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Flying Hospitals

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“Flying Hospitals”: A Brief History of EMS in the US Military

This past September, a New York Post article lamented the news that FDNY medical and fire response times had risen for the second year in a row. Combined response times by ambulances to life-threatening medical emergencies had ‘soared’ up 3.5%, a whopping 20 seconds, to 9 minutes and 50 seconds, sparking panic from Mayor Adam’s office and a task force looking into potential causes (<https://nypost.com/2023/09/16/nyc-response-times-to-fires-medical-emergencies-soaring/>). That this seemingly minor increase was rightfully seen as an outrage speaks to how far as a society we have come to expect and rely on our Emergency Medical Services, the first responders who transport us from danger to safety and often provide medical care along the way. What many EMS patients and providers do not realize is that this publicly-funded service that many of us in the civilian sector take for granted today originated in the military.

The National EMS Memorial Foundation traces the origins of EMS back 160 years to the Civil War, when Major Jonathan Letterman established the U.S. Ambulance Corps for the Army of the Potomac (emsmemorial.org). While Letterman is considered today to be the father of American EMS, he was certainly not the first to propose the idea that mortality could be significantly reduced by shortening the time and distance between injuries in the field and medical treatment. This paper will examine the impact that war has had on medicine in the United States in terms of advancing medical transport, field care, and rapid evacuation. We will trace the major advances in emergency medical care made during several historical conflicts and, where applicable, will examine the modern corollaries in the civilian sector.

American military history, and thus American military medicine, began with the Revolutionary War. By the time the “shot heard ’round the world” was fired in Lexington, there was no overarching organization for the American military, which at that time consisted of several disjointed state militias. The Continental Army’s Medical Department was formally created in July of 1775, attempting to add some level of overarching organization to what at that time consisted of makeshift regimental hospitals. With only two civilian hospitals in the nascent United States, in New York City and Philadelphia, Dr. John Cochran proposed a “flying hospital,” a precursor of modern field hospitals, to go along with the Continental army (Steahly 15). These flying hospitals were “often located in a hut or a tent with a few beds and a surgeon’s table,” and were staffed by physicians and surgeons dedicated to military units (Steahly 17). This was a revolutionary idea for the time, as European medicine was practiced in large academic centers in large cities. With his precious troops often departing after short stints to return to farms or taken out by disease, Washington understood that he had to keep as many men in fighting shape as he possibly could. The rapid setup of hospitals throughout Pennsylvania, close to the sites of active battlefields, was an important stride forward on this front (Blanco).

As the frontlines surged and receded, the logistics of evacuating men and supplies to safety was difficult and littered with multiple failures. Even the successes of the time would be considered crude from our modern lens. As Dr. Richard Blanco puts it in “Medicine in the Continental Army, 1775-1781,” the American military victory at Saratoga was considered a medical success as “casualty evacuation, judging by the apparent lack of recorded complaints, was reasonably effective-if one can conceive of carting the wounded along rutted roads in open wagons for five to seven agonizing days as efficient” (687). Still, by the standards of the time, Washington’s medical organization was considered overall successful in maintaining the Continental Army’s readiness to fight. Beyond the clear victories in military medical organization, the importance he placed on rapidly evacuating troops to any number of rotating satellite hospitals has remained a critical interest in all subsequent conflicts.

Though there were certainly additional advancements during the several intervening decades, the Civil War saw the next major stride in emergency care in the American military. Often considered to be a major watershed moment for global military history as well as American history, the conflict saw the rapid introduction and application of technologies that were not yet existent during the Revolutionary War. Troops were moved in large numbers by rail, rifles were mass produced, and the precursor to modern machine guns was developed by Richard Gatling (NPS Civil War Series). As a result, Union casualties alone in this conflict were a staggering 140,000 killed, the equivalent of thirty Revolutionary Wars (Defense Casualty Analysis System—<https://dcas.dmdc.osd.mil/dcas/app/summaryData/casualties/principalWars>). Grave gaps in the military medical system became immediately apparent to Union brass. After the first Battle of Bull Run, Union soldiers were left to either evacuate themselves to Washington or wait for up to a week for help to reach them on the battlefield. Letterman was aghast at the total lack of organization; injured soldiers depended on friends or other soldiers to carry them from the battlefield, unless they were lucky enough to hitch a ride on a rare munitions wagon (Liebig 22). In a seeming step backwards from the Revolutionary War, the army did not bring field hospitals to any of the major battlefields in the early war. Left without treatment on their long journeys to the nearest medical facilities, “patients often succumbed during the long journeys to community facilities or died shortly after their arrival” (McGaugh).

To meet overwhelming demand and right many of the wrongs of the early war, the military medical system needed a rapid overhaul. Enter Dr. Jonathan Letterman, the son of a prominent American surgeon who attended Jefferson Medical College in Philadelphia before being named the medical director of the Army of the Potomac. Seeing the devastating conditions wounded Union soldiers were left in after the Battle of Bull Run, General George McLellan gave Letterman free reign to make any changes necessary. In addition to his equally important work in improving sanitation and supply lines, Letterman’s primary target for improvement was military evacuation. He created a well-organized Ambulance Corps of horse drawn “Wheeling Wagons” whose sole purpose was the evacuation of wounded men in the most expeditious manner possible

(Place). Letterman's ambulances were put into action across the front, where they were immediately found to have positive effect on casualties and troop morale. At Antietam, a far larger battle less than a month after Bull Run, all wounded men were recovered from the field within one day (Liebig 24). This tremendously improved soldiers' odds of surviving minor battle wounds, which otherwise could easily have led to exsanguination or infection.

In addition to bringing soldiers to hospitals with his ambulance corps, Letterman also focused on bringing hospitals to soldiers. By moving medical resources and personnel closer to the front than the better defended rear, soldiers with injuries that required immediate attention could be triaged, stabilized, and prepared for transport to general hospitals. Each brigade was given a hospital wagon, medical supply wagon, and several dedicated medical officers who could make determinations about where the wounded should be sent. These field medical officers, the precursors of modern paramedics, were crucial to Letterman's vision of an integrated military medical system, in which field care could be combined with definitive medical care at a major hospital (Liebig 24). It did not take long for these innovations to percolate into the civilian sector. In 1865, the same year the war ended, the first civilian ambulance service was launched in Cincinnati (National Museum of Civil War Medicine). Just four years later, the first municipally controlled ambulance fleet was rolled out at Bellevue Hospital in New York City by Edward Dalton, a doctor who served in Letterman's Ambulance Corps (Peck). Dispatched through a centrally operated telegraph system, these horse-drawn ambulances would clear traffic with a repeatedly banged gong or foot pedal bell, with "ambulance surgeons" aboard trained, in Letterman's fashion, "in the most easy and expeditious method of putting men in and taking them out" (Letterman—Medical Recollections). Letterman's successes transcended the war that sparked them, with his graduated model of care remaining the basis of both military and civilian EMS systems to this day.



A horse-drawn ambulance from Bellevue Hospital, 1886. (Public Domain)

Much like the Civil War, the First World War ushered in a new era for the American military and its medical system. With massive numbers of troops being transported farther from all existing medical infrastructure than ever before, the existing system was woefully inadequate. It was hoped that the great strides made in ambulance medicine prior to the war's outbreak would carry over, yet history was doomed to repeat itself; just as wounded Union soldiers were left on the field after the first Battle of Bull Run, wounded Expeditionary Force soldiers were left on haystacks and in cattle cars with nowhere to send them after the first Battle of the Marne (Hampton). With no immediate resources available in France, these men depended on individuals driving them in personal cars from the battlefield to the hospital. These brave volunteers, often without any medical training whatsoever, saved countless lives. By the time the U.S. Army officially took control in October 1917, over 3,500 American volunteers, including many whom went on to become famous authors, had served as motorized ambulance drivers in the war (Hansen). With radio technology commercially available, wounded soldiers could use signal boxes to summon ambulances, which were bravely driven through active war zones to reach their targets as quickly as possible (<https://www.emsmemorial.org/ems-history>).

By the end of the war, the American forward field hospitals on the Western Front were among the most well-resourced of the Allied forces. A well-organized triage system allowed for wounded soldiers to first be evaluated at dressing stations, where they were either kept or sent on to more established field hospitals, where emergency surgeries could be performed. From there, the most seriously wounded could also be transported via automobile and rail to the nearest permanent hospital (Reid). A far cry from the field hospitals of the Civil War, which, limited by the technologies of their time, were often little more than amputation stations, the American field hospitals in WWI were equipped with the latest technology in antisepsis and anesthesia. Some even had mobile x-ray machines, which was an immense feat for the time considering that x-ray technology had only been developed a short time before the war's onset (Reid). As the Director of the Red Cross Radiology Service, Marie Curie rapidly promoted integration of x-rays into the Ambulance Corps, creating a fleet of ambulances affectionately called "*petites Curies.*" (NobelPrize.org). These were thought to have saved countless lives and heavily influenced the rapid adoption of x-rays into civilian practice shortly after the war's conclusion.



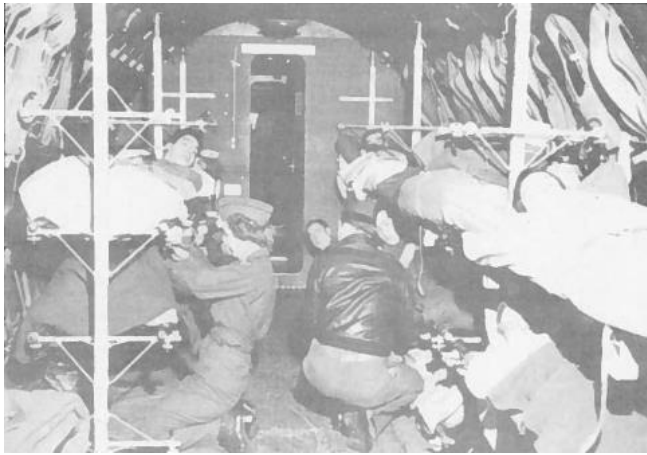
Left: Ambulance drivers lined up outside the American Hospital in Paris—“Gentleman Volunteers: American Volunteer Ambulance Drivers in WWI”

Right: A *petite Curie* mobile x-ray unit used by the French Army (Bibliothèque Nationale de France, Département Estampes et Photographie—<https://www.nobelprize.org>)

With the rapid introduction of new technologies in long distance naval and aerial travel during the interwar years, the medical evacuation and transportation capabilities of the military had increased exponentially by the time the Second World War broke out. First, there was the large-scale deployment of U.S. Navy hospital ships. While Americans had used ships as makeshift medical facilities as early as the Civil War, purposefully-built hospital ships first saw major use in WWII. The Americans learned of the value of hospital ships from their British counterparts in WWI, who famously converted civilian ocean liners for this purpose with great success (at the Battle of Gallipoli, the British evacuated over 100,000 personnel on hospital ships alone) (U.S. Naval Institute—<https://www.usni.org/magazines/proceedings/1937/september/fleet-hospital-ship>). With WWI convincing the United States military that it had to be prepared for prolonged conflicts overseas, there was an urgent need for mobile bases that could occupy the space between field hospitals and permanent hospitals. With the logistical challenges associated with fighting a war on two fronts on opposite sides of the globe, hospital ships that could house large numbers of wounded troops and ultimately transport them across thousands of miles of open ocean were invaluable (Riske—USN Hospital Ships). In World War II and all subsequent American military engagements, these ships have remained a powerful projection of both U.S. military power and humanitarian reach. USNS Comfort and USNS Mercy, the two largest active American hospital ships, continue to be deployed not only to warzones, but also in response to natural and humanitarian disasters from Hurricane Katrina to the Covid-19 Pandemic.

While hospital ships brought urgently needed medical resources far from the American mainland, the military depended mostly on aerial transports to bring its wounded soldiers back home. With the hindsight of modern technology, it is easy to dismiss how much of a feat it was at the time of WWII for the United States to simultaneously fight on two fronts across thousands of miles of ocean. With long distance air travel still largely untested at the outbreak of the war, military brass considered the development of safe, large-scale movers of troops and resources to be a critical interest. The development of the Army Air Force, and subsequently the Army Air Force Medical Services, highlighted the need for a massive paradigm shift in how war was fought. Even when bolstered by Allied hospital ships, European hospitals could not handle 672,000 wounded Americans—4 times as many as in WWI. Air Surgeon David Grant developed a framework for transoceanic evacuation using refitted C-47 Skytrains, which carried men who could survive the journey directly from Europe to New York or from Pacific islands to Australia (Nanney). These “Air Trains” were staffed by Army Air Force Aeromedical Squadrons, which consisted of a flight surgeon, technicians, and flight nurses (Nanney 10). These squadrons, which were specifically trained in flight medicine in low pressure chambers, were deployed to Europe, North Africa, and the Pacific. Aeromedical evacuation cut transport time significantly, especially

in more remote regions. In one example, aeromedical evacuation from Tunisia took one hour, whereas motor ambulance took up to fifteen, and hospital trains up to twenty-four hours (Nanney 11). By May of 1943, the Twelfth Air Force had evacuated some 15,000 patients from Tunisia, with only one death in flight.



Left: An AAF Flight Nurse adjust litters aboard a C-54 Skymaster cargo plane turned air ambulance (from James Nanney's *"The US Army Air Forces in World War II"*)

Right: An AAF Aeromedical Squadron loads a wounded patient aboard a cargo plane in Britain (from James Nanney's *"The US Army Air Forces in World War II"*)

By the end of the Second World War, over a million patients had been successfully transported by air. General Eisenhower, commander of the European Theater of Operations, showered praise on the AAF Medical Services, saying, "We evacuated almost everyone from our forward hospitals by air, and it has unquestionably saved hundreds of lives, thousands of lives." The ripple effects were far reaching, with the Army Medical Department announcing shortly after the war that aeromedical evacuation had officially become the preferred method of transporting the sick in peacetime and war (Nanney 15). In addition to instilling confidence in long-distance air transport, the successes of aeromedical evacuation in World War II also opened the door for many ancillary medical providers. Army Air Force Flight Medics, Flight Nurses (many of whom were stewardesses before the war), and medical technicians, who were specially trained in patient triage and altitude related illnesses, demonstrated the value of specialized lower-level medical providers in war and peacetime (Nanney 11). This continues to hold true in the military and civilian EMS sectors today. Most major hospitals in the United States have air transport teams that can bring critical patients from remote regions to trauma centers in a fraction of the time an ambulance would take. These remain critical lifelines for patients in rural areas with a low density of qualified physicians and facilities.

As the needs of the military changed again to fight different kinds of war in Korea and Vietnam, prehospital medicine again became a target for upgrade. At the conclusion of World War II, the military and its associated medical services were downsized significantly. The United States was ill-prepared for another war when the North Korean army swept southward in June of

1950, just 5 years after Japan had surrendered. With limited resources and medical staff available and time short to counter the North's lightning offensive, Dr. Elliot Cutler, a consultant to the Surgeon General, suggested a complete revamp of the WWII era field hospitals, "believing surgery should be brought to the soldier, not the soldier to the surgeon" (Coates). The concept of a Mobile Army Surgical Hospital (MASH) that could be quickly deployed and redeployed to meet evolving needs at the front line had great value in Korea, where the Americans were almost constantly in a state of retreat early in the war. The MASH guidelines required that hospitals be able to be disassembled and ready depart within six hours, and to be operational within four hours of reaching its destination—an impressive feat by any standard (Baker 423). While work in MASH units was grueling, with one surgeon performing 80hrs of nonstop surgery upon arriving at his post, their positive effect became immediately apparent (Baker 424). In Korea, emergency medical treatment reached new heights; wounded soldiers could be evacuated within minutes by helicopter, transported just a few miles to a MASH unit for life-saving surgery, and then transported by jet or hospital boat to permanent hospitals stateside. This in no small part contributed to the wartime fatality rate for soldiers wounded in action falling from 4.5% in WWII to 2.5% in Korea, less than a decade later (Reister)

In Vietnam, military medicine built upon its successes in the Korean War. Helicopters, which had medically evacuated 18,000 patients in Korea, became a staple in the form of the distinctive UH-1 "Huey's" (Baker 425). Rather than depending on retrofitted cargo jets as they did in WWII, the Air Force Medical Service was given specially designed aeromedical jets, C-9A Nightingales, which could complete transoceanic travel in a fraction of the time (Nanney 18). The concept of the "Golden Hour," the time between injury and definitive treatment, became an achievable standard. The Navy's Combat Search and Rescue service came into its own, with volunteer corpsmen joining airborne missions at their own peril. MASH hospitals were reproduced with the same success as they were in Korea, with the addition of Medical Unit, Self-Contained, Transportable (MUST) Hospitals, which were more permanent, air-conditioned installations. The success of prehospital medical operations in Vietnam were so great that Major General Neel's book, *Medical Support of the US Army in Vietnam (1969–1973)*, became the basis for civilian aeromedical evacuation for decades to come (Holt 35).



Left: Navy Corpsmen prepare to evacuate a wounded marine in Korea. (From “Military Medical Advances Resulting From the Conflict in Korea” pg 425)

Right: Soldiers load a wounded man onto a Huey Helicopter in Vietnam (From “Evacuation and Roles of Care” pg 35)

By the end of the war in Vietnam, the military evacuation framework on which much of the Western world still depends, with helicopters rapidly transporting wounded soldiers to forward operating hospitals, was in place. From January 2003 to December 2011, over 50,000 service members were evacuated to hospitals outside of the theater between Operation Iraqi Freedom and Operation Enduring Freedom (Holt 36). With jet travel easier than ever before, focus has shifted from maintaining highly mobile hospital units to maintaining permanent hospitals in every theater of operation. An American today soldier can be transported by a mix of helicopter and jet travel from Syria to Landstuhl Regional Medical Center in Germany, where military surgeons are available 24/7, in a matter of hours, all the while receiving medical care along the way. Moreover, prehospital care is better than ever before as a result of investment in training and education for all soldiers, not just medical providers. The standard issue of tourniquets, hemostatic dressings, and basic first aid kits have improved battlefield casualty care exponentially (Blackbourne). As has been the case many times in the past, these innovations, first developed by necessity in the military, have been adopted enthusiastically by civilian EMS providers. While there may be no winners in war, the practice of medicine, and specifically prehospital medicine, has benefited from sequential improvement in each American military conflict. As a future Emergency Medicine physician with interests in Disaster Medicine and Search and Rescue, I owe much to the brave military men and women who pioneered the field of EMS, and hope to someday follow in their footsteps in caring for those who serve.

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