



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

---

# **Gulf War Servicemen and Servicewomen: The Long Road Home and the Role of Health Care Professionals to Enhance the Troops' Health and Healing**

**Robin B. McFee, DO, MPH, FACPM**

## **The Impact of War in the Persian Gulf: An Overview for Civilian Clinicians**

The war on terror and Persian Gulf War (PGW) pose a wide array of threats to our troops and new diagnostic challenges to clinicians.<sup>1-19</sup> With advances in body armor and battlefield medicine, catastrophic combat injuries that would have been unsurvivable in prior wars can be treated.<sup>14,20-25</sup> However, the survivors of such injuries face significant psychological and physical challenges, lengthy rehabilitation and readjustment to family, work, and social activities.<sup>20-24</sup> Multiple amputations pose an enormous challenge for survivors and their families. Military medical resources for returning troops are strained and unable to keep pace with the demand.<sup>6,26-32</sup> Traumatic brain injuries (TBI) and tympanic membrane injuries are on the rise given the ubiquitous nature of daily life among insurgents using improvised explosive devices (IED).<sup>15-18,26,33-41</sup> TBI, especially mild and moderate cases, are often overlooked or misdiagnosed; such injuries can significantly impair memory and other activities of daily living. Moreover, they can be mistaken for psychological illnesses. Beyond the psychological trauma of war, chemicals and some infectious diseases can be neurotoxic and damage the central nervous system, resulting in altered behavior and interpreted as psychopathology when in fact the patient is suffering from neurotoxicity.<sup>42,43</sup> Our troops will be exposed to desert illnesses and pathogens endemic in the Middle East but relatively uncommon in the U.S. Some of these can pose a diagnostic challenge to clinicians unaccustomed to these illnesses.<sup>1-3,42-66</sup> In a world of emerging pathogens and infections endemic to one region but often unknown to North America, it is important to

become more familiar with these illnesses such as malaria, leishmaniasis, brucellosis, and others given the likelihood our returning troops may be so infected and requiring timely diagnosis and appropriate treatment.<sup>1,43,45,46,56,61,66,67</sup>

The roles of women in the military have changed.<sup>7,13,68,69</sup> Unlike in prior wars, there are significant numbers of women in all military branches of service deployed overseas and in combat theaters, performing a wide array of operating specialties beyond medical and communications. Although women have typically been assigned to activities that were not considered direct combat roles during times of war, albeit females have done dangerous jobs including being pilots during World War II to the present, in the current war in the Persian Gulf, the distinction between combat and noncombat roles have become almost meaningless given adversaries do not wear uniforms, and confrontation has become urban warfare using guerilla tactics against any US troop, convoy, or post regardless of military designation. As such, women, thought to be in “safer” roles such as convoy drivers, find themselves in the “front lines” facing IED and other weapons just like their male counterparts. In addition to combat-related injuries and the stressors of war, women face discrimination and many are at risk for sexual abuse, victimization, and assault, often from servicemen.<sup>7,13,68,69</sup> Of note, male servicemen have reported sexual abuse. Nevertheless, women in the Persian Gulf face a complex array of biopsychosocial stressors not necessarily faced by their male counterparts. These new threats can pose significant challenges to female military, warranting the attention of civilian and military medical professionals.

From substance abuse, combat, infections, sexual abuse, and mental illness, troops about to be deployed to or returning from the Persian Gulf, as well as their families, face potentially significant medical, psychological and financial challenges.<sup>6,8-10,27,29-33,70-77</sup> In an era of limited surge capacity, the complex needs of our returning troops will require civilian health care professionals (HCP) to provide much of the care and fill looming voids.

Physicians and other clinical HCP have long been taught that one of the keys to evaluating and effectively treating a patient is having an appropriate framework or pathway for diagnosing, and treating, which includes referral to specialist care, and follow-up. Context is critical and no less so for our patients who are about to leave for or return from the Persian Gulf War. These patients face enormous threats and are at risk for a complex array of biomedical and psychosocial morbidities, some of which may go undiagnosed and impair the patient’s return to normal

social function. Beyond devastating wounds, the sometimes more subtle injury—TBI, which is becoming a significant and important pattern of injury in the current PGW, TBI can negatively impact social and work functions.<sup>15,17,18,26,33,78-80</sup> posttraumatic stress disorder (PTSD), TBI, and other biopsychosocial injuries may be contributing to the worrisome rate of homelessness that is afflicting returning PGW II troops.<sup>12,70,81</sup> Given our goal as HCP should be to facilitate the returning servicemember's ability to reenter society and to function in daily life, learning about the threats they faced, the medical issues requiring care, and the resources they will need is essential. Taking the time to obtain a thorough history is critical to assessing the symptoms and ultimately making the correct diagnosis. A comprehensive physical examination can help the HCP, given many biomedical exposures or injuries, such as TBI, present with symptoms similar to psychiatric illnesses like PTSD. Patients may have both—yet each require highly specialized care and long-term follow-up.

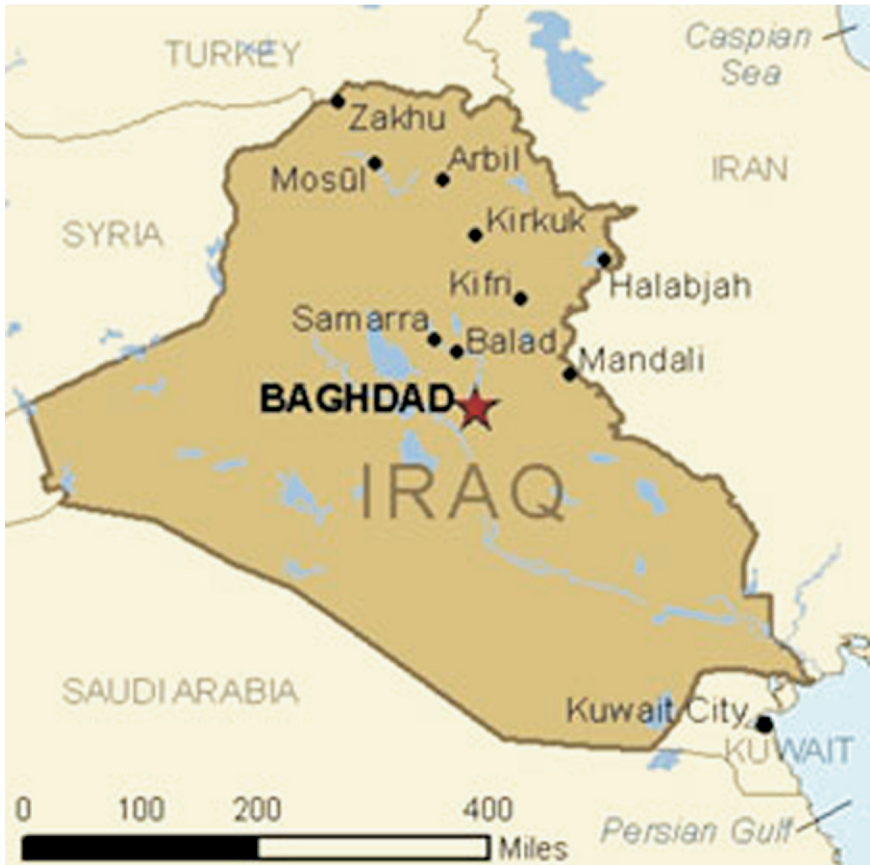
Civilian medical resources are often untrained in the nuances of military care. The following monograph describes and discusses many of the challenges our Persian Gulf troops will face in the hope it will better prepare civilian health care professionals provide appropriate services, address gaps in resources, promote collaboration between biomedical and psychosocial professional disciplines, and ultimately assist our patients to successfully reenter society.

## **Gulf War Servicemen and Servicewomen: The Long Road Home and the Role of Health Care Professionals to Enhance Their Health and Healing**

### *War, Adolescents, and the Middle East (Figs 1 and 2)*

“Never in the field of human conflict was so much owed by so many to so few.”—Winston Churchill

These words were uttered by Prime Minister Churchill at Parliament in tribute to the pilots of the Royal Air Force (RAF); an iconic speech in its historical significance and, perhaps cautionary or prescient in wisdom. Many of those RAF pilots were adolescents, frighteningly outnumbered by the Luftwaffe, but were nonetheless, able to protect Great Britain and defeat the Nazis. The fate of the world often rests on the shoulders of our youth. The cause of freedom often depends upon our younger generations. Indeed, throughout history, awesome responsibilities have been placed on adolescents. Many of the servicemen and servicewomen participating in Operation Iraqi Freedom (OIF) and Operation Enduring



**FIG 1.** Map of Iraq. Reproduced from the Department of Health and Human Services, Centers for Disease Control and Prevention. Available from: <http://www.n.cdc.gov/travel/destinationIraq.aspx>. (Color version of figure is available online.)

Freedom (OEF) are between the ages of 17 and 21; adolescents by medical definition.<sup>82,83</sup> Such incredible responsibilities undertaken far from home, while experiencing new and vastly different cultures, and being subjected to dangers and violence on a scale beyond comprehension, are the reality of these warrior-adolescents. No one could debate the horrors these young people see on a daily basis, nor the impact—physical, psychological, and social—that they face on their tours of duty and will continue to cope with upon their safe return, God willing, to the United States, Great Britain, or other coalition nation. They age from adolescent to adult in the first battle. Yet they are still adolescents. When they return, we must adapt the health care we deliver to address this hybrid of



**FIG 2.** Map of Afghanistan. Reproduced from the Department of Health and Human Services, Centers for Disease Control and Prevention. Available from: (Color version of figure is available online.)

battle-tested adolescent-adult, addressing the full realm of needs and helping this individual to be able to return to some developmentally appropriate normalcy.<sup>82-84</sup> The major spheres of influence of an adolescent must be addressed and restored—family, friends, career, close relationships, personal development, health behaviors.<sup>82-84</sup>

However, adolescents are not the only ones who fight wars. Adults—single, married, parents, male, and female. Most of us imagine the return home to be joyous and fulfilling, will it be if someone has been wounded?<sup>6,9,12,14,18,31,71-73,78</sup> Or if someone has lost their job? Or has lost the loved one who was supposed to be waiting at home? Or meeting children who in return are facing a stranger because they were babies

when dad (or mom) deployed?<sup>71</sup> What readjustments will those returning face that we can assist as their health care provider?<sup>9,85</sup> While PTSD is expected, so should substance abuse. Tobacco use among troops is highly prevalent. Often they smoke non-U.S. cigarettes; what health risks beyond the norm would be expected from smoking local tobacco products? Do our communities have the resources for returning troops? The Veterans Administration (VA) cannot and will not take care of all the returning troops. What can we do as physicians to fill the voids?

The role of the physician has and should always be, in its noblest form, both healer and patient advocate. In our daily practices delivering high-quality health care can be a challenge in the midst of a seemingly dizzying array of insurance plans, financial and time constraints, and a host of other competing issues that impact upon access, cost, and quality. The most dedicated clinicians often aide their patients in fighting for coverage, care approvals, or access to medications even when “the system” seems stacked against the patient. Now imagine an adolescent who has returned from battle, having seen the horrors of war, only to find his or her job has not been preserved, or medical care—physical or psychological—is beyond reach because of either cost, access, or quality? It is challenging enough for adults with good jobs and years of life experience to often obtain appropriate care; think about the returning soldier, sailor, or marine returning from a war zone! We often consider medical care of the military to be the responsibility of military facilities like the VA hospitals, base infirmaries, and the Department of Defense (DoD) Manage Care Support Contract (TRICARE). Yet over one-third of our military in the Persian Gulf are reservists, not full-time active duty military. These are our neighbors, coworkers,<sup>86</sup> and fellow citizens who thus obtain their health care from the nonmilitary medical world—probably us! As such, they are likely to return to our practices when they come home from war. How many of us in health care have been in the military or in a war zone? Yet we will be called upon to help our patients come to grips with such experiences. Moreover, how familiar are we with the many challenges these people will face—interacting in a “peaceful” society, returning to work “business as usual,” receiving appropriate psychosocial and medical care attuned to the risks and threats of living in the Middle East or other far off lands?

As of April 2007 there were over 1.4 million active duty men and women in the U.S. armed services and over 1.2 million reservists.<sup>13,68,69</sup> Almost 15% are women across the various services, with the highest percentages in the Air Force, Navy, and Army. There are over 160,000 U.S. troops in the Persian Gulf—most are in Iraq but there are thousands

in Afghanistan, Kuwait, Bahrain, Turkey, and other countries in the Middle East. Most of the troops are men. However there are a significant number of women serving in uniform as well. While women are generally not assigned direct combat missions, the nature of the urban or guerilla warfare in Iraq, especially, brings the battle to posts and roles not designated as combat operations. Nevertheless, the carnage is real; so are the injuries—mental and physical. Women serving in the Gulf as elsewhere must deal disproportionately with sexual abuse and gender discrimination within the U.S. military and often make accommodations to local cultural customs discriminatory against women that these servicewomen would not face in the U.S.

The military operations in Afghanistan and Iraq represent the largest and most sustained ground combat involving U.S. armed forces since Vietnam. Unlike World War I and II, where large forces engaged each other, in uniform and en masse, the modern wars our troops face employ guerrilla warfare tactics using surreptitiously deployed weapons that include the omnipresent roadside IEDs and combat against enemies that do not wear a uniform and can be indistinguishable from the majority of the civilian population. In addition, some of the troops have had multiple tours of duty.

The likelihood of surviving wounds that in prior wars would have been fatal sets the stage for troops seeing and possibly experiencing horrific wounds, scarring, burns, blindness, or multiple amputations.<sup>20,21,24,41</sup> This type of warfare sets the stage for increased medical and psychological illnesses including PTSD, depression, and substance abuse. Unlike previous wars where the number of deaths mirrored closely the number of wounded, improved battlefield medicine has allowed seriously wounded troops to survive, albeit with loss of limbs or multiple limbs. Are our practices attuned to the special needs of multiple-prosthetic amputees? How many patients with traumatic amputation have we treated? Their needs go beyond stump maintenance—self image, PTSD, retraining for a career, and living with a lifelong disability will be essential components of the long-term care.

In addition, there are numerous potential toxic and infectious exposures our troops face that are uncommon in the U.S.<sup>87-97</sup> While the U.S. military may be sensitive to environmental toxicants, the local practices of developing nations may preclude such safety concerns. Moreover, abandoned chemicals, the intermingling of pesticides, motor oils, and other potential toxicants can impact patients variably. Are there health effects from depleted uranium and, if so, who do we contact? Would we be able to identify intermediate syndrome? How would we approach



OIF/OEF patients with diverse symptoms of unrecognized etiologies, and do we have appropriate resources such as a toxicology service?

The desert region has numerous endemic illnesses ranging from parasites and bacteria, even unusual outbreaks of potentially deadly viruses.<sup>1-5,42,60,98-101,102-104</sup> How many of us have seen a case of dengue or leishmaniasis except in a textbook or lecture?<sup>44,57,65,98,101,103</sup> Or treated a case of Q fever?<sup>5,42</sup> Would we be able to differentiate the neurobehavioral effects of brucellosis from the symptoms of PTSD in a returning Gulf warrior?<sup>43,13,22,27,105-109</sup> How long should we be vigilant for signs and symptoms of malaria from a returning soldier who presents with fever?<sup>46,56</sup>

Most of the troops have folks at home who love, depend upon, and worry about them. What is the impact of the Gulf War on families?<sup>71,109</sup> Are we the health care provider to someone who has a son or daughter, husband or wife, brother or sister, close friend in uniform and in a war zone? What special needs do/will they have that we should anticipate and provide? These may include acts of kindness, not just biomedical care. A random call “how are you doing? Have you heard from (the person in uniform)? Need to talk? Got a support network (friends, family, clergy)?” As physicians, we are in a trusted position to ask and a leadership position to try and help. These are times that call upon us to go beyond the mere medical care. Yes, we all perform in an era of multiple competing demands. Many of our colleagues may even be against the U.S. participation in the Gulf. However, we should learn from the lessons of Vietnam and separate our feelings about the war from those for the warrior—our patient.

In the following sections we will discuss the changing nature of battlefield injuries and the impact on survivors and their families, the endemic illnesses of the Persian Gulf, approaches to PTSD and other threats to health, psychosocial issues, as well as emerging resources under development and yet to be realized for the care of our returning troops.

## *Lessons Learned from Gulf War I*

***Health Care to the Military—A Brief Overview.*** Military personnel receive medical care based upon a variety of factors often associated with their “status”—active or career military, Reservist/National Guard, retired, or veteran of a war. Families are often included. Of note, many receive their care from the civilian health care community owing to the fact a significant proportion of troops and their families are not active military but in fact drawn from Reserve and National Guard units.<sup>6,28-32,70,110,111</sup> Many military families also receive their

health care off base. Lessons learned from Gulf War I raise the question, will the VA and domestic military health care facilities have the capacity to treat the complex and often highly specialized needs of all the returning troops?<sup>13,70,71,76,87-97,112-116</sup>

Military health care includes TRICARE/CHAMPUS (Civilian Health and Medical Program of the Uniformed Services) and CHAMPVA (Civilian Health and Medical Program of the Department of Veterans Affairs), as well as care provided by the Department of Veterans Affairs.<sup>30,32,110</sup>

**TRICARE/CHAMPUS.** TRICARE or CHAMPUS is a military health care program for active duty and retired members of the uniformed services, their families, and survivors and certain former spouses worldwide.<sup>110</sup> As a component of the Military Health System, TRICARE brings together the health care resources of the uniformed services and supplements them with networks of civilian health care professionals, institutions, pharmacies, and suppliers to provide access to health care services while maintaining the capability to support military operations. To be eligible for TRICARE benefits, it is necessary to be registered in the Defense Enrollment Eligibility Reporting (DEER) System. TRICARE offers several health plan options. Currently there are about 9.1 million enrolled beneficiaries. Military treatment facilities (MTF) available for TRICARE beneficiaries include 65 military hospitals, 412 medical clinics, and 414 dental clinics. Some civilian medical facilities and health care providers also accept TRICARE but not universally. In the event a VA or MTF is not available to certain returning troops or their families, it is important to work in the community to assist with access to care, especially given the expected biomedical and psychosocial morbidities associated with the current Gulf War.

**CHAMPVA.** CHAMPVA is a medical program through which the Department of Veterans Affairs helps pay the cost of medical services for eligible veterans, veterans' dependents, and survivors of veterans.<sup>110</sup>

**Veterans Administration.** The U.S. Department of Veterans Affairs is responsible for providing a wide range of benefits to over 25 million U.S. veterans and their families.<sup>110</sup> This includes the almost 700,000 U.S. men and women who served in the first Gulf War build-up and combat from August 1990 to June 1991. Currently there are approximately 1400 VA facilities, although the actual number of hospitals, medical sites, and clinics is much less. According to the VA, a "medical facility" includes a VA health system facility, VA medical center, outpatient clinics, community-based outpatient clinics, and veterans' centers, the latter being a place for "counseling" for servicemember and his/her family.

Excluding these veterans' centers, there are approximately 835 facilities where medical treatment can be obtained. Major benefits provided by the VA include health care and disability compensation for illnesses and injuries incurred on military service. The disability compensation includes monthly monetary distributions based upon the degree of disability for service-related injuries or diseases among veterans. A stipulation of benefits is the identification of health risks during military service. The demonstration of such risks can be straightforward such as battlefield wounds or contentious as continues to be seen by the Gulf War I health effects controversy which will be discussed in the next section.

***Gulf War Syndrome.*** During the first Gulf War of 1990-1991 (PGW I) nearly 700,000 U.S. troops were deployed to the Persian Gulf region.<sup>8,32,87-89,92,93,97,115,116</sup> Of concern, a significant proportion of these troops began presenting with a wide array of medical complaints in the years following the end of the war and their return to the U.S.—often referred to as Gulf War Syndrome (GWS). GWS is sometimes referred to as chronic multisystem illness (CMI).<sup>94,95</sup> Over 1 in 7 U.S. veterans has sought federal health care and 17% of United Kingdom Gulf War veterans describe themselves as suffering from GWS.<sup>94,95</sup>

GW veterans' health problems began to emerge in the early 1990s, often soon after their return to the U.S.<sup>87-93,96,97</sup> However the majority of research was not initiated until 1994 or later.<sup>89-91,115</sup> Moreover, many of the veterans' concerns and symptoms were invalidated or attributed to psychiatric illnesses. Information about possible exposures to chemicals or other environmental risks was also delayed, including information about the detonation of a chemical weapons facility. These delays may compromise some of the value of research results. Therefore one important lesson learned is to value the concerns of returning troops.

After numerous studies, including a 10-year follow-up, CMI continues to be more prevalent among deployed than nondeployed veterans. Of concern is CMI, which has yet to be adequately characterized or diagnosed, nor have etiologies been clearly identified; will it become a problem among current or Gulf War II troops?<sup>8</sup>

Whether called GWS or CMI, symptoms usually include but are not limited to fatigue, musculoskeletal pain, sleep disturbances, cognitive dysfunction, moodiness, and other symptoms. These symptoms also had an impact upon veterans being able to sustain employment and impacted activities of daily living. Among those with persistent medical complaints, approximately 100,000 have been enrolled in a variety of registry and examinations programs.<sup>89-97</sup> Similar symptoms have been experi-

enced by British, Australian, Danish, and Canadian troops deployed during PGW I.<sup>95</sup> Most of these studies and registries report increased numbers and severity of virtually all symptoms when compared with personnel not deployed in the Persian Gulf region.

Numerous potential culprit etiologies have been suggested. Concerns arose within the Veterans Administration and Department of Defense (DoD) whether veterans of Gulf War I have a medical illness of undetermined etiology? Conspiracy theorists opined that DoD was withholding information about possible exposures and undisclosed chemical or other weapons of mass destruction (WMD) operations and that the U.S. Government had much to lose by admitting an illness since a military-associated medical illness would result in an enormous cost of benefits given the VA provides monetary and medical benefits for military-related disability. The government did not divulge the destruction of a nerve agent chemical plant at Khamisiyah until a few years after the war. Nevertheless, the DoD and VA expended enormous resources and undertook numerous studies including collaboration with the Institute of Medicine—a highly regarded scientific organization and other prestigious, independent research organizations such as the National Academies of Science, the UK Royal Society and Medical Research Council.<sup>91,93,95</sup> Resulting research suggested that GWS was not an easily defined, known disease entity, nor was it, as initially thought, a classic psychiatric disorder. PTSD was present but not in sufficient quantity to account for what was emerging as a significant health problem. What has been observed, and persists, is a large number of symptomatic veterans in ill health.

Concerns were also raised about undisclosed biological and chemical weapons as well as countermeasures. Military planners expected biological and chemical weapons. As a result, the DoD authorized a variety of countermeasures be administered to the troops. These included the controversial anthrax vaccine. The British provided their troops with vaccines against anthrax, plague, and pertussis. In some epidemiologic studies, an interaction between unexplained symptoms and receipt of anthrax vaccine, receipt of multiple vaccines and place of vaccination were discovered.<sup>87,88</sup> Evidence of cellular immune activation in a cohort 10 years after PGW I was also detected. Not all ill health were accounted for by these findings.

It is well known in health care that no medical intervention—be it antidote or preventive measure, is a free ride; virtually all carry side effects. Moreover, while individual countermeasures may have been studied by their manufacturers and other medical researchers and evalu-

ated by the Food and Drug Administration, the potential for adverse events by the concomitant administration of multiple countermeasures has not been well tested. Troops in the Gulf may ostensibly become a vaccine-adverse event research cohort.

Some coalition forces also received pyridostigmine bromide to counter the threat of nerve agents and pesticides, the latter being used throughout the theater of operations to reduce the enormous threat of insects and the diseases they transmit. The military also provided N,N-diethyl-m-toluamide (DEET) and permethrin insect repellants. A study at Duke University conducted animal experiments on the combination of countermeasures and insect repellants—DEET and permethrin used by the various militaries.<sup>87</sup> They found that the insect repellants and the nerve agent preventive agent pyridostigmine bromide (BP) were harmless when used alone but could be highly toxic when combined. The researchers suggest that their findings explain the symptoms reported by an estimated 30,000 Gulf War I veterans.<sup>93</sup> These symptoms include respiratory complaints, digestive and skin disorders, fatigue, and memory loss. Some exhibit limb pain or numbness and recurring rashes. The researchers suggest the combination can cause neurological defects. Their results are consistent with a study by the University of Glasgow that identified in a small group of subjects a pattern of nerve damage. Another study demonstrated damage to their immune system in some PGW I troops. Scientists agree it is unlikely there is a unique disease to account for GWS but more likely several etiologies based upon exposures and other yet to be identified influences.

Also worth noting is the wide array of insect repellants used by locals in the desert who do not have access to safer, modern alternatives; these older agents can behave like weakened nerve agents. Sarin originated as an organophosphate pesticide. Those exposed to organophosphates, especially over time, or nerve agent victims, even when treated rapidly and appropriately, may exhibit long-term sequelae that include nightmares and personality changes.

Some allied troops were potentially exposed to the chemical warfare agents sarin and cyclosarin when the munitions facility was detonated in Khamisiyah, Iraq. Numerous studies have been conducted to evaluate the possible association between proximity to Khamisiyah and a wide array of symptoms from troops in that area at the time of detonation. Except for a trend towards more diagnosis of any type of cancer, no other long-term health effects were associated with the detonation at Khamisiyah.

The battlefield by definition is a dangerous place, made so by ubiquitous chemicals, oil well fires, depleted uranium, pesticides, explosion plumes,

aerosolized dust and fumes, and other hazards. Depleted uranium has been implicated for some of the health effects of GWS but it alone cannot account for these given troops in rear areas or sailors—both groups without exposure to depleted uranium experienced similar symptoms to those in proximity to depleted uranium. Multiple chemical sensitivity and Mycoplasma species have also been suggested. Again, studies fail to implicate these in all but a few cases.

With the magnitude of troops in PGW I experiencing the variety and severity of symptoms, clearly there is a problem. What the answers are to the Gulf War health problem remain elusive. To be sure, the etiology(s) of GWS is not a one-size-fits-all answer and the links between cohorts or the ability to assign etiologies to groups has been difficult even after years of research. Troops were exposed to chemicals, infections, and combinations thereof, which have not been experienced on such a scale in the past and thus the science must in effect catch up with the symptoms. With the dizzying array of chemicals and potential combinations of environmental contaminants, toxicants compounded by the horrors of war, continued research is necessary. Nevertheless, a key lesson learned from PGW I that can be applied to the current Persian Gulf experiences is to give the returning troops the benefit of the doubt, obtain a thorough medical, exposure, travel, and occupational history. Infections, military medical countermeasures, environment or battlefield chemicals, and the experience of war can create a dynamic interplay of multiple morbidities confounding diagnosis. Often there is tremendous therapeutic “relief” that results from validating the patients’ concerns. The DoD and VA have developed a variety of resources included web-based risk communication and clinician implementation support (<http://www.pdhealth.mil>) and complementary tool kits ([http://www.pdhealth.mil/clinicians/PDHEM/Toolkit/view/2/guideline\\_ver1.2.doc](http://www.pdhealth.mil/clinicians/PDHEM/Toolkit/view/2/guideline_ver1.2.doc)) and practice guidelines (<http://www.oqp.med.va.gov/cpg/cpg.htm>). Returning Gulf War II troops may pose complex diagnostic challenges and require long-term medical and psychosocial support and care but data suggest early treatment offers the greatest promise for enhanced quality of life and likelihood of recovery.

## *Health Care Needs of Returning Servicemen and Servicewomen*

**Biomedical Issues.** There are over 160,000 troops deployed in the Persian Gulf. According to a CNN review of Pentagon figures, 855 U.S. servicemembers have died so far in 2007. The next highest death toll was in 2004, when 849 were killed.<sup>6,12,45,62,68,69,85,102,111</sup> The total number of

U.S. military deaths in Iraq stands at 3,858, including seven civilian contractors of the Defense Department.<sup>111</sup>

Combat-related injuries are typically the most severe and dramatic health risks encountered during military conflicts. Of note, historically it has been the noncombat injury and illnesses that have had a significant impact on military missions.<sup>1,3</sup> In this section we will discuss the combat-related injury, especially TBI and those resulting in amputation, followed by infections that may manifest in illness either in the Gulf or when the serviceman or woman returns home.<sup>1,3,15-18,20,21,60,62,63,108</sup>

Large numbers of U.S. troops are returning from southwest Asia, an area where numerous endemic infectious illnesses, desert illnesses, and insect-borne diseases are pervasive. Our returning troops may present with infections that are not common to the U.S. but may have initial symptoms that could be misattributed to common, relatively harmless domestic illnesses. Studies suggest clinicians do a poor job of inquiring about recent travel and diagnosing travel-related illness. In fact, less than 20% of patients with a confirmed travel-related illness were asked about travel; this resulted in delayed or missed diagnosis.<sup>117-119</sup> This is a cautionary tale to remind us to inquire about deployment, military experiences—even the monthly and yearly obligatory domestic deployments of Reservists, and travel out of the war zone, realizing each country presents an often unique set of risks.

As it is likely civilian physicians will provide care for a significant proportion of returning Gulf War troops, a familiarity with the medical problems they face—combat and noncombat—is essential to anticipating the needs of the troops and ultimately providing the best biopsychosocial care.

***Combat-Related Injuries.*** Much of our knowledge concerning combat wounds has been derived from prior Gulf War and other military operations. Operation Iraqi Freedom is the first large-scale combat operation since PGW I that involves the U.S. Marines.<sup>24</sup> One of their combat surgical companies has provided updated information for consideration; most wounds were the result of high-explosive weapons/munitions such as mines and grenades, with 51% of the wounds to the extremities.<sup>24</sup> Of note, military blast exposure, mostly in the form of roadside IED, continues to be the primary mechanism of injury.<sup>25,33,37-40</sup> In 2005, the U.S. Military reported 10,953 IED attacks; an average of 30/day. New combat body armor can protect troops from penetrating ballistic injury such as bullets but does not provide significant protection against IED, especially blast overpressure, which will be discussed in the following section.<sup>37-39</sup>



**FIG 3.** Car Bomb. Reprinted with permission from AMA National Disaster Preparedness Program-Basic Disaster Life Support (BDLS version 2.5, Ch. 3-Explosives).

*Explosives and Blast Injury (Fig 3).* Bombings and the use of explosives represent the majority of terrorism-related mass casualty incidents—domestic and foreign, as well as a significant proportion of injuries in OIF and OEF. Explosives inflict damage by creating a rapid release of energy in the form of gases and heat, depending upon the type of explosive used.<sup>33-41</sup> From a terrorism perspective, there are four categories of explosives ranging from (1) projectiles such as missiles; (2) those set to explode when triggered by a target such as land mines; (3) passive weapons detonated remotely; and (4) weapons (usually of category 3) designed and placed to produce the greatest degree of physical and psychological damage. The latter two are used most often in modern insurgencies. There is also a phenomenon referred to as “overpressure” with high explosives.<sup>34,38,39</sup> The flames, “rush of air,” and pressure changes all cause injuries. The chain of events beginning with the initial blast determines the general and neurological injuries that the victim sustains.

The mechanism of injury resulting from explosives includes (Fig 3) primary blast injury, secondary, tertiary, and quaternary blast inju-



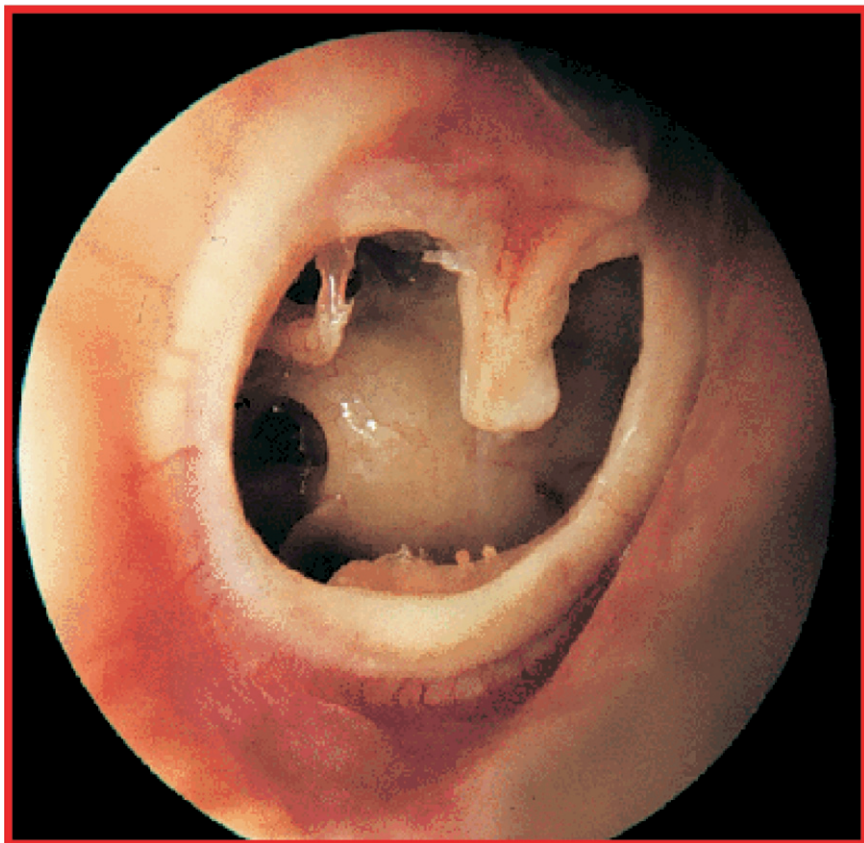
ries.<sup>38-41</sup> Blunt, penetrating, and thermal injuries are all possible as well as psychological trauma. In addition, patients can experience exacerbation of underlying medical conditions such as asthma and hypertension.

*Primary Blast Injury.* Conventional explosives generate a biphasic blast wave (Friedlander Wave Form) that spreads from the primary point source.<sup>33,39</sup> The first phase is a high-pressure shock wave of very brief duration. It is followed by the second phase—the blast wind, which is air in motion, and how the phrase “winds of war” emerged during the Civil War, when observers found some of the dead on the battlefield did not have visible wounds.<sup>33</sup>

Injuries from the initial blast are the direct result of blast overpressure on tissue; the outcome differs comparatively concerning hollow or solid organs.<sup>15-18,35,40,41</sup> Among the organs most susceptible from blast overpressure are the ears, the lungs, the gastrointestinal tract, and the brain. These organs are most affected as a result of the interface between a solid or liquid and air. As the pressure wave passes through the tissue, the molecules of the solid or liquid are thrown into the gas media.<sup>33,38,39</sup> Bowel perforation can be acute or delayed as a result of blast injury. The colon is more susceptible than the small bowel, owing to the relative air in the former. Of note, the patient who may have lung or brain injury from primary blast injury may not appear to have been injured! Stories from WW II of troops found dead with apparently no injuries, when autopsied, were found to have extensive pulmonary and/or brain primary blast injury.

Pulmonary barotrauma is the most fatal of the primary blast injuries.<sup>38,40,41</sup> Disruption caused by pressure differentials across the alveolar–capillary interface can lead to hemorrhage, pulmonary contusion, which on chest X-ray results in the classic “butterfly” or bilobar pattern, pneumothorax, pneumomediastinum, and subcutaneous emphysema.<sup>40</sup> These can also lead to air embolism resulting in ischemia and hypoxia.<sup>38,40,41</sup> Disseminated intravascular coagulopathy is possible (DIC).

The ear is the most vulnerable to blast overpressure.<sup>15,35,40,41</sup> Rupture of the tympanic membrane (Fig 4) is a sentinel finding of blast exposure and can occur at a relatively low pressure differential. Recall the “ear pain” during the landing of an airplane. As little as 5 psi above atmospheric pressure can rupture the human eardrum.<sup>35</sup> The injury is dependent on the orientation of the ear to the blast.<sup>15,35,40</sup> Middle ear and inner ear damage can also occur. Some key signs that may not have been disclosed in the war zone but may be revealed at home include vertigo, tinnitus, otalgia, hearing loss, and bleeding from the external canal. Partial or total hearing loss can complicate triage since the victims will



**FIG 4.** Tympanic membrane rupture. Reprinted with permission from AMA National Disaster Preparedness Program-Basic Disaster Life Support (BDLS version 2.5, Ch. 3-Explosives).

have difficulty following verbal commands and difficulty answering questions.

In a recent study of battlefield blast injury victims in Iraq, researchers noted a significant association between tympanic membrane perforation and loss of consciousness.<sup>15,35</sup> This association between barotraumatic tympanic membrane perforation and concussive brain injury suggest clinicians encountering patients with ear-related complaints should have a high index of suspicion for concomitant neurologic injury including TBI.<sup>15,16,33,34</sup>

*Secondary, Tertiary, and Quaternary Blast Injuries.* Secondary and tertiary blast injuries can result in penetrating wounds. Secondary blast injury results from flying debris.<sup>33,40,41</sup> This also results in blunt injuries;

penetrating injuries result from fragmentation. Approximately 10% of blast survivors will have eye injuries. Signs and symptoms include pain, irritation, foreign body sensation, hyphema, globe damage, altered vision, and periorbital swelling.

In tertiary blast injury the patient becomes a missile and can become impaled or hit a hard surface.<sup>33,34,40,41</sup> This can result in a combination of penetrating and blunt injuries such as fractures, closed and open, brain injuries, etc.

Quaternary blast injuries are the most random of blast injuries and are caused by circumstances associated with the explosion, such as structural collapse, release of dust, toxins, chemicals, even effects of fire.<sup>33</sup> Carbon monoxide and/or cyanide from incomplete combustion of synthetic materials used in new construction is possible. Therefore, in addition to the blast effect, thermal injury is possible and can cause first-, second-, and/or third-degree burns in addition to other traumatic injuries.

Traumatic injuries and traumatic brain/neuro injuries are discussed in the following sections.<sup>15-18,33,40</sup>

While there are many other mechanisms of injury associated with explosives—ranging from crush injury, traumatic asphyxia, and others, they are beyond the scope of this monograph.<sup>33,40,41</sup> However, the use of combination weapons that include chemicals has resumed in Iraq.<sup>120</sup> In early April 2007, several chlorine gas suicide attacks occurred in Iraq, including a truck bomb explosion in Ramadi, releasing chlorine and killing at least 20 people.<sup>20</sup> These attacks have resulted in numerous injuries and deaths and raise the specter of greater use of chemical weapons by terrorist groups worldwide. Chlorine is the prototypical moderately water-soluble irritant gas.<sup>121</sup> It has been reported that Hamas used pesticides, rat poison, cyanide, and even infectious agents as part of their improvised explosive devices.

***Traumatic Injury/Amputations.*** Injuries resulting from war can produce a myriad of emotions.<sup>14,20-25,27,28</sup> The needs of those who suffer amputations are interrelated but distinct from other injuries.<sup>14,20-22,27,28,31</sup> Amputations or blindness result not only in the loss of body function, which is significant in itself, but also are dramatic insults to the patient's psychological sense of body integrity, self-image, competence, and worth. In addition to the loss of sight or limb(s), these wounded must often endure other injuries and psychological traumas, which cannot be underestimated or underemphasized.

Attendant to these wounds are fears of persistent threats, anxiety about military career being curtailed, and response from loved ones. Reactions to past experiences in addition to the above set the stage for complex,

tumultuous emotional struggles.<sup>14</sup> While any of these challenges can overwhelm a person's psychological equilibrium, taken in totality, all of these set the stage for exceptionally devastating physical, psychosocial hurdles.

Studies reveal a variety of emotions after the initial trauma and throughout the rehabilitation process in the amputee—depression, anxiety, resentment, anger, fear, helplessness, hopelessness, grief responses, relationship difficulties, and body image problems.<sup>14,22,27,28,31</sup> Also phantom pain is likely in some. Changes in physical appearance may complicate personal relationships. Family members may need extensive assistance in adapting. Patients have fewer emotional problems and good social support had better outcomes adjusting to prostheses.<sup>14</sup> Clearly a biopsychosocial approach to the blinded or amputee is necessary to promote psychological and physical healing and a successful return to family and society even with the new limitations.

Newer and more advanced prosthetics have been developed which increasingly mimic much of the natural function of native limbs. We are, however, a distance from the “bionics” and surreal prosthetics made famous on a variety of television shows. Nevertheless, amputees face better opportunity for increased function than in the past. Notwithstanding, the road is long and rehabilitation often painful, discouraging, time consuming, and potentially expensive even with benefits.

Evidence suggests, after a traumatic lower extremity amputation, admission to a specialized inpatient rehabilitation program significantly improves functional and vocational outcomes, as well as reduces bodily pain.<sup>21,22</sup> The U.S. Military has two major centers for amputees—Walter Reed Army Medical Center including their Psychiatric Consultation Liaison Service and Brook Army Medical Center in Texas. Reservist/ National Guard troops will likely receive their care, at least initially, from the military. However, civilian clinicians may be called upon, as the patient transitions home, as well as caring family members.

Amputees go through a variety of emotional and physical rehabilitative changes in addition to social ones. Amputees often are concerned about if and how relationships with friends and family will change. Their anger may manifest in different ways and be targeted to family, friends, even health care professionals. Patients must be allowed to find healthy ways to communicate but HCP should be able to tolerate the expression, especially early in the aftermath as a normal response to a horrific, life-changing event. Later, amputees may start expressing fears about sexual functioning.<sup>9,14,20-22</sup> Allowing the patient to address these issues openly, and, facilitating such dialogue among partners, is enormously

helpful. Amputee patients can more effectively be treated if addressing the needs of the patient's family. Loved ones may want to spend time with their injured family member. Of concern, they may not, and reasons should be addressed.<sup>9,14</sup> These include fear of what to say, guilt, squeamishness looking at the wound, and other issues. Children, though often more resilient than given credit for, should nevertheless be assisted in understanding and integrating the experience in a less traumatic fashion before encountering the amputee.<sup>9,14,20-22</sup>

A variety of resources are being developed to care for the traumatized patient. The VA and other military medical facilities are improving their mental health services and emphasizing the need to collocate them with orthopedic and other medical services. Different rules may apply to disability benefits concerning active duty compared to Reserve or National Guard.<sup>110</sup>

Whether military or civilian, it is important to address patient concerns and their future goals. Moreover, it is important to assist them in achieving realistic goals. Some do not want to give up their uniform—either out of duty or out of fear of losing career and being unable to support their family.

***Traumatic Brain Injury (TBI).*** TBI may become the “signature wound” of the global war on terror and PGW II given the ubiquitous nature of explosions, especially in Iraq.<sup>15-18</sup> Blast injury is the most common cause of war injuries; different than in prior wars such as Vietnam when ballistic projectiles caused a significant proportion of injuries. According to the Defense and Veterans Brain Injury Center, TBI afflicts between 14 and 20% of military service members. So far, several thousand have been treated for it, while thousands are believed to be undiagnosed.<sup>17,18</sup>

Primary blast injuries to the brain and spinal cord include blast wave induced concussion as well as barotrauma caused by acute gas embolism, which can produce ischemia and infarction. Loss of consciousness and contrecoup/coup injuries are possible. Of course, the severity of wounds will differ depending upon proximity to explosion, body armor, and other factors.

There are many causes of head trauma. These include blast exposure, gunshot wounds, and motor vehicle injury. According to military data, troops in Iraq experience one explosion a month, on average. Each blast raises the risk that the next one will do harm. A blast creates a sudden increase in air pressure followed by a rapid decrease in pressure.<sup>15-18,33,38-41</sup> These pressure shifts can injure the brain directly, producing contusion or concussion. Air emboli can also occur, resulting in infarcts. Neurological injuries resulting from explosions

are the result of a complex cascade of physical and biological events.<sup>33</sup> A pressure wave from the blast courses through the brain, initiating the damage. While severely injured troops are supposed to be screened for head trauma, others who were not obviously injured but were nevertheless rendered unconscious may not present for care nor be considered victims of head injury. However, the group of troops who are rendered unconscious *are* at risk for TBI and may develop difficulty concentrating, manifest increased irritability or other signs and symptoms but remain undiagnosed. Because behavior-related injury such as PTSD has been considered a disorder associated with malingering, the symptoms of unrecognized TBI can as well, further confounding the situation. Much of what we know about head injuries are from prior wars, sports concussion patients, and civilian TBI literature. Lessons learned from OIF and OEF will undoubtedly provide additional information.

*Diagnosis.* While there are screening/assessment tools available, diagnosing TBI, especially combat-related, is imprecise. The diagnosis remains largely based upon clinical signs and symptoms in addition to a thorough history that includes detailed information about how the patient is adapting to and conducting activities of daily living and, of course, if in proximity to an explosion.

Different syndromes are identified relative to the effects of the trauma and resulting hemorrhage, barotrauma, edema, and tissue disruption.<sup>36</sup> Dyspraxia, dysphasia, executive dysfunctions, paralysis, deficits and dysfunctions of the special senses, and mood disorders can occur and evolve.<sup>15,18,36,40</sup>

Symptoms include frequent headaches, dizziness, and difficulty with concentrating and sleeping. Depression, irritability, and confusion may occur. Some patients may be easily provoked or distracted. Speech and/or vision may be impaired. Many of these symptoms overlap with PTSD.<sup>14,26,71-73,76,78-81</sup> Some TBI victims have been misdiagnosed with personality disorders and lost their jobs upon returning to the U.S. because of unrecognized and thus untreated symptoms. Fortunately most TBI are mild and most patients recover within a year. However, one of five troops with these “mild” injuries may still have prolonged, even lifelong symptoms requiring continuing medical care, according to military estimates.

Walter Reed Army Medical Center categorizes the severity of TBI according to the duration of loss of consciousness and posttraumatic amnesia as follows:

- Mild TBI: an injury causing

- Loss of consciousness for <1 hour or
- Amnesia lasting <24 hours
- Patients usually do not have visible abnormalities on brain imaging
- Moderate TBI produces
  - Loss of consciousness lasting between 1 and 24 hours or
  - Posttraumatic amnesia for 1 to 7 days
- Severe TBI causes
  - Loss of consciousness for more than 24 hours or
  - Posttraumatic amnesia for more than 1 week

*Brain Imaging Studies.* Of note, patients with moderate or severe TBI may have punctate hemorrhages visible in the corpus callosum and other regions, as well as evidence of bleeding or swelling on brain imaging studies.<sup>15,18,26,35</sup> Patients with minor TBI may not have visible abnormalities. Nevertheless, such testing should be obtained and consultation with neuroradiologists, neurology, and neuropsychology specialists in brain injury is important and should be done early.

It is important to remember that troops are proud and thus may be reluctant to seek help for what is seemingly an innocuous injury on par with “getting your bell rung” in a football game. Nevertheless, it is important to ask patients who have been in a war zone, especially OIF and OEF, about exposures to explosive events and perform a thorough evaluation, documenting the functional status. Although not considered combat troops, it is important to screen female troops as well; many have been exposed to IED. If in doubt, consider referral to health care facilities specializing in TBI.

*Treatment.* The usual approach to TBI patients is to work on specific symptoms and deficits—headaches, anxiety, vision problems, memory, and attention span.<sup>15,18,26,35,76,80</sup> To date, there is no “cure” for the injury itself. A multidisciplinary approach is required and clinicians should be knowledgeable about local resources to refer suspected brain-injured patients, neurological and psychological HCP with expertise in the treatment of such patients. It is important to explain to the returning PGW II patient that you are not sending him/her away, that you are enlisting the services of experts but are going to be engaged in the process and help both the family and the patient through this.<sup>122-126</sup>

Medications as needed can be utilized to manage epilepsy and headaches; those with fewer cognitive side effects are preferred compared to older ones, which can compound patient challenges.

Given that the diverse nature of the neuropsychiatric sequelae of TBI and that the trajectory of recovery can continue for several years,

medications should be selected that take into consideration adverse effects and impact on daily living. Mood disorders, epilepsy, and memory deficits can develop within the first 2 years of injury. Psychosis can arise up to 10 years and dementia can occur later during the lifespan of the patient.

It is worth recognizing that poverty and disability are interconnected. Social, familial, and financial support are important, in addition to appropriate medical and neuropsychiatric care.

Some states are being very proactive; Illinois officials have implemented a plan that would screen members of the state's National Guard for TBI and provide a 24-hour hotline with psychological counseling and other interventions.<sup>26</sup>

Stories persist of troops who were in close proximity to explosions but were considered "unwounded" because they did not have obvious injuries. These troops are now developing behavioral and memory problems and have clearly been injured by the blast. Given there can be a time delay between blast and neuropsychiatric symptoms, the astute clinician will be attuned to this issue when caring for returning troops. In the majority of cases, explaining what is occurring, helping the patient and friends cope with some of the challenges, referring to appropriate care, and conveying "tincture of time"—time to heal, is the normal course of illness can be very reassuring.

*Prevention.* Can TBI be prevented? Newer body armor and Kevlar helmets have allowed troops to survive attacks. The current helmets utilized among the four services in OIF and OEF were designed to protect against ballistic projectiles and shrapnel, not necessarily blast injuries. As a result, open head injuries have been significantly reduced; closed head injuries as discussed above now outnumber penetrating ones, which, for obvious reasons, are easier to diagnose.<sup>37</sup>

Some of the standard issue padding is either uncomfortable or inadequate in providing appropriate stability, protection, or comfort. As a result, either the troops do not wear the helmets or the equipment may not provide adequate protection during an explosion. Upgrades are being developed. A civilian charity—Operation Helmet—has been providing free of charge advanced padding systems that troops can install in their helmets.<sup>37</sup> Research into new helmets designed to better protect against explosions is ongoing.

*Infections.* Infections remain a leading cause of death worldwide.<sup>65,106,117</sup> While the U.S. has been able to significantly control many of the infectious diseases and/or vectors that continue to afflict much of the rest of the world, global pathogens remain a threat to the



U.S. nevertheless.<sup>65,106,117,127</sup> Our troops will face two primary sources of risk for infection—wound-associated and endemic infectious diseases.<sup>1-6,49,65,106,108,117</sup> What follows is an overview of the most important exposures that may persist in the patient post deployment and thus may be brought back into the U.S. for civilian physicians to diagnose and treat.

**Wound Infections/Colonization.** Nosocomial infection with multi-drug-resistant *Acinetobacter baumannii* occurs in U.S. hospitals but has emerged as a significant problem among wounded troops and military medical facilities.<sup>1,49</sup> *A. baumannii* can cause wound infections, osteomyelitis, urinary tract infections, and respiratory infections. Not surprising, there is a geographic component to infectious threats. Multi-drug-resistant *A. baumannii* infections are described as epidemic among wounded in Iraq, compared to Afghanistan. Of concern, nosocomial transmission of *A. baumannii* within Walter Reed Army Medical Center resulted in 53 infections and four deaths.<sup>49</sup> As a result, wounded patients are often isolated upon return to the U.S. until they are cleared of *A. baumannii*. Infection control is good medical practice. It is important to address nosocomial infections, especially given the commonplace nature of this problem in U.S. hospitals. While the organism may be different in civilian health care facilities compared to combat hospitals, nevertheless, unnecessary deaths and protracted illness occur because of inattention to infection control measures as basic as handwashing and separating dirty from clean activities.

**Endemic Infectious Diseases: Overview.** During U.S. military deployments over the last 15 years, the four most commonly reported diagnosis categories have been non-combat-related orthopedic injuries, respiratory infections, skin diseases, and gastrointestinal infections. Clearly infectious illness is a leading cause of morbidity in the Gulf.<sup>1,5,42,43-45,48,49,60,102,127-133</sup> Given hundreds of thousands of U.S. servicemembers have been deployed to Afghanistan and Iraq as well as other Middle East and southwest Asian nations since 2001, it is important to discuss the common and/or chronic infections that may occur or persist upon the return of troops.<sup>45,46,55,56,102</sup> Of note, there are both similarities and differences in infection risk concerning Iraq and Afghanistan<sup>58</sup>; it is worthwhile inquiring as to the countries the returning serviceman or woman has been deployed to as well as countries visited on R and R, which can include Qatar, Bahrain, and other Middle East locations, remembering that the incubation periods of endemic illnesses can be quite long—infection can occur in one region with symptoms evolving elsewhere. Infection during deploy-

ment may not manifest until return from overseas and the astute clinician will be alert to unusual signs and symptoms. What follows is a discussion of the infectious agents that already have caused illness or pose a significant threat especially if left undiagnosed.

*Infectious Diarrhea.* During the early stages of OIF and OEF large outbreaks of norovirus and *Shigella* infections resulted in severe gastroenteritis.<sup>1,50-52</sup> Seventy seven percent of personnel deployed to Iraq and 54% of those deployed in Afghanistan reported at least one episode of diarrhea. Personnel in Iraq tended toward more severe symptoms, longer duration of illness, and greater likelihood of multiple episodes that correlated with local food consumption. In the summer of 2004 a surveillance study revealed that 50% of troops in Iraq had multiple episodes of diarrhea.<sup>1,50-52,101</sup> Field tests found enterotoxigenic *Escherichia coli* and enteroaggregative *E. coli* as the most common pathogens. *Entamoeba histolytica* and other protozoans were found. In 2005 another outbreak of diarrhea involving U.S. troops revealed >50% were infected with *Cryptosporidium* species. Soldiers who present post deployment with chronic diarrhea should be thoroughly evaluated including consideration of post infection irritable bowel syndrome and for parasites such as *Giardia*, *Cryptosporidium*, and *Entamoeba*.

*Leishmaniasis.*<sup>1,2,44,57,61,67,102,103,129,131</sup> In 2003 >600 cases of cutaneous leishmaniasis (CL), and between 2002 and 2005 827 cases of CL and 5 cases of visceral leishmaniasis were diagnosed in U.S. soldiers deployed in Iraq, Afghanistan, and Kuwait.<sup>44,57,102</sup> From March 2003 to June 2005 an estimated 23% of deployed U.S. ground forces were diagnosed with leishmaniasis. Leishmaniasis is a sandfly-borne parasitic disease caused by protozoa that live inside mammalian macrophages. This is problematic given U.S. troops suffer intense vector exposures and report receiving numerous insect bites. The high season for insects runs from April to December. As part of a prevention strategy and control research over 50,000 sandflies were collected from sites throughout Iraq; between 0.06 and 2.78% of flies were infected with leishmaniasis. Of concern, use of insect repellent seems to be problematic among troops. In one study of troops infected with Old World Cutaneous Leishmaniasis (OWCL), 80% said they used insect repellants but 26% said that appropriate vector control was unavailable at some point during their deployment.<sup>2,61</sup> In another study, 14.6% reported using DEET more than occasionally and 51.2% never used it. Only 21.6% believed the product was safe. Clinicians caring for Reserve and National Guard members should counsel their patients that DEET, especially 30-50%, is a safe and effective measure to reduce the risk of insect-borne illness. OWCL is



**FIG 5.** Cutaneous leishmaniasis ulcer. Reproduced from the Department of Health and Human Services, Centers for Disease Control and Prevention. Available from: <http://phil.cdc.gov/phil/details.asp>.

usually associated with the species *Leishmania major* and *Leishmania tropica*.

Leishmaniasis infection is characterized by diverse clinical manifestations ranging from asymptomatic infection to self-limited cutaneous disease to life-threatening visceral disease.<sup>103,129,130</sup> There are three major clinical patterns of leishmania disease: (1) visceral disease, in which the parasite replicates throughout the reticuloendothelial system (RES); (2) cutaneous disease, whereby the parasite replicates in the dermis of the skin; and (3) mucosal disease, whereby illness involves the naso-oropharyngeal mucosa.

CL or OWCL is the most common of the three patterns.<sup>44,57,67,102,103,131</sup> In patients with CL,  $\geq 1$  skin ulcer (Fig 5) or nodule forms in the absence of fever, anemia, hepatomegaly, or splenomegaly. It may self-heal without medical intervention in 7 to 12 months. However, it can also, albeit uncommonly, disseminate locally with subcutaneous nodules or regional lymphadenopathy. *L major* and *L. tropica* can evolve into diffuse cutaneous leishmaniasis.<sup>129</sup> The presentation of CL among U.S. troops is generally chronic, painless skin

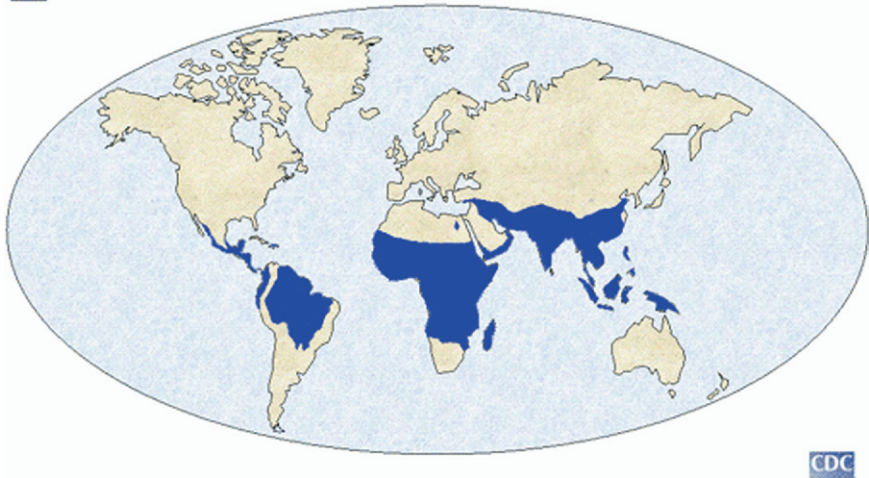
lesion(s), which are often ulcerative, with a dry, scaling eschar. Of note, the appearance of the skin lesion can vary.

Old World Visceral Leishmaniasis Disease (OWVLD) usually begins in the absence of recognizable skin lesions or scars. Leishmania illness is associated with *L. infantum* and *L. donovani*.<sup>45,128</sup> These species are also more likely to cause chronic, reactivating illness. OWVLD can be asymptomatic, subclinical, or symptomatic. Symptoms of OWVLD include irregular or chronic high fever, cough, weight loss, hepatosplenomegaly, lymphadenopathy, and fatigue, with labs consistent with anemia and pancytopenia. In the immunocompromised, those coinfecting with immunosuppressing or other pathogens such as human immunodeficiency virus, in the malnourished, or in young children, visceral leishmaniasis can be fatal. Among the troops infected with visceral leishmaniasis the incubation period is varied but could be prolonged as much as 14 months after returning from the combat theater.<sup>45</sup> Specific parasitological diagnosis requires tissue biopsy specimens from bone marrow, liver, lymph node, or spleen; the latter should be avoided for risk of hemorrhage. Treatment with liposomal amphotericin B has been effective.

Diagnosis depends on parasitological confirmation from skin scraping, slit skin smear, or biopsy. Culture and polymerase chain reaction (PCR) permit speciation; species identification may have an impact upon management strategies.<sup>130</sup>

Treatment for *L. major*, which is usually self-limited but can persist up to 12 months, includes watchful waiting, cryotherapy, heat therapy, topical paromomycin, azoles such as ketoconazole or fluconazole, and the pentavalent antimonials, which can be administered intralesional and parenterally.<sup>67,131,132</sup> However, systemic therapies such as the azoles are reserved for larger or multiple lesions as well as cosmetically problematic lesions. The clinician should be especially sensitive to the cosmetic and emotional needs of the returning troop and not assume the lesion is not bothersome visually. Perception is reality and the serviceman or woman may assign more value to the lesion as part of an overall post combat emotional response. Therefore it is important to take the entire context of their deployment experience—medical and psychological health—into account when providing care. In contrast to *L. major*, other species are often treated more aggressively with systemic therapies. However, treatment may not eradicate leishmania infection as this is a persistent intracellular organism. Nevertheless, systemic treatment can control clinical disease. Leishmania can reactivate in patients who become immunocompromised. Patients should be counseled against blood donation; military policy dictates lifelong deferral of blood donation for

## Distribution of Malaria



**FIG 6.** World map-worldwide distribution of malaria. Reproduced from the Department of Health and Human Services, Centers for Disease Control and Prevention. Available from: [http://www.cdc.gov/malaria/distribution\\_epi/distribution.htm](http://www.cdc.gov/malaria/distribution_epi/distribution.htm). (Color version of figure is available online.)

persons who are diagnosed with leishmaniasis whether treated or not.<sup>2,44,45,103,133</sup> Given some returning troops may be financially challenged and consider blood donation for funds, it is worth emphasizing that the donor can infect an innocent individual. It is also of value to identify patients who have returned from PGW II who may be facing financial hardship and guide them to appropriate resources in the community.

**Malaria.** Malaria is a serious global threat and potentially deadly parasitic illness resulting from the bite of an infected mosquito.<sup>46,56,65</sup> Moreover it remains a significant military challenge in endemic areas. In 2004 there were 56 cases acquired in Afghanistan and diagnosed among U.S. Army soldiers; soldiers presented for care weeks to 20 months after return to the United States. There were 261,456 malaria cases in Afghanistan reported to the World Health Organization (WHO), of which 80% were *Plasmodium vivax*<sup>58</sup> (Fig 6). An outbreak of *P. vivax* among Army Rangers was reported after deployment to eastern Afghanistan.<sup>46</sup> A case of acute respiratory distress syndrome occurred in a patient who may have developed primaquine-resistant *P. vivax*. *P. falciparum* is possible. The observed attack rate was 52.4 cases per 1000 soldiers with the diagnosis made from 1 to 339 days after return to the U.S. Self-reported rates of mefloquine prophylaxis and primaquine prophylaxis were 52 and 31%, respectively. Clearly greater attention, education, and follow-up of

prophylaxis are necessary to reduce the risk to our troops. Given some troops will be treated by civilian health care professionals, malaria should be considered in patients with fever, chills, sweats, headaches, myalgias, fatigue, nausea, and vomiting. Symptoms can occur 7 to 9 days after being bitten but this is variable. Moreover, malaria may cause anemia and jaundice. *P. falciparum* species infection, if not treated, may cause kidney failure, coma, and death.

Malaria is a risk in all areas of Afghanistan below altitudes of 2000 m from April to December. Chloroquine is not an effective antimalarial drug in Afghanistan but, according to Centers for Disease Control and Prevention, is recommended in Iraq as the preferred antimalarial drug. Risks for malaria in Iraq are primarily in the nonurban areas such as Basrah, Dhok, Erbil provinces, and areas below 1500 m.<sup>58</sup> Atovaquone/proguanil, doxycycline, or mefloquine are recommended for prevention. Troops should be counseled against self-medication and the use of locally acquired medications, based upon concerns about safety and effectiveness, especially Halofantrine (Halfin), which can cause serious heart-related side effects including death.

*Q Fever.*<sup>5,42,48,60,63,64,66,98-100</sup> Q fever is an emerging infectious disease among U.S. soldiers serving in Iraq and a worldwide zoonotic infection caused by the rickettsial pathogen *Coxiella burnetii*.<sup>63</sup> It is usually acquired from inhaling infected particle aerosols often after contact with reservoir hosts, which includes cattle, goats, and sheep, or after exposure to contaminated manure, straw, or dust—the latter being kicked up by vehicles or helicopters. Other routes of transmission include ingestion of improperly prepared or raw milk, or tick bites.

Q fever has been identified as a potential biological weapon.<sup>106,134</sup> A report from the Defense Intelligence Agency (DIA) in 1990 suggested that endemic Q fever posed a minor risk to military personnel under normal circumstances but might pose an increased threat to nonconventional forces.<sup>4,62</sup> In 1991 the DIA tested blood samples obtained from Iraqi military personnel in the Gulf War: 21 of 130 tested positive for previous exposure to *C. burnetii*—these data suggest that Q fever may pose more of a threat to U.S. forces in Iraq than previously thought.<sup>62</sup> An epidemic of Q fever among coalition allies, Czech Republic soldiers, occurred in 1997 in soldiers stationed in Bosnia and Herzegovina.<sup>100</sup> In 2003, among 62 cases of pneumonia in U.S. Military members in Iraq, 8 had serological evidence suggesting *C. burnetii* as the etiology. The true incidence of infection is unclear and likely underestimated. *C. burnetii* is highly infectious—a single organism can cause illness.<sup>134</sup>

Of concern, cases appearing at U.S. health care facilities resulting from

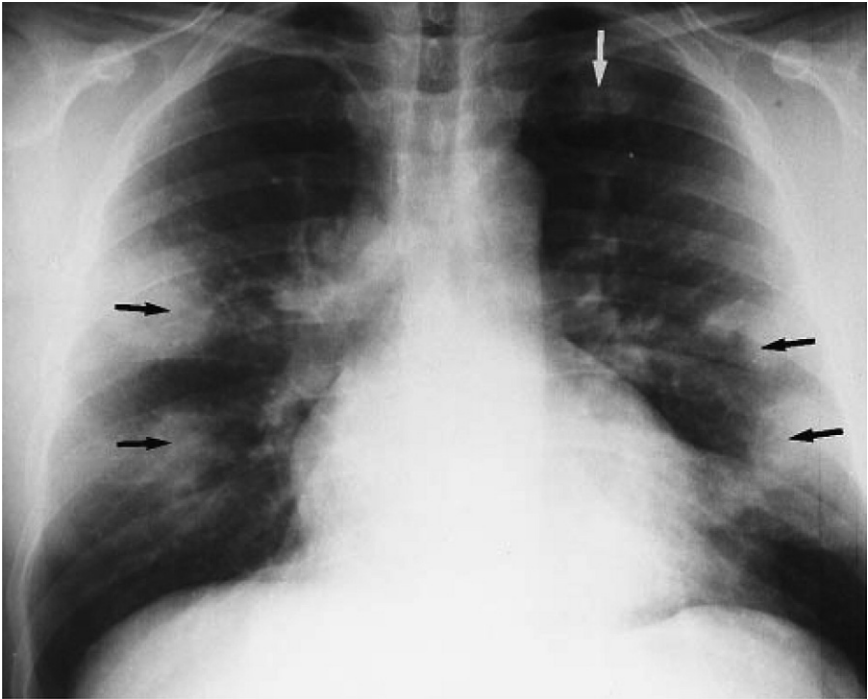
infection in the Persian Gulf were initially misdiagnosed despite the unusual and severe nature of the presenting symptoms in otherwise healthy, strong war-fighters. Again, the caveat is that returning troops may be infected with illnesses endemic to the Middle East; vigilance is key and patients who have recently returned but have seemingly commonplace symptoms may warrant more aggressive investigation given recent exposures abroad.

*C. burnetti* infection is often subclinical or mild and self-limited. Clinically it sometimes resembles a “flu-like illness.” Common clinical presentations include a nonspecific febrile illness, which can remit and recur, and is consistent with atypical pneumonia and hepatitis. High fever, headache, myalgias, malaise, anorexia, and diarrhea are possible.<sup>5,42,108</sup> Chronic infection can occur and involves the heart, arteries, liver, and bone. Laboratory findings include elevated liver enzymes and decreased platelet count. Elevated erythrocyte sedimentation rate may occur. Abdominal ultrasound may reveal diffuse echogenic portal triads sometimes referred to as “starry sky” appearance of acute hepatitis. Chest radiographic findings can include infiltrates but a variety of findings are possible if pulmonary involvement occurs (Fig 7).<sup>64</sup> The most characteristic lesion of liver involvement is the fibrin-ring or “doughnut” granuloma—a fat vacuole surrounded by a ring of fibrin, epithelioid cells, giant cells, and neutrophils.

Differential diagnosis of infectious agents that can cause febrile illness and hepatitis include *Brucella* species (Brucellosis), *Francisella tularensis* (Tularemia), *Treponema pallidum*, human immunodeficiency virus, cytomegalovirus (CMV), Epstein–Barr virus (EBV), the hepatitis viruses, Histoplasmosis, *Coccidioides immitis*, and *Toxoplasma gondii*.<sup>64,64,66</sup> Serum can be sent for *C. burnetti* antibodies. The diagnosis of Q fever is made primarily by serology; immunofluorescence assay is the preferred method.

Treatment of Q fever can be successfully accomplished with 1 month of doxycycline therapy. The regimen of 1 month of doxycycline in combination with rifampin is also appropriate.<sup>64,134</sup>

**Brucellosis.** Brucellosis is a zoonotic disease endemic in the Middle East and caused by several species of *Brucella* organisms that are highly infectious via the aerosol route.<sup>43,134</sup> The British referred to it as “undulant fever” in the mid 1700s, and more recently it has been dubbed “flaky fever” because of the altered mental status that sometimes occurs as a result of the direct neurotoxicity. Transmission is usually through contact with infected animals or ingesting inadequately prepared food or dairy products from sick animals. *Brucella* can be ingested, inhaled, or



**FIG 7.** Chest X-ray Q fever. (Reprinted with permission from Gikas A, Kofteridis D, Bouros D, et al. Q fever pneumonia: appearance on chest radiographs. *Radiology* 1999;210(2):339.)

percutaneously inoculated. It is estimated that inhalation of only 10 to 100 bacteria is sufficient to cause disease in humans.<sup>106,134</sup> The incubation can be as short as 3 days but is variable and can be much longer with some cases developing into an insidious, chronic illness. From 2003 to 2005 there were three reports of brucellosis among U.S. troops. However, in the U.S., like overseas, brucellosis is often misdiagnosed and the number of cases underreported. Worldwide estimates vary; some suggest 88/100,000 persons. Civilian clinicians should emphasize the importance of eating properly prepared foods including dairy products to their patients who are about to be deployed and/or counsel family members in the U.S. to warn loved ones in the Middle East. Sometimes this can be difficult given our troops are often encouraged to interact with local villagers; cultural norms and polite response to offers of food and hospitality are often challenging. Nevertheless, the need to adhere to safe practices is of paramount importance.

Data suggest that, during World War I, Brucellosis—a veterinary pathogen as well as a cause of human illness—was used as a bioweapon



to inflict disease upon beasts of burden, in the hope of providing a military advantage in the pre-jeep era when munitions, men, and materials were transported largely with the use of animals. Subsequently it was one of the first biologicals weaponized by the U.S. military.<sup>134</sup>

Symptoms include irregular fever, headache, profound weakness and fatigue, chills, sweating, arthralgias, myalgias, depression, and changes in mental status. Patients often complain of a few days of high fever, which subsides with treatment and returns shortly after completion of antibiotics.<sup>134</sup> This is usually the result of incorrect diagnosis, inadequate duration of, and/or inappropriate antimicrobial selection. Monotherapy should be avoided.

Treatments include doxycycline and rifampin for a minimum of 6 weeks, or ofloxacin and rifampin. Therapy with rifampin, a tetracycline, and an aminoglycoside is indicated for infections with complications such as endocarditis or meningoencephalitis.<sup>43,134</sup>

It is worth remembering that certain biological illnesses and bioweapons, including brucellosis, may contain neurotoxins that directly or indirectly affect neurological function and alter behavior, even mimicking some of the early behavioral changes of PTSD. Biological illnesses and bioweapons may present with or have deleterious effects on mental status, neurological function, or level of cognitive function, negatively impacting the ability to obtain an accurate history as well as mimicking delirium, dementia, or other age-related cognitive deficits or behaviors including “sundown psychosis.”<sup>106,134,135</sup> Viral hemorrhagic fevers, the equine encephalitic agents, and even anthrax are associated with mental status changes.<sup>106,134</sup> While rates of PTSD among OIF and OEF troops are much higher than in prior conflicts, the astute clinician will also be vigilant for other etiologies and possibly comorbidities.<sup>22,72,73,76,78,80</sup>

*Respiratory Illness.* In 2004 a self-reported survey was collected from >15,000 homeward-bound members of the U.S. military. Sixty-nine percent reported one episode of respiratory illness, while 14% experienced more than three episodes.<sup>3,47,53</sup> Of interest, almost 40% reported they smoked more than a half a pack of cigarettes per day, with 48% being first-time smokers or former smokers who restarted upon deployment. Additionally, from March 2003 through March 2004, several cases of severe pneumonia were reported with clinical symptoms including rapid onset of cough, shortness of breath with or without fever, and accompanied by leukocytosis. Chest radiographs revealed bilateral alveolar infiltrates often requiring mechanical ventilation. Of concern, some of these patients had acute eosinophilic pneumonia (AEP),<sup>47</sup> which is a rare idiopathic disease usually

characterized by pulmonary infiltrates on chest X-ray, eosinophilic infiltration of the lung, and respiratory failure. During this timeframe, 18 cases of AEP were identified among the total military deployed in or near Iraq, 2 of which died. New-onset smoking was the only reported associated result from an epidemiologic study. There have been some association with smoking non-U.S. tobacco products. There have been additional cases of AEP since this study period, one of which presented with symptoms 1 month after returning to the U.S. Early diagnosis is essential because prompt medical treatment with corticosteroids can result in favorable outcomes; late diagnosis can be fatal. This again underscores the concern that an illness can be initiated during deployment but manifest upon return to the U.S. The astute clinician must be mindful of travel-related and deployment-related illness.

**Other Illnesses.** There are ongoing studies to assess the rates of other endemic, arboviral infection, including Sand Fly Fever Virus, West Nile Virus, Sindbis virus, and Rift Valley Fever virus. So far, seroconversion among troops tested has been <3%.<sup>1,34,54,58,65,106,117,134,135</sup> Nevertheless, if troops return with unusual febrile illness, a thorough examination including consideration of Middle East related infections is necessary given the wide range of incubation periods possible.

While U.S. troops are vaccinated against Typhoid Fever, it remains a public health problem in Iraq and Afghanistan; the vaccine is not 100% effective and thus, in the proper context, patients with unusual febrile illness, including relative bradycardia, warrant a more in-depth evaluation. Of concern, multi-drug-resistant (including ciprofloxacin-resistant) *Salmonella enterica Typhi* has been identified in Iraq.<sup>58</sup>

According to the Centers for Disease Control and Prevention, measles continues to be reported in the region. Polio has been reported in Yemen in 2005 and, in 2005-2006, India, Pakistan, and Afghanistan. Highly pathogenic avian influenza (H5N1) has been found in poultry in the Middle East.<sup>137</sup> Pilgrims to the Hajj in Saudi Arabia have acquired meningococcal infections by serotypes A and W-135. Other parasitic infections include schistosomiasis and echinococcus, which to date have not been problematic among U.S. troops.<sup>1,3,58,137</sup>

Cases of ophthalmomyiasis have occurred in Iraq.<sup>59</sup> This presents with abrupt onset of conjunctivitis and is caused by motile, mucoid, flat-segmented larvae with a size <1 mm and caused by *Oestrus ovis*, the sheep nasal botfly, which can deposit larvae in the eye; it can also involve the globe, resulting in sight-threatening complications.

Tuberculosis [*Mycobacterium tuberculosis* (TB)] is the second most

common cause of death in the world, resulting in 3 0 4 million deaths annually and 8 million new cases a year and is endemic in central and southwest Asia.<sup>58,65,127</sup> It is also the most common opportunistic infection associated with human immunodeficiency virus. This is not just a global threat, but a domestic one, with drug, multidrug and extremely drug resistant tuberculosis continuing to be a significant public health concern. WHO estimates suggest cases per 100,000 persons in Afghanistan are twice the number of cases per 100,000 persons in Iraq.<sup>58</sup> The U.S. military uses purified protein derivative of tuberculin to screen troops before and after deployment. The deployment-associated conversion rate is ~2.5%; the number of active cases of TB among U.S. troops serving in the Persian Gulf has been negligible. Nevertheless, it is important to follow-up with troops deployed in endemic regions upon return to the U.S. to ensure that they have been appropriately screened or treated.

## *Psychosocial Issues*

**Overview.** War-zone exposures may have considerable negative emotional and behavioral consequences.<sup>22,32,74,75,109,116,136-140</sup> Men and women evacuated from the war zone with physical injuries are at higher risk for developing PTSD and other trauma-related issues.<sup>22,27,31</sup> Given the mind–body connection often gets severed in current health care and collocation of mental and biomedical services is not often the case, clinical attention should not be solely aimed at the physical wounds of war.<sup>14,22,122-126</sup> Some military members will develop chronic, debilitating mental illnesses as a result of traumatic exposures, either directly from patterns of injury known as TBI or psychiatric, as with PTSD, or from depression.<sup>7-9,13,75,86</sup>

During and after the Persian Gulf War in Iraq and Afghanistan, primary care providers may notice an increased number of veterans or even active duty personnel as well as family members, some of whom may have a loved one who was severely injured or killed.<sup>6,14,20,21,32,71,73,75,82</sup> While the physical wounds of war are often hard to miss—prosthetics, casts, or bandages, psychological trauma and mental illness, even brain injury, may initially present with subtle clues that, if not early diagnosed, can evolve into significant morbidities.<sup>15,17,18</sup> Among the psychiatric morbidities, PTSD and depression are expected to have high prevalence rates among returning troops. While depression, anxiety, and other psychiatric disorders may occur, this monograph will provide more in-depth information on the neuropsychiatric illnesses like PTSD and TBI, especially given clinicians are likely to be more familiar with the early recognition

of depression and anxiety disorders. It bears repeating that multiple psychiatric disorders are possible. Patients want their primary care clinicians to acknowledge their traumatic experiences and responses. Therefore HCP should be sensitive to the complex needs of service men and women returning from the Gulf as well as their families and loved ones. Of concern, most medical casualties will not seek mental health care and many veterans can be expected to be reluctant to acknowledge emotional distress as concerns arise about being diagnosed with a mental illness. Therefore, clinicians should avoid pathologizing common stress reactions and be sensitive to these concerns, while being vigilant about psychopathology and ensuring proper mental as well as physical care is provided.

Mental health professionals and primary care clinicians may find themselves collaborating closer in the aftermath of PGW II than previously with traditional civilian patients as opposed to their Reservist or National Guard civilian patients. It is worth noting that the mental health and primary care clinicians' task is further complicated by what may emerge as a "signature wound" in the Gulf War and war on terror—TBI, which is discussed elsewhere in this monograph.<sup>15,17,18</sup>

The value of faith-based care cannot be underestimated. Chaplain services are valuable partners that are considered trustworthy by troops, are often collocated in combat zones and thus considered participants in the stress environment, and are generally a regular presence throughout the military, including health care facilities. The old adage "there are no atheists in foxholes" may or may not hold true. Nevertheless, faith-based professionals can be enormously helpful for family members; church members may provide a psychosocial and spiritual support network. Inquiring about and arranging faith-based support should be part of the total care plan. Studies support the importance of religion and spirituality as resilience and protective factors<sup>82</sup> as well as being therapeutic in the recovery phase.

***Post Traumatic Stress Disorder (PTSD).*** "There is many a boy here today who looks on war as all glory, but, boys, it is all hell." [William Tecumseh Sherman]

General Sherman's famous remark "war is hell" has never been disputed. Death and destruction takes its toll on people in a variety of ways but it does ultimately take a toll.

PTSD is an anxiety disorder that develops in individuals who have experienced a traumatic event.<sup>22,72,73,76</sup> The term "Post Traumatic Stress Disorder" first appeared in 1980 to describe a set of symptoms. However, this disease has been well described throughout history, often previously referred to as "shell shock" or "war neurosis." Fortunately, greater

attention to the actual science of the psychological impact war has on those serving in battle zones has led to a greater understanding of the psychopathology of PTSD and a better method of diagnosing and characterizing this illness.

***Populations at Risk.*** The following is a list of patients/groups at risk for and experiencing symptoms of PTSD:

- Veterans/active duty military personnel
  - Witnessed frightening aspects of combat
  - Participated in frightening aspects of combat
- Veterans/active duty military personnel who may have experienced military-related sexual trauma
- Family members may suffer traumatic stress by
  - Hearing about frightening events that happened to loved ones
  - Loss of loved one (dead, missing in action, prisoner)
  - Fear of loss
- Non-PGW II veterans may be reminded of frightening/upsetting experiences from past wars which can exacerbate traumatic stress responses.

***Symptoms.*** Unlike many infections and biomedical processes which may have specific laboratory tests to suggest or confirm the diagnosis, PTSD, as with other psychiatric illnesses, is based upon screening tools, patient history, and the careful evaluation of clinical signs and symptoms.<sup>72,73</sup> The clinical history of the patient must be accompanied by the occurrence of a traumatic event. A diagnosis of PTSD cannot be made without a history of a traumatic event.

***Diagnostic Criteria for PTSD.*** According to The American Psychiatric Association (APA), the following are symptoms and criteria for PTSD in its Diagnostic and Statistic Manual of Mental Disorders (DSM):

- The person has been exposed to a traumatic event in which both of the following were present:
  1. The person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others.
  2. The person's response involved intense fear, helplessness, or horror. (Note: Children may express disorganized or agitated behavior.)
- The traumatic event is persistently re-experienced in the following ways:
  1. Recurrent and intrusive distressing recollections of the event, including images, thoughts, or perceptions. (Note: In young chil-

dren, repetitive play may occur in which themes or aspects of the trauma are expressed.)

2. Recurrent distressing dreams of the event. (Note: In children, there may be frightening dreams without recognizable content.)
  3. Acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated). (Note: In young children, trauma-specific reenactment may occur.)
  4. Intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event.
  5. Physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event.
- Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma), as indicated by three (or more) of the following:
    1. Efforts to avoid thoughts, feelings, or conversations associated with the trauma.
    2. Efforts to avoid activities, places, or people that arouse recollections of the trauma.
    3. Inability to recall an important aspect of the trauma.
    4. Markedly diminished interest or participation in significant activities.
    5. Feeling of detachment or estrangement from others.
    6. Restricted range of affect (eg, unable to have loving feelings).
    7. Sense of a foreshortened future (eg, does not expect to have a career, marriage, children, or a normal lifespan).
  - Persistent symptoms of increased arousal (not present before the trauma), as indicated by two (or more) of the following:
    1. Difficulty falling or staying asleep
    2. Irritability or outbursts of anger
    3. Difficulty concentrating
    4. Hypervigilance
    5. Exaggerated startle response
  - Duration of the disturbance (symptoms in Criteria B, C, and D) is more than 1 month.
  - The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

**Screening Tool—Primary Care PTSD Screen (Table 1).** As of August 2007 more than 34,000 Iraq and Afghanistan veterans have been afflicted

**TABLE 1.** PC-PTSD

---

In your life, have you had any experiences that were so frightening, horrible, or upsetting that in the past month you

1. Have had nightmares about the event or thought about it when you did not want to?
2. Tried hard not to think about the event or went out of your way to avoid situations that reminded you of the event?
3. Were constantly on guard, watchful, or easily startled?
4. Felt numb or detached from others, activities, or your surroundings?

---

Endorsement of any three items is associated with diagnostic accuracy of 0.85 (0.78 sensitivity, 0.87 specificity).

with PTSD.<sup>22,72,73,76-81</sup> According to the National Center for Post Traumatic Stress Disorder, 12 to 20% of returning soldiers experience PTSD, compared to 5% in the general population. It is not difficult to understand why so many returning troops from the Gulf Wars have PTSD: studies reveal 94% of soldiers in Iraq are the victims of small arms fire; 86% knew someone who was seriously injured or killed; and 51% had handled or uncovered human remains. These traumatic experiences in addition to long exposures to violence in a foreign, often hostile land, far from home can make service men and women vulnerable.

Women serving in the military, especially combat zones, are not only subject to the dangers and violence of war but also are at risk of assault from fellow service members or their superiors.<sup>13</sup> A 2003 study revealed approximately one in three female veterans who visited a VA facility for health care reported being raped or subjected to attempted rape during their military service. Sexual assault is well recognized as a risk for PTSD. Add this to the psychological trauma of combat and exposure to war—this combination has led to an estimated 20% of servicewomen who will likely develop PTSD compared to 8% of male soldiers, who, statistically, are rarely sexually assaulted. It is worth mentioning that reporting sexual assault can have a chilling effect on the servicewoman's military career; often women do not report this to their superiors, again setting the stage for a variety of psychopathologies. Servicewomen—Reservists, National Guard—who return to our practice should be queried about sexual abuse, gender discrimination, and their experience in addition to an overall history of their overseas deployment and travels.

PTSD when identified and treated early has very promising outcomes whereby 40 to 60% are expected to recover, underscoring the need to address the psychosocial issues of service as well as the biomedical.

**Differential Diagnosis.** Other conditions can cause some of the symptoms experienced in PTSD and these conditions must be ruled out.

Additionally, conditions such as substance abuse and depression may preexist or develop as complications of PTSD.

Some of the conditions in the differential include adjustment disorder, depression, and panic disorder. Moreover, substance abuse must be addressed. The astute clinician will be alert for changes in their patients' behaviors, overall health, and/or concerns expressed by their family. The impact of war not only affects the warrior but the families as well. Family members as well as the returning troops (wounded or not) may feel awkward and unsure how to communicate with each other about the events of war or injuries sustained.

Although generally considered a low percentage of returning PGW I and II troops, it is worth remembering some may be malingerers. Nevertheless, given the atrocities of war, especially on the shoulders of young people, it is better to presume legitimate illness until data prove otherwise.

***Clinical Course.*** The course of PTSD is often determined on the temporal relationship between the trauma and when the individual begins to experience symptoms.

Immediate Onset

- Better response to treatment
- Better prognosis (ie, less severe symptoms)
- Fewer associated symptoms or complications
- Symptoms may resolve within 6 months

Delayed Onset

- Associated symptoms and conditions develop
- Condition more likely to become chronic
- Possible repressed memories
- Worse prognosis

People who experience trauma sometimes repress their memories of the event to avoid the pain of thinking about it or remembering it. These so-called repressed memories sometimes resurface during therapy or may be triggered by something in everyday experience that reminds the patient of the traumatic event.

***Treatment Options.*** The chronic nature of PTSD mandates early diagnosis, appropriate treatment, and long-term care.

A combination of psychotherapy and medication is commonly used to treat PTSD.

***Psychotherapy.*** Psychotherapeutic treatments include debriefing (ie, crisis intervention) and psychotherapy. Psychotherapy can help the person address and manage painful memories until they no longer cause



**TABLE 2.** Key review points to remember about patients and PTSD

- 
1. Re-experiencing symptoms
    - § Nightmares
    - § Intrusive thoughts
  2. Avoidance of trauma cues
  3. Numbing or detachment from others
  4. Hyper-arousal response
    - § Increased startle
    - § Hyper-vigilance
- 

disabling symptoms. Eye movement desensitization and reprocessing has also been tried.

**Pharmacotherapy.** Almost all types of psychopharmacological agents have been used to help resolve the symptoms of PTSD. The use of medication in addition to psychotherapy has been shown to be beneficial in the treatment of PTSD.

**Antidepressants.** Several types of antidepressants are used to treat PTSD<sup>22,78-81,104,105</sup>:

- Monoamine oxidase inhibitors
- Selective serotonin reuptake inhibitors
- Selective norepinephrine reuptake inhibitors
- Tricyclic antidepressants

Each medication class offers a variety of options and side effects. Given there is no “one size fits all” approach to the patient with PTSD and/or other psychiatric illnesses, it is suggested the clinician confer with psychiatric and mental health specialists; especially advantageous would be working with colleagues who have expertise in treating returning troops.

One of the most important services primary care clinicians can do for returning troops, especially those suffering from PTSD, is to acknowledge the traumatic events and resultant responses. In a military survey, over 90% of patients indicated the traumatic event they experienced is important and relevant to their care. Of note, in a VA study, over 90% of patients in VA primary care settings will have experienced at least one traumatic event in their life; most have experienced four or more!

Given the relationship between exposure to a traumatic event and increased health care, utilization appears to be mediated by the diagnosis of PTSD. Health care professionals treating returning troops should be mindful of the essential features of PTSD (Table 2).

Tables 3–5 offer some key domains and verbal prompts when interacting with patients who have returned from the Gulf War.

**TABLE 3.** Determine the patient's status in relationship to the war

---

These questions allow the HCP to acknowledge the relevance and importance of the event.

- "Have you recently returned from the Persian Gulf?"
  - "How has your adjustment been back home?"
  - "Do you have family members or friends who are currently in the Persian Gulf?"
  - "How are you dealing with their absence?"
  - "How has the war in Iraq or Afghanistan (or name) affected your functioning back here?"
- 

**TABLE 4.** Acknowledge the patient's struggles

---

Regardless of their specific duties in or relationship to the war, the HCP should recognize and normalize distress that is associated with the conflict.

- "I am so sorry you are struggling with this"
  - "This has to be a very difficult time for you"
  - "I have other patients who are struggling with what you are dealing with"
- 

Use these as opening points to convey concern, validate their struggle. Do NOT patronize. Also, if you have not experienced war, do not say that you know what they are going through . . . you do not!

**TABLE 5.** Identifying PTSD symptoms

- 
- "I would like to know if you are experiencing any symptoms?"
  - "It is not uncommon for people returning from war to have certain types of reactions. I'd like to know if . . . ."
- 

It is important to acknowledge that the health problems associated with PTSD may represent the dynamic interplay of neurological, psychological, and behavioral factors. PTSD can lead to neurobiological dysregulation, altering catecholamine, hypothalamic-pituitary-adrenocorticoid, endogenous opioid, thyroid, immune, and neurotransmitter systems.

Patients often take their cue from us as health care professionals. Speak calmly, with a matter-of-fact voice in a nonjudgmental demeanor. Reassure the patient that you will be there for him or her over the long haul and that treatments are available and will be provided either by you or by arranging appropriate care. Remember, if you must refer out, remind the patient that you are still involved in the care and not abandoning him or her. Keep a timeline so that as the patient makes progress, you can convey it visibly and encouragingly. If the patient experiences a flashback, remind them that they are in your office and state the date and location. Offer water and other comfort measures as needed.

Battle-injured soldiers present another group of patients. A recent study examined the rates, predictors, and course of probable PTSD and

depression among seriously injured soldiers conducted during and following their hospitalization. At 1 month, 4.2% had probable PTSD and 4.4% had depression. At 4 months, 12.2% had PTSD and 8.9% had depression. The 4-month rate held relatively consistent at 7 months. Not surprisingly, high levels of physical problems at 1 month were predictive of PTSD and depression at 7 months. Bodily injury is a risk factor for PTSD.

Another important group of returning troops from the Persian Gulf are health care providers. A recent study was conducted to determine the level of PTSD and depression among HCP deployed to combat settings.<sup>86</sup> Of respondents, 9% met the criteria for PTSD and 5% met the criteria for depression. Albeit a small study, anonymous surveys revealed deployment exposures and perceived threats during deployment were risk factors for PTSD. Of note, it appeared that exposure to wounded or dead patients did not increase risk. Our colleagues are not immune to the mental or physical injuries of war; we should be alert to behavioral changes in HCP returning from the Persian Gulf.

There remains a stigma associated with mental health. Almost one in four Americans will suffer from a mental illness per year, yet only a fraction will receive appropriate care or be effectively treated. Stigma, shame, access to experienced mental health care in the community, concerns about abandonment, and cost are some of the issues facing persons with mental illness. As health care professionals, we can do much to help destigmatize their psychiatric disease and assist with proper referral and follow-up. Increasingly, civilian HCP may be called upon to provide care to returning veterans. The President's Commission on Care for America's Returning Wounded Warriors reported a lack of mental health professionals to serve military personnel and their families. As of March 2007 only 27 of the 1400 VA hospitals and clinics contained inpatient PTSD centers. Of additional concern, there are only two VA facilities that treat women exclusively.<sup>29,30,110</sup>

Clearly the demand for mental health care for returning troops can be expected to increase dramatically in the coming months and years. The number of veterans who served in Iraq or Afghanistan receiving treatment for PTSD nearly doubled from autumn 2005 (20,394) to summer 2006 (38,144). The number of troops who have separated from the service since 2002 grew to 588,923 by summer 2006, an increase of over 150,000 from the summer of 2005. The VA has made special outreach efforts, since 2004 about 100 retired military who served in the Persian Gulf have been stationed at demobilization sites abroad to talk about PTSD and the resources available to returning troops. This includes enhanced care for

Veterans of Operation Iraqi Freedom and Operation Enduring Freedom who are eligible for 2 years of free military service related health care through the VA. However, it is important to recognize the value of civilian health care, especially given the VA may not be able to handle the increased demand. According to the Office of Inspector General of the Department of Veterans Affairs, it appears that the VA repeatedly understated wait times for injured veterans seeking medical care and in many serious cases forced them to wait more than 30 days, counter to department policy. Of concern, only three in four veterans received timely appointments albeit VA reports to Congress stated 95% of veterans received such care. In 2005 the immune globulin (IG) expressed concerns that over 50,000 veterans were on waiting lists.<sup>29,30,110</sup> Regardless of etiology, returning troops deserve prompt care. The VA may not have the surge capacity to provide the access and quality required and thus military, VA, and civilian medical communities will need to collaborate more closely over the coming months.

### *Impact of Deployment on the Family*

With the new roles the military faces, the frequency of deployment into a threat zone or overseas has increased in the past 10 years since the first Persian Gulf War. Such deployments not only pose a threat to the troops but can be a challenge to the military families left behind. Medical or emotional/behavioral problems as well as financial problems may preexist and with the resulting loss—temporary or permanent—of a parent or spouse can destabilize an already precarious situation, creating significant problems for the family.<sup>71</sup>

Because the U.S. military is all volunteer, the heavy responsibilities are carried by two distinct sources of troops—the active military and Reserve or National Guard, who can and have been activated as well as deployed to combat areas. A significant proportion of those serving in Iraq and Afghanistan are from Reserve or National Guard Units. Do we inquire of our patients if they are active, reserve, or former military or in families of a deployed troop? Such information is critical especially to assist us in anticipating challenges our patients and their families may undergo. While the active duty military family lives with deployment as part of their life, and often lives within military communities where a ready-made support network of friends with similar issues and government services are nearby, Reserve or National Guard service members and their families reside in nonmilitary communities and work in civilian jobs generally remote from military resources or support groups. Families of Reservists can feel isolated and less supported. There are many commu-

nities that have few or none being deployed in active duty and thus are neither familiar with nor equipped to provide the support necessary to a civilian family that has instantly become a military family. Beyond the normal worries for a loved one in a war zone are the financial concerns, especially if deployment results in loss of income in the transition from a high paying civilian job to a lower paying military one. Children can be impacted, especially if the community is demonstrably “antiwar”—adults can often separate the “antiwar” from the “antiwarrior” sentiments; children may not, thus causing a variety of emotional challenges that a savvy clinician should be attuned to and inquire about.<sup>71-74</sup>

According to the Iraq War Clinician Guide 2nd Edition, there are emotional cycles associated with deployment that have been divided into five stages, each associated with specific emotional issues that should be anticipated and addressed.<sup>71</sup> These include the following: (1) Pre-deployment; (2) Deployment; (3) Sustainment; (4) Re-deployment; and (5) Post-deployment.

***Pre-deployment.*** This occurs from the time the family is notified of deployment to when the military member leaves. It often involves psychological denial, intense mental and physical preparation, and anticipation of the departure.

***Deployment.*** This is the phase from the time the member leaves through the first month of deployment. Significant emotional turmoil can occur, especially if the military member is a parent and the family attempts to reach a functional equilibrium. A variety of feelings and emotions occur including numbness, sadness, feelings of isolation, and abandonment. Family members may need to incorporate the roles filled by the deployed parent. Critical is the communication from the deployed member of the family—providing a realistic appraisal of the new environment, which can be reassuring. From a clinical perspective, it is important for HCP to anticipate such phases and to realize family members will experience these phases differently depending upon their cognitive/developmental stage.

***Sustainment.*** This is the phase that spans from 1 month post deployment to 1 month before the announced return date. It is usually marked by “settling into the new routine” and going on with life business as usual. If a family cannot return to this business as usual, especially in the absence of one parent, children may have an especially difficult time. Moreover conflict between the service member and spouse can result, especially if communications are not widely available and thus preclude resolving disagreements or challenges.

***Re-deployment.*** This phase occurs from the 1 month before the expected return to the actual physical return of the service member. As

one would expect, it is a period of intense anticipation, a variety of emotions, including fear, anxiety as well as excitement.

**Post-deployment.** This is the phase beginning with when the service member returns and ending when the family has reestablished equilibrium. This may take several months. Although the homecoming can be a time of great happiness, it can also result in frustration and feelings of “let down” from unrealistic expectations about the reunion. The service member may also experience frustration in finding the family has made some changes or had experiences that he or she were not part of. The spouse/parent left behind may have emerged into a new role of leadership or independence that may conflict with the returning member who begins to exercise formerly held authority. Marital couples may take time to reestablish physical and emotional intimacy. Undiagnosed PTSD, substance abuse, the trauma of war, or other psychological morbidity can impact on the reestablishment of the loving partnership; the astute clinician will anticipate this and work with the family before and during the reunion. Overall it is important that the deployed member reassert his or her role within the family to reestablish a healthy family equilibrium.

Not unexpectedly, children respond to deployment in very individualistic ways depending upon their age and psychosocial and cognitive developmental periods. Infants ( $\leq 12$  months of age) tend to respond to changes in their environment, schedule, or presence and availability of their caregivers. Worrisome signs include apathy, refusal to eat, even weight loss. Toddlers (1-3 years of age) usually take their cues from their primary caregiver. As such, if the non-deployed parent is coping well and present, the toddler should be expected to cope well. Signs of concern include new onset sullenness, temper tantrums, tearfulness, and sleep disturbances. Clearly, socializing the child—play dates, support from other parents—is critical both for the toddler and for the remaining parent. Preschool children (3 to 6 years of age) are more keenly aware of a parent’s absence. Worrisome signs include regressive behaviors in a variety of domains including toileting, thumb-sucking, separation anxiety/clinginess, and sleep disturbances. Irritability, aggression, depression, or somatic complaints may occur. While these can also occur in nonmilitary children, nevertheless, they are worth follow-up. The parent and clinician should be vigilant for children who think their parent left because of something they did. These inaccuracies of thought should be addressed rapidly and in a matter-of-fact manner, discussing the deployment briefly but honestly. This is critical, especially if the military parent gets killed; children should not bear the guilt of their parent’s death and thus feelings of responsibility about the deployment should be immedi-

ately dispelled. Increased attention by the remaining parent, conversations with images of the deployed parent about how much he or she loves the child, and maintaining family routines including physical and emotional warmth are critical. School-aged children (6 to 12 years of age) may manifest their emotional issues by “acting out” or exhibiting irritability, aggression, or complains and whining—which may be uncharacteristic of the child prior to the deployment. Given children are increasingly being exposed to information through their friends, the internet, and other media, it is important to have regular discussions with the child, to allay their worries as opportunities for information sharing. Ideally parents should limit the amount of media exposure children receive during times of war; in the information age, this may be easier said than accomplished. Therefore, regular conversations with children are important to address their concerns factually and with love. The age of initiation of alcohol and tobacco occurs from 10 to 13 years of age.<sup>82-85</sup> Experimentation to chronic use can worsen in the child of a deployed parent. Teenagers (13 to 19 years of age) may behave similarly to children in terms of irritability, rebelliousness, or other challenging behaviors.<sup>71,82</sup> Good communications should be encouraged as their concerns about the deployed parent (and the possible impact losing a parent can have on them and the family) may manifest in destructive ways. Helping the non-deployed parent to set clear and realistic expectations about behavior, school, and home life can provide supportive structure. The non-deployed parent should be counseled to observe for high-risk behaviors, sexual acting out, or changes in behavior that may result from substance abuse.

Clinicians can help their patients and families through these challenging times by anticipating these needs prior to deployment and assisting the remaining family members.<sup>71,73,74</sup> Moreover, underscoring the role of the remaining parent in promoting healthy family dynamics that include planning, encouragement, interaction, and education can make the deployment and sustainment phases less harrowing. Young children can better visualize the time gap between deployment and return using a chart or timeline, perhaps with stars on the different days representing how helpful the child has been in the parent’s absence, which can serve as a gift to the returning parent.<sup>71</sup> Other ideas and resources can be found in the references. The clinician should be mindful that the parent will need support and social encouragement as well. Working with the family, identifying possible sources of support, and working with the patient as well as the organizations such as churches and other natural networks including the parent–teacher organizations can be highly beneficial.<sup>14,20,21,71,82</sup>

## *Returning Home*

Dostoyevsky once opined that a society can be judged by how it treats its prisoners. As physicians, we could argue as a take off on this concept that a society should also be judged by how it treats its veterans and those charged with protecting our freedoms. If this is the benchmark upon which a society should be judged great or glaringly wanting of moral clarity and direction, what does it say about the U.S. when nearly 25% of the homeless are veterans and that the rate of convergence for recently returning veterans of Iraq and Afghanistan, ie, from having a home to becoming homeless, is faster than at any other time in American history?!<sup>70</sup> What does it say when the VA Office of the Inspector General report states that returning veterans are receiving less than optimal care, and must wait an exceedingly long time for such care?!<sup>30,31,110</sup>

**Homelessness.** According to the VA, approximately 196,000 veterans of all ages were homeless on any given night during 2006.<sup>70,110</sup> As if almost 200,000 veterans was not troubling enough, the fact that between 40,000 and 64,000 veterans are chronically homeless—those who live either on the streets or in shelters for more than a year—is even more troubling. While veterans make up 11% of the population, they comprise 26% of the homeless on any given day.<sup>70</sup>

So far, more than 400 veterans of the Iraq and Afghanistan war have turned up homeless in Washington, DC. The VA and other aid groups say there will be a surge in homeless veterans—returning troops—in the coming years.<sup>70</sup> According to experts who work with war vets, and based upon the Vietnam veteran experience, it often takes several years after separating from the military before veterans' problems evolve to a point that drives them into the streets. Of concern, some veterans of Iraq and Afghanistan are already turning up at homeless shelters, and the amount expected could be enormous.

As discussed earlier in this monograph, severely wounded troops who would not have survived their battlefield injuries in previous wars are returning home, albeit traumatized and often with chronic illness or disability. These disabilities include TBI, PTSD, prosthesis, hearing deficits, visual loss, or a combination. Thus the special trait of this war and resultant “survivors” may contribute to the increased homelessness, especially PTSD and TBI, both of which can cause unstable behavior, and lead to substance abuse. These, plus perhaps the impact of longer tours of duty and recall of troops who should have separated from the military, which leads to protracted absence from families, may make reintegration into home and work more difficult.



In OIF more women were serving in combat zones and thus experienced PTSD. In addition, a significant number of women troops have experienced sexual abuse, which is also a risk factor for homelessness, as supported by a recent government survey that disclosed almost 40% of the homeless female veterans of recent wars reported being sexually assaulted by U.S. soldiers while in the military.<sup>13,138</sup> More than 11% of newly homeless veterans are women.

Of concern is the loss of jobs reservists have experienced upon their return. While by law their job must be preserved and await their return, employers are often ignoring this. As a result, Sen. Edward Kennedy (D-MA) and other legislators are working in Congress to enhance the protection for troops and increase the penalties of employers who ignore their responsibilities for profit. We should not tolerate such behavior in our communities.

Home costs and apartment rents may also contribute to the problem. According to the National Alliance to End Homelessness in Washington report of November 2007, among one million veterans who served after the September 11 attacks, over 70,000 are paying greater than 50% of their incomes for rent, which leaves them highly vulnerable.

Nevertheless, the primary factors that enhance the risk for homelessness are untreated PTSD, substance abuse, depression, and other psychiatric illness. Soldiers have a great deal of pride in what they do and who they are, and rightly so. This may also contribute to delays in seeking help. As discussed earlier, we may be the front line or perhaps the only line of defense for our patient with such mental health needs in our communities. What services—job training, home health, housing, social, and psychological—are available in your community and will they be enough if Gulf War veterans start returning home? Now is the time to lay the foundations and prepare for the needs of our troops. As physicians, we can and must be the catalyst for change and ensure the support services that enhance our care plans are in place or available whether by collaborating with other communities or reaching out to the VA for remote services. Some construction companies have dedicated resources to building low-cost homes or pro bono work in concert with volunteers to make a difference in their communities such as “Homes for our Troops” (see Resources section). Before 150,000 plus troops return to the U.S., we should assess our resources, address our care gaps, and prepare our communities now.

***Mental Health Problems and Barriers to Care—Gulf War II Veterans’ Experiences.*** A recent study of four returning combat infantry troops—three Army units and one Marine unit—were surveyed 3 to 4 months after return from Iraq or Afghanistan combat or security duty,

both of which are highly hazardous assignments in those regions.<sup>9</sup> The percentage of study subjects meeting criteria for major depression, generalized anxiety, or PTSD was significantly higher among those serving in Iraq than Afghanistan. Of those who had positive responses consistent with a mental disorder, only 23 to 40% sought mental health care. Respondents indicated there were barriers to receiving mental health—waiting times, but most often the perception of stigma among those most in need of mental health care. Given these troops are likely representative of their colleagues who continue to be involved in PGW II, preparing our practices to address the mental health needs of returning troops is critical. The stigma of mental health is not isolated to military personnel; it remains a persistent challenge. Moreover, patients can feel abandoned when referred from our practice to a mental health professional. Clearly communicating that they are not being “turfed” but instead are being offered specialist care, similar to being offered cardiology referral if a heart defect was found and reassuring the patient that the mental health professional is one more member of a team that will still center around the patient and primary care provider, can enhance the likelihood of obtaining care. Increasingly evidence suggests collocating mental health services as part of the medical practice has improved outcomes. In some rural areas advanced planning will be required to increase opportunities for referral and access to mental health services. Clinicians in such areas may want to reach out to the nearest VA center and establish a collaborative relationship with PTSD and other services in anticipation of patients returning from the Persian Gulf.

***Motor Vehicle Accidents (MVA).*** Large-scale studies following male and female Gulf War I veterans over several periods of time after return from the Middle East demonstrated a significantly higher risk of death from accidents, especially motor vehicle accidents (MVA) during the initial years home.<sup>90-92,96,97</sup> Of note, many were not wearing seatbelts. However, by the sixth year post war, the relative risk of mortality due to MVA had fallen significantly. These results are consistent with a mortality study of Vietnam War veterans.<sup>96</sup> They, too, experienced excess mortality from MVA, which was most pronounced in the first 5 years after serving in Vietnam. After the fifth year, the mortality rate from MVA for Vietnam veterans paralleled non-Vietnam controls. Given MVA are a leading cause of death among adolescents and clearly a worrisome cause of death among newly returning war veterans, it is important for clinicians to alert troop patients about this risk and the cofactors that are likely to be at play—alcohol and other substance abuse,<sup>77</sup> exhaustion, work, stress, or coping related, medication effect. It

is well described that adolescent males who drive with passengers are more likely to be involved in an MVA; returning troops who are adolescents or young adult males are not immune to this reality and should be counseled about the trend in mortality associated with returning war veterans and MVA. Opening up such dialogue may also make discussing seatbelt use and substance abuse more likely.

There has also been an increase in traumatic death among Gulf War I veterans.<sup>32,97,113,115,116</sup> A population-based survey of 30,000 Gulf War veterans revealed that, since the war, these veterans have been involved in serious accidents, injuries, and illnesses, more than non-Gulf veterans.<sup>93</sup> High-risk activities post war may be part of the etiology. PTSD has also been shown to contribute to excess number of deaths due to trauma.

**Substance Abuse.** Roughly one-third of the U.S. population meets criteria for problem drinking<sup>77,114,141,142</sup>; it is not unreasonable to expect this proportion to be higher among individuals with varying degrees of behavioral issues or facing horrific challenges as significant life stressors. An example of a population at risk is the young men and women facing impending deployment to a combat zone or those who are already participating in the war.<sup>77</sup> Fortunately, most reactions are generally mild and transient, as healthy coping mechanisms emerge to the stressor. However, in others fear and uncertainty precipitate unhealthy actions. Maladaptive behaviors manifest in a variety of actions—substance abuse, abusive behaviors to others—sexual or pugilistic, and a host of psychiatric morbidities. Therefore, the HCP who has patients potentially being deployed should anticipate the psychosocial as well as medical needs including a predeployment substance abuse screening.<sup>82,140</sup> Clearly, in the context of primary care, patients should be screened for risk behaviors regardless of their military or occupational status given the prevalence of substance abuse; nevertheless, those about to enter a war zone present an obvious population in need for guidance. Rapid recognition of this potentially life-changing stressor and the need for the HCP to provide resources to develop safer coping mechanisms than alcohol or other drug abuse is essential.

Screening for substance abuse requires a three-stage strategy that should focus on behavior pre-deployment, during deployment, and return from deployment.<sup>7,140</sup> In terms of Reservists and National Guard troops, there is the potential for “slipping through the cracks” if we as clinicians do not follow the same playbook, given active military may receive their care from military clinical facilities and nonactive duty from civilian health care. Nevertheless, each stage warrants brief, focused screening. The goal for returning troops is to ensure they are able to cope with daily life and

**TABLE 6.** Quantity-frequency questions

---

Part I

1. “On average, how many days a week do you drink alcohol?”
2. “On a typical day when you drink, how many drinks do you have?”
3. Multiply the days of drinking a week times the number of drinks = score.

Scoring: Any score exceeding 14 for men or 7 for women suggests an at-risk behavior.

Part II

1. “What is the maximum number of drinks you had on any given day since learning about your deployment (or during deployment)?” = score.

Scoring: Any score exceeding 4 for men or 3 for women suggests a potential alcohol problem.

---

**TABLE 7.** CAGE questions

---

C – “Have you ever felt that you should CT down on your drinking?”

A – “Have people ANNOYED you by criticizing your drinking?”

G – “Have you ever felt GUILTY about your drinking?”

E – “Have you ever had a drink first thing in the morning (an EYE-OPENER) to steady your nerves or get rid of a hangover?”

Individuals who answer “yes” to 3 of the 4 CAGE questions over the past year are likely to be alcohol dependent.

Individuals who answer “yes” to 1 or 2 of the CAGE questions may likely have alcohol abuse.

---

reconnect with family, friends, work, and society. In addition to PTSD and other mental illnesses, battlefield wounds is the deleterious impact of substance abuse on the critical domains of daily living.

There are a variety of screening tools available.<sup>77,140-142</sup> It is important to validate the patient’s concerns, that yes, a war zone is a dangerous place, and acknowledge that an impending deployment elicits a wide range of emotions from fear to excitement. Asking the patient what best characterizes their reaction is a nonthreatening way to open the dialogue. It can be adapted to the returning troop as well. A statement such as, “how are you (have you) handling your concerns/anxiety/fear?” or “some people find that drinking more alcohol, smoking a few more cigarettes, drinking more coffee, or doing drugs like pot help relieves the stress—which of these has been your approach?” If such questions have resulted in insights about substance abuse, then a more formal screen with either the quantity-frequency questions (Table 6) or the traditional CAGE screening should be administered (Table 7).<sup>77,139-142</sup>

Of note, combining the quantity–frequency and CAGE questions with the patient interview can reliably predict 70 to 80% of individuals with alcohol abuse or dependency.

This approach can also be adapted to illicit drug use. The caveat,

however, is that no predetermined cutoff scores have been validated when adapting Tables 6 and 7 for the wide range of illicit drugs, including narcotics, marijuana, ecstasy, cocaine, and designer drugs. Nevertheless, it is critical and good medical practice to explore these risks with the pre-through post-deployment patient. Realize once the patient arrives in the theater of operation, combat stress can amplify preexisting, under-, or untreated substance abuse or mental health issues, underscoring the importance of addressing this with your military (active, Reserve, or National Guard) patient.

There is a sizable “black market” in Iraq and the Middle East—diazepam and alcohol, among other substances that are used to self-medicate—are readily available. Herbal products, over-the-counter medications (some of which are controlled substances in the U.S.), even steroids, are available, some of which may not be made according to Food and Drug Administration or good manufacturing standards and thus the military patient should be counseled about the risks of such products.

Clinicians should be alert to behavioral changes consistent with withdrawal; some of these can be misinterpreted as associated with other morbidities. Sleep difficulties, agitation, anxiety, and autonomic hyperactivity can indicate withdrawal, not just combat stress disorder. The correct diagnosis is critical and warrants appropriate, timely evaluation.

Patients returning to the U.S. after deployment in a combat zone may have significant substance abuse, perhaps even new onset abuse, as well as stress-related behavioral issues, psychiatric illness, and/or traumatic brain injury—all of which share similar signs and symptoms, but presenting widely different diagnostic, therapeutic, and prognostic implications. The fact that PTSD, substance abuse, and combat-related neurological trauma can coexist in a returning PGW II patient poses a diagnostic challenge and thus HCP should be alert to these issues, providing counsel, reassurance, diagnostic and treatment resources, education, and ongoing follow-up to the servicemember patient.

**Sexual Abuse.** Military sexual trauma (MST) refers to both sexual harassment and sexual assault occurring in military settings.<sup>13</sup> Men or women can be victims or perpetrators, although most often women are the victims and men are the perpetrators. VA statistics from October through December 2005 report 1618 females and 1360 males seeking medical care stated they were sexually assaulted or harassed.<sup>145</sup> A somewhat unique aspect of MST is that it occurs in a setting where the victim lives and works. Civilians do not often live and work in the same environment, unlike the military, which ultimately has its own legal rules (Uniform Code of Military Justice) and social norms. As such, the victim often must

live and work closely with their perpetrators, which can lead to an ongoing feeling of victimization, feelings of helplessness, and exacerbating the trauma. Victims may also rely on their perpetrators, who may be supervisors with enormous influence on careers.

An unprecedented number of women are serving in PGW II compared to prior wars. Overall, more than 100,000 female servicemembers have been deployed to the Middle East, including Iraq and Afghanistan, compared with 7500 who served in Vietnam and 40,000 in PGW I. Although typically limited to combat-support roles, as the battlefield lines are blurred and combat occurs in the streets, roadside bombs, ambushes, guerilla warfare have all virtually eliminated the safety categories and distinction between combat and support roles. Ironically driving a truck in Iraq is considered combat-support, yet with IED and roadside bombs, this activity is turning out to be one of the most dangerous jobs in PGW II. Camp Victory was attacked by mortars, resulting in several deaths including two servicewomen. As such, women are in harm's way with their male counterparts. The impact of combat on women, especially in terms of psychiatric illness such as PTSD, remains to be fully characterized. Most data on PTSD and women are derived from civilian research and usually related to sexual trauma, including rape.<sup>143,144</sup> A 2003 DoD report revealed nearly one-third of a nationwide sample of female veterans who sought health care through a VA said they experienced rape or attempted rape during their military service. Of that group, 37% reported that they were raped multiple times and 14% reported being gang-raped. A small VA study following PGW I suggested that rates of sexual harassment and assault rise during wartime. From 2001 to 2005 nearly 44,000 women veterans reported being victims of sexual assault or harassment, sometimes from fellow servicemembers.<sup>77,110,138</sup>

Compared to the civilian population, men and women in the military have been shown to have higher rates of sexual and physical abuse in their backgrounds than the general population and women entering the military are likely to have more traumas accumulated than their male counterparts. Although a small percentage of male veterans revealed being sexually abused/assaulted, the overwhelming majority are women. As such, women experience what has been referred to as a "double whammy" in PGW II: military sexual trauma and combat exposure. What impact this will have ultimately on the psychiatric health of returning women from the Gulf remains to be seen. While sexual trauma presents diagnostic and treatment challenges among civilian patients, the additional impact of military life and the pervasive sense among many military women that reporting a sexual crime is seldom worthwhile can enhance feelings of

vulnerability, loss of control, and fear and exacerbate the effect of other traumas. Since many of the perpetrators of the sexual abuse are supervisors, reporting such traumas can place the victim in a challenging position—career-wise, among colleagues, and just the normal pain attendant with reliving the event during the vetting process of a formal complaint. Also, unlike the typical male bonding that occurs among wartime combatants, small studies suggest this is not the case among female troops during deployment. Such isolation can contribute to the deleterious impact of a wartime experience and is worth remembering when treating female military patients—current or retired, as the signs and symptoms of untreated mental illness resulting from such events can persist and go unaddressed or be considered associated with other issues. Interestingly, such isolation does not appear to occur among Reserve and medical units or when commanders establish a zero tolerance for such sexism.

Female veterans who use VA health care and report a history of MST also report a range of negative outcomes that include poorer health (mental and physical), readjustment problems following discharge (finding work, homelessness, substance abuse), and unresolved mental health issues.

Studies of sexual assault among civilians identify PTSD as a frequent outcome. Interestingly, rates of PTSD associated with MST seem higher than those associated with combat exposure. Major depressive disorder is another common reaction following MST.<sup>77</sup> A large-scale study revealed, not surprisingly, that rape survivors compared to nonvictims were 10 times more likely to use major drugs and 6 times more likely to use cocaine. Anger, shame, guilt, and self-blame are all associated with MST and sexual trauma in general. Moreover, difficulties with trust, social avoidance, and sexual dysfunction may also result—the impact not only seen in the victim but perhaps with loved ones, significant others, life-partners, or spouses.

## Screening

It is important to screen all patients but especially military (active, Reserve, National Guard, or veteran) for a history of sexual harassment (verbal or physical) and assault.<sup>13</sup> Mandated by the VA, it is good clinical practice for civilian providers as well.<sup>110</sup> When screening for sexual trauma, avoid terms that may trigger negative responses, are stigmatizing, and may assume an interpretation different from that of the patient.<sup>13,143,144</sup> These include “rape” and “sexual harassment.” Instead ask questions in a supportive way and with more open-ended, nonthreatening

phrases. Examples include “while you were in the military, did you ever experience any unwanted physical or sexual attention, verbal remarks, touching, or pressure for sexual favors?” “Did anyone ever use force or the threat of force to have sex or physical contact with you against your will?” Remind the patient this conversation is privileged; you care about her/him and are a trusted resource.

Patients who may have to undergo forensic rape examinations are often less traumatized if education is provided, realizing the examination can present powerful triggers. Resnick and Schnicke prepared a 17-minute educational video that has been shown to reduce post exam stress compared to patients who did not view the program.<sup>143</sup>

## *Assessment*

Data are scant in terms of validated measures specifically designed to assess MST. Most checklist measures currently available include a least a question about sexual assault but do not usually assess sexual harassment. Several self-report measures and structured interviews do exist and are designed to assess sexual harassment and sexual assault. One such tool is the Sexual Experience Questionnaire by Fitzgerald, the most widely used measure of sexual harassment. Interview guidance can be obtained from the National Women’s Study interview developed by Resnick and Schnicke.<sup>143</sup> Clearly the most important issue is to engage in the dialogue and elicit information that can lead to appropriate intervention.

## *Treatment*

While there are treatments available that can reduce the psychological impact of sexual harassment and sexual trauma, improving the victim’s quality of life, there are little outcomes-based data on the treatment of MST. Nevertheless, given the results of treatment outcomes with civilians, these can be used to guide treatment of veteran populations until such a time that best practices can be identified for military victims of sexual trauma.<sup>13,110,143,144</sup>

Key interventions start with addressing immediate health and safety concerns, normalizing posttrauma reactions, validating the patient, supporting their existing positive adaptive coping strategies, and helping the patient develop additional coping skills. Addressing the cognitive and affective reactions such as fear, self-blame, anger, and other issues is important. Referral to appropriate mental health expertise but in the context of a collaborative team approach is essential. It is important to recognize the feelings of vulnerability; thus referral without explanation



can lead to feelings of abandonment. Reassuring the patient that you are going to be working with her or him even while the trauma specialist is on board underscores you are bringing on an additional member of the health care team, and that the patient is not being sent away.

Another valuable preparation for community clinicians is to assess and become familiar with the level of local resources available to your patients who may be victims of sexual abuse or MST in advance of returning PGW patients, helping to address gaps in your region, and working with professionals in the field to increase options for care.

## Discussion

New threats to our troops have emerged given the evolving nature of battlefield medicine. More severe, even horrific wounds—traumatic amputations, burns, head injuries—are now survivable but at what impact to the survivor and his/her family?<sup>1,3,5,14,15,18,20,22,24,45,77</sup> Long-term care, the mental and well as physical component of rehabilitation, and readjustment to the U.S. all require HCP to be engaged and aid the civilian troops navigate the often dizzying array of required health care often amid red tape and limited resources.

Psychological morbidities—PTSD, depression, anxiety, substance abuse, and TBI—are significant problems for troops serving in and returning from PGW as well as for some of those preparing for deployment.<sup>22,18,77</sup> Given many of the troops—male and female—are not full-time active military, it is likely they receive medical care from civilian HCP. Reports confirm there is a gap between services needed and available—access, cost, quality, and quantity all need to be addressed from a federal, state and local, military, and civilian perspective.<sup>9-11,29,30</sup> The role of the civilian HCP cannot be stressed enough!

The rates of sexual abuse and MST are on the rise as the number of women in the military, especially in combat zones, increases.<sup>13</sup> Female troops are increasingly in harm's way as the distinction between combat and combat support roles blurs amidst a guerilla war. Whether MST, TBI, or the fog of war—the complexities of treating female troops represent a unique challenge unseen in prior wars.

Whether male or female, the need for mental health services in addition to addressing the physical ailments associated with war will likely exceed current capacity.<sup>7,13,138</sup> Primary care clinicians and civilian specialists will be called upon to fill the voids and must be attuned to the special needs of our servicemen and servicewomen.

The United States is no longer isolated from a dangerous world or protected by its geography.<sup>17,42-44,46,60,65</sup> Oceans and borders can be

readily crossed, making the United States as vulnerable as other nations to acts of terrorism. Geoglobal and societal factors have combined to create conditions that facilitate the emergence and spread of previously unknown clinical entities such as severe acute respiratory syndrome (SARS), emerging pathogens not common to the United States but endemic to other regions, such as West Nile Virus, and relatively harmless viruses evolving into highly lethal pathogens such as the HPAI H5N1 strain of avian influenza as well as the intentional release of biological weapons.<sup>106,107,134,136</sup> Over the last few years we have seen the appearance of monkeypox in the United States as the result of animal importation, and plague patients diagnosed in New York (contracted it in the Southwest). War, increased globalization, climate changes, encroachment of previously untouched natural habitats, worldwide food distribution, human population growth, overcrowding, and travel all favor the spread of infectious diseases—especially ones not commonly seen in the U.S.<sup>1,3,106,107,117,118</sup>

Tens of thousands of our servicemen and servicewomen will be returning from the Persian Gulf—many of whom may have been exposed to undetected chemicals or bioweapons, or be infected with diseases endemic to the region. Certain “desert illnesses” as well as brucellosis, mosquito-borne diseases, can present with central nervous system, behavioral, and mental status changes. Will we diagnose them correctly or will their return be marked by another “Persian Gulf Syndrome?” This syndrome in the early postwar years became synonymous for PTSD. In reality, it represented a variety of etiologies ranging from chemical exposure, desert illnesses, as well as PTSD. Therefore the threat of uncommon illness is but the reality of our future practices. The physician should remain alert for such exigencies.

If the intentional use of anthrax in 2001 taught us anything, it was that an astute physician could save lives. Equally, physicians who do not know the common signs of serious, perhaps deadly, emerging illnesses will lose lives. Emerging infectious diseases can pose a significant diagnostic challenge and threat to our communities. Whether increasing our knowledge and vigilance against emerging threats for our troops or communities, even in a profession fraught with numerous competing demands, the benefit of being able to diagnose rapidly and accurately the index case of an emerging pathogen or helping a servicemember return to health and society is worth the effort.

The optimism of the “antibiotic era” and our so-called victory over pathogens should be tempered by the realization that 5.7 million annual deaths are the direct result of TB, AIDS, and malaria,

according to the WHO. This represents approximately one-fourth of the deaths worldwide per year—the result of three infectious diseases. Multi-drug-resistant TB and extremely drug-resistant TB are on the increase and pose a significant threat worldwide, including the U.S., where in certain regions and among certain risk groups it remains a significant health problem.<sup>106,107,117,127,146</sup>

Recognition of the potential for troops to import an illness endemic to the Middle East and a basic familiarity of the clinical syndromes associated with emerging pathogens—whether those previously unknown, pathogens spread to new areas by global forces, or biological weapons—and subsequently implementing containment and treatment measures will largely rest upon the clinical acumen of the physician.<sup>107,117,127,146</sup> Maintaining an index of suspicion for relatively uncommon illnesses—this includes the common presentations of heretofore nonendemic (to the U.S.) infections, staying abreast of trends in travel-related illness, and emerging patterns of disease, especially in the Middle East, using easily obtained sources such as the WHO internet site may enhance the likelihood of recognizing an uncommon illness.

While the incidence of imported infectious disease presenting to HCF is not well defined,<sup>118,119</sup> it is well known that significant numbers of patients present to medical facilities upon return from traveling with a variety of complaints, including respiratory infections. Studies suggest clinicians do a poor job of obtaining a travel history, including a general lack of awareness by physicians concerning the potential for nonendemic disease in the population that they attend.<sup>118,119</sup> In one such study evaluating whether a travel history was recorded in patients, a travel history was recorded in only 2% of all patients presenting to this emergency department, although among total number of patients presenting to the emergency department, 5.3% actually had the potential for a travel-related illness.<sup>118,119</sup> While many of the illnesses that troops are likely to import are not contagious, we should take small comfort in that it only takes one missed case of a contagion to cause an outbreak!

Physicians and HCP should consider the physical, rehabilitative, and mental health issues within the broader context of a patient who has been in a war zone and now must reenter and adjust to society, job, and family. Addressing these domains as part of the overall therapeutic and clinical management plan is critical. Moreover, these domains, including financial pressures, will impact recovery, not unlike our civilian patients. However, unlike noncombatant civilians, our civilian troop patients may have faced dramatic, draconian, and devastating experiences unfathomable to their neighbors and thus requiring appropriate medical service. Being sensitive

to the self-image and pride of these patients, prearranging or collocating psychosocial services, and allowing for seamless care has been shown to improve outcomes. Integrating psychiatry and primary care, often referred to as co-location, is effective for improving access to mental health services and for increasing treatment engagement.

HCP may be treating the noncombatant family member as well. Psychological morbidities can affect loved ones not deployed and, thus, these patients should be screened and counseled. Financial worries can cause significant stress and, in a nonthreatening manner, compassionate concern and gentle inquiry should be provided. Physicians are often in a position to provide guidance as community leaders and may aid in “networking” on behalf of a financially challenged patient.

It is likely some of our patients serving in PGW will experience some form of injury from MST/sexual abuse, PTSD or other psychiatric illness, physical wounds, or a combination thereof. Like most patients, they may feel a total lack of control. Empowering patients and involving them as active participants in their medical care, education, and choices is an important therapeutic approach.

## **Conclusion**

More than 250,000 U.S. troops have been deployed to the Gulf region. Secretary of VA Principi stated that “We have learned every battlefield poses unique dangers. There are bullet wounds and shrapnel wounds, but there are those things that may not manifest themselves for years. We have to make sure that our system is capable of providing care for them.” He is right! It cannot just be the VA. It takes a village or a community! As physicians and HCP, we enjoy many privileges in a free nation. We have the benefit of working in far safer conditions than our servicemen and women in Iraq, Afghanistan, and other dangerous locations worldwide. Freedom is not free and we have the opportunity to use our professional skills, community position, and network of colleagues to provide for a special population that placed itself in harm’s way for us.

Deploying to or returning from war presents a spectrum of emotions, risks, injuries, and therapeutic challenges. Troops must reenter society after experiencing the horrors of war, the loss of friends, injuries, and deprivation not encountered in the U.S., or they are preparing to enter such a challenging environment, leaving friends, family, safety, and the comforts of home. Unlike previous large-scale wars such as WWII

or Korea, except for families and friends of troops, most U.S. citizens are not engaged in, impacted by, or involved with the war on a daily basis.

Civilian HCP are in a unique position to help prepare the young men and women who serve as civilian military (Reservists/National Guard) and active military who may be our patients, for deployment, provide comfort in the knowledge that we will keep a watchful eye on their loved ones—also our patients, in their absence, and be prepared to care for them upon their return to the U.S.

## **Resources**

### *Homes For Our Troops*

Builds and remodels homes for severely wounded troops. Phone: 1-866-7TROOPS. For more information, review their internet site: <http://www.homesforourtroops.org/site/PageServer?pagename=AboutHFOT>

### *Operation Helmet*

Provides helmet upgrade kits to troops in Iraq and Afghanistan (and about to be deployed); shock-absorbing pads enhance protection against IED and decrease risk of TBI. Phone: 1-936-449-9706 from 8 to 5 CST or visit their internet site at: <http://www.operation-helmet.org/index.html>

### *Suicide Hotline: Veterans Administration*

Post this information for patients. If a patient is in need of immediate crisis counseling, please contact the VA's suicide hotline at 1-800-273-TALK; counselors are available 24/7 to help.

### *Veterans For Americans*

An advocacy and humanitarian organization to ensure that our country meets the needs of servicemembers and veterans who have served in OEF and OIF. Veteran's For America focuses on psychological traumas and traumatic brain injuries. Resources also for women veterans. Internet site: <http://www.veteransforamerica.org/military-women/>

### *Women Veterans' Network of the Department of Veterans' Services*

The central resource for women veterans in the Commonwealth of Massachusetts. The Veterans Administration also has resources for women. <http://www.mass.gov/?pageID=veteranstopic&L=2&sid=Eveterans&L0=Home&L1=Women+Veterans>

The following may be able to assist veterans and their families:

The Department of Defense (DoD) has opened the Military Severely Injured Joint Support Operations (MSIJSO) Center (24/7) to help severely injured service members find jobs and answer their or family member questions. Toll free 1-888-774-1361.

The DoD and [www.military.com](http://www.military.com) have partnered to create an online career center that can assist severely injured service members with benefits, resources, and employment opportunities.

Army Emergency Relief (AER)

Air Force Aid Society (AFAS)

Coast Guard Mutual Assistance

Navy-Marine Corps Relief Society (NMCRS), 875 North Randolph Street, Suite 225, Arlington, VA 22203-1977. Ph: 1-703-696-4904, Fax: 1-703-696-0144.

### *Benevolent and Protective Order of Elks, USA*

In each of the 172 VA Medical Centers, there is an Elk committee at work to help veterans in need, including those who are homeless.

BPO Elks, USA. 2750 N. Lakeview Avenue, Chicago, IL 60614.

### *Disabled American Veterans (DAV) National Service Foundation*

DAV develops financial resources for the assistance, care, and support as well as rehabilitation of disabled veterans and their dependents.

3725 Alexandria Pike, Cold Spring, KY 41076. Ph: 1-877-426-2838.

### *National Coalition for Homeless Veterans (NCHV)*

A resource and technical assistance center for community-based service providers and agencies that provide emergency and supportive housing, food, health services, job training placement assistance, legal aid, and case management.

Ph: 1-800-838-4357 (1-800-Vet-Help)

### *National Association of Hospital Hospitality Houses, Inc. (NAHHH)*

NAHHH is a network of >150 organizations throughout the U.S. providing family-centered lodging and support services to families and their loved ones confronted with medical emergencies.

Ph: 1-800-542-9730.

Of note, some states (Connecticut, for example) establish funds to provide emergency financial assistance.

### *Department of Veterans Affairs*

Internet site: [www.va.gov](http://www.va.gov)

### *The Intrepid Fallen Heroes Fund*

The Intrepid Fallen Heroes Fund provides support toward the severely injured. In January 2007, the Fund completed construction of a \$40 million world-class state-of-the-art physical rehabilitation center at Brooke Army Medical Center in San Antonio, Texas. The “Center for the Intrepid” serves military personnel who have been catastrophically disabled in operations in Iraq and Afghanistan, and veterans severely injured in other operations and in the normal performance of their duties. The 60,000 square foot Center provides ample space and facilities for the rehabilitation needs of the patients and their caregivers. Internet site: <http://www.fallenheroesfund.org/>

## **Acknowledgments**

The author thanks Lt. Deena Disraelly (USN, ret) for tremendous assistance, both for military service and for the preparation of this manuscript. Her insights into the health care issues of returning troops were invaluable. There were several active and retired military who shared their personal experiences but on condition of anonymity; my gratitude for their service and candor. The author also thanks Jamie Walker, an amazing editor and colleague; her guidance, enthusiasm, and skills shared on this and previous manuscripts are greatly appreciated. Thank you to Dr. Caren Teitelbaum, Yale University School of Medicine, Department of Psychiatry, for sharing her knowledge and insightful suggestions.

## **REFERENCES**

1. Aronson NE, Sanders JW, Moran KA. In harm’s way: infections in deployed American military forces. *Clin Infect Dis* 2006;43:1045-51.
2. Weina P, Neafie R, Wortmann G, et al. Old world leishmaniasis: an emerging infection among deployed US military and civilian workers. *Clin Infect Dis* 2004;39:1674-80.
3. Sanders J, Putnam S, Frankart C, et al. Impact of illness and non-combat injury during operations Iraqi Freedom and Enduring Freedom. *Am J Trop Med Hyg* 2005;73:713-9.
4. Defense Intelligence Agency, Armed Forces Medical Intelligence Agency. Medical threat assessment—Northern Iraq. [http://www.gulflink.osd.mil/declassdocs/dia/19950825/950825\\_0146pgv\\_90d.html](http://www.gulflink.osd.mil/declassdocs/dia/19950825/950825_0146pgv_90d.html).
5. Anderson A, Smoak B, Shuping E, et al. Q Fever and the US Military. *Emerg Infect Dis* 2005;11:1320-2.
6. Military Deployment and Coming Home. VA Research and Development. United States Department of Veterans Affairs. <http://www.research.va.gov/news/features/deployment.cfm> last accessed 10/8/2007.
7. Frayne S, Seaver M, Loveland S, et al. Burden of medical illness in women with depression and post-traumatic stress disorder. *Arch Intern Med* 2004;164:1306-12.

8. Engel CC, Jaffer A, Adkins J, et al. Can we prevent a second 'Gulf War Syndrome'? Population-based healthcare for chronic idiopathic pain and fatigue after war. In: Clark MR, Treisman GJ, editors. Pain and Depression. An Interdisciplinary Patient-Centered Approach, vol. 25. Basel, Karger: Adv Psychosom Med 2004, p. 102-122.
9. Hoge CW, Castro CA, Messer SC, et al. Combat duty in Iraq and Afghanistan, mental health problems and barriers to care. *N Engl J Med* 2004;351(1):75-7.
10. Pervasive wound of war. *Washington Times*. 8/9/07. <http://washingtontimes.com/apps/pbcs.dll/article?AID=20070809/commentary/1080>.
11. Seal KH, Bertenthal D, Miner C, et al. Bringing the War Back Home. *Arch Intern Med* 2007;167:476-82.
12. Gawande A. Casualties of war—military care for the wounded from Iraq and Afghanistan. *N Engl J Med* 2004;351:2471-5.
13. Street A, Stafford J. Military Sexual Trauma: Issues in Caring for Veterans. Iraq War Clinician Guide, Dept. of Veterans Affairs. The National Center for PTSD Manuals. Available from [www.ncptsd.va.gov/ncmain/ncdocs/manual/nc\\_manual\\_iwcguide.html](http://www.ncptsd.va.gov/ncmain/ncdocs/manual/nc_manual_iwcguide.html). Accessed March 14, 2008.
14. Wain HJ, Cozza SJ, Grammer GG, et al. Treating the traumatized amputee. In: Iraq War Clinician Guide, Dept of Veterans Affairs. The National Center for PTSD. [http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc\\_manual\\_iwcguide.html?printable](http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc_manual_iwcguide.html?printable) last accessed 12/2/07.
15. Xydakis MS, Beberta VS, Harrison CD, et al. Tympanic membrane perforation as a marker of concussive brain injury in Iraq. *New Engl J Med* 2007;357:830-831.
16. Xydakis MS, Fravell MD, Nasser KE, et al. Analysis of battlefield head and neck injuries in Iraq and Afghanistan. *Otolaryn Head Neck Surg* 2005;133:497-504.
17. With 'invisible injuries,' thousands of brain-damaged troops returning home. *Arizona Daily Star* 9/10/2007. <http://www.azstarnet.com/sn/printDS/200533> last accessed 10/9/07.
18. Okie S. Traumatic brain injury in the war zone. *New Engl J Med* 2005;352:2043-7.
19. Lardner R. Report faults hospital for marine's death. *The Tampa Tribune*, Friday, June 3, 2005. Metro section, page 3.
20. Pezzin LE, Dillingham TR, MacKenzie EJ. Rehabilitation and the long-term outcomes of persons with trauma-related amputations. *Arch Phys Med Rehabil* 2000;81:292-300.
21. Bates B, Kurichi JE, Marshall CR, et al. Does the presence of a specialized rehabilitation unit in a Veterans Affairs facility impact referral for rehabilitative care after a lower extremity amputation? *Arch Phys Med and Rehab* 2007;88:1249-55.
22. Scurfield RM, Tice S. Acute psycho-social intervention strategies with medical and psychiatric evacuees of "Operation Desert Storm: and their families. Operation Desert Storm Clinician Packet. White River Junction, VT; 1991 National Center for PTSD.
23. Gondusky JS, Reiter MP. Protecting military convoys in Iraq; an examination of battle injuries sustained by a mechanized battalion during Operation Iraqi Freedom II. *Mil Med* 2005;170:546-9.
24. Chambers LW, Green DJ, Gillingham BL, et al. The experience of the US Marine Corps' Surgical Shock Trauma Platoon with 417 operative combat casualties during a 12 month period of Operation Iraqi Freedom. *J Trauma* 2006;60(6):1155-61.
25. Iraq coalition casualty count. <http://icasualties.org/oif/IED.aspx>.
26. Sander L. Screening for Brain Injury Is Set For Illinois Veterans. *The New York Times*. 7/4/07. <http://www.nytimes.com/2007/07/04/us/04vets.html?pagewanted=print>. Last accessed 10/8/07.



27. Ruzek JI, Kudler H. Treatment of Medical Casualty Evacuees. In: Iraq War Clinician Guide, Dept of Veterans Affairs. The National Center for PTSD. [http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc\\_manual\\_iwcguide.html?](http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc_manual_iwcguide.html?printable) printable last accessed 12/2/07.
28. Peoples G, Jezior J, Shriver C. Caring for the wounded in Iraq—a photo essay. *N Engl J Med* 2004;351:2476-80.
29. Hasemyer D. The San Diego Union-Tribune. 4/23/03 VA preparing for health issues from Iraq War. <http://signonsandiego.com> last accessed 10/8/07.
30. Vets wait longer for care than VA allows. Arizona Daily Star 9/11/07. <http://www.azstarnet.com/sn/printDS/200619>.
31. Hoge CW, Castro CA, Messier SC, et al. Combat duty in Iraq and Afghanistan, mental health problems and barriers to care. *N Engl J Med* 2004;351:13-22.
32. Richardson RD, Engel CC, Hunt SC, et al. Are veterans seeking veterans affairs' primary care as healthy as those seeking department of defense primary care? A look at Gulf War veteran's symptoms and functional status. *Psychosomatic Med* 2002;64:676-83.
33. Finkel MF. The neurological consequences of explosives. *J Neurol Sci* 2006;249(1):63-7.
34. Gutierrez de Ceballos JP, Turequano Fuentes F, Perez Diaz D, et al. Casualties treated at the hospital in the Madrid, March 11, terrorist bombings. *Crit Care Med* 2005;33(suppl):S107-12.
35. Jensen JH, Bonding P. Experimental pressure induced rupture of the tympanic membrane in man. *Acta Otolaryngol* 1993;113:62-7.
36. Warden D. Military TBI during the Iraq and Afghanistan wars. *J Head Trauma Rehab* 2006;21(5):398-402.
37. Operation Helmet; data on helmets and brain injury. <http://www.operation-helmet.org/index.html>.
38. DePalma RG, Burris DG, Champion HR, et al. Blast injuries. *New Engl J Med* 2005;352:1335-42.
39. Elsayed NM. Toxicology of blast overpressure. *Toxicology* 1997;121:1-15.
40. Halpern P. Medical management of explosives. In: McFee RB, Leikin JB, editors. *Toxicoterrorism*. New York: McGraw-Hill, 2008. p. 471-85.
41. Chapter 3: Explosive And Traumatic Events. In: *Basic Disaster Life Support (BDLS) Version 2.5*. Board of Regents, University of Georgia. 4/04.
42. Ferrante MA, Dolan MJ. Q fever meningoencephalitis in a soldier returning from the Persian Gulf War. *Clin Infect Dis* 1993;16:489-96.
43. Andrews R. Brucellosis in a soldier who recently returned from Iraq. July 2004 *Medical Surveillance Monthly Report* 2004;10:30 <http://amsa.army.mil>
44. Willard RJ, Jeffcoat AM, Benson PM, et al. Cutaneous leishmaniasis in soldiers from Fort Campbell, Kentucky returning from Operation Iraqi Freedom highlights diagnostic and therapeutic options. *J Am Acad Dermatol* 2005;52(6):977-87.
45. Myles O, Wortman C, Barthel R, et al. Centers for Disease Control and Prevention. Two cases of visceral leishmaniasis in U.S. Military personnel—Afghanistan, 2002-2004. *MMWR Morb Mortal Wkly Rep* 2004;53:264-5.
46. Kotwal R, Wenzel R, Sterling R, et al. An outbreak of malaria in US Army Rangers returning from Afghanistan. *JAMA* 2005;293:212-6.
47. Shorr A, Scoville S, Cervosky S, et al. Acute eosinophilic pneumonia among US military personnel deployed in or near Iraq. *JAMA* 2004;292:2997-3005.

48. Anderson AD, Smoak B, Shuping E, et al. Q fever and the US military. *Emerg Infect Dis* 2005;11:1320-2.
49. Centers for Disease Control and Prevention. *Acinetobacter baumannii* infections among patients at military medical facilities treating injured US service members, 2002–2004. *MMWR Morb Mortal Wkly Rep* 2004;53:1063-6.
50. Brown D, Gray J, MacDonald P. Centers for Disease Control and Prevention. Outbreak of Acute Gastroenteritis associated with Norwalk like viruses among British military personnel—Afghanistan, May 2002. *MMWR Morb Mortal Wkly Rep* 2002;51:477-9.
51. Bailey M, Boos C, Vautier G, et al. Gastroenteritis outbreak in British troops, Iraq. *Emerg Infect Dis* 2005;11:1625-8.
52. Connor BA. Sequelae of traveler’s diarrhea: focus on postinfectious irritable bowel syndrome. *Clin Infect Dis* 2005;41(suppl 8):S577-86.
53. Deployment related conditions of special surveillance interest, US Armed Forces, January 2003–June 2005: acute respiratory failure/ARDS. *Medical Surveillance Monthly Report* 2005;11:22. Available from: <http://amsa.army.mi>. Accessed March 15, 2008.
54. World Health Organization (WHO). TB situation in the region. 2003. [http://www.emro.who.int/stb/TBsituation\\_CountryProfile-afg.htm](http://www.emro.who.int/stb/TBsituation_CountryProfile-afg.htm).
55. Kilpatrick M. Institute of Medicine Committee on the Gulf War and Health. *Infect Dis Briefing* 26 May 2005.
56. Spudick J, Garcia L, Graham D, et al. Diagnostic and therapeutic pitfalls associated with primaquine tolerant *Plasmodium vivax*. *J Clin Microbiol* 2005;43:978-81.
57. Mendoca M, deBrito M, Rodrigues E, et al. Persistence of *Leishmania* parasites in scars after clinical cure of American cutaneous leishmaniasis: is there a sterile cure? *J Infect Dis* 2004;189:1018-23.
58. World Health Organization. Communicable disease profile: Iraq. Geneva WHO 2003;42-5.
59. Gregory A, Schatz S, Laubach H. Ophthalmomiasis caused by the sheet bot fly *Oestrus ovis* in northern Iraq. *Optom Vis Sci* 2004;81:586-90.
60. Leung-Shea C, Danaher PJ. Q fever in Members of the United States Armed Forces Returning from Iraq. *Clin Infect Dis* 2006;43:e77-82.
61. Weina PJ, Neafie RC, Wortmann G, et al. Old World Leishmaniasis: an emerging infection among deployed US Military and civilian workers. *Clin Infect Dis* 2004;39:1674-80.
62. Defense Intelligence Agency, Armed Forces Medical Intelligence Agency. Final report: analysis of Iraqi military blood samples. [http://www.gulfink.osd.mil/declassdocs/dia/19950901/950901\\_0600rpt\\_91d.html](http://www.gulfink.osd.mil/declassdocs/dia/19950901/950901_0600rpt_91d.html).
63. Anderson AD. Q fever in OIF deployed soldiers: an emerging disease of military importance. [http://www.ds.jf.org/IZ\\_Diseases/Q%20Fever%20in%20OIF%20Deployed%20Soldiers%20Emerging%20Threat.pdf](http://www.ds.jf.org/IZ_Diseases/Q%20Fever%20in%20OIF%20Deployed%20Soldiers%20Emerging%20Threat.pdf).
64. Fournier PE, Marrie TJ, Raoult D. Diagnosis of Q fever. *J Clin Microbiol* 1998;36:1823-34.
65. McFee RB. Avian influenza: the next pandemic. *Dis Mon* 2007;53(7):337-88.
66. Hartzell JD, Peng SW, Morris-Wood RN, et al. Atypical Q fever in US Soldiers. *Emerg Infect Dis* 2007;13(8):1247-9.
67. Currie M. Treatment of cutaneous leishmaniasis by curettage. *Br Med J (Clin Res Ed)* 1983;287:1105-6.

68. Military of the United States [www.defenselink.mil/](http://www.defenselink.mil/).
69. Global Security on US Military Operations <http://www.globalsecurity.org/military/ops/index.html>.
70. Surge Seen In Number Of Homeless Veterans. Erik Eckholm. The NY Times. 11/8/07. [http://www.nytimes.com/2007/11/08/us/0vets.html?\\_r=1&hp=&oref=slogin&pagewanted](http://www.nytimes.com/2007/11/08/us/0vets.html?_r=1&hp=&oref=slogin&pagewanted) last accessed 11/9/07.
71. Waldrep DA, Coza SJ, Chun RS. The Impact of Deployment on the Military Family. In: Iraq War Clinician Guide. Department of Veterans Affairs, The National Center for PTSD. [http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc\\_manual\\_iwcguide.html?printable](http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc_manual_iwcguide.html?printable) last accessed 12/2/07.
72. Post Traumatic Stress Disorder (PTSD) Mental Health Online. [www.mentalhealthchannel.net](http://www.mentalhealthchannel.net) last accessed 12/10/07.
73. Prins A, Kimerling R, Leskin G. Chapter VII: PTSD in Iraq War Veterans: Implications for Primary Care. In: Ira Qwar Clinician Guide, 2nd ed. Dept. of Veterans Affairs, Washington, DC. Available from: [www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc\\_manual\\_iwcguide.html](http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc_manual_iwcguide.html). Accessed March 14, 2008.
74. Cozza SJ, Benedek DM, Bradley JC, et al. Topics specific to the psychiatric treatment of military personnel. In: Iraq War Clinician Guide, 2nd ed. Dept. of Veterans Affairs, Washington, DC. Available from: [www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc\\_manual\\_iwcguide.html](http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc_manual_iwcguide.html). Accessed March 14, 2008.
75. Grieger TA, Cozza SJ, Ursano RJ, et al. Posttraumatic stress disorder and depression in battle injured soldiers. *Am J Psychiatry* 2006;163(10):1777-83.
76. Treatment of the returning Iraq War Veteran. In: Iraq War Clinician Guide, Dept. of Veterans Affairs. The National Center for PTSD. [http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc\\_manual\\_iwcguide.html?printable](http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc_manual_iwcguide.html?printable) last accessed 12/2/07.
77. Lande RG, Marin BA, Ruzek JI. Substance Abuse in the Deployment Environment In: Iraq War Clinician Guide, Dept of Veterans Affairs. The National Center for PTSD. [http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc\\_manual\\_iwcguide.html?printable](http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc_manual_iwcguide.html?printable) last accessed 12/2/07.
78. Post-Traumatic Stress Disorder: Implications for Primary Care Independent Study Course, Veterans Health Initiative: <http://vaww.sites.lrn.va.gov/vhi> (VA Intranet)
79. National Institute for Mental Health information on PTSD. <http://www.nimh.nih.gov/anxiety/ptsdmenu.cfm>.
80. Koren D, Cohen A, Berman J, et al. Increased PTSD risk with combat-related injury: a matched comparison study of injured and uninjured soldiers experiencing the same combat events. *Am J Psychiatry* 2005;162(2):276-82.
81. Friedman MJ. Veterans' mental health in the wake of war. *N Engl J Med* 2005;352:1287-90.
82. McFee RB. Adolescent health and risk behaviors: the role of the primary care physician. *Johns Hopkins Advanced Studies Med* 2003;3(7):401-11.
83. Elster A, Epner J, Fleming M, et al. Train the trainers guide. Guidelines to Adolescent Preventive Services (GAPS): Chicago, IL: American Medical Association Publications, 1999.
84. Elster AB, Levenberg P. Integrating comprehensive adolescent preventive services into routine medical care; rationale and approaches. *Pediatr Clin North Am* 1997;44:1365-77.

85. Hoge CW, Auchterionie JL, Milliken CS. Mental health problems, use of mental health services and attrition from military service after returning from deployment to Iraq or Afghanistan. *JAMA* 2006;295:1023-32.
86. Kolkow TT, Spira JL, Morse JS, et al. Post traumatic stress disorder and depression in health care providers returning from deployment to Iraq and Afghanistan. *Mil Med* 2007;172(5):451-5.
87. Gulf War injections are toxic cocktail when combined, researchers say. CNN. April 16, 1996. <http://www.cnn.com/HEALTH/9604/16/gulf.war.syndrome/index.html>.
88. Scientist finds nerve damage in Gulf War vets. CNN. 3/27/96. [http://www.cnn.com/WORLD/9603/gulf\\_syndrome/index.html](http://www.cnn.com/WORLD/9603/gulf_syndrome/index.html).
89. Presidential Advisory Committee on Gulf War Veterans' Illnesses. Presidential Advisory Committee on Gulf War Veterans' Illnesses: final report. Washington DC: US GPO 1996. ISBN0-16-048942-3.
90. National Institutes of Health Technology Assessment Workshop Panel. The Persian Gulf experience and health. *JAMA* 1994;272:391-5.
91. Institute of Medicine, National Academy of Sciences. Health consequences of service during the Persian Gulf War: recommendations for research and information systems. Washington DC: National Academy Press, 1996.
92. The Iowa Persian Gulf Study Group. Self-reported illness and health status among Gulf War veterans. *JAMA* 1997;277: 238-45.
93. Kang HK, Mahan CM, Lee KY, et al. Illness among United States veterans of the Gulf War: a population-based survey of 30,000 veterans. *J Occup Environ Med* 2000;42:491-501.
94. Fukuda K, Nisenbaum R, Stewart G, et al. Chronic multisymptom illness affecting Air Force veterans of the Gulf War. *JAMA* 1998;280:981-8.
95. Unwin C, Blatchley N, Coker W, et al. Health of UK servicemen who served in Persian Gulf War. *Lancet* 1999;353:169-78.
96. The Centers for Disease Control Vietnam Experience Study. Post service mortality among Vietnam veterans. *JAMA* 1987;257:790-5.
97. Kang HK. National health survey of Gulf War era veterans and their families. (Abstract). Present at the conference on federally sponsored Gulf War veterans' illnesses research. Pentagon City, VA: June 17-19, 1998.
98. Brouqui P, Dupont H, Drancourt M, et al. Chronic Q Fever: ninety-two cases from France including 27 cases without endocarditis. *Arch Intern Med* 1993;153:642-8.
99. Fenollar F, Thuny F, Xeridat B, et al. Endocarditis after acute Q fever in patients with previously undiagnosed valvulopathies. *Clin Infect Dis* 2006;42:818-21.
100. Splino M, Beran J, Chlibek R. Q fever outbreak during the Czech Army deployment in Bosnia. *Mil Med* 2003;168:840-2.
101. Putnam SD, Sanders JW, Frenck RW, et al. Self-reported description of diarrhea among military populations in operations Iraqi Freedom and Enduring Freedom. *J Travel Med* 2006;13(20):92-9.
102. Aronson N, Bernstein W, Hochberg L. Centers for Disease Control and Prevention. Update: cutaneous leishmaniasis in US Military personnel—southwest/central Asia 2002-2004. *MMWR* 2004;53:264-5.
103. Dowlati Y. Cutaneous leishmaniasis: clinical aspect. *Clin Dermatol* 1996;14:425-31.
104. Agarwal R, Shukla SK, Dharmani S, et al. Biological warfare—an emerging threat. *J Assoc Physicians India* 2004;52:733-8.

105. Gualtieri CT. Neuropsychiatry and behavioral pharmacology. New York: Springer-Verlag, 1991. p. 26-36.
106. McFee RB. Bioterrorism and weapons of mass destruction 2004: physicians as first responders. The DO 2004 March (Special BT Issue):9-23.
107. Peleman RA. New and re-emerging infectious diseases: epidemics in waiting. *Curr Opin Anaesthesiol* 2003;17(3):265-70.
108. Kazar I. Coxiella burnetii infection. *Ann NY Acad Sci* 2005;1063:105-14.
109. Ritchie EC, Benedek D, Malone R, et al. Psychiatry and the military: an update. *Psych Clin of North Am* 2006;4(8):695-707.
110. Dept. of Veterans Affairs. Internet site: [www.va.gov](http://www.va.gov).
111. 11/14/07 Bob Parks. Playing Numbers Game with Our Dead. *The New Media Journal US* <http://www.therant.us/staff/parks/11142007.htm>
112. Bullman TA, Kang HK. Posttraumatic stress disorder and the risk of traumatic deaths among Vietnam veterans. *J Nerv Ment Dis* 1994;182:604-10.
113. Kang HK, Bullman TA. Mortality among US veterans of the Persian Gulf War: 7 year follow-up. *Am J Epidemiol* 2001;154(5):399-405.
114. Arm Center for Substance Abuse Programs with links to world wide ASAP locations <http://www.acsap.army.mil/>
115. Gulf War Illnesses. Federal Research Strategy Needs Reexamination. United States General Accounting Office (GAO). GAO/T NSIAD 98-104.
116. Levantman S. Epilogue: social and historical perspectives on the Vietnam veteran. In: Figley CR, editor. *Stress disorders among Vietnam veterans: theory, research, and treatment*. New York: Brunner/Mazel; 1978. p. 291-5.
117. McFee RB, Bush L, Boehm K. Avian influenza: critical considerations for the primary care physician. *Johns Hopkins Adv Studies Med* 2006; Nov/Dec:
118. Stienlauf S, Segal G, Sidi Y, et al. Epidemiology of travel-related hospitalization. *J Travel Med* 2005;12:136-41.
119. Van Herck K, Van Damme P, Castelli F, et al. Knowledge, attitudes and practices in travel-related infectious diseases: the European airport survey. *J Travel Med* 2004;11:3-8.
120. McFee RB. Update: Chlorine use as a weapon—2007. In: McFee RB, Leikin JB, editors. *Toxicoterrorism*. New York: McGraw Hill, 2008.
121. Rhee J. Pulmonary Agents—(Phosgene, Chlorine, Vinyl Chloride, Vinylidene Chloride). In: McFee RB, Leikin JB, editors. *Toxicoterrorism*. New York: McGraw Hill, 2008.
122. Levant RF, McFee RB. Healthcare for the whole person; reconnecting the mind and body. *Johns Hopkins Adv Studies Med* 2006;6(1):40-1.
123. Study makes case of reintegrating behavioral health, primary care. *Capitation Manag Rep* 2000;3:42-5.
124. Strosahl K. Mind and body primary mental healthcare: new model for integrated services. *Behav Healthc Tomorrow* 1996;5(96):93-95.
125. Hollifield M. Building new bridges in primary care. *Gen Hosp Psychiatry* 2004;26:253-5.
126. Daw J. New rule will change the psychologist-physician relationship. *Monitor Psychiatry*. 2001;12(4). Available at: [www.apa.org/monitor/apr01/physicians.html](http://www.apa.org/monitor/apr01/physicians.html). Last accessed Sept 5, 2005.
127. Sharma SK, Mohan A. Multidrug resistant tuberculosis: a menace that threatens to destabilize tuberculosis control. *Chest* 2006;130(1):261-72.

128. Magill AJ, Grogl M, Gasser RA, et al. Visceral infection caused by *Leishmania tropica* in veterans of Operation Desert Storm. *N Engl J Med* 1993;328:1383-7.
129. Gillis D, Klaus S, Schnur LF, et al. Diffusely disseminated cutaneous *Leishmania* major infection in a child with acquired immunodeficiency syndrome. *Pediatr Infect Dis J* 1995;14:247-9.
130. Wortmann G, Weeney C, Houg HS, et al. Rapid diagnosis of leishmaniasis by fluorogenic polymerase chain reaction. *Am J Trop Med Hyg* 2001;65:583-7.
131. Asilian A, Sadeghinia A, Faghihi G, et al. Comparative study of the efficacy of combined cryotherapy and intralesional meglumine antimoniate (Glucantime) vs. cryotherapy and intralesional meglumine antimoniate alone for the treatment of cutaneous leishmaniasis. *Int J Dermatol* 2004;43:281-3.
132. Reithinger R, Mohsen M, Kolaczinski J, et al. A randomized controlled trial to test the efficacy of thermotherapy against *Leishmania tropica* in Kabul, Afghanistan (abstract 776). In: 52nd Annual Meeting of the American Society for Tropical Medicine and Hygiene (Philadelphia). Northbrook, IL: American Society for Tropical Medicine and Hygiene, 2003; p. 548.
133. American Red Cross. Blood donation eligibility guidelines. 14 September 2004. [http://www.redcross.org/services/biomed/0,1082,0\\_557\\_00.html#infec](http://www.redcross.org/services/biomed/0,1082,0_557_00.html#infec).
134. USAMRIID's Medical Management of Biological Casualties Handbook. Fourth edition 2001. Fort Detrick, Frederick, MD: [www.usamriid.army.mil](http://www.usamriid.army.mil) Accessed January 9, 2008.
135. McFee RB. Preparing for an Era of Weapons Of Mass Destruction (WMD)—are we there yet? Why we should all be concerned. Part 1. *Vet Human Tox* 2002.
136. Gualtieri CT. Neuropsychiatry and behavioral pharmacology. New York: Springer-Verlag, 1991. p. 1-25.
137. Center for Disease Control and Prevention. <http://www.cdc.gov>.
138. Women Veterans' Network of the Department of Veterans' Services The central resource for women veterans in the Commonwealth of Massachusetts. The Veterans Administration also has resources for women. <http://www.mass.gov/?pageID=veteranstopic&L=2&sid=Eveterans&L0=Home&L1=Women+Veterans>.
139. Dawson D. US Low risk drinking guidelines: An examination of four alternatives. *Alcoholism Clin Exp Res* 2000;24:1820-9.
140. Friedman PD, Saitz R, Gogineni A, et al. Validation of the screening strategy in the NIAAA. Physicians' guide to helping patients with alcohol problems. *J Stud Alcoh* 2001;62:234-8.
141. National Institute on Alcohol Abuse and Alcoholism: <http://www.miaaa.nih.gov/>
142. National Institute on Drug Abuse: <http://www.nida.nih.gov>.
143. Resnick PS, Schnicke MK. Cognitive Processing Therapy for Rape Victims: A Treatment Manual. Newbury Park, CA: Sage, 2002.
144. Foa ED, Roghbaum BO. Treating the trauma of rape: cognitive-behavioral therapy for PTSD. New York. Guilford. 1998. Available from: [http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc\\_manual\\_jwcguide.html?printable](http://www.ncptsd.va.gov/ncmain/ncdocs/manuals/nc_manual_jwcguide.html?printable) Accessed December 2, 2007.
145. Piasecki J. America's Secret War: Victims of sexual assault while serving in the military. *L.A. City Beat* 11/30/06.
146. World Health Organization (WHO). Available from: <http://www.who.org>.