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Special Presentation

Published below is the Distinguished Visiting Professor Lecture delivered by internationally renowned surgeon and medical pioneer, Michael E. DeBakey, M.D., at the 50th Anniversary Meeting of the Society of Medical Consultants to the Armed Forces (SMCAF), November 5, 1995, Bethesda, MD. As one of the original founders of SMCAF, Dr. DeBakey has also made significant contributions to military medicine. We are both honored and pleased to provide his remarks to our members and readers.

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History, the Torch That Illuminates: Lessons from Military Medicine

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As in civilian medical practice, only by recording and analyzing military medical experiences can we apply the lessons of the past to future medical practice and improve the care of military personnel. Had certain problems in World War I been recognized and addressed, their repetition in World War II could have been avoided. The end of hostilities brings such a sense of relief that we are inclined to want to put the experience behind us. But we must remain prepared for any natural emergency, and one way to do that is to study the past and incorporate its lessons in future actions.

Introduction

“Those who cannot remember the past are condemned to repeat it”¹ is a familiar dictum of Santayana. Sadly, Hegel maintained that “. . . what experience and history teach is this—that peoples and governments never have learned anything from history, or acted on principles deduced from it.”² Both statements characterize the early phases of military surgery. We failed to profit from the experiences of World War I and earlier wars, and considerable time elapsed before we learned the lessons of World War II, primarily because we had not studied the official British and American histories of the first World War. The American history of the War was, unfortunately, delayed too long in publication; by the time the last volume appeared in 1929, most had dismissed the War from their minds and considered another world war improbable. Despite history’s incon-

testable value in guiding present and future courses in all walks of life, that subject has been increasingly neglected in school curricula and in life.

Let me cite a couple of examples of lessons unlearned from military experience. A case in point is trench foot. Several hundred cases of what was called “immersion foot” occurred during the 1943 campaign in the Aleutians.³ During the following winter, several thousand unmistakable cases of trench foot occurred within the Fifth Army components fighting on the Italian Front, and some 50,000 cases appeared among American forces fighting on the Western Front. Most of those cases could have been prevented had military physicians been familiar with a classic description of the condition, including a useful, well-written warning, written over a century before by Napoleon’s surgeon, Dominique-Jean Larrey. Trench foot, under various other names, had also been reported in the Crimean, Russo-Japanese, and Balkan wars. In World War I, the British armies had learned about it in Flanders and on the Somme, and, because they had remembered their lesson, trench foot was no problem among British troops in World War II.

We, too, had had the experience in the Aleutians in preparation for Italy and the Western Front. In the summer of 1944, in fact, the Surgeon General’s Office prophesied the debacle. At that time, I prepared a report on frostbite, trench foot, and cold injuries, in which I explained how these conditions had damaged the military capabilities of soldiers in various campaigns dating back to Napoleon. The effect had been devastating. My recommendations for prevention and care were sent through channels to Service of Supply. We assumed that someone in the higher command would implement the recommendations regarding the types of shoes and socks to be used and the protective care of the feet and hands of soldiers. Perhaps because the

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report was issued during the summer, when the heat in Washington is rather fierce, it apparently received no attention, and our soldiers were never provided the proper equipment or the proper instruction to avoid these conditions.

During the Battle of the Bulge, in the winter of 1944, the high incidence of trench foot, frostbite, and cold injuries created a great furor and a near-scandal as war correspondents severely criticized the Department of the Army and the Surgeon General for not having prepared our soldiers for this eventuality. I was able to pull out my memorandum showing the date of the summer of 1944, forecasting the possibility and making recommendations for its prevention. This incident illustrates the importance of the higher command heeding and following up on the recommendations made by medical personnel.

Other lessons were similarly ignored, with unfortunate consequences. Had we read about, and remembered, the many futile attempts in World War I to sterilize wounds with antiseptics, we would not have depended so heavily on such extraneous substances as sulfonamides early in World War II. And had we read the report of the Inter-Allied Surgical Conference in Paris in 1917, we could have applied the essential principles recorded there for the management of war wounds and would thus have avoided the cost of this oversight to our men in World War II.

The history of the American Medical Department in World War I contained discussions of the use of body armor, and protective devices were adopted by the Air Force in World War II, with considerable reduction in wounds and deaths. This experience and several intensive studies suggested that such protection during active combat could reduce fatalities by 12% and lower the incidence of wounds by 8%.³ Yet body armor was not in use on any front when the Pacific War ended. Again, we failed to heed history's lessons.

Instances of such failure are abundant. Convalescent camps, authorized for each hospital group in 1918, were absent from the original planning for World War II. No field hospitals were planned in World War I for non-transportable patients who needed immediate life-saving surgery, but were created only when the need arose. Ironically, the same evolution took place, although more rapidly, during World War II, even though it should have been evident that the most lethal wounds required immediate treatment if lives were to be saved. In regard to this problem, however, the Surgical Consultants Division deserves much credit for its early recognition and forward planning in the development of Auxiliary Surgical Groups or mobile surgical teams as a means of bringing definitive surgical care to the seriously wounded in the forward areas. This recommendation by the Surgical Consultants Division was made to the Surgeon General, who approved it and then requested early in 1943 that these groups be organized under the command of Colonel James C. Forsee at Lawson General Hospital in Atlanta, Georgia, into various specialized surgical teams, including general surgeons, thoracic surgeons, neurosurgeons, plastic surgeons, maxillofacial surgeons, orthopedic surgeons, and anesthesiologists. The Surgical Consultants Division selected and recommended the personnel for the various teams for four complete Auxiliary Surgical Groups. Later, a fifth group was added. The surgical personnel of these groups were highly trained specialists in their respective fields, with Board certification or equivalent training. Their earliest experience, represented by the Second Auxiliary

Surgical Group in the Theater of Operation, took place in the Fifth Army in North Africa, Sicily, and Italy. At first they were not readily accepted, owing to the rigid Army's Tables of Organization for Evacuation and Field Hospitals and some resentment by the personnel of these hospitals, who felt it was their responsibility to take care of all the wounded in their hospital. Fortunately, this problem was resolved fairly satisfactorily by the wisdom and diplomatic counsel of Colonel Edward Churchill, the chief surgical consultant, and by Colonel Forsee, the commanding officer of the Auxiliary Surgical Group. Perhaps the biggest factor in their general acceptance and subsequent extensive use in the other armies of the European Theater of Operation was their demonstrated excellent performance in the management and treatment of the seriously wounded soldiers, particularly those with extensive penetrating wounds of the chest and abdomen, and the dramatic reduction in mortality and morbidity of these soldiers.

Each team in the various specialties consisted of a chief surgeon (usually at the rank of major), an assistant surgeon (captain), an anesthesiologist (first lieutenant), a surgical nurse, and two enlisted technicians. They were deployed as needed to the forward installations, such as the Field or Evacuation Hospitals, and occasionally to a Clearing Station. Accordingly, they functioned in mobile installations, usually within 3 to 15 miles behind the front battle lines, and therefore were able to treat the severely wounded often within one-half to one hour after the injuries occurred. Their use in the early phases of the war in North Africa and Sicily was the first time in this or any previous war that such casualties were cared for with this level of surgical expertise in the field hospital adjacent to division clearing stations and with the intrinsic personnel of the field hospital platoons augmented by teams from an Auxiliary Surgical Group. Incidentally, this high quality of surgical care at the level of the clearing station and field hospital proved highly advantageous for the morale of the troops.

Because of the relative shortage of highly qualified surgical personnel, the Auxiliary Surgical Groups were used to great advantage by deploying them as mobile surgical teams not only in the most forward installations, but also in the rear in general hospitals in the communication zone. Because of their competence, they could be assigned as needed at different levels of care and could be returned to their own headquarters once they were no longer needed and the organic hospital staff was able to take care of the wounded.

Another important function of the Auxiliary Surgical Groups was the maintenance of extensive and accurate individual case records. These records proved to be of great value not only by providing critical information during the war through careful data analyses in the development, modification, and establishment of policies that improved the management of the wounded and their proper evacuation, but also by providing highly useful information for military medical planning and logistics. Indeed, in the preparation of the book entitled *Battle Casualties: Incidence, Mortality, and Logistic Considerations* by Colonel Beebe and me,⁴ we relied heavily on analysis of data compiled by the Auxiliary Surgical Groups. During the Korean War, this concept of mobile surgical teams or Auxiliary Surgical Groups attached to a Field Hospital became incorporated as the Mobile Auxiliary Surgical Hospitals (MASH).

From these few examples, it is evident that we should consistently record and analyze each medical military experience and incorporate into future plans lessons learned from such analyses. That is, after all, the way we practice all medicine.

Professional Consultants

Within 3 months of our entry into World War II, a Professional Consultants Division of full-time officers was established in the Office of the Surgeon General (Fig. 1). Professional consultants were also assigned to every theater and all the Zones of the Interior, with the responsibility of assessing and evaluating the activities in their area and of making appropriate recommendations. They were often called in to make personal reports to the Surgeon General or to General Rankin, the head of the Consultants Division. Brigadier General Rankin deserves great commendation for his native intelligence, trained competence, and dedicated honesty of purpose; his uncompromising objective was to provide American soldiers with the best surgical care possible. The consultants, whose Chief in the Mediterranean Theater was Colonel Edward Churchill (Fig. 2) and in the European Theater was Brigadier General Elliott Cutler, were chosen carefully for their training and ability. They traveled to the war zones, so that their concepts and influence became widely distributed, and, without treating patients themselves, they were responsible for the saving of countless lives.

The first major combat experience during World War II came in North Africa and Italy. Because of the investigative training and experience of some of the medical units, they had the ana-



Fig. 1. Service Command Surgical Consultants at their meeting with General Rankin and his staff, October 10-11, 1944, in The Surgeon General's office, 1818 H Street N.W., Washington, D.C. Front row (left to right): Colonel John B. Flick, Colonel B. Noland Carter, Colonel I. Mims Gage, Brigadier General Fred W. Rankin, Colonel W. Barclay Parsons, Colonel Bradley L. Coley, Colonel Grover C. Penberthy. Back row (left to right): Major R. Gordon Holcombe, Lieutenant Colonel James J. Callahan, Colonel Thomas L. Waring, Colonel Claude S. Beck, Colonel Walter D. Wise, Lieutenant Colonel Condict W. Cutler, Jr., Lieutenant Colonel Robert L. Preston, Lieutenant Colonel Ralph Soto-Hall, Lieutenant Colonel Stephens Graham, Colonel John J. Lontzenheiser, Lieutenant Colonel Michael E. DeBaakey, Lieutenant Colonel A. R. Shands, Col. Byrl R. Kirkin. (From: *Surgery in World War II: Activities of Surgical Consultants, Volume I*, Medical Department, United States Army, prepared and published under the direction of Lieutenant General Leonard D. Heaton, The Surgeon General, United States Army. Editors in Chief: Colonel John Boyd Coates, Jr., and B. Noland Carter, Office of the Surgeon General, Department of the Army, Washington, D.C., 1962, page 13.)

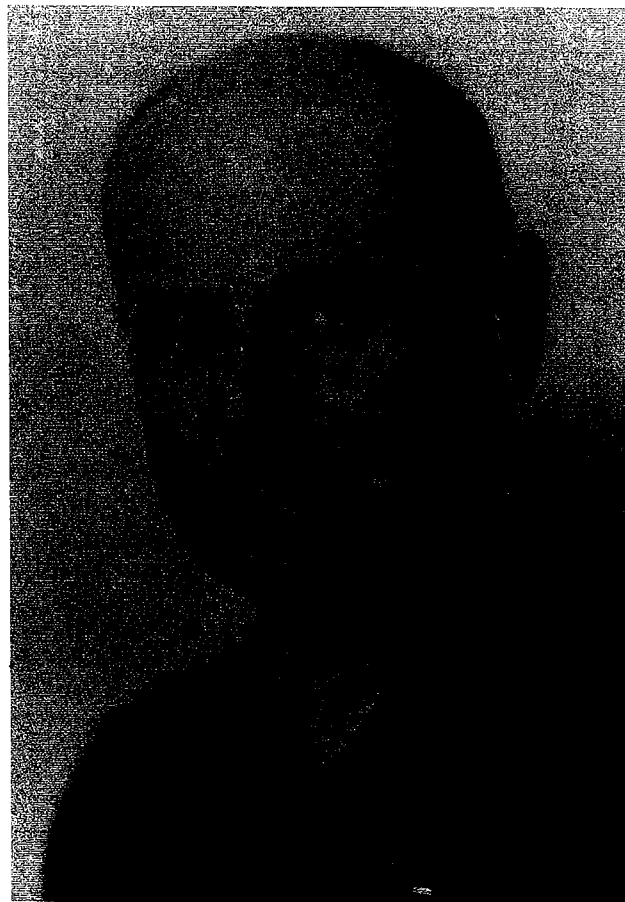


Fig. 2. Colonel Edward D. Churchill, Chief, Surgeon-General Consultants, Mediterranean Theater, World War II.

lytic capability of recording and assessing the medical data and thus of improving procedures and practices. When I was sent from the Surgeon General's Office to North Africa for assignment to the 5th Army, in consultation with Colonel Churchill, to assess experience gained by the Army medical services in North Africa and Italy (Fig. 3), I returned with considerable information on which to base standard procedures for the care of the wounded in battle. The information I brought back allowed us to write T B Med 147 in March, 1945 (Fig. 4), which we prepared on

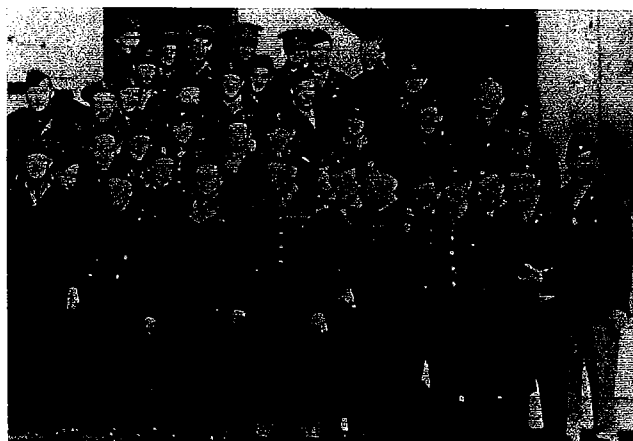


Fig. 3. Professional consultants, Fifth Army, North Africa, World War II.

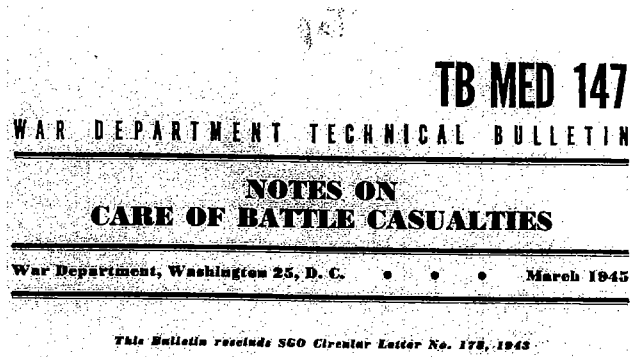


Fig. 4. Technical Bulletin 147: Notes on Care of Battle Casualties, March 1945.

the basis of recommendations derived from the experiences of Churchill and his medical officers in the Fifth Army.⁵ That document was the first comprehensive policy statement on how to treat battle casualties, so you can see how long it took to obtain such a policy. T B 147 replaced T B 146 of 1943, which means that between those two dates there was no official procedure issued for this purpose. Once issued, however, T B 147 became the standard for management of the wounded.

Many principles were established during World War II that could be applied to civilian practice but that otherwise would have required many more years for adoption. A major advance was the concept of phased wound management developed by Colonel Churchill early in the Mediterranean fighting: (1) initial wound surgery, a function of advanced hospitals in the Army area, concerned with surgical procedures designed to save life and prevent or eradicate wound infection; (2) reparative surgery, a responsibility of general hospitals in the Zone of Communications concerned with procedures designed to abbreviate the period of wound healing, restore early function, and minimize ultimate disability; and (3) reconstructive surgery, a function of general hospitals in the Zone of the Interior, concerned with correction of deformities and rehabilitation in general.³ The first two phases took advantage of established principles of wound healing. The concept was based on the fact that shortly after the first phase, most patients (except those with penetrating wounds of the chest and abdomen) are safely transportable, whereas immediately after the second phase, they become non-transportable for varying periods. Proper coordination of the three phases permitted an approach to ideal management of virtually all wounds and even for resuscitation within a military setting. Owing to improvements in rapid transportation and greater accessibility, experience in Korea and Vietnam has permitted certain modifications in these principles of wound management that have enhanced patient care.

In the September 1944, issue of the *Annals of Surgery*, Churchill described the three-phased procedure in "The Surgical Management of the Wounded in the Mediterranean Theater at the Time of the Fall of Rome," a paper Brigadier General Rankin described as "one of the finest dissertations on management of wounds. . . submitted through the Office of the Surgeon General of the U.S. Army."⁶ In the Foreword of that report, Rankin also paid tribute to the role played by the professional

consultants and to their "administrative, correlative, advisory, educational, and analytical functions." Selected for their special training, eminent qualifications, and extensive background and attached to every Service Command in the Zone of the Interior and to all active Theaters of Operations, the consultants performed—and again I quote Rankin—"an incalculably valuable function in promoting higher standards of medical practice" during World War II.⁶ General Rankin recognized Churchill's scientific spirit and flexibility of mind, which allowed him, as Surgical Consultant to the North African and Mediterranean Theaters of Operations, to use an investigative approach and battlefield experience to develop more rational and effective methods in the surgical care of the wounded. The three-phased procedure represented a contribution not only to military surgery, but also to medical science.

The importance of blood transfusions and the delineation of the respective places of plasma and whole blood in resuscitation had similarly not been previously realized. Other improvements in medical practice as a result of the war experiences included anesthetic methods and rehabilitation and reconstruction. The paraplegic program exemplified the humanity with which medicine and surgery can be practiced.

Lessons from Medical Military Research

Although significant information about shock and hemorrhage and about empyema was available from research studies during World War I, the importance of this information was ignored, and the policy early in that war was to discourage clinical investigations in Army hospitals; instead, they were referred to the National Research Council for study by civilians. As a result, there were many delays and false starts associated with research throughout most of the war. Later, when the ban on research was lifted, much valuable information resulted from the work of small groups of investigators in the field. Unfortunately, data from the field were supplied to civilian investigators within the limits permitted by security regulations, but these regulations were often narrowly interpreted, and much of the data therefore never reached the civilian workers.³

Reports were made to appropriate subcommittees, but complete integration of ideas and purposes was rarely achieved because of the fundamental fallacy that a military problem could be detached from its military environment, solved as an abstract problem in a civilian laboratory by civilian investigators unfamiliar with the point of origin, and the solution could then be neatly returned to the military surgeons. The civilian investigators, themselves, recognized the impediments and recommended that only those projects be referred to them that could not be carried out in the military setting.

In spite of the recognition in 1942 that tannic acid jelly should not be used for treatment of burns, use of all escharotics was not discontinued until the following year, when oily, nonadherent agents alone were recommended. The civilian committee was slow in making this determination.

The evolution of recommendations for chemotherapy was similarly delayed. Early recommendations for inclusion in first-aid kits of sulfonamide tablets for oral use and of dusting powder for wounds, despite inadequate data to justify such treatment, was followed by findings in 1,000 cases that when predisposing factors exist for the development of infection in

accidental wounds, the use of chemotherapeutic agents does not prevent infection, although systemic therapy may be of value in avoiding invasive sepsis. After reports from the Mediterranean and European Theaters of the ineffectiveness of local chemotherapy in wound infections, the directive was finally issued forbidding local use of sulfonamides and removing them from the first-aid kits.

In contrast to these experiences, investigations of penicillin and streptomycin were designed far more effectively. Civilian investigators working under the National Research Council set up the studies, and, when they became fully operational, turned them over to members of the Army Medical Corps specially qualified for this work. As a result, when these agents became generally available, the principles of usage were well established, and their limitations and risks clearly defined. The excellent integration of civilian and military efforts here provides a lesson for future planning for research in similar emergencies.

On March 5, 1946, I sent Surgeon General Kirk a memorandum pointing out the unprecedented amount of valuable clinical material available that should be turned to practical use by the establishment of a long-term follow-up clinical research program on Army material, to determine the natural and post-treatment history of selected diseases and conditions. Such a program, I advised, would provide a rational basis for the development of professional procedures and operational policies. I suggested that a recollection of the manpower shortages and other difficulties that frequently occurred in World War II would make clear the utility of such data. Follow-up studies on pilonidal sinus in 1944, for example, showed that existing policies for surgical treatment were wasteful of manpower and that a more conservative policy would save more than 435,000 person-days per year. Other studies provided equally practical results. I recommended that the project be a joint undertaking for the Army and Veterans Administration under the National Research Council, with various subcommittees. The resulting program was the first research undertaken by the Veterans Administration, which has contributed a great deal since then.

The Implications of Military Surgery in Civilian Medicine

On September 2, 1945, World War II ended rather abruptly after our bombing of Japan (Fig. 5). Thousands of casualties in the European and Pacific Theaters began returning home for reparative surgery and rehabilitation. Fortunately, we had had

the foresight to establish specialized centers in vascular surgery, orthopedics, plastic surgery, and neurosurgery—all well-manned with civilians (Fig. 6). Had these centers not been organized, we would have been caught short, with no cohesive plan for this eventuality.

At the end of the war, many patients returning from the Theaters of Operation required further hospital, medical, and surgical specialized care. Again, there had been no planning—no lessons from the previous war. It was a crisis situation, with virtually all surgical specialists leaving the Army. Rankin and Carter, for example, had both left, and I remained alone in the Surgeon General's Office. Surgeon General Kirk asked me to stay (Fig. 7). Because the regular Army could not take over the crisis, it was decided to ask 100 specialists to remain for another year, caring for the casualties and training the full-time military personnel to take over after that. This recommendation was sent to Tracy Voorhees, Assistant Secretary of the Army, with the suggestion that each of the 100 be given an immediate promotion for staying another year. I called each of the 100 personally with our request, and it is a tribute to their character and commitment that not a single one refused, even though some were professors at major medical schools and had been on military duty, away from home, for 4 years. This effort began the training program for medical military officers. General Hawley, Chief Medical Officer of the European Theater, and Paul Magnuson, Chief Consultant in Orthopedics, were brought in to reorganize the Veterans Administration and rapidly prepare it to take over. It was in their endeavor that the concept of the affiliation of the Veterans Administration hospitals with medical schools originated.

I have mentioned a number of errors and oversights made in military medicine only to emphasize the importance of constant assessment and evaluation in avoiding past problems. In no way does this mean that the Medical Department of the U.S. Army was inadequate during World War II. On the contrary, it functioned superbly. Our military personnel received better care than had ever been previously available. But the formulation of policy was clearly a matter of evolution. The Medical Corps, like most other branches, entered World War II as unprepared as at the outbreak of World War I. The fault cannot be laid at the door of the military, but rather can be traced to the apathy of Congress and the American public toward planning for war during peacetime.

The lack of direct control of the Medical Department over its own personnel was another problem, with poor distribution of specially trained personnel where they were most needed. Today, fortunately, the medical profession is fully committed to



Fig. 5. The New York Times headline, September 2, 1945, signaling the end of World War II.



Fig. 6. Surgeon General Norman Kirk (second from right) and Dr. Rudolph Matas (second from left), who acted as a civilian consultant.



Fig. 7. Surgeon General Kirk with Michael E. DeBakey, who remained alone in the Surgeon General's Office after Brigadier General Fred Rankin and Colonel B. Noland Carter left.

specialization, which is now written into the laws governing the Veterans Administration. We must keep in mind, further, that specialized practice emphasizes remedial medicine and that the Medical Department is more than a salvage service. Preventive medicine and planning for future operations are even more vital functions in war than in peace. In this nuclear age, we have a totally new set of circumstances that will require the mobilization of the entire medical personnel of the nation on a disaster basis. No distinction can be made between military and civilian responsibilities, for there will be no distinction between military and civilian injuries.

The end of a war does not mean the end of the problems it creates. The injured and disabled still have to be cared for, and the entire experience has to be scrutinized to extract its valuable lessons. When those of us assigned to the Army Surgeon General's Office as consultants traveled to various war zones, we returned with a great deal of data, from which we prepared official papers and documents with recommendations to improve military medicine. Out of this experience came a book entitled *Battle Casualties: Incidence, Mortality, and Logistic Considerations*, which Gilbert Beebe and I published.⁴ Like my colleagues, I published other articles on cold injuries,⁷ vascular surgery, war wounds of the chest and extremities, experience with streptomycin in Army hospitals, and, shortly after the end of World War II, on the urgency of an analysis of our national medical resources.⁸

With the end of hostilities, however, there is always such a sense of relief that it lulls us into complacency, and we face the next emergency unprepared again. In a presentation to the Medical Service Officer Basic Course, Army Medical Service Graduate School, Army Medical Center in Washington, D.C., on February 11, 1951, Dr. Churchill pointed to this problem when he said: "A year after a war is finished scarcely any of our current periodicals will accept a paper on the surgery of wounds. It becomes a dead subject. Medical students are bored if you mention a wound. I have an old French book, published in 1791

on the subject of wounds by firearms in which the author states the same thing—surgeons in a current war never begin where the surgeons in the previous war left off—they always go through another long learning period. All military medicine, insofar as civilians are concerned, is a discontinuous specialty, consequently, in every new war the same stupid mistakes are made again and soldiers lose their lives and limbs, because the doctor was ignorant of past experience. I cannot overemphasize the need to study military medicine and surgery."⁹ On the basis of my own experience, I certainly concur in those words.

The end of the Cold War and the "peace dividend" are much in the news today, but the military and civilian medical communities must remain alert and ready for any national disaster. The experiences of World War II cannot obviously be directly transferred to the nuclear age, but neither should they be discarded lightly. If we heed those lessons, and the ones learned in Vietnam, the Korean War, and, more recently, in some of the skirmishes during Operation Desert Storm and the use of telemedicine, we will be in a better position to deal with any disaster than we have ever been in the past. And our civilian and military medical components will be prepared to cooperate in any swift mobilization necessary. Effective cooperation will require the wisdom, judgment, and discretion of the finest leadership.

I am tremendously impressed with the leadership in our military medical services today. This has been reinforced by the establishment of the Uniformed Services University of the Health Sciences. Its faculty and its medical students will now be able to sustain proper leadership in military medicine. In addition, I see some of that leadership here at the Society of Medical Consultants to the Armed Forces, whose members are doing such excellent work. I expect that you will be called upon should our nation ever face another national emergency. I know that you will be ready to accept that call, and I am confident that you will execute your task at the highest level of excellence.

Thank you very much.

References

1. Santayana G: *The Life of Reason or the Phases of Human Progress*, p 284. New York, Charles Scribner's Sons, 1920.
2. Hegel GWF: Introduction. In *Philosophy of History* (translated by Sibree J), p 6. New York, PF Collier & Son, 1900.
3. DeBakey ME: Military surgery in World War II. *N Engl J Med* 1947; 236: 341-50.
4. DeBakey ME, Beebe WG: *Battle Casualties: Incidence, Mortality, and Logistic Considerations*. Springfield, IL, Charles C Thomas, 1952.
5. Notes on Care of Battle Casualties. War Department Technical Bulletin: T B MED 147. Washington, DC, War Department, 1945.
6. Churchill ED: The surgical management of the wounded in the Mediterranean theater at the time of the fall of Rome. *Ann Surg* 1944; 120: 268-83.
7. DeBakey ME: Cold injury. Presented July 2, 1951, Medical Service Officer Basic Course, Army Medical Service Graduate School, Walter Reed Army Medical Center, Washington, DC.
8. DeBakey ME: Our national medical resources: the urgency of an analysis. *JAMA* 1945; 129: 417-9.
9. Churchill ED: The standards of military practice in the Army. Presented February 11, 1951, Medical Service Officer Basic Course, Army Medical Service Graduate School, Army Medical Center, Washington, DC.