

Larger War, Smaller Hospitals?

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For most of the U.S. Army's large-scale wars, a large hospital system was deployed. The size of this hospital system deployment was based on clinical and logistical factors, and it helped sustain fighting power in the theater of operations by returning injured soldiers to duty near the fighting. By the 1990s, the desire to have a smaller deployed medical "footprint" led to the Department of Defense (DOD) reducing the number of deployed hospitals while improving the en route care capabilities of strategic air evacuation to DOD hospitals at Landstuhl, Germany, and in the United States. This solution worked well as long as U.S. forces were not challenged in the air.

Recently, the Army recognized that battlefield challenges could make rapid evacuation of casualties impossible at certain times and places, and the U.S. Army Medical Center of Excellence is exploring mitigation for the challenges of prolonged care before the hospital. Similarly, U.S. forces may not be able to promptly evacuate patients from a theater of operations to hospitals in the United States, and the size of the deployed medical footprint may be too small. Army logisticians are examining the challenges for "just in time" logistics in large-scale combat operations, and the Army should also consider the implications if just-in-time evacuation fails.

Big Wars, Big Medical Systems

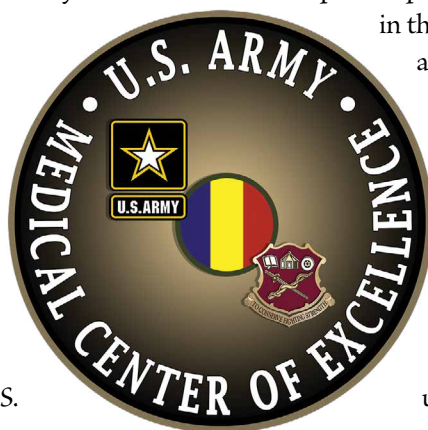
During World War I, the United States deployed over two million "doughboys" to France. The distance from the port of New York to Bordeaux, France, was over 3,600 miles, and troopships traveling at fifteen knots needed

roughly ten days to complete the trip. Any patients evacuated from France to the United States had to be healthy enough to survive that ten-day voyage because even hospital ships had limited medical capabilities, and the hospital ship would run the risk of submarine attack

in the Atlantic. (No U.S. hospital ship was attacked, but over a dozen Allied hospital ships were torpedoed in the Atlantic and adjacent waters, and others hit mines.) Thus, the American Expeditionary Forces (AEF) deployed a large medical system to support the theater. There were mobile hospitals in the combat zone, and divisions had their own medical units, but there was also a substantial communications zone (rear-area) medical

system of fixed facilities for both area support (camp hospitals and dispensaries) and long-term recovery in base hospitals. The fighting was expected to be bloody, and it was. For example, the AEF suffered 70,000 wounded, 19,000 gassed, 2,000 psychiatric casualties, and 69,000 sick and injured in the Meuse-Argonne fighting from 28 September to 11 November 1918. The total number of casualties from that one battle was 160,000.¹

Sick or injured patients, who were very likely to return to duty, outnumbered the wounded, and even many of the wounded and gassed could return to duty after recuperating and convalescence. The AEF established a 120-day evacuation policy, which stated that patients who needed more than 120 days to recover would be sent to the United States; everyone else would be kept in France. Therefore, the hospital system had to be large enough to care for the long-term patients until they could be sent home and for those who would recover





sooner. With the large AEF, the hospital system was large as well; there were over 157,000 beds in the base hospitals, 25,000 more beds in the camp hospitals for routine sick and injured, and about 20,000 cots (without medical attendants) in convalescent facilities.² At times, over 9 percent of the AEF was on sick report (due to the influenza pandemic), so the large medical system was necessary.³ The range of therapeutic drugs was also limited, so most patients got better because their own immune systems fought off infections, aided by supportive care in hospital beds. As an example, there was no measles vaccine and no antibiotics to treat complications associated with measles: the 96,817 measles patients (from an epidemic starting in November 1917) were each hospitalized an average of nineteen days.⁴

The medical system had a silver lining: it returned most patients to duty. This reduced the number of men who had to be shipped to France, freeing shipping space for other purposes and reducing the number of men drafted. Of the 1,000,683 soldiers

hospitalized in France, half of the AEF, 93 percent recovered to return to duty.⁵

The fundamentals had not changed by World War II, though the war was larger and longer than World War I. The worldwide war meant shipping capacity was stretched in more directions over even longer distances, and more depots had to be established; the longer duration meant returning patients to duty was even more important. World War II ships were somewhat faster than those in World War I, but in World War II, they were at risk from air attack as well as submarine attack; convoys had to zigzag their whole route instead of just passing through a small danger zone. Air evacuation was certainly used, with about 121,000 patients flown back to the United States (19 percent of the total number of patients), but the overall death rate of four out of one hundred thousand patients (including shorter, intratheater flights) shows the careful selection of patients for air evacuation. The Army Medical Department (AMEDD) was well aware of



the limits of en route care (a single nurse per aircraft, with virtually no medicine available) and exercised great caution in selecting patients for air transport. In contrast, over 518,000 patients were brought to the United States by sea.⁶ Thus, for most of the war, most patients (63 percent) were healthy enough to travel by troopship with extremely limited medical attendance, and the more severely wounded patients (18 percent) returned by hospital ship.

As in World War I, a 120-day hospitalization policy was standard so that most patients would recover in theater, reducing the number of replacement soldiers needed. Again, large fixed-facility hospital systems were deployed, complementing the large number of mobile hospitals that were forward with the divisions, corps, and armies to provide the initial care. The European theater had over one hundred thousand fixed beds (now termed general hospitals for definitive care and station hospitals for area support); the Pacific theater also had over one hundred thousand beds, while

An aerial photograph of the Beau Desert Hospital Center in 1918 in Bazoilles-sur-Meuse, France. The American Expeditionary Forces had multiple hospital centers, clusters of hospitals with up to twenty thousand beds, plus capacity. (Photo courtesy of the National Library of Medicine)

the Mediterranean theater had about half that number. In the United States, the fixed hospital system had over 153,000 general hospital beds for the wounded and complex patients, and another 101,000 station hospital beds for the short-term sick and injured.⁷

Smaller Wars, Same System

Medical doctrine saw limited change for the wars in Korea and Vietnam. Medicine changed; antibiotics and whole blood were widely available in deployed hospitals where they were not as accessible before, and medical training improved to produce more specialized practitioners.⁸



Operationally, the most notable change was adding helicopters to speed medical evacuation to the hospitals. Combat-zone hospitals changed their capabilities to suit new wartime circumstances, but the communications zone hospitals remained unchanged. While doctrine was unchanged, the wartime circumstances had changed. Neither the Korean War nor the Vietnam War needed the large hospital systems to deploy to the theater of operations because in both wars, there were many hospital beds offshore, especially in Japan.⁹ Korea is close to Japan, and the general and station hospitals established during the military occupation of Japan were used to support the fighting in Korea. There was no need to reinvent the wheel and establish hospitals in Korea when they were a short trip away. Existing hospitals were expanded, upgraded, and received more staff, including Japanese and American civilians, while more hospitals were deployed.¹⁰ Eventually, there were about fifteen thousand Army hospital beds in Japan. The introduction of pressurized aircraft made long-range medical evacuation possible for

Lt. Katy Swope checks patients in July 1943 while they are evacuated from Sicily to Africa for further medical treatment. Fixed-wing air evacuation was used in World War II, typically with a nurse and a medic per aircraft. En route care was very limited, so patients typically were not flown until they were stable, after several days of hospitalization. (Photo courtesy of the National Museum of the U.S. Air Force)

more patients, certainly for the very short flight to Japan, but also for the multistop trip to the United States. En route care was still extremely limited, so patients needed several days or weeks in Japan before it was safe to fly them back to the United States.

The evacuation policy fluctuated. When fighting was heavy, more patients were returned to the United States after stabilizing care, while when the fighting was lighter, a 120-day evacuation policy meant that far more soldiers would return to duty in the Far East. Available data is scant, but out of the tens of thousands of patients treated, about 80 percent of those treated could return to full duty.

In Vietnam, there was a blurring of fixed-facility and combat-zone hospitalization. With fixed bases and no front line, combat-zone hospitals were deployed and semipermanent facilities built for them. When combat operations changed in location and intensity, it was more common to move medical personnel to augment existing facilities than to move hospitals to new base camps, though that did happen. Jets replaced propeller aircraft for strategic lift, speeding evacuation from theater, but there was no change in the en route care capabilities: patients needed to be stable for the six-hour flight to Japan or the ten-to-eighteen-hour flight to the United States, and it could take six to ten days before a patient was safe to fly.

The evacuation policy was set at thirty days, so patients who were expected to recuperate in less than a month were kept in Vietnam. This led to establishing a convalescent center in Vietnam in May 1966 that focused on malaria patients (50–65 percent), but it also received hepatitis patients and the postoperative wounded. The 6th Convalescent Center had an average of over one thousand patients per month, 96 percent of whom returned to duty, which is the equivalent of one to two battalions per month.¹¹ (Late in the war, the 6th was tasked to treat drug-addicted soldiers before they returned to the United States.)

The 6th was only part of the medical system that returned 42 percent of wounded soldiers to duty in Vietnam.¹² Offshore hospitals also supported operations in Vietnam. The Air Force hospital at Clark Air Force Base in the Philippines was used, as was the Army hospital on Okinawa (which was still under U.S. military governance). In 1965, the Army both augmented the existing hospitals in Japan and established three general hospitals to treat patients under a sixty-day evacuation policy.¹³ Between 1965 and 1970, the hospitals in Japan returned around ten thousand soldiers to duty in Vietnam, which translates to about 8 percent of the wounded, or around twelve infantry battalions.¹⁴

Late Cold War Changes

After Vietnam, the Army changed its doctrine and force structure, but it took a decade before the deployed medical system was examined. In 1984, the vice chief of staff of the Army, Gen. Maxwell Thurman, challenged the AMEDD concepts that had not changed since the

early years of the Vietnam War. Thurman started a medical system program review (MSPR) that looked at medicine in both garrison and field operations.¹⁵

The 1960s doctrine had been based on a draftee Army. At that time, replacement manpower for sustained combat power could come from the large reserve components and increased draft calls. Therefore, while field medical care was important, the medical system was not necessarily a critical part of sustaining combat power. It was extremely useful and reduced the transportation problem, but the reserve components would provide units and manpower quickly until the draft produced still more manpower. Switching from a draft to an all-volunteer force reduced both the active duty forces and the reserve components, and the numbers in the training bases declined as well. Thurman pointed out that wounded soldiers who returned to duty would be the main replacement stream for the first 120 days of combat.

Meanwhile, medical researchers identified the main causes of death from combat.¹⁶ The AMEDD had previously focused on areas under physicians' control—the hospitals—and had substantially reduced the died-of-wounds rate, which applied to wounded who died after admission to a hospital.¹⁷

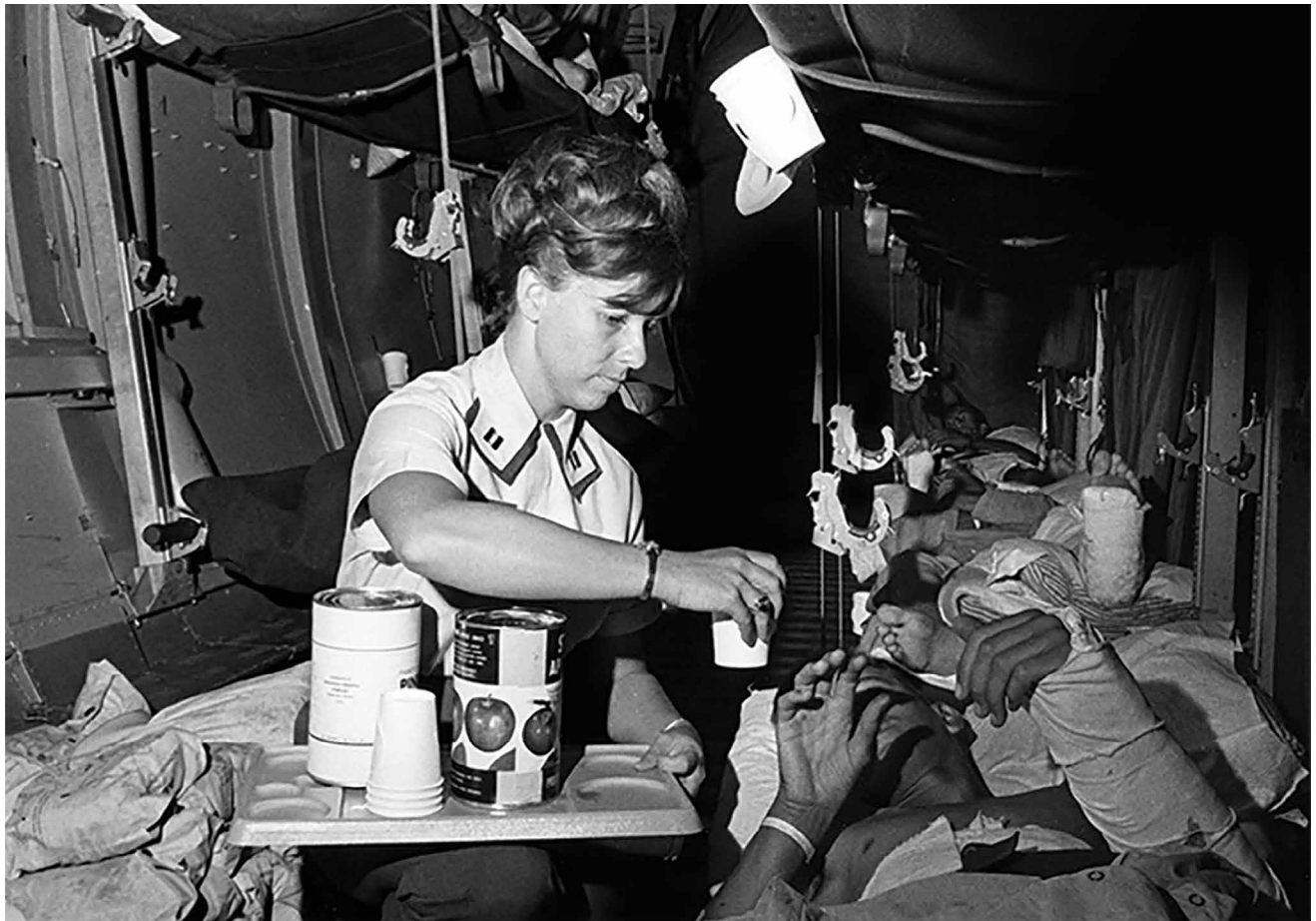
The new data pointed to patients dying before they were admitted to a hospital where they would be categorized as killed in action. Thus, to reduce fatalities (whether killed in action or died of wounds), medical care before the hospital had to be improved. All these changes set the conditions for the MSPR.

That review led to many changes in the AMEDD. To improve unit-level medical care,

- more medical skills for self-aid and buddy-aid were included in initial entry training;
- combat lifesavers were introduced;

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- 91A (basic combat medic) training was upgraded to emergency medical technician–ambulance standards; and
- the 91B (senior combat medic) military occupational specialty, which was previously awarded on promotion to sergeant (assuming the individuals would have received on-the-job training), was now awarded after completion of a new “Super B” training course to ensure senior medics would be able to supervise their juniors.

Deployed hospitals were also overhauled. Tables of organization and equipment were updated to reflect a new generation of vehicles (five-ton truck versus the two-and-a-half-ton truck) and other routine updates of equipment. Simultaneously, hospitalization in the theater of operations was revised, driving changes to types and sizes of hospitals.¹⁸ As early as possible after their admission to the hospital, casualties were identified as “return to duty” (RTD) or for evacuation to the United States (not RTD). Hospitals in the corps area were simplified to the mobile army surgical hospital (sixty beds, all surgical, intended for not RTD) and the

Air Force flight nurse Capt. Shirley A. Armstrong hands out cups of apple juice to the wounded on a C-141 Starlifter in November 1966 during a medical evacuation flight from Tan Son Nhut Air Base, South Vietnam. By the time of the Vietnam War, aircraft were faster and pressurized, but en route care was still very limited, and patients needed several days in hospitals to be stable enough to safely fly. (Photo courtesy of the U.S. Air Force Medical Service)

combat support hospital (three hundred beds, a mix of medical and surgical, intended for RTD). The communications zone (behind the corps) would have general hospitals (one thousand beds were intended to be used to stabilize patients before they evacuated to the United States) and field hospitals (five hundred beds for low-acuity care, for RTD).

Also in the communications zone, medical holding companies were added, each with 1,200 cots for convalescent patients who needed specific exercises before returning to combat. The overhaul not only focused on returning patients to duty, but it also reduced the number of hospitals overall while still increasing the number of operating room table-hours available for

casualty care. Fewer beds were required because fewer soldiers were getting sick (for example, from improved vaccines), and those who did get sick were spending less time hospitalized because of improved pharmaceutical therapies. Air evacuation became the standard mode of strategic evacuation, but it would still be used after hospitalization in theater because en route care

paper, Iraq had formidable forces—nearly one million soldiers and around five thousand tanks, plus chemical and possibly biological weapons—so the Army treated the Iraqis as capable foes, and it deployed the force structure and used the doctrine for World War III. Knowing Iraqi capabilities, especially with weapons of mass destruction, there was no reason to take risks with

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was still a substantial step down in capability from the intensive care unit that hospitals provided. The MSPR and subsequent reviews recognized that earlier air evacuation would allow shifting some hospitalization out of theater, and the Army engaged the biservice Airlift Concepts and Requirements Agency to have it studied by the U.S. Air Force (USAF).¹⁹

However, for the foreseeable future, the Army of the late 80s would have a large theater hospital system for two reasons. First, the forces engaged in a large-scale combat operation would be large (perhaps five hundred thousand soldiers deployed to Europe for a potential World War III in addition to other U.S. services), and they would be facing a capable opponent. Second, there would inevitably be disease and non-battle injury patients. The Total Army Analysis was expecting some 360 casualties per division per day, of whom 143 would need treatment beyond the division rear.²⁰ (The 143 wounded lost to a division plus the 36 killed, captured, or missing, meant the division lost about a company of soldiers each day of action, or each and every platoon lost a soldier.) Six division-equivalents stationed in Germany (and three more due to reinforce) implies that well over one thousand patients a day needed rear-area hospitalization. Casualties among corps- and theater army-level units would increase that number to around 1,500 per day. Patients needing roughly a week to stabilize for strategic air evacuation implies a bare minimum of twelve thousand rear-echelon hospital beds were needed to allow a modest cushion against casualty spikes or delays in evacuation.

Instead of World War III, the Army ended the Cold War fighting Iraq in Operation Desert Storm. On

hospitalization. The Army, following doctrine, supported the roughly three hundred thousand deployed soldiers and deployed forty-four hospitals, from mobile Army surgical hospitals (to follow the combat troops) to general hospitals and field hospitals for rear-area support; these hospitals totaled 13,400 beds in aggregate.²¹ These bed numbers were fortunately overkill for the 467 wounded in action, and for the 14,530 disease and non-battle injury patients who needed in-patient care over the yearlong deployment.²² The hospitals provided excellent care and returned most soldiers to duty, but deploying so many looked foolish in retrospect: the logistical burden was quantifiable, but the amount of insurance provided could not be calculated.

Slimming the System

During the 1990s, with the Soviet Union gone and a more benign world, the U.S. military was cut. To defend the nation's interests with fewer assets required changes, and one change was to the medical evacuation system. The USAF introduced critical care air transport teams (CCATT) that provided essentially ICU-level en route care on ordinary transport aircraft. After the 1993 “Black Hawk Down” episode in Somalia, the Army hospital in Somalia had to send a physician and respiratory therapist on the medevac flight, but later in the 90s, the USAF would provide that type of care. With no drop in care during evacuation, patients no longer needed to stay in theater until they recovered enough for safe evacuation, and thus, the number of hospitals to hold them could be reduced. Large quantities of hospitals were cut from the force structure.



Operation Enduring Freedom never had more than about fifteen thousand personnel deployed, and the medical “footprint” was scattered to support the bases but never needed many hospitals. Operation Iraqi Freedom had far more hospitals deployed but only for the invasion. The only remaining mobile Army surgical hospital was deployed alongside six combat support hospitals, one field hospital, and Navy facilities.²³ That was because the evacuation system could not be robust enough to support the operations; there were no forward airfields for C-17s to evacuate from, and CCATT were not trained to operate in C-130s. During the occupation of Iraq, medical support for U.S. forces was handled by two split-based combat support hospitals located near airfields. When more U.S. forces were deployed for the surge, to a maximum of some one hundred sixty thousand U.S. personnel from all services, no more hospitals were needed because the extra casualties could be handled by more air evacuations.²⁴

Implications for the Future

As long as U.S. air evacuation capabilities are not interdicted, low numbers of deployed hospital beds

Lt. Gen. Frank Helmick, Multi-National Security Transition Command–Iraq and NATO Training Mission–Iraq commander, speaks with a U.S. military patient 27 May 2009 at Ibn Sina Hospital in the International Zone of Baghdad. For most of the operations in Iraq, U.S. hospitals were not operating in tents and having to move as they presumably would in large-scale combat operations. (Photo by Sr. Airman Clayton Murray, U.S. Air Force)

should not pose a problem. Even with more casualties, patients can be evacuated from deployed hospitals. However, projected multi-domain operations suggest the United States will not have unchallenged air capabilities, even for nonthreatening evacuation missions. The Army’s deployable hospitals are being restructured (from combat support hospitals to field hospitals and hospital centers), and by fiscal year 2021, there will be around four thousand deployable beds, counting both active duty and reserve components. While casualty forecasting is not an exact science, any large combat operation against a highly capable foe, especially one with chemical, biological, radiological, nuclear, and explosive capabilities, could easily

overwhelm the hospital capacities. Having too few hospital beds would reduce both the ability to treat casualties and the ability to return soldiers to duty.

In 2009, Secretary of Defense Robert Gates directed that operations in Afghanistan and Iraq be conducted so that troops could get to surgical care within sixty minutes, the so-called “Golden Hour.” The Golden Hour directive has saved lives in Afghanistan and Iraq, but its sustainability in other operations is

questionable. Gen. Mark Milley has acknowledged the challenges of Golden Hour evacuation in high-intensity operations, recognizing the number of potential casualties against tactical evacuation assets, and the possibility that evacuation would be contested.²⁵ To mitigate this tactical problem, the Army is working on prolonged care. The risk of too few hospital beds for sustained, high-intensity operations without strategic evacuation also needs attention. ■

Notes

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2. Joseph Ford, *Medical Department of the United States Army in the World War, vol. II: Administration American Expeditionary Forces* (Washington, DC: U.S. Government Printing Office, 1927), 312.
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4. Joseph Siler, *Medical Department of the United States Army in the World War, vol. IX: Communicable and Other Diseases* (Washington, DC: U.S. Government Printing Office, 1928), 411.
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7. *Ibid.*, 211.
8. For generalities of care of the wounded, see Spurgeon Neel, *Vietnam Studies Medical Support 1965-1970* (Washington, DC: U.S. Army Center of Military History, 1973), 49–58.
9. *Ibid.*, 69–70; Albert Cowdrey, *U.S. Army in the Korean War: The Medics’ War* (Washington, DC: U.S. Army Center of Military History, 1987), 270–76.
10. Cowdrey, *U.S. Army in the Korean War: The Medics’ War*, 270–91.
11. Neel, *Vietnam Studies Medical Support 1965-1970*, 68.
12. *Ibid.*, 52.
13. *Ibid.*, 70.
14. *Ibid.*, 52, 69–70.
15. AMEDD Stockholders’ Report, AHS, 1989, document on file, Army Medical Department Center of History & Heritage, Fort Sam Houston, TX.
16. Ronald Bellamy, “The Causes of Death in Conventional Land Warfare: Implications for Combat Casualty Care Research,” *Military Medicine* 149, no. 2 (February 1984): 55–62.
17. DOW (died of wounds) refers to casualties who die after admission to a medical unit and is thus an indicator of hospital effectiveness.
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