

# Collaboration between Civilian and Military Healthcare Professionals: A Better Way for Planning, Preparing, and Responding to All Hazard Domestic Events

MAJ LeRoy A. Marklund, RN, MS, MPH, ARNP-BC, CCNS, NREMT-P, FP-C;  
 Adrienne M. Graham, MPH; Patricia G. Morton, RN, PhD, FAAN; Charles G. Hurst, MD;  
 Ivette Motola, MD, MPH; LTC Donald W. Robinson, DO;  
 LTC (Ret) Vivian A. Kelley, RN, MSN, FNP; CDR Kimberly J. Elenberg, RN, MS;  
 Michael F. Russler, RN, EdD, MSN, FNP; Daniel E. Boehm, Jr., NREMT-B;  
 CAPT Dawn M. Higgins, RN, MS, EDM, BSN;  
 LTC Patrick E. McAndrew, RN, MSN, BC-CCNS;  
 MAJ Hope M. Williamson, RN, DNP, ACNP-BC, CCNS, NREMT-B;  
 SFC Rodney D. Atwood, LPN, BA, NREMT-B; MAJ Kermit D. Huebner, MD;  
 Angel A. Brotons, EMT-P; Geoffrey T. Miller, EMT-P, AS; Laukton Y. Rimpel, AA;  
 Larry L. Harris, AA; LCDR (Ret) Manuel Santiago, RN, MS, ACNP-C;  
 LeRoy Cantrell, RN, BSN

\*Affiliations listed in Appendix.

**Correspondence:**

LeRoy A. Marklund MAJ, AN  
 3100 Ricketts Point Road  
 APG-EA, Maryland 21010-5400 USA  
 E-mail: leroy.marklund@us.army.mil

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**Abbreviations:**

AACM = Academy of Advanced Combat Medicine  
 AHDE = All-Hazard Domestic Event  
 ANC = Army Nurse Corps  
 ATTC = Army Trauma Training Center  
 CDC = US Centers for Disease Control and Prevention  
 CSTARTS = Center for Sustainment of Trauma and Readiness Skills  
 DHS = Department of Homeland Security  
 DOD = Department of Defense  
 DOJ = Department of Justice  
 DOS = Department of State  
 EMT = Emergency Medical Technician  
 ESF = Emergency Support Functions  
 HHS = Health and Human Services  
 JTTC = Joint Trauma Training Center  
 MCI = mass-casualty incident  
 NDMS = National Disaster Medical System  
 NIMS = National Incident Management System

**Abstract**

Collaboration is used by the US National Security Council as a means to integrate inter-federal government agencies during planning and execution of common goals towards unified, national security. The concept of collaboration has benefits in the healthcare system by building trust, sharing resources, and reducing costs. The current terrorist threats have made collaborative medical training between military and civilian agencies crucial.

This review summarizes the long and rich history of collaboration between civilians and the military in various countries and provides support for the continuation and improvement of collaborative efforts. Through collaboration, advances in the treatment of injuries have been realized, deaths have been reduced, and significant strides in the betterment of the Emergency Medical System have been achieved. This review promotes collaborative medical training between military and civilian medical professionals and provides recommendations for the future based on medical collaboration.

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NRF = National Response Framework  
 NTTC = Navy Trauma Training Center  
 TNCC = Trauma Nurse Core Course  
 VA = US Department of Veterans Affairs

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## Introduction

Effective national emergency preparedness requires mutual endeavors by a variety of governmental and non-governmental agencies to proactive unity of effort that reaches beyond the experience, duty, and mission of any single organization. Coordination and collaboration are separate approaches used by organizations involved with the planning for, preparedness, and responses to all-hazards domestic events (AHDEs).<sup>1,2</sup> When compared to collaboration, coordination is less effective because planning focuses on organizational needs and institutional control of their respective resources. Conversely, collaboration is the art of constructive dialogue and requires initial planning so that organizations mutually agree to share their resources and to render control to the most capable agencies. These actions permit leaders to envision the finale first; all the while, concerned parties demonstrate teamwork in overcoming barriers and achieving set goals.

Collaboration is used at the highest level of government and exercised all the way down to local echelons. The President of the United States and the National Security Council develop the National Security Strategy for the US.<sup>3</sup> The ultimate goal of the National Security Strategy is to establish guidelines for domestic safety and foreign military campaigns in preserving national security. This action requires national power, which includes elements of diplomacy, information, the military, and economics.<sup>4,5</sup> The lead agency for US foreign policy is the Department of State (DOS), and it collaborates with the Department of Defense (DOD).

Homeland security is a national priority, and requires a collaborative, national effort.<sup>6</sup> The National Strategy for Homeland Security complements the National Security Strategy, and provides a comprehensive framework for systemizing federal, state, local, and private organizations that normally do not have roles in national security. An example of domestic inter-agency collaboration exists between the Department of Homeland Security (DHS) and the DOD.<sup>7</sup> Both agencies must plan early and in unison in order to optimize domestic public safety. Collaboration also can filter down to local municipalities, according to the National Response Framework (NRF). The NRF is a tool that enables response agencies at the federal, state, and local levels to organize and provide unified national response efforts against an AHDE,<sup>8,9</sup> which include disasters due to natural hazards, human-made incidents, and special events, such as the Presidential Inauguration or the Super Bowl.

Catastrophic events, especially disasters due to natural hazards, are no stranger to the US (Table 1).<sup>10</sup> Since 1900, the US has experienced eight out of 10 major international meteorological events that required massive amounts of medical supplies along with the actions of civilian and military medical personnel.<sup>11</sup> Fortunately, US military units offer extensive experience and essential equipment tailored for use in search-and-rescue operations or mass-casualty incidents.<sup>12,13</sup> Civilian medical organizations offer a plethora of medical knowledge, skills, and patient transport experience.<sup>14,15</sup> Both parties will benefit from the synergistic effects of these capabilities based on the rich collaborative medical heritage in responding to an AHDE. The purpose

of this review is to stimulate innovation and creativity for civilian and military healthcare professionals in operational planning, preparation for, and responding to AHDEs.

## Historical Aspects of Medical Collaboration

The benefits of medical collaboration extend into ancient times when Rome used a combination of military and civilian clinicians. The most notable historic armies to render medical care on the battlefields were the Roman Legions in the first century BC.<sup>16,17</sup> The *capsarii* were trained within the legion and functioned as combat medics. Roman field hospitals were located near the battlefield, and were staffed by qualified physicians recruited from the civilian (public) sector. Unfortunately, the concept of systematic health care was lost for centuries after the fall of the Roman Empire. In some ways, this Roman-style healthcare system parallels the present-day emergency medical system, whereby first responders provide immediate medical interventions, then transport their patients to more definitive care.

### *Physician Contributions*

While Europe was consumed in war in the early 1800s, Dr. Baron Dominique Jean Larrey, Napoleon Bonaparte's chief surgeon, drew on contemporary medical concepts inspired by ancient Rome.<sup>16-18</sup> Larrey initiated the first known formal first responder academy, designed the first horse-drawn, wheeled ambulance, incorporated an effective patient triage system, and assigned surgeons to field hospitals. It is evident that Larrey understood resource management, immediate patient treatment, and rapid patient transport, as well as the importance of definitive medical care,<sup>19,20</sup> which still are the underpinnings of the current emergency medical system.<sup>14</sup>

Larrey's concepts of military medicine were employed 40 years later by Major Jonathon Letterman during the American Civil War.<sup>21</sup> Letterman persuaded President Abraham Lincoln and the US Congress to authorize the use of military ambulances after the Union Army fiascos during First and Second Battles of Bull Run in 1861 and 1862. Letterman was aghast to witness wounded Union soldiers abandoned on the battlefield, while retreating comrades looted the dead and dying of personal belongings. Soon after the end of the American Civil War, former Union medical officers launched the first known urban, civilian ambulance services in the US at Commercial Hospital in Cincinnati, Ohio, and Bellevue Hospital in New York.<sup>16</sup>

### *Contributions of Nurses*

Early nursing pioneers also were influential in promoting collaboration between civilian and military healthcare systems. In 1854, an English civilian nurse, Florence Nightingale, introduced essential nursing care into British military field hospitals during the Crimean War.<sup>22</sup> Likewise, Clarissa Harlowe Barton, an American nurse, was referred to as "The Angel of the Battlefield" during the American Civil War.<sup>23</sup> Barton lobbied the US Congress to staff Union military hospitals with civilian nurses, which is similar to present-day civil service healthcare professionals who staff US military medical facilities. Barton's efforts

Country	Event Type	Date	Cost (million \$US)
US	Storm	29 August 2005	125
US	Storm	12 September 2008	30
US	Storm	24 August 1992	26.5
US	Storm	15 September 2004	18
US	Storm	13 August 2004	16
US	Storm	23 September 2005	16
US	Storm	24 October 2005	14
US	Storm	05 September 2004	11
Japan	Storm	27 September 1991	10
Japan	Storm	03 September 2004	9

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**Table 1**—Top most costly meteorological disasters for the period 1900 to 2009<sup>10</sup>

provided dividends, as they showed adequate nursing care drastically decreased the infection rate of wounded soldiers. Barton later established the American Red Cross in 1873.<sup>24</sup> The American Red Cross is appreciated for its support of military troops and its assistance to civilians affected by AHDEs.

A French nurse, Marie Marvingt, contributed to flight nursing and became affectionately known as “The Fiancée of Danger” because of her accomplishments as a balloonist and pilot; she earned the Croix de Guerre during World War I for heroism as an aviator.<sup>16,25</sup> She also participated in search-and-rescue operations in the Alpine Mountains and served intermittently as a Red Cross nurse; all the while envisioning the airplane as a flying ambulance. The French military eventually used aircraft as a means to evacuate wounded soldiers from the Balkans to Paris hospitals during World War I. The Americans and British also utilized airplanes to evacuate wounded soldiers, but to a much lesser extent, due to the prevailing attitude that there were enough dead soldiers in France already, “without killing the wounded in airplanes.”<sup>26</sup>

#### *Between the World Wars*

The years between World War I and World War II provided ample opportunities for medical collaboration between military and civilian healthcare professionals.<sup>26</sup> For example, in the 1920s, American military officials authorized the use of military airplanes for civilian disaster relief in response to devastating floods. Similarly, the French and British military used their air-medical ambulance assets to service the health needs of citizens living in the frontiers of Colonial Africa.<sup>25</sup> In the early 1930s, Marvingt developed the first civilian flight nurse training program in Morocco. This same concept was adapted by the US military during World War II. These brave women cared for 1.1 million wounded service members and only 46 patients died while in flight.<sup>27</sup> In fact, General Dwight D. Eisenhower credited penicillin, blood transfusions, and air-medical evacuation as the three most important collaborative medical breakthroughs during World War II.<sup>28</sup>

## Operational Planning

### *Starting Point*

Decision-makers use operational planning for identifying capabilities and making reasonable changes for effective training and education because effective plans strive for excellence in basic proficiencies.<sup>29</sup> In 1942, an American General was impressed by the British mobile surgical units operating in North African deserts since the US lacked similar medical capabilities.<sup>30,31</sup> Cutler ordered Colonel Robert M. Zollinger to design similar medical units using operational planning as a means of providing medical support to the Normandy invasion. Operational planning was a new concept developed by the German War College prior to World War II.<sup>32</sup> The essence of operational planning is to position support elements, such as medical resources, at the right place at the right time, with the right amount to influence success.

In July 1944, General George S. Patton initiated an offensive drive out of Normandy toward Paris.<sup>30</sup> During this campaign, the first American mobile surgical and shock teams were outfitted and positioned at forward field hospitals that were experiencing casualty surges.<sup>33</sup> This strategy allowed medics and nurses to provide patient care, while surgeons performed damage control in the surgical suites. Zollinger’s innovation of maneuvering shock teams and trauma teams is credited to operational planning, and this concept is used today in the semblance of Forward Surgical Teams, Civil Support Teams, US Public Health Service (USPHS) response teams, and intermittent federalized Disaster Medical Assistance Teams (DMATs), which place uniformed service and civilian medical professionals in close proximity to casualties.<sup>34–38</sup>

Since adequate responses to AHDEs requires inter-agency operational planning, it is advisable that local, state, and federal officials seek out collaborative education and training opportunities that test operational plans and ensure that all available resources are utilized approximately.<sup>8,9</sup> Large-scale, domestic, disaster response exercises may be difficult to coordinate or too costly. For these reasons, virtual war games, tabletop exercises, teleconferences, and/or high-fidelity patient simulator scenarios may be acceptable alternatives to test the strengths and flaws of operational plans. Coincidentally, these patient simulation techniques are utilized successfully by military and civilian academic educational settings nationwide.

### *Emergency Medical System*

Operational planning attempts to assure that medical resources are readily available at a moment’s notice.<sup>39</sup> It is important to understand that the current civilian emergency medical system was the brain child of Zollinger following his honorable discharge from military service.<sup>31</sup> He recognized that motor vehicle crashes accounted for many needless deaths, especially to individuals ≤30 years of age. Zollinger sought a solution by applying military operational planning along with his civilian and military surgical expertise to conceptualize America’s present emergency medical system. The original emergency medical system concept was designed for adults; however, over time, pediatric trauma centers came into existence.<sup>40,41</sup>

Country	Disaster Type	Date	Total Number of People Affected
Mexico	Explosion	19 November 1984	708,248
Brazil	Poisoning	01 April 2003	550,000
Soviet Union	Radiation	29 September 1957	400,935
Japan	Radiation	30 September 1999	320,600
India	Gas Leak	03 December 1984	300,000
Canada	Chemical Spill	10 November 1979	220,000
United States	Radiation	28 March 1979	200,000
Italy	Explosion	10 July 1976	190,893
People's Republic of China	Gas Leak	16 April 2004	150,000
Soviet Union	Radiation	26 April 1986	135,000

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**Table 2**—Top industrial disaster events for the period 1900 to 2009 based on total number of people affected<sup>142</sup>

### All-Hazards Domestic Events

The US ranks seventh worldwide in the category of most devastating industrial disasters since 1900 (Table 2);<sup>42</sup> however, the events of 11 September 2001 increased governmental resolve toward responsiveness to terrorism.<sup>43</sup> Terrorism is an atypical occurrence; however, fires, collapsed buildings, power outages, floods, accidental toxic industrial chemical or release of radiation, and infectious disease epidemics are more prevalent. These events may be the result of natural occurrences or terrorist acts, but the end results are casualties with assorted injuries. The US Marine Corps found that its level of readiness, regardless of whether the mission is humanitarian, peacekeeping, or combat, is related to meaningful and quality training.<sup>44</sup> This concept can be applied by military and civilian clinicians for readiness training for coping with AHDEs. The AHDE model provides a framework for responding to a wide variety of disasters and streamlines training and education resources.<sup>8,9</sup>

According to the DHS, federal, state, and local planners should take into account most common emergencies that have occurred in the recent past and during the planning process, consider the most probable perils.<sup>43</sup> Planners also must consider that airports, highways, bridges, chemical plants, nuclear power plants, and railroad lines increase the risk to public safety due to human error, natural hazards, or saboteurs.<sup>8,9</sup> Medical responses also may be required for infectious disease outbreaks. These outbreaks can be attributed to natural epidemics or an intentional release of biological agents. Regardless of the disease source, planners must take into account quarantine and isolation measures, the number of available hospital beds, availability of competent clinicians, distribution of pharmaceutical supplies, and acquisition of specialized medical equipment, such as mechanical ventilators.

### Benefits and Risks of Collaboration

Collaboration is beneficial as exemplified by the international responses following the 2004 Indian Ocean tsunami.<sup>45</sup> Combined support forces of US Marine Corps and Navy personnel, supported the US Agency for International

Development and the United Nations relief efforts until humanitarian relief organizations arrived.<sup>46</sup> Reports indicate that US Marines and sailors delivered 54 million kilograms of relief supplies via air and sea transport; plus six Navy ships generated thousands of gallons of potable water for grief-stricken people.

Collaboration has risks because governmental agencies may be asked to surrender specific responsibilities and resources, which may create inter-agency envy. This was demonstrated by agency rivalry between the New York City Police Department and the New York City Fire Department on 11 September 2001.<sup>29</sup> This type of bureaucratic antagonism created a silo mentality that contributed to hoarding of vital information. In comparison, local and state government officials demonstrated unruly behaviors that led to ineffective responsiveness and attributed toward delayed evacuation and relief efforts after the devastation caused by Hurricane Katrina on 29 August 2005.<sup>11</sup>

### Complexities of Collaboration

Leaders of civilian and military agencies recognize the importance of collaboration, yet resistance makes this effort difficult due to judicial intricacies and resource limitations.<sup>6,11,29,46</sup> In 1987, Bellamy recognized differences in trauma injury patterns between military and civilian patients and promoted separate training programs.<sup>44</sup> On the other hand, the International Committee of the Red Cross and the (US) Centers for Disease Control and Prevention (CDC) recognized that US civilian healthcare providers must be educated, trained, and prepared to treat all types of injuries.<sup>47-49</sup> Therefore, in order to ensure adequate planning, preparedness, and responsiveness to AHDEs, US military and civilian healthcare professionals should collaborate training and education under the auspice of (US) federal laws and regulations.

### Laws and Regulations

Collaboration between military and civilian healthcare professionals must take into account legal ramifications. According to Joint Publication 3-26, military units are

**Table 3—Designation of Emergency Support Functions (ESFs) of Coordinator, Primary, & Support Agencies (ESF #8)<sup>52</sup>**  
 (C = ESF Coordinator/P = Primary Agency/S = Support Agency)

Agencies	Emergency Support Functions														
	#1 Transportation	#2 Communication	#3 Public Works & Engineering	#4 Firefighting	#5 Emergency Management	#6 Mass Care, Management, & Resource Support	#7 Logistics, Management, and Resource Support	#8 Public Health & Medical Services	#9 Search and Rescue	#10 Oil & Hazardous Material Resources	#11 Agriculture & Natural Resources	#12 Energy	#13 Public Safety and Security	#14 Long Term Community Recovery	#15 External Affairs
US Department of Agriculture			S		S	S	S	S		S	C/P/S	S		P	S
US Forest Service	S	S	S	C/P		S	S	S	S	S			S		
Department of Commerce	S	S	S	S	S			S	S	S	S	S	S	S	S
Department of Defense	S	S	S	S	S	S	S	S	P	S	S	S	S	S	S
Amy Corps of Engineers	S		C/P	S		S	S	S	S	S	S	S	S	S	
US Department of Education					S										S
Department of Energy	S		S		S		S	S		S	S	C/P	S	S	S
Health & Human Services			S		S	S	S	C/P	S	S	S		S	S	S
Department of Homeland Security	S	S	S		S		S	S	S	S	S	S	S	P	C
Federal Emergency Management Agency	S	P	P	S	C/P	C/P/S	C/P	S	C/P	S	S		C/P	C/P	P
National Communication System		C/P					S					S			
US Coast Guard	S		S	S				S	P	P			S	S	
Housing and Urban Development				S	S									P	S
Department of Interior	S	S	S	S	S	S	S	S	P	S	P/S	S	S	S	S
Department of Justice	S				S	S	S	S	S	S	S	C/P			S
Department of Labor			S		S	S	S	S	S	S	S	S	S	S	S
Department of State	S		S	S	S					S	S	S			S

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Uniformed Services	Federal Executive Departments	Date Established
US Army	US Department of Defense	14 June 1775
US Navy	US Department of Defense	13 October 1775
US Marine Corps	US Department of Defense	10 November 1775
US Air Force	US Department of Defense	18 September 1947
US Coast Guard	US Department of Homeland Security US Department of Navy (In time of war)	04 August 1790
US Public Health Service Commissioned Corps	US Department of Health and Human Services	16 July 1789
National Oceanic and Atmospheric Administration Commissioned Corps	US Department of Commerce	10 February 1807

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Table 4—Seven Federal Uniformed Services of the United States<sup>53</sup>

authorized to support domestic civilian agencies during an AHED.<sup>6</sup> The [US] Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288) permits state governors to request a Presidential Disaster Declaration and defines relief payments for eligible agencies.<sup>50</sup> The Stafford Act allows state governors, in times of emergency, to request federal assistance if state and local resources are overwhelmed. The President also may provide accelerated federal support if time is of essence in saving lives or mitigating severe infrastructure damage.<sup>51</sup>

The (US) Secretary of Health and Human Services (HHS) has the independent authority under the Public Health Service Act, Section 319, to enact four separate options in the event of a public health emergency:<sup>51</sup> (1) if the President declares a National Emergency, the Secretary of HHS has the authority under Section 1135 of the Social Security Act to waive certain Medicare and Medicaid requirements to ensure citizens have access to sufficient healthcare resources; (2) the HHS enforces public health regulations, such as isolation or quarantine that are designed to prevent the spread and transmission of infectious diseases; (3) the Secretary can request resources through the US Surgeon General, such as deployment of US Public Health Service personnel or HHS can intermittently federalize civilian clinicians as members of Disaster Medical Assistance Teams. The Public Health Service provides professionals who are highly trained in medical research, health surveillance, environmental science, and mental health. Members of Disaster Medical Assistance Teams provide medical care to high-acuity casualties;<sup>40</sup> and (4) HHS can request support from the Federal Emergency Management Agency, which is able to task certain governmental agencies for specific Emergency Support Functions (ESF) as coordinator, support agency, or lead agency (Table 3).<sup>52</sup> For example, ESF8 (public health and medical services) is assigned to the Assistant Secretary for Preparedness and Response. The Assistant Secretary acquires resources from the National Disaster Medical System (NDMS) or from the Public Health Service.

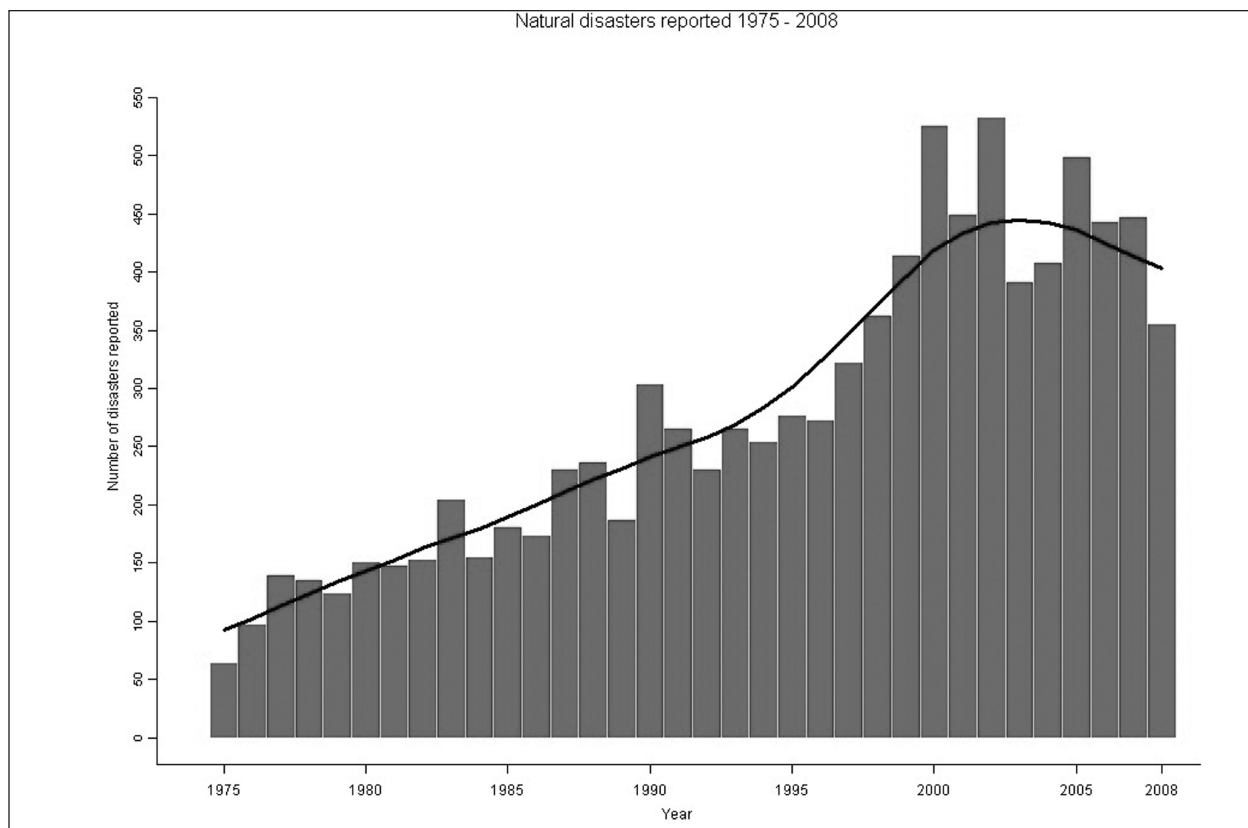
Collaboration between civilians and uniformed service agencies is necessary for the accomplishment of critical tasks by multiple agencies during an AHDE. Hence, the purpose of HHS is to assist state and local governmental agencies during crises.

#### *Posse Comitatus*

In the US, the lead governmental agency responsible for protecting citizens during an AHDE is the Department of Justice (DOJ).<sup>52</sup> The DOJ ensures scene safety for clinicians and secures access for patients who require health care during an AHDE. The Posse Comitatus Act of 1878 forbids the seven federal uniform services (Table 4)<sup>53</sup> to act as law enforcement agencies within the US, except when authorized by an act of Congress.<sup>46</sup> Military units also are governed under Title 10 of the Act, which prohibits military personnel from managing civilian organizations. In other words, US military commanders are not in charge during an AHDE. In contrast, the US Coast Guard is a military service and a branch of the US armed forces, but falls under DHS during peacetime (Title 14, USC 1), and can assist during an AHD.<sup>6</sup> The Coast Guard also can be transferred to the Navy upon a Declaration of War by Congress or by Presidential orders. The Posse Comitatus Act does not constrain the Coast Guard from its maritime law enforcement duties for both US territorial waters and the high seas.

#### *National Incident Management System*

The US Emergency Medical System falls under the NSHS, and complements the NSS by upholding the first objective of the National Defense Strategy—defend the homeland.<sup>6</sup> Civilian and military healthcare professionals are guided by the National Response Framework and the National Incident Management System (NIMS) as countermeasures to thwart the devastating effects of an AHDE. These documents allow US military personnel to support civilian agencies in a collaborative effort to alleviate domestic medical consequences.<sup>54-56</sup> For example, the DOD's



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**Figure 1**—Number of worldwide disasters caused by natural hazards reported by the World Health Organization from 1975 to 2008<sup>62</sup>

response to Hurricane Katrina was the largest military deployment within the US since the Civil War; however, problems including catastrophic infrastructure damage and inadequate recovery plans developed and contributed to delays in the evacuation and relief efforts due to indecisiveness by government officials.<sup>46,57</sup>

The NIMS provides an emergency service system that is flexible and standardizes efforts at all jurisdictional levels in the event of an AHDE.<sup>6,7,46</sup> The NIMS is fairly new to military leadership. Yet, the Secretary of Defense insists that military leaders implement plans and procedures so that military units are able to rapidly support civilian agencies during an AHDE.<sup>46</sup> It also is imperative that military and civilian leaders collaborate early during the planning process, by developing close working relationships. Roles and responsibilities should be clarified prior to conducting AHDEs training or responding to an actual emergency.

#### *National Response Framework*

The NRF outlines the importance of the DOD in providing support to civilian agencies during an AHDE.<sup>6</sup> The NRF is a product of Homeland Security Presidential Directive #5. The NRF is a guide that details how the US collectively will respond to an AHDE, regardless of the severity.<sup>47</sup> The NRF utilizes the NDMS as a support system to manage and coordinate federal medical assets for patient care.<sup>58</sup> A purpose of the NDMS is to assist state and local authorities whose hospitals are damaged by an

AHDE and require patient evacuation to other hospitals located in safer areas. The USPHS can assist by back-filling military hospitals or by transporting casualties from military facilities to Department of Veterans Affairs (VA) healthcare facilities. Executive Order #9597 declared USPHS a military service during World War II and the Korean War.<sup>59</sup> The USPHS also has been militarized for the Vietnam and Persian Gulf conflicts.

#### **Planning for All Hazard Domestic Events**

##### *Private Sector versus Public Sector*

Terrorism is a national security threat.<sup>60,61</sup> Additionally, since 1975, disasters due to natural hazards have increased worldwide (Figure 1).<sup>62</sup> Collaboration between private and public sectors is essential for strengthening a national preparedness culture for coping with an AHDE. A prime example of collaboration between the public and private sectors is the National Disaster Education Coalition.<sup>63</sup> Lowe's Home Improvement Warehouse, in collaboration with numerous governmental and non-governmental agencies, founded this non-profit organization. The National Disaster Education Coalition offers informational pamphlets, such as *Talking about Disasters*, which are free to those who educate the general public about health safety in the event of an AHDE.

The private sector gained a wealth of experience after Hurricane Katrina.<sup>64</sup> Large retail chain stores and telecommunications companies focused on preparation to protect buildings and shield inventory; during storms, some com-

pany employees considered consequences of failure and stockpiled critical supplies, such as drinking water, building materials, fuel, and portable electric generators. Most of these items were provided free-of-charge to citizens in need. Governmental agencies should note these consequences because many communities became self-reliant earlier than anticipated.

#### *Building Academic Bridges*

The development of educational programs is an excellent approach for coping with an AHDE because they establish professional relationships. The Army-Baylor Graduate Program in Health and Business Administration is open to clinicians and administrators from all military service branches along with selected DOD and VA civilian employees.<sup>65</sup> This program is located at Fort Sam Houston, Texas, and students graduate from Baylor University in Waco, Texas. The Army-Baylor program serves the federal health system by preparing military officers as health administrators who are able to interact with their civilian counterparts in solving complex healthcare issues, such as preparing first receivers for mass-casualty incidents. Students experience 12 months of didactic learning plus 12 months of mentorship within military or civilian healthcare facilities prior to graduation.

In 2007, the Chief of the US Army Nurse Corps (ANC) and the University of Maryland School of Nursing collaborated in a unique nursing education endeavor by allowing six ANC officers to function as undergraduate faculty members for two consecutive academic years, and at no cost to the University of Maryland, Baltimore.<sup>66</sup> Hundreds of civilian nursing students interacted with these ANC officers to gain an appreciation about the benefits of military service. In return, the military nursing instructors had multiple opportunities to enhance their leadership and teaching skills by providing didactic lectures, supervising students in the clinical setting, and evaluating student nursing skills during different scenarios in a patient simulation laboratory.

Other examples of academic collaboration include the Stanford University Program in Disaster Management Education and the Wright State University, Boonshoft School of Medicine Education Program.<sup>67,68</sup> The Stanford curriculum is a doctorate-level program offered by the Stanford University School of Medicine. The uniqueness of this program is the inter-departmental collaboration between the Schools of Medicine, Engineering, and Business, as well as professors with military backgrounds.<sup>67</sup> The Stanford program uses a multi-disciplinary approach by incorporating technology and leadership into the curriculum. Students learn about medical device innovation and novel technology that will foster effective responses to an AHDE. Students also learn managerial skills and operational planning that will help them be effective leaders.

The Boonshoft School of Medicine at Wright State University collaborated with the Department of the Air Force's Research Laboratory and established the National Center for Medical Readiness.<sup>68</sup> The National Center for Medical Readiness is a national medical education program model that expands civilian and military response capabilities during an AHDE through medical readiness education

and disaster preparedness research. The National Center for Medical Readiness provides opportunities for clinicians to practice treating critically injured patients during a mass-casualty incident. The National Center for Medical Readiness also trains civilian and military public health and public safety personnel in the event that their services are needed during a mandatory community evacuation. Wright State University and the Air Force also are testing new technology that allows DOD and non-DOD personnel to communicate during catastrophic events.

#### *Shared Experiences*

The Senior Visiting Surgeon Program at the Landstuhl Regional Medical Center, Germany is another collaborative military and civilian training program.<sup>69</sup> The goal of this program is to establish a professional relationship and exchange of ideas between civilian and military trauma surgeons. The Landstuhl Regional Medical Center is the clearing site for all US military casualties evacuated from Iraq or Afghanistan. Civilian and military physicians are afforded opportunities to participate in stabilizing critically injured casualties before they are airlifted to the US.

The Intergovernmental Personnel Act of 1970 authorizes federal agencies to temporarily assign personnel to local and state agencies, universities, and Indian tribal governments.<sup>70</sup> The two-year Intergovernmental Personnel Act programs should benefit all participants because they strengthen partnerships, improve technology, and allow teachers, physicians, nurses, and scientists to develop problem-solving strategies. It is important to note that cost sharing is common practice for both parties. Finalized, formal, written agreements also are required.

#### **Preparing for All-Hazards Domestic Events**

Civilian clinicians benefit from shared knowledge by experienced military providers who have treated injured casualties during conventional and unconventional warfare. From 1980 to 1988, Soviet medical reports from Afghanistan confirmed that casualties were two-and-one-half times more likely to be injured by explosions than from gunshot wounds.<sup>71</sup> In contrast, the Iraq and Iran war from 1980 to 1988 produced an astounding number of chemical casualties.<sup>72</sup> Ongoing military experience in Iraq and Afghanistan is creating numerous casualties with multifaceted wounds.<sup>73,74</sup> There is a high likelihood that these types of injuries may be mimicked during an AHDE. Current preparedness for an AHDE requires clinically competent clinicians trained at all skill levels.<sup>75,76</sup> These healthcare professionals must be the core consultants and evaluators for both civilian and military AHDE drills.<sup>77,78</sup> Using a synergistic and collaborative approach under the guidance of experienced military and civilian clinicians is appropriate.<sup>79</sup>

#### *Global to Local Preparedness*

The DOS, along with the US Defense Institute for Medical Operations conducted collaborative leadership disaster response and trauma system management training with the government of Mauritius in 2007.<sup>80</sup> Fifty medical practitioners participated in this six-day training program that was supported by US and Mauritius governmental

agencies. Likewise, the Miami Center for Public Health Preparedness provides a nationwide network that supports preparedness efforts for local, state, and international health departments.<sup>81</sup> Since 2006, the Center for Public Health Preparedness has trained 7,000 Florida Hispanics and Latinos in community-based Spanish language courses focusing on family hurricane preparedness. The Center for Public Health Preparedness also is used by the US government as a collaborative tool with the governments of Argentina, Columbia, and Venezuela. Similarly, the Disaster Preparedness and Response Training Network is an educational collaboration project,<sup>82</sup> that, since 2005, has provided courses to civilian healthcare professionals in an effort to improve local community services against an AHDE.

#### *Certification Programs*

The template for trauma patient care is Advanced Trauma Life Support (ATLS), a comprehensive training program whereby civilian and military physicians learn nuances of primary assessment and initial lifesaving interventions.<sup>84,85</sup> Most physicians practicing in emergency departments are encouraged to become certified in ATLS every four years, in addition to certifying in Advanced Cardiac Life Support every two years, so that resuscitation efforts improve survival rates.<sup>86,87</sup> Parallel training for nurses and paramedics includes the Trauma Nurse Core Course, Emergency Nurse Pediatric Course, Transport Nurse Advanced Trauma Course, Prehospital Trauma Life Support, and International Trauma Life Support, also known as the Basic Trauma Life Support, which instruct systematic approaches in assessing and treating trauma victims.<sup>88-92</sup> Critics argue that these courses emphasize civilian circumstances and that it is difficult to transition these principles into military situations; others believe that these programs are certificate factories.<sup>93</sup> Readers must be cautious and not duped into believing that these certification programs alone will adequately prepare clinicians for operations during a future AHDE.<sup>94</sup>

Conversely, the Defense Medical Readiness Training Institute in Fort Sam Houston, Texas, offers some of the previously mentioned certificate programs in its joint service military medical training program.<sup>95</sup> Military medical personnel seem to value the efforts of the Defense Medical Readiness Training Institute with providing them an opportunity to rehearse concepts of systematic patient assessment and lifesaving treatments in a safe learning environment. Presentation in these courses has been credited for decreasing the mortality rates for injured US military service members. For example, mortality rates have consistently lessened from 30% in World War II, to 24% in Vietnam, and 10% in the current Iraq and Afghanistan conflicts.<sup>96,97</sup>

Like their fellow civilian emergency medical technician (EMT) peers, US Army healthcare specialists also known as "medics", earn their national registry emergency medical technician basic certification after completing initial medical training.<sup>98</sup> Army, Air Force, Navy, and Coast Guard corpsmen assigned to special operation units or sea duty are expected to provide advanced life support and to be able to practice autonomously in austere and remote environments.<sup>74,95,99,100</sup> With current limited resources, the National Registry for EMT-Paramedics (NREMT-P) cer-

tification is not mandated, but encouraged for military medical personnel because of the focus on the provision of medical care in combat. Advanced Tactical Practitioner training is offered to more experienced prehospital military providers to complement the NREMT-P certification.<sup>101,102</sup> Advanced tactical complement is a federal medical provider certification program coordinated by a group of civilian and military practitioners and implemented by the US Special Operations Command Curriculum and Examination Board.<sup>103</sup> A similar civilian program, the Counter Narcotics and Terrorism Operational Medical Support, incorporates EMT Tactical certification. This program trains civilian first responders to work closely with law enforcement agencies during dangerous circumstances, such as civil disobedience or drug raids. Even so, while advanced life support skills are important, fundamental patient assessment skills and basic lifesaving interventions often have a greater impact on patient outcomes.<sup>76</sup>

#### **Responding to All-Hazards Domestic Events**

In 1998, the US General Accounting Office (GAO) reported that military clinicians lacked suitable exposure to critically injured patients due to base closures and privatization of the military medical system. It recommended the development of collaborative military and civilian training to boost readiness.<sup>98,104</sup> Sixty nationwide metropolitan trauma centers were evaluated to identify facilities that best fit military long-term, medical training needs.<sup>104</sup> In 1999, the DOD selected Ben Taub General Hospital, Houston, Texas, a 588-bed, Level-1 Trauma Center and launched the Joint Trauma Training Center (JTTC).<sup>15,105,106</sup>

The premise of the JTTC is to allow military surgical teams from all of the service branches an opportunity to gain experience in assessment and treatment of injured patients prior to deployment. Numerous military surgeons had concerns about the JTTC program due to credentialing issues and maintenance of clinical proficiency.<sup>107</sup> Also, the JTTC prohibited participants from using their assigned medical equipment or practicing as teams due to legal issues. The JTTC ceased operations in 2001, so three military services established separate training programs.<sup>106</sup> The US Coast Guard and the USPHS are encouraged to use these training venues because studies indicate that trauma training for deployable medical teams at civilian Level-I Trauma Centers is warranted.<sup>15,108-110</sup>

#### *Symmetrical Training*

The US Air Force answered the GAO's challenge by establishing the Center for Sustainment of Trauma and Readiness Skills (CSTARS).<sup>111</sup> Air Force personnel are assigned as staff members in busy Level-1 Trauma Centers throughout the US and host two-week training courses for physicians, nurses, and medics. These military and civilian partnerships enable the constant sharing of cutting-edge, evidence-based practice. While the students are fine-tuning multi-system trauma resuscitation, the civilian centers have the skills and assets of military staff members who are available for shift work and teaching in advanced trauma courses.<sup>112</sup>

There are three CSTARS sites, each of which has a particular focus.<sup>111</sup> The site at University Hospital Cincinnati

supports critical care air transport teams. The Saint Louis University Hospital CSTARS is a training platform that targets active duty Air Force and Air National Guard medical personnel. The largest of the CSTARS hosted by the R. Adams Cowley Shock Trauma Center at the University of Maryland Medical Center trains clinicians and special operation medics. This site includes didactic instruction that is complimented with a robust clinical practicum. The enlisted and special operation personnel also work alongside local emergency medical services and fire departments, responding to scenes. The CSTARS sites include the use of advanced patient simulators to enact combat scenarios, clinical trauma team rotations, and practice with equipment commonly available in deployed settings. Nearly 900 airmen/airwomen attended one of the CSTARS sites annually, based on deployment assignment and rotation.<sup>96,97,113</sup>

The US Navy established the Navy Trauma Training Center (NTTC) in September 2002 and staffed it with 10 full-time medical professionals.<sup>114</sup> The NTTC is located at the Los Angeles County and University of Southern California Medical Center, which is a 600-bed, full-service healthcare facility with a Level-1 Trauma Center.<sup>115,116</sup> The Medical Center evaluates >25,000 trauma cases annually and admits >6,000 injured patients.<sup>117</sup> The NTTC provides 21 days of didactic instruction, medical skills stations, case discussions, patient simulator team training, fresh tissue laboratories, along with clinical rotations. The 12-person team works alongside civilian hospital staff caring for critically injured patients. In addition, Navy nurses are afforded helicopter flight time with Mercy Air, while Navy corpsmen accompany Los Angeles County fire-rescue ambulance crews.

The emergency department at Kings County Hospital Center in Brooklyn, New York, receives >600 victims with penetrating injuries annually.<sup>118</sup> In 2003, the Academy of Advanced Combat Medicine (AACM) was founded.<sup>119</sup> The AACM offers medical training to Army Reservists in a busy, urban, emergency department and trauma intensive care unit. Army Reservists spend one weekend per month for nine consecutive months working alongside civilian nurses and physicians prior to deployment. The AACM is modeled after the US Army Trauma Training Center (ATTC) in Miami, Florida.

The ATTC at the Ryder Trauma Center, Jackson Memorial Hospital in Miami, Florida is a trauma team training program.<sup>13,120,121</sup> The ATTC, in partnership with the University of Miami Miller School of Medicine, the Jackson Memorial Health Systems, and Miami Dade County, is a unique program that offers strategies toward improving patient care and teamwork development among military and civilian medical staff. This program is based on the DOD and the Agency for Healthcare Research and Quality (AHRQ) team strategies and tools that enhance performance and patient safety.<sup>122</sup> The clinical experience occurs in an urban, civilian environment. The training combines lectures, patient simulations, tissue laboratories, mass-casualty experience, clinical time, and uses components learned from both military and civilian healthcare systems. The ATTC is staffed by nine clinicians and two civilian paraprofessionals.<sup>13</sup> They have trained >1,563 medical mil-

itary personnel as of December 2009 who are assigned to various forward surgical teams, combat support hospitals, or special operation surgical teams. It trains 21-person teams and each team logs >144 clinical hours per 14-day rotation. The ATTC's ultimate goal is to improve patient care and increase patient safety by building efficient trauma teams. Team members are delegated specific roles by their team leader, who also is responsible for team oversight of medical planning, prioritizing patient care, and problem solving. The key for success is effective team communication, which allows the team leader to safely orchestrate individual roles into one team effort to improve patient outcome.

#### *Asymmetrical Training*

On 21 May 2008, military staff members assigned to the ATTC along with civilian staff members of the University of Miami Gordon Center for Research in Medical Education exemplified collaborative civilian and military medical training. They combined mutual medical expertise and real-world experiences. Their synergistic efforts created a realistic urban terrorist scenario using patient simulation.

In August 2009, in keeping with the goal of interagency collaboration, the US Public Health Service conducted training at Fort Ambrose Powell Hill, Virginia, because of reports concerning poor performance by federal agencies following Hurricane Katrina in 2005.<sup>124</sup> Four critical flaws of domestic response were evident: (1) lack of establishing unified management across the national response; (2) ineffective command and control structures within the federal government; (3) weak preparedness plans; and (4) poor regional planning and coordination. The Office of Force Readiness and Deployment, within the Office of the Surgeon General, addressed these concerns by conducting a training scenario that involved a H1N1 pandemic after a catastrophic hurricane event. Instructors from agencies within HHS, DOD, and universities; all ESF #8 participants,<sup>52</sup> were used. The field exercise portion was validated by external observers and controllers—there was improvement in field skills, increased confidence in team leadership, and 71% of the participants perceived that they were better prepared for deployment within the context of the four flaws identified during the domestic responses to Hurricane Katrina.<sup>124</sup>

The instruction provided by the US Army Medical Research Institute of Chemical Defense, in partnership with the US Army Medical Research Institute of Infectious Diseases, provide military and civilian medical training. There are three Army-accredited and DHS-approved courses: (1) the Medical Management of Chemical and Biological Casualties course; (2) the Field Chemical and Biological Casualties course; and (3) the Hospital Management of Chemical, Biological, Radiological, Nuclear, and Explosive Incidents course.<sup>125</sup> Civilians have been attending these Army courses since 1984. They train side-by-side with DOD, HHS, DHS, government civilians, and US ally personnel. A total of 2,874 civilians have received the training.

Training handbooks and medical textbooks are available to the public. Course syllabi, CD ROMS, DVD ROMS, digital lectures, websites, consultations, and satellite broadcast training have been developed and are accessible to the

public free of charge upon request. Personnel from New York City have continued supporting the Army resident courses through attendance. Likewise, the University of Nebraska obtained on-site Army training and received computer-based training modules for its homeland defense program. These computerized, civilianized training modules are based on existing Army modules. Similar efforts have been repeated throughout the country.<sup>126</sup>

## Conclusions

Military and civilian health professionals responding to an AHDE are faced with seemingly insurmountable odds. Medical decisions must be made instantly and under challenging circumstances. Collaborative training and education is necessary between civilian and military clinicians for planning, preparedness, and responses to an AHDE.

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## Appendix—Author affiliations

1. MAJ LeRoy A. Marklund, RN, MS, MPH, ARNP-BC, CCNS, NREMT-P, FP-C—Faculty, Chemical Casualty Care Division, US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, Maryland USA
2. Adrienne M. Graham, MPH—Oak Ridge Institute for Science and Education (ORISE) Participant, Chemical Casualty Care Division, US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, Maryland USA
3. Patricia G. Morton, RN, PhD, FAAN—Associate Dean for Academic Affairs, University of Maryland School of Nursing, Baltimore, Maryland USA
4. Charles G. Hurst, MD—Chief, Chemical Casualty Care Division, US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, Maryland USA
5. Ivette Motola, MD, MPH—Director, Division of Prehospital and Emergency Healthcare, The Gordon Center for Research in Medical Education, University of Miami, Miami, Florida USA
6. LTC Donald W. Robinson, DO—Director, Patient Safety Program, Department of Defense, Washington, DC USA
7. LTC (Ret) Vivian A. Kelley, RN, MSN, FNP—Retired, US Army Nurse Corps Officer USA
8. CDR Kimberly J. Elenberg, RN, MS—Director, Education and Training for the Office of Force Readiness and Development, Office of the Surgeon General, US Public Health Services, Rockville, Maryland USA
9. Michael F. Russler, RN, EdD, MSN, FNP—Director, Department of Nursing, California State University, Fresno, Fresno, California USA
10. Daniel E. Boehm Jr., NREMT-B—Faculty, Chemical Casualty Care Division, US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, Maryland USA
11. CAPT Dawn M. Higgins, RN, MS EDM, BSN—US Air Force, Emergency Services Nurse, Willford Hall Medical Center, Lackland Air Force Base, Texas USA
12. LTC Patrick E. McAndrew, RN, MSN, BC-CCNS—Faculty, US Army Trauma Training Center, Miami, Florida USA
13. MAJ Hope M. Williamson, RN, DNP, ACNP-BC, CCNS, NREMT-B—Faculty, US Army Trauma Training Center, Miami, Florida USA
14. SFC Rodney D. Atwood, LPN, BA, NREMT-B—Faculty, US Army Trauma Training Center, Miami, Florida USA
15. MAJ Kermit D. Huebner, MD—Director, Research and Scholarly Activities, Department of Emergency Medicine, Carl R. Darnall Army Medical Center, Fort Hood, Texas; Emergency Medicine Physician, Task Force 28th Combat Support Hospital (Airborne), Sather Airbase, Baghdad, Iraq
16. Angel A. Brotons, EMT-P—Associate Director of Operations and Instructor Development, The Gordon Center for Research in Medical Education, University of Miami, Miami, Florida USA
17. Geoffrey T. Miller, EMT-P, AS—Associate Director of Research and Curriculum Development, The Gordon Center for Research in Medical Education, University of Miami, Miami, Florida USA
18. Laukton Y. Rimpel, AA—Faculty, Chemical Casualty Care Division, US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, Maryland USA
19. Larry L. Harris, AA—Faculty, Chemical Casualty Care Division, US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, Maryland USA
20. LCDR (Ret) Manuel Santiago, RN, MS, ACNP-C—Retired US Navy Nurse Corps Officer; Clinical Nurse Specialist, Department of Surgery, National Naval Medical Center, Bethesda, Maryland USA
21. LeRoy Cantrell, RN, BSN—Educator, Defense Medical Readiness Training Institute, Fort Sam Houston, Texas USA

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