. *NHPF Issue Brief.* 12;(776):1-19.
- Scharoun K, van Caulil K, Liberman A. Bioterrorism vs. health security--crafting a plan of preparedness. *Health Care Manag (Frederick).* 2002 Sep;21(1):74-92.
- Schietinger H. (2002 Sep-Oct) The impact of 9/11 on HIV policy and politics. *J Assoc Nurses AIDS Care.* 13(5):39-44.
- Schneider CP, McDonald MD. (2003 Winter) "The king of terrors" revisited: the smallpox vaccination campaign and its lessons for future biopreparedness. *J Law Med Ethics.* 31(4):580-9.
- Schultz CH, Mothershead JL, Field M. (2002 May) Bioterrorism preparedness. I: The emergency department and hospital. *Emerg Med Clin North Am.* 20(2):437-55.
- Security Self-Assessment Guide for Information Technology Systems National Institute of Standards and Technology
- Shadel BN, Rebmann T, Clements B, Chen JJ, Evans RG. (2003 May) Infection control practitioners' perceptions and educational needs regarding bioterrorism: results from a national needs assessment survey. *Am J Infect Control.* 31(3):129-34.
- Shadel BN, Clements B, Arndt B, Rebmann T, Evans RG. (2001 Dec) What we need to know about bioterrorism preparedness: results from focus groups conducted at APIC 2000. *Am J Infect Control.* 29(6):347-51.

- Sidel VW. (2003 Oct-Dec) Bioterrorism in the United States: a balanced assessment of risk and response. *Med Confl Surviv.* 19(4):318-25.
- Silvagni AJ. (2003 May) NSUCOM establishes bioterrorism preparedness center. *J Am Osteopath Assoc.* 103(5):215.
- Sobel J, Khan AS, Swerdlow DL. (2002 Mar 9) Threat of a biological terrorist attack on the US food supply: the CD.C. perspective. *Lancet.* 359(9309):874-80. Comment in: *Lancet.* 2002 Jul 20;360(9328):261-2.
- Sokas RK, Perrotta DM. (2003 Nov) Preparedness: where is occupational and environmental health? *J Occup Environ Med.* 45(11):1133-5.
- Sosin DM. (2003) Syndromic surveillance: the case for skillful investment. *Biosecur Bioterror.* 1(4):247-53.
- Sosin DM. (2003 Jun) Draft framework for evaluating syndromic surveillance systems. *J Urban Health.* 80(2 Suppl 1):i8-13.
- Spencer RC. (2001 Aug) Lightfoot NF Preparedness and response to bioterrorism. *J Infect.* 43(2):104-10.
- Staiti AB, Katz A, Hoadley JF. (2003) Jul Has bioterrorism preparedness improved public health? *Issue Brief Cent Stud Health Syst Change.* ;(65):1-4.
- Straight TM, Lazarus AA, Decker CF. (2002 Aug) Defending against viruses in biowarfare. How to respond to smallpox, encephalitides, hemorrhagic fevers. *Postgrad Med.* 112(2):75-6, 79-80, 85-6.
- Strengthening the public health system for a healthier future. (2003) Feb *Issue brief (Grantmakers Health).* ;(17):1-41.
- Suarez VR, Hankins GD. (2002 Jul) Smallpox and pregnancy: from eradicated disease to bioterrorist threat. *Obstet Gynecol.* ;100(1):87-93. Comment in: *Obstet Gynecol.* 2002 Dec;100(6):1356; author reply 1356.
- Summary of the executive session on emergency preparedness and the pharmaceutical supply chain. *Am J Health Syst Pharm.* 2002 Feb 1;59(3):247-53.
- Suspected brucellosis case prompts investigation of possible bioterrorism-related activity--New Hampshire and Massachusetts, 1999. (2000 Jun 16) *MMWR Morb Mortal Wkly Rep.* 49(23):509-12.
- Suyama J, Sztajnkrzyer M, Lindsell C, Otten EJ, Daniels JM, Kressel AB. (2003 Jul) Surveillance of infectious disease occurrences in the community: an analysis of symptom presentation in the emergency department. *Acad Emerg Med.* 10(7):753-63.

- Teeter DS. 2002 (May 15) Bioterrorism preparedness: answers for the health-system pharmacist. *Am J Health Syst Pharm.* 59(10):928-30.
- Teeter D, Terriff C (2002 Sep-Oct). Implementing a bioterrorism response plan in your pharmacy. *J Am Pharm Assoc* (Wash). 42(5 Suppl 1):S52-3.
- Terriff CM, Schwartz MD, Lomaestro BM; Society of Infectious Diseases Pharmacists. (2003 Mar) Bioterrorism: pivotal clinical issues. Consensus review of the Society of Infectious Diseases Pharmacists. *Pharmacotherapy.* 23(3):274-90.
- Terriff CM, Tee AM. (2001 Feb 1) Citywide pharmaceutical preparation for bioterrorism. *Am J Health Syst Pharm.* 58(3):233-7.
- Tharratt RS, Case JT, Hird DW. (2002 Jun) 15 Perceptions of state public health officers and state veterinarians regarding risks of bioterrorism in the United States. *J Am Vet Med Assoc.* 220(12):1782-7.
- Thurmond MC, Gibbs EP, Brown CC, Wagner GG, Wilson TM, Lautner BA. (2003 May 15) Educational preparedness of veterinarians for foreign animal diseases. *J Am Vet Med Assoc.* 222(10):1352-7.
- Tieman J. (2002 Sep 2) Hospitals create new models as they gird for bioterrorism. Council on Public Health Preparedness says past year has brought improvements, but gaps remain. *Mod Healthc.* 32(35):8, 16.
- Treadwell TA, Koo D, Kuker K, Khan AS. (2003 Mar-Apr) Epidemiologic clues to bioterrorism. *Public Health Rep.* 118(2):92-8.
- Turnock BJ. (2003 Nov-Dec) Roadmap for public health workforce preparedness. *J Public Health Manag Pract.* 9(6):471-80.
- US General Accounting Office. (August 2003) *Hospital Preparedness: Most Urban Hospitals Have Emergency Plans but Lack Certain Capacities for Bioterrorism Response*
- Valiante DJ, Schill DP, Bresnitz EA, Burr GA, Mead KR. (2003 Oct) Responding to a bioterrorist attack: environmental investigation of anthrax in New Jersey. *Appl Occup Environ Hyg.* 18(10):780-5.
- Varkey P, Poland GA, Cockerill FR 3rd, Smith TF, Hagen PT. (2002 Jul) Confronting bioterrorism: physicians on the front line. *Mayo Clin Proc.* 77(7):661-72. Comment in: *Mayo Clin Proc.* 2002 Jul;77(7):619-21.
- Veenema TG. (2003 Sep-Oct) Chemical and biological terrorism preparedness for staff development specialists. *J Nurses Staff Dev.* 19(5):218-25; quiz 226-7.

- Venkatesh S, Memish ZA. (2003 Feb) Bioterrorism--a new challenge for public health. *Int J Antimicrob Agents*. 21(2):200-6.
- Vulnerability Assessment Framework Critical Infrastructure Assurance Office 1.1 KPMG Peat Marwick LLP
- Waeckerle JF, Seamans S, Whiteside M, Pons PT, White S, Burstein JL, Murray R; (2001 Jun) Task Force of Health Care and Emergency Services Professionals on Preparedness for Nuclear, Biological, and Chemical Incidents. Executive summary: developing objectives, content, and competencies for the training of emergency medical technicians, emergency physicians, and emergency nurses to care for casualties resulting from nuclear, biological, or chemical incidents. *Ann Emerg Med*. 37(6):587-601.
- Webby RJ, Webster RG. (2003 Nov) Are we ready for pandemic influenza? *Science*. 28;302(5650):1519-22.
- Wetter D.C., Daniell WE, Treser CD. (2001 May) Hospital preparedness for victims of chemical or biological terrorism. *Am J Public Health*. 91(5):710-6. Comment in: *Am J Public Health*. 2001 May;91(5):708-9. *Am J Public Health*. 2001 May;91(5):716-8. *Am J Public Health*. 2001 May;91(5):718-20.
- Wetterhall SF. (2003 Summer) Responding to bioterrorism. *Ethn Dis*. 13(3 Suppl 3):S3-58-62.
- White, S B (April 2003) *Hospitals and the Metro Milwaukee Economy*.
- Williams JL, Sheesley D.(2000) Response to bio-terrorism directed against animals. *Ann N Y Acad Sci*. ;916:117-20.
- Winstanley S, Whittington R. (2004 Jan) Aggression towards health care staff in a UK general hospital: variation among professions and departments. *J Clin Nurs* 13(1):3-10.
- Young D. (2003 Nov 1) Experts warn drug industry, government about weaknesses in drug supply chain. *Am J Health Syst Pharm*. 60(21):2176, 2180, 2184.
- Young D. (2002 Oct) Experience with disaster yields lessons in preparedness. *Am J Health Syst Pharm*. 59(19):1812, 1814-6.

Appendix D: End Notes

- ¹ George Mason University NCR Vulnerability Assessment Project Healthcare Literature Review 2004
- ² Adopted: Fall 1994, Source: Public Health Functions Steering Committee, Members (July 1995): American Public Health Association, Association of Schools of Public Health, Association of State and Territorial Health Officials, Environmental Council of the States, National Association of County and City Health Officials, National Association of State Alcohol and Drug Abuse Directors, National Association of State Mental Health Program Directors, Public Health Foundation. U.S. Public Health Service, *Agency for Health Care Policy and Research, Centers for Disease Control and Prevention, Food and Drug Administration, Health Resources and Services Administration, Indian Health Service, National Institutes of Health, Office of the Assistant Secretary for Health, Substance Abuse and Mental Health Services Administration*
- ³ Note: Source of services is Mapquest.com, Inc. Based on US Postal Service CASS certified addresses, roof-top latitude and longitude information, and location-based databases applications.
- ⁴ See Appendix C for thumbnail reviews of vulnerability risk management tools and methods.
- ⁵ A *point of service* is a distinct postal address. Many physicians and other health professionals have more than one practice addresses.
- ⁶ *Ibid*
- ⁷ Berlin, Jr., R. B. and Schatz, B. R. *The evolution of healthcare infrastructure from physical centers to logical agreements* University of Illinois at Urbana-Champaign <http://www.canis.uiuc.edu>
- ⁸ Private communication of unpublished data
- ⁹ Iowa Hospital Association *Economic Impact of Health Sector* May 2004
- ¹⁰ White, S B Hospitals and the Metro Milwaukee Economy April 2003.
- ¹¹ Dennis O'Leary. Testimony before Subcommittee on Oversight and Investigations House Committee on Energy and Commerce. October 10, 2001
- ¹² *Ibid*.
- ¹³ JCAHO Emergency Management Standards
- ¹⁴ Note: The selection of elements is not intended to be exhaustive. Those listed relate specifically to emergency response and workforce skill sets related to anticipate threats.
- ¹⁵ Baker, E.L., Melton, R.J., Strange, P.V., Fields, M.L., Koplan, J.P., Guerra, F.A., & Satcher, D. (1994). Health reform and the health of the public: Forging community health partnerships. *JAMA*, 272(16), 1276-1282.
- ¹⁶ US General Accounting Office. (August 200³) Hospital Preparedness: Most Urban Hospitals Have Emergency Plans but Lack Certain Capacities for Bioterrorism Response
- ¹⁷ © 2001 Kaiser Foundation Health Plan, Inc.
- ¹⁸ *Security Self-Assessment Guide for Information Technology* System National Institute of Standards and Technology, *Assessment and Strategy Development Tool Kit* Department of Justice, *Reference Manual to Mitigate Terrorist Attacks against Buildings*, Federal Emergency Management Agency, *Protecting Your Community's Assets: A Guide for Small Wastewater Systems* National Environmental Training Center for Small Communities, *A Guide to Highway Vulnerability Assessment for Critical Asset Identification and Protection*. The American Association of State Highway, and Transportation Officials' Security Task Force, *Department Of Justice Standards for Protection of Federal Facilities (Appendix K)* U.S. Department of Justice, *Vulnerability Assessment Fact sheet* Environmental Protection Agency, *Navigation and Vessel Inspection Circular No. 05 03*, United States Coast Guard, *Physical Security Assessment for Department Of Veterans Affairs Facilities* National Institute of Building Sciences, *Security Guidelines for the Electricity Sector* North American Electric Reliability Council, *Medical Center Hazard and Vulnerability Analysis* Kaiser Foundation Health Plan, Inc., *Biological, Chemical, and Radiological Emergency Planning/Preparedness Capabilities"* New York City Department of Health, Hospital Weapons of Mass Destruction Needs and Resource Assessment Survey Marasco Newton Group Ltd., WMD Checklist Institute of Medicine, Preparing for Terrorism: Tools for Evaluating the Metropolitan Medical Response System American Hospital Association (see Appendix C for brief reviews)
- ¹⁹ (http://www.gnyha.org/eprc/general/templates/Hazard_Assessment_KP.pdf).
- ²⁰ FEMA *Reference manual to mitigate potential terrorist attacks against buildings* Page 10
- *Elements of these systems, methods, and tools have been integrated into the NCR Healthcare Organization tool.
- ²¹ Chen FM, Hickner J, Fink KS, Galliher JM, Burstin H. On the front lines: family physicians' preparedness for bioterrorism. *J Fam Pract.* 2002 Sep;51(9):745-50. and,
- ²¹ O'Leary. Dennis Testimony to US Senate committee October 2002

²² Raymond J. Decker, Director, Defense Capabilities and Management, before the Subcommittee on National Security, Veterans Affairs, and International Relations, Committee on Government Reform, House of Representatives. October 12, 2001.

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