

**GAO**

Report to the Chairman, Subcommittee  
on National Security, Veterans Affairs,  
and International Relations, Committee  
on Government Reform,  
House of Representatives

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October 2001

**CHEMICAL AND  
BIOLOGICAL  
DEFENSE**

**DOD Needs to Clarify  
Expectations for  
Medical Readiness**



**G A O**

Accountability \* Integrity \* Reliability

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### Abbreviations

ASD-HA	Assistant Secretary of Defense for Health Affairs
CB	chemical and biological
CBW	chemical and biological warfare
CBO	Congressional Budget Office
CMRT	Continuing Medical Readiness Training
CINC	Unified Commander in Chief
CREST	Casualty and Resource Estimation Tool
CUD	Common User Database
DOD	Department of Defense
FCBC	Field Management of Chemical and Biological Casualties
JCAHO	Joint Commission on the Accreditation of Healthcare Organizations
JRCAB	Joint Readiness Clinical Advisory Board
JSCAP	Joint Strategic Capabilities Plan
MAT	Medical Analysis Tool
MCBC	Medical Management of Chemical and Biological Casualties
NBC	nuclear, biological, and chemical
OEP	Office of Emergency Preparedness
PACOM	U.S. Pacific Command
TAA	Total Army Analysis
THCSRR	Total Health Care Support Readiness Requirement
USAMRICD	U.S. Army Medical Research Institute of Chemical Defense
USAMRIID	U.S. Army Medical Research Institute for Infectious Diseases
USFK	U.S. Forces Korea
WMD	weapons of mass destruction



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United States General Accounting Office  
Washington, DC 20548

October 19, 2001

The Honorable Christopher Shays  
Chairman, Subcommittee on National Security,  
Veterans Affairs, and International Relations  
Committee on Government Reform  
House of Representatives

Dear Mr. Chairman:

The U.S. strategy against chemical and biological (CB) weapons is based largely on deterrence. In the event deterrence fails, medical response planning will be essential. However, following the 1991 Gulf War, reviews that we and the Inspector General of the U.S. Department of Defense (DOD) completed in 1992 and 1993 identified a number of shortcomings in DOD's capacity to provide medical support for the numbers of contaminated casualties that were predicted, and in 1996 we found that many of the problems identified in these reports persisted.<sup>1</sup> In the 10 years since Desert Storm, DOD has implemented a mandatory immunization program for anthrax, but, despite statements from defense officials emphasizing the seriousness of these threats, questions remain about DOD's overall medical readiness for the full array of chemical and biological warfare threats that have been identified. The attack on the United States, on September 11, 2001, underscores the need for medical readiness should deterrence fail.

You asked us specifically to determine how DOD has adapted its medical corps to emerging CB threats. As we agreed with your office, our objectives in this review were to assess (1) the efforts of DOD and the services to incorporate CB threats in medical personnel planning and to

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<sup>1</sup>*Operation Desert Storm: Full Army Medical Capability Not Achieved* (GAO/NSIAD-92-175, Oct. 18, 1992); *Operation Desert Storm: Problems With Air Force Medical Readiness* (GAO/NSIAD-94-58, Dec. 30, 1993); *Operation Desert Storm: Improvements Required in the Navy's Wartime Medical Care Program* (GAO/NSIAD-93-189, July 28, 1993); *Chemical and Biological Defense: Emphasis Remains Insufficient to Resolve Continuing Problems* (GAO/NSIAD-96-103, Mar. 29, 1996); and Inspector General, DOD, *Medical Mobilization Planning and Execution* (93-INS-13, Sept. 30, 1993).

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adapt its medical specialty mix accordingly and (2) the extent of medical personnel training in the treatment of CB casualties.

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## Results in Brief

Public assessments by defense officials have emphasized the seriousness of the military threat from chemical and biological weapons. However, we found that neither DOD nor the services have systematically examined the adequacy of the current specialty mix of medical personnel for chemical and biological defense. While some of the services have begun to review the staffing of deployable medical units for the capacity to manage the consequences of certain chemical warfare scenarios, they have not done so for biological warfare scenarios. In general, DOD has not successfully adapted its conventional medical planning to CB warfare. For example, the software, evaluations, and review processes it used in medical planning did not incorporate these threats as they did conventional ones, and they have lacked the information on casualty rates or qualified care providers required to address the appropriateness of the current mix of expertise and competencies.

Although joint protocols for treating CB casualties have recently been completed, as recommended by DOD studies, agreement has not been reached among the services on which health care providers are appropriate to provide treatment. DOD officials attributed the weakness of CB medical planning to several factors, including failure to establish this as a medical priority in Defense Planning Guidance (particularly for biological warfare), data and methodological constraints that complicated the task, disagreements among the services about the capacity to implement evacuation policy, and pessimism that medical support could effectively treat substantial numbers of CB casualties. Joint, unified command, and service planners charged with addressing these issues all expressed frustration with inaction on the part of others. In particular, the medical planners for the unified commands stated that, in the absence of better planning support from the services, they had reluctantly adopted a rough method of estimating the medical support required for CB scenarios—applying a fixed multiplier to the support required for conventional ones. This method presumes that the individual medical units currently possess the appropriate mix of health care providers.

Relatively few military health care providers are trained to a standard of proficiency in providing care to CB casualties. Service medical planning officials generally maintained that their medical units had to be prepared to handle a broad range of casualties and that even specialists would have to serve as generalists when they were in theater. They believed that

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specialized military medical training was the appropriate way to address any additional medical skills needed to deal with CB casualties rather than adjusting the mix of health care specialists. However, while progress has been made since the Gulf War in increasing the availability of such specialized training, these courses are essentially voluntary. On the basis of the number of students who have taken the various courses, we found that no more than 19 percent of uniformed health services personnel had completed any specialized CB military medical training. No more than 2.2 percent of medical officers had completed the full 7-day course in the Medical Management of Chemical and Biological Casualties. Even the individuals who have been trained cannot be readily identified in the event of an emergency because either the tracking systems do not exist or they are not currently functioning. Except for the Army's Medic 2000 study, which found that the lowest proficiency scores among medics were for nuclear, biological, and chemical (NBC) skills, the services have not rigorously tested proficiency in assessing and treating CB warfare casualties. This study and other indirect evidence indicate that proficiency is low, partly because of weak or absent requirements for training, testing, and certification.

Although the service surgeons general have begun integrating chemical and a few biological scenarios into their medical exercises, medical planners from each of the five regional unified commands told us that to their knowledge no realistic field exercise of medical support for chemical or biological warfare had been conducted. Additional data provided by DOD showed that only two joint military exercises planned since 1993 had included both medical response and chemical or biological warfare. Similarly, key readiness evaluations used to advise the President on readiness to implement the national security strategy had never set a scenario for the unified commanders requiring medical support for weapons of mass destruction. Officials told us CB medical support is rarely exercised because of conflicting priorities encountered by both warfighters and medical staff and because it is very difficult and expensive.

In sum, DOD and the services had not fully addressed weaknesses and gaps in modeling, planning, training, tracking, or proficiency testing for the treatment of CB casualties. The resulting medical structure has not been rigorously tested for its capacity to deliver the required medical support. As a consequence, medical readiness for CB scenarios cannot be ensured. The persistence of this situation suggests a disagreement about the significance of the threat, a failure of leadership, or an acceptance of a high level of risk.

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We recommend that the Secretary of Defense address the gap between the stated CB threat and the current level of medical readiness by clarifying DOD's expectations regarding medical preparation for CB contingencies and, as appropriate, integrating chemical and biological medical readiness in Defense Planning Guidance. To the extent that DOD continues to regard CB threats as serious in its areas of operations and expects its medical forces to prepare for them, the Secretary of Defense should require that the services and joint staff agree on evacuation capacity and the medical providers qualified to provide specific wartime care, develop joint planning models that include CB scenarios, develop training requirements and assess their effectiveness with proficiency metrics and standards, develop and maintain the systems to track CB training and proficiency, and increase the realistic exercise of medical support for both chemical and biological scenarios. DOD has reviewed a draft of this report. It concurred with the recommendations and provided additional comments.

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## Background

DOD officials and U.S. government reports have stated that CB warfare must be considered a potential threat in future conflicts. Any reshaping of the military medical force to respond to CB threats would occur in a context including (1) a broad variety of CB agents that could produce a range of effects from minor irritations to mass casualties and (2) a dual medical mission with tensions between the needs of day-to-day peacetime care and wartime operations. Within these constraints, the joint staff of the Office of the Secretary of Defense and the services play distinct but interrelated roles in ensuring medical readiness. The tools available to them for this purpose include various types of training and exercises.

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## High-Level Officials Have Emphasized the Seriousness of CB Threats

In June 1995, Presidential Decision Directive 39 declared that "the United States shall give the highest priority to developing effective capabilities to detect, prevent, defeat and manage the consequences of nuclear, biological or chemical (NBC) materials or weapons use by terrorists." The former Secretary of Defense further emphasized at his confirmation hearing in January 1997 that U.S. forces in theater face the threat of chemical and biological weapons:

"I believe the proliferation of weapons of mass destruction presents the greatest threat that the world has ever known. We are finding more and more countries who are acquiring technology—not only missile technology—and are developing chemical weapons and biological weapons capabilities to be used in theater and also on a long-range basis. So I think that is perhaps the greatest threat that any of us will face in the coming years."



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In 1998, the Chairman of the Joint Staff issued Master Plan Exercise Guidance that identified NBC defense and force protection as his top training issues, and DOD began its much-publicized Anthrax Vaccine Inoculation Program. In fiscal year 2001, the budget for the Defense Health Program, which includes financing for both peacetime and deployment care, was approximately \$18.2 billion. The President's Budget Request for the Chemical and Biological Defense Program was \$836 million, an increase from the \$791 million in total obligations for fiscal year 2000.<sup>2</sup> The Defense Health Program budget for fiscal year 2000 incorporated at least \$137 million for medical training.<sup>3</sup> The Army Medical Department's NBC Defense Readiness Program uses about \$17 million annually in operation and maintenance funds to purchase countermeasures and provide supplemental support for exercises and training of medical units for NBC.

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## The Threat Is Composed of Varied Agents

Anticipating the medical personnel needs associated with chemical and biological warfare is complicated by the wide array of such agents, the differences in their effects, and the variety of ways they might be used. The physiological effects of specific agents identified as potential threats are extremely varied, as detailed in appendix I. In general, a chemical attack would typically result in illness quickly, whereas biological agents could result in illnesses with delayed onset. The distribution of victims would usually be limited to the area downwind from a chemical attack but could be more widely spread for contagious biological agents. First responders to a chemical attack on a battlefield or in a war zone would be soldiers, medics and corpsmen, but because of the delayed effects, the first responders to a biological attack on military personnel in a war zone would more likely be sick-call physicians. (See appendix II.)

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## The Dual Medical Mission Complicates Planning

Not only must medical personnel requirements be tailored to cover a variety of potential threats; they must also be coordinated with the medical personnel requirements of day-to-day care for military personnel, dependents, and retirees. The military medical service has historically had

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<sup>2</sup>Fiscal year 2000 funding data are based on total obligation authority. According to Army Medical Department officials, this is the source for most CB warfare training funds. See DOD, *Chemical and Biological Defense Program: Annual Report to Congress, March 2000* (Washington, D.C.: 2000).

<sup>3</sup>Additional amounts were used to support the Uniformed Services University of the Health Sciences and to finance the Health Professional Loan Program that provides scholarships to medical personnel in exchange for military service.

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a dual mission—supporting the force during deployments and providing a health care benefit to DOD personnel and their dependents. Some mismatch naturally exists between the skills required by wartime and peacetime care.<sup>4</sup> For example, some of the services most used by DOD beneficiaries in peacetime, such as obstetrical care, are not likely to be in high demand by a deployed force. Military surgeons train for wartime inpatient care but currently practice mostly outpatient and pediatric care. Similarly, the skills required for responding to a chemical or biological attack may not be naturally encompassed in the demands of a peacetime health care service. This is important insofar as any skills that are uniquely required in wartime must be sustained in the absence of much direct use.<sup>5</sup>

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## Department, Joint Staff, and Services Play Different Roles in Ensuring Medical Readiness

Defense planning is led by the Office of the Secretary of Defense, which sets overall policy and develops Defense Planning Guidance that is based on the President's national security strategy. Every 2 years, the Joint Chiefs issue a Joint Strategic Capabilities Plan (JSCAP) based on this formal guidance that gives missions to the nation's unified combat commands which have operational control of U.S. combat forces. Each command is headed by a Commander-in-Chief (CINC). They are responsible for fighting and winning the nation's wars within a particular area of responsibility, usually geographic. The CINCs develop war plans and requirements that specify the combat troops that will be needed to meet the threat and mission assigned by the JSCAP.

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<sup>4</sup>See W. M. Hix and S. Hosek, *Elements of Change in Military Medical Force Structure: A White Paper* (Santa Monica, Calif. RAND, 1992), and Congressional Budget Office, *Restructuring Military Medical Care* (Washington, D.C.: July 1995). For example, CBO reported that "the care furnished in military medical centers and hospitals in peacetime bears little relation to many of the diseases and injuries that medical personnel need to be trained to deal with in wartime."

<sup>5</sup>The services have handled this mismatch historically by developing substitution rules to determine which peacetime specialties can be employed to fulfill the various wartime medical needs. For example, the Navy permits obstetricians to fill certain field surgical positions because it must meet the need for fully qualified obstetricians in peacetime, and Navy medical officials told us that these specialists are familiar with basic abdominal surgery. However, the risk of such substitutions is not clear, and service officials identified no formal process for determining their effect on standards of care. Recognizing that not all physician specialties are substitutable, a study of medical requirements by DOD's Office of Planning, Analysis, and Evaluation recommended a follow-on effort to determine the mix of physician skills required to support the wartime effort, in order to ensure that adequate care is provided. See DOD, Office of Planning, Analysis, and Evaluation, *733 Update Wartime Medical Report* (Washington, D.C.: July 24, 1997), p. ESii.

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Each service then calculates the additional number of troops it will need to support the combat force. The total number of combat and support troops determines the military population at risk. On the basis of the threat, the population at risk, and previously developed doctrine, the service medical planners project the required hospital and unit assignments. Each of the services has the responsibility to work within the budget identified by DOD to train and equip its forces and to staff the needs identified by the CINCs. Specifically, in the context of medical readiness, the services are responsible for ensuring that individuals and units can perform the functions (such as medical assistance) to which they are assigned.

The CINCs then review the services' plans for filling their needs. For example, a CINC medical planner would review the adequacy of service components' plans for medical support and would integrate their logistical requirements. The Joint Staff helps the CINCs resolve any readiness problems discovered in the context of the Joint Monthly Readiness Review or through other means. Any systemic problems or shortfalls in readiness the CINCs note are brought to the attention of the joint staff for medical planning (J4), which works to resolve them. Finally, DOD finances the services and reviews service expenditures (including those on medical personnel and services).

The services and CINCs address their responsibilities to ensure readiness partly through training and exercises. Training can be provided either to individuals or units, and exercises are of several types, including (1) tabletop exercises that test decision making in response to a single problem; (2) command post exercises, in which multiple decision makers respond to dynamic scenarios; and (3) full field exercises, in which opposing armies compete to simulate a range of activities from combat to medical response. Tabletop and command-post exercises are useful to the extent that they identify important policy and operational issues, but they do not demonstrate actual ability to provide effective medical care in a forward setting. Field exercises may be further divided, based on the specific capabilities they are intended to test, such as the ability to detect agents and quickly don protective gear, the ability to function in protective gear, or the ability to decontaminate exposed personnel. (Decontamination is not a doctrinal responsibility of medical units, although they may, in practice, be required to perform it.) Our focus was on exercises that test the ability of medical units to correctly diagnose and treat symptomatic patients.

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## Scope and Methodology

To assess the efforts of DOD and the services to adapt their medical specialty mix to CB warfare threats, we examined medical personnel planning processes, interviewed medical planners, and reviewed studies of medical requirements. We also reviewed literature and interviewed experts in the treatment of CB-related injuries and diseases.

To assess the extent of medical personnel training in the treatment of CB casualties, DOD's ability to track who has been trained, and the extent of proficiency testing and readiness exercises, we interviewed service trainers and medical administrative officers regarding related training requirements, the availability of training opportunities, and the portion of medical personnel who had completed such training. We also questioned medical planners from the unified commands and queried the joint exercise planning database regarding exercises incorporating both medical components and chemical or biological warfare. We reviewed the use of CB threats in medical personnel planning and compared it to the stated threats and to methods used to plan, train, exercise, and test the readiness and proficiency of medical support for conventional warfare as well as methods the Office of Emergency Preparedness uses to develop better trained medical personnel for domestic response to disasters, including CB agents.

Specifically, we conducted interviews with the Office of the Secretary of Defense for Health Affairs, the Office of Program Analysis and Evaluation, and Joint Medical Planning Staff. We met with planning and training officials at the Army Medical Department at Fort Sam Houston, the Navy Surgeon General's Office, the Navy Bureau of Medicine and Surgery, and the Air Force Surgeon General's Staff at Bolling Air Force Base. We attended the annual Association of Military Surgeons and the Weapons of Mass Destruction 2000 meetings. We also met with officials of the Joint Readiness Clinical Advisory Board, the U.S. Army Medical Research Institute of Infectious Diseases, and the U.S. Army Medical Research Institute for Chemical Defense. We attended meetings between the unified command medical planners and Joint Medical Planning Staff (J4), and we conducted follow-on interviews by phone and e-mail.

Our inquiry was limited to medical personnel planning and training for CB threats. The scope of our work covered active duty and reserve medical personnel planning and training by the Army, Navy, and Air Force; we did not separately examine the Marines, for whom the Navy provides medical support and personnel. Our focus was on medical readiness to support the armed forces in the event of chemical or biological warfare agent exposure in areas outside the United States. Although we conducted some

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interviews with the Office of Emergency Preparedness to examine its approach to medical personnel planning for CB consequence management, we did not focus on DOD's support of domestic preparedness efforts. Similarly, we did not explicitly test alternative theories regarding the cause of the current planning and training conditions, although we asked DOD officials for their analysis of the underlying causes. We conducted our study in accordance with generally accepted government auditing standards between December 1999 and April 2001.

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## DOD and the Services Have Not Systematically Reviewed the Adequacy of the Medical Specialist Mix for the Treatment of CB Casualties

While some of the services have begun to review the staffing of deployable medical units for the capacity to manage the consequences of certain chemical warfare scenarios, they have not done so for biological warfare scenarios. Similarly, DOD's efforts to assess medical requirements, and CINC and joint staff efforts to develop and review war plans, have not addressed CB scenarios as they have conventional ones, and joint medical planning tools lack the ability to do so. CB warfare planning failures were attributed to service disagreement about evacuation capability, which personnel were qualified to provide treatment, and the inherent difficulty of such planning. In addition, with respect to medical planning for biological warfare defense, service officials cited the absence of direction in the Defense Planning Guidance. In the absence of effective formal planning, combat medical planners expressed concern that they can make only an educated guess about CINC requirements for specific medical personnel in the event of a chemical or biological attack. Medical planners stated that the planning process currently lacks the capability to adequately estimate medical requirements in the event of chemical or biological warfare.

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## Service Methods for Personnel Planning Do Not Specify the Personnel Required to Manage CB Casualties

Each service determines its medical personnel requirements by using one or more models that predict the number and nature of casualties that would ensue from scenarios incorporated in current Defense Planning Guidance. However, service officials stated that these scenarios have not included biological warfare. In addition, the services varied in the nature and status of their efforts to incorporate chemical warfare in medical personnel planning. The service-based efforts were largely reviews of the

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staffing of medical units rather than more thorough reviews of the medical force structure.<sup>6</sup>

For example, the Army is DOD's executive agent for CB warfare support. Yet Army officials stated that its medical structure, Medforce 2000, was primarily based on cold war scenarios that assume many serious traumas requiring surgical care, a high rate of fatalities, and few cases of nonbattle injury and disease.<sup>7</sup> The Army force structure is planned through a biannual assessment of the Army's future requirements, known as the Total Army Analysis (TAA). The Army Medical Department identifies the medical personnel and equipment required to support the force in the combat scenarios used in the TAA, determines the composition of medical teams, and recommends an appropriate workload.<sup>8</sup>

Based in part on the TAA for 2005, the Army estimated the additional number of beds that would be needed to cope with casualties from a chemical attack but did not analyze the specific skill mix needed. Following Defense Planning Guidance, TAA had not incorporated biological warfare scenarios. Army Medical Department officials indicated both that they were not authorized to structure medical care for biological contingencies and that battlefield CB scenarios causing mass casualties would overwhelm current medical capabilities. Not until 1998, for TAA for 2002 through 2007 did the Army fully integrate general medical requirements and begin to use chemical casualty scenarios (involving a liquid nerve agent and mustard) to drive force requirements. To support a periodic adjustment of rank structure within particular specialties, the Army is reviewing 39 medical staff functions to assess whether the need for them has changed.<sup>9</sup> Army officials told us that it would take about 3

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<sup>6</sup>All the service medical planners are constrained by existing structures, including medical centers, field hospitals, hospital ships, and mobile hospitals, and important parts of their planning processes concern decisions about how best to staff these units.

<sup>7</sup>Army medical officials told us that, during the Gulf War and in Bosnia, this emphasis on surgical capability meant that medical units did not have the right specialty mix for the general medical illnesses they encountered at sick call.

<sup>8</sup>Specifically, the Army applies its Patient Generator Model to estimate casualty rates, using the same patient condition categories as the Medical Analysis Tool (MAT) but with more detailed specification of patient data. Then the Army uses these data to determine essential medical personnel requirements.

<sup>9</sup>Such reviews had been completed for podiatry, patient holding services, hospital litter bearers, veterinary animal care, and ear, nose, and throat services. Functions such as respiratory care, which could be affected by the introduction of chemical agents, were reviewed just before the new TAA and are not likely to be revisited for another 2 or 3 years.

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years to complete this process for all medical functions. They explained that under the present planning system, the number of billets for particular medical specialties is based largely on the historical staffing of Army treatment facilities.<sup>10</sup>

Similarly, according to the Navy, its medical requirements are not directly set or affected by CB warfare scenarios. Navy medical planning efforts rely primarily on analyses and methods such as DOD's 733 Update report, the Total Health Care Support Readiness Requirement (THCSRR) model for developing medical requirements, and the Medical Analysis Tool (MAT), which have limited utility for planning a medical specialty mix for CB warfare. The 733 Update projected an upper bound for the number of beds required in support of a chemical scenario, not a biological one, and included no findings with respect to the nature of the personnel required. The MAT—medical planning software approved by the joint staff and used extensively by the Navy for planning and current operations—lacks treatment protocols, casualty rates, and bed requirements necessary to model specialty mix for CB warfare. Thus, the Navy has not identified the specific personnel mix required to treat casualties exposed to CB warfare agents. Without specific casualty rate estimates for chemical contingencies, Navy medical planners estimate medical personnel requirements for chemical contingencies by increasing the estimate for conventional conflict by a specified percentage.<sup>11</sup>

The Air Force, like the Army, determines the expected distribution of patients by condition and severity and then matches unit types to this workload to arrive at personnel requirements. The Air Force also periodically reviews medical unit composition. It has reviewed its array of medical units and has added units for infectious diseases, theater epidemiology, and preventive aerospace medicine within the past 3 years.

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<sup>10</sup>Another hindrance to planning medical requirements for CB scenarios has been the lack of agreement on treatment protocols for injuries and illnesses attributable to CB exposures. These protocols were not completed by the Joint Readiness Clinical Advisory Board (JRCAB) until early 2000, too late to incorporate in this planning cycle.

<sup>11</sup>The Army has developed and is testing a new model, the Casualty and Resource Estimation Tool (CREST), for estimating CB warfare casualties and bed requirements. CREST is a plume model that can estimate need for various types of beds but cannot determine need with respect to specific expertise or skill mix. Although CREST will provide a means of estimating CB warfare casualties and bed requirements that MAT lacks, some joint medical planners were critical of the model because it was not developed jointly and because casualty rates can be highly sensitive to variations in assumptions. For specific scenarios analyzed with CREST, casualties ranged up to 500,000.

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Air Force medical planners indicated that they were challenged to keep up with the workload associated with predeployment examination and immunization. However, officials told us they had not adjusted Air Force medical units and personnel for biological warfare. Air Force officials volunteered that mass casualty scenarios would inevitably cause bottlenecks.<sup>12</sup> In addition, they noted that medical requirements are quite sensitive to presumed rates of evacuation and that the Army and Air Force do not agree on the rates that would be achievable.<sup>13</sup>

While maintaining that the current specialty mix is generally appropriate to these emerging threats, service planners did identify additional skills that would be key to successful medical management of CB warfare casualties. Some Army officials expected that chemical warfare readiness would require an increase in respiratory therapy, ward nursing, and internal medicine. Others noted that the Army did not have a lot of infectious disease experts in deployed hospitals for surveillance and prevention. Similarly, Air Force officials expected that chemical warfare scenarios would require more respiratory technicians, pulmonologists, critical care nurses, and intensive care beds. They stated that the threat of biological warfare would increase the need for infectious disease and preventive medicine personnel as well as personnel to collect baseline, predeployment data. Air Force and Navy medical planners both anticipated that chemical scenarios would require more emergency personnel who could recognize and respond to symptoms quickly. (See appendix II.) Although these informal assessments varied, they implied that the current specialty mix needed revision.

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## Medical Planning Methods Have Not Been Adapted to CB Warfare

DOD's tools for planning medical requirements are highly structured and scenario dependent, and the possibility of CB warfare presents a large variety of potential scenarios and weapons. Many of the tools and studies

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<sup>12</sup>For information on service medical requirement models, see *Defense Health Care: Tri-Service Strategy Needed to Justify Medical Resources for Readiness and Peacetime Care* (GAO/HEHS-00-10, Nov. 3, 1999).

<sup>13</sup>Several Army officials were skeptical about Air Force capacity to evacuate at the rates required and stated that the Army had not complied with the joint planning guidance based on these concerns. Army officials were skeptical that the Air Force's Critical Care in the Air plan would work in mass casualty situations. Air Force officials noted that the Army's medical requirements were highly sensitive to assumptions about the speed with which patients could be evacuated: Quicker evacuation drastically reduces the estimated need for medical personnel in the field.



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for planning conventional medical response lack features required to adequately plan for CB support or to assess the effect of CB warfare on the appropriate mix of medical specialties. The services also could not agree on which health care providers should implement joint treatment protocols.

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### Precise Medical Requirements Planning Confronts a Broad and Uncertain Range of Scenarios

CB warfare casualty estimation is highly complex and scenario-dependent and therefore requires the consideration of many and varied factors. In addition, the results can be highly sensitive to minor variations in some assumptions. Potential biological warfare agents include anthrax, botulinum toxins, viral encephalitis, enterotoxins, hemorrhagic fevers, plague, Q fever, smallpox, and tularemia.<sup>14</sup> Once a specific agent is known, the method and quantity in which it is weaponized and delivered are just two factors that can determine the kinds of resulting injuries and illnesses. Additionally, the population at risk and troop configuration, where the weapon hits relative to the population, the intensity of the conflict, the likely air stability, humidity, temperature and sunlight, warning times, the availability of protective equipment, and evacuation rates all potentially affect exposure, casualty and medical workload rates. With more than a dozen highly variable factors at play, casualty estimates can and do vary from zero to more than half a million. Casualties could appear immediately or much later at sick call and in hospitals. They may need simple decontamination or they may be contagious. They may need to be evacuated or they may need to be isolated. A precise planning process based on highly specific scenarios may be challenged by a range of scenarios this broad and uncertain.

Faced with similar issues and uncertainties, for instance, the Office of Emergency Preparedness (OEP) takes a more qualitative approach to focus its personnel planning efforts on ensuring a highly flexible response. OEP officials stated that there are so many variables that it would be impossible to predict casualties and mold a response. Instead, they plan for a range of scenarios, from the relatively easy to mass casualty scenarios involving thousands of cases. However, a flexible response is predicated on the existence of adequate numbers of well-trained personnel and teams that can be mobilized. OEP is supporting efforts to identify the

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<sup>14</sup>D. R. Franz and others, "Clinical Recognition and Management of Patients Exposed to Biological Warfare Agents," *Journal of the American Medical Association*, 278:5 (1997), 399–411.

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core competencies needed among physicians, nurses, and emergency medical technicians and to encourage their incorporation in standard board certification.

Compounding these problems, DOD officials characterized data on chemical warfare casualty rates as limited and generally dated. They stated that most of the available data were derived from warfighting and medical care as practiced during World War I. These rates might be lower in today's more mobile, highly dispersed warfighting. For more novel agents, even historical data are unavailable.

Similarly, while DOD experts believe that very good data are available on the effects of biological agents once the nature and extent of exposure are known, they stated that generally little was known about the exposures that would result from weaponized agents. Computer models can help generate estimates for purposes of testing their sensitivity to a range of assumptions, but validating many of the assumptions may not be possible.

DOD Evaluations of Medical Requirements Have Not Fully Assessed CB Scenarios and Lacked Data for Assessing Specialty Mix

Two major reviews of medical personnel requirements were completed by DOD's Office of Program Analysis and Evaluation (PA&E) in the 1990s. Section 733 of the National Defense Authorization Act for Fiscal Years 1992 and 1993 directed the Secretary of Defense to conduct a comprehensive study of the military medical care system required to support the Armed Forces during a war or other conflict.<sup>15</sup> DOD completed the study and in April 1994 issued a final report to the Congress, *The Economics of Sizing the Military Medical Establishment: Executive Report of the Comprehensive Study of the Military Medical Care System*, generally known as the 733 Report. In August 1995, PA&E was directed to update the report's estimates to reflect changes in force levels and planning scenarios and to better include rotational and training requirements. This study, the 733 Update, was completed in May 1999. Both reports found that DOD had programmed far more physicians than were needed for the wartime missions associated with two nearly simultaneous regional conflicts.<sup>16</sup> Although the Office of Program Analysis and Evaluation approved the 733 Update, DOD never issued it because the Air Force disputed the results. The Air Force maintained that the physician level recommended was too low because it did not reflect recent

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<sup>15</sup>Pub. L. No. 102-190, National Defense Authorization Act for Fiscal Years 1992 and 1993.

<sup>16</sup>In July, 2001, DOD dropped the two nearly simultaneous regional wars scenario as the principal basis for military planning.

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joint guidance that expanded Air Force support of humanitarian civil assistance and disaster requirements.

Neither the original 733 Report nor the update fully assessed the medical requirements for CB warfare threats. In the absence of a standard methodology for estimating theater casualties from such weapons, the 733 Update was based on a conventional conflict with a major excursion used to estimate chemical casualties. The separate chemical warfare scenario based on the results of the Joint WMD Analysis was used to estimate medical workload.<sup>17</sup> However, the scenario expected after the release of an aerosol cloud of a biological agent would be quite different.

The 733 Update's review of workload requirements was based on an analysis of conflict scenarios from the Defense Planning Guidance (to generate possible casualty streams) in conjunction with medical planning factors (such as evacuation policy, dispersion factors, and the average lengths of hospital stay). The authors of the updated study cited a lack of approved data on the care requirements of victims of NBC agents and noted that the study relied instead on the expert opinions of several military medical professionals to generate estimates. The study recommended DOD charter a medical panel to review various agents and their associated health effects and medical requirements for future DOD planning. The Joint Readiness Clinical Advisory Board was given this assignment.

The 733 Update used the methodology developed for the original study to identify the total number of physicians required but recognized that "not all physician specialties are substitutable." The study concluded that "the current manning policy for deployable hospitals varies greatly from the...identified 733 requirements for surgeons and other specialties."<sup>18</sup> In addition, the updated study found that the care factors necessary to

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<sup>17</sup>DOD, *Joint WMD Analysis (J-8)* (Washington D.C.: 1997).

<sup>18</sup>The analysis established requirements for facilities (surgical and medical beds, operating rooms) and physicians at each echelon of care, including medical facilities in the continental United States. It also developed estimates of peak loads for intra- and inter-theater medical evacuations, recommended an active-reserve component mix that minimized the number of active duty personnel required, and compared projected intra-theater care requirements against the wartime capabilities currently programmed for specific theaters. The analysis did not review the organization or staffing of patient hospital care and basic medical units, and it did not review their ability to provide required medical care.

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## Joint Medical Planning Lacks the Capability to Determine Medical Personnel Needs for CB Warfare

identify needs by physician specialty were last reviewed in a 1988 study. The 733 Update's first recommendation was that "A follow-on study should be undertaken to update the common-use care factors and determine the appropriate mix of physician specialties needed to support the wartime requirements in deployable hospitals."<sup>19</sup> Officials of DOD's Office of Program Analysis and Evaluation told us that they did not know if any action had been taken on this recommendation that a study of physician specialty mix be conducted.

We found that the Joint Staff lacked functional tools for planning medical needs for CB warfare and that as a consequence, CINC medical planners were concerned they could make only educated guesses regarding these needs. The Medical Analysis Tool (MAT)—software CINCs use to identify medical requirements, review war plans, assess the sufficiency of service support, and develop schedules for deploying medical personnel and equipment to the theater of war—has lacked capability to support planning for the risks of CB warfare. This is significant in part because the MAT is the only tool the Joint Staff has approved for medical planning. The MAT uses casualty rates, patient types, and specific treatment protocols to project medical requirements—that is, admissions, evacuations, and beds required. When we reviewed the progress of CB medical planning, the MAT had neither incorporated profiles identifying the types of injuries and illnesses CB attacks would generate nor the treatment protocols these injuries and illnesses would require. Booz-Allen Hamilton, the contractor responsible for the MAT planning tool, was taking steps to incorporate CB treatment protocols developed by the Joint Readiness Clinical Advisory Board (discussed below), but the services have not agreed on the medical personnel who are qualified to treat patients with these protocols.

In addition, the medical planners at the CINCs, who do the day-to-day medical readiness planning, voiced strong concerns about the adequacy of service planning for CB and stated that they had neither appropriate warfare planning factors nor service-approved casualty rates with which to estimate medical requirements.<sup>20</sup> In the absence of this information,

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<sup>19</sup>733 Update *Wartime Medical Report*, Executive Summary, p. ES-ii.

<sup>20</sup>While the Center for Army Analysis has conducted a joint study of chemical warfare casualty rates, this was performed for the purposes of estimating protective equipment needs and did not include the level of detail about specific types of casualties required for determining medical personnel needs.

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The Services Lack Consensus  
on Which Health Care  
Providers Should Implement  
Joint Treatment Protocols

medical planners stated that they estimated CB medical requirements by using a rule of thumb: They supplemented the estimated number of medical personnel required for conventional warfare with an additional percentage to cover the undetermined medical need in the event of CB warfare. However, this method assumes that the medical requirements for CB support would exceed those of conventional war but would not differ qualitatively. Both the Joint Staff for Medical Readiness and the theater medical planners recognized that this estimation method was neither precise nor well validated.

The Joint Staff for Medical Readiness reviews the estimates the CINC planners produce without examining the mix of specialists. This suggests a limited ability to conduct joint medical planning for CB scenarios. The Joint Staff officials stated that they were reluctant to accept a CB planning model unless the operations, intelligence, and WMD communities had fully approved it.

The Joint Readiness Clinical Advisory Board (JRCAB) was assigned to act on the 733 Update recommendation to develop treatment protocols for injuries and illnesses associated with CB warfare. It oversaw the creation of separate CB expert panels that recently completed 22 treatment protocols for patient conditions that could result from biological warfare and 20 for chemical warfare. The protocols include type of injury, type of treatment facility needed, bed requirement, patient length of stay by specific bed type, and specific treatment requirements (e.g., lab tests) for each level of care. The task was given to JRCAB because it had already been charged with the larger task of further standardizing medical systems for war and peacetime operations in support of a joint approach to medical planning. In particular, it was charged with developing a Common User Database for MAT and future medical modeling tools that would specify for each patient condition the treatment required, the time required to provide the treatment, and the personnel who should provide it. Without a common, up-to-date database using current clinical protocols, all the service medical models use different assumptions about the treatment needed, and the results are neither comparable nor readily defensible.

JRCAB officials reported that achieving service agreement on treatment providers was the most contentious issue they encountered; the advisory board eventually had to settle for agreement on generic providers with links to service specifics. Officials told us that the issue was that the services, particularly the Army, did not want to give up flexibility in deciding who would provide treatment in the field. Therefore, the ability to

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use these protocols to efficiently plan joint specialty mix requirements will continue to be limited for both conventional and CB warfare.

In sum, although some progress has been made, DOD has not fully assessed the effect of emerging CB threats on its overall medical personnel or specialty mix requirements. CB medical planning is complicated by several factors, and the weaknesses we observed had several potential causes. First, as in conventional planning, planners are constrained by a dual mission, existing medical facilities, and current force structure. Second, some methodological constraints are more particular to CB planning: Pertinent data are limited and often dated; CB casualty estimation is highly complex and scenario-dependent and the results can be highly sensitive to minor variations in assumptions; computer models can help generate these estimates, but validating the underlying assumptions is not always possible. Third, Army officials told us that no direction had been given in the Defense Planning Guidance to plan medical support for biological warfare scenarios—even though biological warfare scenarios are different than those for chemical warfare.<sup>21</sup>

Officials stated that exercises incorporating a more realistic, larger number of casualties would overwhelm current systems and medical capabilities. However, without realistic planning and exercises, being overwhelmed by an actual CBW attack is all the more likely. In addition, contentious issues such as the adequacy of medical personnel mix or the appropriateness of evacuation plans may never be resolved without data from credible exercises.

Over and above these constraints, joint, CINC, and service planners all said they were constrained by lack of agreement or inaction on the part of

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<sup>21</sup>This mirrors the trend in civilian preparedness. According to D. A. Henderson, Johns Hopkins Center for Civilian Biodefense Studies: “Of the weapons of mass destruction (nuclear, chemical, and biological), the biological ones are the most greatly feared, but the country is least well prepared to deal with them. Virtually all federal efforts in strategic planning and training have so far been directed towards crisis management after a chemical release or an explosion.... This exercise is not unfamiliar. Spills of hazardous materials, explosions, fires and other civil emergencies are not uncommon events. The expected scenario after release of an aerosol cloud of a biological agent is entirely different.... Public health administrators would be challenged to undertake emergency management of a problem alien to their experience and in a public environment where pestilential disease, let alone in epidemic form, has been unknown.” D.A. Henderson, “The Looming Threat of Bioterrorism,” *Science*, 284:5406 (Feb. 26, 1999).

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others. Service planners stated that they could not plan for biological warfare defense if it was not included in the Defense Planning Guidance. Joint Staff officials stated that they were reluctant to push CB planning without an assessment tool that the operations, intelligence, and WMD communities had fully approved. Although the approved joint planning tools had yet to incorporate CB medical response, an NBC casualty estimation tool the Army developed was being resisted by CINC medical planners, who stated that they had not been involved in its development. Joint planning has been further slowed by service disagreements on the key issues of who is qualified to provide specific treatments and what evacuation capabilities will be provided. In the end, the continuing disagreements would seem to reflect a lack of high-level consensus and leadership.

Several sources suggest that the effect of these planning shortfalls is that the current mix may be wrong. The 733 Update concluded that the current manning policy varies greatly from the 733 identified requirements for surgeons and other specialties. More recently, RAND documented a command-post exercise that found that the Assistant Secretary of Defense for Health Affairs “must . . . redesign the medical facilities and force structure to meet CBW medical requirements, as their current focus, on trauma surgery in war, will not respond well to CBW casualties.”<sup>22</sup> Finally, even in the absence of changes in formal planning, medical planners within all three services informally anticipated a variety of specific changes needed in specialty mix to adequately address CB scenarios. However, Army medical planners said the need for specialized CBW skills should be met through training rather than by specialty mix adjustment.

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## Levels of Training, Testing, and Exercising for Medical Management of CB Casualties Remain Low

Although medical personnel generally receive instruction in such matters as donning chemical protective gear, only the Army includes an introduction to CB casualty management in basic training for medical staff. Specialized courses have been developed and are available in various formats. However, specific training to manage and treat CB casualties is effectively voluntary, funding is unstable, and relatively few providers are trained. The services also lack or do not use information systems for tracking personnel who complete the training, and they do not conduct regular standardized proficiency testing, even among the medical

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<sup>22</sup>Desert Breeze 5: Responding to WMD Threats in the CENTCOM AOR (Santa Monica, Calif.: RAND NDRI, March 2000), p. xiv.

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personnel who would have early contact with potential CB casualties. Although the service surgeons general have begun integrating chemical and a few biological scenarios into their medical exercises, they remain extremely rare.

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### Some Basic Training Includes Personal Protection and Very Basic CB Warfare Medicine

The Army, Navy, and Air Force require medical personnel to receive some familiarization with personal protection for NBC environments. Each Army corps, including the Medical Corps, does its own basic training. Enlisted personnel who will become medics take 8 hours of NBC training as part of their Initial Entry Training course, which is 10 weeks long. Army Medical Department officials said the course trains to the minimum acceptable skill level because of the cost of training so many people. Army officials stated that they were developing a longer basic training program for medics but could not yet fund it.<sup>23</sup> All new Medical Corps officers (physicians, physician assistants, and nurses) take a 12-week basic course that includes 39 hours of NBC training. They are also required to take the Army Medical Department Officer Advanced Course, which includes 10 hours of additional NBC instruction as part of an 8-week correspondence course.

All Navy field hospital personnel are required to learn decontamination procedures and receive familiarization training in how to function in a chemically and biologically contaminated environment. However, Army Medical Department officials observed that this is just-in-time training and meant that many Navy trainees coming to their programs had not had the prerequisite training in donning protective gear that all Army trainees complete in their initial training. Navy officials said that they were unaware of any such problem.

All Air Force Medical Service personnel are required to take some basic NBC defense training annually. However, in the past, both its subject matter and duration were left to the individual installation commanders, and Air Force officials indicated that as a result, the training has varied from post to post. New guidance has specified that this will be a 1-day course covering the basics of NBC treatment, donning protective gear, and performing basic mission functions while wearing the gear. The Air Force

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<sup>23</sup>Like the medics, Army medical junior noncommissioned officers receive a basic course with 8 hours of NBC training. A few noncommissioned officers go on to take the Army Health Physics Specialty Course, which includes some additional NBC training.



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has refocused the available training on the mobile medical personnel most likely to need it. Others will continue to get the training on a just-in-time basis.

In addition to the services' training efforts, the Defense Medical Readiness Training Institute administers a triservice medical readiness program. Its Combat Casualty Care Course for junior officers, medics, and first responders is a 9-day course with 8 hours of NBC training. Institute officials told us that the Army requires all medical personnel to take this course but the Navy and Air Force do not. For staff in units that provide definitive care, the Institute also offers a combat casualty management course with a small NBC component.

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### A Range of Specialized CB Warfare Medical Courses Has Been Developed

The Army's principal unit for training health care professionals in the principles of chemical casualty care is the Chemical Casualty Care Division of U.S. Army Medical Research Institute of Chemical Defense (USAMRICD), which operates under the sponsorship of the Army Medical Department Center and School. The Operational Medicine Division of the U.S. Army Medical Research Institute for Infectious Diseases (USAMRIID) at Fort Detrick is the Army's principal authority on biological casualty care. Medical Management of Chemical and Biological Casualties (MCBC) is taught by both centers jointly.<sup>24</sup> It was designed primarily for physicians but is open to physician assistants and nurses and, with permission, to senior medics and medical service corps officers of all three armed services.

The 6-1/2 day MCBC course provides familiarization with the principles, management, and treatment of CB warfare injuries in combat. It includes lectures from expert researchers, with both clinical laboratory and hands-on field training. It is the only CB warfare medical course that meets the criteria for entry on an officer's permanent record, the Officer Record Brief, and the only one that the Army Training Requirements and Resources System tracks. According to Army training officials, this course had 280 slots per year until 1998 and was heavily subscribed with waiting lists, when it was doubled to up to 560 slots. In the 4 years between 1996 and 2000, a total of 1,375 service medical personnel (including physicians, physician assistants, nurses, and medics) took the on-site MCBC course.

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<sup>24</sup>Before 1992, each ran its own training course, but the two courses were combined after the Gulf War.

(See table 1.) A disproportionate number of these were from the Army. The Army has about 52 percent of service medical corps personnel but 68 percent of the MCBC on-site trainees.<sup>25</sup>

**Table 1: Military Officers and Enlisted Personnel Trained in Courses on CB Medical Treatment, Fiscal Years 1997–2000**

<b>Course</b>	<b>Days training</b>	<b>Army</b>	<b>Navy</b>	<b>Air Force</b>	<b>All services</b>
MCBC on-site	7	929	330	116	1,375
MCBC off-site	3	4,201	394	1,288	5,883
FCBC on-site	5	724	71	13	808
FCBC off-site	3	668	1	17	686
Biological Warfare Satellite Course	1.5	6,863	3,177	12,617	22,657
Chemical Warfare Satellite Course	1.5	1,692	371	1,524	3,587
Navy CBRE Familiarization	1		2,337		2,337
Navy CBRE Casualty Management	3		463		463
<b>Total</b>		<b>15,077</b>	<b>7,144</b>	<b>15,575</b>	<b>37,796</b>

To better meet the demand for course information beyond the limited slots available, the institutes have pursued other, less thorough training options. During Operation Desert Shield, they developed emergency courses that grew into an exportable off-site version of the medical management course pared down to 3 days of training, with the biological care portion of the class cut from 3 days to half a day. Army personnel again made up two-thirds of those trained. The Air Force has shown far more interest in off-site training than the Navy (1,288 compared with 394).

As more combat medics asked to take the medical management course, the Institute of Chemical Defense tailored a course for them. In fiscal year 1999, it began the new course, Field Management of Chemical and Biological Casualties (FCBC), whose purpose is similar to that of the medical management course but which is less clinically intensive and has more emphasis on early care in the field. The focus is on prehospital emergency treatment and casualty decontamination. It is offered four times a year, and a reduced off-site version is also available. For both

<sup>25</sup>Some of the remaining slots go to civilian personnel.

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versions of the course, 1,494 military personnel have taken the class, all but 102 of whom were Army trainees.

Because the demand for this training had not been met by the resident and exportable courses, several distance learning programs were developed to offset the shortfall:

- In September 1997, the Army's Institute for Infectious Diseases offered its first satellite class on the medical management of biological casualties. The live satellite video teleconference on biological casualty care comprised 3 half-days of broadcast material. In 4 years, 22,657 military health service officers have taken these courses, but attendance peaked in 1998 when, for the first time, the Air Force required all medical staff to take minimum NBC training and approved this course as meeting the requirement. (See table 1 and more detail in appendix III, table 5.) Nearly 8,000 Air Force personnel registered for the course in the year of the directive.
- In April 1999, the Institute of Chemical Defense followed with a course titled Medical Response to Chemical Warfare and Terrorism. Among the reported worldwide audience of from 2 million to 3 million people estimated to have viewed at least part of the broadcast, 3,587 military personnel registered for the course.
- The Institute of Chemical Defense (ICD) has also developed several distance learning products based on these courses that are available through its Web site, distributed free each year at several military medical conferences and shipped to military medical commands and treatment facilities. It distributed about 13,300 educational products last year, including handbooks, textbooks, CD-ROMs, and videos.

Navy officials told us that they have waiting lists for both the medical management and field management courses and that there are not enough seats to meet their requirements. Stating that they had had trouble making enough seats available in Army courses, they indicated that they had developed their own, simpler courses. Institute of Chemical Defense officials administer enrollment for both institutes and strongly disagreed, saying that the Navy and Air Force routinely ask for fewer slots than the institutes offer.<sup>26</sup> In fiscal year 1999, the Navy began offering a 1-day course for general NBC awareness entitled Navy Familiarization Course in the

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<sup>26</sup> In its comments on the draft, DOD reported that since our visit to USAMRICD Navy participation had increased and that every Navy slot for the course had been filled.

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Medical Management of Chemical, Biological, Radiological, and Environmental Casualties. This training focuses on all medical support personnel, first responders, and support personnel. The Navy has also started its own 3-day Chemical, Biological, Radiological, and Environment Casualty Care Management course. Personnel from the Naval Environmental Health Center and Naval Environmental Preventive Medicine units conduct this training at the requesting command. Through fiscal year 2000, 2,337 personnel have had the 1-day awareness course, 463 the 3-day casualty care course.

Considering all these forms of special CB warfare medical training, approximately 37,000 military medical personnel have been trained in the past 4 years. (See table 1.)

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**Courses Are Voluntary, Target Populations Are Not Fully Identified, Funding Is Unstable, and Relatively Few Military Health Care Providers Are Trained**

Although several courses are now available for interested personnel, this alone does not ensure DOD's medical readiness. There is no mechanism—either joint or within a service—for defining the medical NBC training requirements to support medical readiness. As a result, CB warfare medical courses are generally voluntary, filled mostly by rank-and-file interest rather than by command requirements. Most Army personnel who take the medical management course take the off-site version, which offers only a half-day of medical training for treatment of biological warfare casualties. The Army is considering requiring all active-duty physicians slated to join military units in time of war through the Professional Officer Filler System to take either form of the medical management course. Only medical officers at NBC weapons depots are now required to take it, and only members of civil support teams are required to take field management training. The Air Force had required everyone to take a minimum familiarization course but has cut the requirement back to mobile personnel and allows it to be met by the satellite courses. The Navy requirements are that personnel deploying to field hospitals learn decontamination procedures. Little else in the way of NBC medical training is required of all other physicians, physician assistants, nurses, medics, or corpsmen.

Target populations for the courses generally have not been well identified. This is important because, without knowing who falls into the target population, the services cannot size the classes appropriately to address the population's need. In contrast, many other Army Medical Department courses are targeted to a defined population with an estimated attrition rate. This determines the numbers of slots needed each year to train and sustain the target group.

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Funding for components of this training has been unstable. Army training officials told us that funding for CB warfare medical training actually decreased after the Gulf War and then increased following the passage of the Combating Proliferation of Weapons of Mass Destruction Act of 1996 (commonly known as the Nunn-Lugar-Domenici Act) and a report we issued in 1996.<sup>27</sup> Army officials indicated that, although the medical management course had more stable funding as part of the budget for the Army Medical Department Center and School, funding for the remaining Institute of Chemical Defense courses had been reduced. This included the field management course and all the distance learning programs, which they stated was cut by more than half for fiscal year 2001 and had been eliminated for fiscal year 2002.<sup>28</sup>

When specialized medical training is defined at its broadest, all the attendees of all the medical courses in the past 4 years, including satellite distance learning broadcasts and familiarization classes, totaled 37,796. Even without adjusting for the attrition of trained personnel or trainees taking more than one course, fewer than 18.6 percent of the 203,378 officer and enlisted health care providers in fiscal year 1999 had completed any specialized CB warfare medical training.

Considering just medical corps officers trained through both the on-site MCBC course and its less rigorous off-site version means that 5,486 or 9.8 percent of current service end strength have been trained (see table 2). The Army leads with 16 percent trained. The Navy had 3.3 percent, while the Air Force trained 6 percent over 4 years.

However, only a small fraction of military medical officers have been fully trained in the military's "gold standard" resident Medical Management of Chemical and Biological Casualties (MCBC). During the past 4 years, 611 service medical corps physicians have taken the resident course or, more broadly, 1,375 medical corps personnel (physicians, physician assistants, and nurses).<sup>29</sup> With the current end strength of 55,978 active and reserve

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<sup>27</sup>Pub. L. No. 104-295, title VII, The Intelligence Authorization Act for Fiscal Year 1997; *Chemical and Biological Defense: Emphasis Remains Insufficient to Resolve Continuing Problems* (GAO/NSIAD-96-103, Mar. 29, 1996).

<sup>28</sup>Officials told us that funding for these classes was actually unspent funds for new CB warfare equipment under development. They stated that since this equipment had now been fully developed, the money had to be redirected to produce and field it.

<sup>29</sup>Only 4 years of comparable data were available for the various courses.

duty medical corps officers (not correcting for attrition, which would lower the estimate), fewer than 2.5 percent have received this training (see table 2). The Army has not trained more than 3.7 percent of its physicians, physician assistants, and nurses in the MCBC course, while the Navy has trained 2.4 percent, and the Air Force less than 1 percent.

**Table 2: Fiscal Years 1997–2000 4-Year Medical Personnel CB Warfare Training Totals as a Percentage of Fiscal Year 2000 End Strength**

<b>Training and end strength</b>	<b>Army</b>	<b>Navy</b>	<b>Air Force</b>	<b>All services</b>
<b>Totals</b>				
CB warfare training	13,385	6,694	14,051	37,796
Officer medical corps end strength (physicians, physician assistants, and nurses)	24,761	13,961	17,256	55,978
End strength enlisted medical personnel	81,588	33,768	32,044	147,400
Medical Health Service health care providers	106,349	47,729	49,300	203,378
<b>Percentages</b>				
Medical Health Service health care providers receiving any training	12.6%	14.0%	28.5%	18.6%
Medical Corps officers receiving MCBC training either on or off site	16	3.3	6	9.8
Medical Corps officers receiving MCBC on-site training	3.7	2.4	0.7	2.5

## Tracking Is Too Weak to Support Meaningful Training Requirements

Tracking completed training would be necessary to quickly determine who has received specific individual training or to quickly assemble teams of fully trained personnel. Neither DOD nor any service has an operating, centralized system to quickly identify who has received training. The systems that exist do not consistently track all relevant CB warfare courses. As a result, an accurate summary of current personnel who have received any particular CB medical training cannot be given and DOD cannot readily retrieve the identity of qualified and trained personnel.

The Army Training Requirement and Resources System tracks only the completion of training for courses on its requirements lists. Although the medical management course is tracked for Army personnel, the field management course, the combat casualty course, and other mass casualty courses such as Medical Effects of Ionizing Radiation and Radiological Hazards Training are not. Army manpower requirement planners do not track training either; they track only the basic area of concentration for officers who are medical specialists. Training compliance checks still have to be done through the unit or hospital commander. Officials told us that a

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centralized training and competency database like the one maintained by the Joint Commission on Accreditation of Health Care Organizations for civilian medical care is not available and cannot be implemented. However, that they track only medical specialists' area of concentration, not their military training, is inconsistent with medical planners' statements that it is training, not specialization, that ensures CB warfare readiness.

The Navy stated that it had no way of tracking training throughout a career but that Navy medicine needed a system to track it. Individual commanders are supposed to track their unit's training and combat readiness, but officials told us that this is typically only a count of how many personnel have had the required training and what percentage have their shots or know how to wear protective gear. The commands are supposed to use the Standard Personnel Management System to report their information so that Navy Medicine can verify compliance with training requirements. However, the system has not been working for some time, and they were without aggregate data.

Similarly, the Air Force does not maintain a list of trained personnel. Most of the task of ensuring Air Force wartime medical readiness falls on the commanders of the Military Treatment Facilities, who are expected to report on unit readiness to their major commands through the Medical Readiness Decision Support System. It tracks officers' current assignment, primary training, and additional certifications. However, most Air Force training consists of the Army satellite courses, which are not considered part of Continuing Medical Readiness Training (CMRT) and are not recorded by the CMRT system. The Air Force does not mandate or track completion of MCBC training.

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## Proficiency Is Not Systematically Tested

Proficiency testing is needed to ensure that personnel who have completed training are actually able to perform key tasks. While the Army's courses conduct hands-on testing, trainees are not required to pass a final test to receive credit for course completion or for Continuing Medical Education. Although each service establishes proficiency and currency standards for NBC defense training, most standards consist of the local commander's check on his or her unit's readiness, not individual proficiency. For example, Navy commanders are supposed to check their units' readiness, but we were told that they have no proficiency measures. Moreover, Army officials stated that units do medical proficiency training but would be very unlikely to train for NBC. They also said that no one regulates medical operations to make sure they follow the standard

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doctrine and that lessons-learned observers need not be certified. Mastery of subject matter and treatment receives insufficient systematic verification in either the classroom or the field. Similarly, the elaborate credentialing practices of peacetime medical care have no parallel in wartime. While this yields substantial flexibility, it may also raise questions about quality.

One general indication that unit NBC training is inadequate comes from results at the Army Combat Training Centers. According to the March 2000 Annual Chemical and Biological Defense Program report, Army units at the company, battalion, and brigade levels were unable to perform all NBC tasks “to standard.” The 2000 report also concludes that this “less than satisfactory performance at the Combat Training Centers is directly attributable to lack of homestation NBC training (p.136).”

Another measure is an evaluation (Medical Training 2000) conducted by the Army that included a criterion-referenced assessment of the proficiency of its medical first responders—medics. According to the Army, this is important because the skills that may be key to addressing a CB attack, including rapid assessment of unusual symptoms, are not typically practiced in garrison. The Army study of its active duty medics found that only 16 percent passed a multiple choice test on assessing and managing NBC casualties, and the Army concluded that this indicated a very low degree of general medical readiness among medics. (See figure 1.) Their readiness to treat NBC casualties was lowest of all skills measured. (Navy and Air Force officials told us that they had no comparable assessments of proficiency among medical personnel.)



**Figure 1: Proficiency Measures From the Army Study *Medical Training 2000*, Slide from *Medic Training 2000* Briefing Presented by Major General James B. Peake**

**MEDIC TRAINING 2000  
Outcomes at Baseline**

<b>Skill</b>	<b>Medics* perceiving they can perform the skill</b>	<b>Medics* passing a cognitive test (&gt;=70%)</b>	<b>Medics* passing a hands-on skill test (&gt;=70%)</b>	<b>Medics* passing a hands-on skill test (critical criteria standard)</b>
Assess Casualty	69%	50%	17%	3%
Manage Airway	84%	66%	51%	2%
Control Bleeding	91%	54%	20%	8%
Insert IV	93%	89%	77%	29%
Treat NBC Casualty	25%	16%	not tested	not tested

\*Total military medical experience of medics tested in Phase I (N = 347)

***LOW***

Source: Medic Training 2000 briefing presented by Major General James B. Peake, Commanding General, AMEDD Center and School, at the Medic-WMD 2000 Conference, April 3-6, 2000. See also U.S. Army Center for Healthcare Education and Studies, *Medical Training 2000* (San Antonio, Texas: Fort Sam Houston, Army Medical Department Center and School, n.d.).

The technical report of the Medical Training 2000 Study completed by the U.S. Army Center for Healthcare Education and Studies concluded:

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“Finally, special attention must be drawn to the problem of training combat medics to treat NBC casualties. Data from self-ratings of proficiency, supervisors’ ratings of proficiency, and written tests (Phases I, II, and III) indicated that 4 out of 5 combat medics had significant deficits in this area. In every evaluation conducted in this study, the lowest scores were always for treating NBC casualties. Both academic and unit training failed to teach combat medics this essential skill. It is unlikely that there will be a simple solution to this problem. Assessing and treating an NBC casualty is not a fundamental skill. Combat medics must have a good grasp of the principles required to treat a conventional casualty before they can begin to grasp the complexities involved in caring for NBC casualties. Moreover, high fidelity NBC training is complex and resource-intensive. The ability to treat an NBC casualty was not tested with a hands-on test in this study because the logistical burden was too high. If the ability to treat an NBC casualty is critical to the role of a 91B10-level combat medic, then new academic and unit training programs as well as adequate logistical support must be developed to teach and sustain the skill.”<sup>30</sup>

Given that medics had received only 8 hours of CB familiarization with their basic training and that even the summaries available from Army field manuals (as excerpted in appendix I) are necessarily rather technical, these results are not surprising. These low proficiency scores come just as the Army is preparing for more mobile combat where medics may be deployed farther from higher-level support.

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## A Minority of Medical Units Participate in Service CB Exercises and the CINC’s Very Rarely Exercise CB Medical Readiness

In May 1998, the Chairman of the Joint Staff published guidance for exercise and training objectives that identified NBC defense and force protection as the top training issues. Nevertheless, in March 2000, DOD’s Chemical and Biological Defense Program Annual Report concluded that CB scenarios are not adequately exercised. The report found that although the Army had more than 750 models and simulations, very few combat simulations incorporated the effects of NBC and none incorporated all aspects.<sup>31</sup>

Officials told us that although medical response to a CBW incident has been exercised domestically, outside the United States comparable

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<sup>30</sup>U.S. Army Center for Healthcare Education and Studies, *Medical Training 2000* (San Antonio, Texas: Fort Sam Houston, Army Medical Department Center and School, n.d.), p. 6.

<sup>31</sup>DOD, *Chemical and Biological Defense Program Annual Report to Congress* (Washington, D.C.: March 2000), p. 133. Also see *Chemical and Biological Defense: Units Better Equipped, but Training and Readiness Reporting Problems Remain* (GAO/NSIAD-01-27, Nov. 14, 2000).

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The Services Train a Small  
Minority of Units With Field  
Exercises of CB Medical  
Support

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exercises of medical support have been minimal. Although the service surgeons general have recently begun integrating chemical and a few biological scenarios into their medical exercises, medical planners from each of the five unified commands reported that these commands have not conducted a realistic field exercise of medical support for chemical or biological warfare. A key readiness review, which is used to advise the president on readiness to implement the national security strategy, has never set the unified commanders a scenario requiring medical support for weapons of mass destruction.

Army medical officials stated that the Army generally does not exercise casualty management, evacuation, triage, or decontamination for CBW scenarios. The Army conducts training exercises for its field hospitals, battalion aid stations, and medical companies at its three combat training centers. Officials told us that in recent years they have generally included a chemical scenario and that they piloted a biological scenario in 1999. Although Army Health Care Operations officials told us these exercises were more realistic than those that might be performed at their home base, they exclude the more persistent chemical agents that could bring the exercise to a halt. In general, most brigades go through the combat training centers about every 2 years, with two or three companies of 130 troops from each brigade, or 10 percent of the troops being directly involved in the chemical play. Simulated casualties range from 10 to about 150 of 260 personnel. Demonstrating the importance of field exercises, Army officials told us that, in the first training exercise, casualty rates can run as high as 75 percent, but as the units learn how to respond this drops sharply to as low as 10 percent. However, according to Army health care operations officials, it is not unusual to have 100 percent turnover in personnel every 2 years.

The Army also has command post staff exercises that are limited to decision making and do not involve units in the field. The AMEDDX exercise, for example, involves units that volunteer to train in evacuation, reception, and treatment, including CB casualties. Golden Medic is a command post exercise for Army reserve units that includes some CB play but does not exercise medical treatment. Even though personnel not directly involved in CB play can learn from after-action reports, the modest proportion of Army units annually participating in exercises involving CB medical support (combined with the turnover rate among medical personnel) raise questions about medical readiness for CB in the Army, DOD's lead agent for CB medical readiness.

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Like all hospitals certified by the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO), Air Force hospitals are required to exercise their ability to respond to mass casualties annually. In addition, depending on local threat conditions, they are required to conduct exercises in responding to an attack. It was not clear to Air Force headquarters how many of these involve CB, as the hospitals are not required to report the content or result to the major commands. Air Force health care officials said that in the past they have had difficulty getting medical care included in regular combat readiness exercises and even then the medical play was often cancelled. However, they reported having made significant strides since May 2000 with a considerable shift in their organizational staffing. Army and Air Force officials told us that the completion of the JRCAB protocols for the treatment of CB casualties has allowed more meaningful exercise of CB medical care. The protocols were loaded onto handheld computers as patient care algorithms that allow exercise umpires to score how the simulated casualties fared. As a result, the Air Force was able to include medical management of chemical or biological casualties in three of its recent major field exercises—Pacific Warrior, Consequence Island, and Golden Medic. Air Force officials estimated that roughly 15 to 20 percent of medical staff have participated in exercises of medical care of chemical or biological casualties.

Navy officials told us they had not conducted a field exercise of CB medical support. They stated that a full response to CB would quickly bankrupt the services. They argued that any full response plan would have to be joint. The Navy reported that in general only a small percentage of their exercises involve medical care. Officials told us that medical play during routine combat readiness exercises often lacks a scenario involving a CB event because it becomes “too hard,” or the CB portion that was planned is eliminated because “it does not let the warfighter exercise his needs.” They have recently begun to include chemical or biological care tabletop exercises for medical staff. Their most recent Vanguard exercise included a response to both chemical and biological agents (sarin and plague). Another is planned with a biological agent for October 2001. Their recent science and technology exercise included a response to a chemical agent (sarin). Another tabletop exercise was played against chemical and biological agents (smallpox). Two smaller tabletop strategic exercises for the leaders of Navy medicine were held at Camp Lejeune and included a response to plague.

#### Joint CB Medical Readiness Is Rarely Tested

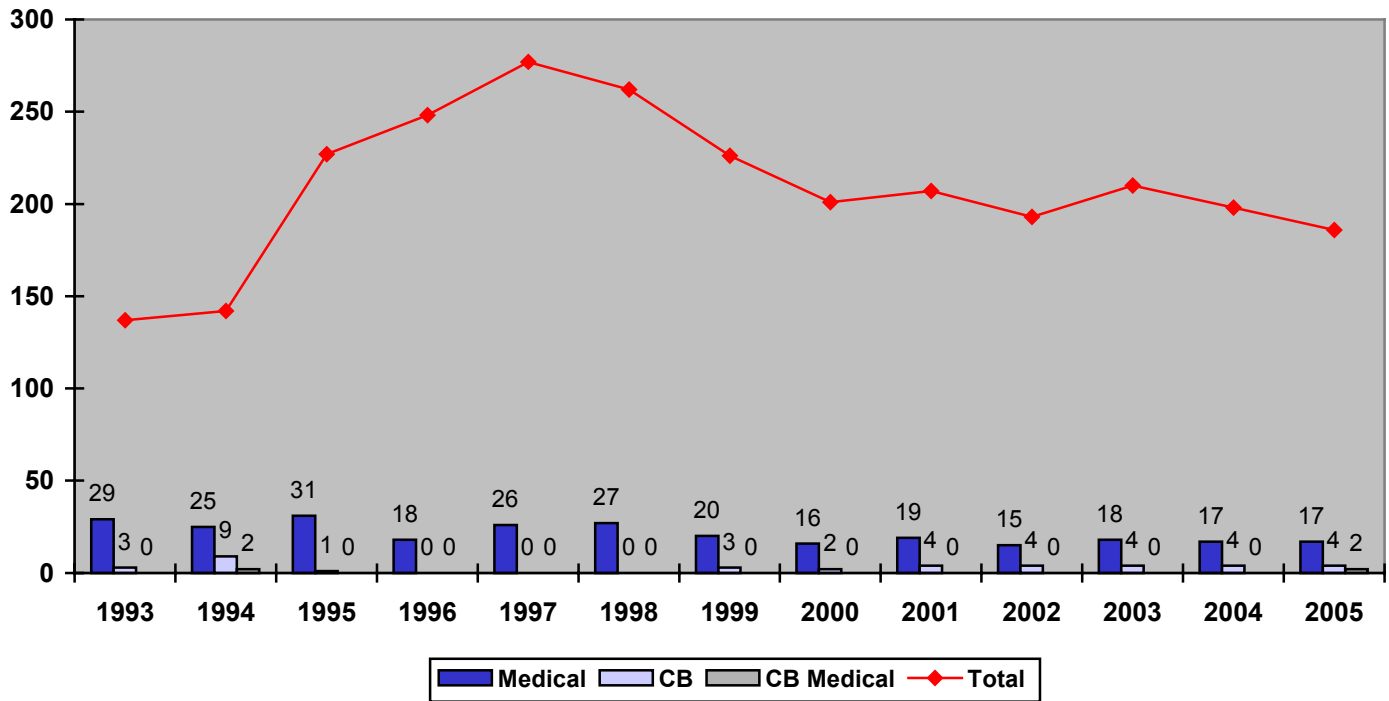
Although the service surgeons general have begun integrating chemical and a few biological scenarios into their medical exercises, validating any of the services’ planning assumptions would require both realistic CB

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scenarios and full medical participation in joint combat readiness exercises. For example, Army officials voiced concern about the lack of joint exercises to support key Air Force lift capacity assumptions. The joint staff requires the unified commands to examine quarterly scenarios of regional warfare. The focus of the review is determining the armed forces' current readiness to execute the full range of the national military strategy, including peacetime engagement, deterrence, conflict prevention, and winning the nation's wars. Service and Joint Staff told us that as of June 2000 this key review had never asked the CINCs to address a scenario that incorporated medical support for CB contingencies. We were told it might do so in the future.

Given the difficulty and expense of exercising realistic CB scenarios, some service officials argued that more has to be done at the joint level. For example, Army officials voiced concerns about the lack of joint exercises to support Air Force lift capacity assumptions. The Joint Exercise Management Program of the joint staff (J-7) maintains data on all exercises planned by the various CINCs and major commands in order to coordinate approval and funding of the exercises. These data provide a rough approximation of pertinent CINC exercises based on keyword searches of exercise abstracts. Overall, CINCs planned 2,714 exercises between fiscal years 1993 and 2005 (figure 2). Of these, 278 (or about 10 percent) involved some medical play, and 38 (1 percent) involved chemical or biological warfare scenarios. Only 4 exercises involved both medical support and either chemical or biological scenarios.

**Figure 2: Numbers of Planned CINC Exercises, Fiscal Years 1993–2005**



Source: J-7, Joint Exercise Management Program, April 2001.

Although the frequency of all planned CINC exercises rose after the Gulf War and then gradually declined to 201 in 2000, the number of joint medical exercises of all types peaked at 31 in 1995 and fell to 16 in 2000. (See figure 2.) Exercises incorporating chemical or biological warfare (CB), and in particular medical response to chemical or biological warfare (CB Medical) have remained few and far between. Given that the threat was said to be increasing, these trends are at odds. Indeed, the last joint CB medical exercise that would have been completed was in 1994, and the next one is not planned until 2005. Figure 2 shows the total number of

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planned joint exercises for 1993–2005, as well as those involving medical support and CBW.<sup>32</sup>

Overall, little exercising has been done above the level of unit commanders. The CINCs do not track these unit exercises, and neither they nor DOD could provide us with a summary of them. Essentially, although there are more than 150 joint exercises planned annually, relatively few include either CB warfare or medical matters, and virtually no joint exercises include both CB warfare and field medical response. Medical officials told us that in combat exercises the only roles generally played by medical staff are to assist in recognizing a CB event and planning the logistics required for handling it. Medical staff commented that both CB warfare and medical support have to fight for inclusion in combat readiness exercises. The problem they saw was that CB defense is not the primary objective of any exercise. Medical planners argued that, on the one hand, if CB defense were made the primary exercise objective without direction from the Joint Chiefs, then it would be harder to get broad participation in the exercise. On the other hand, when CB defense is not the primary objective, then the threat tends to be watered down so that other objectives will not be disrupted by showstoppers.

The term “mass casualties” refers to any level of casualties that overwhelms the existing medical resources at a given site or level of care. Army planners charged with the medical response to CBW told us that a realistic mass casualty CB scenario had never been exercised. They stated that “their realistic working assumption was that a genuine CB event in the battlefield would overwhelm the medical system.” They said that given

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<sup>32</sup> U.S. Pacific Command officials also confirmed that PACOM had conducted command post CB exercises, but had not included a field exercise of medical support. U.S. Central Command staff could not recall any field exercises of CB medical support. CENTCOM’s Desert Breeze exercises had a tabletop CB warfare medical component. The Neon Falcon exercises included CB warfare decontamination but not medical treatment. Central Command officials also said that while field exercises are generally the responsibility of the component commands, they did not have any knowledge of these exercises or their lessons learned. They reported that the Joint Unified Lessons Learned System for reporting and retrieving lessons learned from exercises had been down for a year and a half. Joint Forces Command reported two exercises. In November and December 1999, it trained and exercised to plan for the millennium celebration. No medical units were actually deployed. In May 2000, it participated in the Top Officials (TOPOFF) exercise, whose purpose was to prepare to conduct surveillance, decontamination, treatment, and evacuation of chemical victims in Portsmouth, New Hampshire, and biological victims in Denver, Colorado. DOD had no significant field role. No DOD medical units were deployed in a field role other than a Chemical Biological Incident Response Force to assist with decontamination. U.S. European Command also reported that it had not conducted CB exercises.

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that the medical system will be overwhelmed, mass casualty scenarios should be exercised to prepare our medical force leaders to sustain medical operations in the face of such an event. DOD health affairs officials acknowledged that they did not know how many casualties they could handle and agreed that they could have better knowledge of their current capabilities.

In sum, DOD development of appropriate CB courses is an important contribution to adequate readiness but may not be sufficient to guarantee readiness. Treating CB casualties is an advanced medical skill, but without requirements, relatively few military medical personnel receive advanced training. Army testing of medics confirmed that proficiency was low. Army officials characterized the funding for individual CB medical training as unstable. Unit training appears insufficient because skills to ensure readiness are rarely exercised due to conflicting priorities encountered by both warfighters and medical staff and because it is difficult and expensive. Even individuals who have been trained cannot be readily identified because either the tracking systems do not exist or they are not currently functioning. Certification based on proficiency standards in the classroom or the field is not being done, in part because neither the metrics nor the standards have been developed.

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## Conclusions and Recommendations

The President, Secretary of Defense, and Joint Chiefs have all emphasized the importance of preparing U.S. military forces for emerging CB threats. Last spring, DOD reported to the Congress that “the probability of U.S. forces encountering CB agents during worldwide conflict remains high.”<sup>33</sup> However, we found that the likelihood of CB casualties receiving proficient medical care remains low. Although we found efforts to plan and train for these threats, there is a wide and longstanding gap between DOD’s appraisal of CB threats and DOD’s medical preparedness to meet them. This suggests a lack of consensus about the threat, a failure of high-level leadership, or the acceptance of a potentially high level of risk.

DOD and the services have not adequately modeled or evaluated medical specialty mix or fully resolved their differences. DOD has not developed comprehensive, meaningful training requirements, adequate tracking systems, or rigorous proficiency testing. The available evidence indicates

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<sup>33</sup>DOD, *Chemical and Biological Defense Program Annual Report to Congress* (Washington, D.C.: March 2000), p. i.



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that proficiency is low. From training only a fraction of personnel to failing to conduct realistic, challenging combat field exercises that include CB medical treatment, DOD has not fully responded to the threat as stated. Consequently, 10 years following Operation Desert Storm, serious concerns remain about DOD's capacity to provide medical support for CB warfare casualties.

We recommend that the Secretary of Defense address the gap between the stated CB threat and the current level of medical readiness by clarifying DOD's expectations regarding medical preparation for CB contingencies and, as appropriate, directing the Joint Staff to integrate biological medical readiness in Defense Planning Guidance.

To the extent that DOD views chemical warfare or biological warfare as a serious threat in its areas of operations and expects its medical forces to prepare for these contingencies, we recommend that the Secretary of Defense direct that

1. The services and Joint Staff support completion of the Common User Database by concluding an agreement regarding which personnel are qualified to provide specific treatments. Without such an agreement, the services' medical models use different assumptions about which personnel are qualified to administer treatments, and the results are neither comparable nor readily defensible. This database should eventually be validated by proficiency testing of the identified personnel to help further refine training and specialty mix requirements.
2. In furtherance of a triservice approach to medical planning, the services and joint staff use these enhanced modeling capabilities to develop defensible and transparent risk assessments associated with various evacuation rates. The services and joint staff develop and approve joint models and tools to support more timely, flexible, and integrated planning for these threats and enable effective updating of both long-term specialty mix evaluations and short-term combat medical requirements.
3. The services develop CB medical training requirements and assess the effectiveness of the training with rigorous proficiency metrics and standards.
4. DOD develop and maintain information management systems to monitor completion of required CB training and track the proficiency

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of medical personnel, at least for medical first responders and personnel in high-risk areas of operation.

5. The joint staff, CINCs, and services increase the realistic exercise of medical support to a level commensurate with current CB threat assessments. To the extent that there is a threat of mass casualties, exercises should explore the limits of medical capabilities and the full consequences of scenarios that overwhelm them.

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## Agency Comments and Our Evaluation

DOD provided written comments on a draft of this report on September 10, 2001. These comments are reproduced in appendix IV. In view of the September 11 attack, we reconfirmed with DOD that the report was still unclassified and cleared as amended. DOD concurred with all our recommendations and provided additional technical comments which we have incorporated as appropriate. DOD indicated that it plans to take a number of specific steps but did not make clear that they will collectively redress the lack of clarity regarding expectations for CB medical readiness.

In responding to our recommendation that the Secretary of Defense address the gap between the threat as stated and the current level of medical readiness, DOD stated that the Joint Staff will be asked to reexamine CB training issues and to propose adjustments to enhance medical readiness. It is not clear, however, that referring the matter to the Joint Staff for further study will be sufficient to address the gap, clarify expectations, or integrate medical readiness for biological warfare in Defense Planning Guidance.

To the extent that DOD views CB warfare as a serious threat and expects the nation's military medical forces to prepare for its contingencies, we offered several additional recommendations. In response to our recommendation that DOD complete the Common User Database and validate it with proficiency testing, DOD stated that the Joint Staff will be requested to coordinate the completion of the Common User Database and to consider service-specific environments. However, it remains unclear whether DOD intends to identify specific types of personnel qualified to treat specific problems and to validate their qualifications with proficiency testing.

DOD had several comments regarding our recommendation that it use enhanced modeling capabilities to develop risk assessments for various evacuation rates. Regarding modeling capabilities, it stated that the MAT

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can now provide requirements once casualty rates have been determined. We note that this process still cannot generate defensible specialty mix requirements until the Common User Database identifies the specific types of personnel qualified to address specific patient conditions. DOD also stated that the many variables and the absence of historical casualty data have so far precluded arriving at any one set of conclusions that would be more logically defensible than any other set. We do not wish to minimize the difficulties associated with modeling and estimating medical requirements for CB attacks, and for this reason have suggested modeling a range of assumptions to assess risks.

Regarding evacuation capabilities, DOD specifically concurred with the need to better assess the percentage of casualties needing evacuation but not the actual calculation of medical requirements based on delay estimations and evacuation capacity. However, we were told that evacuation rates have a tremendous impact on the size of the medical forces required on the ground and in the air. We found that Army and Air Force officials strongly disagreed about actual evacuation capabilities. Army officials told us that because of this dispute, the Army is out of compliance with this part of the Joint Strategic Capabilities Plan. Therefore, without interservice agreement on evacuation, there is effectively no coherent process for estimating overall joint medical requirements. DOD further acknowledged that the evacuation issue is greatly complicated by the BW threat. This underscores the need to use enhanced modeling capabilities to assess risks.

DOD responded to our recommendation to develop CB medical training requirements by saying that it had formed a working group for NBC medical training requirements and that the Joint Staff will be asked to establish an NBC oversight group. However, DOD was silent about assessing the effectiveness of these requirements with rigorous proficiency metrics and standards.

DOD concurred with our recommendation to improve information management systems, and it suggested that we broaden this to recommend a joint system to track the monitoring of training and the proficiency of all personnel identified for functioning in a CB environment. We concur and have changed the recommendation. While having service-tracking systems would be an improvement, a joint system would be best. Similarly, although the scope of this report was limited to CB readiness, we agree that it would be logical and appropriate to include medical readiness for nuclear events in such as system.

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DOD concurred with our recommendation to increase the realistic exercise of medical support. It stated that the Assistant Secretary of Defense for Health Affairs will request heightened medical participation in all relevant exercises. However, we note that the Assistant Secretary's concurrence is a necessary but insufficient condition for fully implementing this recommendation. Most exercises are controlled not by the medical staff but by those responsible for warfighting operations. Concurrence of the military operations staff will be essential if medical participation is to be included in combat exercises and not the first thing cut when it gets in the way of other goals or becomes "too hard." DOD was also silent about the realistic exercise of mass casualties—exercises that explore the limits of medical capabilities and the full consequences of scenarios that overwhelm them.

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As we agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from its issue date. We will then send copies of this report to the Secretary of Defense, the Ranking Minority Member of your Subcommittee, and other interested congressional committees and members. We will also provide copies to others on request. If you have any questions or would like additional information, please call me at (202) 512-2700. Other key contacts and contributors are listed in appendix V.

Sincerely yours,



Nancy R. Kingsbury, Managing Director  
Applied Research and Methods

# Appendix I: Specific Signs, Symptoms, Diagnoses, and Treatment for Some Common Chemical and Biological Agents

Agent	Signs, symptoms, and diagnosis	Treatment
Pulmonary: Phosgene	Eye and airway irritation, shortness of breath, chest tightness, and delayed pulmonary edema	Termination of exposure, resuscitation, enforced bed rest and observation, oxygen with or without positive airway pressure for signs of respiratory distress, and other supportive therapy as needed
Nerve:GA, GB, GD, GF, VX	<p>Vapor:</p> <p>Small exposure—miosis, rhinorrhea, mild difficulty breathing</p> <p>Large exposure—sudden loss of consciousness, convulsions, apnea, flaccid paralysis, copious secretions, miosis</p> <p>Liquid on skin:</p> <p>Small to moderate exposure—localized sweating, nausea, vomiting, feeling of weakness</p> <p>Large exposure—sudden loss of consciousness, convulsions, apnea, flaccid paralysis, copious secretions</p>	<p>Administration of MARK I Kits (atropine and pralidoxime chloride); diazepam in addition if casualty is severe; ventilation and suction of airways for respiratory distress</p> <p>Management of a casualty with nerve agent intoxication consists of decontamination, ventilation, administration of the antidotes, and supportive therapy. The condition of the patient dictates the need for each of these and their order.</p>
Vesicants:Mustard, Lewisite	Asymptomatic latent period (hours): Erythema and blisters on the skin; irritation, conjunctivitis, corneal opacity, and damage in the eyes; mild upper respiratory signs to marked airway damage; gastrointestinal (GI) effects; bone marrow stem cell suppression	<p>Decontamination immediately after exposure is the only way to prevent damage. There is no specific supportive therapy. The eyes are the organs most sensitive to mustard vapor injury.</p> <p>The management of a patient exposed to mustard may be simple, as in providing symptomatic care for a sunburn-like erythema, or extremely complex, as in providing total management for a severely ill patient with burns, immunosuppression, and multisystem involvement.</p>
Anthrax	<p>Inhalation: Incubation period of 1-6 days: Fever, malaise, fatigue, cough, and mild chest discomfort followed by severe respiratory distress with dyspnea, diaphoresis, stridor, and cyanosis</p> <p>Within 24–36 hours after onset of severe symptoms: Shock and death</p> <p>Physical findings are nonspecific.</p>	Although effectiveness may be limited after symptoms are present, high-dose antibiotic treatment with penicillin, ciprofloxacin, or doxycycline should be undertaken. Supportive therapy may be necessary.
Plague	<p>Pneumonic plague (incubates 2–3 days): High fever, chills, headache, hemoptysis, and toxemia, progressing rapidly to dyspnea, stridor, and cyanosis; death from respiratory failure, circulatory collapse, and a bleeding diathesis</p> <p>Bubonic plague (incubates 2–10 days): Malaise, high fever, and tender lymph nodes; may progress spontaneously to the septicemic form, with spread to the central nervous system and lungs</p>	Early administration of antibiotics is very effective. Supportive therapy is required.

**Appendix I: Specific Signs, Symptoms,  
Diagnoses, and Treatment for Some Common  
Chemical and Biological Agents**

<b>Agent</b>	<b>Signs, symptoms, and diagnosis</b>	<b>Treatment</b>
Viral hemorrhagic fevers	VHFs are febrile illnesses that can be complicated by easy bleeding, petechiae, hypotension, and even shock, flushing of the face and chest, and edema. Constitutional symptoms such as malaise, myalgias, headache, vomiting, and diarrhea may occur.	Intensive supportive care may be required. Antiviral therapy with ribavirin may be useful in several of these infections. Convalescent plasma may be effective in Argentine hemorrhagic fever.
Botulinum toxins	Ptosis, generalized weakness, dizziness, dry mouth and throat, blurred vision and diplopia, dysarthria, dysphonia, and dysphagia followed by symmetrical descending flaccid paralysis and respiratory failure. Symptoms begin as early as 24–36 hours but may take several days after inhalation of toxin.  The botulinum toxins as a group are among the most toxic compounds known to humans. No routine laboratory findings. Biowarfare attack should be suspected if multiple casualties simultaneously present with progressive descending bulbar, muscular, and respiratory weakness.	Intubation and ventilatory assistance for respiratory failure. Tracheostomy may be required. Administration of heptavalent botulinum antitoxin (IND product) may prevent or decrease progression to respiratory failure and may hasten recovery.

Source: Field Management of Chemical Casualties Handbook, 2nd ed. (Aberdeen Proving Ground, Md.: USAMRICD, July 2000), and Medical Management of Biological Casualties Handbook, 2nd ed. (Fort Detrick, Md.: USAMRIID, August 1996).

# Appendix II: General Distinguishing Features of Chemical and Biological Terrorism

<b>Feature</b>	<b>Chemical</b>	<b>Biological</b>
Time from attack to illness	Rapid: minutes to hours	Delayed: days to weeks
Distribution of victims	Downwind from point of release	Widely spread through the battlefield and beyond
First personnel to respond	Soldiers, medics, corpsmen	Sick call physicians and nurses, infectious disease physicians, epidemiologists, public health officials, laboratory personnel
Release site	Swiftly discovered; area of attack can be cordoned off	Difficult to identify; area of attack cannot be cordoned off
Decontamination of patients and environment	Acutely important in most cases	Not needed in most cases
Medical treatment	Antidotes	Vaccines, antibiotics
Patient isolation	Not needed after decontamination	Crucial if communicable disease is involved; advance hospital planning for isolating many patients is critical

Source: D. A. Henderson, "The Looming Threat of Bioterrorism," *Science*, 283:5406 (Feb. 26, 1999); and DOD

# Appendix III: U.S. Military CB Warfare Medical Training Summary Tables, Fiscal Years 1997–2000

**Table 3: Officers and Enlisted Personnel Trained in MCBC Courses, Fiscal Years 1997–2000**

<b>Course</b>	<b>Days in course</b>	<b>Army</b>	<b>Navy</b>	<b>Air Force</b>	<b>All services</b>
Total in-house	7	929	330	116	1,375
Medical Corps Officers: physicians, physician assistants, nurses		872	290	96	1,258
Enlisted: medics, corpsmen		57	40	20	117
Total off-site	3	4,201	394	1,288	5,883
Medical Corps Officers: physicians, physician assistants, nurses		3,108	173	947	4,228
Enlisted: medics, corpsmen		1,093	221	341	1,655
Total trained		5,130	724	1,404	7,258
<b>Annual average</b>		<b>1,283</b>	<b>181</b>	<b>351</b>	<b>1,815</b>

**Table 4: Officers and Enlisted Personnel Trained in FCBC Since Fiscal Year 1999**

<b>Course</b>	<b>Days in course</b>	<b>Army</b>	<b>Navy</b>	<b>Air Force</b>	<b>All services</b>
In-house	5	724	71	13	808
Off-site	3	668	1	17	686
<b>Total</b>		<b>1,392</b>	<b>72</b>	<b>30</b>	<b>1,494</b>

**Table 5: USAMRIID Biological Warfare Satellite Broadcasts, Fiscal Years 1997–2000**

<b>Year</b>	<b>Army</b>	<b>Navy and Marines</b>	<b>Air Force</b>	<b>All services</b>
1997	942	856	1,558	3,356
1998	2,422	992	7,978	11,392
1999	1,869	939	2,431	5,239
2000	1,630	390	650	2,670
<b>Total</b>	<b>6,863</b>	<b>3,177</b>	<b>12,617</b>	<b>22,657</b>



Appendix III: U.S. Military CB Warfare  
 Medical Training Summary Tables, Fiscal  
 Years 1997-2000

**Table 6: Military Health Service Total End Strength, Fiscal Year 1999**

<b>Duty status</b>	<b>Army</b>	<b>Navy</b>	<b>Air Force</b>	<b>Total</b>
<b>Active duty</b>				
Physician Medical Corps	4,332	4,086	3,951	12,369
Nurse Corps	3,300	3,146	4,333	10,779
Physician assistants	478	235	455	1,168
Total active physicians, physician assistants, and nurses	8,110	7,467	8,739	24,316
<b>Reserve and Guard</b>				
Physician Medical Corps	4,380	2,707	2,472	9,559
Nurse Corps	11,778	3,702	5,895	21,375
Physician assistants	493	85	150	728
Total Reserve and Guard	16,651	6,494	8,517	31,662
<b>Total active, Reserve, and Guard physicians, physician assistants, and nurses</b>	<b>24,761</b>	<b>13,961</b>	<b>17,256</b>	<b>55,978</b>
<b>Enlisted</b>				
Enlisted active duty	29879	22,459	20,711	73,049
Enlisted Reserves	51,709	11,309	11,333	74,351
<b>Total enlisted</b>	<b>81,588</b>	<b>33,768</b>	<b>32,044</b>	<b>147,400</b>
<b>Medical Health Service</b>				
Active duty Medical Health Service officers and enlisted	37,989	29,926	29,450	97,365
<b>Total Medical Health Service health care providers</b>	<b>106,349</b>	<b>47,729</b>	<b>49,300</b>	<b>203,378</b>

# Appendix IV: Comments From the Department of Defense



HEALTH AFFAIRS

THE ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D. C. 20301-1200

SEP 10 2001

Ms. Nancy Kingbury  
Managing Director, Applied Research and Methods  
United States Accounting Office  
Washington, D.C. 20548

Dear Ms. Kingsbury:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "CHEMICAL AND BIOLOGICAL DEFENSE: DoD Needs to Clarify Expectations for Medical Readiness," July 13, 2001 (GAO Code 713054).

The Department appreciates the opportunity to review and comment on the subject report and supports the medical readiness issues raised during the review. Recommended adjustments were discussed with your auditors to ensure technical accuracy in the published report. Specific DoD comments are included in the attachment.

A handwritten signature in black ink, appearing to read "J. Jarrett Clinton".

J. Jarrett Clinton, MD, MPH  
Acting Assistant Secretary

Attachment:  
As stated

SPECIFIC COMMENTS ON THE RECOMMENDATIONS

**RECOMMENDATION 1:** The GAO recommended that the SECDEF address the gap between the stated CB threat and the current level of medical readiness by clarifying the Department's expectations regarding medical preparation for CB contingencies and, as appropriate, by directing the Joint Staff to integrate biological medical readiness in DPG.

**DOD RESPONSE:** Concur. As the coordinating body with the Services and the CINCs on issues of this nature, the Joint Staff will be requested to conduct a re-examination of CB medical training issues and provide suggested adjustments to enhance the DoD's medical readiness posture.

**RECOMMENDATION 2:** The GAO recommended that the Services and Joint Staff support completion of the Common User Database (CUD) by concluding an agreement regarding which personnel are required to provide specific treatments. This database should eventually be validated by proficiency testing of the identified personnel to help further refine training & specialty mix requirements.

**DOD RESPONSE:** Concur. The Joint Staff will be requested to coordinate this effort with the Services. The elements and scope of the Medical CUD must be widely disseminated and agreed on by the Services and the Joint Staff so that general treatment of NBC casualties can be jointly accomplished and trained to. The CUD must be comprehensive, include all echelons of care, and consider Service specific environments. Additionally, the requirement to train physicians to treat CB casualties must be accomplished in the Services and with standardized protocols defined by the Joint Medical NBC Defense Readiness Working Group.

**RECOMMENDATION 3:** In furtherance of a tri-service approach to medical planning, the GAO recommended that the Services and Joint Staff use enhanced modeling capabilities to develop defensible and transparent risk assessments associated with various evacuation rates. The Services and Joint Staff develop and approve joint models and tools to support more timely, flexible and integrated planning for these threats and enable effective updating of both long-term specialty mix evaluations and short-term combat medical requirements.

**DOD RESPONSE:** Concur. As noted in the GAO report, the sole DoD-approved tool for the development of Health Service Support (HSS) predictive requirements to support theater operations is the Medical Analysis Tool (MAT). The MAT is capable of providing requirements (and subsequently adequate modeling of those requirements through its Course of Action Analysis function) for the WMD environment, once casualty rates are determined.

The many variables and the absence of historical data have, to date, precluded arrival at any one set of conclusions that would be more logically defensible than another set as jointly accepted planning factors. The Services will move forward in the development of CBRNE associated *casualty rate's* that would enable MAT to provide requirements data for the WMD environment. This would give the Unified CINC's a more tangible grasp of the casualty expectations and the HSS assets subsequently required in an asymmetrical environment. Having said this, the US has ratified the NATO Standardization Agreements [2475,2476 & 2477] "Allied Medical Publication P-8, Medical Planning Guide of NBC Casualties (NBC)" on 25 Aug 00, which establishes a methodology for

assessing NBC casualties and could serve as a basis for casualty rate determination. The evacuation issue is greatly exacerbated by the BW threat; it must be addressed as a joint issue and incorporated into medical modeling. Additionally, if the GAO recommendation pertains to the percentage of patients that will require evacuation, DoD concurs. However, if the GAO recommendation pertains to the evacuation (EVAC) policy, DoD non-concurs. EVAC policy only places patients into the EVAC system, not into beds thereby generating bed and personnel requirements. Bed generation is a function of the EVAC delay and is determined by the average length of stay (ALOS) or stay time. Finally, the report attributes inter-service disagreement as a major reason for the lack of standard CB casualty/evacuation planning factors. This is an over-simplification of a very real problem, which the report acknowledges. The Joint Staff be requested to establish a joint CB casualty rates working group with representatives from the Services to determine rates for use in MAT modeling.

**RECOMMENDATION 4:** The GAO recommended that the Services develop CB medical training requirements and assess the effectiveness of the training with rigorous proficiency metrics and standards.

**DOD RESPONSE:** Concur. During the FY01 Joint Medical NBC Readiness Conference, a working group began to identify and quantify the medical NBC training requirements for all Services to follow. The results of their work and plan will be briefed to the Joint NBC Board for approval. The Joint Staff will be requested to take the lead in this effort and provide a written proposal to establish the formation of a Joint, Service, and DOD medical NBC oversight group.

**RECOMMENDATION 5:** The GAO recommended that the Services develop and maintain information management systems to monitor completion of required CB training and track the proficiency of medical personnel, at least for first responders and key personnel in high risk areas of operations.

**DOD RESPONSE:** Concur. DoD suggests that the recommendation be worded as "...track the proficiency of medical personnel, at least for those personnel identified as essential in the medical response to an NBC event." Rationale: the diverse nature of the NBC threat suggests that the current wording is too narrow. Currently, numerous stove-piped systems exist within the Services to track training. The TRICARE Management Activity (TMA) will be tasked to develop a joint tracking system to monitor training and proficiency of personnel identified to function in a CB environment.

**RECOMMENDATION 6:** The GAO recommended that the Joint Staff, CINCs and Services increase the realistic exercise of medical support to a level commensurate with current CB threat assessments. To the extent there is a threat of mass casualties, exercises should explore the limits of medical capabilities and the full consequences of the scenarios that overwhelm them.

**DOD RESPONSE:** Concur. Historic "across-the-board" decreases in exercise funding for medical participation have directly impacted upon the level and frequency of exercise involvement. To maximize future medical participation, the Assistant Secretary of Defense for Health Affairs [ASD(HA)] will request that the Joint Staff, working with the CINCs, emphasize heightened medical participation in all relevant exercises. This would include participation in pre-planning activities with J2, J3, J4, J7, and other directorates in order to develop realistic scenarios that test our skills and capabilities in CBW environments.

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# Appendix V: GAO Contacts and Staff Acknowledgments

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## GAO Contacts

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## Staff Acknowledgments

In addition to the persons named above, Penny Pickett, Jonathan Tumin, and Teia Harper made key contributions to this report.

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# Related GAO Products

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*Bioterrorism: Federal Research and Preparedness Activities* ([GAO-01-915](#), September 28, 2001).

*Chemical and Biological Defense: Improved Risk Assessment and Inventory Management Are Needed* ([GAO-01-667](#), September 28, 2001).

*Chemical Weapons: FEMA and Army Must Be Proactive in Preparing States for Emergencies* ([GAO-01-850](#), August 13, 2001).

*Coalition Warfare: Gulf War Allies Differed in Chemical and Biological Threats Identified and in Use of Defensive Measures* ([GAO-01-13](#), April 24, 2001).

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*Combating Terrorism: Chemical and Biological Medical Supplies Are Poorly Managed* ([GAO/T-HEHS/AIMD-00-59](#), Mar. 8, 2000).

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*Chemical and Biological Defense: Emphasis Remains Insufficient to Resolve Continuing Problems* ([GAO/NSIAD-96-103](#), Mar. 29, 1996).





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