Military Aeromedical Evacuations From Central and Southwest Asia for Ill-Defined Dermatologic Diseases

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Objectives: To determine the diagnoses of US military patients medically evacuated from Central and Southwest Asia for ill-defined dermatologic diseases, to compare these diagnoses with data from earlier military conflicts, and to identify ways to reduce the number of dermatologic evacuations of military personnel from the combat zone.

Design: We evaluated the preevacuation and postevacuation diagnoses of military personnel who were evacuated from Central and Southwest Asia for ill-defined dermatologic conditions. Outside the combat zone, these individuals were examined by dermatologists who provided a diagnosis regarded as correct for the purposes of this study. We excluded patients with precise preevacuation diagnoses, battle-related cutaneous injuries, and incomplete identifying data.

Setting: The geographic area of responsibility for the US Central Command, including Iraq and Afghanistan. Data from January 1, 2003, through December 31, 2006, were obtained from aeromedical evacuation records and the military’s electronic medical records system.

Patients: A total of 170 patients evacuated from the combat zone for ill-defined dermatologic diseases, such as skin disorder, not otherwise specified (International Classification of Diseases, Ninth Revision, Clinical Modification code 709.9).

Main Outcome Measures: The postevacuation diagnosis assigned, in nearly all cases, by a board-certified dermatologist.

Results: Dermatitis, benign melanocytic nevus, malignant neoplasms, benign neoplasms, urticaria, and a group of nonspecific diagnoses were the most common post-evacuation diagnoses.

Conclusions: We propose that thorough predeployment identification of individuals with chronic skin diseases, emphasis of preventive measures, and development of treatment plans will reduce the number of dermatologic evacuations. Improving diagnostic accuracy and treatment plans via teledermatology may also reduce evacuations. The most common dermatologic diseases leading to evacuations are similar to those from 20th century wars.

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Throughout the history of warfare, dermatologic diseases have been responsible for troop morbidity, poor morale, and combat ineffectiveness. In tropical and subtropical environments, skin diseases are prevalent and severe and have been responsible for more than half of the man-days lost to frontline units. Exposure to solar radiation, extremes of temperature and humidity, endemic diseases and infestations, crowded living conditions, diminished opportunity for personal hygiene, and the chafing and sweating caused by wearing protective gear such as helmets and body armor, all contribute to the high prevalence of wartime cutaneous disease.

Although mortality from skin diseases is low, military personnel are routinely evacuated from the combat theater for dermatologic reasons. Common dermatologic situations that have led to evacuation include patients for whom the diagnosis is uncertain, who fail to respond to treatment, require care beyond the scope of deployed medical organizations, or have skin disease that renders the individual unable to wear his or her protective gear. In most cases, these evacuations are medically appropriate. However, evacuations occasionally occur not because the disease is serious but because the diagnosis is uncertain. In many of these situations, had the diagnosis been initially straightforward, the evacuation would have been obviated.

The diagnoses used to justify the evacuation of patients with skin diseases are generated mostly by nondermatologists (physicians or physician extenders). On repatriation (ie, evacuation to a hospital...
outside the combat zone), nearly all evacuated individuals have their condition evaluated by 1 or more board-certified dermatologists for definitive diagnosis and treatment. Consequently, each evacuated patient receives a diagnosis at 2 different times: the first (preevacuation) diagnosis made by the nondermatologist who requested the evacuation and the second (postevacuation) diagnosis made outside the combat zone, in nearly all cases, by a dermatologist.

For this study, the preevacuation and postevacuation diagnoses were analyzed to satisfy 3 objectives: (1) to categorize the true diagnoses given to patients who were evacuated with uncertain dermatologic diagnoses, (2) to compare the diagnoses of skin conditions requiring repatriation during the 4-year study period to previous wartime data, and (3) to identify proactive measures that can be taken to reduce the likelihood of future evacuation for cutaneous diseases.

### METHODS

The study population consisted of military personnel who were aeromedically evacuated for skin diseases during the study period (January 1, 2003, through December 31, 2006) from the US Central Command (CENTCOM) area of responsibility, which includes Operation Iraqi Freedom in Iraq and Operation Enduring Freedom in Afghanistan. The US Transportation Command Regulating and Command and Control Evacuation System (TRAC2ES), a database used for the purposes of tracking aeromedical evacuations, provided demographic data on all individuals who were medically evacuated from CENTCOM during the study period.\(^2\) The TRAC2ES database also provided the names of the originating and receiving military treatment facilities, the preevacuation International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM), diagnosis and numeric code assigned by the nondermatologist clinician in the combat zone, the military’s medical specialty (MEDSPEC) code (main medical specialty involved in the care of the evacuated individual), and a brief narrative identifying the reason for evacuating each patient.\(^2\)

This database was queried to identify those patients who were assigned ICD-9-CM codes for diseases of the skin and subcutaneous tissue as well as those assigned the MEDSPEC code for dermatology. Entries pertaining to non-US military personnel and multiple entries for the same patient (owing to data entry at several points along the evacuation route) were excluded. Cutaneous diseases directly related to battle injuries (eg, burns) and entries with incomplete identifying data were also excluded.

The Defense Medical Surveillance System (DMSS), an executive information system containing historical data on diseases and medical events as well as longitudinal data on personnel and deployments,\(^3\) provided the postevacuation diagnosis after evaluation at the destination medical facility. When the DMSS could not be mined to produce the postevacuation dermatologic diagnosis, we checked the military’s electronic medical records (EMR) systems (Armed Forces Longitudinal Technology Application, Armed Forces Longitudinal Technology Application-Theater, and the Composite Health Care System I). Biopsy data were obtained from the EMR systems and compared with the postevacuation clinical diagnosis from the DMSS. When discrepancies were found between the histopathologic diagnosis and the clinical postevacuation diagnosis, the histopathologic diagnosis was used.

Analysis of the initial ICD-9-CM diagnoses revealed 6 separate recurring diagnoses that we have dubbed “mystery rashes” because each diagnosis is broad and vague, causing us to infer that the clinician who ordered the evacuation was uncertain of the patient’s cutaneous condition. These 6 different “mystery rash” diagnoses are dermatitis not elsewhere classified/ not otherwise specified (NEC/NOS) (ICD-9-CM codes 692.89/692.9), skin disorders NEC/NOS (ICD-9-CM codes 709.8/709.9), other erythrovesicular dermatitis (ICD-9-CM code 690.8), nonspecific skin condition NEC (ICD-9-CM code 782.1), erythematous skin condition NOS (ICD-9-CM code 695.9), and screening for skin condition (ICD-9-CM code V82.0). All other initial skin diagnoses (ie, those assigned a more precise diagnosis) were excluded. This protocol was approved by the Malcolm Grow US Air Force Medical Center (Andrews Air Force Base, Maryland) institutional review board.

### RESULTS

During the study period (January 1, 2003, to December 31, 2006), 918 individuals were evacuated from the combat zone for dermatologic reasons. After exclusion criteria were applied (Figure), the remaining 170 patients received 1 of the 6 preevacuation “mystery rash” diagnoses (Table 1) and are the subjects of this study. The final diagnoses of these 170 patients are listed in Table 2.

One hundred fifty-four of 170 patients (91%) were evaluated at destination by a board-certified dermatologist. The remaining 16 patients were evaluated by the family medicine/primary care (3%), internal medicine (2%), and allergy/immunology (1%) departments; the general surgery, orthopedics, otolaryngology, plastic surgery, and podiatry departments each saw 1 patient, making up the remaining 3%.

Biopsy data were obtained for 76 of 170 patients (45%). Of these, the histopathologic examination confirmed the postevacuation diagnosis in 31 of 76 patients (41%) and was consistent with the diagnosis in 22 of 76 (29%). There were histopathologic differences that required no change in treatment in 12 of 76 patients (16%). Of the 11 cases (14%) in which there were histopathologic discrepan-
In addition to identifying the dermatologic diagnoses that led to medical evacuation, another aim of this study was to determine how the final diagnoses in our series compare with historic data from previous military engagements. In previous conflicts, as in the current operations in CENTCOM, patients with skin conditions were first seen by nondermatologists. Oftentimes, if the diagnosis was uncertain, the patients were then referred to a dermatologist. Most of the patients in our data set ultimately had their conditions evaluated by dermatologists. Because dermatologists also ultimately evaluated patients whose conditions had uncertain diagnoses in previous conflicts, comparison of the final diagnoses in our study with final diagnoses from previous conflicts is informative. Past recommendations by the military dermatology community emphasizing the need for increased research on the prevention and early treatment of skin disease would be validated if cutaneous disorders considered untreatable in today’s combat zone are similar to those from past combat experiences.1

Dermatologic disorders experienced by deployed military personnel vary with the environment, setting, duration of deployment, and troop living conditions. The environmental conditions of the first Persian Gulf War (1PGW, 1990-1991, largely set in and around Kuwait) and those World War II (WWII) campaigns in semiarid climates are similar to those of the current operations in Iraq and to a lesser extent in Afghanistan. Medical data from the 1PGW and earlier conflicts serve as a useful comparison for current military operations in CENTCOM. The most common dermatologic diagnoses from selected previous military conflicts are listed in Table 3.

A weakness in our study is that diagnostic strategy, accuracy, and nomenclature vary among dermatologists and over time. Histologic and other methods of laboratory confirmation were not always available. Consequently, we used the data available to us, which were largely based on clinical diagnoses, albeit they were those made by trained dermatologists.

What were the final, postevacuation diagnoses that the dermatology consultants assigned to the 170 people evacu-
ated for a “mystery rash”? Combined, dermatitis NOS (ICD-9-CM code 692.9) and dermatitis, unspecified (ICD-9-CM code 692.9) accounted for 20% of the “mystery rash” diagnoses (n = 34). The diagnoses that were assigned ICD-9-CM code 692.9, including eczema/eczematoid dermatitis (n = 8), resemble the most common diagnoses of previous campaigns, including the 1PGW. Because exposure to irritants, overheating, extremes of temperature, chafing from clothes, and psychological stress are precipitants of dermatitis and eczematous flares, the deployed military environment frequently leads to such exacerbations.9 Changing skin lesions are a common presenting complaint in civilian as well as military primary care clinics, including those in the CENTCOM area of responsibility. The exposure to intense solar radiation often prompts CENTCOM personnel to present for evaluation of worrisome skin lesions. Indeed, most of the patients who received the diagnosis of benign melanocytic nevus (n = 16), the second most common postevacuation diagnosis, included the 1PGW. Because exposure to irritants, overheating, extremes of temperature, chafing from clothes, and psychological stress are precipitants of dermatitis and eczematous flares, the deployed military environment frequently leads to such exacerbations.9

Changing skin lesions are a common presenting complaint in civilian as well as military primary care clinics, including those in the CENTCOM area of responsibility. The exposure to intense solar radiation often prompts CENTCOM personnel to present for evaluation of worrisome skin lesions. Indeed, most of the patients who received the diagnosis of benign melanocytic nevus (n = 16), the second most common postevacuation diagnosis, were referred because of changing or irregularly pigmented nevi. In this study, benign melanocytic nevus includes the diagnoses of intradermal, junctional, compound, combined, blue, and congenital nevi. Benign melanocytic nevus was not among the common diagnoses assigned in previous conflicts, perhaps owing to increased public awareness and emphasis on examining oneself for suspicious growths.

Malignant neoplasm (including 2 cases of malignant melanoma) was the next most common postevacuation diagnosis in this study (n = 13). In 2 series of outpatient skin diseases during the 1PGW, only a single cutaneous malignant neoplasm was found.7,8 Hepburn,10 when writing about his experience in the Persian Gulf, speculated that the relatively young age of his study population was the reason why no basal cell carcinomas, melanomas, or other cutaneous malignant neoplasms were found. The mean and median ages of patients diagnosed as having malignant neoplasms of the skin in our series was 42 years (range, 24-57 years); this relatively advanced age may partially explain why 13 malignant skin neoplasms were ultimately diagnosed.

Our data reveal that dermatosis NOS, neoplasm skin uncertain behavior, nonspecific skin eruption NEC, and skin disorders NEC/other collectively make up the fourth most common postevacuation diagnosis (n = 11). Although 1 or more dermatologists examined 10 of 11 cases, the final diagnosis in these 11 patients remained uncertain. These diagnoses have been grouped as “uncertain final diagnoses” in Table 2.

During our study period, urticaria as a group was one of the fifth most common final diagnoses for a “mystery rash” (n = 8). Acute urticaria was among the top 5 outpatient cutaneous diagnoses in a British outpatient series from the 1PGW.7,10 Physical urticaria in particular can be exacerbated or caused by wartime occupational exposures as well as the physical stresses of heat, cold, vibration, and pressure.9

Military personnel with atopic dermatitis (n = 8) have marked flares during wartime. Indeed, most military dermatologists in WWII recommended that personnel with a history of atopic dermatitis not deploy overseas because they often required prolonged and repeated hospitalizations.5

### Table 3. Most Common Dermatologic Diagnosis From Selected Military Conflicts

<table>
<thead>
<tr>
<th>Conflict</th>
<th>Climate</th>
<th>Dermatologic Diagnosis a</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Army, WWII, Tunisia Camp (inpatient)</td>
<td>Semi-arid</td>
<td>Bacterial infections, Scabies, Dermatitis (all causes), Fungal infections, Eczema (all types), Bacterial infections, Fungal infections, “Dermatitis of unknown etiology” (including psoriasis, lichen planus, erythema multiforme, and the eczemas), “Dermatitis of known etiology” (including dermatitis venenata, dermatitis medicamentosa, and infectious eczematoid dermatitis)</td>
</tr>
<tr>
<td>US Army, WWII, Mediterranean Theater</td>
<td>Semi-arid</td>
<td>Warts, all types, Acne, all types, Dermatophytoses, all types, Pseudofolliculitis barbae, Penile ulcer (? cancroid)</td>
</tr>
<tr>
<td>US Army, Vietnam Conflict (95th Evacuation Hospital, Da Nang)</td>
<td>Tropical</td>
<td>Warts, all types, Acne, all types, Dermatophytoses, all types, Pseudofolliculitis barbae</td>
</tr>
<tr>
<td>British Army, 1PGW</td>
<td>Arid</td>
<td>Eczema, Warts, Scabies, Acute urticaria, Psoriasis</td>
</tr>
<tr>
<td>US Army 1PGW</td>
<td>Arid</td>
<td>Fungal infection, Eczema, Bacterial infection, Viral infection (including herpes simplex, herpes zoster, and viral exanthem), Dermatitis (all causes)</td>
</tr>
</tbody>
</table>

Abbreviations: 1PGW, First Persian Gulf War; WWII, World War II. aThe most common diagnoses from these earlier conflicts serve as a useful comparison with the final diagnoses obtained from our study population. The list of diagnoses refers to outpatients unless otherwise stated.
CONCLUSIONS

When medical conditions prevent military personnel from conducting their wartime duties, the combat capability and mission focus of their unit are adversely affected. Regardless of the precipitating diagnosis, any medical evacuation out of the combat zone may hamper wartime operations owing to time away from the battlefield. Treating medical disease in theater (instead of evacuation) reduces time away from the battlefield, but it is conceivable that patient outcome might be compromised. Cutaneous disorders not directly related to combat injury rarely threaten patient safety and are good candidates for intratheater treatment. We suggest that several measures will reduce the likelihood of aero-medical evacuations for non–battle-related skin diseases and therefore allow for treatment in the combat zone: (1) conduct thorough predeployment screening to identify individuals with chronic skin diseases, (2) emphasize preventive measures to both patients and clinicians and develop treatment plans that will permit lengthy deployments without the need for ongoing dermatologic care, and (3) improve diagnostic accuracy in the field of operations.

Identifying those military personnel destined for CENTCOM with a history of eczematous and atopic dermatitis, urticaria, psoriasis, and other chronic skin diseases during predeployment medical screening will allow these individuals to receive specific evaluations by dermatologists. During these predeployment assessments, preventive measures can be emphasized, self-treatment for each condition can be reviewed, and advice about when to seek medical care during flares can be outlined. Ultimately, a dermatologic predeployment screening could also lead to the recommendation that an individual not deploy because of risk of a severe exacerbation in-theater.

We also suggest there are ways to improve the diagnostic accuracy of nondermatologists in the field environment. One way is to assign a consultant dermatologist in the combat zone, a practice the US Army officially began in March 2005. Another is to give non-dermatologist clinicians additional training on recognition, diagnosis, and treatment of specific cutaneous diseases that repeatedly generate medical evacuations. This dermatologic instruction could be added to the predeployment operational medical training curriculum that currently includes care for the trauma patient; nuclear, biological, and chemical warfare; and field sanitation and hygiene.

The military has produced reference guides to assist the diagnosis and treatment of disease in theater. One such manual, “Diagnosis and Treatment of Diseases of Tactical Importance to US Central Command,”11 provides an overview of those diseases in Central and Southwest Asia likely to be encountered by deploying medical personnel. Future editions can include an algorithmic approach to those skin diseases most responsible for aero-medical evacuation, emphasizing diagnosis and treatment of these entities, as well as prevention of flares.

A fourth avenue to improve diagnostic accuracy is to create a virtual dermatology clinic to provide consultative support. Teledermatology in the US Army dates back to 1992,12 and a formal Army teledermatology consult system utilizing the Army’s e-mail system, Army Knowledge Online, was established in April 2004.13 This teledermatology consult system is now available to military (and other federal) medical personnel from all branches of service, including those deployed to CENTCOM. From April 2004 until June 2006, 996 teledermatology consult requests originated from the CENTCOM area of operations.14

Although ICD-9-CM codes can be extremely precise, they often create ambiguity because many practitioners resort to using broad, vague, all-encompassing diagnoses such as “macules and papules” and “rash and other nonspecific skin eruption.” When using the Department of Defense EMR systems, the clinician selects a diagnosis from a pick list. It is often easier for the busy practitioner to select a broad, yet imprecise, diagnosis (eg, nonspecific skin eruption NEC or skin disorders NEC) from this pick list than to search for a more definitive one. This practice may partly explain the “mystery rash” group of postevacuation diagnoses and represents a limitation of our study. On the one hand, dermatitis NOS/dermatitis unspecified, this study’s most common diagnosis after repatriation, may also be subject to the practice of selecting an imprecise diagnosis from the electronic pick list for reasons of expediency. On the other hand, when a dermatologist uses the term dermatitis, it usually describes one of the many pruritic, scaly erythematous eruptions that exhibit spongiosis on histologic examination.

Another study limitation is that we assumed that the postevacuation clinical diagnosis was correct. The post-evacuation diagnosis was usually assigned by only 1 physician, not a consensus of several, and the extent of each workup is unknown. In addition, the complete post-evacuation medical documentation of each patient was not reviewed owing to the challenges of locating medical records from medical facilities in the United States, Europe, and the Pacific region. Indeed, many of the evacuated patients were evaluated before the implementation of the military’s EMR, which contains all medical documents entered into the system after its implementation date. If we had been able to review the notes of the dermatologists who evaluated the repatriated patients, a more precise diagnosis might have been surmised, decreasing the number of inexact diagnoses.

Although skin diseases cause few fatalities, they have an appreciable role in combat and operational primary care. Lessons learned in the 20th century regarding the need for the prevention and early identification and treatment of skin diseases in the combat zone still hold true today. Our “mystery rash” series illustrates the dermatologic diagnoses that are troublesome for both patients and clinicians in CENTCOM. The results of this study largely agree with observations from the 1PGW and in other 20th-century American and British conflicts: eczematous and atopic dermatitis and other chronic skin conditions continue to be among the most common reasons that deployed military personnel seek dermatologic care.
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REFERENCES