Hospitalizations for Hepatitis A, B, and C, Active Component, U.S. Armed Forces, 1991-2011

Although genetically quite distinct from one another, hepatitis viruses A, B, and C all cause inflammatory liver disease (hepatitis) in humans. Hepatitis A virus (HAV) is spread through fecal-oral transmission and has a long history as an important cause of disease in military populations. Hepatitis B and hepatitis C viruses (HBV and HCV, respectively) are both spread by percutaneous or mucous membrane exposure to infected blood or body fluids and therefore have similar risk factors (e.g., unprotected sex with an infected partner, intravenous drug use, transfusion of contaminated blood).

Screening and immunization programs implemented in the United States and in the U.S. Armed Forces have had major beneficial effects on the incidence of new infections caused by these hepatitis viruses, especially types A and B. Hospitalization data is available from the Defense Medical Surveillance System (DMSS) starting in 1990. This report describes hospitalization trends of hepatitis types A, B, and C during a 21-year period (1991-2011) against the backdrop of important strides in the prevention of hepatitis disease.

HAV

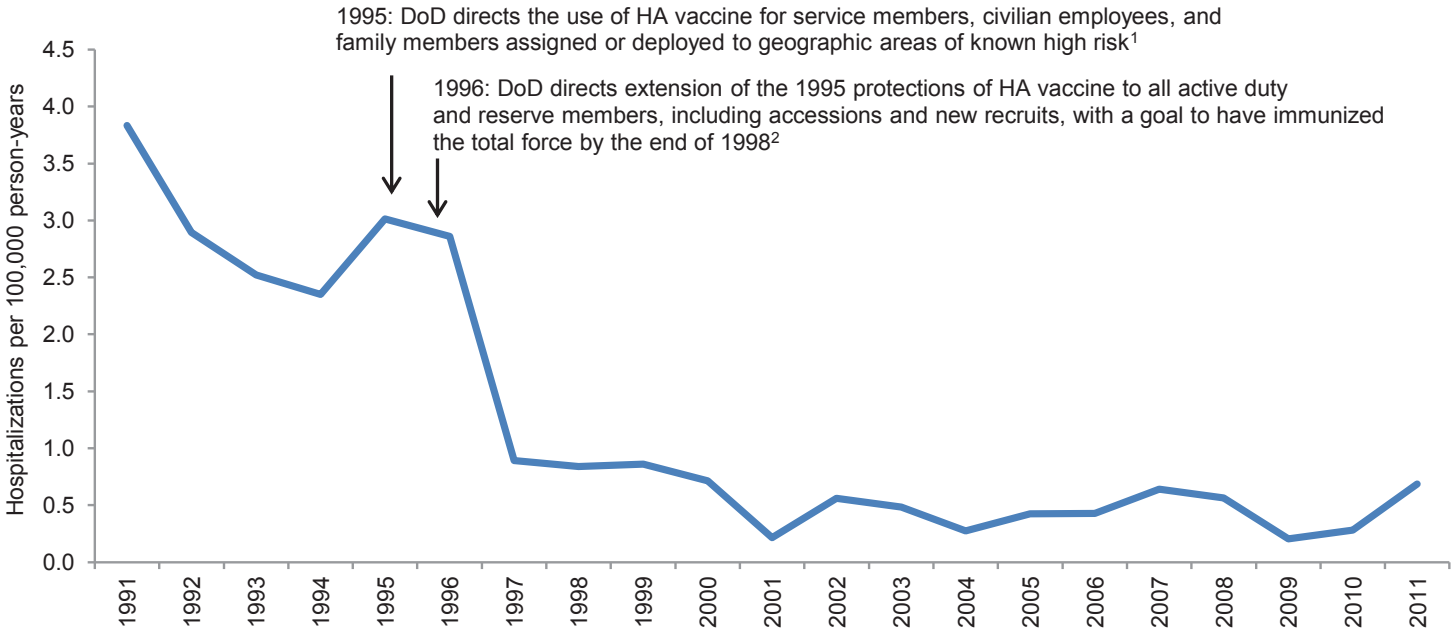
Hospitalizations for acute hepatitis A were identified by International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) diagnoses codes 070.0 or 070.1 in any diagnostic position. From 1991 to 2011, there were 415 hospitalizations for acute hepatitis A among active component members of the U.S. Armed Forces; the crude overall hospitalization rate during the period was 1.3 per 100,000 person-years (p-yrs) **(Figure 1)**. Annual hospitalization rates of acute hepatitis A fell dramatically following the implementation of the Department of Defense's 1995 and 1996 policies for use of hepatitis A vaccine in the Armed Forces.[1,2] The recent low hospitalization rates of acute hepatitis A among U.S. military members (range for 2000-2011: 0.2 to 0.7 hospitalizations per 100,000 p-yrs) likely reflect not only recruit screening and immunization but also the widespread use of hepatitis A virus vaccine among children and adolescents in the United States.

HBV

Hospitalizations for hepatitis B were identified by ICD-9-CM codes 070.20, 070.21, 070.30, or 070.31 (acute) or 070.22, 070.23, 070.32, 070.33, or V02.61 (chronic) in any diagnostic position. From 1991 to 2011, there were 820 and 241 hospitalizations of active component members for acute and chronic hepatitis B virus infections, respectively; crude overall hospitalization rates during the period were 2.4 (acute hepatitis B) and 0.7 (chronic hepatitis B) per 100,000 p-yrs **(Figure 2)**.

Annual hospitalization rates for acute hepatitis B declined by 88 percent from 1992 to 1997 (8.7 and 1.0 per 100,000 p-yrs, respectively) and were relatively stable over the next 14 years; the rate in 2011 was lower (0.7 per 100,000 p-yrs) than in any other year of the period. Following the creation of a new ICD-9 code for chronic hepatitis B in late 1994, rates of hospitalizations for chronic hepatitis B increased to 2.2 per 100,000 p-yrs in 2001 and slowly

FIGURE 1. Trend of incident hospitalizations for hepatitis A , active component, U.S. Armed Forces, 1991-2011



declined to their lowest levels ever in 2010 and 2011 (0.3 and 0.7 per 100,000 p-yrs, respectively).

The decline in hospitalizations for acute hepatitis B in the U.S. military during the 1990s likely reflects an increased prevalence of hepatitis B immunity among service members resulting from HBV childhood vaccination campaigns in the United States. Declines after 2002 likely reflect the combined effects of immunization prior to entry into service as well as the 2002 implementation of the DoD policy for screening and vaccination of immunologically naive recruits.[3] The gradual decrease in hospitalization rates for chronic hepatitis B probably represents, at least in part, delayed effects of the factors that have decreased acute hepatitis B incidence.

HCV

Hospitalizations for hepatitis C were identified by ICD-9-CM codes 070.41 or 070.51 (acute) or 070.44, 070.54, 070.70, 070.71, or V02.62 (chronic) in any diagnostic position. From 1991 to 2011, there were 737 and 899 hospitalized cases of acute and chronic hepatitis C, respectively, among active component members of the U.S. Armed Forces; crude overall rates during the period were 2.3 (acute) and 2.7 (chronic) per 100,000 p-yrs **(Figure 3)**. Hospitalization rates of acute hepatitis C diagnoses steadily declined (by 80%) from 1994 to 2000 and then again from 2004 to 2011 (by 97%). Rates of chronic hepatitis C hospitalizations declined from 1995 to 2000 (by 67%). From 2001 to 2011, hospitalization rates for chronic hepatitis C remained relatively stable, ranging from 2.5 per 100,000 p-yrs (2002) to 4.4 per 100,000 p-yrs (2008).

There is no vaccine for hepatitis C; thus, other factors must account for the declines in rates of hospitalization for acute and chronic hepatitis C documented here. First, there were no ICD-9-CM diagnostic codes specific for hepatitis C prior to October 1991 or for chronic hepatitis C until October 1994. As such, during the early years of the surveillance period, hospitalizations for hepatitis C-related illnesses could not be ascertained from the hospitalization records used for this report. Second, a reliable test for HCV infection (a test for antibody to the virus) was not widely available until approximately 1992. As a result, laboratory confirmation of HCV infection was not generally possible until after that time. Third, many individuals who are infected with HCV, especially those who are chronically infected, are asymptomatic; thus, in the early 1990s, absent other indications, asymptomatic individuals were unlikely to be tested. The asymptomatic HCV infections of service members may have been identified eventually, e.g., when attempting to donate blood, which was routinely screened for hepatitis C after 1991, or during other medical evaluations. Thus, the initial identification of persons already infected in 1991 may have been distributed over subsequent years. Fourth, the confirmation of a diagnosis of chronic hepatitis C in the 1990s depended in part on documentation that the patient's "acute" infection had not resolved over a period of six months or more following initial detection of the infection. As a result, it is not surprising that the peaking of cases of chronic

FIGURE 2. Trend of incident hospitalizations for acute and chronic hepatitis B, active component, U.S. Armed Forces, 1991-2011

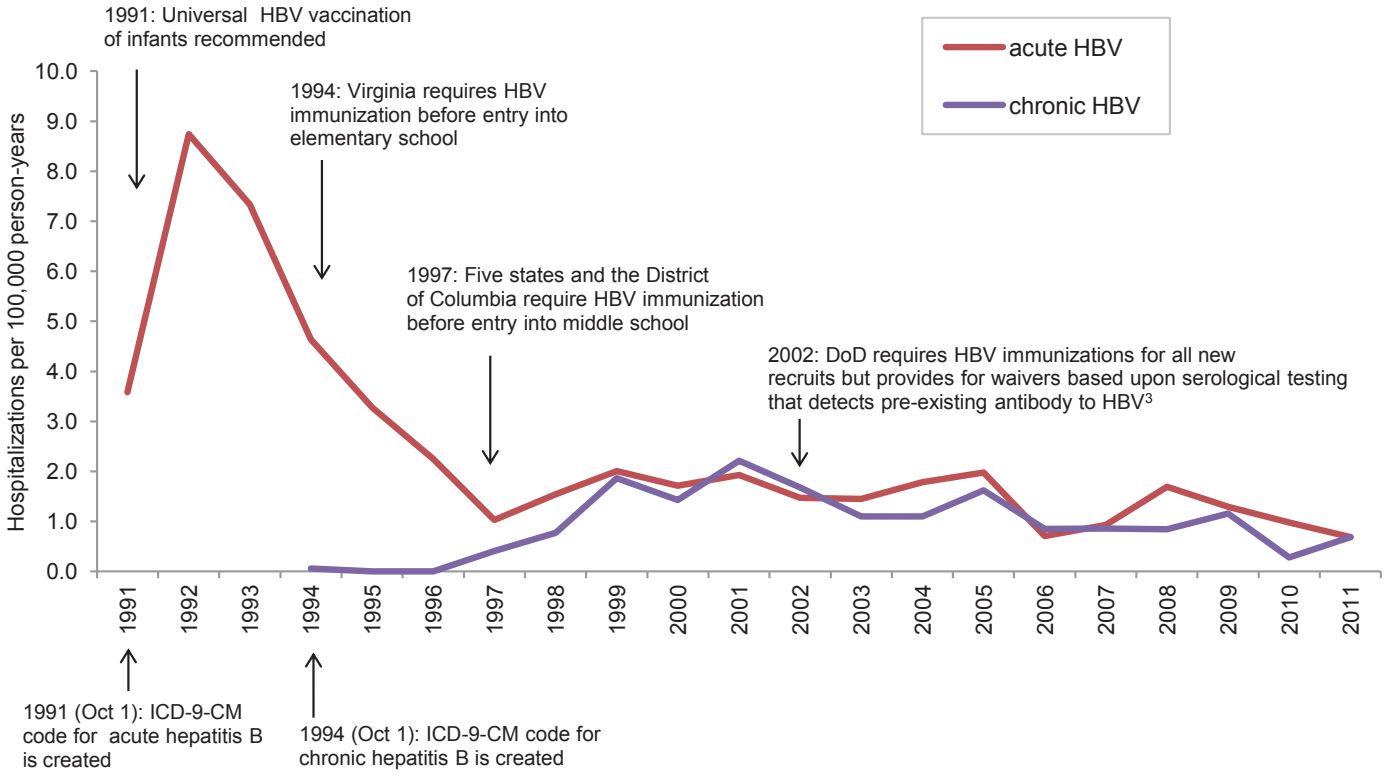
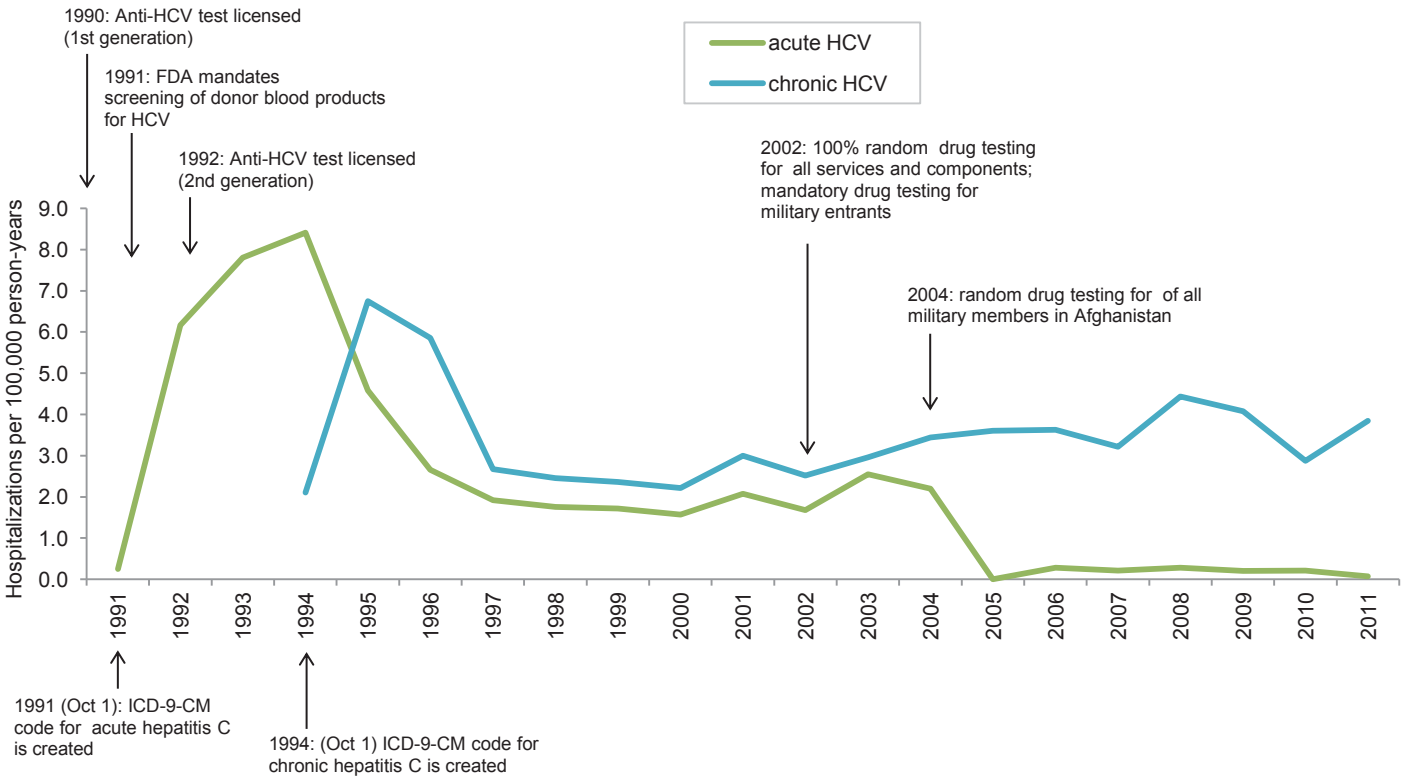


FIGURE 3. Trend of incident hospitalizations for acute and chronic hepatitis C, active component, U.S. Armed Forces, 1991-2011



hepatitis C lagged behind initial diagnoses of acute hepatitis C. Lastly, as many as 80 percent of cases of acute hepatitis C go on to develop persistent infection that leads to chronic hepatitis C. Accordingly, any changes in the incidence of acute hepatitis C will likely be followed by corresponding changes in the incidence of chronic hepatitis C. In summary, as a result of the factors described above, the peak in hospitalizations for acute hepatitis C in the early 1990s was occasioned by the introduction of laboratory tests that enabled detection of HCV infections and ICD-9-CM codes that permitted the documentation of HCV-specific diagnoses in standardized medical records.

Since the late 1990s, the hospitalization rates for both acute and chronic hepatitis C have been relatively stable except for the precipitous and lasting drop in the rates for acute hepatitis C beginning in 2005. A previous *MSMR* report described a downward trend in combined inpatient and outpatient diagnoses of acute hepatitis C since 2000, particularly beginning in 2005.[3] The paucity of hospitalizations since then suggests that recent health care practices have deemphasized the need for inpatient evaluations and management of acute hepatitis C.

The last decade's declines in the incidence of both acute and chronic hepatitis C are most dramatic for service members aged 40 and older. For example, in 2000, the rate of diagnosis of acute hepatitis C was more than fourfold higher among members 40 years and older compared to any younger age group; in 2010, the rates in all age groups were approximately the same. In 2000, the rate of diagnosis of chronic hepatitis C was approximately fivefold higher among service members 40 years and older compared to any younger age group; in 2010, the rate among 40 years and older service members was only about two and a half times that among younger service members.[4]

HBV and HCV in the era of HIV

Because HBV and HCV share risk factors with human immunodeficiency virus (HIV), measures aimed at preventing acquisition and transmission of any one of these viruses can have beneficial impacts on transmission of the others. Since the early 1990s, all donated blood has been screened for the presence of all of these viruses. Not only does the identification of infective blood preclude its transfusion into others, but the recognition of presumably "silent infections" in donors can enable such individuals to avoid unwitting transmissions of life threatening infections to others (e.g., sex partners).

The periodic screening of military service members for HIV antibody identifies persons infected with HIV, who may be at high risk of infection with HBV or HCV. As such, counseling of HIV infected individuals may reduce their risk of acquiring HBV or HCV or transmitting HIV, HBV, or HCV. Increased awareness among service members in general about behaviors that increase risk of acquiring HIV infection (e.g., unprotected sex with infected partners, illicit drug use) should contribute to the prevention of HBV and HCV acquisitions by them. When applicants for military service are screened for drug abuse, HIV infection, and recent history of hepatitis, the exclusion of those who screen positive reduces the prevalence of service

members with risk factors for these viral infections. For service members, the performance of randomized and ad hoc drug screening, periodic HIV testing, and periodic health and medical examinations all serve not only to detect individuals at risk but also to sensitize and educate service members about the risks for these diseases. Lastly, in the health care setting, the widespread application of universal blood and body fluid precautions reduces the risks of transmitting these three viruses to patients and to health care workers.[4,5]

There are several limitations to this report that should be considered when interpreting the results. First, trends in rates of hospitalization over time may reflect differences in case management for acute and chronic hepatitides and changes in hospitalization guidelines within the military health system. Second, the summary of hospitalization rates reported here is not as comprehensive as the previously cited report that utilized both inpatient and outpatient health encounters.[4] However, because this report focused on hepatitis-specific hospitalizations, it was able to assess hepatitis incidence among U.S. military members since 1991 (electronic records of outpatient encounters of U.S. military members have been centrally collected and archived since 1997). Third, while the vaccines against HAV and HBV played major roles in the declining incidence rates of these diseases among active component members, the decline in HCV incidence reflects the effects of several factors. The relative impacts on HCV incidence of the factors described above are difficult to discern from available data; it is clear, however, that HCV disease among active component military members has sharply declined over the past two decades.

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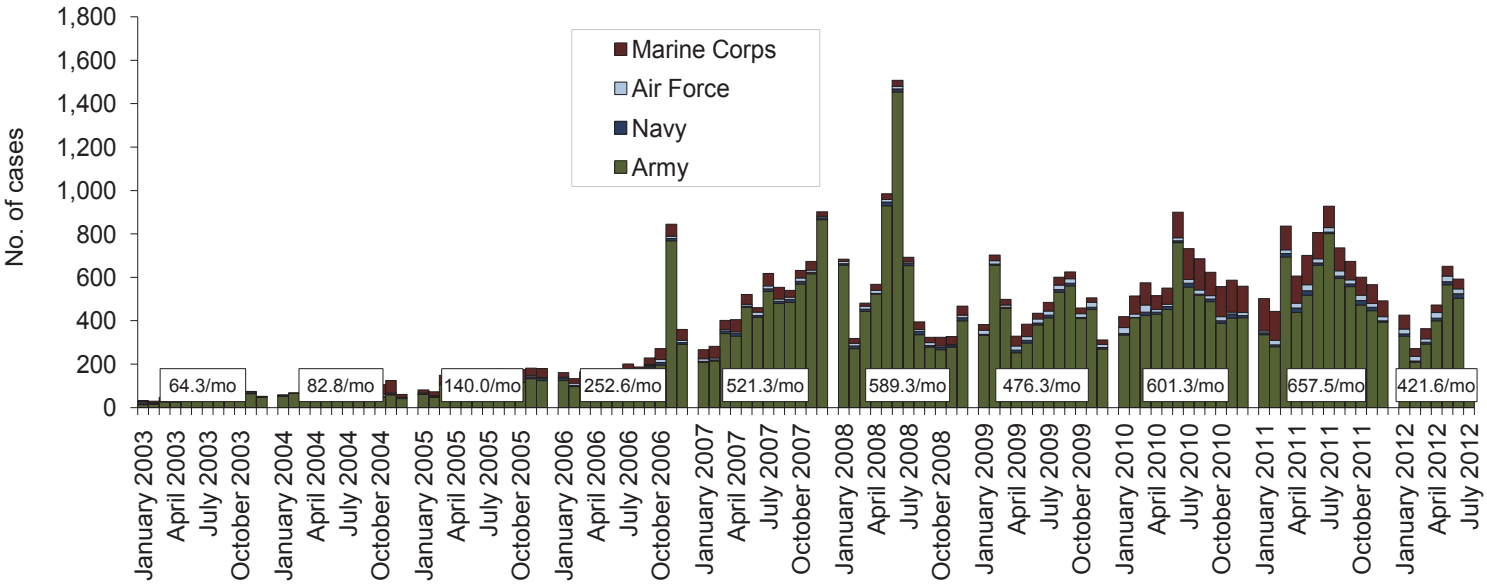
Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003-July 2012 (data as of 26 August 2011)

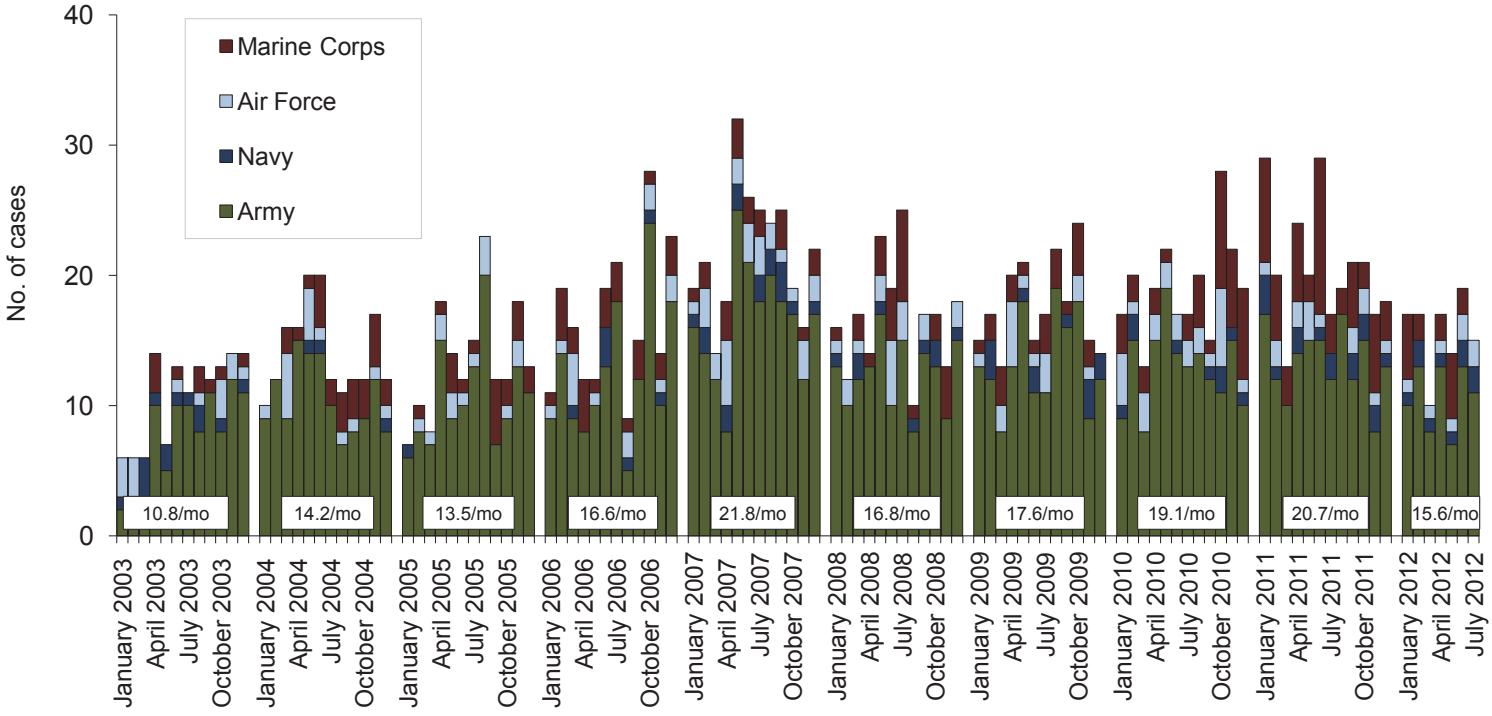
Traumatic brain injury (ICD-9: 310.2, 800-801, 803-804, 850-854, 907.0, 950.1-950.3, 959.01, V15.5_1-9, V15.5_A-F, V15.52_0-9, V15.52_A-F, V15.59_1-9, V15.59_A-F)[a]



Reference: Armed Forces Health Surveillance Center. Deriving case counts from medical encounter data: considerations when interpreting health surveillance reports. *MSMR*. Dec 2009; 16(12):2-8.

[a]Indicator diagnosis (one per individual) during a hospitalization or ambulatory visit while deployed to/within 30 days of returning from OEF/OIF. (Includes in-theater medical encounters from the Theater Medical Data Store [TMDS] and excludes 3,084 deployers who had at least one TBI-related medical encounter any time prior to OEF/OIF).

Deep vein thrombophlebitis/pulmonary embolus (ICD-9: 415.1, 451.1, 451.81, 451.83, 451.89, 453.2, 453.40 - 453.42 and 453.8)[b]

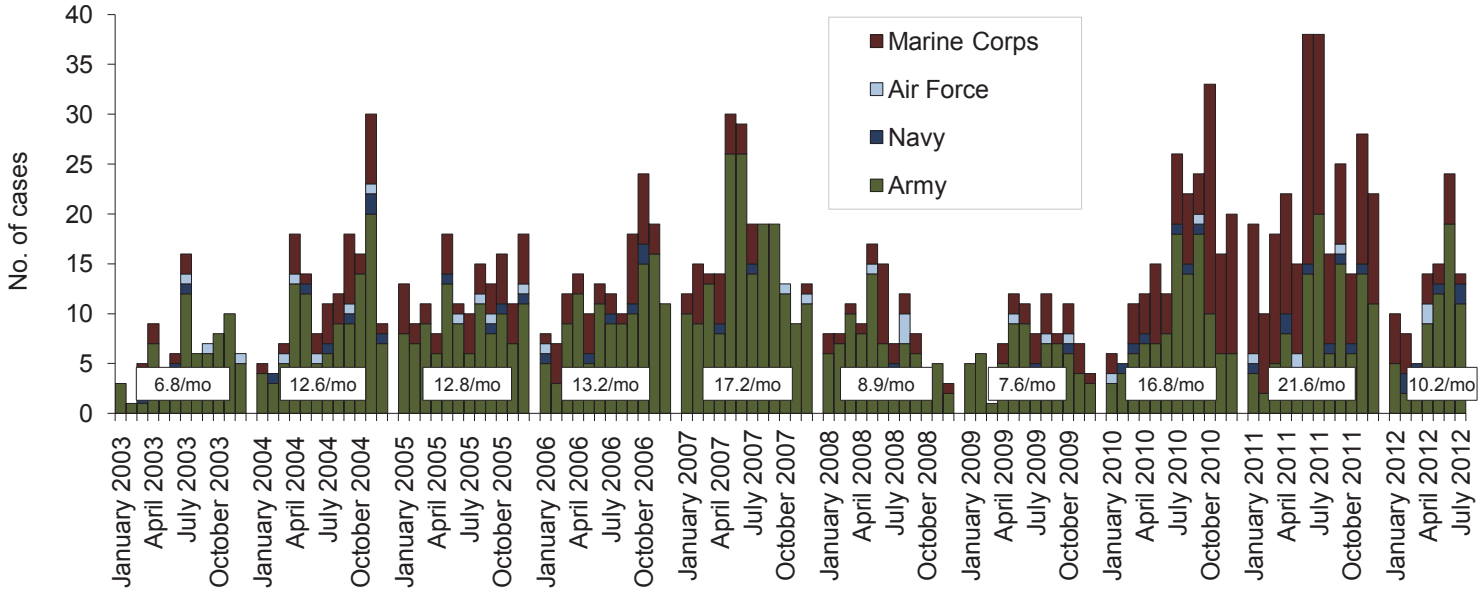


Reference: Isenbarger DW, Atwood JE, Scott PT, et al. Venous thromboembolism among United States soldiers deployed to Southwest Asia. *Thromb Res*. 2006;117(4):379-83.

[b]One diagnosis during a hospitalization or two or more ambulatory visits at least 7 days apart (one case per individual) while deployed to/within 90 days of returning from OEF/OIF.

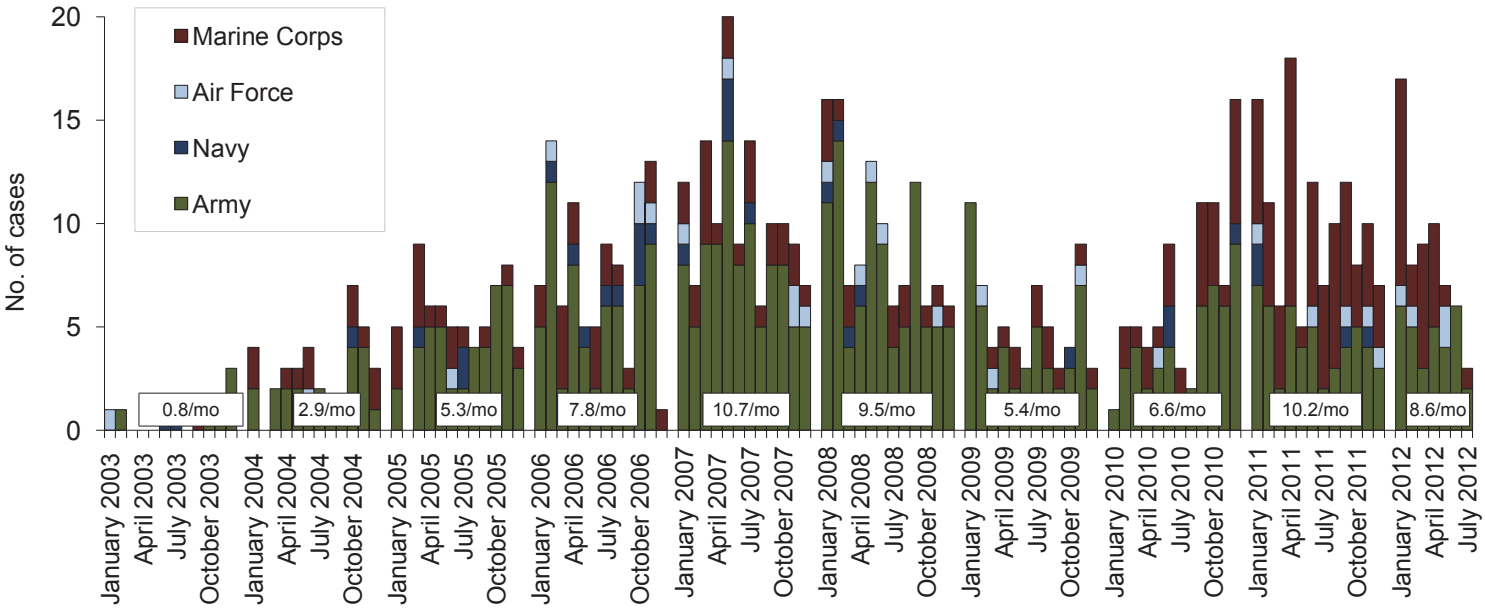
Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003-July 2012 (data as of 26 August 2011)

Amputations (ICD-9-CM: 887, 896, 897, V49.6 except V49.61-V49.62, V49.7 except V49.71-V49.72, PR 84.0-PR 84.1, except PR 84.01-PR 84.02 and PR 84.11)[a]



Reference: Army Medical Surveillance Activity. Deployment-related condition of special surveillance interest: amputations. Amputations of lower and upper extremities, U.S. Armed Forces, 1990-2004. *MSMR*. Jan 2005;11(1):2-6.
[a]Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 365 days of returning from OEF/OIF/OND.

Heterotopic ossification (ICD-9: 728.12, 728.13, 728.19)[b]



Reference: Army Medical Surveillance Activity. Heterotopic ossification, active components, U.S. Armed Forces, 2002-2007. *MSMR*. Aug 2007; 14(5):7-9.
[b]One diagnosis during a hospitalization or two or more ambulatory visits at least 7 days apart (one case per individual) while deployed to/within 365 days of returning from OEF/OIF/OND.

Medical Surveillance Monthly Report (MSMR)
Armed Forces Health Surveillance Center
11800 Tech Road, Suite 220 (MCAF-CS)
Silver Spring, MD 20904

THE MEDICAL SURVEILLANCE MONTHLY REPORT (MSMR), in continuous publication since 1995, is produced by the Armed Forces Health Surveillance Center (AFHSC). The *MSMR* provides evidence-based estimates of the incidence, distribution, impact and trends of illness and injuries among United States military members and associated populations. Most reports in the *MSMR* are based on summaries of medical administrative data that are routinely provided to the AFHSC and integrated into the Defense Medical Surveillance System for health surveillance purposes.

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ISSN 2158-0111 (print)
ISSN 2152-8217 (online)