Medical and Surgical Care During the American Civil War 1861-1865

Medical Grand Rounds

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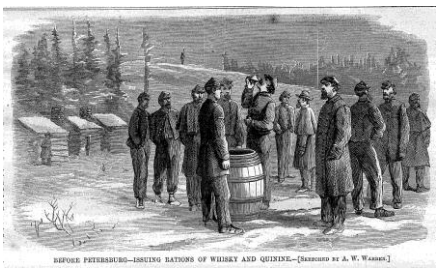

BEFORE PETERSBURG—ISSUING RATIONS OF WHISKY AND QUININE.—[Sketched by A. W. Warren.]

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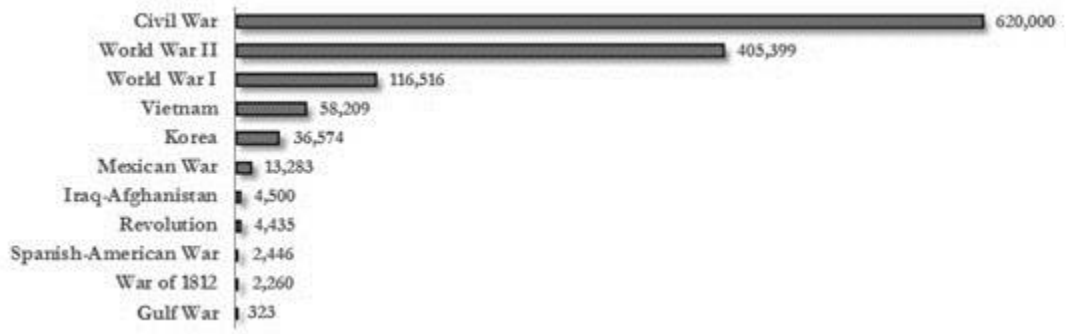
Purpose and Overview: The purpose of this presentation is to describe the state of the art of Medical and Surgical care during the American Civil War. This era is often referred to in a negative way as the Middle Ages of medicine in the United States. Many misconceptions exist regarding the quality of care during this time. Physicians were practicing in an era before the germ theory of disease was established and with very few effective medications. Each side was woefully unprepared, in all aspects, for the extent of the war that would ensue and misjudged the degree to which each would fight for their cause. Despite this, many medical advances and discoveries occurred that will be detailed during the Grand Rounds.

Learning Objectives:
1- Name and describe three medical advances that were made during the war
2- Name and articulate three reasons why so many soldiers died in the war
3- Discuss two noncombat related illness that were prevalent during the war and measures that were taken to reduce their impact.

Introduction

The Civil War was fought in over ten thousand places, several of them in Texas, and was the bloodiest war in the history of the United States. Two percent of the population at the time (approximately 620,000) died during the conflict (1). More Americans died in the Civil War than in all other wars combined. As hard as it is to believe, these numbers may actually be an underestimate of the death toll given that much of the data regarding deaths of Confederate soldiers was destroyed when Richmond burned on April 2, 1865. More recent estimates based on comparative census data put the figure closer to 750,000 (2).



Countless other soldiers were left disabled. The year after the war ended the state of Mississippi spent 20% of its annual budget on artificial limbs for its veterans.

Many misconceptions exist regarding medicine during the Civil War era and this period is commonly referred to as the middle ages of American medical care. Medical care was heavily criticized in the press throughout the war. It was stated that surgery was often done without anesthesia, many unnecessary amputations were done, and that care was not state of the art for the times. None of these assertions were true. Actually during the Civil War there were many medical advances and discoveries including: quinine use for malaria prevention; quarantine could virtually eliminate yellow fever; hospital gangrene could be treated with bromine and isolation; anesthetics could be used safely; an ambulance system was developed for evacuation of the wounded; trains and boats were used to transport patients; large general hospitals were established; specialty hospitals were created; rudimentary neurosurgery was performed; techniques for arterial ligation were developed; and the first plastic surgery was performed. There are many monuments to Civil War soldiers in cities and on battlefields in this country but I am aware of only two to physicians (Hunter McGuire in Richmond, Virginia and Mary Walker in Oswego, New York) (3).

Of the 3.5 million combatants in the Civil War at least 623,026 died and 471,427 were wounded. More died of disease, about 419,000, than in combat- 204,000. This left about 1:10 able bodied Union soldiers dead or incapacitated versus 1:4 in the Confederate army. It is estimated that 66.5% of Union deaths and about 71.8% of Confederate deaths were due to disease. In the

Napoleonic wars there were 8 deaths from disease for every 1 in battle. In the Crimean war the ratio was 3:1. On this continent in the Mexican War (1846-1848) there were 7 deaths from disease for every one in battle. It was not until World War I that weapons killed more Americans than disease (4).

Why did so many die?

Soldiers died from two general causes: battlefield injuries and disease. Twice as many died from disease as combat wounds. Many of the reasons for this will be addressed subsequently. Contributing factors to combat-related deaths were: inexperienced surgeons; the lack of a coordinated system to get the injured off battlefield quickly; wound infections- this was the preantibiotic era and sterile technique was not yet recognized as important; and the battlefield tactics did not keep pace with advances in weaponry. Contributing factors to disease related deaths included: poor sanitation and overcrowded camps; sanitation was often ignored by line officers; inadequate pre-enlistment screening of recruits; poor diet; lack of immunity to childhood diseases; and there were few specific treatments for disease.

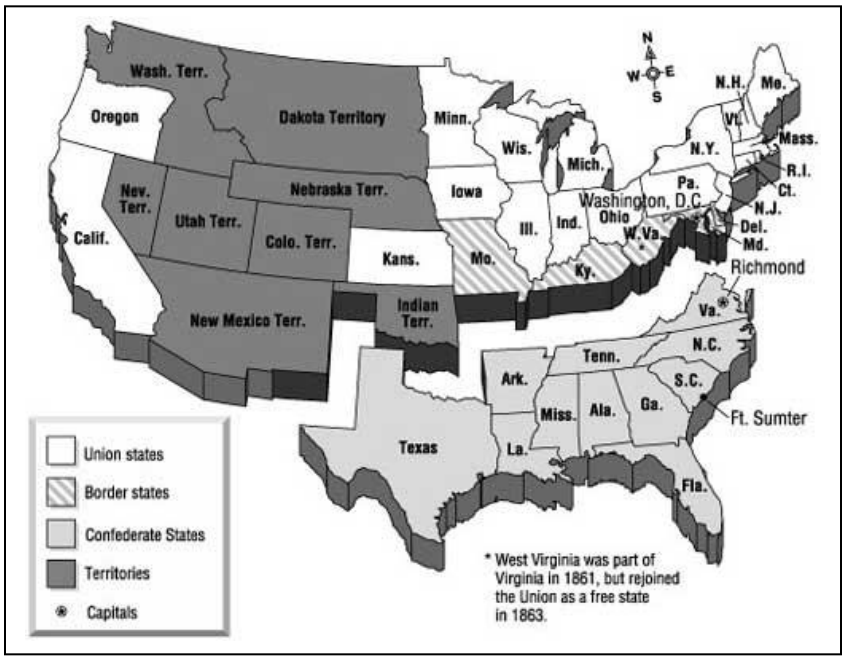
War Department General Order #51 set out the criteria for preinduction physical exams and stated "In passing a recruit the medical officer is to examine him stripped; to see that he has free use of all his limbs; that his chest is ample; that his hearing, vision and speech are perfect; that he has no tumors, or ulcerated or cicatrized legs; no rupture or chronic cutaneous affection; that he has not received any contusion, or wound of the head, that may impair his faculties; that he is not subject to convulsions; and has no infectious disorder that may unfit him for military service."

Sarah Edmonds Seelye served two years in the Second Michigan Infantry as Franklin Thompsor (right). In 1886, she received a military pension. (Courtesy of the State Archives of Michigan)

That was the requirement, however, the reality was that many exams early in the war were of poor quality. Governors needed to fill quotas and examining physicians were paid per recruit. If you could walk, carry a gun, had canine teeth and a trigger finger you passed. One entire regiment had no physical exams whatsoever. One doctor routinely examined 90 patients per hour. New York was particularly egregious in that of 47,417 men enlisted in 1861, 5,554 were discharged in the same year for disability. The system was so poor that it is estimated that about 400 women served as soldiers during the war (8). The highest rank a woman soldier achieved was major. At least 6 of these female soldiers delivered babies during the war. The quality of physical exams improved with the Draft Act of 1863 when fines and prison sentences were put in place for physicians that were derelict in their duties, resulting in many more recruits being rejected from service.

Infrastructure in the North and South 1861-1865

In order to better understand medical care delivered during this period it is important to understand the societal and medical infrastructure at the time. In 1861 the population of the Union states was about 21 million and the Confederate states 9 million. Of this 9 million about 4 million were slaves. There were 21,000 miles of railroad tracks in the North, while only 9,000 in the South. The South had 18,945 manufacturing establishments with a total investment of 89 million dollars, which was less than that of the state of New York alone (>22,000-total investment 173 million dollars). In addition, the vast majority of chemical manufacturers were in the North.



The first medical school was established in the United States in Philadelphia in 1765. In 1861 there were 85 medical schools. There was no prerequisite preparation for admission, no entrance exam and no medical licensing boards. Medical School was 2 years in duration. In the first year there were lectures given in two four month semesters. The second year was a repetition of the first. Professors supported themselves by selling tickets to their lectures (5). Medical schools at the time were more like proprietary schools. There was a large entrance fee and as a result very few students ever failed. The Flexner Report was still 50 years in the future, which required two or more years of college and a four year curriculum. In 1862 there were 6 colleges of Pharmacy in the U.S.. They were in Philadelphia, Maryland, New York, Cincinnati, Chicago and Massachusetts. Of the 11,000 pharmacists practicing in 1861 <5% had any formal coursework. Pharmacy was considered a trade with a 2-3 year apprenticeship. Only 4 states required examination and licensing (Louisiana, Georgia, South Carolina and Alabama) and most doctors prescribed, compounded and dispensed their own medications. The first Nursing school in the United States did not open until after the war at Bellevue Hospital in 1873. About 18,000 women served as nurses in the Civil War. They worked mostly in the larger general hospitals. At these hospitals about 1 in 4 of the nurses were women. The only formally trained nurses at the start of the war were nuns. Dorothea Dix served as the superintendent of female nurses during the war. The germ theory of disease would not be established until 1870 and Koch's postulates in 1890.

Disease was thought to be a result of either direct or indirect inflammation (6). Indirect inflammation was thought to be caused by excess blood flow to a tissue, a theory promulgated by a prominent 18th century physician Benjamin Rush. This led to the concept that bloodletting might be beneficial. By the time of the Civil War bloodletting had largely fallen out of fashion.

Samuel Everett

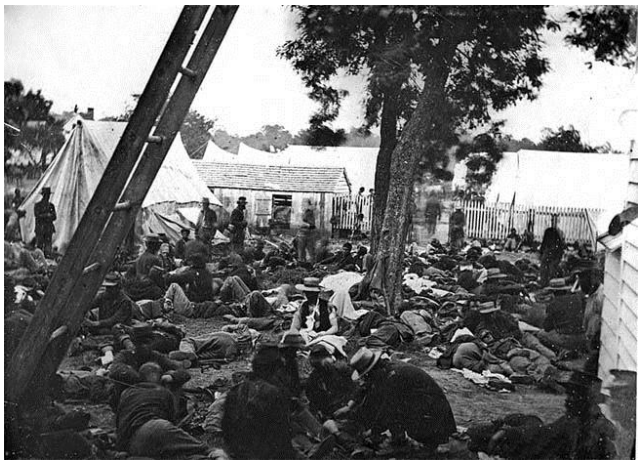
Before the war the United States had a peace time army of 16,000 soldiers. There were 113 doctors in the army. At the start of the war 23 went south and 3 were dismissed for disloyalty (7). At the end of the war there were 12,070 doctors in the union army and 3,236 in the Confederate army. Before the war began of the 11,000 doctors in the North only 500 had performed surgery; of the 3,000 doctors in the South only 27 had performed a surgical procedure. In the Union army 335 physicians died during the war; 51 of combat related injuries (Samuel Everett was the first physician killed at the battle of Shiloh). The largest military hospital prewar was at Fort Leavenworth and had a total of 40 beds. The only hospital in Washington, D.C. before the war was a two story six room building used to isolate small pox patients. By the end of the war hospitals such as Satterlee Hospital in Philadelphia were commonplace. Satterlee contained 2,500 beds in 36 wards and was constructed in only 40 days.

The first major battle of the war fought at Bull Run in Manassas, Virginia on July 21, 1861 illustrates how woefully unprepared the Union was from a medical standpoint at the start of the war. Both sides with few exceptions expected the war to be short. At the onset Lincoln called for only 75,000 volunteers for 3 months. Fortunately at Bull Run casualty figures were not large compared to future battles (North- 481 killed, 1,011 wounded; South- 387 killed, 1,582 wounded). Despite this many problems were encountered. At Bull Run there was no military ambulance corps. Ambulances were driven by civilians who fled when the first shots were fired. If they left the ambulances behind healthy soldiers stole them to flee back to Washington, D.C.. Not a single wounded soldier was returned to Washington, D.C. in an ambulance. Tragically, wounded soldiers remained on the battlefield for days, the first two spent in the rain. Each regiment (1,000 men) had only two doctors some of which were political appointees and had no medical degree. Only Ohio, Massachusetts and Vermont had rigorous exams for their physicians. Incredibly, Surgeon General Finley did not order medical supplies until after the battle was over, leading the prominent newspaper editor Horace Greeley to comment “the medical bureau is not accused of misfeasance or malfeasance, but of nonfeasance”.

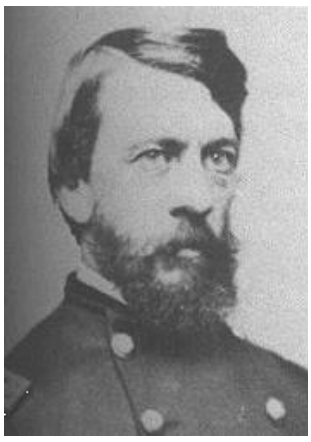
Organization of battlefield medical care

How medical care was delivered on and after the battlefield changed during the war (10). There was an advance station also known as a primary or field dressing station a few hundred yards behind the battle line. It was staffed by an assistant Surgeon or a steward and was marked by a yellow or red flag. Minor wounds were dressed, tourniquets were applied and from here patients

were transported usually by stretcher to the field hospital. Early in the war stretcher bearers were members of the regimental band and many of them fled when the first shots were fired. The field hospital was about a half mile to a mile behind the battle line. There were ambulances here that were used to bring the wounded to temporary battlefield hospitals which were larger, often under tents, and out of artillery range. Later in the war patients were transported to large general hospitals by train or ship. These did not exist when the war began. Camp Letterman was a large temporary hospital at Gettysburg staffed by 650 medical officers, with 1000 ambulances and 3000 drivers and stretcher men that took care of 14,193 union and 6,802 confederate casualties. One hundred and six of the 650 medical officers were left behind to take care of the wounded after the battle. There were still wounded there when Lincoln gave the Gettysburg address four months later. Many of those in the audience were staff of Camp Letterman. Triage was carried out at the field hospital level. Flesh wounds and other minor wounds were treated with opium. Head and stomach wounds were cared for by stewards and walking wounded and kept comfortable with opium or laudanum because they were expected to die. Extremity wounds were surgical cases and amputation needed to be done quickly before infection set in. The less injured often took care of the more seriously wounded. Soldiers detailed to the field hospital were often those with behavioral problems. At the battle of Antietam there were 71 Union field hospitals. As the war went on these were consolidated. There was no military ambulance corps in the Union army until August of 1862. Until that time civilians drove the ambulances. Early in the war the ambulance corps was under the Quartermaster corps, which meant that ambulances were often commandeered to deliver supplies and ammunition to the front. Ambulances were important because soldiers that transported patients often did not return to their units and the battlefront. Jonathan Letterman set up his own ambulance corps in the East under General George McClellan. Medical directors chose all the soldiers for their services.



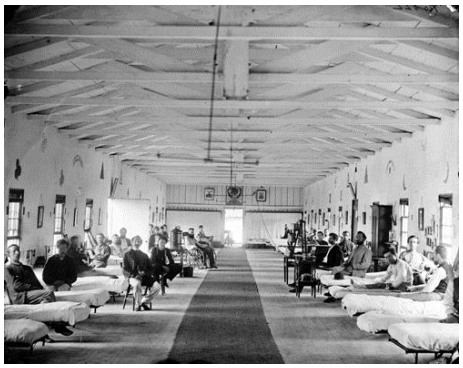
Field hospital



Jonathan Letterman

Ambulances could not be used for other purposes and only the ambulance corps was allowed to remove wounded from the battlefield. Letterman was responsible for a number of organizational improvements within the Army of the Potomac and was given a free hand by McClellan to implement them. He moved quickly and was very effective. For example, at the second battle of

Bull Run (August 29-September 1, 1862) 3 days after the battle there were still 3,000 Union wounded on the field and they were not all retrieved until September 9. Less than 3 weeks later at the Battle of Antietam on September 17, 1862, the single bloodiest day in the history of American warfare, all 9,416 wounded Union soldiers were removed from the battlefield by the end of the following day.



Pavilion of a general hospital

Large general hospitals were established by September of 1862 (7). These were in large cities and soldiers were transported by train or ship. At the end of the war there were a total of 400 with about 400,000 beds. They were built in the pavilion style and each pavilion cared for about 60 patients. There were 2 million admissions to these hospitals with an overall mortality of 8%. In Richmond Sally Tompkins, a nurse, opened a hospital and paid for it herself. She was named a captain in the Confederate army, she was the only woman to serve as a Confederate officer. There were 16 such hospitals in Washington, D.C., 7 in Alexandria, Virginia and 27 in Philadelphia. In the South the largest general hospital, Chimborazo, was in Richmond, Virginia. It was built out of tobacco crates on 40 acres. It contained 5 separate hospitals each made up of 30 buildings. There were 150 wards with 40-60 patients per ward. The census was as high as 4,000. They treated about 76,000 patients with a 9% mortality.

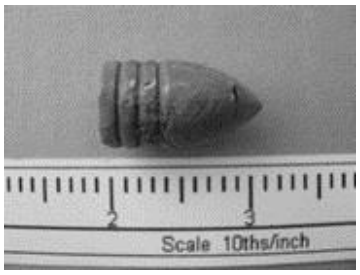
Combat-related injuries

Types of Weapons and Number of Wounds Treated

Type of Weapon	Number	% of Recorded Cases
Conoidal (minié) ball	108,049	76.0%
Round or musket ball	16,742	12.0
Fragment of shell	12,520	9.0
Pistol or buckshot	3,008	2.0
Grape, canister, etc	1,153	1.0
Solid shot	359	0.3
Explosive musket ball	139	0.1
Unknown missile	103,829	—

Compiled from data in *Medical and Surgical History,* Surgical Section, vol. 3, p. 696.

Before interpreting the data regarding combat-related injuries it is important to recognize limitations in the reporting. In order to be reported a soldier had to be either transported to or make it back to a field hospital and this may have resulted in an underreporting of deaths from cannon fire. As can be seen in the table most of injuries resulted from the Minié ball invented by the French officer Claude-Etienne Minié in 1849 (4). The Minié ball is a 0.58 caliber bullet that is slow moving and is made from soft lead. It flattens on impact and creates a wound that grows larger as the bullet moves

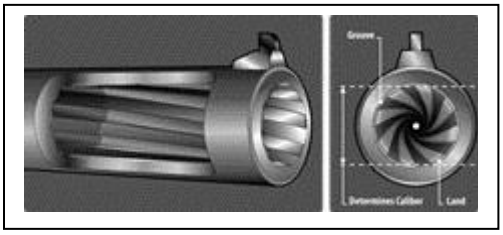


deeper into tissues. It shatters bone above and below impact and usually did not exit. Because of its relatively slow muzzle velocity it brought bits of clothing, skin and bacteria on the skin into the wound. The majority of gunshot wounds occurred in the upper and lower extremities but the fatality rate from these wounds was low. Only 18% had wounds to the abdomen but these were more often fatal from intestinal perforation in the preantibiotic era.

Distribution of Wounds Among Those Listed as Killed in Battle or Admitted to Hospitals

Site	Killed in Battle	Wounded
Trunk	51%	18%
Head and neck	42	11
Lower extremities	5	35
Upper extremities	3	36

Compiled from data in *Medical and Surgical History*, Surgical Section, vol. 3, p. 692.



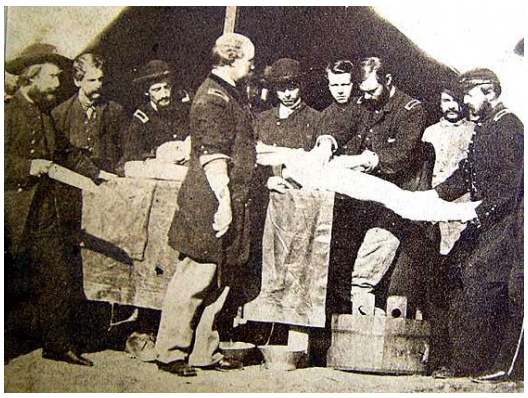
Commanders in the field were also slow to adjust their tactics in keeping with advances in weaponry. In the revolutionary war era smooth bore muskets were accurate only up to about 50 yards and were difficult to load quickly making rapid repetitive fire difficult. However, the newer rifled muskets in use in the Civil War were accurate at up to 500 yards and troops could easily fire them at a rate of 3 times a minute and sometimes faster. In the Revolutionary War men could charge a fixed entrenched position with the possibility of success, whereas, in the Civil War this same tactic was sure to fail. It required at least 3 times as many attackers as defenders to overrun a line of well entrenched men and sometimes even more. This was evidenced by the catastrophic failures of Picket's charge at Gettysburg in the East, and Hood's charge at Franklin, Tennessee in the West (9). Six high ranking Confederate generals were killed at the battle of Franklin where over 7,000 men died in a five hour period. Two of these generals have towns in Texas named after them- Patrick Cleburne and Hiram Granbury.


John Sedgwick

The most famous example of a lack of appreciation for the improvement in weaponry by those in high command occurred at the Battle of Spotsylvania Courthouse. John Sedgwick was the highest ranking Union officer killed in the War. When directing troop movements he stated "What? Men dodging this way for single bullets? What will you do when they open fire along the whole line? I'm ashamed of you dodging that way. They couldn't hit an elephant at this distance." Moments later a bullet fired by a Confederate sharpshooter from more than 500 yards struck him in the head killing him instantly.

Surgical procedures

Three of every 4 surgical procedures performed during the war were amputations. Each amputation took about 2-10 minutes to complete. They were often done on a door placed



Fatality Rate from Amputation at Various Sites

Deaths from Amputation for the British Army in the Crimean War and the Confederate Army of Northern Virginia, 1863

Amputation Site	British Army in the Crimea—% Deaths	Confederate Army of Northern Virginia Timing of Amputation % under 48 hours	% after 48 hours
Hip*	100%	66%	—
Thigh*	56	38	73%
Shoulder joint	33	31	71
Lower leg	30	30	49
Arm	26	14	37
Foot	23	3	12
Forearm	5	12	22

between two barrels. There were 175,000 extremity wounds to Union soldiers and about 30,000 of these underwent amputation with a 26.3% mortality. The further from the torso the amputation was carried out the greater the survival (4). If there was a compound fracture present with splintering of bone amputation was carried out quickly. As the war went on it was noticed that if amputation was done within 24 hours the mortality was 25% versus 50% if the amputation was performed after greater than 48 hours. Only about 1 in 15 Union physicians were allowed to amputate. General order number 19 mandated that all cases of amputation must first either be designated for operation by the surgeon in charge of the hospital or be determined by a majority vote of at least 3 surgeons to be detailed by the surgeon in charge or the medical corps director (11). Only the most senior and experienced surgeons were allowed to amputate. These changes were put into effect because of the public perception that too many amputations were being performed. Amputations were not carried out using sterile technique given that Lister's classic paper on antisepsis did not appear until after the war in 1865.

Anesthesia was first introduced in the United States in the 1840s. During the Civil War it was used in over 80,000 cases. In 76% of cases only chloroform was used, in 14% only ether, and in 10% of cases a mixture was used. Chloroform was preferred because it had a quicker onset of action, could be used in small volumes and was nonflammable. During the war there were only 43 anesthesia related deaths. Anesthesia was fairly light (Stage II) leading to the misperception that it was not being used; this was the case in only a very small number of cases (most at the Battle of Iuka).

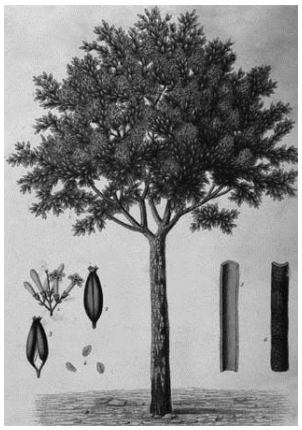
Postoperative wound infections when they developed were a serious problem in the preantibiotic era. Laudable pus was thick and creamy (thought in retrospect to be due to *Staphylococcal* infection) and associated with a better prognosis than malignant pus which was thin and bloody (thought in retrospect to be due to *Streptococcal* infection). Hospital gangrene was a peculiar type of necrotizing fasciitis that was seen in the larger general hospitals. It was probably a result of a *Streptococcal* infection, since nurses taking care of these patients occasionally developed erysipelas, but the exact organism remains unknown. A large percentage of patients with it died (46%). The treatment was to dissect away dead tissue and inject the wound margins with bromine under anesthesia. The wound was then packed with a bromine soaked dressing and the

patients isolated in separate tents with a separate bandage supply. Nurses dressed these patients wounds last and washed their hands in chlorinated soda between patients.

Non combat-related death and illness

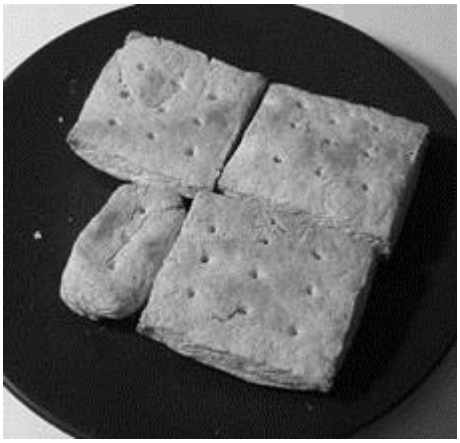
A variety of factors contributed to a high rate of non combat-related illness including camp condition which were overcrowded and filthy. Latrines were often not used, drained into drinking water supplies, or not covered daily. Food quality was poor from several standpoints. It was poorly stored, poorly cooked and there were not enough sources of vitamin C in the diet leading to scurvy. General Order 52 of the Army of the Potomac required camps to be pitched on new ground, to be drained by ditches 18 inches deep, tents were required to be struck twice a week to sun their floors, cooking was to be done only by company cooks, all refuse was to be burned or buried daily, soldiers were required to bathe twice a week and change clothing at least once a week, and latrines were required to be 8 feet deep and covered by 6 inches of dirt daily.

There were very few useful medications at the time. In 1860 the U.S. Pharmacopoeia listed 871 drugs, 67% of which were botanicals. In 1860 Oliver Wendell Holmes stated at a meeting of the Massachusetts Medical Society "I firmly believe that of the whole materia medica, as now used, could be sunk to the bottom of the sea, it would be all the better for mankind, and the worse for the fishes". Holmes was nearly censured by the Massachusetts Medical Board for his comments. Industrial capacity to mass manufacture drugs was also in its infancy and many factories just produced extracts of plants. Medications that were helpful included: quinine for malaria; morphine; chloroform and ether; as well as paregoric. Others were harmful. Calomel or mercurous chloride was used for diarrhea. Mercury is excreted in high concentration in saliva. This led to excessive salivation, loss of teeth, gangrene of the mouth and cheeks in some patients. There were several famous cases of Calomel toxicity. One involved Louisa May Alcott the author of Little Women and the second Carton Burgan who was treated for typhoid fever with the drug. He was one of the first people to



Cinchona tree

undergo plastic surgery in the United States. Dr. Gurdon Buck performed a series of 5 operations using skin from his forehead to rebuild his cheek and the side of his nose. Fowler's solution was used to treat fevers and this contained arsenic. Although no one was keeping track, physicians of the time generated an enormous number of RVUs. This following was excerpted from the log of a Union physician "I was up at Surgeon's call and before breakfast prescribed for 86 patients at the door of my tent. After meal I visited the hospital and wrote prescriptions for 100 more; in all visited and prescribed for 186 men. I had no dinner. At 4 o'clock this labor was completed and a cold bite was eaten. After this, in the rain, I started for Sharpsburg, four miles distant, for medical supplies from the Medical Purveyor at that place". His salary was $155 dollars a month.



Hard tack

The soldier's diet consisted of fresh or pickled beef. It was heavily salted and often needed to be soaked prior to cooking and was often spoiled. Salt cured pork was often rancid and mostly fat. Coffee and hard tack were staples of the diet (6). Hard tack was a large biscuit that was often dipped in coffee to make it more palatable. There was very little in the way of fresh fruits or vegetables. Desiccated vegetables were often substituted but the process itself led to the loss of biologic activity of vitamin C, which led to many potentially preventable cases of scurvy. Scurvy had been known to result from the lack of fresh foods and greens in the diet; an observation made by Johann Bachstrom in 1734. As early as 1747 James Lind had treated and prevented it with citrus fruits. In Great Britain the Merchant Shipping Act required all soldiers to receive one lime per day leading to the nickname of British sailors as limeys. The case fatality rate of many diseases worsened as the war went on and this paralleled the rate of scurvy and night blindness leading some to speculate that it may have been a contributing factor.

Case-fatality Rates for Diseases that Caused 2500 or More Deaths in White Union Troops

	*Fiscal Year**				
	1860	1861	1862	1863	1864
Average number of soldiers	41,556	288,919	659,955	675,413	645,506
% in general hospitals**	0	3.3	6.9	8.2	11.1
Typhoid fever	17.5%	25.7%	32.6%	44.0%	59.5%
"Typhomalarial fever"	N.U.†	N.U.	5.0	9.9	11.2
Consumption	10.1	22.2	35.0	42.7	67.1
Pneumonia	.2	19.5	22.6	25.2	30.8
Chronic diarrhea/dysentery	1.3	3.5	11.6	17.3	23.6
Smallpox and varioloid	2.2	30.1	32.8	43.4	42.7
Remittent fever	0	0.9	1.3	1.2	1.6
Acute diarrhea/dysentery	0	0.3	0.4	0.5	0.6
Congestive intermittent fever‡	2.8	16.2	25.8	27.0	25.8
Measles	0.3	2.6	7.5	7.3	11.0

The most common ailment of soldiers in the war was from gastrointestinal disorders. There were 711 cases per thousand soldiers per year. The rate was higher in the West where sanitation was worse. The mortality rate of acute diarrhea and dysentery was 3-17:1,000 per year, while that of chronic diarrhea and dysentery was 126-162:1,000 per year. There were no cholera outbreaks.

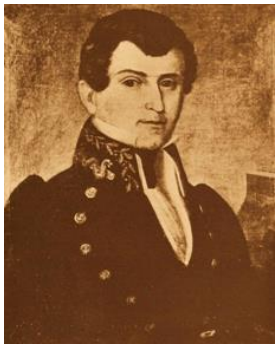
Malaria was also frequent with 522 cases per 1,000 per year (12). This was particularly high in Southern states such as Arkansas and Mississippi. In Arkansas there were 1,287 cases per

thousand soldiers per year. William H Van Buren discovered in 1861 that quinine could be used prophylactically to prevent malaria. Southern states did not have a large enough supply to use it in this way. Although the cause of malaria was unknown at the time, it was known that its incidence could be reduced or worsened by certain behaviors. Locating camps away from stagnant water, sleeping in closed rooms, sleeping on elevated ground or upper floors of buildings were known to reduce risk. Digging ditches or canals and sleeping outdoors were known to increase risk.

Yellow fever was a major problem in the South, particularly in Texas, killing over 10,000 people. There were more outbreaks in Texas during the war than in any other state in Galveston, Houston, Port Lavaca, Sabine City and Matagorda. Epidemics occurred in summer and autumn months. It was known as the stranger's disease since it often affected newcomers to the area. Those that are infected and survive acquire life-long immunity. Outbreaks would often occur after a ship arrived from a Caribbean port. It could be prevented by quarantining newly arrived ships in most cases. Attempts at its prevention by Benjamin Butler in New Orleans may have been the first example of a medical incentive plan.

Deaths from Yellow Fever in New Orleans, 1852-1867

Year	Number of Deaths
1852	456
1853	8,400
1854	2,500
1855	2,670
1856	74
1857	199
1858	4,855
1859	92
1860	15
1861	0
1862	2
1863	2
1864	6
1865	1
1866	192
1867	3,320



Butler told Dr. Jonathan M. Foltz to "order off all ships to quarantine that you make think proper and as long as you keep yellow fever away from New Orleans your salary shall be paid. When yellow fever appears in this city your pay shall cease". Dr. Foltz quarantined all ships for 40 days 70 miles below the city and this virtually eliminated yellow fever in New Orleans (5).

There were over 75,000 cases of typhoid fever in the Union army during the war. In the first year of the war it affected 5.9%. It resulted from exposure to fecally contaminated food and water, as well as flies. It killed 17% of affected soldiers in 1861 and 56% by 1865. It was especially common in Washington, D.C. where it claimed the life of Abraham Lincoln's son Willie.

Measles outbreaks were also common. There were at least 67,000 cases in the Union army with more than 4,000 deaths. Of the 1,200 soldiers in the 12th North Carolina 800 developed measles in the early months of the war. Rural populations often had very little immunity and were mixed with city dwellers in overcrowded camps. Farmers made up 48% of the Union army. Epidemics

often occurred at the time of an influx of new troops. The death rate was almost twice as high in African American as in whites, 11% versus 6%.

A small pox vaccine had been invented by Edward Jenner 70 years before the war but a large percentage of the population was not vaccinated. Annual incidence was 5.2 cases per thousand in whites and 35.1 per thousand in African Americans. Cases were quarantined. Because vaccine material was in short supply during the war material was aspirated from the pustules of vaccinated people. This unfortunately resulted in the transmission of many cases of syphilis.

Ten percent of all deaths in the Civil War occurred in prison camps. This was due to overcrowding, poor hygiene, contaminated water and inadequate rations. Eighteen percent of all Union soldiers imprisoned died, while 12% of Confederate soldiers imprisoned died. Death rates were particularly high for Union prisoners at Camp Sumter near Andersonville, Georgia (23.3%) and Confederate prisoners at Elmira, New York (24.4%). Dr. Wirz, the commander of Andersonville, was executed for war crimes after the war. The largest prisoner of war camp west of the Mississippi was located in Tyler, Texas.

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