DVATEX: Navy medicine’s pioneering approach to improving hospital emergency preparedness

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ABSTRACT
The level of emergency preparedness considered adequate for hospitals prior to the events of 9/11 is no longer sufficient. To analyze and improve emergency preparedness in Navy healthcare facilities, the US Navy Medical Department has established the Disaster Preparedness, Vulnerability Analysis, Training and Exercise (DVATEX, pronounced ‘dee-va-tex’) program. The four-stage program includes a hospital or clinic self-assessment, a site visit to each Navy hospital and clinic (during which a team of emergency preparedness experts trains staff, performs a vulnerability analysis, and conducts an exercise of the facility’s emergency management plan), development of an after-action report, and ongoing support to improve preparedness (Figure 1). In its first year, the DVATEX program has been successful in identifying hospital vulnerabilities, applying remedies, and developing long-term plans to improve preparedness.

INTRODUCTION
Hospitals require a higher level of emergency preparedness than ever before. On September 11, 2001, the Pentagon was hit by a hijacked plane and burned just a few miles south of the Navy Bureau of Medicine and Surgery—Navy Medicine’s headquarters in Washington, DC. The US Navy Medical Department operates three medical centers, 22 hospitals, and more than 130 clinics around the world to serve the combat medical needs of the active Navy fleet, Marine forces, their families, and retired veterans. Recognizing the existence of new and unconventional threats, the leaders of Navy Medicine began to scrutinize the adequacy of emergency preparedness in all of their healthcare facilities.

To tackle this complex task, a new headquarters organization—the Navy Medicine Office of Homeland Security—was established in November 2001 to ensure the highest levels of emergency preparedness in US Navy hospitals and clinics. An interdisciplinary team of physicians, nurses, healthcare administrators, and emergency management experts was created to provide visionary leadership, to influence change throughout Navy Medicine, and to improve coordination with other federal agencies.

The mission of the Navy Medicine Office of Homeland Security is to ensure that the Navy’s healthcare facilities can promote, protect, and restore the health of sailors and Marines, their families, retired veterans, and all others entrusted to the Navy’s care, anytime, anywhere, regardless of the emergency or disaster. To achieve this mission, the team:

- prepares Navy hospitals and clinics to operate in times of crisis, disaster, and emergency;
- identifies and remediates vulnerabilities that put people and facilities at risk;
ensures that Navy Medicine staff protect themselves so they can care for others;

- trains emergency responders and exercises emergency response activities to ensure competence;

- promotes effective military and civilian collaboration in emergency response; and

- leads change to prevent and deter health-related consequences of natural disasters and intentional attacks.

The foundation of the work of the Navy Medicine Office of Homeland Security consists of planning assumptions. These include:

- Hospitals and healthcare workers are on the front lines of the global war on terrorism and are therefore at risk of attack or of being called to respond to the consequences of an attack or a natural disaster.

- Health professionals must protect themselves, must be highly trained, and must be prepared for all hazards.

- Hospital emergency response plans must be exercised regularly to ensure effective response.

The Navy Medicine Office of Homeland Security’s immediate challenge was to assess the real level of emergency preparedness in an organization that has healthcare facilities—from major medical centers to small community clinics—throughout the world. While the state of preparedness for these facilities was being assessed, it was critical to begin the process of applying solutions to identified vulnerabilities.

The purpose of emergency management planning in hospitals and clinics is to ensure that the organization establishes, maintains, and revises a plan to respond to any emergency situation or disaster, including natural, manmade, industrial, or transportation disasters, terrorism, and acts of war. Optimal emergency planning in hospitals and clinics improves the quality and efficiency of healthcare services provided to the largest number of emergency patients in the shortest period of time.

Strengthening emergency preparedness in a resource-constrained environment presents a challenge for healthcare leaders. To tackle this challenge, the Navy Medicine Office of Homeland Security developed the Disaster Preparedness, Vulnerability Analysis, Training and Exercise (DVATEX) program, which advocates a systems approach to hospital emergency planning and operations. This approach integrates disparate hospital functions into a single system to achieve a common goal.\(^1\)

Planning is an organized effort to anticipate what may occur and to develop cost-effective countermeasures.\(^2\) DVATEX is an example of deliberate planning—planning conducted without the mental duress that accompanies a crisis. Deliberate planning permits thoughtful analysis of threats and avoids crisis action planning—the planning that occurs during an event when little time is available for analysis or careful thought.\(^3\)
In March 2000, the American Hospital Association, with the support of the Office of Emergency Preparedness, convened a forum to address the subject of hospital preparedness for mass casualties. The forum reached three conclusions:

- Hospital preparedness for disasters has historically focused on a narrow range of potential incidents.
- Limited data exist on hospital emergency capabilities and more data is needed.
- Traditional planning has not included internal disasters—situations when the hospital is itself the victim of disaster. Such a situation demands planners to consider evacuation, quarantine, and diversion of incoming patients.4

These considerations, as well as others, were integrated into the design of DVATEX.

A team of military experts was assembled to execute DVATEX, but additional expertise was required, and a civilian partner was contracted to join the DVATEX team. EAI Corp., headquartered in Abingdon, MD, provides chemical, biological, radiological, nuclear and explosive (CBRNE) defense assessments, planning, training, equipment, and exercises. EAI has been involved in national preparedness efforts since 1995 and in the CBRNE arena since 1980. Its focus is an “all-hazards” approach to preparedness, response, mitigation, and recovery. EAI has trained more than 96,000 emergency response personnel, conducted assessments and planning activities for more than 100 jurisdictions, and acquired emergency response equipment for more than 300 cities, counties, states, agencies, and military installations. The firm has provided anti- and counter-terrorism services to many federal and state organizations.

The DVATEX program was designed to ensure that Navy hospitals and clinics can operate even when stressed by an emergency. DVATEX is a four-stage process that includes a site visit by an interdisciplinary team of emergency preparedness experts to each Navy hospital or larger ambulatory care clinic. The visit itself takes place over three to five days, but planning for the DVATEX site visit begins months in advance. One critical aspect of advance work is a self-analysis of preparedness conducted by the hospital or clinic.

The DVATEX visit combines three elements designed to strengthen the level of emergency preparedness in a hospital or clinic: vulnerability analysis, training, and exercise of emergency management plans. The desired end is a hospital or clinic whose staff, systems, and facility are better prepared to respond to and recover from any emergency.

**Vulnerability analysis**

The site visit includes a vulnerability analysis to assess the hospital’s or clinic’s level of preparedness. Every aspect of emergency operations and response is scrutinized to determine if it is likely to work effectively in an actual disaster or mass casualty event. To gather data for analysis, the DVATEX team interviews key personnel, reviews hospital records, and performs a physical survey of the facility. During this analysis, DVATEX analysts develop a realistic assessment of the capabilities of the facility.

When the DVATEX program was initiated, extensive literature searches did not yield the existence of

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**Professional background of the DVATEX team**

- Emergency medicine
- Disaster medicine
- Emergency nursing
- Healthcare executives
- Emergency medical services
- Antiterrorism/law enforcement/fire response
- Facilities engineering
- Critical incident stress management
any analysis tools that could meet the needs of the program. The team believed a tool was required that did not just employ minimum standards but used benchmarked goals that would lead to highly refined emergency preparedness. The DVATEX team created two tools to provide the framework for a reproducible vulnerability analysis: the Hospital Emergency Analysis Tool (HEAT©) and its companion tool for facilities without inpatients, the Analysis Tool for Ambulatory Care (ATAC©).

The HEAT and ATAC tools evaluate the presence or absence of critical preparedness factors on a 100-point scale, with a higher score indicating better emergency preparedness. The scoring system allows facilities to compare themselves to like facilities (in size and trauma designation) or to evaluate improvement in their emergency preparedness over time. The factors selected for evaluation in HEAT were identified based on research, the DVATEX analysts’ experience, and current health care standards, including emergency management standards developed by the Joint Commission on the Accreditation of Healthcare Organizations.5

The vulnerability analysis using HEAT or ATAC includes assessment of leadership and governance; emergency management planning; clinical operations; safety, fire and security; logistics and facilities; communications warning notification; public information; media relations; training, drills, and exercises; and performance improvement and quality.

A key aspect of the vulnerability analysis is inspection of the physical facility. While no building can be fully protected from an individual intent on causing harm, actions can be taken to make hospitals less attractive targets. The DVATEX vulnerability analysis includes evaluation of the entire building, HVAC systems, fire protection, life-safety systems, and the most up-to-date drawings of the facility as recommended by the Centers for Disease Control and the National Institute for Occupational Safety and Health.6

Training

Trained hospital and clinic staff are the foundation of effective emergency response. The DVATEX process includes training seminars for clinical and nonclinical staff, since all must be able to perform effectively under stress. Programs include training healthcare executives in emergency preparedness, training clinicians and nonclinicians in response to CBRNE events, the Hospital Emergency Incident Command System (HEICS), and risk communications for public health emergencies. The training schedule is developed well in advance of the visit so programs can be marketed to hospital staff.

Emergency management plan exercise

The capstone event of the DVATEX site visit is a four-hour tabletop exercise of the facility’s emergency management plan. The exercise includes members of the hospital or clinic staff as well as representatives of the local community response agencies. The scenario is a hypothetical (but plausible) scenario based on a natural catastrophe, a dirty bomb, release of a hazardous material, or the outbreak of a disease (intentional or natural). The catastrophe begins a chain of events that allows participants to exercise...
the decision-making that would be required in an actual emergency. Because this is a tabletop exercise and does not involve actually moving patients, the facilitator may stop progress at any time to discuss key issues, make recommendations, or educate the participants.

Healthcare organizations have often operated in isolation. Integrated, community-wide preparedness must be in place to ensure effective response and to serve as a deterrent to possible attack. The tabletop exercise enables integration of the facility’s emergency management plan with that of the community. Conflicts between participating agencies may surface during the exercise that can be worked out in a training environment instead of during an actual crisis. Key players from the medical facility and local response community can establish or strengthen their relationships through the exercise. If possible, a full-scale exercise of the hospital emergency management plan is evaluated during the DVATEX visit. This permits an even more in-depth analysis of the hospital’s level of preparedness and is valuable in identifying gaps in planning.

Communication between the DVATEX team and the hospital or clinic executives is critical during all phases of the program. At the conclusion of the site visit, the DVATEX team delivers an executive summary of the vulnerability analysis to the facility’s leadership. Following the visit, the facility receives a comprehensive after-action report (AAR) that provides details about the vulnerabilities identified, an explanation of why the vulnerability is significant, and suggestions for actions that can be taken to address the issues.

Follow-up program

While the DVATEX visit itself produces significant improvements in emergency preparedness, it is only the beginning. A follow-up process is necessary to ensure that the program produces long-term emergency management improvements. The follow-up program uses the recommendations provided in the AAR as a basis for the development of an action plan for each facility. The hospital’s executive leadership can use the AAR to craft their emergency preparedness strategy. DVATEX assists them in:

- identifying resource needs and prioritizing action;
- identifying emergency management training opportunities; and
- fine-tuning command and control of emergency response.

The follow-up program ensures that a hospital or clinic has all the information it needs to make strategic decisions about emergency preparedness and is able to reduce risk to the facility’s staff, patients, equipment, and structures.

CONCLUSION

Hospitals in the US have been challenged to upgrade emergency preparedness because the risk of responding to an attack or mass casualty event is more real today than ever. The DVATEX program has proven to be a cost-effective method for simultaneously addressing multiple emergency preparedness issues. The program has received praise from training participants for demystifying response to CBRNE events, and healthcare executives have remarked favorably on the benefits of the program. The commander of the National Naval Medical Center, Rear Admiral Donald C. Arthur, remarked, “DVATEX is our single-most important tool for guiding plans for effective homeland security.” Captain Joe Moore, Commanding Officer of the Naval Medical Clinic at Pearl Harbor, HI, stated, “The DVATEX program provided me with the feedback and guidance that allows me to better focus the efforts of my staff. We are smarter in our training and purchasing of equipment and more vigilant in our delivery of healthcare.”

Navy Medicine is committed to ensuring that Navy hospitals can continue to provide care for patients even under the most difficult conditions. DVATEX focuses attention on emergency preparedness at all organizational levels. The program has identified significant strengths that contribute to effective response. DVATEX also permits Navy Medicine to identify the issues that are
putting people and facilities at risk and guides the immediate and long-term responses needed to address them.

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DISCLAIMER
The views expressed in this article are those of the author and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, or the US Government.

REFERENCES