# EVALUATING THE LEGACY OF CIVIL WAR MEDICINE: AMPUTATIONS, ANESTHESIA, AND ADMINISTRATION

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## Introduction

In thinking of Civil War medicine the picture that comes to mind is of a young wounded soldier restrained by three or four men on a crude operating table. The surgeon has a sharpened blade and a bottle of whiskey. The soldier takes a drink. Then, the surgeon swiftly removes the limb as the soldier squirms and cries out. The operation is done in a matter of minutes, and the soldier is left next to a building with the masses of other wounded. Limbs are stacked high; the stench is unbearable. Sanitation seems to be a foreign concept. The worst characters in this Civil War tragedy are the surgeons who just cut off every afflicted limb and left the soldiers to their pain, not even providing them with anesthesia. The medical incompetence appears so profound. When the war is over, the soldiers are memorialized as heroes; the doctors are not even mentioned.[1] Even worse to look at are the mortality statistics. Twice as many soldiers died from disease than from combat during these four gruesome years. In total in the North, 67,058 died from combat, 43,012 from wounds, and 224,586 from disease.[2] Was Civil War medicine truly this terrible?

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The legacy of Civil War medicine is profoundly tarnished by the mortality statistics and the myth described above. Civil War medicine was not nearly as crude as it has been depicted to be. There was anesthesia; there were amputation restrictions.[3] Sanitation improved as the war went on.[4] This is not to say that Civil War medicine was flawless. In order to truly examine it, Civil War medicine must be studied in context. Furthermore, there was more to Civil War medicine than the science. Medical administration was a trial during this period as well. Battlefield medicine was far from perfected, especially since the United States was a relatively new country that had fought few massive wars. Therefore, while the disease mortality rate of the Civil War points to an inadequate medical system, the Civil War was actually a crucial time for the development of battlefield medicine and the American Medical Corps.

## Nineteenth Century Medicine

Nineteenth century medicine was by no means advanced according to today's standards. While medicine was progressing, its rate of progress was slow, and most important fundamental principles of medicine today were not discovered until after the Civil War. Therefore, in order to properly evaluate Civil War medicine, understanding 19th century medicine is essential.

Paris was the center of medicine in the 19th century, an age which witnessed a revolt against dogmatism and a new emphasis on scientific thought.[5] As universities were freed of political and ecclesiastic control, more social classes were able to attend, and true scientific thought was encouraged. A new type of clinical observation emerged that focused on active examination and explainable symptoms.[6] Furthermore, laboratory medicine, meaning research-based medicine, gained a foothold.[7] As medicine became more systematic, scientists moved away from the four humors view of the body and began conducting experiments in chemistry, notably biochemistry. In 1838, Theodor Schwann and Malthais Schleidan

formulated the cell theory, and in 1854, Hugo von Mohl, John Goodsir, Robert Remak, and Rudolf Virchow demonstrated that cells arise from other cells.[8] These two discoveries make up the modern cell theory and the foundation of all biological advances. With the discovery of cells came new opinions about the origins of disease, reviving interest in microbiology. The most widely accepted theory about how disease was spread was the "filth theory." According to the filth theory, epidemics were caused by miasmatic hazes rising from decaying organic matter.[9] However, some disagreed with this hypothesis. The idea that epidemic diseases were caused by micro-organisms and transmitted by contagion was not new in the mid-19th century. It had been proclaimed by Fracastorius in the 16th century, Kircher in the 17th, and Lancisi and Linne in the 18th. Opposing the filth theory, Jacob Henle proposed the role of micro-organisms again in 1840. Unfortunately, many of his contemporaries viewed him as old-fashioned until some notable discoveries occurred. Bassi, Donné, Schoelein, and Grubi each proved fungi to be the cause of certain diseases. In 1850, bacteria, discovered earlier by Leeuwenhoek, were also confirmed as sources of disease.[10] Even though micro-organisms as the source of disease was well documented, many did not accept this theory until about 20 years later.[11] Nevertheless, people knew something was causing diseases, igniting a public hygiene movement in Europe and the dawn of the preventive medicine age.[12]

In the dawn of the preventive medicine age, many popular health movements emerged to prevent diseases. Traditional 19th century medical treatments were based on nosologies, families of diseases formed based on similar symptoms. The same treatments were used to cure these apparently related diseases.[13] The main treatments used were bloodletting, purgatives, emetics, cantharides, and quinine. Bloodletting was used frequently in the first half of the 19th century but eventually began to lose its appeal. Purgatives, also called laxatives, and emetics, which induce vomiting, were utilized because they were believed to reduce symptoms by cleansing the stomach and bowels. However, their side effects could be terrible. Cantharides were skin irritants, meaning that blistering was used as a common treatment. Quinine was one of

the only medically-valid treatments during this time; commonly administered as cinchona bark, quinine was used to treat many diseases including cholera, dysentery, and diarrhea.[14] Two other medically-valid treatments in the 19th century were surgery and the smallpox vaccination.[15] With only three helpful medical treatments, it is no wonder that many health movements gained a strong foothold. The Thomsonian Movement was based on botanical treatments.[16] Grahamism stressed exercise, frequent bathing, and temperance in food and drink and opposed drugs.[17] Homeopathy was based on the premise similia similibus curantur, meaning "like is cured by like"—what causes an illness in a healthy person will cure that illness in a sick person.[18] Such popular health movements reflected people's frustration with the inability of current medical practices to prevent or cure most diseases. By the time the Civil War began, many traditional medical practices had lost their credibility, but few new ones had been discovered.[19]

Despite frustrations, the 19th century did witness medical innovations. The Industrial Revolution gave rise to a number of new technologies for medicine, including the stethoscope, ophthalmoscope, and hypodermic syringe. Some biological advances were made, as discussed above. Many other scientific advances also occurred, including Darwin's theory of evolution and Mayer and Joule's law of conservation of energy.[20] The rise of research and clinical observation as the primary method of medical advancement fueled these scientific discoveries. Furthermore, the new emphasis on the scientific nature of medicine led to a revamping of medical education in Europe and the United States. As more discoveries were made, medicine grew more complex, leading to the emergence of specializations. In an era of specialties, one convergence occurred: medicine and surgery, initially different professions, merged.[21]

During the 19th century, surgery, as it was mentioned above, was one of the few valid medical treatments. However, before the discovery of anesthesia, surgery had many problems. Haggard described four prerequisites to successful surgery: 1) knowledge of anatomy, 2) a method for controlling hemorrhage, 3) anesthetics

to deaden pain, and 4) knowledge of the nature of infection and methods for its prevention. Before the discovery of anesthesia, soporifics such as whiskey and opium were used to dull pain.[22] Then, from 1842 to 1847, ether, nitrous oxide, and chloroform were discovered. Oliver Wendell Holmes coined the term "anesthesia," and after Queen Victoria used anesthesia during the birth of her seventh child, Prince Leopold, it became acceptable and fashionable.[23] It was adopted for use in nearly every hospital in Europe and soon gained a strong foothold in the United States.[24]

Understanding 19th century medical practices is crucial to accurately examining Civil War medicine. Civil War doctors were operating with limited scientific knowledge. The origins of disease were uncertain, treatments could be deadly, traditional practices had fallen to heavy criticism, and medicine had only recently emerged as a truly scientific profession. With the unsteady state of medicine, Civil War doctors were in a bind. They did have one advantage: Civil War doctors were able to learn from foreign experiences in battlefield medicine.

## Foreign Influences on American Battlefield Medicine

Two conflicts greatly influenced American battlefield medicine: the Napoleonic Wars and the Crimean War. Dominique Jean Larrey, the chief doctor of the Grande Armée, was one of the greatest army surgeons during the Napoleonic Wars.[25] He was a skilled surgeon who once performed 200 amputations in 24 hours. However his talent was not only with the medicine; he was also an administrative genius. Having developed the first-aid system of triage and invented "flying ambulances," Larrey was the first to implement field units to give first aid and immediate surgery to the wounded.[26] Triage was employed during the Civil War, and the ambulances volantes, or flying ambulances, helped save numerous lives. Flying ambulances began picking up the wounded as soon as the battle began, instead of waiting until its conclusion, giving rise to the modern concept of "first aid to the

wounded."[27] Letterman used these developments in his Civil War system. Larrey's colleague, Pierre Francois Percy, further assisted with the organization of the medical department. Percy also wrote the *Manuel du chirugien d'armee*, "The Army Surgeon's Handbook."[28] These French precedents aided administrative reform of the Army Medical Department during the Civil War.

Not only were the precedents of the Napoleonic Wars important to Civil War battlefield medicine, but the Crimean War also taught the United States' Army Medical Department many lessons. The Crimean War appeared to be a medical disaster. The care was poor and the evacuation hospitals were filthy. The shortcomings were well -publicized, leaving the public outraged.[29] However, things got better due to the efforts of Florence Nightingale. Florence Nightingale worked with a team of 38 nurses to improve the quality of care for the wounded, greatly reducing the mortality rate.[30] Because of her success, she achieved widespread fame, and her nursing techniques were copied during the Civil War.[31] She was able to open up a school for nurses at St. Thomas' Hospital in 1860.[32] Florence Nightingale made nursing into a formidable profession. Her influence did not stop at nursing, however, as she designed a battlefield hospital that provided maximum ventilation. This design was used during the Civil War in such hospitals as Satterlee.[33]

Foreign influences helped advance American battlefield medicine during the Civil War, along with medical innovation, reorganization, and some key players. However, the most important influence on Civil War battlefield medicine was the United States' Army Medical Department—both its practices and organization.

## History of Military Medicine in the United States

At the start of the Revolutionary War, the Continental Congress passed a resolution for the medical organization of the army. The Hospital Department of the Army was officially established on July 27, 1775. The period of the Revolution was one of

great chaos for the medical department. There were conflicts of authority and other disputes. These clashes had a detrimental effect on the welfare of the troops. Furthermore, inexperience led to faulty plans of organization. Nevertheless, the measures taken to centralize authority and provide adequate equipment and facilities eventually led to the creation of a reasonably efficient organization.[34]

Unfortunately, none of the developments stuck because the medical department was dismantled at the end of the Revolutionary War. After muddling through the War of 1812, Congress passed an act creating a permanent Army Medical Department on April 14, 1818.[35] The establishment of a permanent medical department did not end the troubles. Controversies erupted over rank, leadership, supplies, and bases. Thirty years after its creation, during the Mexican War (1846-1848), the administration and medical practices were still inadequate.[36]

While its efficiency in times of war was contemptible, the Army Medical Department did collect a lot of data. Statistics had recently emerged as a method for analyzing medical practices and treatments. The work of the Army Medical Department helped advance this "arithmetic method."[37] Treatments and theories were tested, and their usefulness was determined. These studies influenced the standard practices of the Army Medical Department and led to more detailed examinations of traditional military diseases.[38]

The principal diseases that army surgeons dealt with were classified as fevers. These included malaria, typhoid, dengue, yellow fever, and cholera. Quinine, opium, mercurials, purgatives, venesection, and other narcotics were all used to treat such diseases. Most of these diseases were attributed to heat, moisture, decaying matter, and filth. A few suggested the role of micro-organisms, but this idea did not gain a strong hold in the years before the Civil War. Diarrhea and dysentery, the camp diseases, were believed to be caused by bad air, other meteorological factors, alcohol, and poor diets. In 1859, shortly before the Civil War, research identified an amoeba causing one form of these camp diseases. However,

practices changed little, as bleeding, emetics, purgatives, quinine, opium, blistering, and other questionable treatments continued to be used. Scurvy, rheumatic and respiratory conditions, and venereal diseases continued to afflict soldiers in the years leading up to the Civil War. Some treatments were found to be more successful than others, such as the use of mercury to treat syphilis. However, despite the continued use of questionable treatments, these traditional medical practices began to decline in popularity in the years leading up to the Civil War. Statistical studies revealed the limited effectiveness of many popular treatments. Unfortunately, as these methods were increasingly discredited, few new credible methods emerged.[39] Faced with this standstill in medical innovation, one surgeon general, Joseph Lowell, looked to diet as a method of disease prevention. He urged the consumption of less meat and more beans, rice, cornmeal, soup, fresh fruits and vegetables, beer, and water. This would have helped with eliminating scurvy.[40] There was one credible method of disease prevention during the years leading up the Civil War: the smallpox vaccination. It became a requirement in 1818, and though it was not foolproof, it helped greatly to reduce and almost eliminate the disease in army bases.[41]

Since the spread of disease was often ascribed to miasmas from decaying matter, epidemics were difficult to prevent. Hospitals were not properly set up before the Civil War to halt the spread of infection. Therefore, surgery was a risky undertaking. Hospital gangrene, septicemia, erysipelas, and tetanus were all threats to recovery. Some, however, began to use chlorine vapors to disinfect the sickrooms; unfortunately, they did not disinfect the instruments, limiting this achievement's effect. There was one new common practice in army surgery by 1852: the use of anesthesia. Chloroform and sulfuric ether were the anesthetics of choice and were widely used in the Civil War. While anesthesia gave pre-Civil War surgeons the ability to perform more complex procedures, limited medical knowledge and experience slowed the rate of surgical innovation before the Civil War. The typical surgeries were amputation, excision, eye surgery, ear surgery, restorative

surgery, and abdominal surgery. Due to increased demand, this list grew quickly during the Civil War.[42]

The Army Medical Department had been in existence for 43 years by the Civil War. During this time, the department did not develop adequate organization or profound medical advances. The Civil War would provoke a more explosive growth of the Medical Department in four years than in the approximately 40 years of its earlier existence.

## The Scientific Obstacles and Developments of Civil War Medicine

As the Civil War began, common medical practices were losing credibility, but innovation was not keeping pace with the rate of doubt. Thus, at the start of the Civil War, doctors were in a bind: they were criticized for using traditional treatments but not presented with alternatives.[43] Faced with this predicament, they began to experiment. As a result of this willingness to test new ideas, medical practices were improved and new ones invented. The mortality statistics seem horrific, but they cloud the pioneering nature of Civil War medicine.[44]

Of all Civil War medical practices, surgery is the most highly criticized. The belief that excessive amputations were performed during the war has led to close scrutiny of surgical practices. In fact, this was not the case because of restrictions put in place.[45] While it is one of the most criticized aspects, Civil War surgery was actually incredibly inventive.

Contrary to popular belief, anesthesia was widely used during the Civil War. According to Union records, at least 80,000 operations were performed with anesthetics and only 254 without. Occasionally, anesthesia supplies were exhausted during major battles.[46] Chloroform was preferred in the field because it was not explosive. Either ether or a mixture of ether and chloroform was preferred in hospitals because of its safer nature. The death rate from anesthesia was incredibly low—around 1.4 percent. This low death rate probably resulted from the low quantity of anesthesia

used; the anesthetic was only administered until the patient was insensitive to pain.[47] Because the patient was not knocked out, he was often in a state of delirium or excitement. Thrashing and moaning occurred, necessitating assistants to restrain the patient. After the anesthesia had worn off, no soldier was able to recall the procedure or any pain.[48]

With the ability to operate on a patient without pain, surgeons were more willing to experiment. Furthermore, the abundance of wounds led to the need for improved surgical practices. The location of the wound directly correlated with its fatality; for instance, a wound in the spine had a fatality rate of 55.5 percent, while a wound in the upper extremities had a 6.5 percent fatality rate.[49] The first step to saving any soldier was to stop the bleeding by applying a tourniquet or direct pressure. Vessels could also be tied with silk thread, horsehair, or cotton thread. The same methods were used in cases of hemorrhaging. Then, the surgeon would try to extract the bullet from the wound.[50] Unfortunately, due to ignorance about the nature of bacteria, probing with a finger or a nèlaton (a long, thin ceramic-tipped metal wand) could be more harmful than helpful. Bacteria could be transmitted into the wound or tissue could be punctured or damaged.[51] Once the surgeon was done with these tasks, he applied dressings, sometimes from reused cloths, and administered an opiate to decrease the pain.[52]

Then, the surgeon had to evaluate the soldier and decide if surgery was necessary. Out of 60,266 shot wounds, about 26,467 wounded were treated conservatively, meaning no amputation or excision was performed. Such cases had a fatality rate of 17.9 percent. Of the 29,143 amputations performed, the fatality rate was 25.8 percent. Out of 4,656 excisions, the fatality rate was 27.5 percent.[53] While the odds of survival were lower for those who underwent amputation or excision, such procedures were performed when they were believed to be the best course of treatment. Thus, more lives were probably saved by these techniques. Amputations were usually performed in the event of massive tissue destruction by minié balls. Often, the shattering of the bone led to infection.

To prevent the spread of infection, amputation was deemed the best course of action.[54] In terms of amputations, two techniques were used: the circular method and the flap method. A surgeon who operated by the circular method left an open, raw stump that healed gradually. This procedure took less time and required less anesthesia. On the other hand, the flap method, while more aesthetically appealing because it left a flap of skin to cover the stump, ultimately allowing for quicker healing, took longer and was more complicated. Thus, it required more anesthesia and better lighting, which were not always available. Overall, the circular method was the preferred method. Another option that surgeons had was excision. Excision is the removal of the part of the limb with the shattered bone and wound. The rest of the limb is left intact; however, this was not always favorable because the limb ultimately ended up weaker. Furthermore, excisions were more dangerous and complicated; thus, their popularity decreased.[55]

Over the course of the war, surgeons also developed new techniques. Some new methods for abdominal, eye, orthopedic, plastic, chest, and head surgery were developed. Arterial ligation, the tying of major arteries, was one of Civil War surgery's most profound advances.[56] Techniques became more successful as the war went on, through better understanding of anatomy. However, as beneficial as the practice became, it was not an easy task for a Civil War surgeon because it involved finding and then tying a bleeding vessel. The conditions the surgeons operated under were not always favorable; therefore, it was only performed in life-threatening situations. Today, ligation is still considered one of the more difficult surgical procedures.[57]

In terms of abdominal and chest wounds, no major innovations were made.[58] Plastic surgery saw some advances, but most procedures were performed by civilian doctors after a soldier's discharge. Thus, plastic surgery's influence on Civil War medicine was limited. Dentistry experienced some innovations. Its main contribution was in the use of dental splints for jaw fractures, created by James Baxter Bean. Eye injury treatments were also limited at the time of the Civil War. However, a notable achievement was

the use of iridectomy, the removal of a portion of the iris, to treat glaucoma. Today, nearly the same operation is performed.[59]

Neurosurgery was greatly tested during the Civil War. Massive head injuries were common and needed to be treated; however, not many treatments were available. Scalp wounds were not a great source of distress to military surgeons, but fractures of cranial bones were serious. Trephining, an old technique, was the removal of bullets or bone fragments from the skull by making a large hole. While this technique appeared largely fatal before the Civil War, it was performed with a 43 percent survival rate as a desperate measure.[60] When a soldier was knocked unconscious from a head wound, surgeons had no method of treatment. They had to let nature run her course. Without modern imaging technologies, surgeons were limited in their ability to treat head wounds. However, the massive number of nervous system injuries and diseases led to the establishment of a specialty hospital called Turner's Lane Hospital in Philadelphia to study such afflictions. The hospital was headed by Dr. S. Weir Mitchell, a leader in neurology.[61]

Despite surgical innovations, infection posed a major problem for Civil War surgeons. Termed "pyemia," or "blood poisoning," infection was hard to control due to ignorance of its origins.[62] Today, there are antiseptics and antibiotics to prevent its spread in hospitals, but Civil War surgeons lived in fear of hospital epidemics of pyemia. Correctly assuming that the presence of foreign material in wounds predisposed a soldier to infection, surgeons attempted to remove such matter in a process known as surgical debridement. This is still a fundamental technique in wound treatment. However, this was usually done with dirty fingers and equipment, negating the value of the procedure.[63] The lack of understanding of the importance of sterilization in surgical procedures and other methods of treatment led to increased infection.[64] The two most prevalent wound infections were hospital gangrene and erysipelas, today known to be streptococcal infections, but tetanus was equally threatening. These typically resulted in death.[65] Civil War surgeons did take some preventive measures.

Soldiers with erysipelas or hospital gangrene were isolated in separate tents or buildings. Nurses and supplies were assigned exclusively to such locations to eliminate cross-infection. Also, the affected limbs were amputated to try to prevent the spread of the infection.[66] One notable innovation in the treatment of hospital gangrene was the use of bromine. After a Union surgeon's successful clinical trial, it was adopted for widespread use during the last two years of the war. It proved more valuable than previously used agents, such as nitric acid and iodine.[67] Unfortunately, though, 46 percent of patients with hospital gangrene still died in the Civil War. While this number seems incredibly high, one should note that 20 percent of hospital gangrene patients die today.[68] In reality, Civil War surgeons and physicians were not so incompetent.

Another myth that must be dispelled is the belief that physicians and surgeons believed pus was necessary for a wound to heal. This belief is compounded by the use of the term "laudable pus." In fact, this term had been used since ancient Egypt to mean the better of the two pus types. Civil War physicians distinguished between the two types: laudable and malignant. Laudable pus, which most likely resulted from staphylococcal infections, was described by Dr. Robley Dunglisen of Philadelphia as "pus of good quality...of yellow color, opake [sic], inodorous, and of a creamy appearance." The more serious threat to survival was the malignant, or ichorous, pus, which was thinner, had a more offensive odor, and tinged with blood. This pus, caused by streptococcal infections, usually led to pyemia and death.[69] Civil War doctors did what they could to prevent the spread of both types of pus and were pleased when a wound healed without pus. Furthermore, they studied patients who died of such pus-caused infections. In calling pus "laudable," Civil War physicians did not believe it was praiseworthy.[70]

To prevent the spread of infections, including those caused by pus, Civil War surgeons experimented with "antiseptics." The antiseptics used include carbolic acid and tincture of iodine. While the doctors did not understand the true nature of the antiseptics, their use of antiseptics certainly helped in preventing the spread

of infection. At the time of the Civil War, the doctors observed that antiseptics decreased the odor of infected wounds. By applying antiseptics, they believed they were treating the "miasmas" arising from wounds—what they credited as the cause of disease. Nevertheless, despite their incorrect scientific assumptions, Civil War doctors were able to demonstrate the effectiveness of antiseptics. It was not until Joseph Lister's experiments that the scientific nature of antiseptics was explained.[71]

Not only did Civil War doctors and surgeons have to deal with massive numbers of wounded soldiers and infections, but they also had to treat the typical army diseases. Such diseases included diarrhea and dysentery, malaria, smallpox, tuberculosis, rheumatism, sexually transmitted diseases, and many more. Most of these diseases were caused and spread by lack of sanitation, fatigue, and poor diets.[72] Unfortunately, the Civil War was not a time of great advancement in the treatment of traditional army diseases. Usually, army doctors used the same treatments as they had in earlier years.[73] One notable point of achievement was the marked decrease of smallpox. The mandatory immunization of all soldiers reduced the disease's presence. While not every single soldier was vaccinated, the effort to vaccinate all reduced this formidable threat.[74]

Unfortunately, the importance of a balanced diet was not as widely accepted as the importance of smallpox vaccination. Lack of fruits and vegetables led to scurvy, a common army problem. While the doctors realized that the standard ration of a field soldier led to scurvy, they did not understand the singular importance of fruits and vegetables.[75] Not only did the deficient diet of a Civil War soldier lead to scurvy, it also impaired the soldier's health overall. While there are no statistics, it goes without saying that the deficient diet contributed to the prolongation of other ills and the failure of injuries to heal.[76] The inadequate diet compounded by the massive fatigue a soldier experienced left him in a shaky state of health, whether or not he was suffering from an evident disease.[77] This state was termed "fatigue duty."[78]

The treatments of typical army diseases were not improved notably during the Civil War. Doctors did what they could for the soldiers using the limited medical knowledge they had compared to today's standards. Regrettably, many soldiers returned home with their health impaired by chronic diseases.[79] On a brighter note, the widespread presence of disease and lack of treatments led to the development of sanitary commissions. "The U.S. Sanitary Commission helped improve the overall health and survival rates of the soldiers by emphasizing clean habits."[80]

The scientific aspect of Civil War medicine had mixed results. While some remarkable advances were made, other long-existing problems persisted. Due to the high volume of wounded, surgery was greatly advanced, with improved techniques and new procedures. Infection was the most notable problem, but, by the end of the war, surgeons and physicians were experimenting with methods to combat its spread, some of which are used today. In dealing with typical army diseases, however, the track record of Civil War doctors is very poor. The regular camp diseases were prevalent among the troops, but few advances were made. This is often the most enduring legacy because two times as many soldiers died from disease as from battle during the Civil War. Traditional military base diseases aside, the scientific side of Civil War medicine was not as deplorable as it has been made out to be.

## The Administrative Developments of Civil War Medicine

The administrative advances of the Army Medical Department during the Civil War have left the more prominent legacy. At the start of the Civil War, the department was no better organized than in previous wars. There were no efficient methods for transporting the wounded, the set-up of hospitals was inadequate, and no effective system for determining which wounds to treat first was in place. Furthermore, the department was not prepared to handle the massive scale of the Civil War, since most were expecting this to be a short conflict.[81] Soon it became evident that

a new military medical system was necessary. The Army Medical Department realized the enormity of this task, which required both reorganizing military medicine and efficiently managing such a massive system. Clearly, some incredible reforms were needed.

Two administrative developments made managing military medicine more successful in the Civil War. First, an ambulance service and a field hospital system were implemented to facilitate the rapid evacuation of wounded soldiers. Second, an extensive system of military hospitals was organized.[82]

The first major development of battlefield medicine in the Civil War was the implementation of the triage system. Soldiers suffering from mortal wounds were made as comfortable as possible and either left to die or evacuated last from the battlefield. Mortal wounds typically included bullets to the abdomen, chest, and head. Distinguishing soldiers based on wounds allowed Civil War doctors to concentrate on those they were capable of saving.[83] The removal of the wounded from the field while the battle was still occurring also helped save lives. In previous wars, all the wounded were rounded up at the end of the battle; unfortunately, many soldiers probably died or were doomed to die because of no immediate treatment.[84] How were Civil War doctors able to overcome this problem and extract the wounded during combat? This was where the genius of Jonathan Letterman, who would later be remembered by General McClellan as the most "superior in power of organization and executive ability," came into play.[85]

At the end of the Seven Days' Battle in 1862, the medical director of the Army of the Potomac, Jonathan Letterman, prepared a plan for an ambulance corps. Previous ambulances were poorly constructed and very uncomfortable for the wounded. Furthermore, the Quartermaster Department of each army corps controlled the ambulances and tended to use them for everything but transportation of the wounded.[86] Letterman's proposal for an ambulance corps was welcomed by General McClellan. On August 2, 1862, General McClellan ordered the implementation of Letterman's plan. The ambulance corps was now under the control of the Medical Department. Letterman's plan included designated

stretcher-bearers and teamsters who carried the wounded to the field dressing stations. Now, soldiers could continue fighting without having to step around wounded comrades or attempt to care for them. Furthermore, the wounded arrived at field dressing stations more rapidly, where they were initially treated. Those who needed further care were sent to field hospitals at the back of the lines.[87]

Transporting the wounded from the dressing stations to the field hospitals was another facet of Letterman's system. Trained ambulance drivers and attendants were stationed nearby to carry the more seriously wounded to the field hospitals, which Letterman also reformed.[88] Instead of on the traditional regiment basis, Letterman arranged them based on division and enlarged them. These division hospitals were better staffed and more able to handle the massive number of wounded. Furthermore, Letterman set up hospital tents and medical supplies for the field hospitals. All of these stations were typically located near streams for easy access to running water, and many surgeries were performed outside to decrease the risk of infection.[89]

Once a soldier was adequately cared for at a field hospital, he was either sent back to duty or sent to a larger hospital for further care. These larger hospitals were farther away. Thus, Letterman had to organize yet another system for transporting the sick and wounded efficiently and comfortably. To do this, Letterman organized hospital trains and ships with adequate provisions and doctors to care for the soldiers en route. Once the soldiers reached the general hospitals, they had traveled through Letterman's whole system.[90] Because of its great success, Letterman's system was adopted by many other Union armies and imitated by Confederate armies. Finally, on March 11, 1864, Congress made Letterman's plan the official system.[91]

Congress also set up a federal system of general hospitals during the Civil War where wounded and sick soldiers arrived by way of Letterman's boats and trains if they needed prolonged care. More than one million soldiers were treated in such hospitals, and fewer than 10 percent died.[92] Such remarkable results were due

to the careful organization of the general hospitals. After trying many plans, a pioneering design was developed. Made from wood, pavilion-style general hospitals had single-story patient wards fanning out from a central administrative facility. These hospitals could be built quickly and allowed for adequate ventilation.[93]

Maintaining such high survival rates could not have been done without the creation of the U.S. Sanitary Commission and Nursing Corps. The U.S. Sanitary Commission contributed massively to healthcare during the war, filling in the gaps left by overwhelmed doctors and surgeons. Mainly under the direction of Frederick Law Olmstead, the U.S. Sanitary Commission greatly aided the U.S. Army Medical Corps. It organized nurses, food, and supplies; kept meticulous records; publicized the war effort to gain support; and conducted hospital inspections to ensure healthy habits and sanitary practices. The inspection system of the Commission led to the establishment of a Medical Inspector General, later discontinued.[94]

Dorothea Dix was mainly responsible for the creation of the nursing corps, modeled after the work of Florence Nightingale. In fact, most Civil War nurses were nicknamed "Nightingales." Dix, the Superintendent of Nurses, placed stringent restrictions on women accepted to the nursing corps. By 1863, Congress wore down these restrictions and placed the female nurses under the control of the Medical Department. Despite some administrative squabbles, nurses, both male and female, were very beneficial to the care of the soldiers.[95]

The last notable aspect of Civil War medical administration was the creation of specialty hospitals. Specialty hospitals had been opened in the United States for civilians beginning in the 1850s. However, they had never been adopted for use by the military. Eventually, the Union and Confederate Medical Departments set up specialty hospitals. Such hospitals included the Desmarres Hospital in Washington, D.C. for eye and ear diseases, the aforementioned Turner's Lane Hospital, and "stump hospitals"— hospitals for soldiers who needed artificial legs.[96]

The administration of Civil War medicine has an impressive track record. An effective system of field hospitals, ambulances, and general hospitals, compounded with the creation of the U.S. Sanitary Commission and Nursing Corps, allowed for improved care to the wounded. Without such administrative advances, the Army Medical Department would have been in complete chaos. It is hard to imagine Civil War soldiers suffering any more.

## The Legacy of Civil War Medicine

At the time of the Civil War, the United States was less than a hundred years old. Medicine had been around for ages, literally. In examining the legacy of Civil War medicine, both the scientific and administrative aspects must be considered. Clearly, administrative advances were more profound, but valuable scientific developments also occurred. Surgery greatly progressed with the development of new procedures and improvement of existing ones. Furthermore, despite ignorance of the source of infection, doctors and surgeons tried many methods, some successful, to limit its spread. Unfortunately, despite amassing considerable data, Civil War doctors were unable to advance the treatments and cures of traditional army diseases.

Even though effective treatments were not developed, an efficient system for treatment of soldiers was created. Under the brilliant guidance of Jonathan Letterman, the Union army adopted a proficient system of battlefield medicine. Letterman organized an ambulance corps, field hospitals, and hospital trains and boats to care for the soldiers from the moment they were wounded until they either returned to combat or were placed in the hands of the capable federal general hospitals. Letterman's system was sanctioned by law but disappeared from Army Regulations after the Civil War. Even though it disappeared from regulations, it did not disappear from armies. The plan was adopted by European armies, notably the Prussian army in the Franco-Prussian War of 1870-1871. Overall, it was so successful that it became the basis of

all modern army systems. The United States used it during the two World Wars. Today, Letterman's system is still used in the Army Medical Department with only one noticeable change: helicopters are used to evacuate wounded.[97] Before Letterman's reorganization, the Army Medical Department was in disarray, unprepared to fight any wars on a massive scale.

The Civil War also left a statistical and research legacy. Under the direction of Civil War Surgeon General Hammond, reports from physicians and data on wounds, diseases, and deaths were collected. The information was synthesized and published as the *Medical and Surgical History of the War of the Rebellion*. Hammond also oversaw the creation of the Army Medical Museum, which contains specimens, photographs, drawings, descriptions, and more, and expanded the Library of the Surgeon General. The work directed by Surgeon General Hammond, mainly the *Medical and Surgical History of the War of the Rebellion*, is considered the United States' first major contribution to academic medicine. Civil War medicine, ironically in light of its bad reputation, actually put American medicine on the world stage.[98]

The most enduring legacy of Civil War medicine is its profound influence on the development of the American Army Medical Department. Statistics do not accurately reflect the true genius of Civil War medicine, especially pertaining to administration. Without the organization created in the heat of the moment during the Civil War, would the United States Army Medical Department have been prepared to enter World War I? In fact, many European countries employed the same system, modeled after the Civil War. It is clear that without the developments of the Civil War, many countries, including the United States, would have found themselves more unprepared than they already were for the massive numbers of wounded in 20th century conflicts. The medical developments of the Civil War prepared the United States Army Medical Department to enter the 20th century and a whole new era of warfare.

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