

MILITARY PREVENTIVE MEDICINE: MOBILIZATION AND DEPLOYMENT Volume 1

Section 1: A Historic Perspective on the Principles of Military Preventive Medicine



John Ward Dunsmore

Washington and Lafayette at Valley Forge

1907

Many of the medical challenges of deployment have not changed in the centuries since Washington and Lafayette rode out among the soldiers at Valley Forge. Personnel still have to be protected from the elements, they still need safe food and water, they still need properly located latrines, and they still must be given means to protect themselves from disease and insects. General Washington's innovations, such as army-wide smallpox vaccinations, strict camp hygiene (instituted by Baron von Steuben), and command emphasis on preventive medicine measures, make him a hero of modern military preventive medicine.

Art: Courtesy of Brown & Bigelow, St. Paul, Minnesota.

Chapter 1

PREVENTIVE MEDICINE AND COMMAND AUTHORITY—LEVITICUS TO SCHWARZKOPF

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INTRODUCTION

LEVITICUS AND THE PREVENTIVE MEDICINE PARADIGM

- The Book of Leviticus
- The Paradigm

COMMAND AUTHORITY AND PREVENTIVE MEDICINE IN AMERICAN MILITARY HISTORY

- The Revolutionary War
- The Civil War
- World War I
- Between the World Wars
- World War II
- The Korean War
- The Vietnam War
- Operations Desert Shield and Desert Storm

THE PREVENTIVE MEDICINE CONCEPT FOR COMMANDERS

- The Commander's Principal Staff and Operational Planning
- The Medical Threat Estimate

SUMMARY

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INTRODUCTION

Throughout history under a variety of titles—cleanliness, field hygiene, environmental sanitation, preventive medicine, force protection—activities and programs have been developed to maintain the health and operational performance of military forces and to prevent disease, injury, and disability. Legters and Llewellyn describe military medicine as “a unique brand of occupational medicine, one that deals with the prevention and treatment of diseases and injuries resulting from work in military occupations and operational environments.”^{1(p1141)} Bayne-Jones notes that through the performance of inspectorial, advisory, and regulatory duties, military preventive medicine is concerned with the administration of the entire military force, thus having a scope that exceeds all other elements of the military medical departments.² Military preventive medicine is therefore the central function of military medicine. Unlike casualty management of individual patients, military preventive medicine is intimately involved with military commanders, staffs, and units on a continuous basis.

The promotion and preservation of health and the prevention of illness and injury can rarely be accomplished solely through medical channels. Responsibility for the health and welfare of the members of a military unit falls on the commander, as dictated by federal law and military regulation. Law and regulation are the basis for command authority and military preventive medicine through which unit commanders can influence the health of their commands and thus gain command of health.

An understanding of these seemingly simple relationships among military preventive medicine, military medicine, and command authority and responsibility has been the essential foundation for successful preventive medicine activities throughout military history and continues to be so today. Equally important are the relationships between unit commanders and their staffs and the military preventive medicine personnel advising and supporting them. This chapter will explore the historical basis for these relationships and the generic lessons that may be learned and applied in the current and future practice of military preventive medicine.

LEVITICUS AND THE PREVENTIVE MEDICINE PARADIGM

The Book of Leviticus

As Commander-in-Chief of the Continental Army during the American Revolutionary War, General George Washington published a general order on “The Means of Preserving Health” (Figure 1-1) in which he referred to Moses as “the wisest General that ever lived” and quoted elements of the Mosaic Sanitary Code from the Old Testament. This echoed similar references by the leading military physicians of the 18th century, such as Pringle,³ Brocklesby,⁴ and Munro⁵ in England and Rush⁶ and Tilton⁷ in the United States, and presaged Wood’s book *Moses, the Founder of Preventive Medicine*.⁸ Each of the above authors recognized that the book of Leviticus is probably the earliest textbook of preventive medicine.

In his “Notes on the History of Military Medicine,” Garrison⁹ analyzes Leviticus, chapters 8 through 15, and identifies several functions of the Levites, or Jewish priests, whom he defined as hygienic police. Their functions included regulating diet, food sources, water, and personal and sexual hygiene; recognizing and investigating disease; quarantining diseased persons and purifying con-

taminated articles and structures; educating the community on these topics; advising leaders on the community’s hygiene; and conducting a census of the community. In addition, these priests accompanied the army into the field and into battle, providing guidance on all aspects of camp sanitation and the health of the force.

The priests of Israel, while having wide-ranging responsibilities to the leaders and members of the community they served, are not identified as having responsibilities for treating the sick or injured. Thus began a separation of those responsible for the health and well-being of the group from those who provided treatment in an attempt to restore health.

The Paradigm

From the five books of Moses found in the Old Testament, a broad picture of preventive functions emerges that has continuing relevance for military preventive medicine. The nation, religion, and army of Israel were inseparable during the 40 years in the wilderness, and the activities of the priests, the hygienic police, were intimately involved with all three. The priests’ functions can be broadly charac-

INSTRUCTIONS for SOLDIERS in the Service of the
UNITED STATES, concerning the Means of preserving HEALTH
Of CLEANLINESS

IT is extremely difficult to persuade Soldiers that Cleanliness is absolutely necessary to the Health of an Army. They can hardly believe that in a military State it becomes one of the *Necessaries of Life*. They are either too careless to pay Attention to this Subject, or they deceive themselves by reasoning from Cases, that are by no Means similar. Hitherto they have enjoyed a good State of Health, tho' they paid little or no Attention to such Punctilios; hence they conclude, that, tho' in the Army, they shall continue to enjoy an equal Degree of Health, under the like Degree of Negligence: Such reasoning has proved fatal to thousands. They do not consider the prodigious Difference there is in the Circumstances of five or six People, who live by themselves on a Farm, and of thirty or forty thousand Men, who live together in a Camp. The former chiefly subsist on vegetable Food; they lodge warm and dry, and they breathe in pure Air, which is not contaminated by noxious Vapours: The latter in general subsist too much on animal Food; they sleep frequently on cold and damp Beds, and they breathe foul Air, that is constantly injured by the very Breath of a Multitude; and is frequently rendered much more dangerous by the Stench and Exhalations that arise from putrid Bodies. The Air is injured, as I have just said by the Breath of a Multitude and the perspirable Matter that comes through the Pores of the Skin helps to extend the Disorder. But the Blood and Offals of Cattle that are killed near the Camp, with the different animal Substances that are daily thrown there by the Soldiers themselves, must soon fill the Air with a pestilential Smell, unless they are immediately removed or covered sufficiently deep. When the Soldier pours out Water, in which Flesh has been boiled; when in a peevish Mood he throws away Part of his Ration, because it is too much roasted, or because it is not roasted enough; or even when he throws away Bones that are not well picked; he seldom considers that such Things must soon become putrid, and that he is sowing the Seeds of Disease and Death for himself or his Companions. The Soldier should burn his Meat rather than throw it away: History informs us that great Armies have followed this Rule. Soldiers are not supposed to be acquainted with the Art of preserving Health; they are little versed in Books; but, to the Honour of American Soldiers, it is allowed that no men in Christendom of the same Occupation are so well acquainted with their Bibles: Let them, once more, read the History and Travels of the Children of Israel while they continued in the Wilderness, under the Conduct of Moses; and let them consider at the same Time that they are reading the History of a great Army, that continued forty Years in their different Camps under the Guidance and Regulations of the wisest General that ever lived, for he was inspired. In the History of these People, the Soldier must admire the singular Attention that was paid to the Rules of Cleanliness. They were obliged to wash their Hands two or three Times a Day. Foul Garments were counted abominable; every Thing that was polluted or dirty was absolutely forbidden; and such Persons as had Sores or Diseases in their Skin were turned out of the Camp*. The utmost Pains were taken to Keep the Air in which they breathed, free from Infection. They were commanded, to have *a Place without the Camp, whither they should go, and have a Paddle with which they should dig, so that when they went abroad to ease themselves, they might turn back and cover that which came from them*†.

Besides these general Regulations, it is also necessary for the Preservation of Health, that every Soldier be particularly attentive to his own Person. The Straw on which he sleeps should be frequently dried; and he should never spread it on damp Ground, when he can get Hurdles, Bark, Boards, Leaves, or any other dry Substance to put under it. A Soldier should change his Shirt and Stockings once every two or three Days: Though his Stock of Linen is small, a Shirt is soon washed. Little Attention is due to the Colour, provided it be clean. Women are never wanting in a Camp for such Offices. A Man is seldom aware of the Quantity of noxious Matter that comes through his own Skin and is deposited on his Shirt; but if he takes up a Shirt that has been worn a few Days by another Person, he is frequently offended by the disagreeable Smell.

These are some of the reasons why CLEANLINESS of every kind is necessary towards preserving Health in an Army: They are Reasons which every Soldier may understand; but should he neglect to regulate himself accordingly, the Regimental Surgeon will doubtless attend to the Neglect, and his Officers will see that he does his Duty. For every Soldier by his Neglect not only endangers his own Life, but the Lives of his Companions. Nature, or the God of Nature, has commanded, that men who live in Camps should be cleanly: Whoever proves too obstinate, or too slothful to obey this Command, may expect to be punished with Death, or suffer under some dangerous Disease.

W.

*Numb. 5. i.

†Deut. 23 xii.

Fig. 1-1. The text of General George Washington's broadside: Instructions for Soldiers in the Service of the United States Concerning the Means of Preserving Health: Of Cleanliness. Source: Bayne-Jones S. *The Evolution of Preventive Medicine in the United States Army, 1607–1939*. Washington, DC: Office of the Surgeon General, Department of the Army; 1968: 190–191.

terized as advisory, educational, inspectorial, investigational, and interventional. Focus was placed equally on individual and community behavior in attempting to prevent and control threats from disease, the natural environment, and food and water. In the absence of scientifically grounded medical knowledge, these efforts were based on pragmatic, experiential, or ritualistic actions. Elements of these

practices can be found later in the successful military medicine that supported the Roman legions. A strong case can be made for these five functions—advice to leaders, education of unit members, inspection to ensure compliance, investigation of non-compliance, and intervention to protect the group—as the continuing core functions of military preventive medicine.

COMMAND AUTHORITY AND PREVENTIVE MEDICINE IN AMERICAN MILITARY HISTORY

The Revolutionary War

During the 18th century, two outstanding English surgeons general, Sir John Pringle³ and Dr. Richard Brocklesby,⁴ drew on their own extensive experience and that of van Swieten¹⁰ in Austria, among others, to publish several books on military hygiene and the preservation of the health of troops. The doctrine and practices described were known to George Washington from his service in the colonial militia alongside regular British troops during the French and Indian Wars. Many of the American physicians who provided the medical leadership during the Revolutionary War had received their medical degrees from Edinburgh, read Brocklesby's and van Swieten's books and knew Sir John Pringle personally. Thus from the beginnings of the republic, both the commander in chief and the leading physicians who served with him shared a view of the importance of preserving the health of troops and the fundamental responsibility of command at all levels to accomplish this mission by relying on sound medical advice.

In his writings, Pringle addressed the officers as well as the physicians because of his conviction that the maintenance of the health of troops is the responsibility of command and, therefore, line officers. In addition, he noted that prevention cannot be based on anything that a soldier can avoid but must be governed by regulations and orders he is required to obey. Each of Pringle's themes appeared in the publications of the leading American physicians during the Revolution. Dr. John Jones¹¹ specifically referred to Pringle, and Dr. Benjamin Rush, in *Directions for Preserving the Health of Soldiers*, addressed his book equally to Army line officers and to physicians, while clearly stating that the health of troops is a command responsibility.⁶ In a letter they wrote to President John Adams, Rush and then-retired General Washington described the relationship of the physician general to the commander-in-chief as having the closeness of a family member; the physician general was an essential element of

the Army staff who should be aware of and concur with all orders and plans for the Army.²

Recognition of the role of command authority in preventive medicine is seen in many of Washington's letters and general orders but is nowhere more clearly indicated than in his decision in 1777 to order the inoculation of the entire Army against smallpox, describing it as "the greatest enemy to the Continental Army."^{2(p52)} This decision was based on the recommendation of his Physician in Chief, Dr. John Morgan. Many historians point to the subsequently smallpox-free condition of the Continental Army as a major contribution to winning the war.

Also of importance was the work of Baron von Steuben, first Inspector General of the Continental Army, who wrote and published, with Congressional approval, *Regulations for the Order and Discipline of Troops of the United States*¹² in 1779. This document contained many directions for the preservation of health and prevention of disease. Congressional approval made these legal regulations that required compliance and execution by all officers.

By the end of the American Revolutionary War, then, nearly all the basic concerns of preventive medicine had been identified and, in many cases, made mandatory by the commander in chief and the Congress.^{2(184–185)}

- Responsibility of command for the health of troops
- Medical officers as advisors to line officers
- Discipline
- Personal hygiene
- Diet and nutrition
- Clothing and shoes
- Threats from extreme heat, cold, fatigue, and wetness
- Morale building and recreation
- Health education
- Immunization
- Environmental hygiene
 - Location and design of campsites and

- shelters
- Avoidance of crowding
- Sanitation of camps
- Disposal of excreta and waste
- Protection of water supplies
- Reduction of disease-transmitting human contacts
- Rudimentary medical intelligence

Further progress depended on developments in the biological and medical sciences during the late 19th century and throughout the 20th century.

The Civil War

The relationship between command and military preventive medicine during this period was strongly influenced by the abysmal sanitation and disease experience of the Mexican War (1846–1848) and more directly by the British and French experience in the Crimea (1854–1856). Press reports made these experiences common knowledge. In Britain, the government responded by establishing the Royal Sanitary Commission. This body was composed of leading civilians who exerted enormous influence directly on commanders and their chief medical officers, forcing the former to pay more attention to medical advice. Equally important among the commission's work were the establishment of the specialty of Army Health in the British Army; the publication of a new British Army regulation giving medical officers the power to advise commanders on all matters pertaining to the health of troops; the establishment of the Royal Army Medical School in 1860, with specific courses of instruction in military hygiene; and the publication of the sanitary history of the Crimean War, the first medical war history published by a government. Thus, at the outbreak of the American Civil War, knowledge of these experiences and accomplishments was available and exerted a significant influence in the United States on government officials, military leaders both medical and nonmedical, and the general population.^{2(p89–92)}

The incompetence of the US Army Medical Department in the earliest days of the war led President Lincoln to follow the British model and appoint the United States Sanitary Commission. The Commission's initially circumscribed inspectorial and advisory powers rapidly expanded to true operational agency status, with the authority to conduct preventive services for the Army and authorization to communicate directly with the Surgeon General, medical officers, commanders of troops at

all levels, the Secretary of War, and the President. As evidence of its power, the Commission played a major role in Congressional legislation directing the reorganization of the Medical Department and forcefully influencing the appointment of Lieutenant William A. Hammond as Surgeon General and Surgeon Jonathan Letterman as Medical Director for the Army of the Potomac.^{2(p102–104)}

Among the myriad activities of the Commission, several stand out. First was capturing the attention of command, from the commander in chief down to divisions in the field, concerning its responsibilities for the health of troops. Second was establishing the highly efficient Camp Inspection Service, with a heavy emphasis on sanitation and hygiene. Third was publishing material by distinguished physicians and surgeons to educate both medical and nonmedical officers with such titles as "Military Hygiene and Therapeutics," "Rules for Preserving the Health of Soldiers," "Control and Prevention of Infectious Diseases," "Quinine as a Prophylactic against Malarious Diseases," and "Scurvy."^{2(p104)} Each of these topics was recognized as requiring medical advice and command action. These publications introduced a new model for health education and set the standard for several decades.

Perhaps the most important action influenced by the Commission was the appointment of LT Hammond as Surgeon General in 1862. Enormously talented, he attracted and appointed equally able medical officers, such as Letterman, John Shaw Billings, and Joseph Janvier Woodward, each of whom had proven ability to work well with field commanders. Hammond doubled the number of medical inspectors supervising sanitary matters, established the Army Medical Museum for educational purposes, compiled and issued the pamphlets of the Sanitary Commission, and established a comprehensive system of sanitary reports.

The command-directed and then Congressionally dictated inoculation of troops against smallpox during the Revolutionary War continued during the Civil War. A major medical innovation during the Civil War was the official introduction of quinine sulphate as prophylaxis for malaria. Recommended by the US Sanitary Commission and enthusiastically promoted by Hammond, oral quinine prophylaxis (given daily as a whiskey bitters drink) was mandated by the command (Figure 1-2) and enforced by line officers. The alcohol content reportedly made this a troop favorite.

During the Civil War, the initial chaos of mobilization was replaced by a military establishment within which commanders were made to take responsibil-

**Headquarters, Army of the Mississippi,
IUXA, AUGUST 25TH, 1862.**

**GENERAL ORDERS,
NO. 117.**

The season for billious and intermittent fevers in this region and climate is at hand. The Medical Officers of this Army will, therefore, take the most prompt and efficacious measures to counteract the effects of malaria on our troops. To this end, their attention is again called to the Circular of the Medical Director of the Department, dated, July 13th, 1862. In addition to which, the following directions will be strictly carried out, viz:

1st. All working parties will invariably be supplied with rations of bitters, prepared as prescribed below, and to be given twice a day to the individuals of each party under the direction of a commissioned officer in quantities not to exceed half a gill at a time.

2nd. All guides and scouting-parties out at night, will, likewise, have administered to them, under the direction of a Medical officer, a half-ration of bitters. It will be given to them between Retreat and Tattoo.

3rd. The bitters to be issued, will be made, as follows:

96 grains of Sulp. Quinia,
100 " "Cinchinoa,

to each gallon of whisky; or, for each barrel of 40 gallons:

8 ounces of quinine,
13 " "Sulp. Cinchinoa;

this will make about thirteen hundred full rations.

4th. Medical Directors of Divisions will make prompt requisitions for the necessary supplies to carry this Order into effect.

5th. Division, brigade and detachment commanders will see to the execution of this order, and direct the issues under it to be accurately stated in the weekly Sanitary and Inspection Report.

**BY ORDER OF GENERAL ROSECHANS.
H.G. KENNETH,
*Lieut.-Col and Chief of Staff***

[OFFICIAL]

Fig. 1-2. Army of the Mississippi's General Order No. 117 concerning the use of quinine bitters for the prevention of malaria. Source: US Archives

ity for the health of troops and to accept the advice of both the US Sanitary Commission and their own military physicians. In spite of the fact that there was still no scientific basis for preventive medicine interventions and that disease remained the major

cause of morbidity and mortality in the military, great improvements had been made. As reported by Duncan,¹³ this experience was significantly better than that recorded during the Mexican War or by the French in the Crimea, as is shown in Table 1-1.

TABLE 1-1

DEATHS FROM DISEASE AND BATTLE DEATHS IN PRINCIPAL WARS, FOREIGN ARMIES AND U.S. ARMY, 1846-1945

War	Date	Deaths from		Ratio of deaths from disease to deaths from battle injuries and wounds
		Disease	Battle injuries and wounds [*]	
Mexican War (United States) [†]	25 Apr 1846-5 Jul 1848	11,155	1,721	6.48:1
Crimean War (French)	1854-1856	70,000	7,500	9.33:1
Civil War (North)	15 Apr 1861-1 Aug 1865	199,720 [‡]	138,154	1.45:1
Danish War	1864			
German		310	738	0.42:1
Danish		820	1,446	0.57:1
German War (German)	1866	5,219	4,008	1.30:1
Franco-Prussian War (German)	1870-1871	14,904	17,225	0.86:1
Russo-Turkish War	1877-1878	80,000	20,000	4.00:1
Sino-Japanese War (Japanese)	1894-1895	15,850	1,311	12.09:1
Spanish-American War	1 May 1898-31 Aug 1898	1,939	369	5.25:1
Philippine Insurrection	Feb 1899-Dec 1902	4,356	1,061	4.11:1
Boer War (British)	1899-1901	11,377	6,425	1.77:1
War in Southwest Africa (German)	1904-1907	689	802	0.86:1
Russo-Japanese War	1904-1905			
Japanese		21,802	58,257	0.37:1
Russian, less Port Arthur		18,830	23,008	0.82:1
World War I	1 Apr 1917-31 Dec 1918			
Total United States Army		51,447	50,510 [§]	1.02:1
American Expeditionary Forces		16,951	50,105 [§]	0.34:1
World War II	7 Dec 1941-31 Dec 1945			
Total United States Army		15,779	234,874	0.07:1
United States Army in Europe		1,779	135,576	0.01:1

^{*}Includes deaths due to disease or nonbattle injury while captured or missing in action

[†]Data are derived in part from *Historical Register and Dictionary of the United States Army, 1789-1903*. Vol 2. Washington, DC: Government Printing Office;1903: 282, and are somewhat understated

[‡]Includes disease deaths among the relatively small number of volunteers remaining in federal service subsequent to 1 Aug 1865

[§]Includes gas casualties

Source: *Communicable Diseases Transmitted Chiefly through Respiratory and Alimentary Tracts*. Vol 4. In: *Preventive Medicine in World War II*. Washington, DC: US Army Medical Department, Office of the Surgeon General; 1958: 11.

World War I

The US military entered World War I better prepared from the preventive medicine standpoint than at any other time in its history. Several factors produced this situation. The medical debacle of the Spanish–American War, with typhoid fever outbreaks at many military camps causing extraordinary morbidity and mortality, focused attention on these problems and led to governmental attention in the post-war period. This resulted in Congressional legislation to reorganize the Army Medical Department and empower it by giving it direct communication with the newly established Chief of Staff and General Staff Corps.

More importantly, the emergence of medical microbiology, the growth of diagnostic laboratory capabilities, and the expanding understanding of vector-borne diseases (eg, malaria, yellow fever) and disease causation in general provided the tools needed for scientific military preventive medicine. The success of the Army Medical School and the Army Medical Research Board in Cuba, Puerto Rico, and the Philippines led to the development of an extraordinarily competent and experienced cadre of military physicians. These physicians earned national and international respect for their medical research, thus greatly enhancing the status of military medicine and demonstrating to line officers the potential contributions of military preventive medicine. New immunizations (eg, typhoid fever vaccine) and field hygiene innovations (eg, chlorination of water using the Lyster bag) from the Army Medical School were matched by the publication of outstanding manuals and textbooks of military preventive medicine by Munson,¹⁴ Ashburn,¹⁵ Havard,¹⁶ Vedder,¹⁷ and Dunham.¹⁸

Against this background, most of the US Army had developed significant field experience during annual maneuvers beginning in 1910 and culminating in the 1916 expedition into Mexico led by General Pershing. Troop hygiene and health were excellent during the latter part of this period due to the experience gained by commanders and their supporting medical officers. So when the United States entered the war in 1917, the operational experience of the past 7 years and the bioscientific and medical knowledge base developed over the preceding 3 decades produced a highly competent and ready force. The commanders who went to Europe shared General Pershing's view of the commander's responsibility for troop health and the essential role of sound medical advice and technical expertise. The Medical Department benefited not only from

the field experience and intimate staff relationships of the preceding 7 years but also from the experiences of allied British and French forces during the first 3 years of the war in Europe.

General Pershing set the tone for his expeditionary force by placing his chief surgeon and a small group of medical officers on his general staff. This intimate involvement of medical officers in all staff actions and operational planning provided the essential foundation for command responsibility and support for preventive medicine activities throughout the American Expeditionary Forces. Sanitary inspections by medical officers, first established by Surgeon General Lovell in 1818 and vigorously employed by Surgeon General Hammond in the Civil War, were reintroduced. The model for activities of sanitary inspectors had been developed during field exercises and the expedition into Mexico. It was now implemented throughout the US Army in the United States and Europe with exceptional results—the health of the American Expeditionary Forces was as good as that of troops in the United States.

Perhaps the most important outcome of this period was the official recognition that the activities of military preventive medicine extend well beyond the limits of the Medical Department and are, in fact, concerned with the administration of the whole Army. This valuable lesson had been and continues to be difficult to learn and retain when the mission of military medicine seems to focus solely on the hospital-based care of sick troops and combat casualties. Military physicians are often the first to forget this fundamental point and thus contribute to the misunderstanding and ignorance of their line officer colleagues.

Between the World Wars

The 2 decades preceding World War II saw enormous advances in microbiology and medical science in general. Many of these emanated from ongoing research at the Army Medical School and the overseas medical research boards. Perhaps more important was the broadening of epidemiology as a discipline in both civilian and military preventive medicine. From focusing almost solely on infectious disease and its causative agents, epidemiology expanded to encompass noncommunicable diseases, with the recognition that host, environmental, occupational, cultural, and social factors are influential elements in health and disease. This broadened scope fit the increasingly broad scope of military operations and supporting activities as new

technologies were rapidly introduced into the servicemembers' environment.

Preventive medicine and public health educational resources, such as schools, courses, and institutes, increased rapidly during this period. Impressive also was the publication of many notable textbooks for practitioners of preventive medicine and the revisions of military preventive medicine texts. Atabrine was introduced and tested as a quinine substitute for prophylaxis and treatment of malaria. During this same time, sulforamides were shown to cure and prevent many bacterial infections, thus expanding the concept of chemoprophylaxis.

World War II

The volumes published by the Army Medical Department covering preventive medicine in World War II are a rich source of information on the fundamental principles of military preventive medicine, which endure in spite of changes in the biomedical sciences. They should be read by anyone seeking to become or claiming to be a specialist in military preventive medicine. From them come two major examples of command authority and preventive medicine—one successful and one not.

The successful example involves the control of malaria in the Pacific theater of operations. Malaria was incapacitating the US Army with attack rates of 1,781 per 1,000 on Guadalcanal and 4,000 per 1,000 at Milne Bay. This led General MacArthur to comment "This will be a long war if for every division facing the enemy I must count on a second division in hospital with malaria and a third division convalescing..."^{19(p2)} General MacArthur recognized not only the threat to his forces but also the need to change the attitude of his subordinate commanders. This attitude was exemplified by a general officer with 40% of his troops incapacitated with malaria who said playing with mosquitoes in wartime was a waste of time while he was busy preparing to fight. MacArthur grasped the basic concepts: (a) command from highest to lowest levels must be educated about malaria and its prevention and understand that command authority must be used to enforce malaria discipline; (b) there must be a highly trained and competent malaria control organization operating with the full support and authority of the chain of command; and (c) malaria control supplies, equipment, and personnel must have a high priority for transportation ordered by the command. MacArthur realized that technical competence and advice of medical specialists was

essential, but command must recognize its responsibility and use its authority to accomplish this mission. The medical establishment acting alone will fail. Recognition and application of these principles greatly reduced the strategic medical threat from malaria in this theater.

Cold injury has been recognized as a substantial threat to troops, at least since the time of Napoleon, and was even described in the armies of Alexander the Great. The World War II volume entitled *Cold Injury—Ground Type*²⁰ provides lasting lessons on this strategic medical threat, successful prevention strategies, and painful examples of failures such as occurred during the winter of 1944–1945 in Western Europe. The threat had been recognized by operational and medical staffs in 1943, but plans for educating and training commanders and troops in foot care were not implemented. While the planners recognized that cold weather uniforms and footwear were essential to prevent a disaster, only inadequate amounts of marginally acceptable items were procured.

The price paid was 90,000 cold injury casualties, with a preponderance among combat infantrymen—the equivalent of losing seven divisions of riflemen at a time when no replacements were available. General Patton described the situation: "The most serious menace confronting us today is not the German Army, which we have practically destroyed, but the weather which, if we do not exert ourselves, may well destroy us through the incidence of trench foot."^{20(p168)}

The knowledge was available and the threat had been recognized, but neither the commanders nor their staffs had been energized. This was partially due to a failure in the relationships between commanders and their Chief Surgeons and medical staffs. It was also attributable to the attitude engendered by the seeming total collapse of the German forces and the rapid Allied advances that raised hopes for a German surrender and an end to the war before cold weather arrived. General Bradley wrote after the war that in September he responded to a crisis in supply and transport by deliberately bypassing winter clothing in favor of ammunition and gasoline.²¹ The command gambled and lost. There is no evidence that the medical staff estimated or presented the possible casualty numbers before this apparently uncalculated risk was taken.

The Korean War

The Korean War is notable in that medical officers recognized the threats posed by infectious dis-

ease, such as malaria, and the environmental extremes of the Korean winters. Drawing on the recent lessons of World War II, malaria discipline was successful, with commanders actively involved at all levels.

In contrast, the first year in Korea saw a repetition of command ignoring medical advice about cold injury, leading to devastating effects on improperly clothed, shod, and trained troops.²² After the experience of the first chaotic year, the military made significant improvements in the prevention of cold injury in such areas as command and medical planning training, provision of appropriate uniforms, and enforcement of foot care down to the individual level. In spite of these advances, the tactical situation frequently overcame the best prevention efforts, again taking a toll primarily on riflemen in forward exposed areas.

The Vietnam War

During the 12 years between Korea and the introduction of large US units into the Republic of South Vietnam in 1965, many experienced preventive medicine officers left active duty, taking with them hard-earned expertise. In addition, chloroquine-resistant falciparum malaria emerged, requiring renewed attention to basic malaria discipline. Prophylaxis now required chloroquine–primaquine on a weekly basis and Dapsone taken daily, thus increasing the requirement for command supervision of compliance. Preventive medicine assets supported command supervision through urine testing of randomly selected field units to confirm the presence of prophylactic drug metabolites.²³

A highly significant example of command attention to preserving the health of soldiers can be found in the experience of the 9th Infantry Division commanded by Major General Julian Ewell. Operating in the inundated Mekong Delta area, troops were continuously exposed to environmental conditions leading to bacterial and fungal skin infections and warm-water immersion foot. General Ewell documented staggering losses from these conditions among his riflemen—in some cases, reducing company strength by 50%.²⁴

COL Alfred Allen in *Skin Diseases in Vietnam, 1965–72*²⁵ documents the comprehensive preventive medicine program of field research, field surveillance, training, and education brought to bear in response to Ewell's request for assistance. Appropriate prophylaxis and treatment helped, but the major impact was achieved by gathering and presenting data related to the most significant prob-

lem—warm-water immersion foot. The data showed that prevention depended on restricting field operations to 48 hours of troop exposure, followed by a 24-hour drying period. General Ewell implemented this policy through a command directive, holding subordinate commanders at each level responsible for its vigorous implementation. In response, the rates of “paddy foot” and troop losses declined significantly.

Operations Desert Shield and Desert Storm

The deployment of US Central Command forces to the Saudi Arabian desert under the command of General Norman Schwarzkopf raised the specter of previous military operations in the same locale, which were associated with large servicemember losses because of disease and environmental conditions.²⁶ Schwarzkopf's force sustained the lowest disease and nonbattle injury rates seen in US forces during the 20th century (Figure 1-3).

This success was due in considerable measure to the willingness of commanders at all levels to include in their deployment and campaign plans the important medical threats and command policies based on sound medical advice to control their impact. Well-prepared military preventive medicine officers established essential surveillance activities down to the battalion level to monitor preventable disease. This allowed them to respond rapidly with appropriate recommendations and essential interventions to control identified breakdowns and outbreaks.

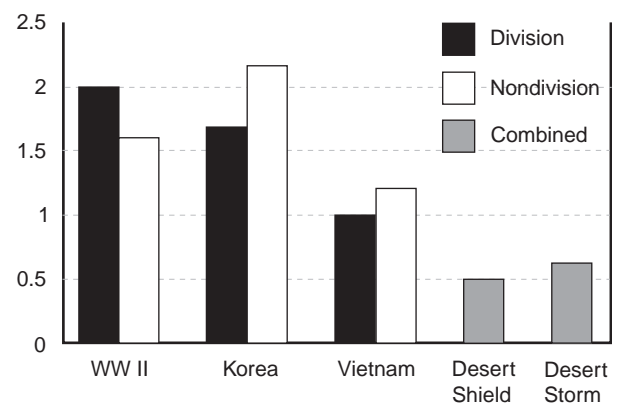


Fig. 1-3. Disease and nonbattle injury rates in World War II, Korea, Vietnam, Desert Shield, and Desert Storm, showing the particularly low rates in Operations Desert Shield and Storm (number of hospital admissions / 1,000 soldiers / d). Source: Briefing slides, Office of the Surgeon General, US Army, Washington, DC, 1992.

The success of these activities led to the Joint Chiefs of Staff requirement that surveillance for preventable disease at the small-unit level be implemented in all future deployments of US forces.²⁷ Preventive medicine activities during the subsequent deployment of US forces to Somalia followed this model of command recognition of responsibility for

preserving the health of servicemembers. The message reproduced in Figure 1-4 demonstrates the concern and attention of the Somalia Task Force commander to these issues. Again, command policies, preventive medicine advice and surveillance, and rapid investigation and intervention when outbreaks occurred successfully preserved the fighting strength.

ADMINISTRATIVE MESSAGE

PRIORITY

P 08I621Z DEC 92 ZYB PSN 277700S23

FM CJIF SOMALIA//J-4/MED//

TO USCINCENT MACDILL AFB FL//CCSG

CG FIRST FSSG// G-1//

CG THIRD MAW//G-1//

CG FIRST MARDIV//G-1//

FIRST SRI GROUP//S-1//

INFO BUMED WASHINGTON DC//JJJ//

CMC WASHINGTON DC//MED//

COMMARFURPAC//G4/MED//

BT

UNCLAS //N06200//

MSGID/GENADMIN/CG I MEF G4 MED//

SUBJ/COMMAND RESPONSIBILITIES IN MAINTAINING TROOP HEALTH//

RMKS/1. THE MEDICAL THREAT IN OPERATION PROVIDE HOPE IS AMONG THE HIGHEST EVER FACED BY US FORCES, PROBABLY MUCH GREATER THAN IN THE VIETNAM CONFLICT. THE PREVENTION OF FORCE DEGRADING ILLNESS IS A COMMAND RESPONSIBILITY.

2. PREVENTIVE MEDICINE PERSONNEL HAVE PROVIDED VERY SPECIFIC RECOMMENDATIONS WHICH WILL PRESERVE COMBAT READINESS BY KEEPING PERSONNEL HEALTHY. IT IS UP TO INDIVIDUAL COMMANDERS TO IMPLEMENT THESE RECOMMENDATIONS IN THE MOST AGGRESSIVE MANNER.

3. SPECIFICALLY, UNIT COMMANDERS ARE RESPONSIBLE TO INSURE THE FOLLOWING:

A. ALL PERSONNEL ARE TO EXERCISE COMPLETE MALARIA AND MOSQUITO DISCIPLINE, INCLUDING KEEPING SLEEVES DOWN AT ALL TIMES, PROPER USE OF DEET INSECT REPELLENT ON ALL EXPOSED SKIN, AND THE FULLEST USE OF BEDNETS. PERMETHRINE SPRAY SHOULD BE ISSUED, AND ALL UNIFORMS AND BEDNETS SHOULD BE TREATED.

B. MALARIA MEDICATION WILL BE TAKEN AS PRESCRIBED, AND MONITORED BY UNIT COMMAND STRUCTURE. IF MEFLOROQUINE IS USED, IT WILL BE TAKEN ON SUNDAYS BY ALL UNITS. IF DOXYCYCLINE IS USED, IT WILL BE TAKEN WITH THE MORNING MEAL BY ALL UNITS. ACCOUNTABILITY IS REQUIRED.

C. HAND WASHING AFTER USE OF LATRINE AND BEFORE MEALS IS REQUIRED. UNIT LEADERS WILL INSURE THAT ALL TROOPS UNDERSTAND AND COMPLY WITH THIS REQUIREMENT. HAND-WASHING STATIONS ARE TO BE PROVIDED AT THE EARLIEST POSSIBLE TIME. WHEN CHOW HALLS ARE ESTABLISHED, NO TROOP WILL BE PERMITTED TO ENTER WITHOUT WASHING HANDS. ENFORCEMENT IS REQUIRED.

D. ABSOLUTELY NO FOOD, WATER, OR ICE WILL BE CONSUMED FROM THE LOCAL ECONOMY. FAILURE TO COMPLY WITH THIS RESTRICTION CARRIES THE HIGH POTENTIAL OF EPIDEMIC DIARRHEA AND HEPATITIS. UNIT COMMANDERS SHOULD INSURE THAT ALL TROOPS UNDERSTAND THE TREMENDOUS THREAT ASSOCIATED WITH EATING FROM THE ECONOMY.

(Fig. 1-4 continues)

E. COMMANDERS WILL INSURE THAT HUMAN WASTE IS HANDLED IN STRICT ACCORDANCE WITH PREVENTIVE MEDICINE RECOMMENDATIONS, SPECIFICALLY, LATRINES ARE TO BE CONSTRUCTED AND MAINTAINED IN FLY-PROOF CONDITION, TO PREVENT FLY CONTACT WITH HUMAN FECES AND SUBSEQUENT DIARRHEA EPIDEMICS

F. WHEN CHOW HALLS ARE ESTABLISHED, THEY ARE TO BE OPERATED IN FULL ACCORDANCE WITH PREVENTIVE MEDICINE RECOMMENDATIONS. AN IMPROPERLY RUN CHOW HALL CAN RESULT IN EPIDEMIC DIARRHEA. THE PRIORITY ON “GETTING A HOT MEAL TO THE TROOP” SHOULD AT NO TIME OVERRIDE PROPER PROCEDURES IN CHOW PREPARATION. INATTENTION IN THIS AREA HAS RESULTED IN MASSIVE EPIDEMIC DIARRHEA IN PAST OPERATIONS.

G. COMMANDERS WILL INSURE THAT HEAT INJURIES ARE PREVENTED BY ALLOWING A PERIOD OF ACCLIMATIZATION, ADJUSTING WORK SCHEDULES TO AVOID THE HOTTEST PARTS OF THE DAY, AND ENFORCING AGGRESSIVE WATER DRINKING (UP TO 1 CANTEEN PER HOUR).

H. HIV AND AIDS ARE EXTREMELY COMMON IN EAST AFRICA, INCLUDING SOMALIA. PROSTITUTES ARE REPORTED TO BE 50% OR MORE HIV INFECTED. COMMAND CLIMATE SHOULD ACTIVELY DISCOURAGE ANY SEXUAL CONTACT WITH LOCAL PERSONNEL THROUGH POSITIVE LEADERSHIP AND EDUCATION.

4. PREVENTIVE MEDICINE PERSONNEL ARE AVAILABLE FOR UNIT TRAINING. ALL TROOPS ARE TO BE THOROUGHLY BRIEFED AS EARLY AS POSSIBLE IN THE EXERCISE, AND RE-BRIEFED AS NEEDED.

5. DISEASE AND INJURY TREND WILL BE AGGRESSIVELY MONITORED THEATER-WIDE TO IDENTIFY PROBLEMS IMMEDIATELY AND TAKE CORRECTIVE ACTION. ACCURATE DISEASE REPORTING IS A HIGH INTEREST ITEM.

B/

Fig. 1-4. The text of the Joint Task Force Somalia commander’s administrative message outlining the responsibilities of unit commanders in maintaining their troops’ health. Source: Commander Joint Task Force Somalia. *Command Responsibilities in Maintaining Troop Health*. Washington, DC: US Central Command; December 1992.

THE PREVENTIVE MEDICINE CONCEPT FOR COMMANDERS

The Commander’s Principal Staff and Operational Planning

The preceding review presents a deceptively simple picture that intentionally ignores the major obstacles to preventive medicine and command interaction. It is imperative to identify these issues, which originate both from commanders and their staffs and from the military preventive medicine personnel advising and supporting them.

Prevention activities lack the glamour and immediacy of saving the lives of combat casualties. Prevention is focused on potential threats, requires considerable investment of resources (eg, money, personnel, supplies, equipment, time), and involves modifications of behavior by units and individuals. And if prevention is successful, nothing happens. In this situation, the command emphasis required for successful prevention programs may easily be replaced by command resistance.

Commanders and their principal staff officers—chief of staff, G/J1 Personnel, G/J2 Intelligence, G/J3 Operations, G/J4 Logistics—may be ignorant of the historical impact of medical threats. They may not have been exposed earlier in their careers to military medical officers with competence in and understanding of military preventive medicine. Common attitudes of staff are reflected in the statements “If it ain’t broke, don’t fix it” and “Come back when there is a clear need or problem, Doc.” Of course by the time it is “broke” or the need is clear, it is too late for prevention. Other attitudes focus on the dangers of death or dismemberment in combat and ridicule efforts to maintain health and prevent disease. Another negative attitude is reflected in using operational security (OPSEC or the “need to know”) considerations to avoid sharing essential mission information and intelligence with medical staff sections. Commanders foster these attitudes and exacerbate the obstacles to successful preven-

tive medicine programs if they do not provide emphasis and support for these activities through both personal and corporate behavior.

Commanders can make preventive medicine a part of their daily personal behavior and a consistently high-ranked item on the list of things they vigorously check on. From a corporate standpoint, commanders can make clear to their senior staff and subordinate commanders the importance they attach to having preventive medicine involvement in all aspects of operational planning and mission execution. The commander's model should include centralized planning and decentralized execution, with priority for resources given to combat units. Subordinate commanders must be given adequate resources so they can make prevention work. Good data gathering systems are required to enable the commander to constantly check up on this area and to have a basis for rewarding success and punishing failure.

As important as these command-centered problems are the barriers to successful preventive medicine from within the medical staff. Preventive medicine is the reverse of the usual clinical medicine paradigm where the individual patient goes or is taken to the provider of care. In preventive medicine, the provider and the intervention must go to the "patient," who in this case is the military unit. Some medical personnel, while they have excellent clinical skills, have only the most rudimentary understanding of preventive medicine in general and of military preventive medicine in particular. This lack of understanding may be matched by a similarly abysmal lack of knowledge of or experience in nonmedical military matters, such as military planning, the operational environment, and the functioning of military organizations.

Medical staff sections must establish strong relationships with all nonmedical principal staff well before planning for a major military operation starts. The medical personnel must be able to recognize the essential elements of the operational plan options being developed. They can then provide information early in the planning process regarding possible medical threats and estimates of their impact on the force and mission accomplishment. Military preventive medicine officers must participate in the planning process by proactively coordinating with the Personnel, Intelligence, Operations, and Logistics staff sections; they must not remain confined with the Medical Staff section. They must bring to bear knowledge of the history of successes and failures in military preventive medicine and a detailed technical knowledge of all the elements of the multi-disciplinary preventive medicine team.

The point must be clearly made that no war has been won because one side had the superior medical treatment and casualty care capability, but throughout military history, battles and entire campaigns have been lost because of the impact of preventable disease. Preventive medicine also has a role in reducing other types of medical threats. Of equal importance is the education of commanders and staff officers, both nonmedical and medical, that preventive medicine plays a major, officially recognized role in health hazard assessment of weapons systems; transportation platforms; toxicity of fuels, propellants, and obscurants; and changes in operational doctrine that cause potential decrements in service-member performance (eg, continuous operations). A similar role for preventive medicine is also defined within force protection programs, which have become a major focus during post-Cold War military deployments and operations.

Recognition of the staff and command context within which preventive medicine activities affect a specific operational plan is as important as skill in and technical knowledge of preventive medicine and military operational planning. During a recent multinational military exercise in the United States, the medical threat from the tick vector of Lyme disease was identified. One allied force ordered permethrin for treating field uniforms after arrival in the United States. The G4 (Logistics) executed the order, which was delivered exactly on time and rapidly distributed to the allied force. However, there had been no coordination with the G3 (Operations) and G1 (Personnel) staff sections, and thus no time was allowed in the exercise schedule for training troops in the use of permethrin, nor was there time or a suitable area for application. Very few troops accomplished even partial treatment of one of their three field uniforms. A high percentage of the force sustained tick bites, and more than 24 cases of Lyme disease were diagnosed.²⁸ Even with recognition of the threat and appropriate procurement and distribution, prevention may fail if the actual implementation is not completely coordinated with each staff section, integrated into the operational plan, and understood by commanders and leaders at all levels.

The Medical Threat Estimate

The fundamental planning tool for medical staffs in general and preventive medicine officers in particular is the medical threat estimate. Appropriate analysis and development of the medical threat estimate provide the basis for interaction with the principle staff sections as the operational plan is developed.

All staff planning activity, including medical, fundamentally starts with the commander's mission statement and the operational options being considered by the staff to accomplish this mission. For each option considered, there should be an estimate of supportability from each staff section. For the medical staff, this begins with the generic elements of the medical threat, as documented in Joint Publication 4-02, *Doctrine for Health Service Support in Joint Operations*, 1994.²⁹ These elements, as shown in Exhibit 1-1, are used in making an assessment of medical threats that potentially apply to the specific operational setting and are a composite of ongoing or potential enemy action and environmental conditions that could reduce the operational effectiveness of military units.

The medical threat assessment is then applied to each of the operational planning options under consideration. An estimate is made of the potential threat to the health of the force and mission accomplishment: first, if policies and programs are not implemented for maximum reduction and control of these threats and, second, if policies and programs are given appropriate resources, integrated

into the operational plan, and supported by command at all levels. This medical threat estimate must be developed in close consultation with each principle staff section, and cost-benefit estimates should be made before the estimate is presented to command as part of the decision package. This process is outlined in Exhibit 1-2.

An essential element of both the medical threat assessment and the medical threat estimate is the absolute requirement for consistent and accurate medical reporting, sick-call surveillance, and rapid investigation of any breakdowns in program execution or outbreaks of disease. All of this must be accomplished within all units of the command, reaching down to the battalion or company level. Routine hospital reports will not accomplish this goal.

Only by having these tools at hand can the commander make informed choices during the planning process based on a sound estimate of the medical threats, the policies and programs to counter the threats, and the data gathering requirements for monitoring and rewarding success and identifying and correcting failure.

EXHIBIT 1-1

THE MEDICAL THREAT: GENERIC ELEMENTS TO CONSIDER IN REGULAR OPERATIONS AND OPERATIONS OTHER THAN WAR

Elements of Regular Military Operations

- Infectious disease
- Extremes of environment
- Conventional munitions
- Biological weapons
- Chemical weapons
- Directed energy weapons
- Blast effect weapons
- Flame and incendiary weapons
- Mobilization, deployment, and battle stress
- Nuclear weapons

Elements of Operations Other Than War

- Medical threats to the indigenous population
- General stability of the country (eg, social, political, economic, security), within which the operation is conducted
- Specific type of military operation
- Scenarios for use of force
- Application of Geneva Convention protection
- Logistical support, host-nation infrastructure, and other support considerations

Adapted from: *Doctrine for Health Service Support in Joint Operations*. Joint Staff: Washington, DC; 15 November 1994: A-1 through A-7. Joint Publication 4-02.

EXHIBIT 1-2

THE MEDICAL THREAT ESTIMATE PROCESS

1. Identify the medical threat categories that apply to the military operation being planned.
2. Assess within these medical threat categories, the specific threats that may be encountered. Rank these within each threat category (eg, disease, environmental) by probable time of occurrence (before, early in, during, or after deployment). This results in a prioritized medical threat assessment.
3. Apply this medical threat assessment to each of the operational planning options. Estimate the potential impact on the force and mission accomplishment in both the absence and presence of appropriate command policies, programs, and resource commitments for threat reduction. This is the medical threat estimate; it provides the command with decision-making information regarding operational plan options and costs for threat reduction.

Source: *Medical Threat Estimate*. Bethesda, Md: Department of Military and Emergency Medicine and Department of Preventive Medicine and Biometrics, Uniformed Services University of the Health Sciences; 1995. PMO580.

SUMMARY

The core functions of military preventive medicine have remained constant from the book of Leviticus to the present. So too has the inescapable relationship between preventive medicine and command authority. Obstacles exist to the successful development of these relationships, from both the non-medical and the medical points of view, but they can be overcome. The medical threat estimate can

be used as a tool and a process for integrating preventive medicine into the military planning process. This chapter and the rest of this text are dedicated to assisting military preventive medicine officers in their efforts to support the commanders, who are responsible for the health of their commands, by providing them the means to gain command of health.

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