Health care facilities' "war on terrorism":
a deliberate process for recommending personal protective equiment

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Abstract

The protection of health care facility (HCF) staff from the effects of weapons of mass destruction has gained heightened attention since 9-11. One critical component of protection is Personal Protective Equipment (PPE). No universal standard exists for an "essential" level of PPE for HCF staff. The absence of such a standard raises the need for development of national policy for PPE levels, particularly in HCFs. We describe a process used by the Veterans Health Administration (VHA) for recommending policy for "essential" PPE levels. Although the recommendations are specific for VHA, the process, findings and applications may be useful to other institutions as they attempt to resolve this critical issue. This descriptive account will serve to generate practical scientific debate in the academic community and lead to definitive public policy recommendations for the Nation's HCFs in executing their roles in the event of a terrorist attack.

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1. Introduction

Until the terrorist attacks of September 11, 2001, most people working in the emergency management and health care communities based plans and operations on the assumption that use of weapons of mass destruction (WMD) was little more than a theoretical concern. A theoretical threat no more, WMD are a valid concern and have prompted expedited planning that ensures in-place programs for defending people and facilities against the harmful effects of chemical, biological, and radiological agents and high-explosive devices. In the January 2000 issue of JAMA, Macintyre and colleagues described health care facilities (HCFs) as "an integral, yet often overlooked component of overall community response."[1] In the recent past, personnel at HCFs could expect to treat the occasional patient contaminated with hazardous agents, but often after prehospital personnel performed on-scene decontamination. Now, *the scene may be at or near the HCF.*[1] Previous studies show that patients will converge on hospitals and may bypass prehospital evaluation. In a mass casualty situation, it is likely that large numbers of patients will leave the scene and present themselves to hospitals. HCF personnel may find themselves on the front lines, being the first to assess victims contaminated with WMD agents.[2] HCF personnel are attempting to embrace this new role, but are finding that existing standards for personal protection and decontamination were developed for traditional "first responders" going to the scene of an incident. They do not take into consideration the scenario of patients who present to a HCF after exposure to an unknown concentration of an unidentified chemical, biological, or

radiologic terrorism agent. Personnel in fixed facilities become the "first responders" or "first contact personnel" in the case of biological terrorism or for patients exposed to chemical terrorism who bypass the prehospital system. This role as front-line community responders is expanding and receiving new emphasis.

Many HCF leaders and practitioners are compelled to "do something" to prepare staff and facilities for terrorist use of WMD, lest they find themselves vulnerable and unprepared. Since national scientifically validated standards and guidance on issues such as PPE levels and decontamination procedures for hospital-based personnel are lacking, HCF decision makers are applying a variety of approaches in preparing those who may receive large numbers of contaminated victims. The Veterans Health Administration (VHA) of the Department of Veterans Affairs (VA), the largest and most comprehensive health care system in the U.S., is taking deliberate steps in preparing its HCFs for response to WMD incidents. The process described here for recommending selection of PPE levels may assist others as they begin to address the complexities associated with the novel challenges facing HCFs in this unfamiliar environment. Clinicians, planners, administrators and managers at all levels and with a variety of experiences have presented diametrically opposing views on appropriate PPE levels for providers at HCFs.

Our purpose in writing this article is to present the approach by VHA's Emergency Management Strategic Healthcare Group (EMSHG) Technical Advisory Committee (TAC), a group that focused specifically on preparedness issues for VHA

personnel at its 163 medical centers. One of the initial tasks of the EMSHG TAC was to determine "essential" levels of PPE for all VHA HCFs. The term "essential" was used in place of "minimum" as a modifier for PPE standards to avoid any potential negative connotation. While this approach may or may not be appropriate for other environments, our intent is to provide sufficient detail, so as to encourage broader consideration, scientific evaluation, and academic debate of appropriate PPE levels at HCFs confronting these new threats.

1.1. Veterans Affairs' EMMMSHG TAC

In 2000, the EMSHG Director formed the EMSHG TAC, a group of approximately 20 expert advisors, to review emergency management issues and recommend policies relevant to VHA internal emergency management practices.[3, 4] The TAC is advisory to the EMSHG Director who is the principal advisor to the VHA Under Secretary for Health on emergency management issues. TAC membership includes VA internal advisors as well as expert representatives from the U.S. Army Medical Research Institute of Chemical Defense (USAMRICD), U.S. Army Medical Research Institute of Infectious Disease (USAMRIID), Centers for Disease Control and Prevention (CDC), U.S. Public Health Service (PHS), Federal Bureau of Investigation (FBI), Federal Emergency Management Agency (FEMA) and the former National Domestic Preparedness Office (NDPO). The mission and function of the EMSHG TAC has been previously described elsewhere.[3, 4]

The EMSHG TAC conducted its work through ten task forces (Box 1). The PPE and Decontamination Task Force, chaired by VA's Director of the Office of Occupational Safety and Health, was divided into two focus groups: one to address PPE, the other to address decontamination. Task Force membership included VA safety managers, emergency managers and trainers, industrial hygienists, hazmat team members and an occupational health physician, as well as experts from USAMRICD and academia. Over a several month period, the group met by conference calls and frequent email communications. The primary goal of the PPE and Decontamination Task Force was to "provide guidance to the EMSHG TAC Chair (and ultimately VHA leadership) on policy for level(s) of 'essential' PPE necessary for the national network of VA HCFs." The Task Force proceeded to: 1) Conduct a background review of the scientific and administrative foundations of PPE regulations and guidelines and examine significant issues, including those specific to VA HCFs; 2) Assess current practices regarding PPE levels in other (non-VA) HCFs; 3) Define possible essential PPE options and determine "pros" and "cons" of selecting each option; and 4) Arrive at a recommended option of essential PPE and present results to the EMSHG TAC for concurrence/consensus. The process included review of the literature and many discussions with representatives of regulatory bodies, HCFs, and acknowledged experts.

2. Background

The threat of nuclear, biological and chemical terrorism against the United States civilian population is now more real than ever. The willingness of political and other factions to implement terrorist plans, along with the increasing availability of WMD, are recognized as prominent factors in the increasing risk of terrorism in America.[5] WMD such as nerve agents (sarin, soman, VX), blister agents (sulfur mustard, lewisite), blood agents (hydrogen cyanide, arsine) and biological agents such as bacteria (anthrax, plague, tularemia), viruses (hemorrhagic fevers, smallpox), and toxins (botulinum, ricin, staphylococcal enterotoxin B, T-2 mycotoxin) comprise a lethal arsenal for terrorist organizations and their sponsors.[6] In addition to chemical and biological warfare agents, more than 60,000 chemicals are produced in the United States, 2,000 of which the U.S. Department of Transportation considers hazardous.[7] Although not as lethal as the highly toxic nerve agents, industrial chemicals are potential terrorist weapons because they are readily accessible, poorly defended and can be deployed over a widespread area. Accidental releases of toxic industrial materials may also occur in communities near HCFs. Such events may be more likely to occur than WMD incidents and would have similar effects.

Other terrorist weapons include radioactive material involving alpha, beta, or gamma radiation. The type of emitter and delivery mechanism (e.g., explosives, water contamination, or physical contact resulting from hidden emitters) will have a significant

impact on the type of PPE and the time of exposure permitted during decontamination activities.

While HCFs are an important part of community emergency management plans and Local Emergency Preparedness Committees (LEPCs), many HCF Directors and managers indicate that they are not currently prepared for WMD agent releases or mass casualty incidents. The recommendations for PPE selection reported in this manuscript will assist HCF managers in fulfilling essential PPE requirements and participating in a fully implemented national WMD PPE program for HCFs. Table 1 describes the PPE levels (A, B, C, and D) that were assessed by the Task Force.[3]

2.1. Significant Issues

Expectations of HCF personnel, care of victims exposed to WMD agents, and the levels of respiratory and protective clothing are obvious concerns. As with other contemporary health care systems, VA is engaged in "business continuity planning," i.e., implementing measures that ensure continuous patient care with minimal disruption. The Task Force's focus was on *internal* VA concerns and procedures that contribute to patient and staff health and safety. Its processes, however, relied heavily on input from a wide range of experts representing a variety of settings; therefore, recommendations may be generalizable to other HCF settings.

Many factors must be considered and will influence selection of essential levels of

2.1.1. Health care facility staff

- May be called on to accept Emergency Medical Services (EMS)-delivered or self-reporting victims of a WMD agent exposure. HCF employees involved in WMD events may include police and security personnel; firefighters and hazardous materials response organizations; receptionists; and nurses, physicians, and other clinical and administrative support staff;
- May be exposed to unknown toxic chemical or biological agents at unknown concentrations and are at risk of developing harmful effects from secondary contamination;[8]
- Have an obligation to protect their patients, guests, employees, and the facility from exposure to internal and community hazardous material spills and WMD agent exposure;
- Are obligated to respond to community emergencies when called upon under community emergency response plans;
- May not be able to readily identify the nuclear, chemical or biological agent, the concentration of that agent, the duration of the exposure, or the extent of population exposure. Further, it would be entirely possible for a terrorist to combine any of the above agents or incorporate them into a high yield explosive device to enhance dispersal or to create a more confusing clinical picture or syndrome.

2.1.2. Regulatory and Compliance Factors (Internal and External)

- Occupational Safety and Health Administration (OSHA) regulation 29 CFR Part 1910.134(d), Selection of Respirators, requires that civilian employers "*provide an appropriate respirator based on the respiratory hazard to which the worker is exposed and workplace and user factors that affect respirator performance and reliability.*"[9] Further, OSHA requires that employers "*shall select a NIOSH-certified respirator*" and that "*the respirator shall be used in compliance with the conditions of its certification.*"[10] (NIOSH is the National Institute of Occupational Safety and Health.) The OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) regulation 29 CFR Part 1910.120 also has PPE requirements.[11]
- OSHA specifies Level A protection for workers in environments that are known to be "immediately dangerous to life and health" (IDLH) and specifies Level B as the minimum protection for workers in danger of exposure to unknown chemical hazards.[12] Air-purifying respirators may be used only when monitoring equipment assures that the concentration of the chemical does not exceed the respirator protection factor assigned by NIOSH.
- NIOSH currently certifies air-purifying respirators for general civilian protection from chemical agents when the chemical and concentration can be detected and measured by the wearer.[13]

- At the time of this writing, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) is revising its emergency management standards, but does not currently specify the level of protection required in healthcare facility hazardous material plans and training.[14] JCAHO does require, however, that HCFs must have documented plans to maintain employee safety.[15]
- Many HCFs have established written policies in support of community emergency management and response plans. In some cases, the procedure is to "lock down" the facility in an attempt to allow staff time to identify the WMD agent before accepting victims.

Emergency care regulations under 42 U.S.C. 1395 dd (13) (commonly known as the Emergency Medical Treatment and Active Labor Act or EMTALA)[16] require HCFs to provide a medical screening exam and stabilization up to the level of their capability for all persons presenting to facility grounds. Patients must be stabilized prior to transfer to another healthcare facility or alternate treatment location. If a HCF establishes a decontamination unit with Level B PPE capability and has current capacity to accept victims, it would be obligated to provide service to victims who arrive at the facility and require this level of service. If the capability and capacity to decontaminate victims were not established, the facility would not be obligated to accept contaminated victims under this code. Although the regulations are undergoing review and new interpretive guidelines were recently published, at the time of this writing, unless a waiver specific to the current event were issued, the facility would still be obligated to perform a medical

screening exam and stabilization to the extent resources permit. EMTALA allows an exception for handling certain biological exposure cases. A community or region may designate facilities to handle specific bioterrorism patients. HCF staff may transfer or refer these patients to designated sites, thereby fulfilling their obligations under EMTALA.[17] A corporate legal opinion may be necessary to ensure appropriate interpretation of this issue.

2.1.3. Unique PPE and Equipment Issues

- NIOSH has certified an air purifying cartridge for chemical, biological, and radiological/nuclear (CBRN) environments with the use of a full face mask, once conditions are understood and exposures are determined to be at appropriate levels for use with this respirator. Additionally, NIOSH has developed a concept standard for a powered air-purifying respirator (PAPR), but a standard for this more popular type of respirator for CBRN has not been certified for civilian use. However, on July 27, 1994, OSHA, in conjunction with the Army Chemical Stockpile Emergency Preparedness Program (CSEPP), issued a notice approving the use of specially equipped PAPRs, under certain circumstances, for responders in communities near chemical warfare weapon depots where known chemical agents are stored.[18]
- Level C respiratory protection incorporates a High-Efficiency Particulate Air (HEPA) filter or P-100 cartridge. Level C protective clothing provides effective protection against nearly all nuclear and biological agents. Level C particulate filters do not,

however, provide protection against T-2 mycotoxins, a biological agent that requires an approach similar to chemical agents. Gamma radiation permeates all levels of protection. All victims treated in HCFs, including symptomatic victims with suspected or confirmed bioterrorism-related illnesses, should be managed using current established CDC Guidelines for Protection.[19, 20] "Standard precautions," such as those used in the care of pneumonia patients, provide protection against most biological agents.

- Air-purifying respirators may be used only when the monitoring process determines that the chemical agent has been identified and that its concentration does not exceed the respirator protection factor assigned by NIOSH for that respirator system. Chemical agent detection equipment can detect the presence of multiple chemical agents; however, for many highly toxic industrial and chemical warfare agents, current detectors do not have the sensitivity to measure concentrations at the level where physical effects occur. Current equipment with real-time detection capability is limited, expensive, and often unreliable.[21] Further, anecdotal reports from users indicate that many detection devices cannot be effectively operated while the user is wearing protective gloves, and with Level A PPE in particular.[22]

2.1.4. Experience with Past Chemical Terrorism Agent Exposure

An assumption often made in chemical agent assessments is that persons who are able to escape the target area and who are alive and ambulatory when they arrive

for treatment at a HCF are not "carrying" fatal levels of contaminant. This assumption and the assessment of the protective value of "time and distance" factors have not been scientifically evaluated. The following two incidents demonstrate the necessity for high levels of caution in HCF workers.

In 2000, an individual ingesting industrial strength organophosphate in a suicide attempt was transported to the hospital by a friend. During initial treatment, three emergency department personnel developed symptoms and one required intubation. All exposed individuals survived, including the suicidal patient.[8]

During the receipt and treatment of 640 sarin-exposed victims of the 1995 Tokyo subway attack, Tokyo's St. Luke Hospital's emergency department (ED) medical staff did not wear PPE or conduct decontamination procedures. Once a chemical exposure was suspected, the ED staff removed the clothing of the victims to limit the ongoing toxicity and secondary contamination of the medical staff.[23] There was secondary sarin exposure of the St. Luke medical staff from affected victims. Atropine and, in one case, pralidoxime were administered to several healthcare workers during the incident. (The hospital staff, however, did not show decreased plasma cholinesterase activity.)[24] Other more viscous agents, such as VX and HD, would present a lesser vapor hazard, due to their lower volatility. Chemical agents of lower toxicity than sarin would also be expected to present a lower hazard threat.

It is expected that immediate decontamination efforts would reduce employee exposure. Nine percent of EMS workers and a significant number of hospital workers at

other hospitals in Tokyo experienced acute symptoms. This was presumably due to staff's failure to remove victim clothing (a cultural issue in Japan) or otherwise perform decontamination prior to placing victims in unventilated ambulances and hospital treatment rooms.[25]

Some experts believe that terrorists will learn from and perpetrate acts more sophisticated than the Tokyo attack. These acts may generate higher WMD agent concentrations and present a greater likelihood of high secondary WMD exposures to healthcare personnel. Further, hospitals with experience in the management of mass casualty, high stress events have reported that EMS responders often do not decontaminate victims before hospital delivery and that hospitals must expect to receive self-presenting contaminated victims from WMD target areas.[26]

2.1.5. Timely Warning of a WMD Event

To maximize the effectiveness of a HCF's protective response, notice of a WMD event must be received prior to victim receipt. Unfortunately, HCFs may learn of an event only as victims are presenting at the reception area, lobby, or front gate. HCFs should be prepared to isolate entrance areas and establish "fall back" decontamination, treatment, and victim relocation areas to maintain the safety of patients, guests, and staff in the facility. Law enforcement personnel closely involved in contaminated victim management (e.g., guiding, restraining, decontaminating) will require chemical detection equipment and levels of protection as part of the decontamination team.

2.1.6. Mitigating Factors and Discussion Points

- NIOSH has approved air-purifying cartridges for use when working with a large number of chemicals below IDLH concentrations.[13] Risk assessments may consider acquisition of cartridges to cover the most likely agent exposures. Additional study of this concept is necessary.
- Emergency response is initiated at the local community level. Communities will not receive additional state or federal assistance until it can be mobilized and, theoretically, only if local resources are exhausted.
- Emergency care clinicians may have different cultural perspectives from EMS personnel in responding to victims. EMS personnel, as field-based first responders, have been trained to be more cautious in evaluating the nature of a hazard prior to handling victims. Emergency care clinicians may be more open than EMS personnel to receiving victims and providing care without having exercised caution over the circumstances associated with victim exposure. HCF-based personnel may, by nature, be more vulnerable to the unannounced presentation of contaminated victims.
- Quantities of PPE units purchased will depend in some measure on the degree of decontamination procedures selected and developed by each HCF. The greater the number of victims that can be decontaminated at a HCF, the greater number of PPE units that will be required. Other rate-limiting steps, such as time to disrobe, may limit decontamination capacity. Further, it may

be difficult to determine at what point a patient is decontaminated, i.e., the so-called "how clean is clean?" dilemma.[27, 28]

- Another related factor involves the percentage of contaminated victims that are non-ambulatory after exposure to a WMD agent. A greater number of non-ambulatory victims increases the likelihood of secondary contamination levels and the need for higher levels of protection.
- The use of high-powered fans around the decontamination site may allow for a lower level of PPE selection by establishing a relative airflow behind which employees may find enhanced protection. Additional research is necessary to validate this premise.

3. Non-VA HCF Postures

EMSHG TAC members contacted representatives of several respected healthcare organizations to ascertain their PPE posture and to establish the current, generally accepted industry response to victim decontamination in WMD events. Table 2 represents accepted PPE levels at a sample of HCFs or organizations. The majority of these healthcare organizations currently use Level C based on:

- Isolation from the exposure incident (non-first responder status);
- Advanced notice of victim receipt;
- Detection levels within OSHA/CSEPP parameters;

- Low level of contaminant aerosol around victim (based on either a high contaminant evaporation rate for victim exposed to vapor only, in which case most of the contaminant will evaporate by the time victim is received at the decontamination location, or contamination with a substance with a low evaporation rate, resulting in little or no airborne contaminant around the victim);
- The effectiveness of acid gas/organic vapor HEPA filter cartridges for powered PAPRs for probable exposure to WMD; and
- Economic impact of providing higher PPE levels.

The Montgomery County Fire and Rescue Service, Bureau of Life Safety Services, in cooperation with the U.S. Army Soldier and Biological Chemical Command (SBCCOM) National Protection Center, conducted testing of PAPRs, cartridges, and high efficiency filters for use during WMD exposures. This protective equipment evaluation resulted in the approval by the State of Maryland's Department of Labor, Licensing and Regulation of Level C PPE clothing with a PAPR system with protective capability from dust, fumes, and mist, acid gases, and organic vapors.[29]

Military PPE has been tested for protection against chemical weapons, but NIOSH has not certified military PPE for civilian purchase or use for any purpose (Table 3).[18, 30] In an attempt to resolve the impasse for civilian first responders in communities near chemical weapons stockpiles, CDC and CSEPP sponsored nerve and mustard agent testing of commercial respirators and chemical suits.[31] Testing resulted in the

approval of several Level A and Level C PPE units for purchase by Metropolitan Medical Response Systems (MMRS). As a result of the testing by CSEPP, several specific filter canisters for PAPRs were shown to provide protection against exposure to specific chemical agents.[32] However, NIOSH certifies entire PPE units, not individual filter canisters. NIOSH has developed a draft concept standard for evaluating WMD Capable PAPRs for use "by first receivers and others in atmospheres where the levels of CBRN contamination will be at low concentrations due to prior victim decontamination, minimal secondary contamination emitted from ambulatory victims or because of the extreme distance from the event."[33] Once this standard is finalized, manufacturers may have their PAPRs certified by NIOSH as meeting this performance standard. Prior to finalization of NIOSH's performance standard, manufacturers can be asked to what degree their PAPRs meet this standard.

Decisions surrounding PPE level selection depend on factors well beyond those deemed "simply financial." For example, Level A and Level B PPE have important limitations with respect to mobility, donning time, length of use (wearer heat exhaustion and dehydration potentials), weight, dexterity, response time, and cost. Providing mass casualty care while exclusively wearing Level A PPE may present insurmountable challenges for healthcare providers.[22] Potential advances in PPE and collaboration with NIOSH to resolve certification issues are under development.

When HCF staff are able to identify the hazardous material and its concentration (e.g., via community coordination or from on-site detector readings) and if

the result is below IDLH level, the decontamination team may, based on its own risk assessment, elect to use Level C with appropriate filter cartridges.

In support of PPE selection, decontamination station staff should also use: 1) high capacity fans to establish an airflow away from team members, the decontamination station, and facility intake vents, thereby lowering possible concentrations of contaminant vapor, mist, or gas; 2) monitors and materials for detecting radioactive, organic, and inorganic agents and, if possible, their concentrations; 3) communications equipment that allows contact with the local incident commander, other local healthcare providers, the community public health system, and other emergency response organizations.

4. Proposed Essential PPE Options: Pros and Cons

The third step of the PPE and Decontamination Task Force was to consider all aforementioned factors, including the myriad of regulatory compliance issues, impact of PPE selection on the health and welfare of patients, staff and others, and VA HCFs' role in community WMD response. The Task Force was instructed to recommend an "essential," rather than a "minimum" standard. Those VA HCFs that have the resources and quality improvement programs in place to move to a higher level would be permitted to do so, but the goal would be for VA HCFs to have a basic capability across the entire system. Table 4 represents the pros and cons of each PPE option that the Task Force recommended for consideration.

5. Recommended Essential PPE Option for VA HCFs

The PPE and Decontamination Task Force briefed the full TAC membership on the process used to arrive at a recommendation and presented its findings and conclusions. The Task Force recommended that the EMSHG TAC endorse Option 6:

"VA HCFs use a combination of PPE Levels A through D, based on a risk assessment before and during a WMD event."

- *Each decontamination station must have at least two personnel capable of performing victim screening and decontamination while in Level B PPE, with ready back-up of two additional personnel in a stand-by and swap-out capacity.*
- *The remainder of the decontamination team must be equipped with Level C PPE. Level C PPE should be used in cases when: 1) casualties present after exposure to chemical agents and the contaminant and concentration can be determined and are below IDLH levels, or 2) casualties present after exposure to biological agents, with the exception of T-2 mycotoxins.*
- *As part of a Comprehensive Emergency Management approach, each HCF would conduct a Hazard Vulnerability Analysis. This process will demonstrate the range of potential/likely hazards for the facility and community. An unexpected hazardous substance could impact the HCF through a transportation accident or terrorist incident. In an ideal situation, a responder at a HCF would initially have accurate information regarding the hazards and could apply PPE specifically for that risk.*

Disadvantages of Option 6 include the requirement for rapid, accurate identification of the agent and its concentration at each HCF, and its vulnerability to incorrect decision making during the initial response. Additionally, it is likely to be less cost effective, as sites must purchase multiple levels of PPE and equipment for agent identification. HCFs would have to conduct training specific for each piece of equipment and level of PPE.

Additional issues that must be addressed by hospital administrators in their final decisions on essential PPE for HCFs include:

- Legal considerations

Under what circumstances may HCF providers refuse to treat victims who may present a danger to the health and safety of patients or the employees themselves? May HCFs, in cooperation with emergency response partners, establish, in advance, a level of victim decontamination that will be accommodated? Applying EMTALA in a situation involving the presentation of contaminated patients is most likely dependent on the HCF's decontamination capabilities. Assuming that the HCF has the appropriate capability (including equipment, trained staff, and policy), and that decontamination is advisable as part of the stabilization process (particularly is the patient's health and safety would otherwise be compromised), is seems likely that the HCF staff should decontaminate the patient or arrange transport to a HCF that does have the appropriate capabilities. Following Hurricane Katrina, during which some hospitals were forced to turn away patients, many discussions arose regarding EMTALA and its applicability to

disaster or mass casualty situations. The following conclusion was cited on www.emtala.com: "EMTALA is a requirement that applies to normal situations."[34] The site further implies that the requirements do not necessarily apply to disaster situations.

Legal concerns also surround the question of HCF staff safety. OSHA has clear regulatory guidelines regarding HCFs' use of PPE levels, decontamination, and training.[11] Further, many hospitals have unionized staff, which may be protected by contractual obligations regarding these issues. Hospital and other HCF leaders must ensure compliance with EMTALA and OSHA, or risk violation of regulations and potential legal actions.

- Budget and financial considerations

The purchase of PPE (and necessary decontamination equipment) for any system, whether as vast as the VA and its HCFs or as compact as a single HCF, will be no small undertaking. Implementation of a standard program extends beyond buying equipment and must factor in issues such as initial and sustainment training, equipment maintenance and monitoring, fit testing and medical surveillance, record keeping, and logistics. Recent approximate costs for a high-end, Level A ensemble (including overgarment, boots, gloves, self-contained breathing apparatus, and canisters) range from $4,000 to $5,000. Additionally, training costs may be $300 to $400 per responder per year. The total cost per facility will depend on the facility's mission, as well as its role in local emergency plans as cited by the Local Emergency Planning Committee or other local/regional body, and will be dependent on the results of assessments

mandated by OSHA. PPE must be available for primary and backup team members simultaneously. Additionally, once a particular set of PPE is used in a "hot zone" response, it is considered compromised and must be replaced. It is possible that a particular facility may be able to access funds administered by HRSA, CSEPP site programs, LEPCs, states, or other entities to assist with PPE purchases and training.

- Labor issues

HCF employees may be entitled to hazardous duty pay if they are required to don PPE. A decision will need to be made as to whether using PPE is an "essential duty" and if so, how to manage employees who are unwilling or physically unable to participate. This could be particularly problematic for some shortage specialty areas such as nursing.

Non-HCF employees, such as rotating residents or moonlighting physicians, may cover emergency services in some HCFs. A single provider may be present on a night shift. Finally, any PPE policy will need to be coordinated with the HCF's employee labor unions.

5.1. Conclusion

The terrorist use of WMD agents against the U.S. and its citizens is a real and new challenge to HCFs. Victims who survive initial exposure will rely on HCFs to provide timely decontamination and treatment. Unprepared HCFs may not only be

unable to render appropriate interventions, but may also risk compromising care of the existing HCF patient population and the ability of the HCF to continue operations.

No national standard exists that assists HCFs in determining essential levels of PPE for staff. There are also no scientific or empirical assessments to validate the most effective air-purifying respirator and PPE ensemble for HCF providers and other staff. Some authors have suggested that a HCF-specific type of PPE, Level H, should be designed.[35] The need for a HCF-specific type of PPE stems from the fact that PPE for "first responders" was initially developed for the scenario in which providers went to the scene of an incident rather than one in which patients present to a distant site. While the assumptions for the original scenario would hold true if an incident occurred on the grounds of the HCF, the more common situation would be that health care workers are functioning as "first receivers" and managing patients who have been exposed at a remote site. Patients who live to make it to a HCF may represent a different secondary exposure threat than those evaluated immediately after an exposure. Further, the risk from continued exposure to the original threat is minimized at a distant site.

VA, as the largest integrated health care system in the nation with 163 medical centers located throughout the U.S. and its territories, has elected not to wait until standards are established. Rather, it has devoted careful and deliberate attention to arriving at the best solution for essential PPE selection for its HCF staff. The EMSHG TAC and its PPE and Decontamination Task Force, drawing on input of the experts, coupled with careful examination of current principles and practices, have

recommended an option of PPE that is based on local hazards vulnerability analyses and will provide the initial step toward HCF preparedness for WMD events.

Carefully designed studies and scientific inquiry on effectiveness, appropriateness and safety of PPE selection are axiomatic to an effective system with resultant protection of patients and staff. There is no national consensus on definitive PPE levels in HCFs, as evidenced from the cited sample reviews of and interviews with non-VA HCFs and organizations. There is, however, a tremendous need for applied research and other studies on the "best" approach to PPE selection and many other protective and intervention measures inherent in this age of domestic terrorism. The EMSHG TAC recommendation on essential PPE levels provides one option for consideration. It is the hope of the authors that, by sharing the process employed by VA in addressing this very complex issue, the opportunity for scientific, academic and practical debate and discussion is generated and encouraged.

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Health care facilities' "war on terrorism":
a deliberate process for recommending personal protective equiment

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Box/Table Legends

Box 1: EMSHG TAC Task Forces

PPE and Decontamination
Research
Basic Training
Surveillance
VA's Role in the Community
Quarantine
Pharmaceutical Caches
Organizational Support
Telemedicine
Emergency Management Academy

Table 1 Personal protective equipment levels

Level "A" (fully encapsulates the body so that no vapor penetrates the suit): respiratory protection is SCBA or supplied air. Other features include inner/outer chemical gloves and boots, and PAS device. This is typically worn by responders into IDLH incidents or unknown atmospheres for the purpose of rescue, assessing, or mitigating the hazardous materials event.
Level "B" (full-body chemical suit that may not protect against vapor in an IDLH environment): respiratory protection and other protection features are normally the same as used in level A. This is typically worn by responders who have identified the material or agent, have determined expected exposure levels, and may conduct rescue or further incident assessment and initiate recovery, even in IDLH environments.
Level "C" (full-body chemical suit): respiratory protection is air purifying. this normally consists of inner/outer gloves along with chemical resistive boots. This is typically worn by responders or others who have assessed exposures either by reviewing plans or by monitoring of chemical agents. Cartridges must be specific for the types of agents expected and must not exceed exposure limitations.
Level "D" (no respiratory protection required; minimal skin protection): In an HCF, it is recommended that anytime persons may be in contact with chemicals, chemical-resistive clothing including gloves, boots, and face and eye protection be worn.

SCBA, self-contained breathing apparatus; PAS, personal alert system; IDLH, immediately dangerous to life and health.

Table 2 Accepted PPE levels at sample HCFs

Inova Fairfax Hospital (Falls Church, VA)	Level C with PAPR
University of California, Irvine Medical Center (Orange, CA)	Level C with PAPR
George Washington University Hospital (Washington, DC)	Level C with PAPR
Kaiser Permanente (California, Statewide)	Level A, level B with air line and rescue tank
Harbor-UCLA Medical Center (Los Angeles, CA)	Level A
Johns Hopkins University Hospital (Baltimore, MD)	Level D
Maimonides Medical Center (Brooklyn, NY)	Level B
Mount Sinai (New York, NY)	Level B

Table 3 Distinctions between military and civilian PPE

Civilian	Military
Termed *personal protective equipment*	Termed *Mission-Oriented Protective Posture*
Four levels (A is most protective, D is least protective)	Five levels (4 is most protective, 0 is least protective)
Worn by personnel specifically trained to enter "hot zones"; intended for "hot zone" entry	Worn by combat personnel in or close to zones where potential for chemical, biologic, radiological/ nuclear, or explosive threat exists; not intended for "hot zone" entry[a]
Protective mask (in higher levels) includes a self-contained air supply.	Protective mask filters environmental agents while providing respiratory, eye, and face protection but does not include a self-contained air supply.
Regulated by OSHA and NIOSH	Not regulated by OSHA or NIOSH

[a] The military deploys specialized teams when "hot zone" entry is required. These teams are trained in and wear PPE similar, and sometimes identical, to that worn by civilian responders.

Table 4 Pros and cons of recommended PPE options

Options	Arguments for	Arguments against
Option 1:		
No action; VHA provides no national guidance for the selection of PPE for emergency victim decontamination.	•Autonomy of local facilities.	•Less than essential protection
	•HCFs would not spend money on low-probability incidents	•Inappropriate protection •No HCF preparedness •Possible OSHA violations •Threat assessments not always accurate
Option 2:		
Use level A PPE	•Complies with OSHA regulations •Eliminates concerns re: type and concentration •One size fits all	•Degrades functional capabilities •Time required to don •Restricts work •Requires fit testing •Requires medical surveillance •Limits operational time to 30-60 minutes maximum •Unreasonable cost / benefit ratio •Extensive training required •Requires high level of fitness
Option 3:		
Use level B PPE	•Protects employee •OSHA compliant •Easier to don than Level A •Easier to work in •Cooled air to wearer •Offers protection with less movement restrictions than with level A	•Requires fit testing •Medical requirements •Limited operational time •Extensive training requirements •Requires high level of fitness
Option 4:		
Use level C PPE	•Provides protection in non-IDLH environment •Less donning time •No fit testing for hooded system •Physical stress levels lower than with level A •Dexterity superior to level A •Protects against wide range of hazards if levels below IDLH	•Not certified by NIOSH for IDLH environment •Respirator cartridge may not filter chemicals used in terrorism •Terrorism agents are extremely toxic •Terrorism agents have low warning properties •Respirator must meet OSHA requirement
Option 5:		
Use level D PPE	•Avoids employee exposure to many biologic agents	•Does not protect employee sufficiently to allow assistance to nonambulatory victims •Not OSHA-compliant •Patients may not adequately self-decontaminate
Option 6:		
Use a combination of levels A through D, based on risk assessment before and during a WMD event	•Provides range of protection based on the threat •Allows HCF to establish requirement based on risk analysis	•Need to have staff that can determine type and concentration of agents •Requires complex decision making in potentially stressful and time-sensitive situations
	•Complies with OSHA •Offers initial protection, and employee can reduce to lower PPE level when medically appropriate	•Must purchase more than one PPE level •Some of decontamination team must meet requirements for levels A and B