Teledermatology *in* Military Medicine

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Dermatology is one of
the most heavily used
teleconsultation services in the
Department of Defense. . . .
This e-pub serves as an
excellent guide for medical
professionals of all Services
and will help to significantly
increase the capabilities of
providers in the field.

Foreword

Access to specialized medical care such as dermatology in austere environments has long been a concern for deployed service members and providers. Medical professionals in various areas of responsibility often encounter unusual skin diseases from all over the world. If these conditions are not properly treated or go unrecognized, they can negatively impact the health and readiness of service members, putting the mission at risk. Previously, the lack of specialized health care in remote settings caused patients to be transported to larger medical facilities, which required additional mission time, money, and logistical support. Today, continuing advances in telemedicine enable military dermatologists to provide care to patients anywhere in the world. Dermatology is one of the most heavily used teleconsultation services in the Department of Defense.

With teledermatology, medical providers in the field can send digital images, audio files, and text to locations where dermatologists are available to evaluate this information and provide recommendations to providers at remote sites. Video conferencing sessions for live interactive consults have also become increasingly valuable. Teledermatology helps ensure all personnel, regardless of where they are serving, have access to trained skin specialists and serves as a critical tool in maintaining readiness and a fit fighting force.

This inaugural edition of *Teledermatology in Military Medicine* is an ideal resource for military dermatologists and providers who operate at home bases and various remote areas of responsibility. This 12-chapter book covers all major skin diseases from bacterial, fungal, and viral infections to bullous disorders, arthropod-borne diseases, and tumors of the skin. Other selected topics include shipboard consults, cold and hot weather factors, and combat-related burns. The unique factors affecting dermatologic care in each major geographical command are discussed. Representative cases and more than 620 color images are included in this book to demonstrate instructional sample cases from each region.

Dermatologic conditions remain a common complaint among deployed service members, and teledermatology can substantially reduce the number of patients who need to be evacuated for treatment. As described in Chapters 1 through 3, teledermatology can enhance readiness while reducing costs and prevent unnecessary evacuations by providing virtual health care to service members worldwide. The heavy use of teledermatology demonstrates the significant impact that skin disease has on deployed service members and the important contributions military dermatologists make to the worldwide mission.

New applications of teledermatology, such as the CarePoint information portal, will continue to improve with advances in technology. The CarePoint portal recently replaced the Army Knowledge Online Teleconsultation Program and will soon integrate into the Military Health System Genesis, the new military electronic medical record system.

To enhance the access and availability of this electronic publication, the Borden Institute has made its full content available at http://www.cs.amedd.army.mil/borden.

This e-pub serves as an excellent guide for medical professionals of all Services and will help to significantly increase the capabilities of providers in the field. I would like to extend a special thanks to the authors and contributors for their efforts in creating this much-needed publication.

RAYMOND S. DINGLE
Lieutenant General, U.S. Army
The Surgeon General and
Commanding General, USAMEDCOM

Prologue

Dr Marion Sulzberger, considered one of the luminaries of modern dermatology, would appreciate the strides military dermatology has made in teledermatology over the past 30 years. As a naval medical officer in World War II, he understood the significant impact skin disease had on the fighting force. In 1942, he coauthored with Drs Clarence Livingood and Donald Pillsbury the *Military Manual of Dermatology* that was circulated as a field manual and served as a reference after the war for the growing specialty of dermatology.

The goal of the *Teledermatology in Military Medicine* book project was to capture a piece of history. The images and case studies outlined in this book span the "war on terrorism." The Army's teledermatology program got its start in 2002 as a temporary solution to the emerging problem of providing dermatologic services to deployed personnel as the conflict in Afghanistan grew and the US military prepared for the invasion of Iraq. That temporary solution continued to evolve, but was eventually retired in 2018 to be replaced by a more modern web platform. However, by that time the world had smartphones, reliable bandwidth, and social media. The world has changed, but the skin diseases that impact service members persist. For this reason, the role of the dermatologist is as relevant today as it was in World War II. However, the modern dermatologist now has the ability to expand his or her scope to a broader virtual community. This is the legacy and ongoing mission of teledermatology in the military. In addition to contributing to the care of thousands of service members, it will also continue to influence future generations of military dermatologists.

Since 2002, the Army Knowledge Online Teleconsultation Program has rendered over 15,000 consultations and has answered them at an average of 5 hours and 14 minutes each. This is a remarkable feat given the consultations come from every region of the globe, from war zones to humanitarian crises, from land and from sea. Teledermatology has helped US service members, coalition partners, civilians, and even enemy personnel. It continues to positively impact the young and the old, as well as the fortunate and unfortunate. It accomplished what it did with the expertise of a small cohort of dermatologists and logisticians who evangelized its adoption by the US Army, US Navy, US Air Force, and US Coast Guard.

This book is a salute to those who served, contributed, and sacrificed so others can continue to take military teledermatology to even greater heights.

JON H. MEYERLE, MD
Colonel, Medical Corps
US Army (Retired)

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One of the primary missions of military medicine is to maintain the health of service members in support of stateside and overseas missions that are often in isolated areas with limited to no access to specialty care. . . . With technological advancements and the application of telemedicine, providers even in the most remote environments can have access to specialty care and support.

CHAPTER ONE

Introduction to Telemedicine

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INTRODUCTION

One of the primary missions of military medicine is to maintain the health of service members in support of stateside and overseas missions that are often in isolated areas with limited to no access to specialty care. Healthcare providers in these settings are typically physicians serving as general medical officers just out of internship with little secondary training or specialists serving in a generalist status. They can also be physician extenders such as physician assistants, family nurse practitioners, or service members with advanced medical training (eg, a medic). These individuals are responsible for providing care in austere environments with few resources and with limited access to specialists—and are often called upon to provide services beyond their expertise. In most cases, it is expensive and time consuming to reach a specialist for a formal consultation, especially when traveling from an austere or hazardous environment such as a battlefield or ship. With technological advancements and the application of telemedicine, providers even in the most remote environments can have access to specialty care and support.

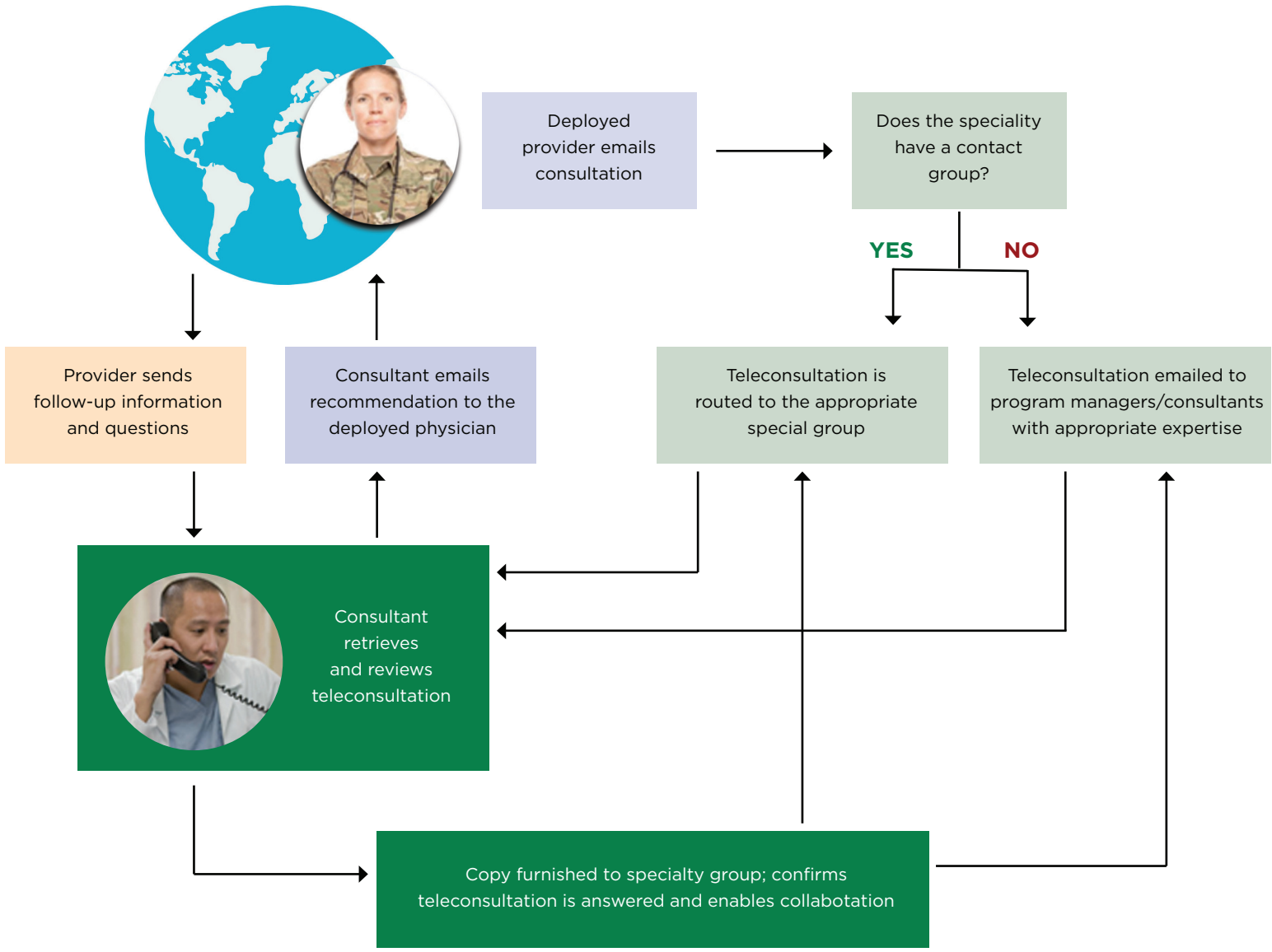
RISE OF TELEMEDICINE PROGRAMS

Telemedicine has grown in use and popularity over the years, starting with the invention of the telephone by Alexander Graham Bell in 1876. After that, the use of telephones for medical purposes soon became a standard practice, but it was not until the 1940s that the first use of video communications for medical purposes was reported.[1] In 1948, two Pennsylvania physicians were able to transmit radiologic images over 24 miles. Later, in 1959, a live two-way interactive telemedicine initiative between Virginia and Nebraska allowed group consults for behavioral health and education.[1] These programs were followed a decade later by longer transmissions (including transoceanic) of electrocardiograms and X-ray film from shipboard physicians to monitoring facilities on land.[2,3]

One of the most notable examples of remote medical monitoring was the system devised by the National Aeronautics and Space Administration (NASA) for Project Mercury in 1959. This system helped physicians, or "monitors," on Earth manage the medical needs of astronauts on space flights. These assigned monitors (primarily US Air Force Medical Corps physicians) provided input into the Project Mercury mission through their detailed understanding of spacecraft and medical instrumentation. These physicians also had specialized knowledge of the physiologic stresses the astronauts would experience while on board the spacecraft. Similar to deployed doctors of today, the primary objective of the NASA monitors was to preserve the health of pilots during the mission and provide medical advice to the flight directors and commanders.[4] This telehealth platform was unique because it emphasized training physicians on the proper use of NASA technology and on the interpretation of the health data as it pertained to the specific space mission.

Other forms of telemedicine began taking shape in the latter half of the 20th century, using a combination of audio (two-way radio or phone) and video imaging.[5] These systems assisted providers in caring for underserved and rural populations where access to specialty trained physicians and other healthcare providers was inadequate. One such

Figure 1-1. AKO Teleconsultation Program. The process is initiated by a deployed provider and culminates with an emailed recommendation from a specialty consultant. Further correspondence with the consultant can be continued by the deployed provider as needed.



example is the program developed in the 1970s by the Indian Health Service, NASA, and Lockheed Martin. By employing a satellite network designed to monitor astronauts in space, this collaborative group was able to provide remote medical support to the Papago tribe on an isolated reservation in southern Arizona.[6] During this time, the federal government also funded the creation of several teleradiology programs, which now comprise the Digital Imaging Network.[7] This network stores and transmits medical imaging for diagnostic purposes to those working in federal government facilities; some states have adopted similar networks for their own use.[8] With the rise of personal computers and the internet in the 1980s and 1990s, it became even easier for physicians to connect to medical imaging systems in realtime and evaluate cases at home and abroad.

HISTORY OF TELEMEDICINE IN THE GLOBAL HEALTH MISSION

The concept of remote medical evaluations has gained ground in urban and rural populations as cost effective alternatives to in-person medical care. The ability to provide advanced medical services via telemedicine to remote environments through the use of innovative technology and communication systems was expanded for overseas humanitarian and military missions in the late 1980s. Following a 1988 earthquake in the Republic of Armenia, located in the former Soviet Union, medical professionals established a global telemedicine link between Armenia and several US medical centers. The ability to use a "store-and-forward" telemedicine system between these sites improved clinical decision making and treatment, particularly for trauma care, by providing a link at the point of care to remote medical providers with specialized expertise.[9]

Satellite transmissions of digital computed topography scans during the Persian Gulf War (1990–1991) are the first reports of remote medical monitoring in a combat zone. This platform laid the foundation for a telemedicine system employed by US forces deployed to Somalia for Operation Restore Hope in 1992. The Somali mission aimed to provide services for a country plagued by war, famine, and disease and to fill the gap left by local hospitals in Mogadishu that were understaffed and underequipped. However, despite the increased access to medical care in deployed field hospitals in Somalia, the lack of specialized healthcare professionals

in the deployed environment required patients to be transported to larger medical facilities in Germany, which required additional time, money, and logistical support.

By February 1993, a new system known as the Remote Clinical Communications System (RCCS) was developed to increase access to specialized medical services in Somalia. This system consisted of a "fly away" deployment kit that included a high-resolution digital camera, a laptop with image acquisition software, and a portable satellite transceiver. At the time, the package cost approximately $65,000. Images and consult monographs were transmitted by dial-up modem or satellite to a home-based system with an average cost per consult of $145 per transmission. The home-based RCCSs at medical centers in Germany and the continental United States consisted of two desktop personal computers with imaging software and a thermal dye transfer printer with a total equipment cost of $50,000. The average response time for a consult was less than 24 hours.[10]

The success of the RCCSs both at home and abroad led to the use of a similar system for humanitarian missions over the next 3 years in Croatia, Kuwait, Panama, Egypt, Kenya, and other areas. Building from the RCCS platform, a store-and-forward model was established, in which electronic medical records, in combination with digital photography, were transmitted from a remote location by satellite or telephone lines to a home-based computer at the Walter Reed Army Medical Center in Washington, DC. Trained physicians, who operated a telemedicine service 24 hours a day, were then able to evaluate the consult with relevant imaging and lab work and provide recommendations to the provider at the remote site. Video conferencing for live interactive consults was also available. This system required little training given its ease of use. It facilitated direct communication between physicians and integrated consults into the online medical database known as the Composite Health Care System (CHCS), which could be remotely accessed from other military healthcare facilities. A review of the consults from 1993 to 1996 showed 70% of the patient population cared for via this telehealth platform consisted of active-duty US military personnel and local nationals; the remaining patients were United Nations members and US civilians. Specialty cases were primarily for medical and surgical services, with dermatology care being the most requested individual medical specialty consultation.[9]

A critical element of the telemedicine platform for the military is the ability to remotely communicate with specialty care providers in order to correctly identify service members requiring evacuation to a higher level of care.[11] When service members are medically evacuated, transportation assets must be activated and replacement personnel must be dispatched. Of the 450 soldiers evacuated during Operation Restore Hope, it was estimated that up to 10% could have been treated in country with remote access to specialized care if the RCCS platform had been used.[10] The telemedicine system's value in an austere environment was apparent. At that time, the average cost for transporting and evaluating each soldier was $2,880 based on an average of 30 duty days lost per soldier.

IMPLEMENTATION OF TELEMEDICINE IN IRAQ AND AFGHANISTAN

Following the invasion of Iraq in March 2003, a new asynchronous store-and-forward platform for telemedicine was developed to manage patients requiring remote consultations and evaluations for possible evacuation. Streamlining this process was particularly crucial because the evacuations had to be carefully orchestrated, demanding significant time and expense due to the complex nature of patient and troop movements. Ground transportation was also impacted by the emergence of improved explosive devices and the ongoing threat from hostile enemy fire, as well as the unique hazards of desert and urban environments. Evacuations are risky since they expose personnel to hostile action; however, the logistics of dispatching replacement personnel to the patient's location and inserting new personnel into combat environments are always complex.[12]

Utilizing the Army Knowledge Online (AKO) email server, a low-bandwidth system available globally to all service members, the new AKO Teleconsultation Program is able to target providers deployed outside the United States at mobile (non-fixed) facilities with internet access (Figure 1-1). Using this program, deployed providers can easily contact specialists via email and potentially avoid unnecessary medical evacuations to a higher level of care. AKO system referrals follow a simple, standardized format of patient histories that include pertinent medical data, lab work, and images. A referral is embedded in an email and forwarded to a program manager who then sends the material to specialty consultants.[12]

The AKO Teleconsultation Program received more than 10,000 consultations from its inception in April 2004 to February 2012 with an average response time of 5 hours.[11] Approximately 75% of the cases during that time originated in Iraq (52%) and Afghanistan (24%),[13] with the number of consults from each theater correlating with troop involvement in that region.[13] Of over 10,000 cases referred to the system, 462 of those patients were evacuated based on recommendations from consultants while 131 evacuations were averted.[13]

SUMMARY

Access to specialized care for deployed troops and patients in remote settings has long been a concern. Beginning with NASA missions in the late 1960s, remote medical monitoring has been increasingly used in place of face-to-face encounters with specialists. Telemedicine platforms continue to improve with advances in technology. From radio-transmitted messages to those sent via satellite uplink and dial-up modem, to the modern system of high-resolution digital imaging sent by low-bandwidth, high-speed internet—telemedicine has become an integral part of the military's medical mission. Telemedicine has become especially valuable in the care of deployed troops since it can prevent costly evacuations for conditions that could be treated by local general medical officers, physician extenders, or medics. In certain circumstances, telemedicine can also provide needed justifications when evacuations are warranted.

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CHAPTER TWO

Evolution of Teledermatology

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INTRODUCTION

The impact of skin disease on world health is significant. In rural and underserved regions, lack of access to dermatology services can lead to diagnosis and treatment delays. Delayed intervention results in increased morbidity and mortality from skin conditions. Telemedicine platforms in dermatology can overcome these issues and do not always require expensive equipment or elaborate training of referring providers.

INCIDENCES OF SKIN DISEASE

Nearly 25% of all patients seen by primary care physicians in the United States have skin complaints,[1] with one in three patients reporting a chronic skin condition. Globally, dermatologic disease ranks in the top 20 diseases with the heaviest economic burden. In 2004, $37 billion was spent on healthcare associated with skin diseases, primarily skin cancers, acne, eczema, and chronic ulcers. This estimate did not include additional costs such as time away from work, loss of productivity, and diminished self-esteem from skin conditions.[2]

Because one in five people are expected to develop at least one skin cancer in their lifetime, skin malignancy evaluations are one of the most common reasons for dermatology referrals. Between 1985 and 2011, the number of new melanoma cases in the United States doubled each year; in 2016, it was the fifth most common cancer for men and seventh most common cancer for women. Approximately 7,000 people are estimated to die each year from skin cancer in the United States and over 65,000 a year globally from melanoma.[3]

With increasing incidences of skin disease comes an ever-expanding demand for referrals to skin specialists. The number of dermatologists in the United States has not kept up with the demand. A 2017 survey of five major metropolitan centers showed the average wait time from referral to appointment with a dermatologist was 32 days —up from 22 to 24 days from the previous decade.[4] Access is even more limited in rural regions, where few, if any, dermatologists are available.

TELEDERMATOLOGY IN AUSTERE AND REMOTE SETTINGS

Teledermatology plays a vital role in overcoming the challenges of increased patient demand for dermatologic care, which includes long wait times for services, significant time away from work due to skin-related illnesses, and limited availability of dermatology specialists. Dermatology is a visual field with many diagnoses made by physical examination or photographs alone. For this reason, using digital photography and having a concise medical history in a “store-and-forward” system has been readily embraced by dermatologists. One of the first case series summarizing the use of teledermatology in a rural population was the 1995 Oregon study performed in conjunction with the National Library of Medicine’s high-performance computing and communication initiative. Digital photographs were taken at the point of care and transmitted by dial-up modem to a secure computer at the

closest urban medical facility in Oregon. At the receiving facility, dermatologists evaluated the images and relayed recommendations to the referring providers.[5]

Providers in third world countries and other underserved regions have used store-and-forward models globally for many years. Two systems employed by providers in remote regions of Africa underscore the value of teledermatology in providing care. Médecins Sans Frontières (MSF), also known as Doctors Without Borders, has employed teledermatology for its field workers in South Sudan, Ethiopia, and the Democratic Republic of the Congo. A store-and-forward format was preferred over a realtime video conferencing system because of limited resources in the region. From 2010 to 2014, 65 telemedicine cases were referred to the MSF system with a notable increase as the 4-year study progressed. Forty-three of those cases were for dermatology, while the rest consisted of cross-specialty cases primarily for infectious disease, pediatrics, and internal medicine.[6] Of those 43, 46% were diagnosed with a bacterial, mycobacterial, parasitic, or Human immunodeficiency virus (HIV) related diseases.[6]

The African Teledermatology Project, a store-and-forward online platform that started in 2007, experienced similar results. With the help of American, Austrian, Australian, and African universities, the project provides dermatology support to local physicians, dermatologists, and healthcare workers in hospitals and clinics throughout Africa. See http://africa.telederm.org/ for a full list of partners. In a span of 77 months, 1,229 cases were submitted through the online platform from Uganda and Botswana for review with an average response time of 1 week. The most common diagnoses were atopic dermatitis, warts, and Kaposi's sarcoma (both HIV related and non-HIV related). Referrals increased as the study progressed; however, the quality of the study was limited by a lack of standardization and limited follow-up.[7]

For both African teledermatology programs, diagnosis was the primary reason for referral; the second was management of known diagnoses for consultation. The cases were assigned either a definitive diagnosis or a differential diagnosis with support by multispecialty consultations, if needed. Diagnosis variations based on the referring providers differential diagnoses and those rendered by the consultant were attributed to incomplete patient histories, lack of standardization for referrals, and poor photograph quality. However, even in the case of the Africa Teledermatology Project, which had significant technological limitations, there was a 60% agreement between the referring provider's diagnosis and the consultant's diagnosis.[7]

Off-site and on-site dermatologists generally agree on the same cases. For example, a 2016 study at an outpatient clinic in Egypt was performed to assess the accuracy of diagnoses by teledermatologists using digital imaging and a standardized one-page health history form. Six-hundred cases were selected at random, with in-office evaluations and assessments made by resident dermatologists. Photographs were taken and transmitted along with medical history forms to two off-site teledermatologists. A diagnostic concordance of 87% was found between the on-site resident dermatologist and the two teledermatologists, with an 86% agreement between the two teledermatologists. Significant for this study was the higher rate of agreement among all dermatologists for lesions present for many weeks as opposed to those of sudden onset, reflecting the number of variations that can be present in an acute lesion. The authors concluded from this study that a standardized referral format with high-quality photographs (several over time in the case of an evolving lesion) can increase the diagnostic accuracy of teledermatology consultants.[8]

SKIN DISEASE IN THE MILITARY

". . . combat mortality from dermatologic disorders is low, but morbidity from mundane skin conditions can render soldiers noneffective. Prevention and treatment of ordinary dermatologic disorders and recognition of tropical diseases and infections should therefore be central to the practice of military medicine. Commanders must continually be educated that protecting the individual soldier's skin is integral to conserving the fighting strength."[9]

Brigadier General Russ Zajtchuk
Medical Corps, US Army
August 1994, Washington, DC

The austere environment in which the US military frequently operates requires special consideration given its impact on skin disease. Individuals placed in extreme conditions require special skin care and hygiene to maintain an effective skin barrier.[10] Because access to specialized healthcare providers is often lacking at these locations, teledermatology has become an increasingly important method for maintaining the fighting force.[11]

As far back as the American Civil War, skin disease has been a common cause of troop morbidity and mortality. Data on disease nonbattle injuries shows that approximately 74,000 patients had skin conditions during the Civil War, with the majority being infectious diseases (measles, smallpox, gonorrhea, syphilis), followed by complications related to injuries and infections aboard hospital ships.[11] Decades later, troops during World War I had high incidences of cutaneous disease that required hospitalization. Overall, 126,365 soldiers were admitted for skin-related problems from April 1917 to December 1919.[12] Admissions were primarily for cases related to skin infections (cellulitis, abscesses, impetigo, carbuncle) and infestations, with the rest being chronic skin complaints of dermatitis, psoriasis, and pityriasis.[12] More than 2 million days of military service were estimated lost as a result of these admissions.[12] To handle the large number of skin disease cases, dermatologists were assigned to camps and military hospitals, and specialized facilities were established solely for the purpose of treating skin conditions.[12]

During World War II, dermatologic diseases continued to be a major source of morbidity for service members fighting in a variety of climates. Unlike World War I, however, the US Army Medical Corps in World War II did not provide official provisions for dermatologists or dedicated facilities for the treatment of skin diseases.[10] In fact, the majority of military providers had little knowledge of dermatologic diseases and had no means for accessing specialized skin care experts.[10] This situation is surprising given that 25% of outpatient visits in temperate climates and up to 75% of visits in tropical climates were due to dermatologic problems during this period.[11] In fact, these visits often led to incorrect diagnoses and treatments from untrained providers.[11] Evacuations from the Pacific theater due to skin-related disorders in 1945 outnumbered all other injuries requiring evacuation combined.[10]

It was not until the spring of 1945 that the first consultant in dermatology was named by the Office of the Surgeon General to the US Army Medical Corps.[12] The dermatology consultant's function was to provide instruction in dermatology to the medical officers in the unit and assist with specialized medical care, both at home and abroad.[11] However, it would not become commonplace to deploy dedicated dermatologists for several decades. Cutaneous diseases continued to be a primary issue for US troops in tropical environments, especially later in the Vietnam War.

During the Korean War, skin disease was among the top five reasons for hospital admissions and outpatient visits, and it was the number one reason for admissions during the Vietnam War. From 1968 to 1969, 47% of all lost workdays in the 9th Infantry Division were related to skin disease with some battalions reporting it as high as 80%. Hot and humid conditions for troops on the front lines, in addition to poor skin hygiene, likely accounted for the jump in skin disease incidences compared to those stationed on deployed and stateside bases.[10]

Environmental conditions continued to jeopardize the health of service members in the 1990s. During the Persian Gulf War (1990–1991) and subsequent humanitarian missions in Cuba, Panama, and Haiti, skin complaints represented 12 to 15% of all outpatient visits to medical facilities.[11] While it soon became standard practice to deploy trained dermatologists as general medical officers, which provided at least informal access to trained specialists, very few deployed as a dedicated dermatology consultants; most of these officers provided general healthcare support.[11]

As the US military evolved and refocused its response to conflicts in the early 2000s, the need for deployed dermatologists to serve as consultants finally became apparent. A 2003 proposal for restructuring dermatologic support methods for providers abroad recommended reducing the number of dermatologists deployed as general medical officers in order to increase the number of available providers for dermatologic consultations. For those units not authorized a full-time dermatologist, this proposal included a system that allowed dermatologists to rotate between facilities, providing medical care and also instructing general medical officers on the care of dermatology patients.[11] As technology advanced, this model gave way to the modern teledermatology system employed by providers in locations with no dedicated dermatologist.

SUMMARY

Skin disease is a major cause of morbidity for US service members in deployed and austere environments. Dermatologic conditions account for one of the largest medical reasons for lost work time and continue to be one of the top causes of evacuations during wartime. Dermatologists have not traditionally been a part of the deployed medical force; however, as observed during World War I, their presence can drastically improve how healthcare is delivered and how quickly service members can return to duty. While dedicated dermatologists have become increasingly available in combat environments, the success of telemedicine platforms and teledermatology services in underserved and remote regions has ushered in a new era in modern military medicine. In the past, dermatologists could only reach remote service members by long-distance air or ground travel. Now, all it takes is a click of a button to send a digital consult from anywhere in the world.

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CHAPTER THREE

Military Medicine and the Role of Teledermatology

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INTRODUCTION

Military providers have access to many teledermatology platforms, with four of them being the focus of this text. They are the Regional Health Command-Central (RHC-C) platform for continental US operations, the Army Knowledge Online (AKO) Teleconsultation Program for deployed providers, the Pacific Asynchronous TeleHealth (PATH) system for personnel in the Pacific Command region (for fixed and mobile health clinics), and the Health Experts onLine at Portsmouth (HELP) for naval medical personnel. These platforms grew from the first telemedicine platform developed by the Telemedicine and Advanced Technology Research Center (TATRC) at the US Army Medical Research and Materiel Command in Fort Detrick, Maryland. TATRC promotes technological innovations in telehealth for the advancement of military medicine.

FOUNDATION FOR MILITARY TELEMEDICINE

The TATRC, in conjunction with the Walter Reed Army Medical Center, recognized the need for a web-based dermatology program in the late 1990s and created a program that was compliant with US Health Insurance Portability and Accountability Act and Privacy Act guidelines. After serving as the pilot, the Southern Regional Medical Command formally adopted the program in February 2002 and was followed by the four other regional medical commands. The commands supported US Army, US Navy, and US Air Force facilities as the demand ebbed and flowed during the buildup and drawdown of the Iraq–Afghanistan conflict.

The RHC-C Teledermatology Service

The RHC-C dermatology program is provided at no cost to supported military units. Consultations are answered by Air Force and Army dermatologists assigned to the San Antonio Military Medical Center at Joint Base San Antonio, Texas. Primary care managers at supported units refer their dermatology patients to their managed care departments, who screen patients for entry into the program. If patients meet the program's criteria, they are sent to a consult manager who is often an enlisted medic, civilian medical assistant, or nurse. Each patient then completes a patient worksheet before the consult manager acquires the digital photographs. The consult manager then takes the images and data from the interview worksheet and uploads that content onto the teledermatology server. Consultations are answered within 3 business days. The program is currently supporting approximately 10 Air Force and Army medical treatment facilities each month. The RHC-C dermatology program answered 5,198 consultations from April 2004 to fiscal year 2016. In 2007, a graduate medical education module was added to the software. This module allows the consultations to be reviewed by dermatology residents undergoing training at Brooke Army Medical Center and Lackland Air Force Base, Texas. Recommendations from the residents are reviewed by staff dermatologists, who evaluate their diagnoses, treatment plans, and follow-ups. Reports are sent to the resident, the dermatologist who answered the consultation, and the director of the residency program on a regular basis to provide supervising oversight as well as quality assurance feedback on each resident's performance.

AKO Teleconsultation Program

As discussed in Chapter 1, the AKO Teleconsultation Program is an asynchronous store-and-forward telemedicine platform and uses the low-bandwidth AKO email server, which is available to all military providers. The system's creation was inspired by the RHC-C Teledermatology Service. Following a presentation during the 2003 Military Dermatology Conference in Maryland from Colonel (Retired) Hon Pak, a former chief medical information officer and chief information officer with the US Army Medical Education Department, a team was tasked to design an easy-to-use, email-based teledermatology program. A pilot program (soon to be known as the AKO Teleconsultation Program) was developed and accepted by the US Army surgeon general in April 2004. Data collected from this program started in April 2004 and ended in December 2012. During this time period, dermatology accounted for 40% of all cases sent to the AKO Teleconsultation Program (ie, 4,379 consults out of 10,817 total cases). An average of 480 dermatology consults were sent each year during this time, with the patient demographics heavily weighted toward young, male US service members (average age of 28 years).[1]

From 2004 to 2012, the number of total consults submitted to the AKO Teleconsultation Program remained fairly stable, peaking around 2011 at 1,819 and falling off after that time because of the Iraq drawdown.[1] Transitional periods after major conflicts often show a drop off in the use of medical services, which accounted for the less than expected number of consultations during this time.[1]

Between 2005 and 2009, 2,197 consults were sent to the AKO Teledermatology Program. Of those referrals, 75% of the patients were diagnosed by the consultant (mostly for smallpox vaccine reaction and leishmaniasis) with the rest receiving differential diagnoses. Less than 2% were recommended for evacuation from Iraq (estimated total cost of $562,380), while 5% were recommended for travel to the deployed dermatologist in Iraq for evaluation (estimated cost of $416,000). Because 31% of all consults to the AKO Teleconsultation Program were for dermatology, the Department of Defense saved an estimated $30.4 million over 4 years by preventing unnecessary evacuations.[2]

To further underscore the importance of teledermatology in deployed settings, a review of cases sent to the AKO teledermatology platform from January 2011 to December 2012 was completed to determine the effects on evacuations and patient movements. For the purpose of this review, an evacuation was defined as moving a patient from a remote location to a higher level of care. An evacuation was "facilitated" if a referring provider ordered it based on a consultant's recommendation. For the 658 cases referred in 2011–2012, 46 evacuations were avoided and 41 were carried out. Most evacuations were for skin cancers, mastocytosis, psoriasis, and methicillin-resistant staphylococcus aureus infection.

During Operation Iraqi Freedom (2003–2011), patient referrals for skin cancer screenings were common, and those with malignant skin cancers such as melanoma were quickly evacuated. Teledermatology services played a key role in evaluating suspicious pigmented or non-melanoma lesions and were often the critical justification in deciding to push forward with an evacuation.[1] In 2013, a questionnaire was sent to providers who had used the AKO system in the past 12 months. The results indicated that the role of teledermatology in clinical decision making in deployed settings may have been underestimated because many providers did not provide follow-up information on the evacuation status of patients for operational security reasons or privacy, or both.

The most common diagnoses encountered in austere environments are also those most commonly seen in general dermatology clinics—eczematous dermatitis, contact dermatitis, skin cancer, drug reactions, psoriasis, and urticaria. The top 20 diagnoses are summarized in Table 3-1. Treatment modalities in deployed environments also match those typically used in nondeployed dermatology clinics, with emollients, topical steroids, oral antibiotics, and antihistamines topping the list. However, leishmaniasis, arthropod bites, vaccination reactions, genetic conditions, and traumatic injuries were more prevalent than in general dermatology clinics. These differences reflect not only the environmental hazards encountered by service members in austere environments, but the relative lack of medical care for local inhabitants (eg, for genetic conditions).[1] Further evaluation of specific cases in the US Central Command region are discussed later in Chapter 5 of this text.

A 2008 review evaluated the factors involved in the success of the AKO Teleconsultation Program, in which system users and consultants were interviewed to determine the benefits and drawbacks to the system and to identify areas needing improvement. Both groups reported ease of use, short response times from specialty providers, and increased access to specialty care as advantages. For dermatology consultants supporting the system, a lack of follow-up with patients was the greatest concern. For referring providers, increased workload, a lack of awareness about the platform, and insufficient training (especially on acquiring appropriate photographs) were the biggest impediments to care.[3]

Pacific Asynchronous TeleHealth

In the late 1990s, providers at Tripler Army Medical Center (TAMC), Hawaii, developed a store-and-forward telemedicine platform aimed at providing care to the indigenous people of US-affiliated Pacific Islands. These islands included the US territories of American Samoa, Guam, Northern Mariana Islands, the Republic of the Marshall Islands, Federated States of Micronesia, and the Republic of Palau. This telemedicine platform gave patients access to medical specialties unavailable in their home country, and allowed TAMC residents in training to gain experience with managing infectious diseases and other chronic illnesses uncommon to the military population (eg, dengue fever, leprosy, leptospirosis, and tuberculosis). In its infancy, the Pacific Island Healthcare Project (PIHP) used letters, telephone calls, and fax machines to provide care to a region spanning several time zones across isolated islands spread out over the Pacific Ocean.

Table 3-1. Top 20 dermatologic diagnoses of 658 teledermatology consultations in Iraq from January 2011 to December 2012

Diagnosis	Number of Cases	Percentage (%)
Eczematous dermatitis	90	14
Contact dermatitis	58	9
Evaluation for nonmelanoma skin cancer	33	5
Psoriasis	26	4
Urticaria	25	4
Tinea infection	24	4
Folliculitis	19	3
Arthropod bite	18	3
Drug eruption	17	3
Verruca vulgaris	17	2
Pityriasis rosea	16	2
Herpes virus infection (herpes simplex virus, varicella zoster virus)	16	2
Evaluation for a suspicious pigmented lesion (Melanoma)	14	2
Impetigo	14	2
Leishmaniasis	13	2
Acne	12	2
Nevus	12	2
Alopecia	10	2
Reaction to the smallpox vaccine	10	2
Lichen planus	8	1
Total	452	70

Top 20 dermatologic diagnoses. Source: Hwang JS, Lappan CM, Sperling LC, Meyerle JH. Utilization of telemedicine in the US military in a deployed setting. *Mil Med*. 2014;179(11):1347–1353.

In 1997, a standardized consultation webpage was established to provide a common portal for primary care and specialty access. Providers uploaded medical histories along with digital photographs to a secure form on the PIHP website. An email then notified a consultant of a pending case and included a link to the relevant clinical material on the PIHP website. Comments by consultants or initiating providers prompted email notifications, allowing for an open discussion of difficult cases through the web-based portal. Over several years, this program helped reduce the number of patients transported to TAMC for specialized care and helped decrease the length of stay for those requiring transport.[4]

In 2004, the Pacific Asynchronous TeleHealth (PATH) service was formed, independent of the AKO Teleconsultation Program. PATH is designed to incorporate consults from Korea, mainland Japan and Okinawa, and Guam. PATH access is important for junior physicians who primarily staff clinics in this region and helps alleviate issues associated with long-distance travel for face-to-face meetings with specialists. This can be a problem for patients from local populations, who are often deterred by monetary, language, and cultural barriers associated with such travel. Initially used to manage pediatric asthma remotely, PATH now accepts consultations for any specialty, with over one-third of them placed for adults.[4] Based on a review of 1,000 pediatric consultations received from 2006 to 2009, PATH referrals resulted in 43% of the consults being resolved to the satisfaction of the referring provider without the need for face-to-face intervention. Reducing the need for in-person evaluations saved an estimated $200,000 each year during this time in provider visit costs,[5] with one report estimating an additional $750,000 saved each year on medical evacuation costs.[6]

The teledermatology system provided by PATH allows patients from any location in Regional Health Command-Pacific's area of responsibility to access a dermatologist at TAMC without the need for travel, often with a response in just 18 hours.[5] A review of this platform showed that because up to 46% of referrals to the PATH teledermatology system are reviewed by in-house dermatologists, it can also streamline the process to obtain general dermatology consultations. Through the traditional referral system, patients can wait up to 29 days before being seen by a dermatologist.[7] The cost of travel and lodging for specialty care for active-duty service members and their families is estimated at $5,640 for a 10-day trip (compared to an estimated $2,730 for a 5-day trip for one nonmilitary patient). In light of these expenses, a teledermatology consult can save thousands, while still generating revenue in the form of relative value units for each encounter (estimated 2.51 relative value units for a teledermatology encounter at about $127/case).

Accuracy and reliability are critical to the value of teledermatology. It has been shown in other teledermatology platforms that a detailed patient history with appropriate photographs ensures the quality of consults remains on par with care received during face-to-face encounters.[6,8] Even from remote locations, proper consults through the PATH teledermatology system were noted to resolve clinical issues 89% of the time. Additionally, the majority of consults processed through PATH for dermatology issues were for initial evaluations, many of which were triaged and resolved without the need for further follow-on care with a dermatologist. This frees up the dermatologist to focus on more complex cases, while providing treatment for minor conditions via a telemedicine service.

Health Experts onLine at Portsmouth

Building off the PATH platform, the Navy developed a secondary telemedicine website in 2014 called the Health Experts onLine at Portsmouth (HELP). This system provides specialized expertise in an asynchronous store-and-forward format to primary care providers in the Middle East, eastern United States, Guantanamo Bay, and Europe, and on naval vessels deployed worldwide. Similar to PATH, this system uses a secure website with a standardized medical history form and an email notification process to notify consultants of pending cases. It also has the ability for referring providers to respond to comments and follow up with additional questions. Consultations are currently received and responded to in less than 6 hours, with 75% of the cases receiving a response in less than 1 day. From 2014 to 2015, 6.8% of all 585 cases were sent to the teledermatology service, the third most requested service behind psychiatry at 8.7% and orthopedics at 11%.[9]

A review of 585 cases from 2014 to 2015 demonstrated that HELP consultations saved $467,181 over 1 year by preventing 39 unnecessary patient evacuations and an estimated $105,400 by avoiding outpatient specialty in-person visits by local civilian providers when available. It was estimated that the projected 740 cases processed through HELP each year saved approximately $140,900 on medevacs and $28,260 for referrals to civilian providers. Eighteen consults resulted in evacuations that were not initially requested by referring providers, with over half of them from overseas treatment facilities.[9]

COMPARISON OF CIVILIAN AND MILITARY TELEDERMATOLOGY SYSTEMS

While the benefits of teledermatology are clear, each military platform is different and distinctions exist between these platforms and civilian teledermatology services. One key component to any successful teledermatology service is the ability to integrate with a patient's existing medical record. This allows referring providers and consultants to stay informed on the patient's disease, and helps keep communication lines open if any questions should arise. RHC-C, PATH, and HELP can be integrated into a patient's online medical record on the Armed Forces Health Longitudinal Technology Application (AHLTA). The AKO Teleconsultation Program, however, has anonymized data, making its incorporation into individual records impossible. A shared limitation for any system is the difficulty in providing direct feedback to consultants with information on the final diagnosis, disease course, and evacuation status. Deployed providers were responsible for updating consultations in patients' healthcare records. For example, while it was estimated that between June 2014 and December 2015 at least 50 evacuations were avoided based on recommendations from specialists via the HELP platform, the final disposition on whether evacuations were ultimately performed was not possible because the evacuation tracking system and electronic medical records are not integrated.[10] Because communication between providers is relatively simple with email and medical records, it is often concluded that if there are no further discussions about a case, then the consultant's recommendations were considered successful and an evacuation was not necessary.[1]

Reimbursement in civilian medical systems is a common concern for providers using telemedicine-based platforms and is under review by the federal government, state governments, and medical insurers. In 2011, military proponents of the teledermatology model wrote in favor of insurance coverage for teledermatology because the overall reduction in healthcare costs outweighed any concerns for over-utilization.[11] In 2004, the American Academy of Dermatology issued a position statement on the use of teledermatology and the need for patients in rural and underserved areas to be insured. This statement was revised in 2016 but maintains the need for insurers to cover patients for teledermatology services. While the Centers for Medicare & Medicaid Services does reimburse for live interactive telemedicine services, store-and-forward models, as of 2014, are only covered on a trial basis in Alaska and Hawaii. Some state Medicaid programs are beginning to cover asynchronous consults as long as the patient is in a qualifying underserved location where an in-person consult would be difficult. Most private insurers compensate providers on a case-by-case basis, if at all.[12]

Fortunately for military members, insurance coverage is not a concern. Active-duty service members, their family members, and retirees are covered by TRICARE, the federally funded health management system. Regardless of monetary compensation, assessing TRICARE's workload is still a concern because funding for medical facilities and staffing are based on patient volume. PATH and HELP allow the workload by specialists to be captured directly by the system; the RHC-C system does so indirectly. Unfortunately, capturing this workload is difficult when using an email-based model like the AKO Teleconsultation Program.[9]

The new Military Health System (MHS) electronic records system, Genesis, will soon replace systems used throughout MHS and is being rolled out to all Army, Air Force, and Navy facilities. A telehealth module was not part of the original contract awarded to the developer, so MHS personnel intend to build a telehealth module within MHS Genesis. The module is not expected to be released for several years; however, legacy systems will be used until then. The legacy programs will merge into the Global Telehealth Portal until the MHS Genesis telehealth module is formally launched, possibly around 2025.

One pitfall to teledermatology and any telehealth system is professional liability. The Feres Doctrine[13] protects military providers from medical liability regarding illness or injury to active-duty service members operating in the line of duty. For their civilian counterparts, however, liability with telemedicine consults can be a vexing concern. According to the American Academy of Dermatology's position statement on teledermatology,[12] medical professional liability for any consult originating in a provider's office, whether live or asynchronous, may be shared by the consultant and referring provider. Consultants are solely responsible for cases originating exclusively from a patient.[12] Furthermore, not all medical malpractice insurers cover telemedicine services, so even if a consultant is willing and able to engage in telemedicine, these services may not be covered by malpractice policies. This lack of coverage exposes consultants to undue financial liability.[12] Appropriate credentials and privileges are also a consideration for civilian providers, since care delivered across state lines may require additional licensing. Military providers are covered through MHS for the care they provide in this capacity, which reduces the malpractice burden as well as state and local requirements encountered by civilian providers.[13]

SUMMARY

Future applications of telemedicine and teledermatology models are expected to become more diversified as technology advances. With the reduction of medical evacuation and transportation costs to in-person care, increased access to specialists, integration with online medical records, and ease of use in austere and remote settings, telemedicine has become a standard mode of care for military providers at home and abroad. However, factors such as lack of provider training, legal and ethical risks, and reimbursements must be taken into account for the continued success of these systems. Despite these drawbacks, the rising number of consults placed to both military and civilian teledermatology platforms indicates that referring providers are satisfied with the results and will continue to utilize these systems for their patients.

The future of military medicine will continue to include a global telemedicine effort, since the limited number of specialty providers has made telemedicine, or "virtual health," an area of emphasis for MHS.[14] While the limited supply of specialists is often an impediment to patient access to specialty care, employing technological advances to provide remote "virtual" healthcare continues to gain ground in MHS.[15]

In summary, a virtual health model, or virtual medical center, uses telecommunications to provide consultations, education, imaging, and remote medical monitoring.[16] A variety of modalities are being developed to deliver these services, including email-based services, internet-based platforms, and telephones. To ensure the continued growth and success of telemedicine, the Army in December 2017 designated the Brooke Army Medical Center at Fort Sam Houston, Texas, as the home base for the virtual medical center.

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CHAPTER FOUR

Teledermatology Cases From US Military Commands

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INTRODUCTION TO CASES IN CHAPTERS

The geographic combatant commands have ongoing missions in designated regions. A command's area of responsibility can be geographic or functional depending on the prescribed mission. This flexibility gives the United States improved control over military forces in the region and more effective management of special operations and the transport of troops.

A region's area of responsibility can be diverse and extensive. Service members may be exposed to unique terrain, local flora and fauna, different types of foods, extreme weather, and austere living conditions. These factors can lead to illnesses and injuries—not typically experienced in the continental United States—becoming more prevalent and requiring referral to specialists for further management. Additionally, common diseases that impact the broader population may be exacerbated by the local environment or even become unmanageable depending on the availability of care in a region. In the past, patients who could not be managed locally may have required evacuation to larger medical treatment facilities for further care—costing time and money, and placing the local mission at risk. As described in Chapters 1 through 3, telemedicine can reduce these costs and prevent unnecessary evacuations by providing virtual healthcare to service members worldwide. This is particularly true in the specialty of dermatology, especially as technology continues to improve.

In the following chapters, each command will be discussed in detail with respect to unique factors affecting dermatologic care. Representative cases are included to demonstrate instructional sample cases from each region. Because further testing such as biopsies for histopathology is often not available, dermatologists often give the most likely diagnosis given the lack of information available. The US Central Command will be explored in depth because of the large number of dermatologic cases referred from this region in the past decade and the increased troop activity in deployed settings as compared to other commands.

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In the following chapters, each command will be discussed in detail with respect to unique factors affecting dermatologic care. Representative cases are included to demonstrate instructional sample cases from each region. Because further testing such as biopsies for histopathology is often not available, dermatologists often give the most likely diagnosis given the lack of information available.

CHAPTER FIVE

US Central Command

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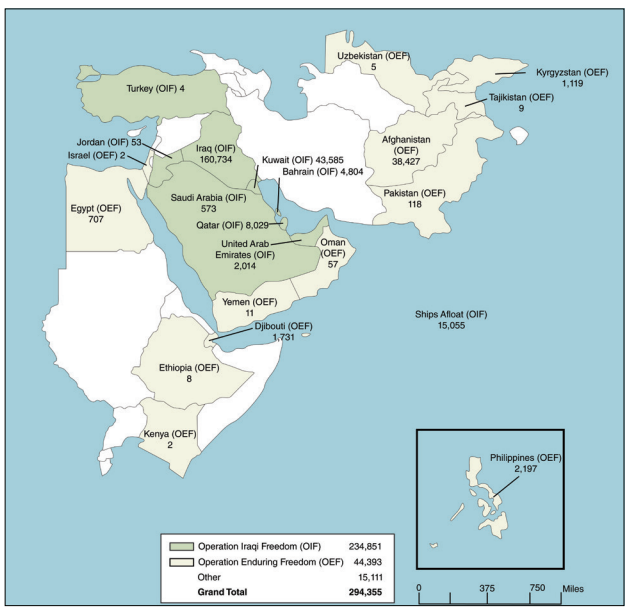


Figure 5-1. Deployed service members in December 2008 for Operation Iraqi Freedom and Operation Enduring Freedom.

Source: Defense Manpower Data Center, DRS 11280, Modified Location Country Report, December 2008.

INTRODUCTION

The US Central Command (CENTCOM) area of responsibility (AOR) includes 20 nations and stretches from northeast Africa across the Middle East to central and south Asia.[1] The Department of Defense has had a significant presence in this AOR over the past 2 decades (Table 5-1), especially with the ongoing operations in Iraq and Afghanistan as well as the numerous support personnel in Kuwait and Qatar.[1]

The climate and geography of CENTCOM's AOR can vary significantly. Afghanistan, for example, is a mountainous region with an average elevation of about 4,000 feet, with peaks extending up to 20,000 feet. Most of Afghanistan has a subarctic mountain climate with dry, cold winters; its lowlands have an arid and semiarid climate. However, the country has clearly defined seasons. Extremes are common, with temperatures as high as 120 °F during the summer and well below zero at elevations in the winter.[2]

Table 5-1. The Department of Defense's presence in the US Central Command area of responsibility (fiscal years 2002 to 2012)

				Percentage Change (service members)		
Fiscal Year	Afghanistan	Iraq	Total	Annual	FY03 to FY12	FY08 to FY12
2002	5,200	0	5,200	NA	NA	NA
2003	10,400	67,700	78,100	1402%	NA	NA
2004	15,200	130,600	145,800	87%	87%	NA
2005	19,100	143,800	162,900	12%	109%	NA
2006	20,400	141,100	161,500	-1%	107%	NA
2007	23,700	148,300	172,000	7%	120%	NA
2008	30,100	157,800	187,900	9%	141%	NA
2009	50,700	135,600	186,300	-1%	139%	-1%
2010	63,500	88,300	151,800	-19%	94%	-19%
2011	63,500	42,800	106,300	-30%	36%	-43%
2012	63,500	4,100	67,600	-36%	-14%	-64%

Troops in the US Central Command area of responsibility. Source: Table 1 from Belasco A (2009). Troop Levels in the Afghan and Iraq Wars, FY2001-FY2012: Cost and Other Potential Issues (CRS Report No. R40682). Accessed from Congressional Research Service website: https://fas.org/sgp/crs/natsec/R40682.pdf.

Table 5-2. The most common consultations for dermatologic problems during the Vietnam War, Persian Gulf War, peacekeeping operations in Bosnia-Herzegovina and East Timor, and Operation Iraqi Freedom combined.

Dermatologic Condition	Percentage (%)
Dermatologic, other	23.9
Warts	10.7
Fungal infection	10.4
Acne	9.0
Eczematous, other	7.2
Sexually transmitted disease	6.1
Bacterial infection	5.6
Benign neoplasm, other	5.1
Urticaria	2.3
Psoriasis	2.1
Contact dermatitis	2.1
Pigmented nevus	2.0
Viral infection, other	1.9
Atopic dermatitis	1.7
Actinic keratosis	1.6
Alopecia	1.4
Basal cell epithelioma	1.2
Seborrheic dermatitis	1.2
Dyshidrosis	1.2
Malignant neoplasm, other	0.9
Drug eruption	0.8
Pityriasis rosea	0.6
Lichen simplex chronicus	0.4
Parasitic disease	0.4
Collagen vascular disease	0.3

Prevalence of dermatologic diseases in modern military operations. Data source: Gelman AB, Norton SA, Valdes-Rodriguez R, Yosipovitch G. A review of skin conditions in modern warfare and peacekeeping operations. *Mil Med*. 2015;180(1):32–37.

Historically, dermatologic complaints make up about 20% of all medical encounters in deployed settings.[3] From April 2004 to December 2012—there was no active teleconsult service before this time—there were 4,379 specific dermatology teleconsult requests to the Army Knowledge Online (AKO) Teleconsultation Program for all US operations in the AOR. This represented approximately 40% of all teleconsults received in the US AOR. This large percentage is possibly due to dermatology being a highly visual field and the ease of transmitting photos for evaluation in contrast to other fields.[4]

Eighty-nine percent of these dermatology-specific consults originated from the CENTCOM AOR (Afghanistan, Iraq, Kuwait, Bahrain, etc). This is not surprising given the scale of operations and the large number of deployed personnel in this area during that time period (Figure 5-1). Other areas of this AOR, such as the United Arab Emirates, Egypt, Kyrgyzstan, and Jordan, had fewer consults correlating to the number of service members deployed in that location at the time. Iraqi consult numbers peaked in 2009 at the height of having "boots on the ground" and sharply declined with troop withdrawals starting in 2010.[4] Similarly, in Afghanistan, a peak in the number of consults was noted during 2010 and 2011 as more service members were deployed there (see Chapter 3, Table 3-1).[4]

A recent review of dermatologic complaints of deployed military personnel since World War II revealed that common issues in peacetime clinics are still common during deployments.[3] Warts, fungal infections, and acne top the list in most areas (Table 5-2).[3] The authors did note variations depending on the operational environment (eg, an increase in eczematous conditions in hotter and drier climates). Overall, a mix of dermatologic conditions and concerns could be expected at any dermatology or primary care clinic.

A similar variety of diagnoses was noted for the CENTCOM AOR from 2004 to 2014. Common conditions such as warts, acne, and fungal infections were well represented. It is important to keep in mind, however, that the numbers reported in this text represent only the cases where dermatology consults were requested; incidences of common dermatologic conditions were likely much higher. Consults were commonly requested when the deployed provider lacked experience with the condition, when the condition was atypical, or if there was an unexpected or poor response to treatment.

With an operational environment that included extremes in temperature, low humidity, high altitude, and various exposures, it is not surprising that eczematous dermatitis topped the list of diagnoses. The numerous diagnoses of lichen simplex chronicus speak to the chronicity of this skin condition, possibly due to the long deployments of recent years. Psoriasis, which was second for the number of cases in the CENTCOM AOR from 2004 to 2012, is often present or flares up in these types of environments.[3] Deployment tempo, limited facilities, and minimal availability of adequate therapeutics likely contributed to these conditions being common problems.

The frequency of arthropod assaults, in particular the transmission of cutaneous leishmaniasis through infected sand flies, was also not unexpected. Not apparent in the data, however, was the notable decrease in overall incidences of leishmaniasis over time as structured facilities and sanitation improved.[3] Other notable trends included the apparent increase in drug-related skin eruptions as compared to previous time frames. This can likely be attributed to the increase in oral medications used in the form of malaria prophylaxis, as well as the increased availability and variety of oral medications to treat bacterial and fungal infections. Nonmelanoma skin cancers and medical requests to rule out melanoma also increased in the CENTCOM AOR from 2004 to 2014. It is unclear if these increases are related to increased exposure of service members to ultraviolet radiation, improved provider training (ie, more awareness of skin cancer than in the past), or a combination of both.

In addition to chronic occurrences of common dermatologic conditions, many uncommon syndromes were also diagnosed in local populations that came under the care of military providers. Most of these conditions were at later or more severe stages than are seen in communities with greater access to healthcare. Examples of these conditions included xeroderma pigmentosum, lamellar ichthyosis, X-linked ichthyosis, Klippel-Trenaunay syndrome, and epidermolysis bullosa simplex.

The following pages provide examples of the variety and type of consults received from the CENTCOM AOR from 2004 to 2014, with additional discussions where indicated.

ARTHROPOD-BORNE DISEASE

Arthropod-borne disease has had a significant impact on military operations throughout history. Although major advances have been made in understanding the etiology and prevention of the disease, the condition remains commonplace on today's modern battlefield. It is particularly common in warmer climates and is often more prevalent early in a military conflict before a significant infrastructure can be established. The majority of cases are nonspecific and diagnoses are made by looking at the environment and associated symptoms, and by examining the onset, distribution, and duration of the lesions.

Some of the most commonly requested consults coming from the CENTCOM AOR were in the arthropod-borne disease category and involved general arthropods (likely mosquitoes), scabies, and blister beetles. Leishmaniasis, which is transmitted by the bite of the sand fly and is endemic to much of this AOR, was also a common consult for both active-duty military members and local populations. Active-duty members are often mildly symptomatic with slow healing lesions on the exposed skin of the dorsal hand or lower extremity. More chronic forms of the disease were noted in members of the local population.

BLISTER BEETLE DERMATITIS



CUTANEOUS LEISHMANIASIS



Scabies deserves special mention since it is common to both deployed and nondeployed personnel. Infestations can cause significant morbidity because of the symptoms and can spread quickly in berthing areas, especially in close living quarters.

The blister beetle, also known as the Spanish fly, was reported as the causative agent in several significant blistering reactions in service members in the region. These beetles, from the family *Meloidae,* secrete a defensive blistering agent known as cantharidin that causes vesicles and bullae on human skin, with varying amounts of surrounding inflammation.

SAND FLY BITES





SCABIES













OTHER INFECTIONS

As with arthropod-borne disease, superficial cutaneous infections have been historically common in both deployed and nondeployed units. Infectious conditions such as warts and various presentations of tinea consistently top the list of reasons why service members seek care.[3] Viral infections were also well represented in consults, with the most common being suspected herpes simplex virus, followed by the varicella zoster virus and molluscum contagiosum. Various forms of viral exanthems were also frequently consulted, including cases of erythema multiforme suspected to be secondary to chronic infection with the herpes simplex virus.

A common entity known as pityriasis rosea is also represented in this category because the inciting factor may be human herpesvirus 6 or 7 infections; drug-induced pityriasis rosea is also common in the adult population. Bacterial infections occurred in many forms and included primary impetigo and furunculosis. However, they occurred more often with other primary processes, such as arthropod assaults that had become secondarily impetiginized or developed evidence of a cellulitic process. Multiple cases of pitted keratolysis along with fungal infections are related to issues of exposure and hygiene facing service members.

As previously mentioned, it was not uncommon for military providers to evaluate more chronic or extensive cases in the local population. For example, multiple cases of suspected deep fungal infections were noted (confirmation was not attained as further testing for local civilians was unavailable). Most military providers are fairly familiar with cutaneous presentations of infectious disease, so most consultants were seeking a second opinion, assistance with an atypical presentation, or treatment recommendations. However, there are many cases in which experience likely plays a factor, especially for entities like anthrax, which is rarely seen at duty stations in the continental United States.

CUTANEOUS ANTHRAX





CHROMOBLASTOMYCOSIS





CONDYLOMA ACUMINATUM





HERPES SIMPLEX











ERYTHEMA MULTIFORME

















HYDROA VACCINIFORME





EROSIO INTERDIGITALIS BLASTOMYCETICA



UNILATERAL LATEROTHORACIC EXANTHEM



MOLLUSCUM CONTAGIOSUM


1a


1b

PITYRIASIS ROSEA


1a


1b

TINEA INFECTION

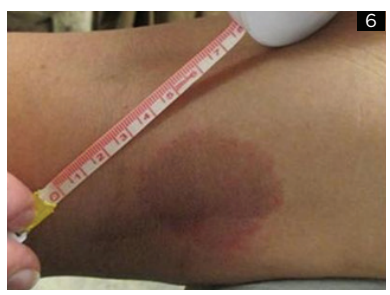

1


2

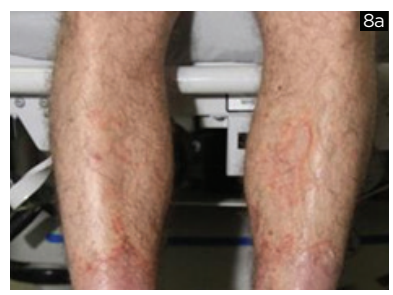

3


4


5


6


7


8a


8b


9


10


11


12a


12b


13


14

TINEA VERSICOLOR


15a


15b


1a


1b

PITTED KERATOLYSIS



VIRAL EXANTHEM



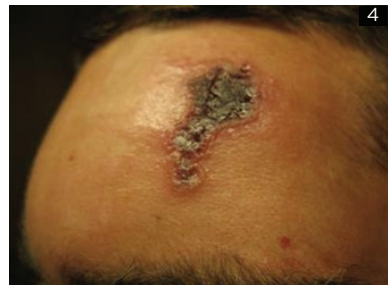


HERPES ZOSTER









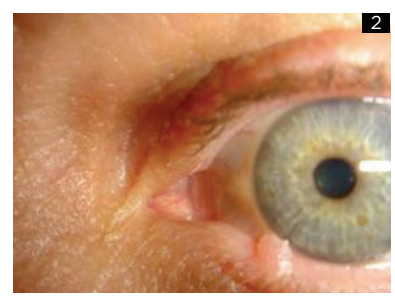


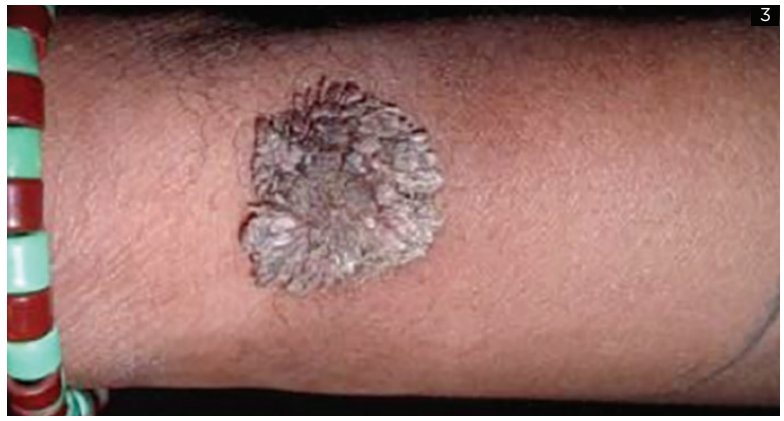




VERRUCA











NEOPLASMS

In reviewing common categories of skin diseases by military conflict (since World War II), neoplasms were not in the top five until the last decade.[3] It is unclear if this represents a true increase in incidences of skin neoplasms or more awareness of skin cancer by general practitioners—perhaps both. Overall, skin cancer awareness has increased, most notably over the last couple of decades. The importance of early skin cancer diagnoses is now more widely appreciated and could explain the increased numbers of dermatologic visits by both deployed and nondeployed personnel.

Nonmelanoma skin cancers, primarily represented by basal cell carcinomas and squamous cell carcinomas, are common in the general population and generate dermatologic referrals through teledermatology services and through traditional clinical referrals. For teledermatologists, photographs can help highlight malignancy features versus features associated with benign neoplasms. Malignancy features often lead to biopsy recommendations, which may require patients to evacuate depending on the site's capabilities, the type of cancer suspected, and the location of the lesion. Local populations often experience more extensive diseases given their restricted access to specialized medical care. Chronic infections appearing as large ulcerated fungating plaques are often the key differentials in these cases.

Atypical pigmented lesions that raise melanoma concerns are common teledermatology consults given the potential morbidity and mortality associated with melanoma diagnosed in later stages. For deployed service members, a teledermatology consult could be the difference between effective monitoring and regular skin checks versus evacuation for surgical excision. Cases that represent possible melanoma referrals are illustrated in this chapter.

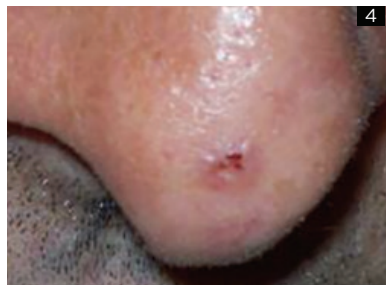
Additional cases represent benign neoplasms commonly seen in dermatology outpatient clinics as syringomas, benign nevi, seborrheic keratosis, cysts, and sebaceous hyperplasia.

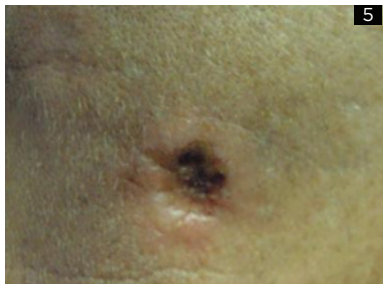
BASAL CELL CARCINOMA


1


2


3

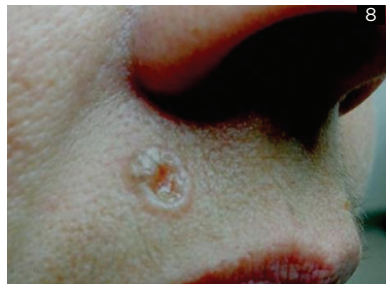

4


5



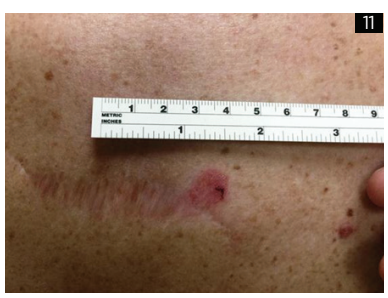
6


7


8


9


10


11


12

EPIDERMAL INCLUSION CYST


1a


1b

FIBROMA

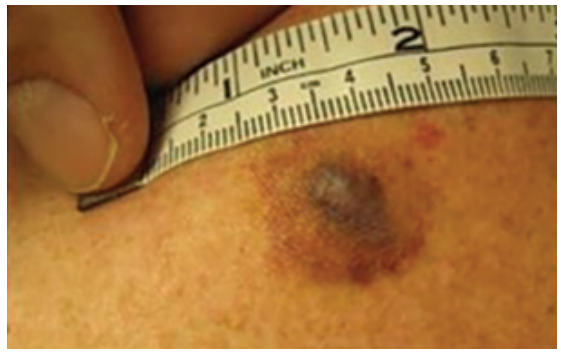

1a


1b

FIBROUS PAPULE



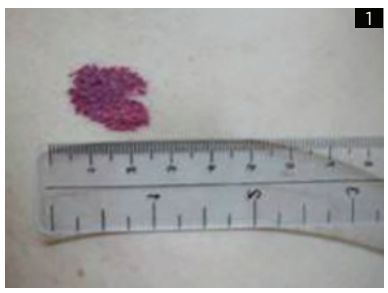
TARGETOID HEMOSIDEROTIC HEMANGIOMA



HYPERTROPHIC SCAR



HEMANGIOMA









KELOID















MELANOMA

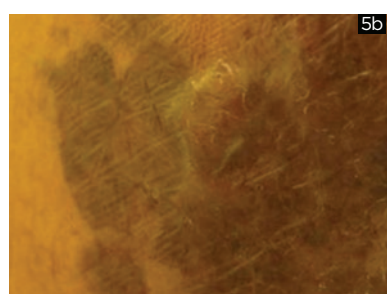














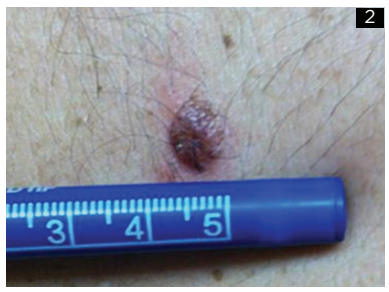
UNKNOWN NEOPLASM

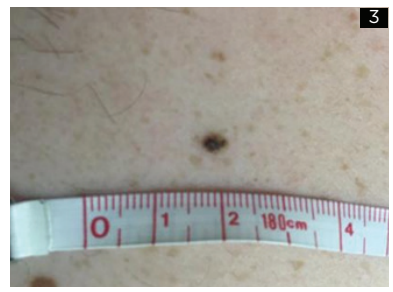




MELANOCYTIC NEVUS





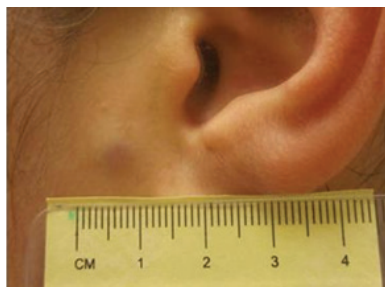




NEUROFIBROMATOSIS



PILOMATRIXOMA



PSEUDOCYST OF THE AURICLE



PYODERMA GANGRENOSUM



PYOGENIC GRANULOMA











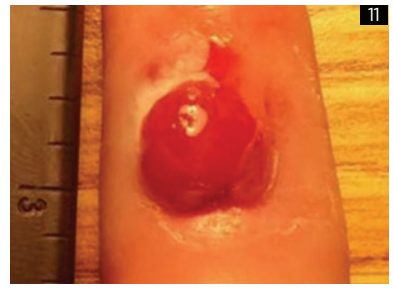










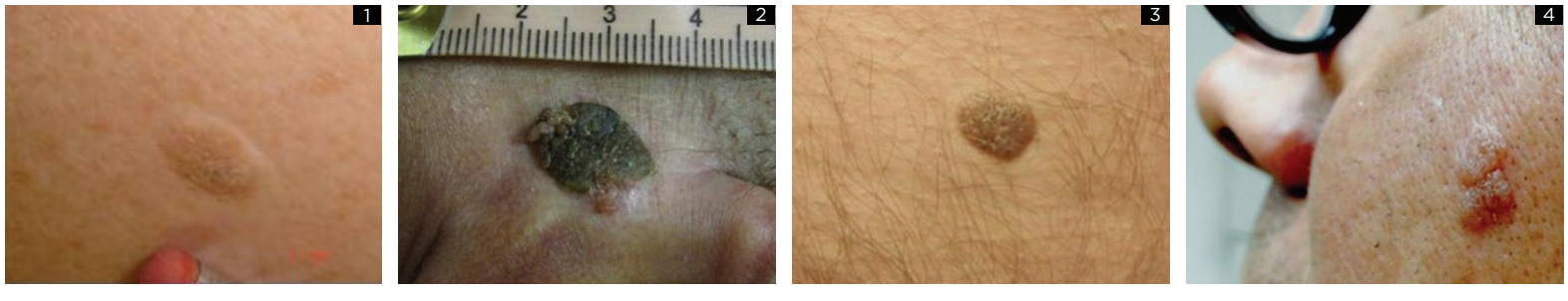




SQUAMOUS CELL CARCINOMA



SEBORRHEIC KERATOSIS



SEBACEOUS HYPERPLASIA



SYRINGOMA



VELLUS HAIR CYSTS



ACNE AND ROSACEA

Acne and rosacea represent two common inflammatory follicular conditions seen in almost all populations. From 2004 to 2014, exacerbations of rosacea were noted in deployed service members, possibly due to increased stress, exposure to ultraviolet radiation, medications, and various skin irritants—all known triggers of rosacea. Commonplace acne and its management are not represented in this section. However, it is important to note that many oral and topical acne medications (topical and oral retinoids, tetracyclines, benzoyl peroxide, etc) cause increased sun sensitivity that in deployed settings such as CENTCOM can lead to photo-related dermatitis and even burns.

ROSACEA



MISCELLANEOUS

The following cases were either small in number or did not fit nicely in one of the previous categories. However, these cases are good examples of how a simple picture can be invaluable to diagnosing entities that are common to dermatology clinics but perplexing to unfamiliar providers.

ACROKERATOELASTOIDOSIS

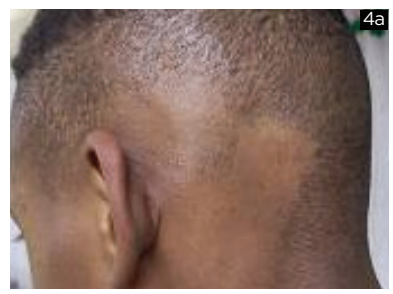


ALOPECIA AREATA

























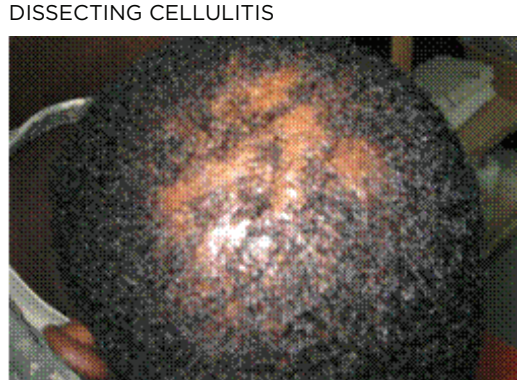
CENTRAL CENTRIFUGAL CICATRICIAL ALOPECIA



DIABETIC FOOT ULCER



DISSECTING CELLULITIS



IDIOPATHIC GUTTATE HYPOMELANOSIS



GRANULOMA ANNULARE





LICHEN STRIATUS

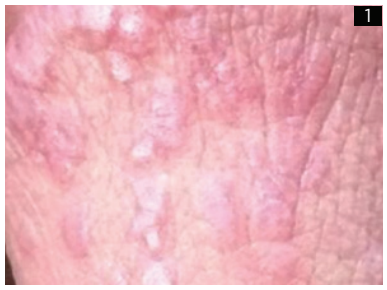








LICHEN PLANUS


1


2


3a


3b


4a


4b


5


6a


6b


7


8a


8b


9


10a


10b


11


12a


12b


13


14a


14b


15a


15b


16


17


18a


18b


19

MORPHEA


1a


1b


2a


2b


3


4a


4b

PITYRIASIS LICHENOIDES CHRONICA


1a


1b


1c


2

DIGITAL MYXOID CYST



PIGMENTED PURPURIC DERMATOSIS



PITYRIASIS RUBRA PILARIS


1a


1b

PUNCTATE PALMOPLANTAR KERATODERMA



AUTOIMMUNE CONDITIONS

It is estimated that approximately 3 to 5% of the US population is affected by some type of autoimmune disease. Genetic and environmental components are established factors when determining causes for most autoimmune diseases. In systemic lupus erythematosus, for example, multiple genetic factors are believed to interact with environmental factors (eg, sun exposure, infection) to initiate or worsen an already ongoing disease process. Some predisposed individuals may experience autoimmune disease symptoms given the environmental and psychological stressors associated with deployment. In addition, skin symptoms can often be nonspecific, chronic, and difficult to treat, prompting deployed providers to seek consultation. As stated in previous sections, patients in the local population often have more extensive and chronic diseases.

CHRONIC BULLOUS DISEASE OF CHILDHOOD









CUTANEOUS CALCINOSIS





AURICULAR CHONDRITIS





DESQUAMATION





DERMATOMYOSITIS





DISCOID LUPUS ERYTHEMATOSUS







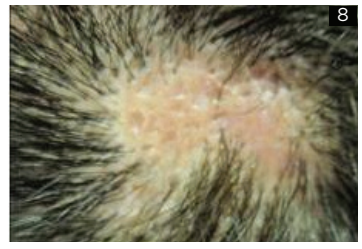












CUTANEOUS LUPUS ERYTHEMATOSUS


1a


1b


2a


2b


3a


3b

PEMPHIGUS FOLIACEUS


1a


1b

PEMPHIGUS VULGARIS

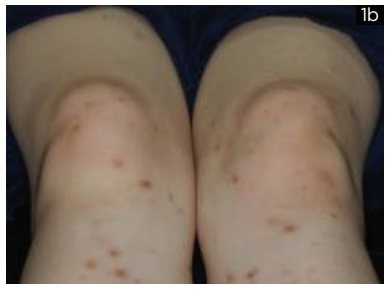

1a


1b

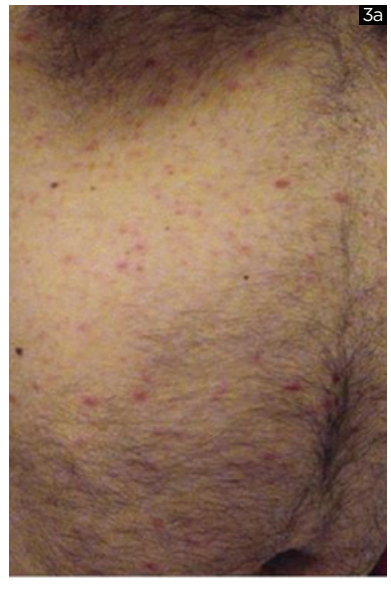

1c

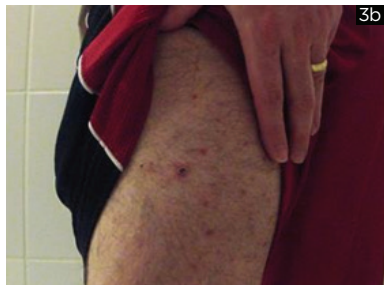
PITYRIASIS LICHENOIDES ET VARIOLIFORMIS ACUTA (PLEVA)


1a


1b


2


3a


3b


4a


4b

VITILIGO


1


2


3a


3b

GENETIC CONDITIONS

Often there is a distinct difference between deployed and standard stateside medical practices. As seen in previous sections, patients in the local population often have more chronic or extensive diseases because of limitations in available healthcare. Genodermatologic syndromes shown in this chapter demonstrate this disparity in healthcare. Many of these local patients were never diagnosed or properly treated for their condition, leading to the striking presentations seen in the photographs.

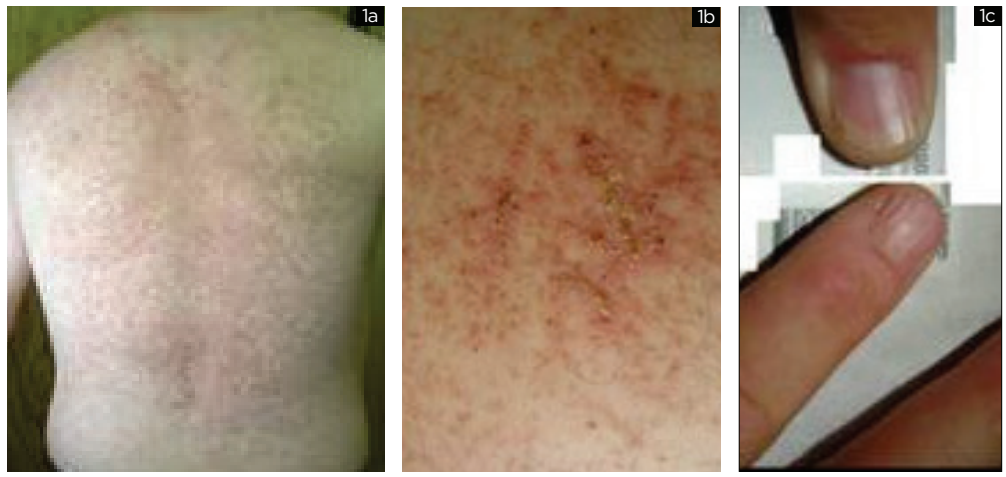
Genetic skin conditions exacerbated by low humidity, heat, and excessive sun exposure are all part of CENTCOM's local environment. Without preventative measures normally instituted for children and adults with these conditions, clinical treatments can be in stark contrast to the typical picture seen in dermatology and pediatric clinics in the United States. Children in this environment can experience xeroderma pigmentosum, congenital ichthyosis, epidermolysis bullosa, and porphyria, in addition to examples of congenital syndromes with tumor growths or vascular malformations, keratodermas, premature aging syndrome, and congenital malformations.

While aiding those in need can be greatly rewarding, it can also be frustrating when all that can be provided is a suggested diagnosis and maybe some symptomatic or supportive care. However, in some cases, a higher level of care can be arranged.

GIANT CONGENITAL MELANOCYTIC NEVUS



DARIER DISEASE



DYSTROPHIC EPIDERMOLYSIS BULLOSA



EPIDERMOLYSIS BULLOSA


1a


1b


1c


2a


2b


3


4a



4b


5a


5b

KLIPPEL-TRENAUNAY SYNDROME



MAFFUCCI SYNDROME


1a


1b


1c

HYPERTRICHOSIS (FAUN-TAIL NEVUS)



PROTEUS SYNDROME


1a


1b

SYSTEMIC SCLEROSIS


1a



1b

CONGENITAL ICHTHYOSIS


1


2


3


4


5a

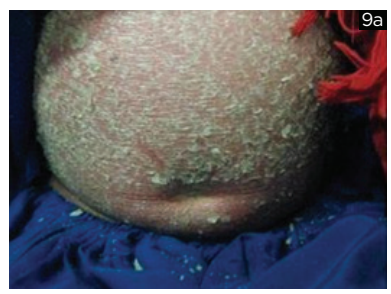

5b


6a


6b


7


8


9a


9b

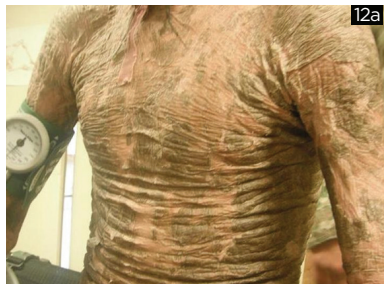

9c


10a


10b


10c


11


12a


12b


13


14


15a


15b


16

CUTANEOUS PORPHYRIA


1


2a


2b


3a


3b


4a


3c


5


4b


6

STEATOCYSTOMA MULTIPLEX



XERODERMA PIGMENTOSUM


1a


1b


2

PSORIASIS

Other than eczematous dermatitis, psoriasis was the most common suspected skin condition consulted during the 2004 to 2012 time period. Flares can occur rapidly and are sometimes widespread, which can be somewhat alarming to patients and providers unfamiliar with the condition. Service members in the CENTCOM AOR are exposed daily to stress and dry arid conditions, which are precipitating factors for flares. Sun exposure, while beneficial for psoriasis when used properly, can cause koebnerization in sunburned areas of the skin if patients are exposed to levels of ultraviolet radiation outside the recommended therapeutic range (typically, 15 minutes of natural sunlight three times weekly).

Fungal or other infectious etiologies are often suspected before psoriasis, and therefore consulted patients often fail a course of targeted therapy prior to a dermatology referral. If psoriasis is recognized, inadequate treatments (ie, low-potency steroids) are often the problem rather than recalcitrant disease, so proper education for primary care providers on psoriasis therapy is key to managing these cases. However, patients with psoriasis over large body surface areas (usually greater than 10%) or who have decreased quality of life because of morbidity associated with their psoriasis (involvement of hands or feet, pustular psoriasis, psoriatic arthritis) often require systemic medications not approved for use in deployed settings. In these cases, an evaluation by a teledermatologist can be vital to the patient's health and continued mission success.

GUTTATE PSORIASIS










INVERSE PSORIASIS





PSORIASIS WITH POST-INFLAMMATORY VITILIGO




PUSTULAR PSORIASIS



PSORIASIS


1a


1b


1c


2


3a


3b


4a


4b


4c


5a


5b


5c


6a


6b


7a


7b

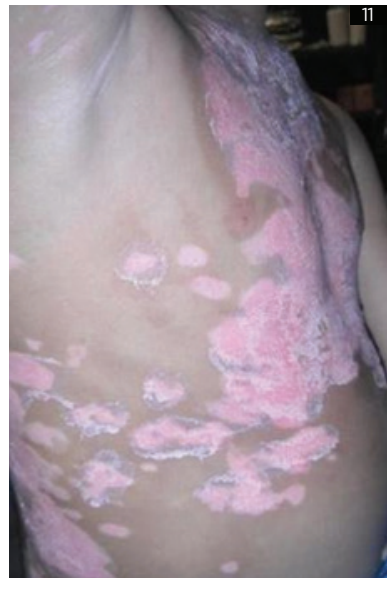

7c


8


9


10a


10b

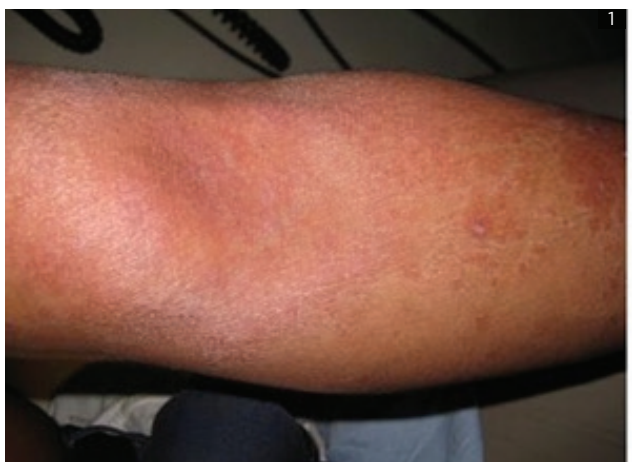

11

ECZEMATOUS DERMATITIS

Eczematous dermatitis was by far the most consulted skin category from April 2004 to December 2014, approximately five times more than any other category or diagnosis. This is not surprising given the mostly dry climate and temperature extremes seen in the common operational areas of deployment. In a 2015 review article, *A review of skin conditions in modern warfare and peacekeeping operations*,[3] a similar distribution of eczematous dermatitis in arid climates was noted during the Persian Gulf War and Operation Joint Endeavor in Bosnia-Herzegovina, with much lower incidences reported in more humid climates during the Vietnam War.[3] The increased number of consults could also be attributed to the difficult task of establishing the etiology of an itchy "rash," since eczematous dermatitis is often nonspecific in appearance. Even to a trained teledermatologist, a specific diagnosis cannot be offered from history and photographs alone, especially when an associated trigger or exposure is not grossly obvious.

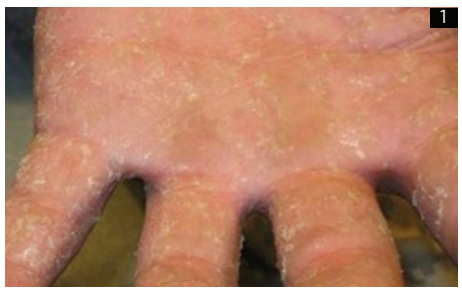
Military personnel are consistently exposed to a wide assortment of precipitating or exacerbating factors for eczematous dermatitis. High temperatures, low humidity, and rough terrain (common in CENTCOM) are frequent aggravating factors for many patients because they can lead to repeated wet/dry cycles in perspiration-soaked boots or clothing. Many service members also have daily contact with oils, greases, and solvents, which can lead to allergic dermatitis or may exacerbate patients with a previous history of atopic dermatitis. A special consideration for military personnel is the presence of allergic contact dermatitis from protective clothing or boots, particularly when distribution of the rash supports a contact allergy (such as dermatitis of the dorsal feet sparing web spaces indicating boot dermatitis, or axilla sparing the vault indicating clothing dermatitis). In these instances, it is important to remove inciting or aggravating factors when identified, maintain proper hygiene, apply topical steroids and moisturizers, and treat for secondary infections when suspected. Additional recommendations depend on the patient's response to therapy and site capabilities. Providers may also recommend potassium hydroxide for funguses or a biopsy if able.

ATOPIC DERMATITIS





DYSHIDROTIC ECZEMA

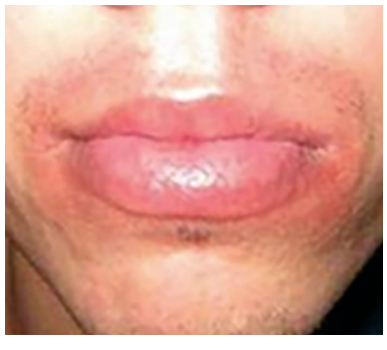




KERATOSIS PILARIS



LIP-LICKER'S DERMATITIS



SEBORRHEIC DERMATITIS







CONTACT DERMATITIS


1


2a


2b


2c


3a


3b


4

5a


5b


6a


6b


7


8a


8b


8c


9


10

DRUG REACTIONS

Suspected drug reactions have occurred more often in recent military conflicts than reported in the past. This is not surprising given the significant increase in the number of medications to treat most ailments and the increased availability of these medications over the counter and by prescription. The most frequently prescribed medications in theater are antibiotics and analgesics, which are two categories that contain medications widely recognized for potential adverse skin reactions. Drug reactions typically occur within 1 to 2 weeks of starting a drug; however, they may occur after 6 to 8 weeks in cases of drug reaction eosinophilia and systemic symptoms or drug-induced hypersensitivity syndrome. Drug reactions such as lichenoid drug eruptions may occur months to years after the drug is initiated.

The vast majority of personnel stationed in the CENTCOM AOR are required to take daily doxycycline for malaria prophylaxis. Doxycycline is a well-known photosensitizer and was the suspected culprit, or at least on the differential of many patients, for nonspecific diffuse morbilliform rash. Fixed drug eruptions were also common in differentials with antibiotics or nonsteroidal anti-inflammatory drugs as the most suspected culprits. Erythema multiforme (presented in the infectious disease category) is a common drug eruption, although this pattern is most often seen with herpes simplex virus infections. More serious reactions such as Stevens-Johnson syndrome or toxic epidermal necrolysis are not represented as cases for examples of drug reactions and were likely not referred for teledermatology consults given their acute and life-threatening nature.

In all cases of suspected drug eruptions, discontinuation of the offending agent is vital and supportive care may be required for resolving reactions.

DRUG ERUPTION























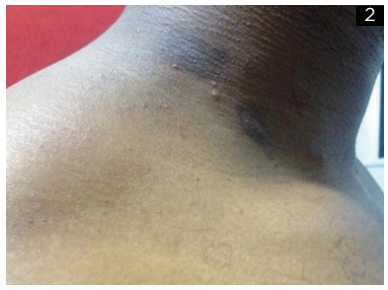
LICHENOID DRUG REACTION





FIXED DRUG ERUPTION


1


2

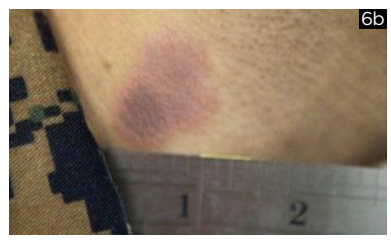

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3b


4


5


6a


6b

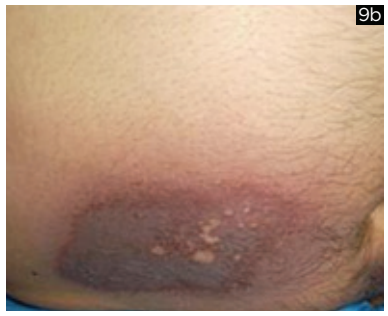

7a


7b


8a


8b


9a


9b


9c


9d

PSEUDOPORPHYRIA CUTANEA TARDA


1a


1b


1c


2a


2b

MORBILLIFORM DRUG REACTION


1a


1b


1c


3

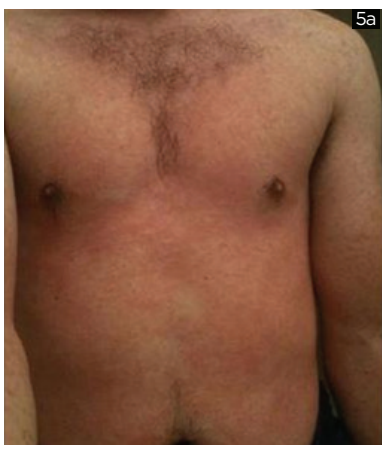

2


4a


4b


4c


4d


5a


5b

PETECHIAL DRUG REACTION


1a


1b


2

STEROID-INDUCED HYPOPIGMENTATION



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1. Area of Responsibility. US Central Command website. https://www.centcom.mil/area-of-responsibility. Accessed April 24, 2017.
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CHAPTER SIX

US Pacific Command

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INTRODUCTION

The US Pacific Command (PACOM) covers a vast area, spanning over 36 nations.[1] Its territory of responsibility is formed by a western border comprised of Mongolia, China, India, and the Indian Ocean. The northern and eastern borders are bound by the Pacific Ocean, while the southern border extends to Antartica.[1] The area's size and diversity present unique challenges since it is home to half of the world's population, with over 3,000 languages spoken by its inhabitants.[1]

PACOM has a presence in the Indo-Asia Pacific Region so the United States can protect and defend its territories and interests.[1] More than 380,000 US military and civilian personnel are assigned to PACOM, including the Navy's Pacific Fleet with over 200 ships and approximately 1,100 aircraft. The PACOM force includes more than 140,000 sailors, 86,000 Marines, and 46,000 airmen.[1]

HISTORICAL PATTERNS

The US military first established a presence in the Pacific theater during World War II. The Pacific theater was divided into the southwest Pacific area under the command of General Douglas MacArthur and the Pacific Ocean area under Admiral Chester Nimitz.[1] Reports from 1942 to 1945, when troop activity was heaviest in the region, show that 5% of admissions to field hospitals were for dermatologic conditions, primarily fungal infections (including chromomycosis and phaeohyphomycosis) and acneiform rashes.[2] Similar patterns of dermatologic disease occurred during the Vietnam and Korean wars, with infections being the top reason for hospitalization, followed by exacerbation of previously existing eczematous dermatitis and acne.[3] Exposure to organochlorines such as Agent Orange during the Vietnam War also accounted for chemical-related skin injuries; however, the long-term side effects of this compound, such as soft tissue sarcomas and other skin malignancies, were not reported until decades later.[4]

DERMATOLOGY CASES

PACOM represents 0.18% of all dermatologic cases referred (88 in total) from 2004 to 2014. The selected cases represent the range of dermatologic cases received from this region, from classic infantile atopic dermatitis to atypical mycobacterial infections. A majority of these cases were congenital pediatric conditions as well as common inflammatory dermatoses. For congenital disorders, recommendations were sought from various specialties, including dermatology for further work ups. This often required multidisciplinary involvement in order to fully evaluate the patient. For example, providers referred a child with a large port wine stain discoloration because of concerns about Sturge-Weber syndrome (a neurocutaneous syndrome associated with seizures and glaucoma), while another born with a giant midline congenital nevus was referred for a possible magnetic resonance imaging scan for spinal melanosis. More common entities like allergic contact dermatitis, infantile atopic dermatitis, infantile

TOPICAL IMIQUIMOD REACTION



BULLOUS ARTHROPOD BITE





BURULI ULCER





CONTACT DERMATITIS



DERMATOMYOSITIS



TOPICAL FLUOROURACIL REACTION





ATOPIC DERMATITIS







GIANT CONGENITAL MELANOCYTIC NEVUS


1a


1b


1c


1d

GUTTATE PSORIASIS


1a


1b

PHOTOALLERGIC REACTION


1a


1b

INFANTILE HEMANGIOMA


1c

GUTTATE PSORIASIS





SCABIES





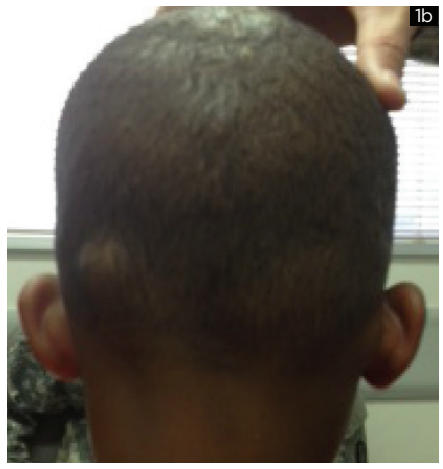
SILICONE IMPLANT REACTION





TINEA CAPITIS





hemangiomas, and psoriasis were also represented. Referrals for cutaneous reactions to topical chemotherapy agents were also notable for this region. In these instances, primary care providers sought reassurances for normal expected side effects since they were unfamiliar with the use of these medications.

Additional cases are included that highlight specific dermatologic skin considerations based on the deployed location. A local child infected with *Mycobacterium ulcerans* (endemic to Africa, South America, and the western Pacific—Papua New Guinea in this case)[5] highlights the destructive, scarring ulcerations formed by this organism. Additionally, a case of cutaneous granulomas secondary to cosmetic injection of silicone common to Japan display the dangers of this practice.

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CHAPTER SEVEN

US European Command

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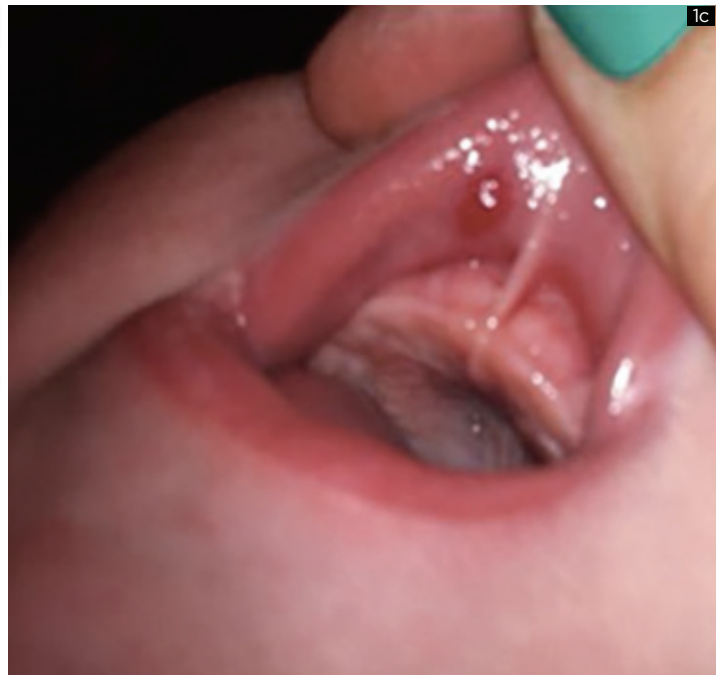
INTRODUCTION

Headquartered in Stuttgart, Germany, the primary mission of the US European Command (EUCOM) is to deter transnational threats, ensure force readiness, maintain and build strategic allies, and support NATO relationships. EUCOM directs the operations of more than 100,000 military and civilian personnel across 10.7 million square miles of land and 33.6 million square miles of sea. EUCOM currently has approximately 62,000 active-duty US military personnel. The Air Force comprises the bulk of these numbers with more than 28,000 service members in the region. The Army has slightly fewer on the ground with approximately 25,000, followed by the Navy and Marines with approximately 8,500 service members in total.[1] The US military has an ongoing presence in Central and Eastern Europe for Operation Atlantic Resolve to support allies in the region and to respond to Russia's actions in the Ukraine.[1]

INFANTILE HEMANGIOMA


1a


1b


1c

MELANOMA


1a


1b

DERMATOLOGIC CASES

Dermatologic cases referred from EUCOM are similar to those seen in the United States, since both areas have comparable climates, living conditions, and occupational exposures. EUCOM represented 0.7% of all dermatologic cases (about 5,000 in total) referred to the Army Knowledge Online Teleconsultation Program from 2004 to 2014. The majority of cases were inflammatory dermatoses such as acne, seborrheic dermatitis, eczema, folliculitis, and autoimmune dermatoses. Neoplasms occurred less frequently; no genetic consults were placed. Bosnia-Herzegovina placed the most consults, followed by Germany, the United Kingdom, and Italy. Two consults were placed from Albania.

Highlighted cases were selected for discussion to emphasize the multidisciplinary care required in more extensive cutaneous disease. One case of multiple infantile hemangiomas with a concern for internal involvement is presented, in addition to a patient with a newly diagnosed melanoma who required evacuation to a nearby medical treatment facility for a wide local excision and further work ups. More common cases such as acne and seborrheic dermatitis are not discussed here.

Reference

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CHAPTER EIGHT

US Southern Command

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INTRODUCTION

The main mission of the US Southern Command (SOUTHCOM) is to provide security operations for Central and South America, the Caribbean, and surrounding waters. It is also responsible for the defense of the Panama Canal. SOUTHCOM, which is headquartered in Doral, Florida, is a joint command with over 1,200 military and civilian personnel.[1] The US military has maintained a presence in the region since the early 1900s with the construction of the Panama Canal and remains a force for ongoing operations in the region.[1]

SOUTHCOM's services and operations impact the following component commands and units: US Army South; Air Forces Southern; the US Naval Forces Southern Command and US Fourth Fleet; US Marine Corps Forces, South; US Special Operations Command South; Joint Task Force-Bravo; Joint Task Force Guantanamo; and Joint Interagency Task Force South.[1]

CONTACT DERMATITIS



MORBILLIFORM DRUG REACTION





TOE WEB INFECTION













VARYING CONDITIONS

Environmental conditions vary drastically for this region. Its range extends from the heat and humidity in Central America to the cold peaks of the Andes Mountains in South America. The Andes are the longest continental mountain range in the world and begin in the rainforests of Venezuela and end at the glaciers of Chile.[1] Given SOUTHCOM's area of responsibility, it is understandable that flares of cutaneous diseases such as atopic dermatitis, contact dermatitis, and fungal infections of the feet occur in its hot and humid environments. Infections include several cases of gram-negative toe web infection, a common secondary infection typically involving pseudomonas seen in chronic untreated or severe tinea pedis.

Additionally, a case of a possible chloroquine induced photosensitive or photoallergic drug eruption is included, since drug reactions to antimalarial medications are common (in this case to chloroquine) in deployed settings. However, these reactions are becoming less common as the standard of care for antimalarial prophylaxis continues to improve.

Reference

1. US Southern Command. https://www.southcom.mil. Accessed April 24, 2017.

CHAPTER NINE

US Africa Command

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INTRODUCTION

The US Africa Command (AFRICOM), headquartered in Stuttgart, Germany, is a recent addition to the Unified Command Plan. AFRICOM was established in 2007 as a separate entity from the US European Command, US Central Command, and US Pacific Command to provide counterterrorism support in the African region and Middle East. AFRICOM has additional units in England, Florida, and at various US embassies. The command supports US foreign policy by providing military assistance and support programs to build stronger and more secure African nations. Approximately 1,500 to 2,000 service members, civilians, contractors, and host nation employees are assigned to AFRICOM.[1]

REGIONAL CONCERNS

Africa contains 16% of the world's population and encompasses 6% of the earth's land mass.[1] Tropical rainforests and subarctic mountain ranges are found in this region, but most of the continent is composed of hot, arid desert (in fact, Africa is the hottest continent on Earth).[1] As seen in other regions, patients with common conditions such as warts, psoriasis, contact dermatitis, and bug bites were referred for evaluation and treatment plans, as were cases of allergic contact dermatitis that developed from the wearing of combat boots and was exacerbated by the hot environment. A patient with a case of psoriasis was also referred to teledermatology because of the large body surface area involved. Typically, light therapy or systemic treatments are used when psoriasis covers more than 10% of the body surface area. However, for deployed personnel without access to light therapy boxes, refrigerators for

BULLOUS IMPETIGO


1a


1b

BURULI ULCER



CONDYLOMA ACUMINATUM



CONGENITAL ICHTHYOSIS


1a


1b


1c


1d


2a


2b

DRUG ERUPTION







IMPETIGO





TINEA FACIEI



PSORIASIS





HERPES ZOSTER





YELLOW NAIL SYNDROME


1a


1b

biologic medication storage, or labs for monitoring medication side effects, topical medications are the preferred therapy, despite being less effective. As expected in the AFRICOM region, arthropod assaults were common, and cases with more dramatic presentations or that were atypical in appearance are illustrated.

VARIOUS INFECTIONS

Infections, especially in the local population, were often referred for further care. These cases included superficial bacterial infections such as impetigo and cellulitis, in addition to a case of Buruli ulcer disease secondary to infection with *Mycobacterium ulcerans*. Most Buruli ulcer cases reported to the World Health Organization come from Africa, with most of those coming from western and central Africa.[2] In the last several years, Australia has noted an increase in cases as well.[3]

Other common infections, such as primary varicella in a local child (not commonly seen in the United States because of current vaccine guidelines), extensive tinea faciei, and nail infections due to pseudomonas, are summarized. A case of erythema multiforme that is likely secondary to a herpes simplex infection is included. Clinical managers primarily play supportive roles in these cases by administering antiviral prophylaxis if the rash becomes recurrent. Fewer cases of drug-related erythema multiforme are reported in medical journals in general. However, it is important (especially in deployed patients) to monitor for severe drug reactions such as Stevens-Johnson syndrome or toxic epidermal necrosis, since these life-threatening conditions can cause mild mucosal involvement in the early stages and be similar in appearance to erythema multiforme.

The most visually dramatic cases from AFRICOM were the referrals for two children with congenital lamellar ichthyosis. One child was referred for contracture deformities, growth retardation, ectropion, and eclabion with involvement of the cornea. Oral retinoids can be used, but with minimal access to medical care, monitoring a simple regimen of moisturization and topical keratolytics showed impressive results after only a few weeks. The second child was also referred with a similar presentation and recommendation for care. Ophthalmologic input was particularly critical for this case since the patient had severe ectropion at 10 days old.

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3. US Pacific Command. https://www.pacom.mil/. Accessed April 24, 2017.

CHAPTER TEN

Shipboard Consults

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For naval physicians at sea, medical care capabilities are often limited. Unless on board one of the US Navy's hospital ships, such as the *USNS Mercy* or *USNS Comfort*, it is likely that prescription medications, labs, imaging, and equipment for procedures are not easily available. Staffing is also limited and is often restricted to a few (or one) general medical officers and corpsmen, with possibly a surgeon and an anesthesiologist on board as well. Given these conditions, specialty consults via telemedicine platforms become vital for these physicians—just as

ALOPECIA AREATA



DARIER DISEASE



LICHEN PLANUS





NEUROTIC EXCORIATIONS







it was for their predecessors, who relied on telephones and video communications in the early half of the 20th century.

For shipboard physicians, preventing medical evacuations is of upmost importance because it is costly and causes loss of work time, thereby jeopardizing the military mission. At times, physicians may be asked to determine if a patient's condition affects their ability to continue their deployment and, in some cases, continue their military career (as seen in the following cases of suspected neurofibromatosis type I and keratosis follicularis, or Darier disease). The shipboard physician must determine the best course of action based on the resources at hand (limited though they may be) and on the recommendations of telemedicine specialists.

RETINOID DERMATITIS





CONCERN FOR DERMATOFIBROSARCOMA PROTUBERANS

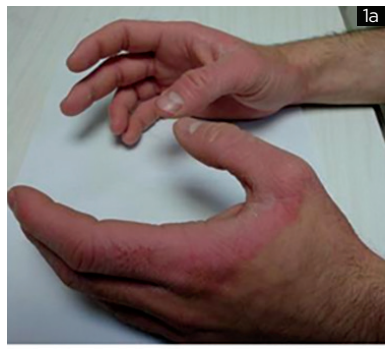


NEUROFIBROMATOSIS



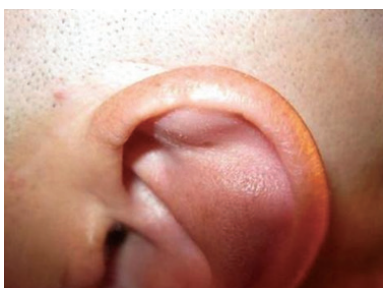


PALMOPLANTAR KERATODERMA





PSEUDOCYST OF THE AURICLE



PYOGENIC GRANULOMA





SMALLPOX VACCINE REACTION


1a


1b


1c


2a


2b


3a


3b


3c


4a


4c


4b


4d

SMALLPOX VACCINE REACTION (continued)


5a


5b


5c


5d


5e

CHAPTER ELEVEN

Environmental Exposures

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INTRODUCTION

Service members encounter all types of temperature extremes, from the hot and humid climate in Panama in Central America to the cold and snowy regions of Russia. Similar temperature extremes are seen in the US Northern Command's area of responsibility, which encompasses the continental United States, Alaska, Mexico, Canada, and portions of the Caribbean and US Virgin Islands. Deployments and training missions can lead to extended periods of exposure to these extremes, often causing health conditions with significant dermatologic symptoms.

COLD WEATHER WARFARE

Historically, few US military units have received extended training in mountainous and cold weather warfare. When conducted, it is usually at special training centers in Alaska, Colorado, Vermont, and California.[1] Paramount to success in these environments is proper clothing and the proper use of equipment, not only to increase survival but also to allow military forces to thrive in problematic environments.[1] In the past decade, the US military has increased its operations in mountainous, rugged terrain (Afghanistan, Iraq, Pakistan, Syria) and has operated many times at elevations of 8,000 feet or higher.[1]

IMMERSION FOOT SYNDROME



Approximately one-quarter of the earth's land mass is designated as "severely cold," meaning temperatures stay below freezing, snowfall exceeds 60 cm a year, and ice is present more than half of that time.[1] Not only are troop movements and ground transportation hindered in this environment, the added obstacles of snow, ice, and mud during winter can potentially be fatal if service members are not properly trained.[1]

The "wet cold" weather environment is especially concerning for troop movements because it consists of wet snow and rain, with temperatures between 20 and 40 ^{0}F.[1] The effect of wet, damp clothing and equipment, along with the cold temperatures, causes core body temperatures to drop significantly faster than in "dry cold" conditions, since water conducts heat away from the body more efficiently than air.[1] As a result, conditions such as hypothermia, frost bite, chilblains, and trench foot can occur and greatly affect combat readiness.[1] Several examples of cold-related injuries are illustrated in the following section.

PERNIOSIS









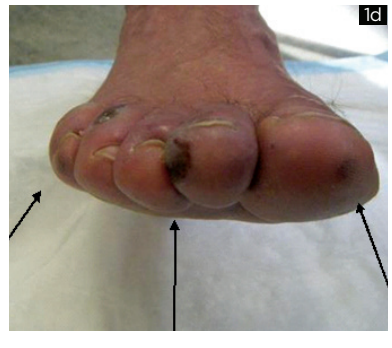


VASCULOPATHY









MILIARIA RUBRA







HOT WEATHER WARFARE

Past military operations in hot climates (northern Africa and the Pacific theater in World War II, Vietnam, and Korea, as well as military operations in Afghanistan, Iraq, Syria, and other regions[1]) have shown that with proper hydration, training, and rest, service members can succeed in these environments. However, when heat is compounded by heavy or thick clothing and equipment or by extended periods in non-air conditioned vehicles or rooms, this stress can be debilitating and result in significant injury.[2] Additionally, service members may not have the luxury of resting or properly hydrating given training and mission requirements, which can cause further injury.[2]

Apart from behaviors that protect individuals from the effects of heat (seeking shade, hydration, resting, reducing clothing layers), physiologic responses occur in the body to minimize heat strain, primarily sweating and vasodilation.[2] Typically, the skin's temperature mirrors the ambient temperature (below the normal core temperature). As the outside temperature increases, the skin's temperature also increases so the process of vasodilation and evaporative cooling from sweating occurs until the heat is dissipated.[2]

If sweating is impaired or if the heat cannot be dissipated, the body's core temperature will rise, which causes excessive physiologic strain.[2] Illnesses related to heat are designated as "heat exhaustion" and "heat stroke." The latter is potentially life threatening.[2] However, most presenting signs and symptoms are nonspecific to dermatology, so discussions of these types of injuries are outside the scope of this text. Some specific dermatologic complaints related to heat illnesses are pruritus and rash due to the blockage of eccrine sweat ducts. This blockage is more commonly known as miliaria, or heat rash. Without treatment (removing clothing, cooling, and drying the skin), ongoing exposure to a hot climate with impaired sweating can lead to heat casualties. Several cases are illustrated for a broad presentation associated with this classic hot weather rash.

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CHAPTER TWELVE

Trauma

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Studies reviewing combat-related injuries in Afghanistan and Iraq from 2005 to 2009 show that there were more blast-related injuries than previously seen in other military conflicts of the 20th century, which is likely due to the use of improvised explosive devices by enemy combatants.[1] These injuries were noted to be more common in young males owing to the large number of males in combat units, and often involved the extremities due to improved body armor protecting the head, neck, and trunk.[1] However, traumatic brain and spinal injuries increased during this time, but were secondary to blunt force traumas from blasts.

A recent publication assessing noncombat-related injuries of US soldiers deployed to Afghanistan from 2001 to 2013 noted that for patients seen in nonmilitary combat settings, vehicle injuries and injuries related to occupations, sports, or physical training were the most common causes of medical evacuations.[2] Fractures topped the list of injury type, followed by dislocations and pain and inflammation from overuse.[2] Given that 30% of all medical evacuations during this time were related to noncombat-related injuries, reducing these factors could boost military readiness in combat zones.[2]

Both combat and noncombat-related injuries were referred to teledermatology during the time period studied from 2004 to 2012. Combat-related injuries represented are primarily burns from blasts or shrapnel from improvised explosive devices. Selected cases of noncombat-related injuries are represented to include cases of burns secondary to boiler room accidents, inappropriate cryotherapy and laser hair removal procedures, and chemical burns from jet fuel. Additional cases of atypical abrasions and burns with a pattern and distribution consistent with self-induced injuries are included. One case with a pattern and injury consistent with child abuse is also included.

PHYSICAL ABUSE


1a


1b


1c

TRAUMATIC BURNS



















CHEMICAL BURNS





CONTACT DERMATITIS







CRYOGENIC BURN



IMPROVISED EXPLOSIVE DEVICE (IED) INJURY







KELOIDS

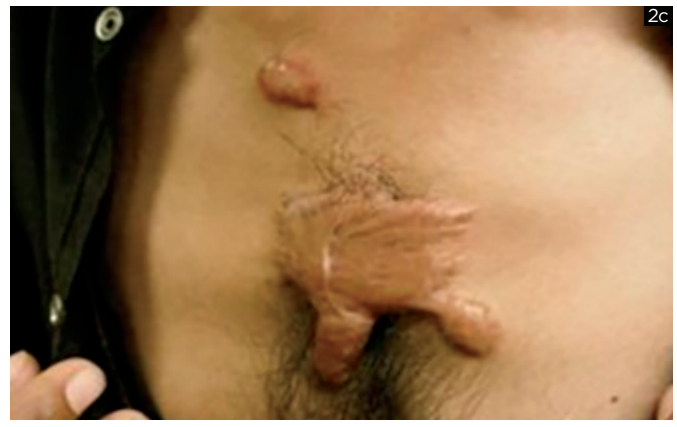












LASER HAIR REMOVAL BURN





SHRAPNEL INJURY



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Virtual health is the future of where we are going in our nation. To remain successful and to face future challenges we must be relentless . . . in our pursuit of innovation and our commitment to bring care closer to our patients while leveraging cutting-edge technology.

Epilogue

Teledermatology in the military continues to grow and change, adapting to new situations and requirements, much like the US Army itself. The medical community is undergoing significant changes as the Defense Health Agency (DHA) takes command of all administrative and management responsibilities at military medical facilities. This change is a result of the National Defense Authorization Act for Fiscal Year 2017, which mandates the realignment of military medical care under a single entity to improve medical readiness, increase access to care for beneficiaries, and reduce health care costs.

One of DHA's main priorities is to leverage telemedicine to support operational forces worldwide. The CarePoint information portal, recently introduced to replace the Army Knowledge Online (AKO) Teleconsultation Program, streamlines medical care processes and consolidates all teledermatology consults into one easy-to-access site across the Department of Defense. In the coming years, CarePoint will be integrated into the new military electronic medical record (EMR) system called Military Health System (MHS) Genesis. MHS Genesis provides an all-inclusive system for the health records of service members, veterans, and family members.

When on-ground dermatology services are not available, medical providers can access the CarePoint site from any military treatment facility and submit a secure online consult that is compliant with the Health Insurance Portability and Accountability Act of 1996 for a rapid response. CarePoint offers a standardized, clear, and concise method for submitting, answering, and evaluating teledermatology consults and photos not initially available in the early days of the AKO email consultation program.

The consults in CarePoint are usually answered in several hours to 7 days, compared to in-person evaluations that can take from 30 to 90 days in some areas. Although the AKO system produced similar numbers, the CarePoint system has improved security features and is able to more effectively integrate into MHS Genesis. MHS Genesis will replace all current EMR systems and integrate inpatient, outpatient, dental, and deployed patient data into one system. The CarePoint site, which will be part of this new EMR, contains a link for teledermatology consults. Unlike previous systems, consults in CarePoint can be uploaded directly into the patient's medical record.

Telehealth continues to evolve and is the face of tomorrow in military medicine's ongoing endeavor to reduce wait times, enhance readiness, decrease medical costs, and increase access to care for all patients worldwide.

At the groundbreaking of the new Army Virtual Medical Center at Brooke Army Medical Center, on January 4, 2019, Lieutenant General Nadja West, US Army Surgeon General, said, "Virtual health is the future of where we are going in our nation. To remain successful and to face future challenges we must be relentless . . . in our pursuit of innovation and our commitment to bring care closer to our patients while leveraging cutting-edge technology."

RACHEL C. FALKNER, MD
Major, Medical Corps
US Army

Acronyms and Abbreviations

AFRICOM	US Africa Command
AHLTA	Armed Forces Health Longitudinal Technology Application
AKO	Army Knowledge Online
AOR	area of responsibility
CENTCOM	US Central Command
CHCS	Composite Health Care System
DHA	Defense Health Agency
EMR	electronic medical record
EUCOM	US European Command
HELP	Health Experts onLine at Portsmouth
HIV	human immunodeficiency virus
IED	improvised explosive device
MHS	Military Health System
MSF	Médecins Sans Frontières
NASA	National Aeronautics and Space Administration
PACOM	US Pacific Command
PATH	Pacific Asynchronous TeleHealth
PIHP	Pacific Island Healthcare Project
RCCS	Remote Clinical Communications System
RHC-C	Regional Health Command-Central
SOUTHCOM	US Southern Command
TAMC	Tripler Army Medical Center
TATRC	Telemedicine and Advanced Technology Research Center