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## Civil War Medicine: The Toll of Bullets and Bacteria

**ABSTRACT**

*The American Civil War caused the deaths of over 600 000 soldiers, two thirds of whom died from infectious illnesses. Unsound hygiene, dietary deficiencies, and battle wounds set the stage for epidemic infection, while inadequate information about disease causation greatly hampered disease prevention, diagnosis, and treatment. Pneumonia, typhoid, diarrhea/dysentery, and malaria were the predominant illnesses. Convincing evidence indicates that epidemics played a major role in halting several major campaigns and prolonged the fighting by as much as 2 years.*

*War is cruelty. There is no use trying to reform it. The crueller it is, the sooner it will be over.*

General William T. Sherman,  
just before beginning his  
Savannah Campaign in 1864<sup>1</sup>

If General Sherman's belief had been accurate, the American Civil War should have lasted only a few months at most, instead of 4 long years. Unfortunately, the great cruelty of that war did not foreshorten it, as the millions of Southern and Northern men who fought and died or were prostrated by illness or injury found to their detriment. It is difficult to look back from our modern perspective and understand the scale of the carnage there, where tens of thousands of troops would fall in a single day during a single battle. It is perhaps even more perplexing to realize that the majority of illnesses and deaths were caused not by bullets, but by bacteria.

To understand this fact one must consider the historical context of the War Between the States as the last great armed conflict in the world fought without knowledge of the Germ Theory of disease. While the European pioneers Semmelweiss and Pasteur struggled to elucidate and tame the mysteries of bacterial infection, mid-century America and most of the rest of the world were ignorant of their revolutionary ideas. The ill-fated participants in the Civil War saw sickness and death as random and inscrutable acts of God, striking savagely at soldiers on both sides of the conflict.

### Devastating Wounds and Filthy Camps Contribute to Disease

The natural history of epidemic infection was played out without the hindrance of antibiotics, antiseptics, vaccination, quarantine, or even simple decent cleanliness. As General Robert E. Lee lamented about his troops, “They are worse than children [at keeping clean], for the latter can be forced.”<sup>2</sup> Measles, typhoid, dysentery, and malaria flourished in the 1860s. Only 1 illness was definitely known to be preventable, as Edward Jenner's experiments in the late 1700s had shown that inoculation of cowpox material could prevent smallpox. In some circles, malaria was known to be alleviated by judicious use of quinine, but the timing and dose were not well established, and no consistent policy for malaria prevention was undertaken by the Civil War armies. Ironically, carbolic acid was utilized as an antiseptic, but only after infection had set in, not in the preemptive fashion that Lister later showed was crucial.

Both soldiers and surgeons held sadly inaccurate views of disease causation. Theories often revolved around the idea of toxic *miasma* or *effluvia* emanating from the wet Southern swamplands

where many battles were fought, with poor ventilation in the tents considered a contributing factor. Other putative causes included too much or too little of a certain foodstuff, like salt pork or hardtack; heat alternating with cold; battle stress; and the smell of the sinks (latrines). Indeed, a report by a special committee of the American Medical Association in 1864 noted that the air was full of “pus corpuscles, floating about as dust,” which would settle on wounds and cause infection. These experts suggested that the need for improved ventilation was “the great lesson of the war.”<sup>3(p127)</sup>

Surgeons on both sides had not the least knowledge of antiseptic technique, using the same unsterile instruments on infected and uninfected cases alike and in fact even reusing soiled bandages. Union General Carl Schurz from Wisconsin graphically described the surgical aftermath of the battle at Gettysburg: “There stood the surgeons, their sleeves rolled up to their elbows, their bare arms as well as their linen aprons smeared with blood, their knives not seldom held between their teeth, while they were helping a patient on or off the table. . . . The surgeon snatched his knife from between his teeth. . . . wiped it rapidly once or twice across his bloodstained apron, and the cutting began.”<sup>4</sup>



**Figure 1.** Soldiers recuperate from battlefield surgery.

Unfortunately, Civil War soldiers had a high risk of undertaking a visit to the surgeon’s tent, as well as to the undertaker. Bullets were the overwhelming cause of injury on the battlefield, accounting for an estimated quarter million wounds.<sup>3(p114)</sup> About 20% of all wounded men died before receiving medical care, leaving a huge number to flood the field stations and makeshift hospitals (Figure 1). The vast majority of penetrating injuries were caused by bullet-shaped minié balls or round musket balls, with the remainder caused by artillery shells or grape shot (a cluster of small round projectiles fired from a cannon, generally used at close range with devastating effect).<sup>3(p84)</sup> Interestingly, very few wounds were caused by bayonets or sabers.

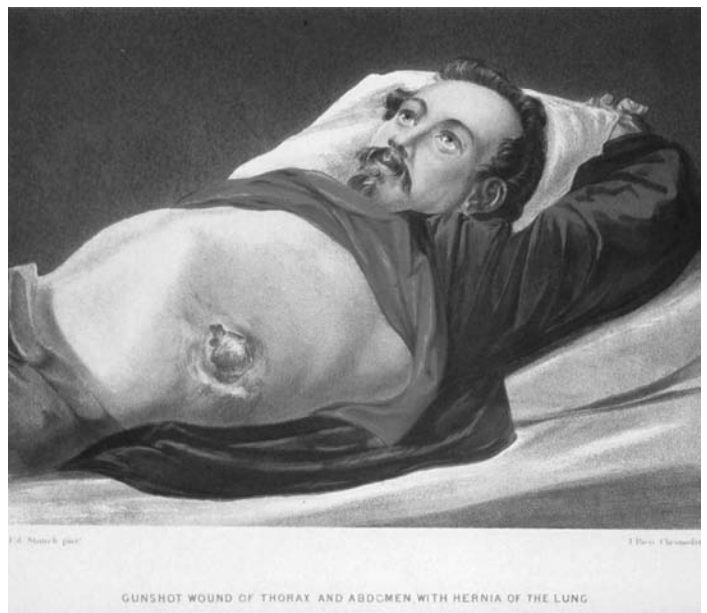
While injuries to the extremities were very common (approximately two thirds of all wounds) given the exposure of these areas, they were not usually fatal, though amputation was



**Figure 2.** The grisly harvest of battlefield injuries.

required about 20% of the time, and secondary infection was prevalent and highly dangerous (Figure 2).<sup>5(pp86-90)</sup> Injuries to the abdomen, chest, and head occurred at about one quarter the rate of extremity wounds but carried a much higher mortality (30%-50%). Needless to say, postsurgical sepsis, chronic infection, and chronic disability were frequent concomitants of battle injuries (Figure 3).

If soldiers dodged bullets and cannonballs, they could not escape the main source of disease transmission, the camp itself. The risk began with basic training, where large numbers of susceptible, mostly rural young men not previously exposed to childhood illnesses were brought together. Measles, mumps, pertussis, and varicella took their toll. General Mansfield Lovell thus replied to General Lee regarding his request for more troops: “[I will send these troops] as soon as I can have them put through the measles, a



**Figure 3.** An illustration from the *Medical and Surgical History* showing a chronic chest wound.

process which they are now undergoing, one-half of them now being sick.”<sup>6</sup> The seasoned survivors then went on to the field, where they fell prey to the “camp diseases,” including smallpox, pneumonia, and erysipelas (skin and soft-tissue infection, usually streptococcal), which were spread from person to person and by aerosol.

Many line officers recognized the salutary effects of personal hygiene, quarantine of the sick, and other public health measures, but during active campaigning all standards fell by the wayside. Few commanders enforced regulations, which directed latrines to be placed downstream from camp; therefore, fecal transmission of diarrhea, cholera, and typhoid proceeded almost uninhibited. No wonder a Texas surgeon complained, “We had an awful time drinking the meanest water not fit for a horse (indeed, I could hardly get my horse to drink it).”<sup>7</sup> The tough, stoic Johnny Rebs and Billy Yanks learned to put up with rancid meat, polluted water, and latrine filth. And vermin. “I have seen men literally wear out their underclothes [sic] without a change and when they threw them off they swarm with Vermin like a live Ant hill when disturbed,” wrote one consternated Iowa sergeant.<sup>8(p153)</sup>

Last, it should be mentioned that many if not most Civil War participants were relatively immunosuppressed owing to malnutrition and concurrent illness. Prolonged protein depletion and widespread vitamin C deficiency (scurvy) contributed to impaired immunity. Attempts to augment the diet with fruit and vegetable products and higher-calorie food sources were thwarted by supply inadequacies, especially on the Southern side as the war ground on.

### Crude Treatments Often Contributed to Poor Outcomes

It should be said at the outset that Civil War doctors were by and large a sincere and hardworking lot. Without the aid of X-rays, blood tests, or microbiological cultures, the physicians did their best to make a reasonable diagnosis. They relied on the patient’s history and the obvious external signs found on rudimentary exam, as few possessed the stethoscope introduced by Laennec earlier in the century. However, very few of them were well-trained in the traditional European manner, and many were downright incompetents who had in fact bought their degree from one of the numerous proprietary diploma mills extant in the United States. The failures of the American medical education system that came to light during the Civil War would lead to several decades of reforms culminating in the creation of the American Medical Association’s Council on Medical Education in 1904 and the Flexner Report of 1910.

As truly effective treatments were so few—salicylic acid (the active ingredient in willow bark), quinine, opium, and colchicine among them—Army surgeons put their faith in a variety of misplaced therapeutics. Favorite agents included Sulfate of magnesia (a cathartic), ipecac (an emetic), whiskey, and the mercurial agents calomel and “blue mass.” Overdose of the latter 2 often resulted in loss of teeth and hair, renal damage, and (rarely) gangrene of the oropharynx and death. Fortunately, bleeding had become archaic by the 1860s, but the medical armentarium still included cupping, blistering, and the application of leeches. When one poor young soldier fell ill with hepatitis, he wrote, “I believe these damn

quacks . . . are doing me more harm than good. They know nothing but Calomel and Quinine. . . . Yesterday they dosed me with Elixir of Vitriol, and today intend [to] paint me in the region of the liver with Iodine, which burns like the devil.”<sup>8(p157)</sup>

Yet, despite incurable disease and inadequate doctors, the soldiers bore their lot bravely and even with humor. One infantryman from North Carolina wrote home, “I think I look as well as ever I wasnt sick since I left home onley bad cole and caught the Bowel complaint that is nothing much in camp for they nearly all git it.”<sup>8(p151)</sup> Soldiers said bluntly that “bowels are of more consequence than brains,” leading to the conclusion that a soldier with chronic diarrhea “didn’t have the guts for soldiering.” Chronic illness joined with frequent death to decimate armies; a given regiment could be expected to lose half its number in a year as the result of disease alone, but men struggled against these odds and kept going. Perhaps the main reason for this stoicism was the fact that civilian life, though safer by far, was also unpredictable; high rates of infant mortality and early death due to accidents and epidemics inured people to suffering.

The most effective treatments that competent surgeons administered were rest and nutrition. Many used quinine effectively for malaria and tried to implement universal smallpox vaccination. They sought, without much success, to emphasize the doctrine of hygiene, which was coming into vogue. During times of battle, they bound up wounds, set fractures, and amputated seriously injured extremities. Many were as good with a blade as their twentieth-century descendants, though they undertook all procedures in an unsterile fashion. The record indicates that Civil War physicians did their best but were unfortunately ignorant of the essentials of disease causation. They were battling an unfair opponent, and the attack of disease proved capable of halting large armies in their tracks.

### The Horrific Scorecard of Disease During the Civil War

Mortality from infections was horrendous, with almost 275 000 deaths from disease in a total military population of approximately 2.2 million in the Union army<sup>9</sup> and an estimated 164 000 deaths among the 750 000 soldiers in the Confederate army.<sup>10</sup> (Confederate figures are incomplete because of the destruction of records during the fall of Richmond.) Moreover, the morbidity was immense: 6.4 million separate medical diagnoses—mostly infections—were reported among Union forces, and 220 000 men were discharged for reasons of chronic disability.<sup>9</sup> However, the ratio of 2 deaths from disease to 1 death from battle wounds still represented an improvement over previous conflicts, as the rate during the recent Mexican-American War had been 7 to 1.<sup>11</sup>

Among Union soldiers, pneumonia (including influenza and bronchitis) accounted for 1 765 000 episodes of illness and 45 000 deaths; typhoid for 149 000 episodes and 35 000 deaths; diarrhea/dysentery for 360 000 episodes and 21 000 deaths; and malaria for 1 316 000 episodes and 10 000 deaths.<sup>9</sup> (Similar data for Southern casualties are lacking, but incidence and death rates were likely proportional. Tuberculosis, syphilis, gonorrhea, viral hepatitis, and staphylococcal skin infections (boils) were prevalent but only rarely caused death and generally did not interfere with military

### Diseases of Minor Military Importance\*

Disease	Illnesses	Deaths
Smallpox	18 952	7058
Tuberculosis	29 510	6946
Measles	76 318	5177
Meningitis	3999	2660
Diphtheria	8053	777
Yellow fever	1371	436
Epidemic jaundice	77 236	414
Venereal diseases	182 482	158
Scarlet fever	696	72

\*Union figures only

campaigning (Table). Surgical infections, including gangrene and bacteremia (*pyemia*), were dreaded because of their high mortality rates but similarly had little overall impact on the war.

Surprisingly, certain infections were much less prevalent among the armies than their reputation in civilian settings would indicate. Diphtheria caused 8053 cases and 777 deaths, while scarlet fever accounted for only 696 cases and 72 deaths.<sup>3(p127)</sup> Smallpox outbreaks were few and of no military importance. The reason for these low attack rates is not clear. Tetanus and gas gangrene were rare, possibly because most battles occurred on unplowed ground that was not contaminated with clostridial spores. Many diseases such as brucellosis, leptospirosis, and typhus were undoubtedly present and much more common than they are today, but their true identities were unrecognized in the 1860s, and their symptoms were attributed to other diseases.

The impact of infectious diseases on the course of the Civil War is difficult to overstate. Good evidence links infectious complications with the failure of several important Union campaigns early in the war, including abortive campaigns along the Eastern seaboard<sup>12(pp67-84)</sup> and in the West at Corinth.<sup>12(pp156-182)</sup> The latter was particularly momentous, in that failure of the Corinth campaign in 1863 resulted in phlegmatic General Henry Halleck being replaced as operational commander in the West by General Ulysses S. Grant, whose conquest of Vicksburg the next year paved the way for future glory.

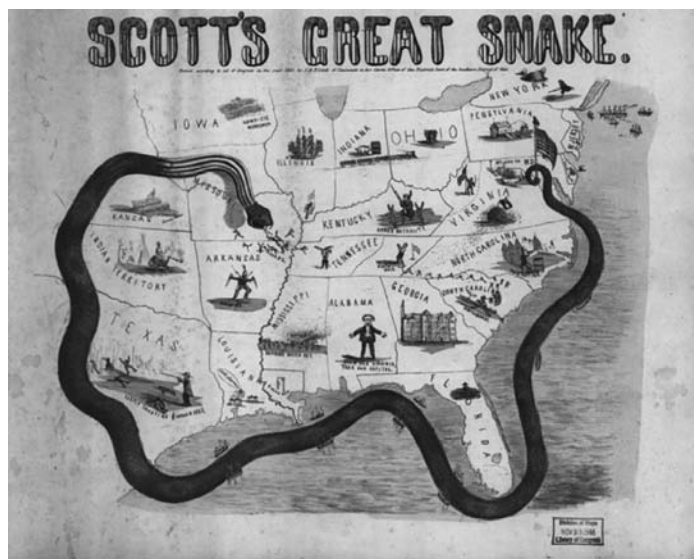
The most celebrated episode of military failure caused by microbial intervention remains McClellan's Peninsula Campaign. In the spring of 1862, General George B. McClellan was the linchpin of Lincoln's war plan—actually a variant of Winfield Scott's celebrated Anaconda Plan (Figure 4)—to land troops on the Virginia peninsula in a bold move to take Richmond speedily.<sup>13</sup> However, malaria, typhoid, and dysentery assailed his army in the swampy encampments along the Chickahominy River, reducing troop strength by one third. Indeed, incidence figures point to 3 disease episodes per soldier over a 9-month period ending in April 1862.<sup>12(pp98-151)</sup> By late summer McClellan's army was hopelessly bogged down in Virginia heat and mud. Several hard-fought

battles (the Battles of Seven Days) against the Confederate army of northern Virginia, led for the first time by General Robert E. Lee, highlighted the futility of the Union effort. In the end, McClellan was forced to abandon the project and retreat with his men to a winter encampment, where infection and low morale were rampant. Chickahominy thus became a term connoting horror and despair: "The mention of that name causes a shudder to run through the survivors of the Army of the Potomac, and brings sad memories to thousands of householders."<sup>12(p133)</sup>

The failure of Union efforts on these important fronts prolonged the war by 1 and possibly even 2 years.<sup>12(pp3-45)</sup> Of course, the Confederates suffered greatly, but they were not on the offensive; thus, 1862 and 1863 saw Northern stalemate and a continuation of Southern hopes. Ironically, one could argue that disease ultimately betrayed the South by taking the life of General Stonewall Jackson in 1863 after Chancellorsville. This ruthless fighter, who was indispensable to Lee, died of pneumonia after the amputation of his left arm for a gunshot wound. Lee is reported to have said of Jackson after the surgery, "He has lost his left arm, but I have lost my right arm."<sup>14</sup> Later in the war epidemic disease continued to cause immense difficulties for both North and South but was not a decisive factor. The Southern forces were too attrited, and the Federal advance was relentless under the leadership of hard-fighting men like Ulysses S. Grant and William T. Sherman.

### The Medical Aftermath of the Civil War

Major advances during the Civil War included an effective battlefield triage system; a professional ambulance corps; refinements in the delivery of anesthesia during surgery; development of large, clean pavilion-style hospitals; inauguration of a nascent public health movement; and improved methods for amputation and bone setting. The nursing corps became professionalized, with widespread use of women as nurses. Many nurses became famous



**Figure 4.** Winfield Scott's Anaconda Plan, adopted by Lincoln, called for blockading the South on the East coast, taking control of Mississippi, taking Richmond, and dividing the Confederacy in half.

for the compassionate care they gave under horrible conditions, including Mary Ann “Mother” Bickerdyke (Figure 5),<sup>15</sup> Louisa Mae Alcott, Mary A. Livermore,<sup>16</sup> and Mary J. Safford (who later graduated from medical school and became a prominent physician). William A. Hammond (Figure 6), Jonathan K. Letterman, and Joseph K. Barnes were prominent physicians who held critical posts in the Union army and were instrumental in perfecting the system of battlefield triage and treatment. Hammond commissioned and Barnes edited the massive and encyclopedic *Medical and Surgical History of the War of the Rebellion*, which set the standard for documentation of medical care during wartime.



**Figure 5.** “Mother” Bickerdyke, iconic nurse and veterans’ activist.



**Figure 6.** General William Hammond, forward-looking Surgeon General from 1862-1863, whose innovative ideas led to a backlash resulting in his dismissal. He later became a prominent neurologist and founder of the *Annals of Neurology*.

By 1867 Lister had described his experiments with carbolic acid antiseptics, while the findings of Semmelweis and Pasteur were becoming widely known. Within a few years the centuries of superstitious clinging to theories of divine retribution and toxic effluvia gave way to a scientific understanding of infectious disease causation and prevention. However, this knowledge came too late for those who suffered during the Civil War. If the soldiers of that war had fought only 10 years later, the death toll from disease might have been a mere fraction of what it was.<sup>17</sup> In fact, the metaphorical Third Army killed more people than minie balls and grapeshot ever could have and crippled hundreds of thousands as well. Yet with the end of the war came renewal. The Civil War thus remains a pivotal event in American medical history, the final sepulcher of unscientific medical thinking and a monument to the awesome power of disease.

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