The U.S. Military and the Influenza Pandemic of 1918–1919

Carol R. Byerly, PhD[a]

SYNOPSIS

The American military experience in World War I and the influenza pandemic were closely intertwined. The war fostered influenza in the crowded conditions of military camps in the United States and in the trenches of the Western Front in Europe. The virus traveled with military personnel from camp to camp and across the Atlantic, and at the height of the American military involvement in the war, September through November 1918, influenza and pneumonia sickened 20% to 40% of U.S. Army and Navy personnel. These high morbidity rates interfered with induction and training schedules in the United States and rendered hundreds of thousands of military personnel non-effective. During the American Expeditionary Forces' campaign at Meuse-Argonne, the epidemic diverted urgently needed resources from combat support to transporting and caring for the sick and the dead. Influenza and pneumonia killed more American soldiers and sailors during the war than did enemy weapons.

[a]Independent scholar, Boulder, CO

Address correspondence to: Carol R. Byerly, PhD, 1811 Columbine Ave., Boulder, CO 80302; tel. 303-546-6654; fax 303-449-6243; e-mail <Carol.Byerly@Colorado.edu>.

©2010 Association of Schools of Public Health

In the fall of 1918, U.S. Army and Navy medical officers in camps across the country presided over the worst epidemic in American history, but the story was not new. War and disease have been linked throughout history as armies, weapons, and human pathogens have met on the battlefield. The conquistadores brought with them diseases that devastated the New World; typhus plagued Napoleon's armies; and typhoid fever humiliated the American Army during the Spanish-American War. But now U.S. Army and Navy personnel knew how to test and sanitize water supplies, vaccinate troops against typhoid and smallpox, and treat or prevent other infections. Modern bacteriology, it seemed, had tamed many diseases. Navy Surgeon General William C. Braisted proudly stated that "infectious diseases that formerly carried off their thousands, such as yellow fever, typhus, cholera, and typhoid, have all yielded to our modern knowledge of their causes and our consequent logical measures taken for their prevention."[1]

Twentieth-century warfare, however, had evolved to an even more deadly scale as industrialized armies of millions battled on the plains of Eastern Europe, the cliffs of Gallipoli, and in the deadly trenches of the 550-mile-long Western Front. When the European arms race exploded into war in 1914, the empires shocked themselves and the world with the killing power of their artillery and machine guns, their U-boats and mines, and their poison gas. These new weapons generated new, horrible injuries that took life and limb in a flash or festered into gangrenous wounds that could further maim and kill. The carnage traumatized some men into shellshock, and poison gases burned and suffocated others so horribly that nurses dreaded caring for them because they could provide little comfort. War diseases—notably the soldiers' nemeses diarrhea, dysentery, and typhus—flourished, and the trenches offered new maladies such as "trench foot," an infection caused by wearing sodden boots and standing in water and mud for days on end, and "trench fever," a debilitating fever transmitted by body lice.

Then, in the fourth dreadful year of the war, as the American Expeditionary Forces (AEF) assumed fighting strength and prepared their first great offensive against the Germans, the flu struck. By the War Department's most conservative count, influenza sickened 26% of the Army—more than one million men—and killed almost 30,000 before they even got to France.[2,3] On both sides of the Atlantic, the Army lost a staggering 8,743,102 days to influenza among enlisted men in 1918.[4] (p. 1448) The Navy recorded 5,027 deaths and more than 106,000 hospital admissions for influenza and pneumonia out of 600,000 men, but given the large number of mild cases that were never recorded, Braisted put the sickness rate closer to 40%.[5,6] (p. 2458)

The Army and Navy medical services may have tamed typhoid and typhus, but more American soldiers, sailors, and Marines would succumb to influenza and pneumonia than would die on the industrialized battlefields of the Great War. The story of the influenza epidemic in the military is often lost in the historical narrative of the Great War, included merely as a coda to that four-year horror, coinciding with the final battles and the Armistice. But an examination of medical reports and War Department and Department of the Navy documents from the war reveals that the war and the epidemic were intertwined.[7] World War I and influenza collaborated: the war fostered disease by creating conditions in the trenches of France that some epidemiologists believe enabled the influenza virus to evolve into a killer of global proportions. In turn, disease shaped the war effort by rendering much of the Army and Navy non-effective and diverting resources, personnel, and scarce human attention and energy from the military campaign. The exigencies of war also thwarted many of the efforts such as crowd mitigation and quarantines to control the epidemic. The influenza epidemic in the U.S. military therefore provides a cautionary tale about the power of war to change the health environment and the power of disease to influence the conduct of war.

GOING TO WAR

The United States at first hung back from the killing in Europe, as many Americans believed it was not their fight. But under increasing pressure from Britain and France, and angered by German U-boat attacks that threatened American commerce and security, and the revelations in the Zimmermann Telegram that Germany was urging Mexico to attack the United States, President Wilson abandoned neutrality and in April 1917 asked Congress for a declaration of war.

The U.S. economy was already booming as farmers and manufacturers shipped foodstuffs and military supplies to the belligerent nations. Now the United States would also generate its own military force that would help overwhelm the enemy and bring about the armistice of November 11, 1918. Congress quickly established a draft, and more than 4,600 Selective Service draft boards screened 10 million men to find the strongest and most fit soldiers and sailors. The military grew from just 378,000 strong in April 1917 to more than 4.7 million by war's end, with an Army of 4.1 million and a Navy of 600,000. Seventy-two percent of enlisted forces were inducted, and the military

Figure 1. Locations of Army training camps in the U.S. in 1918

Source: War Department (US). Annual report, 1919. Washington: Government Printing Office; 1920. p. 1519.

population reflected the country's ethnically diverse and racially segregated society. An estimated 20% of Army draftees were foreign-born and the troops spoke at least 46 languages, some 5,700 were Mexican aliens, and 12,500 were American Indians.[8] (p. 367-409) More than 400,000 African Americans served in the Army, some in two black combat divisions but most in labor battalions. The Navy employed only 5,300 black sailors, confining them to positions as cooks and stewards.[9]

War mobilization drew millions of civilians into military institutions and extended the military into all corners of the country. To train and supply these men, the Army and Navy expanded existing facilities and directed training activities at various civilian organizations. Military camps, arsenals, air fields, and supply depots sprouted up in every state. The Army began training recruits in the fall of 1917 at 32 large camps, each home to 25,000 to 55,000 troops. Soldiers also went to specialized camps for training in specific fields such as artillery training at Camp Knox, Kentucky, railway operations at Camp Benjamin Harrison in Indianapolis, military engineering at Camp Forrest, Georgia, and medical unit training at Camp Crane, Pennsylvania. The War Department also operated some 40 air fields for aviator training and 10 embarkation and debarkation camps.[8] (p. 677—78) The Navy expanded its training capacity from 6,000 recruits to more than 100,000 at stations on both coasts, the Gulf of Mexico, and Lake Michigan, and also had specialized training centers such as the Navy gas engine school and the aviation ignition school at Columbia University in New York. In addition to the training camps, in the summer of 1918 the War Department established the Student Army Training Corps (SATC), intended to augment the work of the Reserve Officers Training Corp (ROTC) and prevent war mobilization from emptying institutions of higher education. Under the program, more than 500 colleges and universities trained officer candidates and provided technical instruction in fields such as auto mechanics and radio operation. By the Armistice, about 158,000 young men had enrolled in SATC programs.[8] (p. 556) This expansion of military institutions created a virtual network of young adults across which influenza could and would travel (Figure 1).

As the Army grew, the Army Medical Department raced to meet its needs. Military medicine was more like public health medicine (which managed large

populations) than private medicine (which focused on care for individuals). By necessity, line officers cared less about who was sick or on leave than who they could send into battle. This was called the "effective" rate—how many men were available in a given unit to work and fight. Medical officers therefore tried to keep non-effective rates as low as possible, and measured their success statistically more than by individual patient care. The Army Medical Department tracked sickness in camps, combat units, labor battalions, ports, and ships by the day, week, month, and year, and compared its record with civilians, earlier wars, and other armies. Army Medicine also combined the old sanitation model of clean water and fresh air with the new public health approaches of educating soldiers on how to stay healthy and prevent disease. Army Surgeon General William C. Gorgas came out of the sanitary tradition and stressed good food, clean water, fresh air, and no crowding, but like other Progressives, also saw the Army as an opportunity to instill young men with middle-class values such as good personal hygiene.[10]

To care for the growing Army, the Medical Department increased its hospital capacity from 9,500 beds to 120,000 in the United States alone. The Red Cross assisted by recruiting trained nurses for the Army Nurse Corps and organizing ambulance companies and 50 hospitals of 1,000 beds each out of American universities and medical institutions. The Army Medical Department ultimately numbered 30,500 medical officers, 21,500 nurses—including 350 African American physicians but no black nurses until December 1918—and 264,000 enlisted men.[8] (p. 257) The Navy Bureau of Medicine and Surgery had some 3,000 medical officers, 1,700 nurses, and 11,000 enlisted men.[5] (p. 2066, 2073) As one civilian public health official pointed out, with almost 30% of American physicians in military service, ". . . there were sections of the country that were absolutely stripped of physicians." During the pandemic in civil society, therefore, ". . . the great majority of available, medical and nursing personnel, were already in the Army or Navy, so that the available personnel from which to draw was limited."[11]

World War I was largely a ground war, so the Army bore the brunt of the fighting. While some 55,000 Marines served with the AEF, most of the Navy's responsibilities involved patrolling for U-boats, sweeping for enemy mines, escorting troop and cargo ships across the Atlantic, and mining the North Sea against the German Navy. Mobilization got off to a slow start in the United States, and a year after the declaration of war, the AEF in Europe numbered fewer than 400,000. By May 1918, however, hundreds of thousands of soldiers were crossing the Atlantic each month to build a combat force of two million by November. This transport of an army to another continent and back was one of the great achievements of World War I and demonstrated the power of the American government and economy. But such triumph also carried danger because as the doughboys traveled "Over There," they did not travel alone.

A LETHAL VIRUS

Influenza sailed with American troops across the Atlantic and when it exploded in late August and September in Europe and the United States, medical officers found themselves on the front lines of an epidemic worse than any of them had ever seen or imagined. Many were among the most knowledgeable and skilled physicians in the country and had just recently entered military service. They did their best to save those stricken by influenza, but could do little more than provide palliative care of warmth, rest, and a gentle diet, and hope that their patients did not develop pneumonia.

One of the tragedies of the influenza epidemic is that by the 1910s, the medical profession held many of the scientific and epidemiological tools to understand the nature and extent of the damage influenza and pneumonia were wreaking on their patients, but lacked the tools to effectively fight them. While virology would not emerge until the 1930s, physicians could identify many of the bacteria causing the deadly pneumonias that were killing their patients, but without antibiotics they could do little to fight the infections. Thus, as the epidemic struck their camps, hospitals, ships, ports, or divisions, many medical officers documented what they saw, as if trying to define that which they could not control. They ran tests and did autopsies, recorded their laboratory and clinical findings, compared morbidity and mortality rates across time and with other units, and tried to stay healthy themselves. They wrote detailed reports to their superiors and published myriad articles on the influenza of 1918–1919. These studies and reports would provide some of the most extensive documentation on the pandemic, informing civilian and military researchers alike as they struggled for years after the war to understand what had caused the epidemic and its widespread suffering.[2,4,5,7]

As they conducted their analyses, military medical officers soon understood that the wave of influenza that had run through many U.S. training camps during the spring of 1918 constituted a first wave of the pandemic. Fourteen of the largest training camps had reported influenza outbreaks in March, April, or May, and some of the infected troops carried the virus with them aboard ships to France.[12] In the late

spring and summer, influenza visited all of the armies of Europe, including the AEF, but because influenza was common in the military, and few patients became critically ill, medical officers were not alarmed. But by the late summer some saw the emergence of a new, lethal influenza.

Captain Alan M. Chesney, medical officer with an AEF hospital at Valdahon, an artillery training camp behind the front lines in France, documented the evolution of a more virulent influenza from his vantage point. A physician who was later dean of the Johns Hopkins Medical School, Chesney noted that three different infantry brigades of 4,000 men occupied the post in succession, "thus every three or four weeks there occurred a marked change in the population of the post." He theorized that "the history of the epidemic, therefore, resolved itself into distinct periods corresponding to the various brigades which entered the post," and "the frequent changes in the population of the post, brought about by the short stay of each brigade, exercised considerable influence upon the course of the epidemic of influenza."

During Chesney's first documented period, the month of June to July 27, the 5th Artillery Brigade had 77 "relatively mild" cases of influenza. During the second phase, July 27 to August 23, 200 men of the 58th Artillery Brigade became ill, about 6.5%. None of them died, but the outbreak was serious enough that the next brigade cleaned out the barracks, even washing the walls, before they moved in. Despite this precaution, during Chesney's third phase, August 23 to November 8, more than one-third of the 6th Artillery Brigade, 1,636 soldiers, contracted influenza and 151 died. Chesney concluded that ". . . these successive outbreaks tended to be progressively more severe both in character and extent, which would speak for an increasing virulence of the causative agent."[13]

Medical officers such as Chesney wanted clean barracks and also worried about crowding. Surgeon General Gorgas had recommended that Army housing provide 60 square feet per man, but did not often prevail. As Gorgas told one training camp commander, "We know perfectly well that we can control pneumonia absolutely if we could avoid crowding the men, but it is not practicable in military life to avoid this crowding."[14] The Medical Department even asserted that "there is to be expected a definite relation between the degree of crowding and the amount of respiratory infection."[2] (p. 111) But if it was difficult to control crowding in the training camps, it was impossible in the battlefields. Evolutionary biologist Paul Ewald has argued that trench warfare and its crowded conditions enabled an especially aggressive and deadly influenza virus to gain footing in humans.[15] As soldiers in the trenches became sick, the military evacuated them from the front lines and replaced them with healthy men. This process continuously brought the virus into contact with new hosts—young, healthy soldiers in which it could adapt, reproduce, and become extremely virulent without danger of burning out. From there, according to a Navy report, "It is reasonable to suppose that late in August influenza of severe type was spread from French, Spanish, and Portuguese seaports to the Orient, South Africa, the United States, and South America."[5] (p. 2427) As Chesney and Ewald suggest, the influenza of 1918 was a product of trench warfare, and the influenza that attacked the 6th Artillery at Valdahon would travel the highways of war, circling the globe.

INFLUENZA IN THE CAMPS

Braisted pinpointed the arrival of the epidemic in the United States to Tuesday, August 27, 1918, at Commonwealth Pier in Boston ". . . when three cases of influenza were committed to the sick list." The next day produced eight cases, and on August 29, 58 cases were reported, 15 so ill they were transferred to the U.S. Naval Hospital in Chelsea.[5] (p. 2427) Within 48 hours, three medical officers who had seen the patients also fell ill.[5] (p. 2473–4) Influenza reached civilians in Boston and on September 8, arrived "completely unheralded" at the Army's Camp Devens, outside of the city. Within 10 days, the base hospital and regimental infirmaries were overwhelmed with thousands of sick trainees.[16,17]

Gorgas sent his best epidemiologists to Camp Devens to investigate. His team included Victor C. Vaughan, dean of the University of Michigan School of Medicine and director of the Surgeon General's Office of Communicable Disease; William Henry Welch, famed pathologist from Johns Hopkins; and Rufus Cole, respiratory diseases expert from the Rockefeller Institute.[18] They found the medical situation "grave," and recommended 16 measures to control the outbreak, the most dramatic being a halt to transfers in or out of Devens until the epidemic passed. Camp Devens physicians performing autopsies described influenza pathology as unique, characterized by "the intense congestion and hemorrhage" of the lungs.[19] Cole and Welch observed one such autopsy, and Cole noted that Welch, "turned away from the blue, swollen lungs with wet, foamy, shapeless surfaces [and] became excited and nervous, saying, 'This must be some new kind of infection or plague.'" Added Cole, "It was not surprising that the rest of us were disturbed, but it shocked me to find that the situation, momentarily at least, was too much even for Dr. Welch."[20]

But as Vaughan and Welch investigated Camp Devens, the virus kept moving. Before any travel ban could be imposed, a contingent of replacement troops departed Devens for Camp Upton, Long Island, the Army's debarkation point for France, and took influenza with them. Medical officers at Upton said it arrived "abruptly" on September 13, 1918, with 38 hospital admissions, followed by 86 the next day, and 193 the next. Hospital admissions peaked on October 4 with 483, and within 40 days, Camp Upton sent 6,131 men to the hospital for influenza. Some developed pneumonia so quickly that physicians diagnosed it simply by observing the patient rather than listening to the lungs. "The patient looked sick and suggested a serious condition," they wrote, "his face was often cyanotic, sometimes ashy, sometimes just pinched looking. He expressed no pain or suffering. If his mind was clear he expressed a sense of euphoria, or of unnatural realization of his condition, which in particular marked the advanced stages of the disease."[21] Private James Downs entered the hospital on September 23 with a temperature of 104 degrees and died three days later. An Army pathologist clipped a piece of Downs' lungs and sent it to the Army Medical Museum as a specimen of the damage influenza was doing to young soldiers.[22] As they walked through Camp Upton's pneumonia wards of 900 patients, medical officers experienced "horror at the frightfulness of the sight of the hopelessly sick and dying and at the magnitude of the catastrophe that had stricken wholesale the young soldiers prepared to face another enemy but helpless before this insidious one." That sight, they said, "will haunt for life the minds of those who saw it."[21]

In efforts to contain the outbreak, Camp Upton's commander John Mallory put its 30,000 inhabitants under quarantine, barring travel in and out except on "the most urgent business."[23] But in wars and epidemics there is much urgent business and people got through. Naomi Barnett of Brockton, Massachusetts, had sped to Upton to care for her fiancé Jacob Julian when she learned he was ill. They planned to be married before he departed for duty in France but the young woman died of pneumonia two days after arriving at the camp. Her beloved died 30 minutes later. "Relatives," reported the local newspaper, "are planning a double funeral in Brockton."[24] To control influenza and pneumonia, the hospital provided patients with 100 square feet of floor space, separated beds by sheets, and furnished face masks to everyone in the camp. As pneumonia spread, medical officers also sprayed the mouths and throats of 800 healthy men daily with the solution of dichloramine-T as a preventive measure, but when they compared their influenza rates with 800 untreated men, they were disappointed to find that "…over a period of twenty days the incidence in the two groups was the same."[2] (p. 121)

As Upton medical officers climbed the peak of their epidemic, the virus traveled west and south, arriving at Camp Grant, Illinois, on Saturday, September 21, 1918, with 70 hospital admissions. "So sudden and appalling was the visitation that it required the greatest energy and cooperation of every officer, every man, and every nurse to meet the emergency," wrote one observer.[4] (p. 749) Hospital admissions rose to 194, then 370, then 492, to a high of 788 admissions on September 29. Hospital officials summoned all officers on leave, converted barracks to hospital wards, and by "extreme effort" expanded the hospital capacity from "10 occupied beds to a capacity of 4,102 beds in six days."[4] (p. 751) Influenza still overwhelmed every department. The hospital laboratory resorted to local civilian facilities to perform specimen tests. Camp ophthalmologists saw patients with conjunctivitis, an influenza complication, and ear, nose, and throat specialists saw those with other dangerous secondary infections. As individuals became seriously ill, camp officials sent out "danger" or "death" telegrams to families and loved ones, but soon they received so many return calls, telegrams, and visitors, they had to set up a separate hospital tent as an information bureau. Medical personnel were not immune. Eleven of the 81 medical officers fell ill, and three civilian and three Army nurses died. The epidemic even caused the Medical Department to drop its prohibition on black nurses so that Camp Grant called African American nurses to care for patients. The women had to wait, however, until separate, segregated accommodations could be constructed.[25]

Ten days after the epidemic struck, hospital admissions began to fall but pneumonia took hold, and Camp Grant's daily death toll began to climb. It reached double digits on October 1 with 14 deaths, then 30 the next day, 46 the next, and 76 on October 4. The mortuary was designed to handle only four deaths a day. On Friday, October 4, with more than 100 bodies in the mortuary camp, officials negotiated with local undertakers to take the bodies at $50 each, but when someone produced a flatbed truck to remove the dead, the Army quickly provided more dignified closed trucks. The number of dead broke 100 on October 5 and reached a horrifying high of 117 deaths on October 6.[4] (p. 750–4) The last day the Camp Grant death toll exceeded 100 was October 9, but the decline was too late for its commander. Col. Charles B. Hagadorn, a West Point graduate and career officer who had served in Russia and the Panama Canal Zone, was acting camp commander when influenza struck. Although

Camp Grant's sickness and death rates were no worse than other camps and better than some, fellow officers later told reporters that Hagadorn had been showing the strain of the epidemic.[26,27] Troubled as more than 500 soldiers died of pneumonia under his command, on October 7, he committed suicide with a pistol shot to his head. In the end, Camp Grant suffered 10,713 influenza victims, including 1,060 deaths in a population of 40,000.[4] (p. 749)

Across the country, medical officers noted the rapidity with which the epidemic hit each camp, in some cases reaching its highest number of cases within 10 days (Figure 2).[5] (p. 2429) The steep gradient of the flu attacks can be seen in the headlines of *The Camp Dodger,* the weekly newspaper of Camp Dodge, Iowa, which strobe the trajectory of the epidemic. The flu struck on September 29, so its first mention is an October 4 headline: "Dodge Battles Spanish 'Flu'; Impose Quarantine, Cases Number 1500, One Death Reported." The next week's front page announced, "Flu Epidemic Subsiding; Fewer New Cases; Death Rate Is Low," and the following week's headline read, "Peak Flu Scourge Has Passed." Influenza disappeared from the front page of the October 25 edition, and the November 1 front page noted, "Services in Memory of Dodge Dead; Soldiers and Civilians Will Pay Tribute Sunday to Victims of Epidemic."[28–31] And that was it. Although Camp Dodge would have one of the worst records among Army camps with more than 13,700 hospital admissions and 700 deaths, the epidemic had passed and the Armistice dominated the news.[4] (p. 2017)

Influenza reached all Army training camps in a month, arriving September 8 at Camp Devens, September 13 at Camp Upton, September 21 at Camp Grant, September 26 at Camp Cody, and then on to the West Coast, arriving October 8 at Camp Fremont, California, and October 9 at Camp Lewis, Washington.[2] (p. 138) War Department training reports show that as influenza arrived at each camp, it "interfered with," "curtailed," "brought to a standstill," or even caused the discontinuation of training activities as recruits and instructors fell ill.[32] The deadly second wave of the epidemic lasted about four weeks in individual camps and ran its course in the Army in about eight weeks, roughly from September 15 to November 15, 1918. The high-water mark for deaths in the United States came the week of October 4 and in the AEF, the week of October 11.[4] (p. 2755) Navy and Army officers observed that the U.S. camps had higher morbidity and mortality rates than shipboard sailors or AEF soldiers and Marines; one report set hospital admissions for influenza at 167 per 1,000 in the AEF compared to 361 per 1,000 in the U.S.

Figure 2. Deaths per 1,000 soldiers each week during 1918–1919 in the U.S. Army

Source: Ayres LP. The war with Germany: a statistical summary. Washington: Government Printing Office; 1919. p. 127.

camps.[4] (p. 1469) Officers believed this was because deployed personnel had been exposed to influenza in an earlier wave and therefore had some immunity to the second deadly wave.[5] (p. 2414)

In some camps, African American soldiers had lower morbidity but higher mortality rates than white soldiers, and some medical officers erroneously attributed this to racial weakness and susceptibility. But segregation, ironically, may have shielded some black units from influenza infection, and the higher mortality could have been due to African Americans' often inferior living conditions and medical care in the military. Segregation in the Army was rarely "separate but equal." One study of the army rations allocated to men at camps Grant, Dodge, and Funston over four months revealed that the 366th Infantry of the Ninety-second Division, one of the black combat divisions, received less protein and fewer calories than the white units, even though they were on the average taller and heavier than their white counterparts.[33] Private Robert Stevens of Louisiana, with the 803rd Pioneers, a black unit that fought in the Meuse-Argonne, also remembered that when several hundred men in his regiment were sick with pneumonia, they had only one medical officer.[34]

Figure 3. Total deaths in the U.S. Army including Marines attached to it: April 6, 1917, to July 1, 1919

Source: Ayres LP. The war with Germany: a statistical summary. Washington: Government Printing Office; 1919. p. 123.
A.E.F. = American Expeditionary Forces

In Europe, influenza attacked Allied and German armies alike, filling field hospitals and transport trains with weak, feverish men all along the Western Front. On October 18, the AEF chief surgeon reported that ". . . influenza and pneumonia continue to prevail in all parts of the A.E.F."[35] Influenza cases outnumbered combat casualties. According to one tally, 227,000 soldiers were hospitalized for battle wounds in 1918, but half again as many AEF soldiers—340,000—were hospitalized for influenza.[4] (p. 1429–41) The epidemic struck during the climax of the American military effort, compromising the AEF's performance in its largest campaign of the war, the Meuse-Argonne Offensive. Influenza clogged transportation lines along the battlefront, choked hospitals, killed thousands of soldiers, and rendered many more non-effective. The flu depleted and demoralized troops, and may have diverted military and political leaders from fighting the war to combating disease. It ultimately killed more American military personnel than did enemy machine guns and artillery (Figure 3).

THE ARMY AND NAVY RESPOND

As he watched the epidemic unfold, Acting Army Surgeon General Charles Richard warned the Medical Corps that ". . . no disease which the army surgeon is likely to see in this war will tax more severely his judgment and initiative."[36] His office distributed numerous bulletins on influenza and pneumonia to Army personnel and fired off daily memos to Army Chief of Staff Peyton March and others making recommendations on the epidemic.[37,18] Concerned about influenza spreading on crowded troopships, Richard advised March against sending troops from infected camps to France until the epidemic was over in their region.[18] March approved this recommendation, which at first affected only a few training camps. But as the epidemic widened, Richard called for canceling all draft calls for registrants destined for infected camps and minimizing transfers between camps. "Epidemic influenza has become a very serious menace," he told March, "and threatens not only to retard the military program, but to exact a heavy toll in human life, before the disease has run its course throughout the country."[18,38] March's office instructed camp commanders to reduce crowding and increase medical personnel, but halted only some of the draft calls, so that in late September new recruits were still entering training camps. Only the Provost Marshall's cancellation of the October draft finally eased pressure on the camps.[39]

Richard also recommended a one-week quarantine of all troops prior to embarkation and reducing the capacity of troopships by one-half. Desperate to build up the forces in France, March rejected these suggestions in favor of rigorous pre-boarding physical screening to control the epidemic. Richard countered: "It is impossible for medical officers to state with any degree of safety that any particular command is free from infection, or that it may safely embark on troopships

for overseas service." He then recommended "that all troop movements overseas be suspended for the present, except such as are demanded by urgent military necessity."[18] Richard was willing to suspend war mobilization to protect the health of the soldiers. March agreed to a 10% reduction in crowding on troopships, but that was all. The controversy reached the White House when President Wilson asked March why he refused to stop troop transport during the epidemic. March described the Army's screening precautions and invoked the exigencies of a war of attrition, pointing out ". . . the psychological effect it would have on a weakening enemy to learn that the American divisions and replacements were no longer arriving."[40] Troop shipments should not be halted for any reason, he told Wilson, and the president deferred to his judgment. March and Wilson had no intention of retarding U.S. participation in the war. By mid-October, however, the practice of taking men from camps that had already weathered the epidemic did finally reduce the influenza rates on troopships and in the AEF.

Sickness rates in U.S. camps ultimately ranged from 10% at Camp Lewis, Washington, to 63% at Camp Beauregard, Louisiana, averaging between 25% and 40%; death rates ranged from less than 1% at many camps to 3.3% at Camp Sherman, Ohio.[2] (p. 138) But the sickness rates probably understated the problem because they captured only those soldiers who reported sick and received medical attention. Army investigators found that some regimental physicians did not send soldiers to hospitals unless they had temperatures higher than 101 degrees.[4] (p. 3794) Many stricken soldiers may have just stayed in bed with or without knowledge or permission of their superior officers. Others may have gone home when they got sick, either with leave or AWOL. "One of the boys played wise and got sick while he was home," Charles Johnston, a soldier at Camp Funston, Kansas, wrote home in early October. "He is down with pneumonia, so will have a prolonged visit while home. Think I will try that when I come home, eh!" Several days later Johnston reported, "There have been hundreds of boys taken A.W.O.L. since [the camp was] quarantined."[41] The situation became so bad that the War Department ordered the investigation of absentees from government service.[42]

While the implementation of treatment and prevention measures varied from camp to camp, medical officers generally tried "all preventive measures which seemed logical," according to Braisted. Quarantines were almost impossible to maintain and had little effect. The Navy, rushing to transport troops across the Atlantic, imposed modified quarantines at many stations but ". . . invariably this measure failed to prevent the introduction of influenza."[5] (p. 2486) As the Army Medical Department explained, ". . . to be of avail in excluding influenza, quarantine must more nearly approach perfection than proved practicable in the large camps of the war."[2] (p. 116) Other prevention measures included daily inspections and temperature-taking, patient isolation, face masks and gowns for attendants, good ventilation, screening between beds, prohibition of indoor gatherings, nose and throat sprays for the healthy, and experimental vaccines. In assessing these measures, however, Braisted concluded that "each particular preventive measure failed in some instances to accomplish recognizable results."[5] (p. 2483) The Army Medical Department similarly admitted that "the best result to be expected from any or all of these measures is a slowing of the progress of an epidemic rather than any considerable diminution in the number of cases."[2] (p. 123-4)

The Great Lakes Naval Training Station in Rockford, Illinois, provided an example of a failed measure. When it offered masks to personnel, only 96 out of 674 hospital corpsmen wore them and they experienced a higher influenza rate than those who did not wear masks—8.3% compared with 7.9%.[5] (p. 2490) Great Lakes was by far the largest Navy camp, with a population of 44,000, and influenza arrived with "explosive violence" on September 16 and within 30 days generated 9,623 cases.[5,11] (p. 2430) Harney Stover, a sailor from Indiana training at Great Lakes, explained to his mother that influenza "affects most men pretty hard for the first few hours. They turned ashen gray and usually faint." He commented that "at the rate it is spreading, everyone will have had it and be well in a week," but he was overly optimistic.[43] Within weeks hundreds of his fellow trainees would die, as would many of those who were caring for them.[5] (p. 2452) Although only one Navy nurse had died during the war to date, 25 succumbed to the pandemic, seven of them at Great Lakes camp: Theresa Burmeister, Myrtle Grant, Edith Hokanson, Emma Kotte, Alice Lea, Garnet Olive Peck, and Amber Story.[5] (p. 2071)

Stover escaped the flu but chafed at the quarantine. He was furious when a local mayor objected to lifting it. "When we get liberty once more the mayor of Waukegan is going to have his darn little town run off the map and get tar and fethered [sic] himself." But if it was difficult to contain the influenza virus, it was harder to contain sailors and soldiers. When false rumors of an armistice hit the camp, "the whole station went wild," wrote Stover. "In the next Regiment, they tore the doors off 2 barracks trying to get out. . . . It was almost an hour before the Provost Guards could make everybody get back in their barracks."[43]

When the Armistice finally came on November 11, it was impossible to maintain quarantines, but by then influenza had passed through most camps, leaving much to celebrate and to mourn. Influenza would again sweep American military camps in the United States and Europe in early 1919, but would be less virulent than the previous wave and find less fuel, as demobilization rapidly depopulated the camps. While the U.S. military had helped to subdue the Germans, the medical profession had failed to conquer an even more deadly, unseen enemy. Now in peacetime, thousands of physicians left military service to return to civilian life, taking with them their searing experiences of war and disease, victory and defeat.

REFERENCES

1. Braisted WC. The Navy and its health problems. Am J Public Health 1917;7:931.
2. War Department (US). Office of the Surgeon General, Medical Department of the United States Army in the World War, vol. 9: Communicable and other diseases. Washington: U.S. Government Printing Office; 1928.
3. Ayres LP. The war with Germany: a statistical summary. Washington: U.S. Government Printing Office; 1919. p. 125-6.
4. War Department (US). Annual report, 1919. Washington: U.S. Government Printing Office; 1920.
5. Department of the Navy (US). Annual report, 1919. Washington: U.S. Government Printing Office; 1920.
6. Still WN Jr. Crisis at sea: the United States Navy in European waters in World War I. Gainesville (FL): University Press of Florida; 2006. p. 225.
7. Byerly CR. Fever of war: the influenza epidemic in the U.S. Army during World War I. New York: New York University Press; 2005.
8. War Department (US). Order of battle of the United States land forces in the World War. Vol. 3. Washington: U.S. Government Printing Office; 1931–1949.
9. Astor G. The right to fight: a history of African Americans in the military. Novato (CA): Presidio Press; 1998. p. 110.
10. Bristow N. Making men moral: social engineering during the Great War. New York: New York University Press; 1996.
11. McLaughlin AJ. Society proceedings, American Public Health Association. JAMA 1918;71:2170-5.
12. Soper G. The influenza pandemic in the American camps, September 1918. 9 October 1918. Box 393, Entry 29, RG 112, National Archives and Records Administration, College Park, MD.
13. A report on epidemic of influenza occurring at the post of A.P.O. 704, AEF [undated memo]. Box 7, Entry 1011, RG 112, National Archives and Records Administration, College Park, MD. Later published as: Chesney AM, Snow FW. A report of an epidemic of influenza in an army post of the American Expeditionary Forces in France. J Lab Clin Med 1920:78-95.
14. Gorgas WC to Scott HL. 1918 April 10. Box 41, Entry 31, RG 112, Box 41, National Archives and Records Administration, College Park, MD.
15. Ewald PW. Evolution of infectious disease. Oxford (UK): Oxford University Press; 1994. p. 110-3.
16. War Department (US). Office of the Surgeon General, Medical Department of the United States Army in the World War, vol. 4, activities concerning mobilization camps and ports of embarkation. Washington: U.S. Government Printing Office; 1926. p. 49-50.
17. Wooley PC to Surgeon General, 1918 Sep 16. Box 84, Entry 31, RG 112, National Archives and Records Administration, College Park, MD.
18. War Department (US). Office of the Surgeon General, Medical Department of the United States Army in the World War. Vol. 6, Sanitation in the United States and in the American Expeditionary Forces. Washington: U.S. Government Printing Office; 1926. p. 349-71.
19. Wolbach B, Frothingham C. A study of pathology of cases dying at Camp Devens during the influenza epidemic in 1918. Trans of the Amer Acad of Physicians 1928;38:177.
20. Flexner S, Flexner JT. William Welch and the heroic age of American medicine. New York: Viking Press; 1941. p. 376-7.
21. Lyon IP, Tenney CF, Szerlip L. Some clinical observations on the influenza epidemic at Camp Upton. JAMA 1919;72:1726-9.
22. Kolata G. Flu. New York: Farrar, Straus and Giroux; 1999. p. 30-1.
23. Close Camp Upton to check influenza. New York Times 1918 Sep 17:10.
24. Brockton girl and fiancé died at camp. Boston Daily Globe 1918 Oct 4:10.
25. War Department (US). Office of the Surgeon General, Medical Department of the United States Army in the World War. vol. 5: military hospitals in the United States. Washington: U.S. Government Printing Office; 1923. p. 200-1.
26. Col. Hagadorn a suicide. New York Times 1918 Oct 9:24.
27. Barry JM. The great influenza: the epic story of the deadliest plague in history. New York: Viking; 2004. p. 212-9.
28. Dodge battles Spanish 'flu.' The Camp Dodger (Camp Dodge, Iowa) 1918 Oct 4:1(col. 6,7,8) [The State Historical Society of Iowa, Des Moines].
29. Flu epidemic subsiding. The Camp Dodger (Camp Dodge, Iowa) 1918 Oct 11:1(col. 8) [The State Historical Society of Iowa, Des Moines].
30. Peak of flu scourge has passed. The Camp Dodger (Camp Dodge, Iowa) 1918 Oct 18:1(col.8) [The State Historical Society of Iowa, Des Moines].
31. Services in memory of Dodge dead. Camp Dodger (Camp Dodge, Iowa) 1918 Nov 1:1(col.1) [The State Historical Society of Iowa, Des Moines].
32. War Department (US). Office of the Surgeon General, Medical Department of the United States Army in the World War. Vol. 7, Training. Washington: U.S. Government Printing Office; 1927. p. 26, 100, 427, 461, 474.
33. Congdon LA. A study of the Army ration and its relation to the height and weight of soldiers in Army cantonments. Mil Surg 1921;48:569-80.
34. Stevens R. WWI questionnaire collection: pioneer infantry. Military History Institute, Carlisle Barracks, Pennsylvania.
35. McCaw JD to Harbord J. Influenza and pneumonia situation. 18 October 1918. Box 5493, Entry 2109, RG 120, Entry 2109, National Archives and Records Administration, College Park, MD.
36. Memorandum, C-362, 24 September 1918. Box 5493, Entry 2109, RG 120, National Archives and Records Administration, College Park, MD.
37. War Department (US). Office of the Surgeon General, Medical Department of the United States Army in the World War, vol. 1: The Surgeon General's office. Washington: U.S. Government Printing Office; 1923. p. 998-1003.
38. Richard C to Adjutant General, 25 September 1918. Box 394, Entry 29, RG 112, National Archives and Records Administration, College Park, MD.
39. War Department (US). Second report of the Provost Marshall General to the Secretary of War on the operations of the Selective Service System to December 20, 1918. Washington: U.S. Government Printing Office; 1919. p. 237.
40. March PC. The nation at war. Garden City (NJ): Doubleday, Doran & Co.; 1932. p. 360.
41. Johnston CL. Life at Camp Funston: reflections of army sergeant Charles L. Johnston. 1918 Oct 6 and undated [cited 2010 Mar 5]. Available from: URL: http://pages.suddenlink.net/tjohnston7/ww1hist
42. Investigation of absentees in government service, 14 October 1918, index of correspondence, September to November 1918. Box 5, Entry 9, RG 163, National Archives and Records Administration, College Park, MD.
43. Burch M. `I don't know only what we hear': the soldiers' view of the 1918 influenza epidemic. Indiana Med Hist 1983;4:23-7.