Glimpsing Modernity

Military Medicine in World War I

Edited by Stephen C. Craig and Dale C. Smith

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TABLE OF CONTENTS

INTRODUCTION

STEPHEN C. CRAIG

In the century that has passed since the beginning of the First World War the world has seen another world war, major conflicts in Korea, Vietnam, Iraq, and Afghanistan, and armed conflicts in the Balkans, Latin America, the Middle East, and Africa. These conflicts have left, or are currently leaving, their own individual physical and psychological imprint on the military participants, the populations affected, and the historians who chronicle them. This collective memory defines the nature of each war, attempts to put the political objectives, the military campaigns, and the suffering and destruction into a broader frame, a more understandable perspective which tempers its impact on future generations. The impression of the First World War remains indelible, largely untempered by time, and compelling to 21st century historians and audiences. The origins of this enduring fascination reside largely in the scientific, technological, and industrial nature of the war and its horrifying, unforeseen outcomes.

In the half century between 1865 and 1914 military and naval science, technology, and industry significantly transformed the weapons, munitions, transportation, and communications capabilities of armies world-wide. Improved casting techniques allowed stronger, larger caliber, and more reliable breech-loading artillery. Rifling and recoil systems improved, more efficiently burning and powerful and in the 1890s smokeless, gunpowder was compounded. The Gatling gun, a machine consisting of 6-10 rifle barrels revolving around a central shaft and cranked by hand, came into use late in the American Civil War and was made obsolete by Hiram Maxim's machine gun (1884) by the turn of the century. These advances increased the accuracy, efficiency, distance and rate of fire, and payload delivered for individual and crew served weapons.

The Union Army in the American Civil War demonstrated the strategic use of railroads. The Prussians, later a unified Germany, and the French continued the development of this technique during the Franco-Prussian War (1870-71). By the turn of the century, the size, capacity, and speed of trains made them indispensable for military supply and troop movement.

The last quarter of the 19th century saw the development of the internal combustion engine and, from the mid-1890s, the diesel engine. Both provided mobility, independent of tracks and time schedule. Automobile chassis were adapted rapidly into military trucks and armored cars. France launched the first diesel-powered ships in 1903 and, a year later, the first diesel-powered submarine.

While France gloried in her modern navy, a bicycle mechanic, Charles E. Taylor, working for Orville and Wilbur Wright in Dayton, Ohio, built the first aluminum water-cooled engine in 6 weeks for the Wright's first flyer. On December 17, 1903, Taylor's engine powered the first heavier-than-air machine, Orville Wright at the controls, 120 feet over the wind swept dunes of Kitty Hawk, North Carolina. Over the next decade, structural integrity, engine and control reliability improved, and a more nuanced understanding of aircraft flight characteristics was obtained. Although largely ignored by American military planners, Europeans grasped aviation's military potential and began its development.

Battlefield communications were also changing. The telegraph demonstrated its worth before the Crimean War. But 1890s brought the advent of wireless telegraphy. The Second Anglo-Boer War its first military use in wartime.

The development and implementation of these technical advances, however, occurred much more rapidly than did the alterations in battlefield tactics required to accommodate them. Napoleonic tactics in an era of more accurate and rapidly firing rifled weaponry had resulted in the slaughter of Pickett's Charge on the third day at Gettysburg in July 1863, frontal assaults on Russian machine gun positions had sent Japanese combat mortality statistics sky high in the Russo-Japanese War (1904-05). In 1914, the German, Russian, French, and British armies would march off to war with 19th century tactical concepts that, unbeknownst to them, had been made obsolete by the very manner in which they could shoot, move, and communicate on the battlefield.

During this same half century, medical and surgical science and technology had also experienced not merely rapid development, but a complete transformation in the approach to, and management of, disease and injury. Ether and chloroform anesthesia had reduced the terror of surgical procedures before the Crimean War, but allowed the surgeon's dirty hands more time in the open wound. The development of bacteriology through the last quarter of the 19th century allowed anti-septic, and, with the invention of the autoclave in the 1880s, aseptic practices to reduce surgical morbidity and mortality. By the late 1890s the

exploratory laparotomy was becoming a relatively safe and common procedure in large urban hospitals.

The new fields of bacteriology established a revolutionary theory for infectious disease causation. Bacteria would hold center stage until the 'filterable agent,' known today as a virus, was recognized in the 1890s. By 1900, vector-borne diseases were identified and the mosquitoes role in transmitting filariasis, yellow fever, and malaria had been established. The body's cellular and humoral defenses against infections had been explored by another new field immunology. Moreover, immunology held out the promise of prevention and cure of infectious diseases in the form of anti-toxins, such as for diphtheria and tetanus (1893) and vaccines, rabies (1885), and typhoid (1896). These advancements gave a scientific foundation to the field of public health. Furthermore, the need to explain the development and transmission of infectious diseases in populations by geography and offer preventive modalities created the field of epidemiology.

Medical diagnostics made significant advancements as well. Improvements in the stethoscope, ophthalmoscope, otoscope, and thermometer made them all more accurate and reliable through the last quarter of the 19th century. The sphygmomanometer, introduced in 1896, would not join them until the 1920s. Bacteriology laboratories were processing throat swabs, urine and fecal specimens, and sputum samples for TB by the late 1890s in large city hospitals. More dramatic was the introduction of the x-ray machine (1895), a medical diagnostic tool whose many applications had to be figured out over time.

These remarkable advancements were accompanied by, indeed some demanded, a growing medical infrastructure. Urban hospitals boasted aseptic surgical suites, laboratories, radiographic and ambulance services; medical research laboratories were established by philanthropists such as Andrew Carnegie and John D. Rockefeller, Sr., medical education became more standardized and academically rigorous; medical practice took its first steps toward specialization; nursing became a properly educated profession; and safe guarding the public's health became recognized as a moral obligation.

Adapting these civilian practice changes to the military field environment proved to be as challenging as the integration of new weaponry and tactics. Organizational and logistical concerns were major hurdles to the integration and provision of state-of-the-art care on, and evacuation from, the battlefield. Moreover, convincing skeptical military commanders and some of the more senior medical officers to accept the intrusion of modern medicine and surgery into mobilization activities and wartime operations only compounded these problems.

The Prussians had learned a hard lesson concerning the organization and implementation of medical services during the Austro-Prussian War (1866). When they invaded France in 1870, initiating the Franco-Prussian War (1870-71), the Prussian's had a more organized and dependable medical service with railroad evacuation of sick and wounded, and all her soldiers had been vaccinated against smallpox. During this same war, the French decided against smallpox vaccination and suffered a devastating epidemic in her army.

During the Russo-Turkish War (1877-78), Dr. Karl von Reyer, a German surgeon in the Russian service, conducted a series of surgical protocols using Lister's antiseptic surgical procedures in combination with judicious debridement and épluchage on wounded patients in his hospital. Reyer demonstrated clinically and statistically that the combination worked better than either technique alone. Regrettably, the German surgical community, enthralled with Lister's method, focused on anti-sepsis while ignoring the importance of debridement and épluchage.

However, by September 1893, US Army Surgeon General George M. Sternberg commented at the Pan-American Medical Congress held in Washington, D. C. that field antiseptic procedures combined with the etiological knowledge of hospital gangrene, erysipelas, and tetanus would reduce battlefield mortality. Sternberg and other like minds also saw the advent of high-velocity rifled bullets as reducing the killed to wounded ratio. If true, this circumstance would not only increase the surgeon's workload and demand close attention to state-of-the-art combat surgical techniques, but also require a robust casualty evacuation system if mortality rates were not to climb.

This prediction was validated during the Spanish-American (1898), Philippine-American, (1899-1902), and Second Boer Wars (1899-1902). But the difficulty of obtaining clean water, the dirt and flies, all challenged the surgeon's ability to achieve anti-sepsis. Evacuation from point of injury to surgeon not only remained bound to the horse-drawn ambulance, but also remained low on a commander's list of priorities. Hence, treatment was often delayed for hours. Complicating this picture was the fact that a high velocity bullet could pass through the chest or abdomen without causing damage that required surgery, but there was no way to tell. During the Spanish-American War all four abdominal cases treated surgically died, while 37% of those treated medically survived. British surgeon G. H. Makins, consulting surgeon to the South African field force, noted that spontaneous recoveries of abdominal wounds did occur and concluded that intestinal wounds should be watched not explored in the field. These results were verified by Russian surgeons during the Russo-

Japanese War (1904-05). This conservative trend, as erroneous as it was, would accompany western military surgery into the First World War.

The four wars just mentioned saw the advent of spacious, steel-hulled hospital ships where electric lights, aseptic surgical techniques, laboratories, and x-ray machines now defined state-of-the-art strategic evacuation. British forces deployed a small portable radiographic machine to South Africa in 1898 and the first typhoid vaccine.

Typhoid fever (Enteric fever) was still endemic in many countries around the world, including the U. S. and U. K., making it a perennial threat to military campaigns. The U. S. Army Medical Department had been embarrassed, and the nation shocked, by a large typhoid outbreak in its mobilization camps in the summer of 1898. By the time British forces sailed for South Africa the following year, Royal Army Medical Corps Director-General James Jameson was actively implementing anti-typhoid measures that included a new typhoid vaccine created by Almroth Wright. Wright was confident his typhoid vaccine was sufficiently safe and efficient to preclude a British repetition of the American experience. Regrettably, his efforts received little support from military commanders. Soldiers were offered the vaccine on a voluntary basis as they sailed for South Africa, but only 5 percent consented; orders to use of only filtered or boiled water were either not given or not enforced by commanders. In late winter and early spring 1900, the British army in South Africa was devastated by typhoid fever.

A conjunction of cooperating militarily astute medical officers and medically educated line officers was, and still is, required for field sanitation and hygiene methods to be efficient and effective. Such a conjunction may have occurred in both the Russian and Japanese armies in their 1904-05 conflict. The implementation of modern field preventive medicine practices appears to have resulted in remarkably low battle to disease mortality ratios, 2.6 for Russia and 2.2 for Japan. [Duncan, *Comparative Mortality of Disease and Battle Casualties in Historic Wars*] This outcome was not lost on western military medical observers. Over the next decade, how to achieve that military-medical cooperation, as well as the adaptation and integration, became more complex as developments in medical science and technology burgeoned.

By June 1914 in the fields of bacteriology and immunology, the role of the mosquito in transmitting malaria and yellow fever, personal protection and environmental mosquito control had been established. Chemical purification (hypochlorite) of water in the field and a more effective typhoid vaccine had been developed. Diagnostic tests, such as the blood smear (malaria), Widal (typhoid) and Wasserman (syphilis) tests were

standard procedures. The disease-carrier state had been established for typhoid, cholera, diphtheria, and bacterial meningitis providing a broader role for the epidemiologist, laboratory technician, and public health officer in controlling infectious diseases.

In surgery, the role of the vasomotor system, blood pressure, blood, and fluid resuscitation in traumatic shock were being investigated. In hematology, blood typing and simple cross-matching procedures described, and methods of blood preservation were being studied and tested. In physiology, research into bodily responses to the effects of hypo and hyperbaric extremes achieved new status as it became militarily relevant.

Wartime requirements and the industrial base that supported them had a catalytic effect on the continuing development of the military and medical technology described above. Heavier artillery with a larger payload; aircraft that could fly at velocities and altitudes beyond human tolerance, aerial bombing; submarines that could dive deeper and stay down longer; chlorine gas and nerve agents; armored and armed rolling pillboxes dubbed 'tanks' impervious to small arms fire; larger troop formations for attack, more accurate and efficient mortars and machine guns to greet them. These generated battlefield experiences and a scope and magnitude of casualties that could never have been imagined, or planned for in 1913. To cope with the large numbers and varieties of casualties during the war, military medicine and its establishment expanded tremendously in size, became reorganized administratively, recognized the need for larger numbers of trained, efficient ancillary personnel, and embraced the requirement for specialized services from maxilla-facial and orthopaedic surgery, psychiatry, and aviation medicine to patient regulating, evacuation, and logistics. In essence, military medicine shed the last vestiges of the 19th century and took on the mantle of a 20th century medical profession.

Glimpsing Modernity is a collection of papers from the U. S. Army Medical Museum sponsored conference on medical aspects of the First World War held in San Antonio, Texas in February 2012. It captures the metamorphosis of military medicine during the war in a series of inter-related vignettes. Some of these stories provide new and insightful interpretations of known military medical themes while others depart from these to examine less well-known, but truly important medical topics.

In the first section, Military Medical Planning & Operations, Steve Oreck reviews the military and medical failures of the amphibious assault at Gallipoli. Operational doctrine for this type of assault had not been developed by 1915. Without that close joint military and naval planning and coordination as a foundation, military and naval medical support

operations - treatment, evacuation, and re-supply – were preordained to fall far short of expectations. The article not only describes the complexities of providing medical support to amphibious operations, but also demonstrates that early medical support planning and integration and follow on execution are imperative to the success of any military operation. William Hanigan continues this theme in another medically challenging venue in his article on military operations in German East Africa and highlights difficulties in executing medical plans during mobile operations. Disease threats in the African theater of operations and preventive modalities were known and prepared for by the more medically progressive German and British MO's. But the concepts of water and vector-borne disease had not been embraced by all physicians nor had the responsibilities for disease prevention and soldier health registered with all line officers. As the disease burden grew during the campaign so too did inadequacies in medical personnel, medical resupply, and evacuation. In "Dr. Jekyl and Mr. Hyde", Tim Cook observes a conundrum familiar to regimental and battalion MO's in any army: the integration of duties and responsibilities of a military officer with those of a physician. This conundrum is a difficult one for career-oriented medical officers in peacetime to contend with, for regimental MO's pulled from civilian practice, given a modicum of military/military medical training, and sent to the Western Front it was undoubtedly a loathsome daily burden for many. "Dr. Jekyl and Mr. Hyde" describes life in the trenches for Canadian MO's and how they dealt with this conundrum, but it reflects the lives of all regimental MO's on both sides of the front.

In the second section, Hospitals, the conceptual development of continuity of medical treatment from point of injury to definitive care facility can be observed through a hospital chain striving to adapt medical science and technology to the battlefield. Jennifer Nieves and Diane O'Malia describe the advent and deployment of American Base Hospitals through the activities of Base Hospital #4. Of the fifty Base Hospitals deployed during the war, Base Hospitals #4 (Lakeside Hospital, Cleveland, Ohio) and #5 (Harvard University) are probably the most famous because of the clinician/researchers – George Crile, Harvey Cushing, Walter Cannon – who worked there and for their research contributions that directly impacted medical and surgical treatment of combat wounded. These tertiary care facilities demonstrated that state-of-the-art, university-centered medical and surgical care could be translated effectively and efficiently to the battlefield environment. In "Mobile Hospital #1"William Montgomery explores the daily activities and associated risks of one of the first motorized hospitals in combat.

Although the concept of a hospital keeping up with the movements of a military campaign was not new in 1914, the combustion engine changed the speed with which it could do so, reduced evacuation time to base hospitals, and could transport modern medical equipment and laboratory facilities to the field with relative ease. It also created new internal logistical and administrative problems, such as the need for more medically owned vehicles, maintenance personnel, and a significant gasoline ration. The gasoline-powered mobile hospital brought medical care more closely into harm's way and a new hope for combat wounded.

Injury and Disease comprise the third section. The industrial, technological, and generalized nature of the war created new injuries, such as those produced by chemical weapons and the traumatic psychosis induced by a variety of wartime experiences, and allowed certain diseases, such as epidemic louse-borne typhus and, in 1918, influenza, to run rampant. As well-known and documented as these have been, the war created other unique medical conundrums. In the "Shadow Land", Emily Mayhew describes the experiences of those nearly 68,000 'slightly injured' (petit blesse) soldiers interned in Switzerland during the war. The medical trials and tribulations suffered by these men concerned not only Lieutenant Colonel Henry Picot, the British officer in charge of the interned, but the Royal Army Medical Corps and the Swiss government. L. G. Walker, Jr. redirects focus to the deadly unity of injury and disease in front line hospitals in "Alexis Carrel's Contribution to the Care of the Wounded". Carrel's passion and determination to discover a viable anti-septic treatment for traumatic infections, his interaction with others in trauma research such as Sir Watson Cheyne, Almroth Wright, George Crile, Walter Cannon, and support given by organizations like the Rockefeller Institute make a dramatic and gratifying story. Moreover, it provides a conjunction between combat, and the wounded it generates, and medical care from field hospital to research laboratory. Pete Starling provides in "White Smoke Rising" an account of the introduction of the chemical weapon on the battlefields of the Western Front and the Royal Army Medical Corps response to the new threat. In particular, Captain Starling focuses on the interplay between the front line efforts at prevention and treatment and the rear area research and development efforts involving career officers and civilian scientists, such as Professor Ernest Starling, mobilized for the war effort. Again, modernity is captured in the use of modern medical science to combat operational problems in real time.

In the last section, Civilians at War, the multi-faceted effects of war on the general population and the efforts of those outside of the military to

ameliorate suffering wherever they found it is reviewed. In doing so, the difficulty of bringing modern technology and medical science to bear in the civilian community enveloped by conflict is reviewed. More importantly, the dilemma often posed by politics and ethnic loyalties on neutrality and humanitarian relief is examined. Bradford Waters, in "Americans Under Fire on the Eastern Front", presents the work of the American Red Cross (ARC) in Serbia, Russia, and Romania largely in the years before the US entered the war. In Serbia and Romania, ARC physicians, surgeons, nurses, and support staff were confronted with many of the same medical, surgical, logistical, and evacuation problems experienced by front line military medical personnel. They also provided food, immunizations, dealt with non-urgent medical care, contended with malaria, and fought a large outbreak of epidemic louse-borne typhus, the bane of the trenches, which claimed a number of ARC physicians and nurses. In Russia, the ARC faced these same issues, a shortage of medical facilities, and how to provide medical and humanitarian care in prisoner-of-war camps as the Russian Revolution burst over the country. Medical care on the Eastern Front is also the locale of Leo van Bergen's article "We only drive off to help the wounded", based on the experiences and records of Dutch ambulances on that front. Van Bergen postulates that the destination and delivery of medical services and humanitarian relief was influenced by political and ethnic considerations. Moreover, these considerations became so powerful in one ambulance that neutrality, the ethical currency that ensures freedom of movement and safety for ambulance personnel, was violated for military gain. Natalia Starostina returns to the Western Front to describe the difficulties encountered in French rail evacuation. Originally designed and configured by the army to accommodate far fewer wounded than generated in the war, the rail evacuation system and its operating regulations were made obsolete as the war began. The tremendous numbers of sick and severely wounded nearly brought rail transportation to a halt. A successful solution to this dilemma was a cooperative effort between civilian railway and military authorities in which original thought and creative innovation established an efficient and effective evacuation system.

Together these glimpses of modernity describe how the first industrial war shaped the development of the academic discipline called military medicine.

SECTION I.

MILITARY MEDICAL PLANNING AND OPERATIONS

CHAPTER ONE

MEDICAL PLANNING AT GALLIPOLI

STEVEN L. ORECK

The assault at Gallipoli in 1915 by British, Imperial, and French forces in an attempt to open the Straits, force the Ottoman Empire out of the war, and provide a more direct route for aid to Tsarist Russia has long been held out as one of the most tragic, and costly, military failures in modern history. Gallipoli very nearly permanently ended the political career of Winston Churchill, and the efforts and sacrifices of troops from Australia and New Zealand, as well as the not unrealistic feeling that these troops were ill-served by the overall British military command, have become a part of ANZAC identity. There are partisans on both sides of the strategic divide, that is whether or not a successful campaign could have achieved the goals set out by the Entente, and part of that debate includes whether or not such a plan was at all practicable. There is general agreement, however, that the overall plan for this campaign was deeply flawed from the beginning, and that throughout the campaign there were a series of conceptual, tactical, and operational errors that doomed the campaign not only to failure, but to disaster.

The errors at Gallipoli included errors in medical planning, which sadly increased the human suffering that attended these assaults. I hope to identify where errors or omissions in medical planning occurred, and their consequence, and to examine how medical planners in the interwar period utilized these "lessons learned" in developing doctrine for future amphibious warfare. In defense of the planners, Gallipoli was really the first large scale amphibious assault in modern times. The American landings in Cuba and Puerto Rico in 1898 had been unopposed, and while some of the Union attacks of the American Civil War (such as Fort Fisher) were opposed, the differences in weapons and technology between the 1860s and 1915 was significant.

The lesson learned from the Gallipoli campaign, at least by the United States Army and the British military, was that amphibious assaults were to

be avoided.[1] Raids with limited objectives, preferably performed at night, might be acceptable but full-scale assaults were to be avoided.(Because the United States Marine Corps had, beginning as early as 1919, seen its future raison d'être as seizing advanced bases in the Pacific in support of U.S. fleet operations as envisioned in War Plan Orange, they had to have an attitude that amphibious assault could be made to work, if only the correct doctrine, and materiel, could be developed (Smith 1992, 23).Necessity having become the mother of invention, it devolved upon the naval physicians assigned to service with the Marine Corps during the interwar period to develop the medical doctrine to support such assaults, and, as the evidence will show, they used Gallipoli (as did their line counterparts) as the bad example to avoid.

In order to understand the problems of medical support for amphibious assault, it is necessary to understand some of the key differences between amphibious assault and a similarly sized assault in a traditional land campaign. One important difference is that an amphibious assault is, by its very nature, a joint endeavor. The naval and military components have different tasks, and coordination and unity of command and planning is absolutely necessary to avoid difficulties. Until the assault force has moved well inshore, there is no rear area for combat service support elements such as medical units, and until there is adequate depth to allow for medical units to be set up onshore, transportation of the wounded for medical treatment involves shore to ship movement with its' attendant complications. Amphibious assaults, as opposed to unopposed or lightly opposed landings are frontal assaults, and as such generate a very large number of casualties in a relatively short period of time. These were some of the issues that medical planners had to deal with in preparing for the Gallipoli assault and, unfortunately for them and their troops, with little if any guidance from the British Combined Operations Manual of 1911.

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[1] The literature on the development of amphibious warfare in the interwar period is replete with examples of how the US Army, the British Army, the Royal Navy and Royal Marines all rejected major amphibious assault. For examples see books by Arch Whitehouse Amphibious Operations, Ian Speller & Christopher Tuck Strategy and Tactics: Amphibious Warfare, Jeter Isely & Phillip Crowl. The U.S. Marines and Amphibious War, Kenneth Clifford Amphibious Warfare Development in Britain and America From 1920-1940. Other analyses include Donald Bittner "Britannia's Sheathed Sword: The Royal Marines and Amphibious Warfare in the Interwar Years- A Passive Response" (The Journal of Military History, 1991) and David MacGregor "The Use, Misuse, and Non-Use of History: The Royal Navy and the Operational Lessons of the First World War" (The Journal of Military History 1992).

In addition to the special requirements of an amphibious assault, the medical planning attendant on any assault or invasions still had to be dealt with. Issues of water supply, sanitation, and the climatological and geographic constraints of the assault/invasion area have to be dealt with. At a minimum, input from the medical staff is required. Sadly, even these "normal" medical planning inputs were not sought, or if offered not acted upon.

From the beginning, an amphibious assault at the Dardanelles was a backup plan, to be utilized only in the event of the failure of a purely naval assault to force open the straits. The commander of the military component of the assault, General Sir Ian Hamilton, was informed by Lord Kitchener of his appointment to command this effort March 12, 1915 while in London-and the timeline for an assault (if necessary) was to be late April. In his diary, Hamilton noted he sent staff to the intelligence section to see what information was there and nothing was found except standard texts (Hamilton 1920, 1, 14). Hamilton did not even know who his Director of Medical Services (DMS) would be on March 17, when he was enroute to Egypt (Hamilton 1920, 19). In fact his DMS was to be Surgeon-General Sir W. G. Birrell (RAMC), who had been brought out of retirement. Surgeon-General Birrell would not even arrive in Egypt until April 11, 1915, by which time Hamilton and the General Staff, though not the Administrative Staff, had moved forward to Mudros on the Greek island of Lemnos (James 1965, 87). The bulk of medical planning prior to mid-April, such as it was, had been done by members of the General Staff, not the Administrative Staff which included the DMS and his (limited) staff as well as the Adjutant-General.

A further complication in planning was the division of responsibilities between various components. The primary destination for seriously wounded was to be Egypt, with Malta being a secondary receiving area. The senior medical officer in Egypt, Surgeon-General Ford (RAMC), was not involved in the planning and furthermore the bulk of his assets came from medical units of the Australian Imperial Force (AIF). These AIF medical units were to become responsible for a much larger number of wounded (ANZAC and other) than they were designed to handle, and relations between Ford and the medical staff of the AIF were distant and strained at best (Butler 1938, 82; Tyquin 1993, 23). Egypt was to have been an intermediate stop for the AIF, which had been raised in Australia for service in France.

The division of responsibility between the Navy and Army was arcane. While the Navy was responsible for the material condition of hospital ships, the fitting out of these ships as hospital ships (equipping and

staffing them) was an Army responsibility with exception of those ships that were actually part of the Royal Navy. Once wounded had been delivered to the beach, it was the responsibility of the Royal Navy to get them from the beach to a receiving ship (of some sort) at which point their immediate responsibility ceased. Overall control of shipping to and from the invasion area was under Royal Navy control. While hospital ships were pained in accordance with Geneva regulations, and as such were exempt from enemy attack, most wounded were to moved on transports (black ships) which were used for mixed purposes and therefore not protected by Geneva rules.

As noted, during the assault casualty handing/evacuation was the responsibility of the Royal Navy between the high water mark and the deck of the receiving ship, the rest was up to the Army. It is not clear when joint, that is Army-Navy, medical planning began, however the first joint staff meeting of any kind between the Army and the Royal Navy took place on April 10, 1915 in Egypt, less than two weeks before the planned assault date (de Roebeck, BNA, ADM 137/400). As icing on the cake, during the assault, the Administrative Staff including the DMS would be on one ship (and this not even at Gallipoli but at Mudros on the day of the assault), the General Staff on another ship, and the naval medical staff on yet a third ship with limited communication between them (Butler 1938, 125; Tyquin, 1993, 20-21).

As if the obstacles in the way of proper medical planning were not already bad enough, there seemed to be an attitude among the officers of the General Staff that the medical staff was either superfluous or irrelevant. T. H. E. Travers opined that the short shrift given medical planning was typical of Victorian/Edwardian British army thinking that saw casualties fatalistically and was ambivalent about the importance of medical matters (Travers 1994, 412-13). General Hamilton had been the Chief of Staff for Lord Kitchener during the Boer War, and it is entirely possible he retained the disdain for medical arrangements that had been a hallmark of that campaign, where Kitchener had over-ruled many of the requests of the medical staff (Harrison 2010, 171). In any case, until Surgeon-General Birrell arrived at Mudros about a week before the planned assault, the only medical officer on the scene interacting with the General Staff was Surgeon Lieutenant-Colonel A.E.C. Keble (RAMC), a relatively small (although prescient as we shall see) fish among the whales of the staff.

The initial estimate, by the General Staff, for casualties for the Gallipoli assault was only 3,000. The RAMC training manual (1911) suggested that for a force of the proposed size casualties would be 9,000

(Butler 1938, 137). Lieutenant-Colonel Keble, prior to the arrival of Surgeon-General Birrell at Mudros, had proposed an estimate of at least 10,000 and from Alexandria Surgeon-General Birrell had requested increases in both hospital ships and facilities to be established on Mudros with those requests being reduced by the War Office (Tyquin 2003, 137; Harrison 2010, 174-75). Given that the medical staff was only becoming involved with planning for the assault three to four weeks before the projected landing, even had the General Staff and the War Office agreed with Birrell and Keble, it would have been impossible to have more medical units or hospital ships available in the region in time for the assault. In the case of hospital ships this would have taken six to eight weeks for a ship to be fitted out/converted, and then additional time to sail to the Eastern Mediterranean.

The medical support for the British and Imperial units consisted of the organic medical staff for the units, as well as some attached casualty clearing stations, but the more robust support was primarily from the AIF in the form of stationary hospitals, the first of which arrived on Lemnos transferred from Egypt on March 15 (Tyquin 2003, 132).It needs to be noted that preliminary surveys of the proposed staging facility on Lemnos highlighted the inadequacies of the harbor facilities at Mudros, the very poor road system on the island, and the verylimited supply of fresh water on Lemnos. While Lemons' location was excellent, these factors called in to doubt its ability to serve as a support base and to support larger medical units caring for wounded. The situation on Lemnos would never be remedied, and as late as August of 1915 the 52nd (Lowland) Casualty Clearing Station, assigned Lemnos for convalescent care, would have extreme difficulties obtaining an adequate water supply (War Diary 52nd CCS, BNA WO95/4356).

Unfortunately because of the expectations of the Australians that the AIF was headed for service in France, and not a more independent role, as well as the expectation that British medical services would be providing the line of communication (LOC) level care meant that the medical staffing of the AIF was well under what was required (Butler 1938, 88).Similarly the equipment and stores, both medical and Red Cross/comfort that the AIF possessed were less than would be required in its new role. The Australian Army Medical Corps (AAMC) was advised in September, 1914 to create one Casualty Clearing Station (CCS), two Stationary Hospitals (200 beds), and two base hospitals (520 beds). The AAMC contingent began arriving in Egypt in January, 1915 at which point they were off loaded and diverted from their planned destination on the Western Front. The CCS subsequently went to the Dardanelles and the

two stationary hospitals to Mudros, leaving the two base hospitals as the major medical units supporting the assault in Egypt (Barrett, 1918, 8, 19-21). From this small start, the AAMC had, by June, 1915, expanded in to responsibility for 10,600 hospital beds and numerous separate locations including a separate unit for venereal disease cases (Barrett, 1918, 41).

The Royal Navy managed medical support for the Royal Naval Division, the Royal Marines, and for naval personnel in general. This included separate hospital ships belonging to the Royal Navy. Medical care for the French units was also separately managed, with their own senior medical staff for planning and their own evacuation chain. While it is probable that there was some ad hoc mutual support during the campaign, there were no formal plans for such support.

Surgeon-General Birrell's order for arrangements of medical care was promulgated April 24, 1915. It can be seen that the number of hospital ship beds were grossly inadequate, even for the expected number of casualties, and the shore to ship medical evacuation is really not defined properly. Most importantly there is no mechanism for control of the flow of wounded. The overall plan for the evacuation flow from ANZAC is shown in figure (1). This is adapted from the scheme the BEF used in Western Europe, however the key differences are the distances involved and the necessity for seaborne transport for much of the evacuation. Figure (3) illustrates the "local" distances from the beach areas to the island bases supporting the assault.

It appears that the medical units detailed to support the assault, both the various medical ships (hospital ships and transports), and the land based units, were never filled in on the overall medical plan, to the extent that such a plan existed. Personal accounts and war diaries indicate that units were given perhaps seven to ten days notice, and only the most sketchy details of any "system". To add to the difficulties, there were deficiencies in equipment and personnel for many of the units, which was compounded by a good deal of shuffling of personnel to try and plug gaps and equipment getting lost or misplaced in a ship different than that which transported the medical personnel.

The assault was delayed for 24-48 hours due to bad weather, but on April 25, the initial landings took place on several beaches on the peninsula, separated by rugged terrain, as well as a diversionary French landing on the Anatolian mainland. The landing sites are seen in figure (3), however this map does not show how rugged the terrain was both in the immediate areas of the landings, and in the intervening terrain. Because of the previous attempts to force the straits, and the geography of the peninsula, neither the landings nor their location was a surprise to the

Ottomans and their German advisors who had had about six weeks for final preparations, having been alerted by previous naval assaults and a brief landing. The results of the assault are well documented, casualties were heavy and the advances limited. In fact, for some of the landing areas the beaches would never be free from artillery fire for the entire campaign. Because the beaches were constantly under artillery fire, it was not possible to provide the planned level of care on the beaches, putting additional strain on the medical evacuation plan.

A.G. Butler's *Official History of the Australian Army Medical Services 1914-18* and Michael Tyquin's *Gallipoli: The Medical War-The Australian Army Medical Services in the Dardanelles Campaign of 1915*, as well as the war diaries of various casualty clearing stations, among many others sources, paint a vivid picture of the chaos that was the medical support during the initial landings. Medical staff, themselves under fire, were overwhelmed with numbers of wounded well beyond what they could handle even under ideal conditions. The medical posts at ANZAC immediately following the landings are shown in figure (4) – it is clear no medical station was in a safe area. Clearing the wounded off the beaches was a significant problem. Even before one allowed for difficulties due to the fact that the landing areas were swept by rifle, machine gun, and artillery fire, launches and tows for evacuating the wounded were not scheduled to be detailed until later in the afternoon, or when their initial duties of landing troops had been accomplished – no boats were detailed for medical evacuation from the initial stage of the landing. During the initial landings there were no organized Royal Navy shore parties, and Vice Admiral de Roebeck in his 1 July, 1915 report summarized this problem thusly:

> The difficulties of disembarkation were accentuated by the necessity of evacuating the wounded, who were very numerous; both operations proceeded simultaneously (deRoebeck, ADM 137/40).

Absent proper medical regulating, wounded were evacuated haphazardly and the hospital ships (one for each major assault area) were soon filled to capacity, and mostly with wounded who should have been triaged to a less capable ship. Wounded on boats or on barges were brought from ship to ship trying to find succor. Lt-Col V. E. Hugo, senior medical officer on the HMHS Gascon noted in his diary that his ship had to turn away one lighter load and five boat loads of wounded because there was no room to take them on board (Hugo, RCS MSO 057/1). Reports of wounded brought aboard ships previously used for animal transport and not cleaned, equipped, or staffed to handle serious cases, while denied by Surgeon-

General Birrel and others later on, are well documented. This included wounded brought aboard ships that had been used as animal transports, with sanitary conditions that could only have been described as totally unsatisfactory, and in some instances with no medical officer aboard.

There was no relief in the days following the landings. The Commanding Officer of the 11th Casualty Clearing Station noted on May 6, 1915, that there had been a breakdown of evacuation arrangements and that the boats and barges detailed for this purpose had been taken for other uses. He communicated with "Naval seniors" but was told that there would be no improvement in the situation for at least 48 hours. On May 9 he was told to hold all wounded as the ships were full, and through the end of the month there were several instances of either no hospital ship (for serious cases) being available, no sweeper available for the lighter cases, or in fact no ship available at all. Throughout the latter part of May transfers of 100-300 wounded per day are considered routine (War Diary 11th Casualty Clearing Station, BNA WO95/4356). The complaints and difficulties of the 11th CCS were typical of all units involved in the evacuation chain.

In the first 10 days after the landing approximately 16,000 casualties were brought to Egypt alone (Harrison 2010, 182). Writing home in May 1915, a member of the staff of the Second Australian Stationary Hospital on Lemnos expressed the anger and frustration felt by the medical personnel taking care of this flood of sick and wounded:

> All of this was somebody's fault, but God knows it was not ours, who already had a superhuman task before us. Someday, perhaps, it may be fixed to somebody holding a much higher position than any of ours. Surely a want of preparation and foresight on somebody's part (Tyquin 1993, 19)?

Recalling that the number of expected wounded for the entire campaign was 9,000-10,000, 16,000 wounded arriving in Egypt in 10 days clearly represented an influx that could only be dealt with by superhuman efforts on the part of the medical personnel.

Frustration with lack of adequate planning was not limited to medical officers. Nursing sisters had to deal with the consequences of inadequate planning with resultant lack of supplies, as this vignette from an Australian nurse aboard a hospital ship illustrates:

> On the return journey to Gaba Tepe, we work hard getting our wards ready, can't get clean pyjama suits; pick out the cleanest, & about 40 pairs of blood stained ones, with the orderlies assistance, we do our best to wash in salt water, & then dry on the deck. Every spare minute is spent in

> making up dressings, & padding splints which the ship's carpenter is making for us (Harris 2008, 29).

This lack of adequate hospital clothing for the wounded, and the necessity for the ships' carpenter to fabricate splints for fractures clearing indicate a lack of planning, specifically for the logistic portion of medical support. It cannot be stressed too strongly that the presence of adequate numbers of trained medical personnel is not enough by itself to provide medical care. Medical personnel must have adequate equipment and consumable supplies, and adequate resupply of expended consumables, in order to carry out their tasks.

Through the latter part of May and then June and July a stalemate was reached, with the action on the peninsula resembling the static warfare of the Western Front. While medical services improved, the lack of proper sanitary preparations, with no sanitary officer having been appointed to the staff at the beginning of the campaign, became a major problem (James 1962, 222;Tyquin 2003, 134). Disease rates were very high, with various intestinal diseases becoming rampant as the weather became warmer during the late spring and summer. Due to the lack of a sanitary officer on the initial planning staff, and for some time after the initial landings, the medical department had to continually attempt to catch up with disease rates that were very high –with up to 20% of the Australian force (for example) presenting to sick call on a daily basis (ButleR 1938, 228-253). This high level of disease placed a continuing strain on the medical evacuation system and hospitals along the LOC.

As a measure to improve medical services the RAMC had appointed Surgeon-General Babtie as "Principal Director of Medical Services" in June to coordinate medical care, and the Royal Navy had appointed Surgeon Vice-Admiral Sir James Porter as "Principal Hospital Transport Officer" shortly thereafter (Tyquin 1993, 34). In fact, this did not improve anything but rather created even more confusion in the chain of command and more opportunities for inter-personal and inter-service squabbling. Medical units on the Gallipoli Peninsula continued to complain about inadequate transport to clear wounded off the beaches and out of field medical units. Bed capacity on Lemnos was expanded, however the infrastrucure to support these units was simply not there – port capacity, roads, and water supply were stretched thinner and thinner. Although bed capacity in Egypt had been significantly expanded by June, clearing of convalescents to the UK or Australia/New Zealand as appropriate, continued to be a bottleneck.

In an attempt to break the stalemate a second landing was made at Suvla Bay in early August. While there were improvements in the

planning for the August landings at Suvla Bay, the number of hospital ships and medical transports having been increased, most of the issues that had plagued the initial landings went unresolved. While the decision to make the Suvla landings was made on July 13, the British and Australian medical staffs were not informed about the details until the day before the landings, effectively cutting them out of the planning process (Tyquin 1993, 37; Tyquin 2003, 150). No effective system of medical regulating was established. Predictably, medical care during the assault and thereafter was less than could have been expected. The scene at Suvla Bay on August 10, a few days after the landing, was described thusly by a British staff officer:

> Meanwhile the condition of the wounded is indescribable. They lie in the sand in rows upon rows, their faces caked with sand and blood; one murmur for water; no shelter from the sun; many of them in saps, with men passing all the time scattering more dust on them. There is hardly any possibility of transporting them (an MP 1919, 159).

Almost all of the medical planning mistakes of the initial landing were repeated during the Suvla Bay landings. There was no system of medical regulation, no clear unity of command between the army and navy with appropriate clear division of responsibility and authority, the medical staffs were out of the planning loop until the last moment, and the difficulties with proper marrying of units with their medical stores during and immediately following the landing continued.

The frustrations of the medical personnel with the continuing unresolved issues were apparent. The experiences of the 14th Casualty Clearing Station at Suvla Bay are typical, and cover the whole range of continuing errors. Upon landing they find that some of their equipment is missing, they have to scrounge tents for themselves, and share out medical equipment and stores with field ambulances and dressing stations closer to the front who are also short of necessary equipment and stores. Two weeks after the landing there are significant difficulties in getting wounded evacuated appropriately. The end of month summary for August notes that the unit in three weeks has cleared approximately 3,000 casualties and that a CCS staffed for 200 patients has been grossly overworked, and has had to perform surgeries well above what was planned (these units were supposed to do little if any surgery, only the most urgent cases). Medical supply remained an issue, with stretchers, blankets, hospital clothing and so forth going with patients to ships, but no returns or resupply forthcoming in a timely manner (War Diary 14th Casualty Clearing Station, BNA WO95/4356).

In the last stages of the campaign, the later fall and early winter of 1915, the basic issues had still not been solved. For example blankets were a shortage item, and were critical as the weather on the peninsula became colder. The Commanding Officer of the 16th Casualty Clearing Station complained to higher authorities that his unit was handling double the number of patients that they were staffed to deal with. From August through November of 1915 this CCS admitted 15,794 patients (War Diary 16th Casualty Clearing Station, BNA WO95/4356). This complaint was typical for all units at Gallipoli, and for units in supporting locations such as Lemnos and Egypt, and while the overloading of medical units had tended to improve during the campaign it was never truly adequately addressed.

When the withdrawal from Gallipoli occurred in December 1915 and January 1916 there were no medical difficulties, in large measure because the evacuations were carried out without any significant Ottoman opposition. The entire campaign had cost approximately 250,000 casualties on land, about 25 times the original staff estimates. The only saving grace was that both sides made a sincere effort to respect the Geneva rules. While medical units on the beaches were frequently exposed to enemy fire, and were often in close proximity to legitimate military targets, multiple diaries and records indicate that medical units never felt they were specific targets, and truces to clear dead and wounded were not unusual. Similarly hospital ships (those marked per the Geneva rules) never felt they were targeted, although the crowded conditions of the anchorages off the Dardanelles meant that stray shells might come close.

As noted earlier, the lesson learned from Gallipoli by the British and the U.S. Army was, in short, do not do amphibious assaults. Analyses made during the war and immediately afterwards, as well as the final report of the Dardanelles Commission, were in my view and the view of others, a whitewash of the situation (*Final Report of the Dardanelles Commission* 1919). In those inquiries, as well as in works published by participants after the war, facts were either distorted or omitted and diaries at least partly rewritten. Not surprisingly, senior officers were anxious to avoid taking blame for the disaster, and the general trend was to blame most of the problems on the inevitable unknowns and bad outcomes that would accompany even the best plans in war. Although generally seen as somewhat biased as well, it was not until A.G. Butler published the *Official History of the Australian Army Medical Services 1914-18* in the 1930s that there was a more open disclosure of many of the medical failings of the Gallipoli campaign.

A brief mention should be made of the German use of "lessons learned" from Gallipoli. Prior to "Operation Albion", the assault on three Baltic islands in 1918, the German staff had looked at Gallipoli and attempted to avoid some of the errors they could see from their observations of the assault. Michael Barrett's *Operation Albion* relates the German preparations in detail, and compared with the British/Imperial planning those preparations were meticulous indeed. Having said that, the landing of adequate medical forces and equipment was later in the schedule (about 48 hours) than it should have been (Green 1936, 429). However, as the assault was not expected or properly resisted, and the defenders collapsed rapidly, the delay in landing medical forces did not result in any significant problems. Following World War I amphibious warfare was not a subject studied in any depth by the German military, and such planning or analysis of amphibious assaults tended to be on the lines of "it's just a big river crossing."

Since War Plan Orange and the prescient analysis by "Pete" Ellis in 1921 made it clear that the Marine Corps would have to assault Japanese held islands in the Pacific, another answer rather than "it can't be done" needed to be found by the Marine Corps ("Advanced Base Operations in Micronesia", 1921). Analysis of Gallipoli by the U.S. Navy and Marine Corps began almost immediately after the war. In 1921 an article in the *Marine Corps Gazette* by Brigadier General Robert H. Dunlap urged the study of British failures at Gallipoli, and one of five prominent areas of failure he noted was "evacuation of the wounded, requiring close cooperation between the Army and Navy" (Daugherty 2009, 204, 206). Captain W.S. Pye, USN, summarized the harsh, although not inaccurate, conclusions about the Gallipoli Campaign from the viewpoint of the American sea services in his two-part article in *Naval Institute Proceedings* in 1924 where he said:

> The British Army and Navy have been conducting joint operations for centuries yet the history of the Dardanelles Campaign, their latest large joint operation, indicates that almost every known error was committed at some time during the campaign (Pye, 1924, 1964).

Although the 1920s were a period of retrenchment for the American military, consideration of future needs and doctrine was not totally ignored. In conjunction with War Plan Orange navy medical personnel had begun to analyze projected needs in support of this plan, estimating hospital beds required and recognizing that hospitalization of forward units would be on hospital ships (Carpenter, 1924). In 1927 Commander W.L. Mann, MC, USN, published his monograph *Medical Tactics in*

Naval Warfare, compiling and expanding on his articles the previous year in the *United States Naval Medical Bulletin*. Errors in British medical planning at Gallipoli were specifically noted as mistakes to avoid. The need for proper medical regulating, close involvement of the medical staff with line staff planners, and proper combat loading (putting medical supplies on the same ship that carries the medical unit they are for) were all stressed as both important and as areas where the Gallipoli landings and campaign had failed (Mann 1927, III(a) 102, III(b) 2, 14).

Beginning in the early 1930s the Marine Corps began detailed development of doctrine for amphibious warfare, with the creation of the Fleet Marine Force 1933 and the development of the *Tentative Manual for Landing Operations*, distributed in 1935. This tentative manual was later adopted in the late 1930s as FTP-167 and further adopted by the army with some modifications as its basic doctrinal publication for amphibious landings. In order to test and refine doctrine and equipment a series of Fleet Exercises (FLEX) were carried out in the 1930s, which from early on involved medical exercises and planning.

As with Commander Mann in the 1920s, the "bad example" of Gallipoli was closely studied as a road map of errors to avoid. The medical section of the 1935 edition of the *Tentative Manual for Landing Operations* specifically addressed issues of medical command structure, medical planning (including medical requirements to the rear of the assault area), triage, medical regulation, and casualty estimates for amphibious assault (*Tentative Manual for Landing Operations*, 295-299).[2] Commander (later Vice-Admiral) Joel Boone, MC, USN recommended A.G. Butler's *Official History of the Australian Army Medical Services 1914-18* for close scrutiny, and offered to loan his copy to other interested physicians for study (Boone n.d.). Medical aspects of the various FLEXs were analyzed in after action reports, and recommendations for improvements forwarded, and particular attention was paid to the areas where there had been conspicuous failures at Gallipoli. Naval medical officers attached to the Marine Corps formed a close-knit circle of physicians working to develop doctrine and procedures to support amphibious assault.

I do not intend to imply that this process of learning from the bad example of medical planning at Gallipoli was by any means smooth. There are numerous examples in the correspondence and papers of medical officers working on this issue of their concerns being ignored or

[2] Preliminary casualty estimates were based on Gallipoli, and the starting point for estimation was 15% of the assault force on day one, and a further 10% over the first three days. Of every five casualties there was one KIA and four WIA, with 30% of the WIA considered permanent losses.

minimized by line officers of both the Marines and the Navy. However, enough support and cooperation was obtained so that by 1938 FTP-167 had extensive coverage of medical planning and services for amphibious operations. While by no means perfect, the medical doctrine incorporating lessons learned from Gallipoli worked well enough at Guadalcanal and in North Africa, where the first U.S. amphibious assaults took place.

In retrospect, the mistakes made in medical planning at Gallipoli seem obvious. First and foremost was the failure of the line staff to recognize the need for medical planning, and to have involvement of the medical staff at all stages of the planning process. In mitigation is the fact that the entire operation was thrown together with very little time for planning of any sort, and the DMS was not appointed and available until very much the last minute. Throughout the campaign the line officers at the staff level did not include the medical staff deeply (or even at all) in the planning process, and exhibited a very laissez-faire attitude to medical issues-until they impacted fighting strength. There was a lack of unity of command, and consequently proper lines of responsibility, a failing stressed numerous times in American analyses but not corrected by British forces until later during World War II as Britain maintained joint, as opposed to combined or unified, command structure for amphibious operations. Medical regulation at Gallipoli was essentially nonexistent, and there were severe failures in medical logistics/combat loading with multiple instances of medical units having their equipment lost or on another ship someplace else (Tyquin 1993, 58).

The Gallipoli assault was the first major amphibious assault in modern warfare and, as with any other first, it was inevitable that there would be many errors that, in retrospect, could or should have been avoided. Less than a week before the assault on April 20, 1915 and about a month after he had been given the command General Hamilton commented in his diary how complex an amphibious operation was, and how such operations contained much that was “not in ordinary soldier tactics” (Hamilton 1920, 118-19). The evidence shows, sadly, that the British general staff of the Mediterranean Expeditionary Force made little if any attempt to use the time they had to involve the medical staff in any meaningful planning, and that they failed to learn from experience and repeated this same error later in the campaign for the Suvla Bay landings.

The senior medical staff was not exempt from blame. While the actions both medical and military of the doctors and medical personnel on the peninsula and at Mudros and in Egypt were almost universally praised for their skill, dedication, and bravery, they were ill served by the leaders who failed to provide for adequate numbers, logistics, and overall planning.

Given that the war had been going on for eight months at the time of the Gallipoli landings, and the effect of modern weaponry, especially machine guns, on assault troops had been amply demonstrated on the Western Front by the winter of 1915, the casual attitude towards planning for casualties by the line staff, and the gross underestimation of casualties by the medical staff (although better than the line staff) is difficult to explain. While a cavalier attitude concerning the capabilities of the Ottoman military was very much in line with the racial attitudes of the day, the continuing laxity illustrated by the planning of the Suvla Bay landings is hard to understand. Contemporary writings and later memoirs all show that it did not take long for the British and Commonwealth forces to appreciate the capabilities of “Johnny Turk” as a soldier.

In his 1927 monograph Commander Mann put together two quotes that might summarize what a medical planner needed to keep in mind in preparing for an amphibious assault. The first, from Captain Taylor (MC) USN defined medical priorities: "In the field the distribution of medical supplies, prompt evacuation, skilled first aid, shelter, food, and restoratives available early for each fallen combatant are of infinitely more importance than highly technical relief to difficult cases" (Mann 1927, III(a)102). The second, from Clausewitz, stated that "In war everything must be simple, but the simple is usually difficult" (Mann 1927, III(a) 102). From the standpoint of the medical personnel United States Navy serving with the Marine Corps, Gallipoli was not totally useless, it did serve as a bad example which aided in the development of workable doctrine for amphibious assault and spared Allied forces in World War II the medical disaster that occurred at Gallipoli.

MEDICAL ARRANGEMENTS FOR THE LANDING OF THE M E F.

(Issued by the Director of Medical Services, MEF)

1. With each covering force the bearer sub-divisions of a Field Ambulance and one tent sub-division will be landed with as much medical and surgical material as can be man-handled by the personnel, giving a total of 150 medical personnel with each covering force.

2. At 2 P.M. on day of landing the personnel of the Casualty Clearing Stations (one for the 29th Division and one for the Australian and New Zealand Army Corps) will be landed with as much surgical and medical material as can be man-handled.

3. When the remainder of the division lands the rest of the Field Ambulances and the equipment of the Casualty Clearing Stations will be put on shore as soon as it can be disembarked.

4. 2 hospital ships will be available
With the 29th Division *Sicilia*
Accommodation serious cases 400
With the A.N.Z. Army Corps *Gascon*
Accommodation serious cases 500

5. I understand from the Senior Naval Transport Officer that the Navy will commence the transport of wounded from the shore to the ships about 2 P.M.
The means of evacuation are as follows:
3 launches each capable of holding 12 cots are available for the 29th Division andthe same number for the A.N.Z. Army Corps. These launches are to be towed to the hospital ships in which the men are to be accommodated.
The following transports are allotted to the 29th Division for accommodation of casualties:

(a) B2 *Caledonia*	400 serious cases	1200–1500 slight cases
B7 *Aragon*	400 " "	1200–1500 " "
B9 *Dongola*	400 " "	1200–1500 " "
(b) Allotted to the A.N.Z. Army Corps		
A25 *Lutzow*	200 serious cases	1000 slight cases
A1 *Ionian*	100 " "	1000 " "
A15 *Clan McGillivray*	100 " "	600 " "
A31 *Seang Chun*	100 " "	600 " "

Medical personnel and medical and surgical equipment for the *Caledonian, Aragon* and *Dongola* have been provided by No. 15 Stationary Hospital and for the *Clan McGillivray* and *Seang Chun* by the A.& N.Z. Corps field ambulances at present, and later by No. 2 Australian Hospital. The *Lutzow* and *Ionian* to

Fig. 1-1

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CHAPTER TWO

DR. JEKYLL AND MR. HYDE: CANADIAN REGIMENTAL MEDICAL OFFICERS IN THE GREAT WAR

TIM COOK

Regimental medical officers played a critical role in offering preventative medicine and surgical care for front-line soldiers during the Great War. In all armies, medical aid was intimately tied to sustaining morale and bolstering fighting efficiency. The regimental medical officer was trained to care for the wounded and the ill, but he was also charged by the army to ensure and enforce discipline among soldiers. This was a contentious task. While the infantry officers and NCOs led their men, exerting paternalistic or harsh control over matters of army discipline, the regimental medical officer was to assist the battalion's officers with the medical component of discipline. The regimental medical officer was to search for potential malingerers, the term associated with soldiers who sought to escape from service at the front through feigned illness. Some of the regimental medical officers embraced this role, aware that discipline was necessary to keep the men in the line and that any slippage would lead to the weakening of fighting efficiency in the battalion; others found the task distasteful and foreign to their profession as healers, especially when it extended to passing judgment on those soldiers suffering from fatigue, mental breakdowns, or a self-inflicted wound.

This article will examine the duties and experiences of the Canadian regimental medical officers, but the critical role played by these soldier-physicians was similar in British, American, French, and enemy combatant services. The Canadian doctors who served as regimental medical officers were members of the Canadian Army Medical Corps (CAMC), but attached to fighting units, and therefore part of their strength. The CAMC was responsible for the care of Canadian soldiers and extended back from the front lines, through field ambulances, casualty

clearing stations, and all the way to hospitals far to the rear, and back to Britain. Medical orderlies, surgeons, and nurses were all part of the system. Closer to the front, each infantry battalion, artillery brigade, and some auxiliary formations had a medical officer, although this article will focus largely on the regimental medical officer in the infantry battalion.

While regimental medical officers were recognized for their important work and bravery during the course of the war, they remained ambiguous figures for front-line combatants. Soldiers often had an antagonistic relationship with the medical officer, with the latter seen as harsh gate-keepers who kept the soldiers from leaving the combat zone through trickery, callousness, or insensitivity. *The Listening Post*, a popular Canadian soldiers' trench newspaper that was written and published by the soldiers for one another, offered this taunt at the medical officers: "When a doctor leaves the civilian life for the military, he becomes a different person altogether. Just like Dr. Jekyll and Mr. Hyde" (*The Listening Post* 5 (6 October 1915) no page number).

The prewar Canadian Army Medical Corps (CAMC), founded in 1904, was a mere 20 officers, 5 nursing sisters and 102 other ranks; however, this was sufficient to serve the paltry permanent force of slightly more than 3,000. But the Great War witnessed the rise of civilian armies, and Canada was no exception. From a nation of fewer than 8 million, around 450,000 Canadians would eventually serve overseas with the Canadian Expeditionary Force. These citizen-soldiers fought, for the most part, on the Western Front. The enormous firepower of modern weapons forced the armies to dig into the ground, and then stay there in their trenches. In this siege warfare, soldiers were killed in sickening numbers from shellfire, shrapnel, and bullets, and later poison gas, mortars, and mine explosions. To respond to this terrible carnage, and to care for the wounded, the CAMC underwent a colossal wartime expansion. In 1918, the CAMC consisted of 1,528 officers, 1,901 nursing sisters, and 15,624 other ranks (Macphail, 1925, 5-6). Before the war, less than 10 per cent of Canada's doctors served in the militia as medical officers; during the course of the war, this figure would climb to a staggering 50 per cent to meet the needs at the front, a level that denuded hospitals and communities in Canada of medical personnel (Jones, 1914, 779; Morton, 1993, 181; Anonymous, 1914, 907).

The Great War is often portrayed as a savage, brutal, and hopeless conflict, with soldiers slaughtered in futile attacks and the wounded left to rot on the battlefield. Canada's losses of over 60,000 dead and 172,000 wounded reveal starkly the terrible nature of combat (Cook, 2008, 612-619). Notwithstanding the number of killed and wounded, the medical

services were effective and efficient in saving lives. Canadian Corps Commander Sir Arthur Currie wrote in the war's aftermath that "the devotion of the medical personnel has been, as always, worthy of every praise (Canada, 1919, 184-5)." Despite having hundreds, even thousands, of wounded arriving at forward medical units during large-scale battles, the doctors and surgeons saved an astonishing 90 per cent of those who entered the medical chain (Macphail, 1925, 105). However, the great challenge, and one that was not overcome during the war, was in collecting the wounded during these engagements, from the soldier's spot of injury, usually in the front line trenches or in No Man's Land, and getting them into the medical chain that linked back to England.

With Canadian forces serving within the British Expeditionary Force and adopting much of its doctrine, the first line of contact for wounded men was the regimental medical officer, who was situated in an aid post – known as the Regimental Aid Post – usually several hundred yards behind the front lines. The wounded were brought there by the medical officer's sixteen stretcher bearers, although these numbers were augmented with more bearers before large-scale battles. This was forward medical care with a vengeance, where the medical officer was subjected to shot and shell. As one long-service medical officer observed, "If I am to be engaged in war work at all I want to be at least near enough the fighting line to hear a gun now and then" (Norris (ed.), 2007, xvii).

Behind the medical officer, and supporting him closely, was a field ambulance, of which there were three in each 18,000-strong division. The field ambulances – with a strength of ten doctors, 182 NCOs and other ranks, and another 57 service corps drivers – collected the sick and wounded from the Regimental Aid Post (RAP) and moved them through the medical chain, either carrying the injured on stretchers or using light rail or motorized vehicles if the terrain permitted (Medical Arrangements, Defence Scheme, 1st Canadian Division, 5 November 1916). In the case of the set-piece battles, where a flood of wounded washed over the front lines, there were often not enough stretcher bearers. The walking wounded were left to stumble back through the trenches, banging from trench wall to trench wall as legs lost strength and blood seeped out, hoping to find medical care, either at a regimental aid post or at the field ambulance, before they slipped into shock, unconsciousness, and then death. The field ambulances also had rest stations that allowed for a temporary reprieve for soldiers suffering from exhaustion, stress, and those who had, in the words of medical officer Percy Bell, "temporarily broken down under active service conditions" (Bell, 1916b, 1091).

From the field ambulance, the wounded were examined again, and if they were not in critical condition they were sent to an Advanced Dressing Station, usually a few kilometers behind the lines. A more permanent structure, the Casualty Clearing Station, was further to the rear, anywhere between 2 and 4 miles from the front, out of range of all but the heaviest-calibre enemy guns. It was here where most emergency surgery was performed, although severe cases, usually those with abdominal, chest, and head wounds, were operated on throughout the forward chain. The CCS varied in size but usually contained semi-permanent structures with over 500 beds. They had X-ray machines, nurses, and multiple surgical rooms. When patients were stabilized, they recovered at the CCS if their wounds permitted, or they were sent further to the rear to larger hospitals along the French coast or on to the United Kingdom. The system of care changed slightly during the course of the war, with surgery moved closer to the front to address wounds before they became infected, but it was an effective arrangement that linked battle front to rear (Lt. Col. J.G. Adami's diary, 10.9.1917).

The regimental medical officer was a critical member of the infantry battalion, even though he remained a part of the CAMC. Nonetheless, he was welcomed into the officers' mess, and because of his work with the senior ranks of the battalion, especially the commanding officer, he tended to have strong relationships with his fellow officers. While some of the medical officers could not find their footing within this closed society, most did, even as they remained men of medicine in a band of warriors.

The medical officer at the front was generally a fit, youthful doctor lacking a specialization. There was no fixed tour of duty, but most served for about half a year before being rotated to a more rearward medical formation; only a dozen or so served longer than that, as they burned out quickly since they were on constant call. As battlefield surgeon A. Mackenzie Forbes wrote of the medical officer in the front lines: "These men are usually chosen from amongst the younger and most enthusiastic members of our profession on active service. To them is deservedly given the greatest credit of all, because from them is expected the greatest self-sacrifice. They must be characterized by strength, both physical and moral, courage, resource and faith in their high ideal of service... Their faithfulness is proven most of all by the great and glorious deeds of daring which have been unrecorded, done quietly and without ostentation, often seen by few, sometimes noticed only by those whom they have willingly risked their lives to aid" (Forbes, 1916, 295-6). While Forbes's contemporary account is windy and heroic, it provides some insight into the medical officer's hardship, if not his actual work.

There was a constant loss of soldiers to enemy shellfire, bullets, and poison gas while an infantry battalion – usually a 1,000 strong – was in the front lines. Moreover, accidents were common: men were injured in countless ways in the dangerous trench environment of jutting metal and wood, craters and dugouts, and with soldiers travelling the front when it was often shrouded in darkness. Illness plagued the homeless soldiers in winter and summer. The medical officer was responsible for the care of all of these injuries and ailments. Sharing the danger and drudgery of service at the front, the 'Doc' or 'croaker,' as the medical officer was sometimes known, was in daily contact with the rank and file. As one soldier remarked, "it is the feeling of the doctor being there that the men appreciate, the confidence he gives them, and his cheery word" (Harrison, 2010, 72). Captain Andrew Macphail of the CAMC echoed these sentiments, writing that "A powerful element in morale is the certainty in the soldiers' mind that they will be cared for if they fall; the presence of the medical officer at the advance is a sign that relief is always at hand" (Macphail, 1925, 131). Another Canadian medical officer observed that soldiers feared being left to bleed to death on the battlefield and the knowledge of medical care was a comforting one that "did much to allay the perfectly justifiable apprehension" (Norris (ed.), 2007, 119). With the medical officer often risking his life under fire to reach the injured, or in dealing with the relentless rush of bleeding and broken men who arrived at his forward station, he was indeed a heroic figure to many of the battalion's soldiers.

The regimental medical officer's operating room was usually located, according to stretcher bearer Fred Noyes, "in dugouts or cellars in the quieter parts of the trenches" (Noyes, 1937, 63). A reinforced dugout offered the necessary protection against shellfire, with most regimental aid posts (RAP) having space for a dozen patients, and usually some room outside for the spill-over of stretchers. A dressing table, storage for medical supplies, and a stove were essential, although every RAP was different. The 16 stretcher bearers (SB) commanded by the medical officer were spread between the front lines and the rear, and usually divided into four squads of four bearers (see Moran, 2009). While the name stretcher bearer denotes a manual carrier of the wounded, the SBs were closer to battlefield medics, and they were trained by the medical officer in front-line care. During a battle they usually roamed in search of wounded soldiers.

When it was quiet in the line, the medical officer might go racing down the trench system to offer immediate care for a wounded soldier, although usually it made sense for the injured man to be carried to the RAP, which

had proper lighting, a supply of medicine, and a slightly more antiseptic environment. The wounds were of every size and nature. Bullets could pass straight through the body, leaving minor entry and exit wounds. But more often a projectile, especially irregularly-shaped shell splinters, tumbled through the body, ripping internal organs and shattering bone, before leaving a ghastly exit wound. Flesh was lacerated and contused, body parts were torn away and crushed. Surgeon William Boyd recounted the horror of face wounds: "the nose, eye, and a greater part of the cheek had been torn away, leaving a great red, bleeding cavity" (Boyd, 1916, 26). Before the advent of penicillin, almost all stomach and abdominal wounds became infected, with men dying in agony (Clutterbuck, 1920, 428; and Archibald, 1917, 298–306).

With these traumatic injuries, the medical officer might be called upon to perform emergency surgery, but more often, in the words of one medical officer, "Very little is attempted in dressing wounds where the missile has penetrated" (Major G.S. Strathy diary, 5 October 1917). Rum was administered for the pain, as well as morphine, if it was available. If morphine was given, a "M" was penciled on the forehead with iodine to ensure that the next link in the medical chain did not also provide pain relief that might lead to an overdose. All-important cigarettes were lit for the shattered men and usually provided instant relief. Once a patient was stabilized, the bearer team then set off with the wounded man, winding through the trenches to the field ambulance.

The medical officer was more harried during the rare, but costly, big pushes. These large set-piece battles, such as Second Ypres, the Somme, Vimy, Passchendaele, and the engagements of the Hundred Days campaign, usually involved most fighting formations in the Canadian Corps. By late 1916, the Corps consisted of four divisions and was 100,000-strong; it was not uncommon to suffer thousands of casualties per day during intense battles. This put an enormous strain on the medical officer and his stretcher bearers.

As the wounded overwhelmed RAPs through their sheer numbers, medical officers were forced to triage their patients. Triage was the appraisal and classification of wounded men, with the ultimate determination of who would be treated first and which soldiers, often with the most terrible wounds, would have to be pushed to the end of the line, and likely to their death. To spend an hour on a severely wounded patient meant that four or five others could not be treated in the same time. With only limited resources, difficult decisions had to be made. For the horrifically wounded, men with open brains, sucking chest wounds, or broken femurs (one of the most lethal of wounds), it was cruel to move

them, and often they were left to die in the trenches. Soldiers who lay out in No Man's Land for long periods of time, sometimes up to twenty four hours, had wounds that seethed with infection, as the farmers' fields in France and Belgium had been impregnated with human and animal waste for centuries. Frank Walker, a prewar machinist and wartime stretcher bearer with the 1st Canadian Field Ambulance, reflected sadly on those who had been lying unattended as the battle raged around them. "Their condition is truly pitiful. In many cases, merciful death has come, but where slight wounds have turned to gangrene and fever, there is nothing to be done but make them as comfortable as possible. We bear them back to safety, but I often think that a quick bullet would be the kinder mercy" (Gaudet (ed.), 2000, 109). Morphine could be given to reduce the pain; the historical records do not record how many lethal doses were given in quiet acts of mercy.

While most regimental medical officers enjoyed the opportunity to practice their trade so close to the front, Major G.S. Strathy, who had served in a field ambulance before transferring to a regiment, observed, "There is one weakness which is apparent [in sending him to the front]. I, like many other M.O.s with no battalion experience, am being sent to a battalion without any special course of instruction in battalion work" (Major G.S. Strathy diary, Sept 21st 1917). There was indeed no formal course for the medical officers, but the army laid out their responsibilities. In addition to caring for the wounded, the medical officer's most important role was to engage in preventative medicine. In the past, disease had laid waste to armies, killing far more soldiers throughout human history than sharpened steel, especially those forces involved in static sieges. With the armies on the Western Front fighting a siege war of monumental proportions, it was the perfect petrie dish for inculcating disease. While Great War statistics are notoriously unreliable, one set for the Canadians suggests that 51,678 soldiers died of wounds sustained in battle, while another 4,960 succumbed to disease (Macphail, 1925, 237). It is astonishing that there were not higher incidences of death from illness and disease in the Canadian forces, and almost a fifth of the disease deaths listed above were attributed to influenza at the end of the war. While these statistics do not account for soldiers who died from infected wounds – which would number in the thousands – disease never destroyed the fighting efficiency of Allied or enemy forces.

The question of sanitation was crucial in controlling loses to disease. Regulations stipulated that the medical officer was to advise the commanding officer "in all matters appertaining to the health of the troops and to the sanitary state of the area they may be occupying" (Duties of

officer in Medical Charge of a Unit, n.d.). While the medical officer did not have the power to issue orders related to sanitation, his advice was usually well heeded; as Captain Andrew Macphail wrote, "it would be a rash and hardy commander who should disregard any sound advice or reasonable request made to him by his medical officer" (Macphail, 1925, 129). Within the battalion, the medical officer worked with the sanitary NCO – often known as the 'shit wallah' – to ensure that latrines were properly dug and monitored, so as not to be vectors for disease (Cook, 2007, 231). However, by the end of 1915, there were mobile laboratories and official sanitation sections that oversaw much of the work in ensuring behind the lines that there was clean water and food supply, as well as means to dispose human and animal waste (Burpee, 1921, 110-112). The importance of tea and rum to the soldiers was partially due to the water being almost undrinkable due to high chlorination. Nonetheless, in the line, it generally fell to the medical officer to daily inspect the trenches, garbage pits, and cooking areas to ensure cleanliness.

Brigade, division, and corps level officers often harassed the regimental and medical officers for laxity in sanitary discipline that included the proclivity of some soldiers to defecate in the trenches, toss the remnants of their dinner over the sandbags into No Man's Land, and drink from infected water sources. Medical officer William Hart of the 5th Canadian Infantry Battalion recounted that in the Ypres salient in April 1915, "the ground seemed so thickly sown with bodies which were barely below the surface that they were constantly cropping out when the surface soil was washed away by rain, and every attempt to enlarge a dug-out or dig a communication trench turned up a dead German" (William M. Hart diary, 14 April 1915). The unburied corpses from previous battles remained a problem on most battle fronts, and contributed to the hordes of rats overrunning the trenches and No Man's Land.

Lice infections remained one of the most difficult problems for the men and the medical officers. With few opportunities to wash regularly, almost all front-line soldiers were plagued by body lice. Lance-Sergeant A.D. Peacock, a prewar lecturer in Zoology at the University of Durham, made a study of the louse that infected the allied fighting forces. He found that of a sampling from ten infantry battalions, only 5 per cent of the men were not infested. The remaining 95 per cent were verminous, with between 10 and 30 body lice. The "lousiest" five per cent, however, had between 130 and 350 lice each, with one miscreant taking the record with 895 individual lice infesting his body (Peacock, 1916, 16-7). In the winter, the layers of clothing left men scratching blind in search of the little monsters. In the summer, clothing could be removed, and soldiers spent

much of their leisure time running candles along their clothes to draw out the blood-sucking insects and then squeezing them satisfactorily between their fingers.

The epidemic of lice did more than simply torment soldiers. The lice transmitted a disease that bedeviled the medical authorities. Coined "trench fever" by the soldiers, it caused headaches and weariness; as one medical officer observed, "these patients also complained of atrocious pains in the bones and muscles, especially in the shins" (Norris, ed., 2007, 122). The fever came and went, with the soldier unable to perform his duties for at least a week (Atenstaedt, 2006, 564–568). The medical authorities diagnosed it as PUO, pyrexia of unknown origin, and it was not until 1918 when it discovered that lice transmitted the fever and that the causative agent was a new type of organism, *Rickettsia*, now known as *Bartonella quintana* (Dubord, 2009, 125-170). The establishment of official baths and steam laundries behind the lines in the latter part of the war assisted in reducing the infestation, but most soldiers and medical officers admitted to losing the battle against lice, and no cure for trench fever was ever found during the war.

The Canadians' first winter in the trenches, 1915 to 1916, was a difficult one. Trenches were still rudimentary, and the drainage of water remained a challenge. Soldiers standing in the slurry of mud and icy water soon developed trench foot, a form of frostbite. Canadian infantryman Victor Wheeler described the ailment: "A man suffered continuous pain in his feet, yet was afraid to take off his boots, unwind his sodden puttees and look to confirm his fears that some of his toes were turning into soft, offensive-smelling mush, and about to drop off joint-by-joint" (Wheeler, 2000, 216). When the pain deadened, gangrene began to set in (Bell, 1916a, 289–294). The army high command was worried that much of its army would be incapacitated by the awful winter conditions, but it could do little more than provide Monty Pythonish orders to the formations in the front lines that "men should not remain wet more than 24 hours" (G.155, from Corps Headquarters, 18 November 1915). Issuing whale oil to all front line units in late 1915 was more effective in combating the ailment, and there were daily inspections over the winter months, with the medical officer supporting the battalion's officers to ensure that men slathered the foul-smelling oil over their feet, and changed their socks daily.

"The prevention of 'Trench Feet' and loss of men from this cause is almost entirely a matter of discipline," thundered one 1st Canadian Infantry Division order. "The GOC wishes great attention paid to this and will regard the occurrence of 'Trench Feet' in any unit as prima facie evidence

of bad discipline and neglect to obey orders" (1st Canadian Division, AQ 23-1, [trench foot]; also see, 2nd Division to all units, A.1-17, 25 October 1916). Units that failed to lower their loss rate from trench foot were punished. Over the winter of 1915, for example, the newly arrived 2nd Canadian Infantry Division had a higher incidence of trench foot than the veteran 1st Division, and this was used as proof that discipline was lax and that junior leaders were weak (Campbell, 2003, 75). The high rates of loss were brought to acceptable levels within a year through the rigorous hounding of soldiers by medical and junior officers, but the stringent supervision continued, to the point in 1917 where every single case of trench foot had to be justified by the battalion's commanding officer, or else his unit would be liable to face group punishment, usually the stoppage of all leave for a period of time (A-147, HQ 6th Brigade, 19 December 1917; Odlum to Headquarters, 4th Division, 1 February 1917). By the end of the war, there were 4,987 cases of trench foot in the Canadian forces resulting in dozens of amputations to the toes and feet, but only two deaths (Macphail, 1925, 279).

The loss of soldiers to venereal disease was equally worrisome to the high command. Throughout history, venereal diseases have been a problem for fighting forces, and the prevalence of prostitutes in the United Kingdom and Europe to cater to the millions of soldiers led to enormous fear and even social unrest among worried civilians (Gibson, 2001, 535–79). There was also an impact on fighting efficiency: an infected soldier was lost to his unit for 30 to 60 days, and the CEF had 66,346 recorded cases (Morton, 1993, 200 and Harrison, 2010, 157). Nearly one in eight Canadians sent overseas was infected (although the above number includes men infected twice or more), but that figure needs to be put into perspective, as it is around the average for Canadian males in major cities during that time period (Soldiers' conduct in England, G.L. Foster, Director Medical Services, Canadian Contingents, report on Venereal Diseases, 18 June 1917). While most venereal diseases were contracted while soldiers were on leave, the medical officer was instructed to conduct a "short arm" inspection of genitals once a week (Memorandum, Venereal Disease, 3 January 1918). At first, all soldiers were punished for their disease, with pay suspended and, in some malicious cases, families at home informed of the offence when they inquired about the pay stoppages (Memorandum, Venereal Disease, 27 January 1917; Morton, 2004, 47-8). As in the case of trench foot, the medical officer was called upon to exert control over the rank and file, with orders to provide lectures "on the dangers and evils of Venereal Disease" (Book of Wisdom III, G.166-11, 1st Brigade to all Battalions, 26 December 1918). The statistics suggest

that they failed to reduce VD; but so too did the padres, chaplains, Salvation Army, YMCA, and other groups that preached abstinence to the soldiers. By 1917, prophylactics were issued, although there was no let up of lectures and pamphlets that predicted eternal shame for the soldier who engaged in licentious and unpatriotic leisure activities (See "The Way to Her House," *Manhood Series* Number Two and "Facts for Fighters," *Manhood Series* Number Three).

Genital inspections, the search for rotting feet, and the supervision of mounds of faeces: this was not the glory of battlefield surgery under fire. Yet, the high command turned readily to the medical officer for his expertise in preventative medicine to ensure fighting efficiency. At the same time, the front-line doctors were also expected to sustain morale and discipline among the battalion's soldiers, although many men of medicine did not want to act as enforcers for the higher authorities. A year into the war, *The Canadian Medical Association Journal* opined that "a man cannot serve two masters and so the military side should have ultimate precedence" (Anonymous, 1915, 216). It was not that simple, of course, with many medical officers torn between their duty to their patients and the military system.

After any time spent at the front, soldiers began to break down from the strain. The medical officer had the authority to relieve men from their trench duties or even to remove them from the firing line, and few senior officers interfered with the medical officer's handling of the wounded and sick (Keirstead, 1982, 25). However, it was not easy for the medical officer to distinguish between the exhausted (which included everyone) and those who were on the verge of a breakdown. And so, as one doctor remarked, the medical officer "must be tender to the weak and harden his heart against the malingerer or him who would shirk" (Macphail, 1925, 130). One of the medical officer's most distasteful tasks was the search for the malingerers, and it occurred during the daily sick parade, which was held behind the lines and in the trenches. Men lined up in the morning, where they waited for the medical officer's senior NCO to question and prod them, usually gruffly and with caustic comment. In the winter time, most of the men had severe colds or bronchitis, although all year round there was a wide assortment of maladies. Lawrence Rogers served as a senior medical orderly and he complained to his wife about the duties: "I am pretty tired and have to get up early in the morning as sick parade is at 7 a.m. and we have to be all ready to receive the sick, lame and lazy mostly" (Lawrence Rogers papers, letter, 14 December 1916). After the orderly's preliminary inspection and oral report, the medical officer came out for his "rounds."

The senior army and medical officers pressured the regimental medical officer to keep down the loss rate in units (as high rates were again seen as an indication of lax discipline), while battalion officers wanted their men available for sentry duty, work fatigues, or combat. Moreover, medical officers did not want to acquire a reputation as being lax and therefore become easy targets for the rank and file, who would soon inundate his sick parade with the groaning and moaning masses who sought temporary escape. So there was enormous pressure on the medical officer to deny that the soldiers were ill, or not sick enough to be excused from the fatigues or the firing line.

Malingering went by many names: old soldering, swinging the lead, shirking, scrimshanking, and working your ticket. Whatever the label, it was about soldiers feigning illness to be temporarily relieved, and it was the role of the medical officer to separate the malingerers from the legitimately ill. The medical officer inspected each patient, checking pulse, asking about symptoms, and conducting a brief physical examination, all the while looking for clues to those who were faking their ailment. This placed the medical officer in an adversarial position with his patients. The normal doctor-patient relationship is usually one of trust, but the exposure of malingers was about unmasking and upholding discipline. Soldiers did not take kindly to the suspicion. Canadian infantryman Alfred Andrews wrote of his disgust in attending the sick parade when he was truly ill: "A fellow who went sick had a bad time of it. He always treated us as if he were a 'lead swinger.' Someone in the London Mail wrote a piece called 'On going sick.' He argued that a man who went sick and stuck it until he got to the base deserved a V.C. I sympathized with him after my experience" (Alfred Herbert John Andrews papers, diary, 11 September 1915). Medical officer Captain Robert Manion believed that the search for malingering poisoned the doctor/patient relationship as it created "suspicion" and distrust, but he felt compelled to do it in the name of discipline (Manion, 1918, 181). None other than Sigmund Freud wrote of the medical officer's dilemma: "The physicians had to play a role somewhat like that of a machine gun behind the front line, that of driving back those who fled (Cooter, 1998, 130).

Those malingerers who simply lied about ailments were usually found out quickly, as the doctor asked questions, queried claims, offered false hopes, and led patients to reveal some incriminating evidence. The more intelligent fakers found ways to produce physical reactions, with an underground dialogue among soldiers on how to beat the system. Removing cordite from a rifle cartridge and chewing it, according to one veteran, "produced a pallor, quickened heart action and frothing at the

mouth" (George Bell, *Back to Blighty*, 113). Gums could be cut to create a seeping bleed in the mouth; soap was ingested to produce frothing; drugs were taken to stimulate disorders; eyes were irritated with dirt, polish, or chemicals; poisonous substances like turpentine or gasoline were drunk; and skin infections were encouraged by picking, scratching, and cultivating wounds (Bourke, 1999, 91; Bourke, 1995, 10-18).

The Canadian trench newspaper, *The Iodine Chronicle*, captured in a cartoon entitled, "Silent Thoughts," the tension between the medical officer and the patient. The soldier patient has been injured in the foot and the medical officer is examining the wound. The distressed patient has a thought bubble that contains a hospital ship, obviously carrying him away from the front, while the medical officer's thought bubble is that of a man swinging a block of lead, hinting that he believes the injured man to be a lead-swinging faker (*The Iodine Chronicle*, 1918, 8). *The Listening Post*, another Canadian trench paper, was so brazen as to run a series of articles that not only acknowledged malingerer, but encouraged it. This malingering dialogue – on how to escape the front – infused much of the soldiers' culture, from their songs to jokes, and from newspapers to cartoons, but it is still a little shocking to see articles in trench newspapers dedicated to "The Ancient Order of Lead Swingers," organized to deceive the medical officers (*The Listening Post*, Dec 1, 1917, no page). The *Vics Patrol*, still another Canadian trench newspaper, offered advice to those "about to go sick." In a deliberate snub at the authorities, the unnamed author also claimed: "For further advice see my publications How to Get a High Temperature and How to get a Very High Temperature" (*The Vics Patrol (24th Battalion) – Trench Edition*, 1916, 10). Soldiers' newspapers brought malingering into the open, but the high command still remained a problem.

With pressure to limit illness, some regimental medical officers simply set a quota, sending most of the ill back into the line. As one disgruntled Canadian soldier remarked, "There's no point in going to our medical officer unless the blood's running out of you" (Norris (ed.), 2007, 174). Most sick men were given castor oil or the No. 9 pill, a mild laxative. In fact, the No. 9 pill became a symbol of the medical officer's supposed callous nature. The No. 9 laxative, when combined with the army diet, with its overabundance of canned meat and lack of fresh fruit and vegetables, could have an explosive effect on the body's digestive tract. While it seemed to have no curative qualities, the No. 9 was so ubiquitous that there was a joke circulating that if the medical officer did not have a No. 9 you instead got a No. 4 and a No. 5, adding to nine, as all were believed to be useless. Soldiers' cartoons depicted the enemy cowering in

fear from No. 9 bombs, which had already done their work in plaguing the Canadians. Soldier-poets tried their hand at doggerel, with this ditty known as *Number Nine*.

The regimental M.O. takes
His daily sick parade;
He stands for all the world to see
Undaunted, undismayed.
His office is a dugout, just
Behind the firing line,
Where our soldier boys are fighting
The foeman of the Rhine.
Young Private Jinks does hap' to be
The first name on the list,
He sadly pipes his soulful eye
With his benighted fist.
Says he 'Please Sir, alas! Alack!
The weather it has rained
It made the trenches slippy, and
My ankle I have sprained.'
The M.O. he looked awful wise,
And then he shook his head.
He hummed and hawed a bit and then
His wisdom forth he shed:
Quote he 'I know a remedy
That suits this case just fine,
Just hand me down that pannier,
We'll give him Number Nine.'
The next man who was doubled up
With an undoubted pain,
As with most feeble accents he
His symptoms did explain.
'I feel,' he said, 'Quite just as if
My innards had 'gone west,'
This very awful feeling makes
Me very much depressed.'
The M.O. he did look profound.
Said he, 'Put out your tongue,
Ah! Yes, exactly what I thought,
It must be the right lung,
Or else the kidneys, but I think
A remedy of mine!
Will fix you up in dandy shape
Yes! Give him Number Nine!
The M.O. is a worthy man,
There isn't any doubt,

And when the shells are flying round
He knows what he's about.
But he's got a good old stand-by,
When it's quiet in the line,
He would sure be lost entirely
Without good old Number Nine (*Now and Then,* Dec 22, 1916, 7).

Not all soldiers were amused with the medical officer's reliance on the No. 9. Private H. H. Burrell, an intelligent and over-aged soldier, remarked with disgust when he contracted an illness in the summer of 1917: "Called on our medical Sergeant to get something for my cough. He gave me a pill!" (Herbert Heckford Burrell, diary, 2 August 1917). Another Canadian wrote incredulously, "No matter what is wrong with you he give you the same pills." (James Fargey, letter to mother, 5 December 1915). The No. 9 pill, penned a disgusted Canadian infantryman, was "a panacea for all ailments" (George Bell, *Back to Blighty*, 113-114).

Despite the examples above, the regimental medical officer and patient relationship was not always combative. The medical officer often had sympathy for his charges. Even as he was aware of the importance in upholding morale, many medical officers did not want to consign worn out men to service. But where to draw the line humanely, and also ensure that fighting efficiency did not drain away through the funnel of the sick parade? As one medical officer wrote, "Soldiers find out very quickly whether the medical officer is going to treat them as human beings, or is going to assume a priori that all soldiers are 'swinging the lead.' They know from the talk that disseminates from nervous soldiers who have been on sick parade, whether they can trust a medical officer with their personal problems" (Ames, 1918, 1023). Captain Robert Manion offered a similar comment: "If he is an old soldier and knows the game well, he may get away with it, sometimes with the tacit consent of a sympathetic medical officer" (Manion, 1918, 105). There were few hard and fast rules, especially with almost everyone ill or sick at the front during the winter months; but it was the medical officer who categorized who was too ill to fight.

The most desperate soldiers, who were unable to punch their ticket through the sick parade, were often willing to harm themselves to escape the front. These injuries were known collectively as self-inflicted wounds (SIW) and they were a more serious manifestation of malingering. The SIW was a hidden terror for the general staff: if a large proportion of soldiers refused to fight, and were so desperate as to maim themselves to escape service, the war would surely be lost. The medical officers were

charged with determining who had been injured legitimately in combat or through accident, and who had taken matters into their own hands.

The regimental medical officer was ordered to determine the nature of wounds, but they were confronted by all manner of strange injuries. Soldiers were crippled by horse kicks; they broke bones by falling down dugout stairs in the dark; they were knocked unconscious in sporting matches; they lost limbs when digging trenches and making contact with unexploded ordnance; and the list goes on, as one would expect within the Canadian Corps consisting of a 100,000 men, most of whom were in dangerous environments. Fatigue led to injuries and deaths, with exhausted men accidently discharging their weapons or losing control of their grenades. Major W.H. Hewgill of the 31st Battalion noted sadly in his diary on 3 October 1915: "Lost a fine boy today. Killed by accidental discharge of a rifle" (Major W.H. Hewgill, diary, 3 October 1915). Lieutenant-Colonel J.J. Creelman of the 2nd Canadian Artillery Brigade wrote of a similar, if not uncommon, tragedy: "One of the men in the Fifth Battery, Pete Paddon, was accidently killed by a rifle bullet the day before yesterday. The poor chap who discharged the rifle will have to be tried by Court Martial for manslaughter" (J.J. Creelman, diary, 3 March 1915). With the high command anxious to control SIW, each and every injury in the trenches or behind the lines – but not during active operations – was studied and captured in a report.

While there were thousands of accidents to members of the fighting forces, gunshot wounds were examined with vigour. Private Joseph Renaud of the 87th Canadian Infantry Battalion was one such case. Renaud was on sentry duty on the night of 31 July 1918 when he called out in pain. Officers rushing to the scene found a bullet wound through the toe on his left foot. The circumstances were suspicious because he was alone and in a relatively safe trench. An investigation ensued, with officers questioning Renaud's comrades. While some of them were close-lipped, a few testified that Renaud had been playing around with his Lee Enfield cartridges the day before. Another soldier showed him how to take half of the powder out of the cartridge to reduce its velocity. Renaud claimed weakly to be shot by an aeroplane, and he had wisely not used his own rifle, which was at the scene with a "pull-through" [cleaning rag] in it. It was a good alibi, but he had not been able to clear away a second rifle before the officers arrived, and so the ruse was revealed and he was court-martialed (Report of Accident, Pte. Joseph Renaud,1105202, 31 July 1918).

Covering up self-inflicted wounds required extensive planning, which was not always possible for desperate men. Medical officers were trained

to look for gun powder residue around wounds, which indicated that a hand or foot had been held close to the barrel of the gun. Craftier soldiers waved their hands above the trench, hoping to draw the attention of a sniper who might take off a few fingers with a well-placed shot, although this came with its own danger as a malicious sniper might aim a little lower, sending a bullet through the weather-softened sandbags and into the soldier's head. Many of the less traumatic SIWs were very difficult to detect. The high rate of venereal disease was sometimes attributed to soldiers deliberately seeking a sexual SIW, and there was no way to effectively police this (Macphail, 1925, 279). One Canadian infantryman remembered watching his comrade prepare bully beef for infection, drilling holes in the tin can to nurture botulism or salmonella (George Bell, *Back to Blighty*, 114). When a senior CAMC officer proposed using poison to kill off the legions of rats in the trenches in 1917, it was eventually decided that such a preventative course would be too tempting to desperate men looking to escape by eating the rat poison ("Sanitation in Canadian Camps" Report from CAMC Sanitary Advisor to DMS Canadian Contingents," 16 May 1917, 7).

The high command also feared chemical weapons as another means by which soldiers could embrace a SIW. With deadlier gases unleashed throughout the war, and especially the German introduction of mustard gas in the summer of 1917, chemical casualties rose significantly. However, while mustard gas injured thousands, it had a low fatality rate, and the high command suspected that some of the wounded were deliberately infecting themselves, either by rubbing chemically-polluted soil in their eyes to induce temporary blindness or breathing in limited doses of gas (Cook, 1999, 157-162; DDMS, circular, 2 October 1917). Throughout the war, there were periodic pushes to frighten the soldiers about the dangers of gas, but the number of casualties continued to climb into the final year of the war; there was little that the medical officer could do, even as treatment improved. The high command was impotent in meeting the perceived threat from chemical weapons, which made the spectre of chemical SIWs even more troubling.

When a SIW was discovered, or even suspected, the medical officer was responsible for placing the patient under arrest, writing up a charge report, and sending him to a hospital behind the lines (Second Army to all formations, II Army Circular Memorandum Self-Inflicted Wounds, 14 August 1915). Those men that were court-martialed were not to be imprisoned but, upon recovering, were sent back to their units to serve their prison term in the field (SIW, A.G.B./1657a, Self-Inflected Wounds, 18 May 1917). The laying of blame could reach levels of absurd mistrust,

with soldiers who suffered from wounds in the left hand or foot often viewed as malingerers throughout their treatment, and forced repeatedly to justify their own wounds to prying medical personnel and investigating military authorities. One medical officer recounted how "the breaking of a dental plate was always regarded as a highly suspicious case," and soldiers learned to protect themselves by seeking out a NCO or officer to write them letters of support that stipulated that they had not deliberately injured themselves (T.B. Smith papers, "Clearing: the Tale of the 1st Canadian Casualty Clearing Station, British Expeditionary Force, 1914-1919," 89). By the end of the war, the CAMC had recorded 729 cases of SIW, although probably there were many more that were not detected or recorded as wounded under other categories (74/672/-II-57a, Self-Inflicted Injuries, 11; Ekins, 2010, 46-50).

In the 1922 *Report of the Committee of Enquiry into Shell Shock*, malingering and shell shock were often conflated, seen in many cases as the former feeding the latter, or with the "dividing line between malingering and functional neurosis …a very fine one" (Great Britain, 1922, 140-1). Shell shock was difficult to identify and harder to treat. It was initially diagnosed as a physical wound caused by the concussive effects of shell blasts that caused microscopic lesions in the brain. It was, therefore, categorized as a physical wound. By 1915, however, shell shock began to manifest itself increasingly in soldiers who were never within range of the guns. Although there remained contested ideas over what shell shock was, as the war progressed and as the number of cases rose, it was necessary to come to grips with the injury. By the summer of 1917, there were cases of brain injuries from concussion, but more attention was devoted to mental exhaustion and sleep deprivation (Humphries, 2010, 503-531). The psychological strain of combat, prolonged fear, and likelihood of maiming or death manifested itself in physical ailments. Afflicted soldiers were unable to sleep or relax, they suffered pounding headaches and symptoms of blindness, mutism and paralysis of limbs. While many cases of shell shock were never reported, it is estimated that there were roughly 15,000 cases in the Canadian forces alone (Cook, 2008, 243).

The medical officer was in the best position to arbitrate and negotiate this challenging illness, as they often knew the men intimately, and had identified many of the chronic malingerers. However, it was not easy to fake shell shock. Lawrence Rogers wrote home to his wife: "real shell shock is a horrible thing if you ever saw a man suffering from it I don't think you would ever forget it[,] but then there is the fellow who comes in and says he is shell shocked we kick those kinds out and send them back

up the line" (Lawrence Rogers letter, 20 June 1917). While much of the literature of the time suggested that those afflicted with shell shock were predisposed because of character flaws and mental illness, Canadian medical officer, Captain Harold McGill, believed that the victims of shell shock were often

> men of finest moral courage ... The man's whole physical nature revolted from the sights and sounds of a bombardment … All the man's natural physical impulses prompted him to take shelter, and to run away if necessary. On the other hand his spiritual courage, his faith to his duty and his discipline forced him to remain. The result was a conflict under which the nervous system collapsed and the soldier became a gibbering maniac" (Norris (ed.), 2007, 172).

The high command was less sympathetic. One Reserve Army [later Fifth Army] order of September 1916 accused that "It has come to notice that there have been a certain number of cases of officers who have failed to do their duty in the face of the enemy." The medical officer and commanding officer's recommendations that the officers "be sent home on medical grounds as suffering from nervous breakdown" was not acceptable.

> It must be clearly understood that failure to carry out their duty by either Officers or men can only be excused on medical grounds when there is physical incapacity. It had been noticed, however, that many officers have been excused who apparently could walk, run and eat well. Under such conditions any failure to control their nerves amounts to cowardice, pure and simple. This fact must be recognized by all Commanding Officers and Medical officers (Reserve Army, HQ, to all forces, A/668/60, 7 September 1916).

Men should be brought to trial for cowardice. "In some cases officer have been sent home on medical grounds who, if they had been privates, would have most probably have suffered the death penalty" (1st Division to all units, A-25-91, 8 November 1916). The sympathetic practice of relieving officers from the strain had to be stopped for fear, it appears, of treating the men too leniently. Medical officers still had options of ordering shell-shocked men away from the front, and this usually involved sending them to rest stations behind the lines that were operated by the field ambulances (Colonel H.A. Chisholm, ADMS, 4th Div, to DAAG, 4th Div, 12 May 1917; Harrison, 2010, 117).

The medical officer was the gatekeeper for shell shock, as one contemporary medical journal made clear.

> There is a story of one of the clearing stations in France where the medical officer in charge said: 'Hello, here are twenty cases of shell shock from the ____ regiment. We have not had any shell shock from that regiment for six or eight months. I wonder if they have changed medical officers.' On inquiring he found that the medical officer who had been in charge was away on furlough and that after a strange officer came on duty there immediately developed twenty case of neuroses" (Ames, 1918, 1020).

This anecdote suggests shell shock was little more than malingering. It was not, but it was considered that a good medical officer could monitor the men and ensure that early intervention saved those in danger of a breakdown. Medical officers like Captain G.S. Strathy offered this rather humane approach in dealing with the crisis:

> Where a man reports that his nerves are gone I never allow him to leave the line until the tour is finished, on account of the other men. I speak to the Company commander, and if his record is good he is kept on some easy duty, such as gas guard in the dugout. Then when we leave the line he is given work at the Base or transferred to the Divisional employment company, or some work well behind the fire zone" (Major G.S. Strathy diary, Addendum, "Malingering or Scrimshanking, and Self-Inflicted Wounds).

Strathy was trying to negotiate his own desire to see worn out men removed from the line, while also ensuring that regiment-wide morale was not eroded. But it was never an easy diagnosis, especially with so many men at the front suffering from exhaustion. One British medical officer agonized that if he sent a man back into the line who endangered himself or his comrades, was he doing his duty to either the army or the patient?; equally troubling, "if they were killed were they or I to blame" (Moran, 1968, 169-70)?

The reputation of fighting units was made in the fire of battle, but formations that suffered from high rates of trench foot, malingering, SIW, or shell shock were viewed as suspect in morale and discipline. While most regimental medical officer were adept at caring for the wounded, training their stretcher bearers, and advising on sanitary matters – all crucial in controlling the wastage rates through injury and disease – they were also charged with policing the rank and file of the battalion. This was no easy task, and such actions did not sit easily for some men of medicine. But sympathy brought its own problems and many medical officers deemed gullible were often taken advantage of by malingerers. Even the perception of this accusation was devastating and most medical officers were encouraged to be hard and inflexible in their assessments of the sick.

Captain G.M. Davis, medical officer of the 5th Canadian Infantry Battalion in 1915, was nearly sent to a rearward hospital because his commanding officer felt he was "more of a professional M.O. than a military M.O. (Captain G.M. Davis papers, diary, 1.7.15)." Davis was not removed, but he was forced to learn the difference between civilian and military medical care.

During the course of the war, some 30 medical officers were killed, 31 died of disease, and 99 were wounded (Macphail, 1925, 250). Most of the killed and wounded were among the regimental medical officers, except for those killed or wounded in two high profile bombings of hospitals in early 1918 and the 27 June 1918 sinking of the hospital ship, *Llandovery Castle*. The regimental medical officer sought to offer care and compassion to his physically wounded charges, and by most accounts he succeeded. However, the medical officer served two masters and there was a tension between being a healer and an enforcer. The soldiers were also forced to negotiate their interaction with the medical officer, and some were dismayed when their healer turned on them, Jekyll to Hyde, denying them their own illness, offering panaceas as medicine, and leaving them to suffer in the mud and misery of the front. This was a war of difficult choices, and few were as challenging as that which the regimental medical officer confronted in his desire to heal while also enforce discipline.

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CHAPTER THREE

STARTING FROM SCRATCH: THE DEVELOPMENT OF MILITARY MEDICAL CARE IN GERMAN EAST AFRICA DURING WORLD WAR 1

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Introduction

It was a flawed campaign in an Area of Operation (AO) where "geographical factors led the dance while strategy and tactics acted like docile partners" (Pradhan 1991,151). Its history, particularly for medical care, remains a curiosity rather than a subject for elaborate analyses. The four volumes of the British Medical Services' History dealing with military medical operations devoted only eighty-eight pages to the German East African sideshow. With its distinctive style the History offered an accurate but understated description of the operations in 1915 (Macpherson and Mitchell 1924, 422):

> *"During this summer campaign, the East African force suffered from flies and other tropical pests and had to be continually on their guard against lions, hippopotami, and other wild beasts."*

Despite academic reluctance there are lessons to be learned from a campaign that required medical personnel to watch out for tropical pests and hippopotami.

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The Protectorate of German East Africa was proclaimed by the German Government in February, 1885. Its boundaries were established

by the Heligoland-Zanzibar Treaty in 1890 but not surveyed until 1910. It was over 384,000 square miles in area, about three times the area of Germany. The Protectorate was bounded on the north by British East Africa and Uganda; the border split Victoria Nyanza. On the west, it faced the Belgian Congo and the long thin course of Lake Tanganyika. Northern Rhodesia, Nyasaland, and Lake Nyasa were on the southwest. Directly south was Portuguese East Africa. Its coast on the Indian Ocean was 780 miles long with the ports of Tanga, Dar-es-Salaam, Kilwa, and Lindi. The island of Zanzibar between Tanga and Dar-es-Salaam was under British control. One hundred miles south of Zanzibar the island of Mafia was under German control.

The geography was forbidding. The coast was hot and humid all the time. The interior was a plateau 3,000-4,000 feet above sea level with temperatures that varied from extreme cold at night to blistering heat during the day. The Usambara and Pare Mountains and Mt. Kilimanjaro were on the northeast border and provided some relief from the heat while the Nguru, Uluguru, and Mtumbi mountains in the central region were near the coast and surrounded by jungle. To the southwest, highlands and mountains lay at the southern edge of Lake Tanganyika and south around Lake Nyaza. Large regions of dense bush, waterless plains and numerous rivers and deltas offered harsh passage for military operations. There were no reliable maps of the interior.

Figure 3.1 Taken from Macpherson and Mitchell 1924, 417

Over seven and one-half million Natives lived in the Protectorate along with fourteen thousand Indians and Arabs and four thousand Europeans. There was only one short metaled road; most dirt roads were dusty and cracked in the summer or muddy and impassable during the rains from December through April. Telegraph lines connecting the two large coastal cities, Dar-es-Salaam and Tanga, to inland towns were easily disrupted and there were only two German wireless installations at Dar-es-Salaam kwanza and Bukoba on Victoria Nyanza. The Usambara (Northern) Railway ran from Tanga to New Moshi near Mt. Kilimanjaro for 220 miles. The Central Railway, completed in 1914, ran 780 miles from Dar-es-Salaam on the coast to Kigoma on Lake Tanganyika. A third line in British East Africa, the Kenya-Uganda Railway, ran from Mombasa parallel to its southern border and then northwest for 580 miles to Kisumu and Kampala around the northern shore of Victoria Nyanza.

Despite the geography and limited infrastructure, German East Africa held several attractions. There were stunningly beautiful areas, with large fertile regions and several deep water ports. Although the Protectorate never paid its own way, sisal, rubber, banana, and cotton plantations showed potential for economic growth. The Congo Basin treaties in 1885 established Free Trade Zones among the Protectorates with provisions for neutrality in the event of a European War. Coinciding with the completion of the Central Railway an international agricultural exhibition in Dar-es-Salaam was scheduled to open in July 1914. (Gardner 1963, 5-16; Miller 1974, 24-28; Macpherson and Mitchell 1924, 416-417; Killingray 2010, 113-115).

Pre-war medical services focused on European settlers and government personnel. In British East Africa, the small medical departments in Kenya and Uganda merged in 1903, but still suffered from financial constraints By 1912, there were forty-nine European doctors in the entire Protectorate. The German East African government organized its system around a heavy-handed military presence left over from the Hehe and Maji Maji rebellions. The system grew to twelve hospitals in large towns and three hospitals at Tanga and Dar-es-Salaam. Just outside of Tanga the Amani Institute had facilities for bacteriological research and lymph manufacturing with a program for native vaccination. By 1914, there were forty-three medical officers (MOs), eleven civilian physicians, and sixty-four Non-Commissioned Officers in service (Beck 1970, 7-57; Iliffe 1998, 7-33).

East Africa was changing at its own pace. Given its geographical isolation, large native population, legal obligations, and potential for economic expansion Governors Dr. Heinrich Schnee in German East

Africa and Sir Henry Belfield in British East Africa wanted little to do with military events in Europe during the summer of 1914.

1914-1915

The organization of the opposing forces and their medical services followed very different paths. Lieutenant-Colonel Paul Emil von Lettow-Vorbeck was 44 years old and a veteran of the Boxer rebellion in China and Herero revolt in German South-West Africa. After suffering the loss of sight in his left eye in combat, he returned to Germany. In October 1913, he was given command of the *Schutztruppe* in Kamerun, but the command transferred to German East Africa in April 1914. He was an experienced African hand with great respect for askaris but a strict, sometimes harsh disciplinarian (Miller 1974, 37-39; Farwell 1986, 105-107).

His original force was composed of 260 European officers and 4,700 askaris with 63 MOs from the Government medical service, 5 veterinary officers, nurses from the German Red Cross Society, and the Chief Medical Officer (C.M.O.), Dr. Hugo Meixner (Farwell 1986, 109-110; Macpherson and Mitchell 1924, 417-418). At peak strength the German force had approximately 3,000 Europeans and 12,000 askaris organized in companies of 162 men and 322 porters. On the march, each column had a Field Hospital (FH) with at least one MO and several askaris trained as medical orderlies; the Lines of Communications (LsOC) changed frequently without fixed establishments. Government hospitals and laboratories in larger towns along the Usambara and Central Railways served as base facilities (Macpherson and Mitchell 1924, 419; Clyde 1962, 75).

Lettow-Vorbeck listened to his MOs carefully particularly Dr. Max Taute who studied at Tübingen and the Kaiser Wilhelm Military Academy. Taute had been researching sleeping sickness in Nyasaland when he joined Lettow-Vorbeck. He would be one of the last MOs to surrender with the *Schutztruppe* in 1918. The German Medical Standing Orders indicated a comprehensive approach to field medical care in East Africa (Clyde 1962, 50):

1. Troops had to be tented on fresh ground.
2. Mosquito nets had to be used by all troops.
3. Askaris' and porters' lines had to be separated to avoid spread of dysentery.
4. Washing facilities and latrines had to be separated from camps.

5. Dead animals had to be buried without delay.
6. Sleeping quarters had to be placed away from trees that dripped irritant sap. (Later, beds were constructed above ground to avoid pests.)
7. Water had to be filtered or boiled when possible.

Malaria discipline was strict and Meixner demanded smallpox vaccinations for all troops and porters.

Medical supplies were always a problem but the staff learned to improvise on the run. Cinchona planters were urged to increase production and send the bark to a government chemist at Amani. Friendly planters or natives offered whiskey, tobacco, rubber, tanned leather and cotton. Homemade string or rope came from sisal; elephant or hippopotamus fat made acceptable ointments (Taute 1939). Additional matériel was stored in caches around the Protectorate.

To their credit the German medical services took full advantage of whatever pre-war strength and expertise they had. A small, cohesive, and disciplined force, rapid militarization of experienced medical care, interior LsOC, flexible tactics, and a uniform strategy made their tasks easier in an extraordinarily difficult AO. There was one unique advantage that Lettow-Vorbeck used throughout the campaign but especially near the end when supplies were low and sickness and desertion cut into the *Schutztruppe*. He could abandon his casualties, sick porters and their families, and POWs to a compassionate enemy. At Nambindinga and Massassi he left almost 800 personnel; at Kwiri he left a disgruntled Meixner to care for casualties and avoid elephants until General Van Deventer arrived. While he bemoaned these losses his force ended up healthier and just as effective (Clyde 1962, 95-98).

The lack of a coordinate plan was evident in the precipitous growth of the East Africa Force (EAF). On September 1, l914, there were 1,200 troops in British East Africa, Nyasaland, and Northern Rhodesia consisting of the King's African Rifles (KAR) and local police. During that month Indian Expeditionary Force "C", under the command of Brigadier-General James M. Stewart, disembarked near Mombasa with 2,227 British and Indian all ranks. On November 2, Indian Expeditionary Force "B" landed at Tanga with 7,927 troops under the command of Major-General (temp.) Arthur E. Aitken. The original strategy was deceptively simple. Aitken was to bring the "whole of German East Africa under British authority". He would protect British East Africa by occupying the port of Tanga and its "hinterland" while Force "C" would advance to Tsavo and Moshi. After controlling the northeast area, he

should consider the capture of the Central Railway from Dar-es-Salaam to Tabora (Pradhan 1991, 59). Aitken started badly and following the disasters at Tanga and Jasin Major-General Michael J. Tighe assumed command in April, l915. The EAF now had Indian and British Infantry, Indian Calvary, Imperial service troops, Royal Engineers, innumerable volunteer regiments, and increasing numbers of porters. The medical services consisted of the Royal Army Medical Corps (R.A.M.C.), the Indian Medical Service (I.M.S.), the Protectorate's services, and local regimental physicians and hospital facilities (Macpherson and Mitchell 1924, 419-422). These disparate elements required some time to consolidate.

Up until late 1914, medical care was provided through ad hoc arrangements for transport and hospitalization. Following amalgamation of the Indian Forces in December, the General Staff organized a plan based on arrangements in the British Army Medical Service (A.M.S.). A temporary Deputy Director of Medical Services (D.D.M.S.) was appointed over all medical care. Lieutenant-Colonel A. D. Milne, former Principal Medical Officer of Kenya, become P.M.O. for all the Protectorate Forces. Two Senior Medical Officers (S.M.Os.) were appointed for the Nairobi and Mombasa areas and two Deputy Assistant Directors of Medical Services (D.A.Ds.M.S.) were appointed for Mobilization and Sanitation. Everyone reported to the D.D.M.S. who reported to General Headquarters. A separate administration was established in Uganda with its own Assistant Director of Medical Services (A.D.M.S.)

This jerry-rigged plan was sufficient during the next year when most of the military operations centered on the Kenya-Uganda Railway. Multiple, small German attacks or raids threatened the railway and kept the EAF on edge but LsOC were short and casualties transported to railheads or advanced bases under the authority of the S.M.O. From there the D.D.M.S. took over. Nairobi became the largest base with three military hospitals, three private convalescent homes, and sanitary and X-ray sections. A hospital train started a run to Mombasa and Kilindini Harbor. A separate Ugandan medical service covered operations around Victoria Nyanza during the capture of Bukoba and destruction of the German wireless station.

In January 1915, the fighting around Jasin on the coast alarmed both the EAF's medical services and Colonel Lettow-Vorbeck. Columns of troops had spread out from the Kenya-Uganda Railway to counter the *Schutztruppe*; their size and locations varied considerably. During the war a British Field Ambulance (FA) was designed to split into three (or more) sections. Each section had provisions for fifty casualties with sixty

stretcher-bearers, one or two MOs, and wheeled transport; one of these sections accompanied each column. However, the various medical units along a LOC from the FA to the bases required coordinated arrangements for personnel, matériel and transport; these were incomplete at the time. Following Jasin the British had to pull back from the Umba Valley. There was too much sickness with too long a LOC. Lettow-Vorbeck.(1987, 64) also learned a lesson from his pyrrhic victory at Jasin and modified his strategy:

> *"Although the attack carried out at Jassini with nine companies had been completely successful, it showed that such heavy losses as we also had suffered could only be borne in exceptional cases….The expenditure of 200,000 rounds also proved that with the means at my disposal I could at the most fight three more actions of this nature. The need to strike great blows quite exceptionally and to restrict myself principally to guerrilla warfare, was evidently imperative."*

One month after Jasin, the Royal Navy began a blockade of the coast. From now on he had no medical reinforcements or dependable supply sources.

Several novel medical units responded to the needs of the EAF. The prescient Milne organized an African Bearer Corps with over 1,000 native personnel who were trained as stretcher bearers. Major C.P. Wiggins organized the Uganda Stretcher Bearer Company that developed into the Uganda Native Medical Corps (UNMC) commanded by G. J. Keane. Over 150 personnel from Church Missionary Society's Mengo High School and the Government Medical Training Center at Kampala served as stretcher bearers or hospital aides. Although the UNMC disbanded following the capture of Bukoba, it gave valuable service and served as a nucleus for a larger organization later in the war (Beck 1970,68-69; Iliffe 1998, 35; Keane and Tomblings 1920; Moyd 1996, 102).

Inexperienced MOs had to adjust to unusual conditions. Captain Frances B. Young, who trained at Birmingham, joined the R.A.M.C. and found himself in East Africa attached to the Indian section of a combined FA (Young 1917, 81-82):

> *"Henceforward, I had to do with a number of African stretcher-bearers, Indian ward-orderlies, babu sub-assistant surgeons, Cape-boy muleteers, and a Boer conductor of transport. Nor could anything had been more different from the European conception of a Field Ambulance, either in its constitution or its duties, for in time of action it might represent anything from a regimental aid-post to a casualty clearing station or even take on the functions of a stationary hospital. The African stretcher-bearers, fifty*

of them, were untrained, and ready to disappear into the bush on the approach of danger."

Simple problems become disabling; freak accidents could kill. The East African Mounted Rifles developed veldt sores that failed to heal. While on patrol, German Staff-Surgeon Neubert was stomped to death by an elephant. Mr. Hannigan, a veterinarian turned coffee planter, amputated the hand of a German trooper whose lacerated finger was infected. The soldier survived and Father Wall was kind enough to bury the Protestant hand in a Catholic cemetery near Victoria Nyanza (Clyde 1962, 59-62; Wilson c.1938).

Two problems surfaced during 1915. First, the R.A.M.C. now had to provide medical care for over 18,000 followers. Secondly, according to one MO the extent of the disease was "alarming". Compared to the Western Front the 690 battle casualties for 1914-1915, was mercifully light but 250 all ranks and 1,709 followers were non-battle fatalities. Most of these occurred in 1915 (Mitchell and Smith 1931, Table 1, 253; Macpherson and Mitchell 1924, 504).

1916

In January 1916 the recently appointed Director of Medical Services (D.M.S.) and acting Surgeon-General, 54 year old Colonel George Douglas Hunter, C.B., C.M.G., D.S.O., R.A.M.C. arrived in East Africa. He served in the Sudan campaign and he was twice appointed P.M.O. of the Egyptian Army. Hunter was an experienced administrator and while not familiar with East Africa he had dealt with the effects of tropical disease on troops. He landed on his feet and immediately requested additional personnel and supplies while he started to clear sick casualties from the advanced hospitals to the General Hospitals at Nairobi and Voi. New troops received a pamphlet titled "How to Keep Fit in the African Tropics" that was issued by the Army Medical Department. Along with sleeping sickness and malaria, the troops were warned about insects. If they had "itchy" feet an experienced native with a clean needle could remove the "jigga". NCI powder (naphthalene, creosote and iodoform) prevented lice; petroleum and soap emulsion stopped bed bugs (BMJ January 15, 1916; BMJ January 22, 1916).

On February 9, Lieutenant-General(later Field Marshal) Jan Christian Smuts was appointed Commander-in-Chief (C.in C.) of the combined East Africa Expeditionary Force (EAEF). He arrived on February 19, just in time to digest the defeat at Salaita. Six weeks later he had an additional 18,700 South African troops. Smuts was the second choice for command.

General Sir Horace Smith-Dorrien who was stellenboshed, many said unfairly, from the Western Front was appointed originally, but he contracted a severe case of pneumonia and returned to England. Smuts trained as a lawyer and built his military reputation fighting the British during the 2nd Boer War and the Germans in South-West Africa earlier in World War 1. He was recognized as an aggressive commander who demanded a great deal from his troops. He was also politically astute and ambitious, the youngest Lieutenant-General in the British Army. He knew what the Union and Whitehall wanted- a rapid solution to this sideshow. His South Africans would adjust to the bush, the Union could take credit and a portion of Portuguese East Africa for its troubles (Nasson 2007).

General Smuts' plan was simple and in line with earlier strategy. He would occupy territory by pushing Lettow-Vorbeck through the neck of the bottle at Taveta Gap, the traders' ancient gateway to Masailand, southeast of Kilimanjaro (Miller 1987, 110). After dividing his larger force, he would out-maneuver and envelope the *Schutztruppe* and deny any potential retreat south or east along the Usambara Railway. Lettow-Vorbeck would be forced to surrender or meet Smuts head on, although this latter outcome was unlikely. There were several peripheral operations throughout East Africa that included the occupation of Uganda around Victoria Nyanza, the occupation of the western boundaries by the Belgians, and the Royal Navy's actions south along the coast to Dar-es-Salaam. The medical services' arrangements for these operations will not be described in detail.

Lettow-Vorbeck was still at the top of his game, but he knew full well that the EAEF was increasing strength. The *Schutztruppe* might dwindle later on, but he could still recruit askaris and porters from the northeast and his food and supplies remained sufficient. Medical support was located along the Usambara Railway with five FHs around the Taveta Gap, Arusha, Vugiri and Koragwe, an infectious disease hospital at Mombo and scattered small depots of medical stores. Close to the Central Railway, he had two base hospitals at Npwapwa and Morogoro while Germans still controlled facilities at Tanga and Dar-es-Salaam (Lettow-Vorbeck 1987, 63; Clyde 1962, 76).

The EAEF organized into two Divisions although the effective strength was, at best, 17,000 rifles. As Smuts advanced along the Voi-Moshi military train line to Salaita and Taveta Hunter organized the first coordinated scheme for evacuation. Four split FAs were sent with the 2nd Division along the Taveta Gap and two to the 1st Division, marching southeast from Longido. Using the other sections, two combined Clearing Hospitals (CHs) were established, one at Baktau east of Mbuyuni and one

at West Longido. A South African General Hospital was broken up into one section at Kedongal that received all casualties; another CH at Maktau evacuated to Voi and then Nairobi. The military operations were partially successful, but they failed to prevent Lettow-Vorbeck from withdrawing in good order along the Usambara Railway. The EAEF's FAs moved forward to New Moshi and Kahe, as did the CH at Maktau.

Not unexpectedly, the medical arrangements broke down. Lettow-Vorbeck was shortening his LsOC and retreating to the strength of his medical services. The EAEF was lengthening their LsOC. Originally, the 1st Division's evacuation was forty miles long; now it was seventy-five miles. The 2nd Division's LOC added twenty miles through the bush. The 1st Division had to use various transports to evacuate to aid stations that in turn evacuated to Longido with motor ambulances. Just as in the first nineteen months of the campaign, the 2nd Division officers took matters into their own hands and backhauled casualties working from the front to Kahe and then to the new railhead at Voi.

The EAEF gradually strengthened as it pushed Lettow-Vorbeck along the Usambara Railway and Pangani River. The average ration strength for 1916 doubled to 98,000, but 41 percent were followers (Mitchell and Smith 1931, Table 1, 253). In March, the force in the northeast was reorganized into three divisions. The 2nd Division was under the command of Major-General Louis J. Van Deventer, a former General in the 2nd Boer War and a stubborn but capable leader. The Division was made up of South African mounted and infantry brigades with an A.D.M.S. and two FAs. The 3rd Division was under the command of Major-General Coenraad Brits, another good Boer General and known as a "convivial" officer. Brits' force had similar arrangements. The 1st Division under Major-General Arthur R. Hoskins had two East African Brigades, with an A.D.M.S. and several split sections of two FAs. Hoskins was a regular British army officer who had served in the Sudan, 2nd Boer War and as Inspector-General of the KAR. By the end of the rainy season the EAEF controlled the Usambara Railway. Evacuation proceeded along the railway to medical units scattered around New Moshi and Voi and then on to Nairobi. Sickness was on the increase but arrangements were under control.

In German East Africa the railways were the spines of the LsOC. They went east to west. Territory between the railways from north to south was bush, waterless plains, rivers, black cotton soil and things that bite. For all practical purposes, columns that moved north to south were not mutually supportable. Van Deventer left the Usambara Railway before the rains and headed south to Dodoma that was located on the Central Railway about

200 miles away. The march to Kondoa-Iringi, halfway to Dodoma, was covered by a FA section and a CH at Aruscha under the control of the divisional A.D.M.S.

The rains arrived. The incidence of sickness soared, communications were poor, the A.D.M.S. was isolated and sanitary discipline was negligible. The 250 beds of the Division overflowed, as the sick could not evacuate to Kahe. By the end of May, the 2nd Division was down to 3,000 effective rifles. All the FAs were now hospitals without supplies. As the rains stopped and the ground hardened, Van Deventer had to send all the sick back before he marched to Dodoma and then east on the Central Railway to Kilossa. The LOC was almost 300 miles long by the time the A.D.M.S. controlled all the FAs.

The 1st and 3rd Divisions with Smuts in command did not leave until the rains stopped. It was over 200 miles from New Moshi to Morogoro that was located along the Central Railway, and if anything, the AO was more difficult. The 1st Division split into four columns so the newly appointed A.D.M.S. Eastern LOC had to continuously rearrange the split FAs as the columns changed locations. The 3rd Division stayed intact. Leaving the relatively comfortable northeast, the force marched through a notorious fly belt and tick infested region to Handeni. Medical organization started to break down. One CH mistakenly evacuated forward which resulted in exhausted casualties trapped in overcrowded FAs. As Lettow-Vorbeck left Morogoro and continued south he abandoned several hundred casualties. When the EAEF occupied the town medical services had to scramble for beds. (Macpherson and Mitchell 1924, 428-459).

Dr. Young described an incident near Handeni that foreshadowed another significant problem for the medical services (Clyde 1962, 67):

> *"I doubt that even such a thruster as Smuts could have got more out of the men, who thankfully rested there, or the beasts who now began to die in great numbers. At first, we made a pyre on which they were consumed; but our sweepers were lazy with their fuel, and the heaps of charred flesh became, in the end, so noisome that we had carcasses dragged into the bush, a mile or more from the camp, to be dealt with by the hyenas and the vultures."*

From June to September approximately 33,000 animals died or had to be killed. The region was jungle, known for tsetse flies that infected pack animals with a parasitic protozoan called *Trypanosoma*. "Fly belts" were everywhere in East Africa, but particularly lethal in this region. There was no cure, although arsenic or tartar emetic would keep the beasts going a little longer. Since there was no veterinary solution and the force could not replace animals quickly enough, the EAEF turned to the ancient and less

efficient means for transport– human porters. (Macpherson et al 1923, 305-315).

Dar-es-Salaam was taken on September 3rd and by the end of the year the Royal Navy controlled the entire coast. The relative stability of the LsOC along the Central Railway allowed immobile medical units to slowly advance forward. Korogwe ended up with a Stationary Hospital, a FA and two Motor Ambulance Convoys (MACs), one going south and one following the Usambara Railway. Handeni had two hospitals, a convalescent depot and a field depot of medical stores. Three hospitals and a FA worked Morogoro. There were similar arrangements headed north from Dodoma in 2nd Division's LOC.

Lettow-Vorbeck kept on moving south away from the Central Railway along the Uluguru Mountains and parallel to the coast. The evacuation schemes eventually collapsed at the front. In the southwest Brigadier-General Edward Northey's force marched north toward Iringa to cut off Lettow-Vorbeck's western detachment. This was unsuccessful and Van Deventer had to march south to relieve Iringa (Miller 1974, 217-221). The evacuation from Iringa to Dodoma became one of the most notorious of the campaign. Captain (later Colonel) Oscar Watkins a former Commissioner in East Africa and in command of the Carrier Corps (CC) described the route (Hodges 1986, 54-55):

> *"By September 1916, when they were suddenly called on for a supreme effort on short rations, the men were already debilitated and overworked. As a final torture, the rains broke early, and converted large areas into swamp, throwing still more work on the Carrier, who…on the Dodoma-Iringa Road had to carry nine miles, mostly waist-deep in water, much of it on raised duck walks made of undressed poles laid side to side….The sufferings and casualties of this period, from September 1916 to March 1917 will never be fully known."*

There were eighteen intermediate posts and one small hospital to cover evacuation of eight-six miles. If the ambulance drivers were healthy and if there were enough replacement parts and if rains did not transform the black cotton soil to muck the lucky casualty could bypass the last half of the trip in a single MAC.

The events at Handeni and on the Iringa-Dodoma line highlighted the predicaments that the medical services faced in the last half of 1916. Logistic problems of any large army on the march had always caused concern, for example Union forces during the American Civil War (Hart 1993, 231-238; Hagerman 1992, 58-63; Sherman 1984, 381-409), but the inefficiencies of human porters in East Africa were in a class of their own. In 1917 Northey's column required 9,370 lbs. of food a day. As a result

the column needed over 10,500 porters to march 150 miles assuming each porter was healthy, consumed 2-3 lbs.of food a day and carried 50 lbs. of matériel. (Hodges 1986, 146-147). Increased sickness required more porters as the positive feedback loop intensified. To reduce the cycle the convoy system for supply that had been used earlier in the campaign was replaced by a series of permanent dumps but this change required additional personnel. (Earlier in the campaign Lettow-Vorbeck's force used 8000 porters from New Moshi to Dodoma.)

Coordination at all levels was poor and hindered evacuation. The A.Ds.M.S. of each division or column controlled evacuation to the LsOC. They were unaware of the precise location of the columns, the extent of the casualties or new operations. The D.Ds.M.S., LsOC controlled the evacuation to the bases. They traveled from base to base and were frequently out of touch. The Inspector General of Communications controlled the transport. His plate was full enough and the medical services had to wait their turn. There was little or no communication between Smuts and Hunter. Hunter stayed at headquarters in Nairobi and later at Dar-es-Salaam; Smuts stayed at advanced headquarters with the 1st and 3rd Divisions. In early September Hunter, on the advice of the general staff, issued an order to keep all casualties in forward units, except those who would not recover within four days. A short time later, the general staff issued an order to clear all local units and the LsOC for unexpectedly large numbers of casualties. Two weeks later, on September 25. Smuts issued another order to evacuate all troops who suffered from "debility or malaria" from the AO. Approximately 12,000 were boarded and left by December. These precipitous orders put a severe strain on the MOs. In another incident, Brigadier-General Sir Charles Crewe promised Belgians in the Lake detachment that the Uganda Force would supply all their FAs; he neglected to tell Hunter and when the time came, Hunter could not comply with the offer. Further eroding Hunter's credibilty South African troops' morale plummeted when they learned that if they were evacuated as "temporarily unfit", they would lose their pensions (Macpherson and Mitchell 1924, 444-445; War Diary, D.M.S. East Africa, c. November, 1916).

During this period medical supplies were a critical issue. Shipments from India and England were irregular; requisitions to South Africa were delayed or incomplete. Distribution was arranged among the D.Ds.M.S., the Inspector General of Communications and Quartermaster-General The latter two departments were understaffed and overworked and in many instances they refused to modify Field Service Regulations to meet unusual operational requirements (Fendall 1921, 165-172). Fortunately the

British Red Cross Society circumvented the bureaucracy by directly supplying forward hospital units or FAs on an as needed basis and by the end of 1917 various relief agencies distributed enough matériel and comforts to meet demands. The Young Men's Christian Association brought in secretaries from India and South Africa and seven colored secretaries from the U.S. The organization assumed responsibility for canteens and eventually established thirty-three huts around the AO (*Report of the Joint War Committee* 1921; Taft 1922).

Communication and supply gradually improved but a pattern was set for the duration. With stable LsOC the medical services could move hospital care forward but Smuts was a thruster and while his indirect strategy was partially successful it did not follow a line of "least expectation". His tactics failed to use any line of "least resistance" (Hart 1991, 315). Given these conditions rations, sanitation and evacuation became chaotic at the front. When Smuts left the AO in early 1917 he came under criticism from Nationalists and his troops for lack of attention to the medical care (Gleeson 1994, 68 n.3; Nasson 2007, 107). The British Medical Services' History noted that: "It is evident that at this time [late 1916] the prevailing idea was the defeat of the enemy no matter how great the cost in wastage from sickness" (Macpherson and Mitchell 1924, 466). Statistics corroborated the assessments. The numbers for the hospitalized non-battle casualties peaked at over 10,500 during the week of December 9; these numbers fell during the next few weeks due to evacuation but they would rise again over the next two years. For the entire year, 579 troops were killed or died of wounds; 1,104 died from disease. Eight-one followers were killed or died from wounds; almost four thousand died of disease or injuries (Macpherson and Mitchell 1924, 504). When asked after the war about the high casualty rates, Brigadier-General Collyer, Smuts' Chief of Staff disingenuously explained that he and Smuts were not informed of the medical difficulties (Farwell 1986, 301).

1917-1918

The final two years of the campaign would see changes in strategy and improvements in hospitalization but continued tactical disregard for field medical care. By November 1916, Brits and the 3rd Division were gone; the EAEF reorganized into two divisions. In January, 1917, Smuts departed for London and the Imperial Defense Committee after proclaiming a victory. His announcement caused bitterness in the remaining troops, but from his standpoint he was correct. Over three-quarters of German East Africa were under Allied control, including the

Central Railway from Dar-es-Salaam to Tabora. Strategy focused on control of the rest of the Protectorate. The *Schutztruppe*, 4000-5000 rifles in strength, marched south from the Rufiji River toward farmlands around Liwale. Since the EAEF controlled the coast separate columns from the ports of Kilwa and Lindi would cut off Lettow-Vorbeck's LOC or at least trap him between the two columns. Northey's force would keep him pinned to the east. By May, the 2nd Division and many of the veterans in the 1st Division left for home; replacements arrived from India, West Africa or the West Indies (Clifford 1920; Downes 1919; Page 1987; Page 1998, 25-49). Sepoys and askaris now made up 70 percent of the troops. In the same month, the divisional structure reorganized again and Hunter began to evacuate by columns rather than by divisions.

Hoskins, the new C. in C., asked a skeptical War Office for an additional 160,000 porters, predicting wastage of 15,000 a month. Amazingly, Hoskins and then Van Deventer, who assumed command in May when Hoskins left for Mesopotamia, almost filled the requirements with the help of Colonel James Ainsworth who was a former official with the Imperial British East Africa Company and a Provincial Commissioner in Nyasaland. Ainsworth was appointed Military Commissioner of Labor to work with Watkins, now in command of the Military Labour Bureau (MLB) previously titled the CC. In early 1917 a mass levy, based on tax rolls, started for all the East Africans and natives from the German Lake Districts, Portuguese East Africa, and West Africa; the levy stopped in August. At peak strength Lieutenant-Colonel Watkins controlled almost 150,000 followers (Hodges l986, 50-59 and Appendix 2, 209-210).

Although the newly organized MLB had its own C.M.O., Major Ernest Hill, South African Medical Service, its medical care began to exert a considerable strain on Hunter's manpower. By August Watkins controlled 83 MOs or sub-assistant surgeons or almost 21 percent of all the MOs in the force. Hunter was losing 15 MOs and 105 other ranks a month. While missionaries provided some relief the EAEF was always short of personnel. Fortunately a local organization stepped in to help. The previously disbanded UNMC joined with the African Medical Corps to form the Uganda and East African Medical Corps. This was eventually called the African Native Medical Corps (ANMC). It was commanded by Major G.J. Keane who organized the original UNMC. The ANMC recruited almost fifteen hundred native personnel as hospital aides or dressers for askaris and porters. Much to the surprise of many, the Corps provided critical medical care during periods when manpower was stretched to the limit.

Medical reinforcements arrived in three split FAs and two CHs. Hunter established his headquarters at Dar-es-Salaam close to three large hospitals with 2,000 beds each – the South African General Hospital, the old Sewa Haji Hospital for askaris, and a new Carrier Corps Hospital. An additional twelve hospitals were built for the porters while two convalescent depots were organized at Morogoro and Dodoma. The hospital arrangements were more than sufficient for the forces. By October, 1917 there were 25,570 beds for an average ration strength that had doubled again to 50,702 troops and 143,959 followers (Mitchell and Smith 1931, Table 1, 253 and Table 12, 258).

In one of the more important changes, Hoskins, as the new C. in C. agreed to provide Hunter with tactical information before deployment that enabled Hunter to organize coherent schemes for evacuation. The forces dispersed into four to five columns, the column strength varied from 2-3 brigades or more and the columns could split at any time. There were four LsOC, with a fifth evacuation from Mombasa to Nairobi. Four column bases were on the coast or at railheads at Lindi, Kilwa, Rufiji, and Dodoma. Each base had almost eight hundred hospital beds with advanced depot of medical stores, casualties evacuated to Dar-es-Salaam or a convalescent depot at Morogoro. The advanced bases had another eight hundred beds each in mobile sections of FAs or CHs. These units evacuated over one hundred miles by large MACs to the column bases. FAs or aid posts accompanied the columns. Banda huts were built for small, temporary hospitals or aid stations along the LsOC. The flexible, but intricate schemes showed extraordinary aadaptability to the unique requirements of the EAEF.

Malaria interfered with wound healing but surgical care at the bases was not a significant problem (Dolbey,2007; Fyffe and Burman 1918). Consequently gradual changes in communications, supply and hospitalization should have improved conditions but nothing altered the sickness. Statistics for 1917 were the worst for the entire campaign. There were 314,571 admissions (58 percent followers) for the year with 26,786 deaths (89 percent followers). Almost 20 percent of strength was constantly in hospital (Mitchell and Smith 1931, Table 10 and 11, 257 and Table 14, 259).

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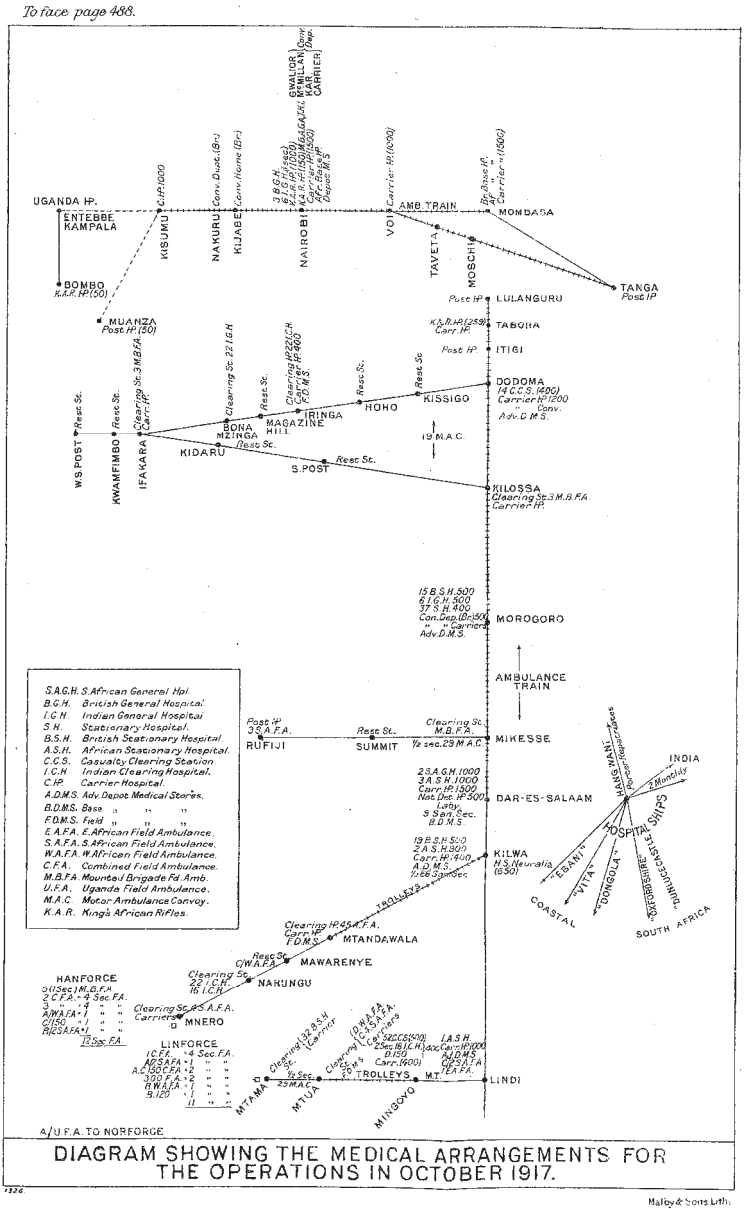

Figure 3.2 Taken from Macpherson and Mitchell 1924, opp. 478

There were plenty of reasons to be sick in East Africa. Forty percent of the Mombasa laborers had hookworm. In one FH 10 percent of the *Schutztruppe* had roundworms. Tapeworms were not uncommon, while the guinea worm borrowed under the skin and into the intestine. African tick fever, yaws, and syphilis were prevalent in all Native East African populations (Macpherson et al 1923, 329-344). "Jigger" fleas were everywhere, along with poisonous snakes, black ants, scorpions, and those bees that attacked the Loyal North Lancashire Regiment at Tanga. Fortunately lions preferred pack animals but elephants trampled camps while crocodiles attacked porters and casualties in rivers. The infections that worried R.A.M.C. personnel everywhere, such as cerebrospinal meningitis (Macphail 1925, 257-260; Kierstead 1987, 155-161; Macpherson et al 1923, 147-173), typhoid fever or smallpox were controlled and despite pre-war outbreaks of sleeping sickness, human infections were uncommon during the campaign (Macpherson et al 1923, 305-315). Plague ceased to be an issue at Dar-es-Salaam in 1917 after arranging food protection and ship fumigation. This gruesome litany of ailments and injuries, however, paled in comparison to the wastage from malaria and dysentery (Anderson 1996; Hodges 1986, 125 and Appendix 5 213; Mitchell and Smith 1931, Table 15, 260; Taute, 1939).

Excluding influenza, malaria was the most frequent, specific cause of infection throughout the entire British Army during the war. In the first months of 1917 in German East Africa, it was responsible for 60 percent of hospital admissions, with a fatality rate of 26 percent for troops and 29 percent of all admissions for followers with fatality rate of 12 percent. Over two percent of casualties went on to become invalids, with anemia, cardiac instability, confusion, peripheral nerve damage, jaundice or chronic "debility" (Mitchell and Smith 1931, Table 20, 285 and Table 27, 304). It was not an overstatement to say that almost everyone had a go with fever. If a trooper did not have *Plasmodia* when he disembarked at Dar-es-Salaam, he carried them by the time he marched into the interior.

European Colonial powers and military medicine had a long history of research and postgraduate education in tropical diseases; they were hardly tyros when coping with malaria. Moreover quinine was one of the few effective medications at that time and its value had been recognized since the sixteenth century (Anderson 1996; Porter 1997; Rocco 2003). Despite this history the nature of the ubiquitous infection overmatched any medical services' expertise. First, malaria in its early stages was a difficult diagnosis which could trap inexperienced MOs into inappropriate therapy. A blood smear in a microscope made the diagnosis- no microscope, no diagnosis and delay in effective treatment. Secondly, " blackwater fever"

was common in East Africa. Taute felt that two-thirds of the malaria deaths were due to this complication that caused destruction of the red blood cells, release of hemoglobin from the cells, the production of black urine from the hemoglobin and ultimately kidney shut down. Its complex treatment required considerable skill. To make matters worse, it was recognized early on that the all-too-frequent association of dysentery with malaria or blackwater fever, increased the mortality rate (Macpherson et al 1923, 294-303). Thirdly, malaria discipline was uneven and inaccurate. Quinine was thought to prevent malaria. Although military experience in Salonika suggested that it was ineffective it may have delayed relapses, so the British and South African troops underwent the quinine parades that were first used by their comrades in the Crimean War. (Sepoys did not have to endure the ritual.) Many troopers felt they would rather have the infection than a daily dose of the wretched quinine. The 9th South African Infantry camped with ducks that for some reason were fond of quinine. Troopers would palm the pills, drop them in the dirt, and the ducks would have their fill with no apparent distress. In a fit of scientific curiosity, Hunter attempted a clinical trial. The 57th Rifles received five or ten grains of quinine every other day. The 127th Baluchis swallowed five grains a day and ten grains on Sunday, while the cavalry received five grains a day. Nothing worked, and follow-up was impossible as the troops went out to chase the *Schutztruppe* (War Diary, D.M.S. East Africa, c. June 1917). Fourthly, malaria was not limited to the steamy coastal regions. Severe rains during the season or intermittent showers throughout East Africa left large pools or swamps of stagnant water that were ideal breeding grounds for the mosquito. It was impossible to apply malaria abatement programs to hundreds of miles of bush. Despite Hunter's initial efforts it took another eleven years just to clear Dar-es-Salaam. Lastly, line officers and local conditions discouraged malaria prevention. The regulation mosquito net with sixteen meshes to the inch changed frequently much to the chagrin of the quartermaster; troops used the nets to clean their rifles. Leggings and long sleeve shirts on the march were more trouble than they were worth. Screens on banda huts were ineffective (Macpherson, Horrocks and Beveridge 1923, 189-238; Macpherson et al, 1923, 227-293). Even with military staff cooperation these conditions presented intractable obstacles. Put in perspective General (later Field Marshal) Allenby who gave his medical services extraordinary logistical help during the Palestine campaign, saw his command crippled by malaria in the Jordan Valley in the summer of l918 (Dolev 2007).

Dysentery was a different matter but just as serious. In that bad period of early 1917, the infection resulted in 7.5 percent of 38,333 hospital

admissions for troops with a case fatality rate of 23 percent. In the followers dysentery resulted in 18 percent of 33,000 admissions and one third of all deaths (Macpherson and Mitchell 1924, 478-479). It was painful, disabling, and lethal.

As far as the military was concerned, dysentery was caused either by amoebae or something else, such as bacteria or worms. Two or more bowel movements a day, with "bloody mucous" made the clinical diagnosis although amoebic dysentery had a tendency to relapse with complications such as liver abscesses, which were usually fatal. Stool examination by microscope separated the different types of dysentery. The treatment for amoebic dysentery was specific: Emetine, an expensive and potentially toxic drug that had to be administered by injection. For all other forms of dysentery, treatment was non-specific, with intravenous hydration, opium for pain, and "putting the bowels to rest". No microscope, no specific diagnosis, so MOs followed the Central Railway Rule: North of the railway every case was something else; south of the railway every casualty had amoebic dysentery (Macpherson et al 1923, 64-116).

In German East Africa malaria was everywhere; dysentery started in the bush. The key was prevention but clean water, decent rations, and proper control of waste were very difficult to organize in the field. Around Longido, C.J. Wilson, a MO with the East African Mounted Rifles blamed the "insanitary" habits of the porters despite strict regulations (Clyde 1962, 58). Along the Pangani River, Young described the effects from marching through hot, waterless bush on presumably cooperative troops (Clyde 1962, 67):

> *"In the parched bush away from the river a patrol of South Africans found a small stream from which to drink. While most of them were on their hands and knees at the water, one wandered a dozen yards upstream to find almost hidden by overhanging grass, a dead army mule, its partly decomposed body a mass of maggots many of which were continually being washed off and carried down to the place where the men were drinking. Such was their need that this did not deter them."*

The futility of the medical services' attempts at sanitary control was dramatically highlighted in early 1917. The first order was issued by Hunter (Clyde 1962, 87):

> *"1. All drinking water MUST be boiled."*

At the same time, another order came down from Van Deventer (Clyde 1962, 87):

"As we will be in close touch with the enemy, and as secrecy of movement is of first importance, NO FIRES are to be lit."

By late 1917, Hunter organized Sanitary Sections in the ports and bases with two additional Sections, north and south of the Central Railway. However, the D.A.Ds.M.S., who were responsible for these latter areas, also had to build or repair sanitary facilities in towns and larger villages. These were frustrating tasks that involved a great deal of time and effort. Line officers were finally given responsibility for sanitation. This was partially effective, but it was easier to blame the porters who could not adjust to military hygiene. The data did not justify the assumption. For 1917, 277/1000 ration strength for troops and 185/1000 for followers were admitted to hospital for dysentery. The numbers dropped in 1918 to 80/1000 ration strength for troops and only 43/1000 for the "insanitary" followers (Mitchell and Smith 1931, Table 14, 259 and Table 15, 260).

In late summer Hunter encountered a MO's worst nightmare. On August 16, *The Manchester Guardian* published a demand for an Inquiry into the high mortality rates for native auxiliaries in East Africa compared to the mortality rates of the South African Native Labour Contingent in France (The Manchester Guardian August 16, 1917; Hodges 1986, 97). The British A.M.S. and I.M.S. were undergoing public relations disasters from the Special Commissions Act of 1916 that mandated outside investigations of the Dardanelles and Mesopotamia campaigns and they did not need any additional grief. Despite efforts to show that the comparison was unreasonable the War Office initiated an Inquiry led by Major-General William W. Pike and Lieutenant-Colonel Andrew Balfour. Pike served as D.D.M.S. in the Indian Army Corps and D.M.S. First Army in France. Balfour was a civil surgeon in the 2nd Boer War, a founder of the Wellcome Bureau of Scientific Research and an advisor in tropical disease at Salonika, Gallipoli, and Mesopotamia. Both MOs were aware of the difficulties associated with military medical care particularly in Africa. They reviewed the entire medical service with Hunter's cooperation. (War Diary, D.M.S., East Africa, October-December, 1917) and correctly identified deficiencies with appropriate recommendations. The report indirectly exonerated Hunter (Macpherson and Mitchell 1924, 503):

"They alluded to the complete dependence of the medical services on other departments of the force; if these failed them in any way, whether as regards to supplies, transport facilities, or through disregard of advice or slowness in acting upon a recommendation, then the responsibility did not rest with the Director of Medical Services."

Among several issues the Inquiry addressed the question of substandard rations. By early 1917 Watkins, Hill, and Ainsworth became increasingly alarmed by the "mealie meal" problem. One of the more common foods was a porridge ground from maze, millet, or plantain. Mealie meal from maze made up the bulk of the porters' rations. The Central Committee of Supplies that was controlled by the settlers had been unsympathetic to earlier complaints that one of every six bags of mealie meal was indigestible and "a pure waste of transport" (Hodges 1986, 119-129). The rejection of 17 percent of the mealie meal supply was too expensive and could lead to increased demands by the porters for better rations even if the gruel was linked to the rising dysentery rates.

An association between mealie meal and dysentery was not difficult to understand. It had to be cooked for about one hour to become palatable, but rations contained too much coarse and gritty maze and required much longer time. The porter on the march had to cook his own food and conditions prohibited adequate preparation so the hungry porter had to wolf down a gluttonous lump of partially cooked maze. One common theory among experienced MOs was that "lienteric" diarrhea caused by sand or dirt in the food irritated the intestinal lining and resulted in bloody mucous and an increased risk of infection. Too much lumpy mealie meal caused irritation Since dysentery was on the rise, mealie meal had to be part of the problem.

Fortunately the British and Indian Armies established different ration scales for different troops. Sepoys had taught them that lesson. Carriers, Cape Boys, Nigerian askaris, Somalis, Muslims, etc. required specific rations. By 1916, there were ten different scales; at least seven changed later. Standards had improved throughout 1917 but the Inquiry forced the issue. Mealie meal left in the open for several days started to ferment; waterproof bags were issued to stop spoilage. Hill substituted beans, but there were still difficulties, so biscuits and rice were issued with some improvement. Trained cooks and supervised kitchens at the bases provided healthier arrangements. The MLB commissioned a civilian agricultural expert, Sergeant-Major L. McAuley, as the official mealie meal taster. He promptly condemned all the coarse, yellow grain from East Africa and arranged for shipment of white grain from South Africa. Typical of any army there was always grousing about the food but as time went on, complaints diminished and the incidence of dysentery fell although the infection still remained a source of considerable wastage (Macpherson, Horrocks and Beveridge 1923, 63-67; Hodges 1986, Appendix 4, 212).

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After the affair at Mahiwa near Lindi Lettow-Vorbeck made a forced withdrawl to the south and on November 25, 1917 the *Schutztruppe* marched into Portuguese East Africa with 13 MOs, 2000 rifles and 1,600 porters. The flawed strategy of the EAEF had been successful again. The King sent congratulations and in December German East Africa became an Allied Protectorate. Lettow-Vorbeck was alone. His last large detachment led by Captain Theodor Tafel had surrendered unconditionally near Mahenge, but his strategy continued to keep a substantial Allied force occupied in the AO. For 1918 the EAEF had average ration strength of 128,656 men. Two-thirds of strength was followers; eighteen percent were askaris.

The fight at Mahiwa convinced the Allies that the *Schutztruppe* remained a dangerous presence. The Portuguese force was poorly-led and ineffective so the EAEF's strategy became one of "virtual extermination" (Macpherson and Mitchell 1924, 493; Miller 1974, 287-291). The tactics remained the same. Van Deventer followed Lettow-Vorbeck's small force into another 300,000 square miles of bush. There was no infrastructure, no gentle climate, and no easy evacuation. Brigadier-General C.P. Fendall, who became Deputy Adjutant-General and Quartermaster-General in March of 1918, described the operations: "The situation became exactly like feeling about for a needle in a bundle of hay. You only found it by pricking your finger, and when it dropped off your finger it was lost again*"* (Fendall 1992, 122). A German scout summed them up another way: "This is a funny war, we keep chasing the Portuguese and the British keep chasing us" (Miller 1974, 310).

Lines of Communications, such as they were, stretched out beyond belief. The EAEF chased Lettow-Vorbeck over 450 miles south to Namacurra and then northeast to Namirrue and west to Numarroe for another 340 miles and then north to the border of Lake Nyasa for 375 miles and finally 450 miles northwest beyond the Livingston Mountains to Northern Rhodesia. One battalion marched 1,000 miles in 97 days while a column marched 1,600 miles in five months. The EAEF established another base on the coast at Porto Amelia, but the tentacles curling north to south and then north again were still 200 to 300 miles long without any infrastructure to speak of. Moreover, Porto Amelia was no sanitary paradise and despite strong recommendations by Hunter and the A.D.M.S. Portuguese authorities failed to improve its hopeless sanitary facilities. Most casualties evacuated from there to Dar-es-Salaam. .

The evacuation system for the EAEF never altered. It just lengthened and when it did field sanitation, rations, and transport broke down again. Panforce, out of Porto Amelia consisted of two columns, Rosecol and

Kartucol, with 8,000 rifles. Northey in a third column traveled east from his base around Lake Nyasa (Miller 1974, 295-321). The usual problems occurred. Van Deventer outran his LsOC while the columns changed locations or split in size. Advanced bases and column bases were never as elaborate as German East Africa, and most of the transport was by porters or motorcars, although the latter worked only around Porto Amelia. The whole system was severely tested but later in the year, as Lettow-Vorbeck marched back to Lake Nyasa following attacks at Namacura and Namirrue, Northey's LOC offered some relief.

After thirty-three years of service, Brigadier-General Hunter retired in December 1917 soon after the Inquiry and left for England three months later. The reasons were unclear, but it could have been related to age, illness or a not so gentle nudge from the R.A.M.C. Hunter died four years later (BMJ May 6, 1922). His successor, Colonel G.W. Tate, D.S.O., carried on using the arrangements that Hunter established during his appointment. During the final year over 11, 000 men were in hospital every day; over 17,000 casualties died (Mitchell and Smith 1931, Table 10 256 and Table 11 257).

For his part Lettow-Vorbeck divided his force into smaller columns. Kudicke, former head of the medical laboratory in Dar-es-Salaam described one combined column on the march (Clyde 1962, 97):

> *"First was the fighting force, followed closely by the Governor and his escort. Then came Field Hospital 1. Then the prisoners-of-war. Then Field Hospital 2. And bringing up the rear walked the families, porters, and camp followers of the askari. My field hospital marched thus: myself and Wölfel at the head, followed by the sick and wounded walking, or on mules, or carried in litters, and then came the porters, followed by the medical orderly."*

The *Schutztruppe* was in unfamiliar territory, but as usual it lived off the land or with help from a native population that was not happy with the Portuguese. Sickness and desertion by the porters and the accumulation of POWs hindered its effectiveness, but the medical staff struggled on even as its strength diminished. Quinine was in short supply early in the year. Taute carried a supply of Peruvian bark so he boiled the bark into a soup, nicknamed "Lettow-Schnapps". It tasted as foul as quinine and judged equally effective. A raid on a Portuguese garrison finally produced enough drug to last six months. An outbreak of small pox prompted Taute and Kudicke to pass old lymph through calves for an active vaccine. Lettow-Vorbeck was blind in one eye, chronically ill with malaria and required surgery for removal of "jiggers" from his toes. Meixner, who was never happy on the march anyway left with the wounded in May. Staff Surgeon

Julius Barthal died at Zombi from a ruptured liver abscess. Kudicke was captured in September; Wölfel, a bacteriologist, was killed at Lioma. Taute investigated sleeping sickness to the very end. He used tissue stains and a microscope that Wölfel had carried in his supplies to identify a species of mosquito that was responsible for human infection (Clyde 1962, 95-98). His research was futile but a tribute to his tenacity. Two weeks after the Armistice, Generalmajor Lettow-Vorbeck and his *Schutztruppe* surrendered at discretion in Abercorn. His final medical staff consisted of four MOs, a chemist, and a veterinary officer.

The sickness continued. The Colonial Office warned of an alarming influenza epidemic in West and South Africa. Freetown lost almost half of its population in three weeks; over 500,000 perished in Nigeria. Statistics were cloudy, but at the end approximately 5 percent of the population in East Africa lost their lives to the Spanish Lady over the next several months (Jackson 2001; Taute 1939; Tompkins 1994).

Outcomes

The extent of sickness during the campaign raised eyebrows in the British A.M.S. and the I.M.S. Fingers pointed in all directions after the war. Both the Inquiry and the British Medical Services' History readily acknowledged the failures. Poor communication with the general staff, poor sanitary control, failure to properly use medical expertise, failure to rapidly acknowledge the porters' unique requirements and so forth. However, both the Inquiry and the History described many occasions where medical recommendations were ignored, and issues such as supply and personnel were beyond Hunters' control. This exculpatory recognition was unusual for the British A.M.S. during the war.

The acknowledgement was not inappropriate given the constraints the AO placed on the medical services' efforts. Lieutenant-Colonel Gordon Covell I.M.S., was at a FA in 1916 and described a patient (Clyde 1962, 72):

> *"I was very busy at Tanga, as the local Africans had no one to attend them, and of course there was plenty of sickness among our own troops although none quite as worrying as the tubercular officer, with blackwater fever who also had a liver abscess and was a chronic alcoholic. His chances did not seem too promising."*

Not too promising indeed. Many of the casualties were desperately ill with multiple medical problems and infections. If they survived the acute illnesses, what was left produced chronic illness with the demoralizing

prognosis of "debility". To add to Hunter's troubles German East Africa remained an isolated sideshow throughout the entire war. Sooner or later the other AsO, with the exception of North Russia, received at least a nod of recognition from the War Office. Smuts' triumphal announcement of victory fulfilled the War Office's expectations but concealed the medical difficulties of the campaign from public recognition until the press intervened. Despite these hurdles Hunter's accomplishments were noteworthy considering that he had to start from scratch. When he embarked in March, 1918 he left an entire medical care system including forty-five hospitals, six hospital ships, three hospital trains, five convalescent units, and four large Sanitary Sections. The almost seamless integration of the ANNC into hospital care was a critical addition to manpower (Macpherson and Mitchell 1924, 501).. After the war the experiences of the ANMC and its "Old Comrades Association" strengthened the pre-war movement for native training schools (Clyde 1962, 77-78; Iliffe 1998, 34-38).

Did the arrangements make a difference? Excluding endemic illnesses such as cerebrospinal meningitis, plague, sleeping sickness and small pox that never seriously affected manpower, the build-up of hospital care and gradual implementation of preventative measures were associated with a steep decline in the incidence of hospitalization and case fatality rates for malaria and dysentery in 1918 (Mitchell and Smith 1931, Table 14, 259 and Table 15, 260). That was good news for the medical services but German East Africa was still a nasty sideshow when compared to other AsO. The incidence of hospitalization for malaria and dysentery during 1917 and 1918 was the highest for all nine AsO listed in the British Medical Services' History. From 1916 through 1918 there was an astounding 631,159 non-battle casualties (45.1 percent followers) with a case mortality rate of 2.6 percent, the second highest rate following 2.8 percent in the Dardanelles. Nine percent of 9052 battle casualties died; this was the second highest rate for all AsO after 9.8 percent in South-West Africa and higher than the 8.6 percent rate in the 2nd Boer War. The high rate of battle fatalities may be related to increased risks from inefficient evacuation and medical comorbidity in a campaign where most wounds involved less complex gunshot injuries (Mitchell and Smith 1931, Table 5, 16).

One final problem went unrecognized until the mass levy of 1917 when it was discovered that many natives were chronically ill before they entered the service. The first survey dealing with the health of a large East African population showed that in some regions almost one-third of conscripts were rejected due to pre-existing illnesses chiefly yaws and

syphilis. (Beck 1970, 65-66; Hodges 1986, 54-55). It was little wonder that many followers broke down when subjected to the stresses of the march. Analyses of available data from two sources indicated that out of approximately one million followers, one out of twelve died in service (Hodges 1978; Hodges 1986, Table 3, 110-111; Mitchell and Smith 1931, Tables 1 and 2, 252. Table 3, 253. Table 4, 254. Table 6a, 255). Serious disease was a way of life for the men in the EAEF.

Lessons Learned

Despite reasonable explanations for poor outcomes there were still troublesome errors that undercut effective medical arrangements during the campaign. Firstly, Hunter's experience as P.M.O. for the Egyptian Army proved inadequate for the sickness in German East Africa. His failure to consult local experts or request additional R.A.M.C. expertise significantly slowed the development of medical care. The lack of microscopes early on was a simple example of a critical oversight due to inexperience in tropical medicine (Crichton-Harris 2001, 68). Secondly, communication failures substantially hindered military medical operations. Coordination among the various administrative MOs and between Hunter and the general staff was spotty at best and it took considerable time to achieve effective cooperation. If Smuts was unconcerned about sickness or unaware of conditions, Hunter should have clarified the situation early on. His own reticence exacerbated the failures. Finally, the absence of adequate field sanitation needed rapid, forceful correction. Difficult perhaps, but essential for the health of the troops and followers as well as the manpower requirements of the EAEF.

However even this last omission can be placed in perspective. How did the *Schutztruppe* fare after Lettow-Vorbeck issued the Medical Standing Orders? Taute delivered a lecture in July 1919 to the Society of Natural Science and Medicine at Tübingen. While he admitted that most records were lost, he gave a thorough description of the medical work, particularly in 1917 and 1918. It was apparent that the *Schutztruppe* was not a great deal healthier than the EAEF. Even when they had an adequate supply of quinine, malaria was epidemic (Taute 1939, 10-11):

> *"No one came through the war without a great number of attacks of malaria and even those who had remained spared throughout the previous years and had regarded themselves as immune on some ground or other had to believe in it. ...At times, in such formations as were daily*

in specially unfavorable regions, eighty per cent of our Europeans were sick."

Dysentery was "one of the diseases that cost us great sacrifice especially among askaris and porters" (Taute 1939, 14). Illnesses slowed the march. During one period on the Rovuma River, a single column, with fourteen companies and two batteries, was eighteen miles long and marched "night and day". There were eighty to one hundred hammocks carrying invalids along with a number of ambulatory sick. Taute reminded the medical services that: "Above all a microscope was necessary without which a doctor in the tropics is more or less helpless." (Taute 1939, 8). Overall his lecture indicated that even a small, cohesive, and disciplined force with experienced MOs and an organized plan for prevention could not significantly reduce the medical risks of East Africa. Although MOs had contributed their fair share to the progress of Bacteriology and Tropical Medicine in the late 19th century, the sciences had not translated to effective measures on the scale of a large military campaign in East Africa.

Events in 1918 highlighted the final and perhaps most enduring lesson. The medical services succeeded in arrangements that they directly controlled such as the organization of comprehensive hospital and sanitary systems at the bases or along stable LsOC. However they had to conform to Smuts' indirect strategy of "calculated dispersion" as well as tactics that in many instances ignored medical recommendations. As the extermination of the *Schutztruppe* became a military objective Lettow-Vorbeck continued his Fabian strategy while the EAEF continued its indirect strategy and lethal tactics as it chased him hundreds of miles through a poorly developed colony governed by an inept Allied nation. At the end both forces were decimated by sickness. By the standards of World War 1 military success might have justified the early casualties but in that final year the butcher's bill was "not worth the candle" (Hart, 1991, 334-337). Inconsistent policy, flawed indirect strategy and unresponsive tactics stunted the development of efficient military medical care. These were the lessons learned and the mixed legacies of those who "had to be on guard against lions, hippopotami and other wild beasts".

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SECTION II.

HOSPITALS

CHAPTER FOUR

ORGANIZATION, COHESION, AND WELL-TRAINED MEN: GEORGE W. CRILE, HARVEY W. CUSHING, AND U. S. BASE HOSPITALS IN EUROPE DURING WWI

JENNIFER NIEVES AND DIANNE O'MALIA

> "We look to you and Harvey Cushing with great expectations for the future of American surgery. You and he are, we think here, doing the best research work in surgery of any men today."
>
> —*Moynihan to Crile in 1903* (Crile 1947, 170)

On May 23rd, 1917, King George welcomed American nurses and physicians on the steps of Buckingham Palace saying

> It is with the utmost pleasure and satisfaction that the Queen and I welcome you here today. We greet you as the first detachment of the American Army which has landed on our shores since your great Republic resolved to join in the world struggle for the ideals of civilization. We deeply appreciate this prompt and generous response to our needs. It is characteristic of the humanity and chivalry which has ever been evinced by the American nation, that the first assistance rendered to the Allies is in connection with the profession of healing and the work of mercy. (Album de la guerre, 1919).

The story of American base hospital units has often been told from this point on, but in actuality, involvement of the US medical profession began several years before the United States entered World War I. Two American base hospital units, the Lakeside Unit out of Cleveland, Ohio under the Direction of Dr. George W. Crile, and the Harvard Unit out of Boston, Massachusetts, under the direction of Dr. Harvey Cushing comprised the first two medical units to operate on European soil. These

units, and the many to follow represent the beginning of change in the way the medical profession behaved during conflict and bolstered the relationship between the medical profession and the Army Medical Service. This is the story of the Lakeside and Harvard units and their influence on medical preparedness.

Experience with the American Ambulance in Paris

Many Americans made Paris their home during the early 20th century. As more Americans populated the city, they needed medical care and desired to be cared for by American doctors. France, the center of the medical world during the Enlightenment, continued to lead in medicine. However, the benefits of medical progress were not always made available to tourists or to resident foreigners without money. An American Hospital had been established during the Franco-Prussian War of 1870 to care for the wounded, much of the equipment used came from America, some of it left over from the Civil War. The hospital was a small facility with an American charter, and provided very limited but invaluable services for the American residents and visitors, a population which reached up to 100,000 each summer.

In 1904, several doctors from the American ex-patriot colony hoped to follow suit and established an American hospital. The Founding Act of the American Hospital in Paris was signed in 1906 and in July 1907, the president of the Board of Governors, signed a deed for a building in a suburb just outside of Paris. In March 1910, the hospital received its first patient. It also included the first dental department in France and in 1914 established a nursing school that offered a three year course to American nurses, preferably, though it was open to others provided they could write and speak English correctly. As the threat of hostilities between France and Germany became a reality, the American Hospital began preparations to accept wounded soldiers.

France declared war on Imperial Germany on August 3, 1914. That same day Dr. G. W. du Bouchet, director of the American Hospital, and the hospital executive committee held a meeting of the "Ambulance Committee." The American Ambassador to France, Myron T. Herrick, former Governor of Ohio and a resident of Cleveland attended this meeting. The committee intended to oversee the development and management of an Ambulance (the term for a French military hospital) under the auspices of the American Hospital. Initially, the committee suggested setting up tents in the garden of the American Hospital, but Herrick and the French government arranged for the Lycee Pasteur, a new

high school still under construction, to be converted to a 1600 bed military hospital. The board approved the offer and after much hard work by local tradesman, the American Ambulance of France received its first wounded on September 7th, 1914. Herrick and Francis Drake of the American Chamber of Commerce in Paris drove their own cars to the battlefields outside Paris to pick up the wounded and bring them to the hospital. When the German army advanced south towards Paris, the hospital purchased a fleet of Ford chassis and, with some clever innovation, constructed an ambulance body out of the wooden packing case in which each vehicle was shipped. This customization cost very little and accommodated two wounded men lying down and four seated.

Although the American Ambulance was fully functioning, medical staffing soon became a problem. Lakeside Hospital in Cleveland, Ohio provided the solution. Early in October 1914, George W. Crile, Chief of Surgery at Lakeside Hospital, received word from Ambassador Herrick that Francis Drake would soon visit the US to raise money for the American Ambulance. At Herrick's suggestion, Drake requested a meeting with Crile to discuss his work in shock-less surgery and nitrous oxide anesthesia. Crile, was an internationally respected surgeon, a dedicated, even driven researcher and instrumental in the establishment of the American College of Surgeons.[1] He expended enormous energy in the investigation of shock, the promotion of blood pressure monitoring during surgery and the use of nitrous oxide gas as an anesthetic, then unknown in France. Keen interest in implementing Crile's methods at the Ambulance led to a conference in Cleveland with Drake, Herrick, Crile and Dr. William E. Lower, a fellow surgeon at Lakeside. Drake asked Crile if he would consider service at the Ambulance but Crile said he would be of no use without his staff. He proposed the formation of a unit among the men at Lakeside Hospital that would take complete charge of a given number of patients. Before the end of the evening Crile had devised a plan of university service. He felt sure he could interest three other universities in taking three months service each, making a year of continuous service.

There was correspondence with Cushing at Harvard University, and with representatives at the Universities of Pennsylvania, Chicago and Johns Hopkins. All but Johns Hopkins accepted the initial challenge, due to a concern for neutrality. "Although this was primarily a good will mission to benefit a hospital in need of qualified surgeons, Crile was fully aware from the start that such training for civilian surgeons could become

[1] George W. Crile was one of four founders of the Cleveland Clinic patterned after the unit plan of organization; everyone working as unit.

fundamentally important to the United States Army at some future date" (Rutkow 2004, 681). Crile cabled a proposal to the Board of the American Hospital and quickly received a favorable reply. On November 30, Crile outlined his plan to operate a ward and an operating room at the American Ambulance in Paris in the name of Lakeside Hospital for 3 months. The Lakeside Board of Trustees approved the plan and gave leave of absence to the doctors and nurses. Trustees of the Peter Bent Brigham Hospital approved the request and Harvard had no objection as long as other funding was secured to pay the cost. Crile and Cushing frequently exchanged letters concerning the staff and equipment necessary at the Ambulance and Crile gave advice on how they could effectively organize the unit. Cushing began to have doubts about the venture and was reluctant to interrupt his work. He wrote to a colleague:

> I shall probably be able to stay only a part of the time…Of just how much use we shall be, I cannot tell. I fear not very much. I have some little apprehension in regard to the way in which the American Ambulance Hospital may be looked upon by the French surgeons. But however this may be we are coming merely with the idea of being some help to the cause of the Allies and however neutral we may presumably be, one cannot help being partisan and almost everyone here with the exception of those of German extraction is in sympathy with the cause of the Allies (Fulton 1946, 392).

Cushing, named the first Surgeon-in-Chief of the Peter Bent Brigham Hospital, and Crile were both Clevelanders and knew each other professionally and socially. The two doctors conducted research in similar areas, such as blood pressure monitoring in surgery and shock. In 1903 both men were invited deliver an address at the Boston Medical Library on the monitoring of blood pressure during surgery. Cushing, like Crile, believed that America must prepare for the eventuality of entering the war, and was aware of the need for well trained medical men in the armed forces. He began corresponding with Sir William Osler on the possibility of going to England on an unofficial basis (Fulton 1946, 388). When Crile wrote to Cushing with an invitation to serve at the American Ambulance after the Lakeside Unit had completed its 3 months rotation Cushing replied that Harvard's surgery department should be able to organize a unit. While humanity provided reason enough to serve in France, both men also recognized it as an opportunity to continue research in their respective fields. Before going to France, Crile wrote to Lakeside Board President, Samuel Mather:

> The research to be carried out is that of observing the effects of fear and exhaustion upon the human body. In my laboratory we have for many years studied the effect of fear and exhaustion in the bodies of animals, but in a peaceful community there is almost no opportunity for the study of human material. In Europe such opportunities are now abundant. They may never again be available on such a scale. The information to be gained by such a study would be of the highest scientific and practical value. It so happens that in no other place but Cleveland has this fundamental problem been so thoroughly investigated, yet our researchers still lack the materials which the Paris hospital could supply (Stanley A. Ferguson Archives, University Hospitals Case Medical Center).

Man as an "adaptable mechanism" (Crile 1915, 58) became the overall thread in Crile's research. More and more he found that phylogeny, the species experience, drives the human existence and survival. His book, *The Mechanistic View of War and Peace*, resulted from this research. Published in October 1915, this study postulates that the human soldier, or machine, is driven by a device within the brain influenced by environmental forces. In his study of brain cells, Crile found that injuries rendered upon the kinetic system[2] were identical no matter how the injury occurred; by emotion, trauma, or disease. In all cases, the life's energy was expended as a result of the injury. In order to locate the origin of this energy he established a laboratory in which he experimented with electrical conductivity, electric capacity and electric potential. His associates in this research were staff and faculty of the Case School of Applied Science and Miss Amy Rowland, his editorial secretary. Their work began with the organs and tissue of animals that had been through various levels of stimulation, depression and death. Crile observed the effects such traumas had on the electric capacity of these tissues. This research was driven by an incident Crile experienced during his term as an intern at Lakeside Hospital. William Lyndman, a young student assistant with whom Crile had worked was seriously injured in a streetcar accident. Both legs were crushed which necessitated amputation. Crile sat at the bedside and observed the impeding death, reading about and performing the recommended course of action, all to no avail. Despite the fact that his organs were sound and he had lost very little blood, Lyndman died the following morning. Crile was overwhelmed by his lack of understanding of what was happening and baffled over the inefficiency of the treatment

[2] The kinetic system is a group of organs in the body by means of which man and animals transform the potential energy contained in food into muscular action, emotion body heat; in short, it is the sytem by whose activity life is expressed. It may be compared to the motor of an automobile (Crile 1915, 11).

(Crile 1947, 29). This episode stayed with Crile throughout his life and pushed him to find the correlation between injury and the body's energy.

It the midst of this phase of Crile's research, Herrick and Drake asked him to begin plans for the medical units. Upon Crile's request, Lakeside Hospital organized a team or unit of medical and surgical personnel. In addition to Drs. Crile and Lower, Charles Stone, neurologist and residents Samuel Ledbetter Jr., Edward F. Kieger, Leroy Sherry and Lyman Huffman comprised the medical staff. The anesthetists were Agatha Hodgins and Mable Littleton. Nurses in charge of the operating room were Iva Davidson and Ruth Roberts.William Crozier, PhD was recruited for special research, while Amy Rowland acted as Record Keeper for the Unit, often interviewing patients and adding notes to their case reports. Board President Samuel Mather assumed the entire expense for supplies and transportation of the resident surgeons and nurses. Board member Howard M. Hanna made a generous contribution for research, and other board members gave gifts of money and supplies. Crile and Lower paid their own expenses.

Crile and Crozier sailed on December 28, 1914 on the *S.S. Lusitania* with supplies, while the surgical unit sailed on the *S.S. Adriatic* on December 30. By January 10, 1915 the staff was operating as they had at Lakeside Hospital. They had jurisdiction over 150 beds and worked from January through March 1915. In support of the American effort, the Ambulance received kind offers of assistance from French residents in many walks of life**: o**pera stars, actors, bankers, millionaires, all stood ready and willing to assist.

Eleven days into the Unit's term, Crile wrote

> Here on an enormous scale was a human laboratory in which I was to observe all the methods of excitation, emotion and death that I had employed during twenty years in search of the identity of the energy in protoplasm which is diminished and finally lost in death by physical injury, pain, emotional excitation, infection, hunger and thirst, loss of sleep, hemorrhage, asphyxia, the destruction of organs, anesthetics, cold, and shell concussion… No investigator would dream of subjecting animals without anesthetic to a tithe of the injuries that were inflicted in battle by normal young men upon each other (Crile 1947, 254).

Cases seen by the Unit fell within several broad categories: gunshot wounds, shrapnel and shell wounds, fractures, frostbite and trench foot. By far the largest percentage of cases treated were compound fractures of long bones and mutilating wounds of the face (Fauntleroy 1915, 68). Base hospitals at a distance from the front, such as the American Ambulance, received primarily severely wounded soldiers, who, once stable enough for

transport, required long convalescence. Injured soldiers who reached the hospital had an excellent chance of recovery. Chest wounds usually did very well. The exceptions were patients with abdominal wounds, most of whom died. Tetanus and gas gangrene were relatively rare occurrences with only four cases out of 1,200 admitted up to March 1, 1915. Although the overall mortality rate was high, those who survived recovered without lasting abnormalities. It was noted in many of the reports submitted by American Ambulance personnel that trench warfare was generating an increase in the number of facial and head wounds. One such case was documented by Dr. George B. Hayes in a September 1916 issue of *The Dental Cosmos*. Hayes was the Chief Dental Surgeon at the American Ambulance since its beginning and worked closely with the Lakeside Unit. Detailed medical records and photographs of this particular case were maintained by the Unit, probably because Dr. Lower performed the plastic surgery necessary after the dental procedures had been done. Initially, the dental department spent most of its time examining the teeth of patients to provide general dental hygiene. As these cases of "fractured jaw" as they were called, started to come in a new branch of dental surgery and dental orthopedics came into existence. Two American Ambulance nurses, not attached to the Lakeside Unit, reported in the *American Journal of Nursing* that the dental surgeons "were doing things that seem quite impossible in the way of healing and repairing shattered jaws…" (K.K. 1915, 552).

Red Letter Day

As word of the Lakeside Unit's service spread, requests to visit the American Ambulance to view Crile's techniques came from medical personnel from as far away as Japan. In response to these requests, Crile organized a special day at the American Ambulance on which the greatest minds in medicine (those not on the Front) gathered to witness the Lakeside Unit in action. On February 6, "Red Letter Day" as Crile called it, Sir Almroth Wright (discovered the typhoid vaccine), Sir Berkeley Moynihan (British surgeon), Dr. Helm (French medical writer), Théodore Tuffier (French surgeon), Alexis Carrel (French surgeon and Nobel Laureate), and Henry Dakin (English chemist) visited the American Ambulance to observe surgical procedures performed by members of the Lakeside Unit. Upon request, nurses and junior members from other services attended the operations and all were treated to a lantern slide program showing the histological changes in brains, adrenals and livers. The day long program, patterned after meetings of the American College

of Clinical Surgery, began with tours of the hospital and dental clinic, after which participants observed surgery using nitrous oxide anesthesia and laboratory demonstrations. The more than 100 attendees saw everything from neurological cases, to fractured bones, to maxillo-facial trauma. The afternoon session offered 15 minute presentations by the afore mentioned distinguished guests. That evening Crile hosted an elaborate dinner at the Ritz for 18 guests to continue discussion of the day's proceedings.

The days following the program were spent testing Moynihan and Wright's suggestion that every other case of infected wound be treated in sunlight without dressings, a method that Crile employed at Lakeside for treating burns and skin grafts. Treatment of serious infection with salt bath and the application of the Balkan splint was also tested. Before leaving the American Ambulance, Moynihan asked Crile if he could send his anesthetist to be trained by Agatha Hodgins. Later, the French sent their anesthetists to be trained. Crile commented in several writings that no portion of medicine was so neglected and so badly done as the administration of anesthetics. The number of patients damaged, either temporarily or long-term, by the faulty administration of anesthetics was tragic and preventable. He felt that the state of the post-operative patient was in direct correlation to the reaction to the anesthetic. In 1906, Crile began research to find out if nitrous oxide gave better protection to the central nervous system, tissue he believed to be of vital importance and if unprotected could result in a serious handicap (Crile 1947, 194). He found a relation between changes in the body due to trauma and the depth of anesthesia to the alterations in the ganglion cells. While operating on goiter patients at Lakeside Hospital, Crile noticed that the patients who had been given advance notice of the upcoming surgery were excited and nervous, showing increased blood pressure. In many cases very unpromising candidates for surgery. The ideal situation would be to administer anesthesia without the patient being aware, therefore, entering the surgical environment in a completely calm and non-fearful state. If a stimulus causes injury to the patient it is noci-association. A nerve block prevents the occurrence of pain, thus no noci-association. The term "anoci-association" was born. Though some criticized the term, others were fascinated by the concept. The success of nitrous-oxide as an anesthetic was visible in swift recovery of the soldiers and the praise they gave it over ether and chloroform. In fact, many patients came out of it quickly, "without after effects and a song on their lips" (Crile 1947, 208)!

On February 9, 1915, Edmund Gros, surgeon at the American Ambulance, and Crile set out for Calais where Crile was to meet Crozier and both would take the *Lusitania* back to the US. Along the way he and

Gros stopped in Dunkerque to examine hospitals along the Front. The previous day, Lower relieved Crile and took command of the Lakeside Unit, where he remained until the end of March, upon which time the Lakeside Unit returned home. Agatha Hodgins was asked to remain in Paris for a short time to teach the administration of nitrous oxide anesthesia to the staff of the American Ambulance.

The Harvard Unit

At the same time a similar hospital unit from Harvard, commanded by Harvey Cushing, was preparing to set sail from Boston Harbor on the *Canopic*. The Harvard Unit landed in Gibraltar on March 28th. Dr. Blake, his staff, and rows of doctors, nurses, and patients lining the upper terrace, and courtyard greeted the Unit enthusiastically at the American Ambulance on April 1st. Unit members included Robert Greenough, MD, surgeon and executive officer, Robert Strong, MD bacteriologist, Robert B. Osgood, MD, orthopedic surgeon, Beth Vincent, MD, assistant surgeon and Walter Boothby, MD, anesthesiologist. Elliot Cutler, MD joined the Unit as resident surgeon.[3] Immediately, cases began to come in. Perhaps not as furiously as Cushing had hoped, but they came nonetheless.

Crile had written to Cushing in January after the Lakeside Unit had completed the first month of their service. His observations and his opinion that neurological material would not be plentiful, as it would probably be treated in other hospitals are worth quoting at length**:**

> There is great cordiality toward the University representatives on the part of the management and the staff of the American Ambulance. The equipment is satisfactory, and if it is not, they will allow you to add to it. Gentile, the instrument maker in Paris, is one of the best I know, and while the instruments are not the same as our own, we have no difficulty in getting on with them.
>
> Last night we had twenty-one cases come in. The problems are more those of judgment in the handling of severe infections in bullet wounds and compound fractures. Next to that we find rather a good series of nerve injuries and a few aneurysms.
>
> Our service consists of nineteen wards with eight beds each. Each ward has a graduate nurse, an auxiliary nurse and an orderly. The auxiliary and the orderly assist in translations and act as interpreters as well. It would be valuable to have a good knowledge of French for the men in the wards for

[3] Cutler left Harvard Medical School in 1924 to become professor of surgery at Western Reserve University Medical School and director of surgery at Lakeside Hospital.

taking histories, etc, but it can be done through interpreters in practically all of the wards. The war department does not require any extended history or description of the cases - only a few questions are asked and the answers can be written in French by the house officers. I have a stenographer in my service who writes English and French, and if you like I can arrange to have a competent stenographer stay over and take service with you. I strongly advise this for your own notes and records. It will not be required so far as records for the Government are concerned.

I do not think there is any opportunity for bacteriological research that would be worth while… There is a bacteriologist attached to the hospital; he has three small research rooms which are none too large for his own use. Of course your bacteriologist could have an opportunity of working in the Pasteur Institute, but that is a considerable distance from here, and he would be quite out of touch. There are some men (including Weinberg)[4] working at the Pasteur Institute on anaerobic infections. There is very little laboratory work that needs to be done here, as we are dealing with healthy young men who are only acutely sick. The clinical laboratory work can be done by the members of the staff. There is not enough work in the laboratory department to be worth while bringing a laboratory man. There is at all events no equipment aside from that of the regular bacteriologist of the institution.

For the University Unit there has been set aside a beautiful laboratory research room, where we can do anything we like. The light is excellent, there is ample room, with sinks, etc. I am using it for physical chemical work. It is also light enough for photography. It is next to the operating room, there being a "scrub up" room between, but it is directly communicating. I hope you will have something going on here in the way of research in one way or the other - that is, some sort of physiological research; we are not equipped for chemical research at the present time, and three months is too short a time I think to undertake to have changes made; but for pathological, bacteriological or physiological work the laboratory is excellent. When I referred to the bacteriological laboratory in a previous paragraph it is not the one I have just described. The other laboratory consisting of three small rooms is in another part of the building.

The great outstanding problem of this war is infection; next comes shock - shock from overwork, loss of sleep, and injury. Among the interesting end effects are injury to the nerve trunks.

You require no nurses at all excepting those for the operating room. You will find this a beautifully run institution, good food, a fine building and a number of interesting people connected with it in one way or another.

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[4] Michel Weinberg, a Russian-born French physician and biologist, disclosed the etiology of the gas gangrene bacillus and created a vaccine while researching at the Pasteur Insititute in Paris.

> You need bring no supplies of any kind whatsoever , except such as are required for special cases – ophthalmoscopes, blood pressure apparatus, etc.
>
> I would suggest your having four men on your staff in addition to the chief. My organization as it now stands consists of myself and a resident staff a secretary, stenographer, a research worker (physical chemical); two anesthetists and two operating room nurses. Ordinarily two operating room nurses are not required, but in emergencies which may arise when there is a large volume of new work, the extra nurse will be needed; besides the extra nurse can always find work in the wards, and having two would guard against your being left alone should one be indisposed.
>
> I find that gas anesthesia is extremely useful here and adds very much to the comfort and safety of the patients, because there are so many patients requiring short anesthesia in very aseptic cases.
>
> I brought over with me at great labor 18 cylinders of nitrous-oxide – cylinders of large size, each containing 3000 gallons. I also brought over a nitrous-oxide machine; in short I have a full equipment here, just as we have at home.
>
> If you would like to use nitrous-oxid [sic] I can arrange to leave you this equipment, and the Ohio Chemical Co., at Cleveland are prepared to send cylinders as you need them, keeping you supplied. I believe it is the opinion of all of us here that this is very well worth while.
>
> It may be that you will not find this experience as interesting as I have found it, but I regard it as the most interesting thing I have ever done. I certainly would not have come for the surgical work alone; but the problems are many and beyond surgical technique… (Crile 1915, vol. 1).

Cushing's initial plan upon arriving was to find the neurological cases and record them. He commented in his diary that few of the wounded escaped from a nerve lesion of some sort. He was impressed by the number of facial wounds and the expert treatment given the men by Dr. Hayes. Cushing stayed at the Ambulance for 10 days and was able to estimate the type of equipment and personnel the US Army would need when it entered the war. He was certain this would occur and to better gauge the medical situation he toured the front with Alexis Carrel, who arranged a visit to a 1,200 bed base hospital at Compiègne. He returned to Neuilly on April 19, operated on several cranial cases, and successfully employed a magnet to remove shell fragments from the skull of a wounded soldier. The first causalities from the use of chlorine gas at Ypres, also arrived at the American Ambulance.

Cushing reported in the *Boston Medical and Surgical Journal* (May 1915) on the typical injuries encountered, the majority of which fell into one of three regions: lower extremities, upper extremities, and facial. Interestingly, the seasons had a lot to do with the difference between the

cases seen by the Lakeside Unit and those seen by Harvard. “We are a little too late to see the frost-bitten or “water-bitten” feet which a few months ago must have been overwhelmingly numerous…” (Cushing 1915, 3). During the month of April, the Unit was seeing in almost every case a growth of organisms, including gas-forming anaerobic bacilli. In May and June this was not as frequent because of the more mild, dry weather. The first chlorine gas causalties presented themselves to the American Ambulance during the battle at Ypres. Soldiers reported that “A huge, low-lying greenish cloud of smoke with a yellowish top began to roll down from the German trenches, fanned by a steady easterly wind” (Cushing 1936, 46).

Cushing returned to Boston on May 17, 1915 and the rest of the Harvard Unit completed its three month rotation, being replaced by a team from the University of Pennsylvania. The Boston-Harvard community sent a second unit to France which took control of a British Base Hospital No. 22 at Camiers from September 1915 through April 1916. Cushing wrote Crile that the time at the American Ambulance was an experience not to be missed. After the sinking of the *Lusitania*, he and others in the medical profession, such as Drs Frank Simpson and Franklin Martin, fervently advocated the necessity of medical preparedness for when America’s resources would be marshaled for the war. He joined the Army Medical Reserve Corps and Major General William C. Gorgas, U. S. Army Surgeon General, asked him if it was possible to organize a base hospital at Harvard. Cushing responded promptly and included several suggestions

> There can be no question but that we could organize here just such a unit. If you can send me the necessary data I will see that the matter is put through…There is one thing that I feel like emphasizing and that is the great desirability of having provision made for Base Hospitals devoted to special lines of work, where for example the neurological, dental, orthopedic and other special thing can be well taken care of” (Cushing 1946, 413).

Development of the Unit Plan

The experience at the American Ambulance convinced Crile that the efficient base hospital should be staffed by men and women who had worked together in civilian hospitals. In the summer of 1915, after Crile had returned to Cleveland, he delivered an informal address before the American First Aid Conference in which he advocated establishing well-organized units of men who had trained and possibly worked together. Upon hearing of Crile’s address, Gorgas, who was at that time restricted

by U. S. neutrality policy limiting the number of medical officers going to Europe as observers asked the Cleveland surgeon to provide him with an outline of an efficient base hospital unit (Jaffin 1992, 25). Crile responded immediately with a full description, from the number of surgeons necessary to the number of nurses; pathologists to stenographers; surgical instruments to dressings. Care of the patient would be the primary responsibility of the unit, while the transportation of patients, control of wards and administration would fall on the regular army service.

In cooperation with the Red Cross Cleveland Chapter, Crile prepared a plan to make US civilian hospitals available for overseas military service. In his report Crile suggested that the Red Cross organize base hospital units at 25 hospitals across the country, with the stipulation that they would pass from the jurisdiction of the Red Cross to that of the War Department should the United States enter the war.[5] He submitted a skeleton organization of a base hospital unit formed from Lakeside Hospital to Gorgas and enclosed a paper entitled "The Unit Plan of Organization of Medical Reserve Corps of the U.S.A. for Service in Base Hospitals" which he had given before the Clinical Congress of Surgeons in Boston in October. In a post script Crile added:

> It has occurred to me that the heads of surgery in the American medical colleges in good standing would form an excellent nucleus from which such reserve organizations may be built. This would on average give the best men to the service both in personal fitness and with experience in organization and of no less importance they would have connections with our best hospitals; they would have a large corps of qualified assistants and would be well distributed over the land" (Crile, 1947, 267).

It is also interesting that early in Cushing's tour at the American Ambulance, Robert Bacon, former Ambassador to France, and Sir William Osler, one of the founders of Johns Hopkins University School of Medicine, approached him with a plan to have several British Hospital Units taken over by groups of American physicians recruited from university medical schools for six-month terms. In his diary Cushing noted that he received a letter from Osler that arrangements would be made through Director-General of the Royal Army Medical Corps, Sir Alfred Keough, for Cushing to see the overseas hospital organization of the

[5] Crile served as chairman of the Cleveland Red Cross Chapter from 1909-1911. The local Cleveland chapter of the Red Cross raised the $25,000 necessary to equip a base hospital. Crile hoped that the Lakeside Unit might be designated as No. 1, but due to the delay raising funds it received the designation of US Army base hospital No. 4.

R.A.M.C., with the possibility of Harvard's supplying officers and nurses for a 1,040-bed hospital. This Cushing did in early May 1915 at General Hospital No. 13 in Boulogne. His visit fell at the time of the 2nd attack on Ypres. This hospital was overwhelmed with cases "as many in a day as the American Ambulance might get in a month" (Cushing 1936, 58). The majority were longitudinal sinus or 'gutter' wounds across the vault of the skull, a casualty common to trench warfare.

Cushing later reflected in his autobiography that "Even though the government would not permit any Army Medical Officers to go abroad to gain experience, some steps toward medical preparedness were being taken. In September 1915 General Gorgas proposed to Crile and me that we set about recruiting from the Medical Reserve Corps two surgical units similar to those we had taken to Neuilly. This plan was soon expanded into the idea of our enrolling the officers and personnel for two Army Base Hospitals to be called No. 1 and No. 2 – each with a university-medical-school background" (Cushing 1936, 79).

Medical Preparedness

President Wilson was hopeful that his policy of neutrality would avoid US involvement in the European conflict. Those who wanted the country to get involved in the war had to settle for urging Americans to become better prepared. Representatives of the major national and surgical associations; including the American Medical Association, the American Surgical Association, the Congress of American Physicians and Surgeons, the American College of Surgeons, and the Clinical Congress of Surgeons, met in Chicago in April 1916 to form a Committee on Medical Preparedness. Many notable physicians including brothers Charles and William Mayo, Surgeon General Gorgas, and the deans of several medical schools were asked to help formulate plans to ensure that the nation was ready if war was declared. Dr. Crile joined the Committee and served on the executive committee (Martin 1934, 32). This committee petitioned President Wilson to increase the medical readiness of the armed forces. The Committee spokesman Dr. John M.T. Finney of Baltimore (Johns Hopkins) wrote offering their services to make a survey of the available medical resources including a list of physicians trained in various specialties and equipment: "The medical profession… respectfully submits that thorough organization of the civilian and reserve medical resources of the country are of primary importance in the proper preparedness" (Hume 1943, 33). This Committee represented approximately 70,000 civilian physicians. The President after consulting with Secretary Baker and

Surgeon General Gorgas accepted the offer. The National Defense Act, passed in June of that year, provided a comprehensive reorganization of the Army including the Medical Department, bringing the Medical Corps, Medical Reserve Corps, Dental Corps, Nurse Corps, Veterinary Corps and the enlisted force into a single department, with The Surgeon-General as head. The act authorized seven medical officers and one dental surgeon per thousand enlisted strength of the Army. Similarly, it authorized a medical enlisted force of 5 per cent of the total enlisted force of the Army (Hume 1943, 33).

Crile sent a letter to the Board President Samuel Mather, urging the Lakeside Hospital to participate in the Red Cross initiative. Mather approved the plan subject to the majority consent. At the April Board meeting, Lakeside Hospital signed an agreement with the Red Cross to assemble and maintain medical personnel sufficient to staff a 500-bed base hospital. The Cleveland Chapter of the Red Cross issued an appeal for funds and personnel were recruited to staff the base hospital. The Red Cross was to be responsible for furnishing all the necessary equipment including furniture, linens, and surgical instruments. The summer of 1916 was spent organizing the physicians and nurses of the Lakeside Unit. By July, a muster roll was sent to Surgeon General Gorgas and Colonel Jefferson Kean of the Medical Corps U.S. Army. Colonel Kean was assigned to the Red Cross and directed the formation of 25 base hospital units in conjunction with civilian hospitals throughout the country. According to Kean

> so large and complex an organization as a base hospital cannot be improvised. Its varied and specialized personnel when brought together require time and training … A chance aggregation of doctors and nurses can no more claim to be an efficient hospital than 1000 armed men collected from the streets can be regarded as a regiment (Cunningham 1916, 395).

The Red Cross requested an experimental mobilization of a completely equipped base hospital made up of personnel from a civilian hospital to determine the practicality of the organization and equipment needs of Crile's plan. The American College of Surgeons was to meet in Philadelphia on October 26-28 and the Presbyterian Hospital Unit under the direction of Dr. George Brewer was asked to mobilize. Brewer, however, could not spare the personnel necessary to the task so Kean asked Crile if the Lakeside Unit could be available. Crile appeared before the Board of Trustees and read a telegram from Colonel Kean

> To our disappointment, Dr. Brewer writes that the Trustees of the Presbyterian Hospital are unwilling that its personnel shall go to Philadelphia. Can we get the Lakeside Hospital unit for mobilization, consisting of 15 officers, 25 nurses, 25 administrative personnel would be sufficient. Will have a detachment of 30 regular hospital corps with medical officer to reinforce personnel…. If you will undertake it, full details will follow by mail. Time very short. Telegraphic answer on general proposition requested. Earnestly hope favorable response (Lakeside 1916, 120).

Secretary of War Newton D. Baker also telephoned to see if the Unit could be ready on such short notice. Kean's office would pay all the expenses of transportation and board for the Lakeside Unit. Crile and Lakeside Superintendent Warner told the Board of Trustees that participation in the mobilization could be accomplished without detriment to the operation of the hospital. After some discussion the Board unanimously decided to approve Kean's request. Crile telegraphed Kean assuring him that the Lakeside Unit could be ready and less than three weeks later they arrived in Philadelphia.

The mobilization took place in Fairmount Park on October 28, 1916. Major Harold W. Jones commanded a detachment of 30 men from the U.S. Medical Department and supervised the construction of the camp. Eighty-five tents were erected on twelve acres and surgical equipment was brought in from the Red Cross depot in Brooklyn, New York. Admission was restricted to members of the American College of Surgeons and invited guests until 12:30 but after that the exhibition was open to the public. Mr. Elliott Wadsworth, Acting Chairman of the Red Cross Central Committee and Miss Jane A. Delano, Chairman of the Red Cross Nursing Committee represented The Red Cross at the mobilization.[6]

The Lakeside Hospital staff included 16 medical officers, 25 nurses, 5 civilian personnel, and 25 administrative personnel**.** The Medical Staff of the Lakeside Unit received commissions in the Army medical corps. A completely equipped dental surgery tent under Dr. Stephan, Director of the Dental Department, was included in the mobilization perhaps because the cases at the American Ambulance requiring dental reconstruction were so numerous that Crile saw the necessity of including a dental unit. Mock wounded and ill soldiers were treated at the hospital and full records were kept. Additional evidence of the support preparedness found at the Clinical Congress was a symposium on the subject. The meeting was held in the

[6] Miss Delano, a pioneer in nursing, was instrumental in creating the Red Cross Nursing program and served as superintendent of the Army Nurse Corps from 1909 until her resignation in 1912 to work full time for the Red Cross.

afternoon of Saturday October 28 and Colonel Kean and Dr. Crile, among others, addressed the informal meeting. Philadelphia physicians, members of the Clinical Congress, and specially invited guests interested in the Red Cross attended. In the evening a formal meeting was held with speakers discussing the observations of medical military activities in Europe.

The trial and error mobilization effectively revealed defects and disclosed unexpected needs, especially in regards to operating room equipment. Experienced medical personnel, surgeons and the Red Cross critiqued and inspected the base hospitals and recommendations were made to improve the efficiency of the base hospital. Dr. Franklin H. Martin, Director General and co-organizer of the American College of Surgeons, noted

> Dr. Crile who so promptly accepted this call to service, undoubtedly experienced mixed satisfaction. …he realized the contrast between this peaceful hospital service in a park in conservative Philadelphia and the stirring actualities of hospital service in the war zone of Europe (Martin 1934, 49).

This led to the establishment of the Committee on Standardization of Medical and Surgical Supplies and Equipment. Drs. Harvey Cushing, John Finney, Will Mayo, George Brewer and George Crile were members of the committee and went to Washington to consult with the Surgeon General on the requirements of the Base Hospitals in wartime. The committee examined the surgical instruments available at the Surgeon General office and found outdated and obsolete instruments. The committee recommended that stocks of state of the art medical supplies and instruments be assembled sufficient for at least 6 months and that it be done immediately. These suggestions resulted in an acceleration of medical preparedness for war so that when the US entered WWI, on April 6, 1917, the base hospitals were prepared and sufficiently equipped to be shipped overseas to France.

Wartime Challenges

On April 28, 1917, 22 days after the US entered the war, Dr. Crile received a telegram from General Gorgas asking if the Lakeside Unit could be ready for duty in 10 days. Crile responded “Mobilization order received: Base Hospital No. 4 is ready to move within the desired time” (Bainbridge 1919, 111). The following week was hectic and an enlistment office was opened in the Lakeside Hospital dispensary. Men from all over the City of Cleveland came to enlist. More than half the recruits came

from Western Reserve University and other colleges in Ohio, and as far away as Pennsylvania, all eager to join the first unit to go overseas. Eight days after receiving the order, 27 officers, 64 nurses and 155 enlisted men, the personnel of Base Hospital No. 4 in its entirety, mobilized. The Unit was assigned to British Expeditionary Forces No. 9 in Rouen where it arrived on May 28. Upon arrival in Rouen, the Lakeside Unit was designated as American Expeditionary Forces Base Hospital No. 4, loaned to British Expeditionary Forces General Hospital No. 9, four miles southeast of Rouen (Bainbridge 1919, 111).

Meanwhile in Boston**,** Cushing received a telegram from Surgeon General Gorgas asking when the Harvard Unit could be ready to sail for France. Cushing answered "Will get ready immediately for earliest possible sailing" (Bliss, 2005, 309). There was keen competition between Crile and Cushing for the honor of being the first to American unit to see active service in the war. Crile had slightly more experience mobilizing a unit after his experience in Philadelphia. On May 11, Hospital Number 5 sailed from New York on the SS *Saxonia* to an undisclosed location. Cushing lost the race with Crile to be the first to set sail by just 4 days. He was disappointed and somewhat resentful saying that Crile had been rushed aboard "undrilled and without uniforms or flags" (Bliss 2005, 312). Cushing was called to the war office when he arrived in London to receive the Unit's assignment and was not happy with the prospect. Their assignment was to Hospital No. 22 at Camiers. Upon arrival at this "down at the heels hospital… under canvas," as described by Cushing, the Unit began peparation for the first convoy of wounded, which was deliverd on May 31st. (Cushing 1936, 111).

While the personnel of each unit was dispatched to assist British hospitals in caring for the wounded, the mission given to Crile and Cushing as directors of these units, was to visit base hospitals, casualty clearing stations (CCS), and evacuation hospitals to investigate current methods used and suggest ways to immediately facilitate improvements. Both of these physicians kept incredibly detailed diaries illustrating day by day, and in some cases hour by hour, what they were experiencing.[7] Crile and Cushing had very specific duties, but happened to stumble upon opportunities in hospital wards that furthered their own interests in research. Crile assignment was to investigate the conditions within casualty clearing stations of the 2nd and 5th armies on the Front and suggest

[7] Cushing was almost court-martialed over a page in his diary on which he made disparaging remarks about a British surgeon. The page found its way into a letter Cushing was sending his wife and was discovered by French officials.

methods to improve the handling of patients. These stations, operated by the Royal Army Medical Corp as part of the casualty evacuation chain closer to the Front, were designed to treat a wounded soldier sufficiently for his speedy return to duty or, in most cases, to stabilize him to be evacuated to a base hospital. Upon Crile's arrival at CCS No. 17 at Remy Siding he found the most obvious areas of concern to be the continued use of ether and chloroform as anesthetics, although there was an interest in nitrous oxide. Shock and exhaustion were contributing to the mortality rate (Crile 1947, 282). An unexpected find horrified Crile and demanded immediate attention. Those who suffered severe gunshots, head wounds, and chest wounds, and were deemed hopeless upon arrival were set aside in what was called the "moratorium ward" to await their ultimate fate. With permission from the British surgeon assigned to CCS 17, Crile took charge of the ward and began intravenous treatments of diluted sea water. This solution is practically identical to the fluids of the body and could supply the damaged body with the energy needed to survive surgery. Harking back to his exhaustive research on the changes in the kinetic system, Crile applied the treatment to soldiers previously relegated to certain death and created what he could now refer to as the "resuscitation ward" (Crile 1947, 287).

Crile visited the St. Omer Shell Shock Hospital No. 4, which at that time had over eight hundred shell shock cases. "Here we have a human being modified by a battle, the components of this modification being essentially a continued pathologic stimulation of the brain-adrenal-thyroid-sympathetic system" (Crile 1947, 296). While he was visiting the wards, anti-aircraft guns opened up. The shell-shocked soldiers jumped to as though an electric current had run through them. Many ran for shelter, some crept under their beds. "Officers as well as men made this reaction. What an illuminating but cruel experiment." The "mechanism" of the soldier in the midst of battle becomes highly activated, involving the entire kinetic system. Many show the face of preoccupation, sleepiness and slight pain, but none show a sign of emotion or a glimmer of intelligence. In many cases this activation will pass, especially after a long sleep. But there is a percentage that will suffer long-term activation." Hearing that Crile was looking into the cause and treatment of shell shock, the Royal Engineers asked him to consider their research on high explosives and answer a specific question "Why in dugouts made to safeguard the lives of soldiers during heavy bombardment, are the lives of some spared and others destroyed with no visible signs of injury"? Immediately, Crile began looking into the theory of negative or vacuum phase of air waves on the blood vessels in the lungs. Tests using stray dogs, requisitioned

through the City of Rouen as test subjects, showed that the force of the concussion killed the dogs in the trench, while the dogs in the open are not adversely affected. Unlike shock, this had nothing to do with the nervous system. "During the negative phase of the concussion wave the expansion of gas in the blood vessels ruptured millions of capillaries in the walls of the lungs, filling the lungs with blood, amounting to drowning in one's own blood" (Crile, 1947, 295). This then became a study of the dugouts designed by both the British and the Germans, resulting in a new design to "prevent death by air concussion, adopted as the standard type of dugout throughout the Allied line. Thus was biology made a useful adjunct to the applied physics of war" (Crile 1947, 296).

On June 22nd, upon Crile's return to General Hospital 9, he suggested the formation of resuscitation teams properly equipped to administer nitrous oxide and give transfusions. On July 22nd, shortly before the third battle of Ypres, Crile's suggestion was put into effect. The team from No. 9 included Drs. Charles F. Hoover, Lower, Crile, Miss Mary J. Roche, anesthetist, Miss Helen Briggs, nurse and several resident surgeons with the Lakeside Unit. They were assigned to CCS No. 17 at Remy Siding. Hoover and Crile left for Dunkerque to collect sea water for experiments. An alarming number of phosgene gassed cases came in, many beyond treatment. Post mortems showed the pharynx, larynx, trachea and bronchi extremely necrosed. "The mucous membrane could be taken out like an inner tube of an automobile tire. Any treatment seemed hopeless" (Crile 1947, 299). The plan was to attempt intracellular resuscitation by infusing sea water with glucose and adrenalin, in the hope it would increase intracellular oxidation; then superimpose blood transfusion and then follow by immediate operation. A drastic and innovative technique that was creating a lot of attention. Transfusion was introduced to the British lines in an attempt to prevent and treat shock and hemorrhage. "Before the end of the war blood was gathered from the wounded and stored at the casualty clearing stations" (Crile 1947, 281).

The first week Cushing and his unit spent at Camiers was consumed by settling in and attending to the 200+ casualties that arrived on May 31st. However the following week, Cushing received an unexpected order to report to the Director Medical Service of the 2nd Army along the Messines Ridge. The British were planning an attack on the German stronghold and captured the remains of the Messines Ridge. There were casualties, though not as many as expected, and surgeons from area hospitals were sent to the casualty clearing stations along the ridge. Cushing was assigned to New Zealand Sanitary Hospital where he finally had his first head case and proceeded to operate "wrapped in a rubber apron and in my boots". A

quick visit from Crile generated a conversation about the overwhelming problem of scabies and lice. While there, Crile was pulled aside by General Bowlby, British surgical consultant assigned to NZSH, who was concerned about Cushing and his exquisite precision during surgery: he was too slow given the number of casualties. Crile advised that it was worth having such a perfect technician on hand and to organize other groups around Cushing to handle the additional patients (Crile 1947, 285). Bowlby swiftly agreed and let the master perform his craft!

Cushing's challenge, as a specialist in neurosurgery, was to stabilize those with cranial injuries and get them to the next stage in the evacuation chain. The greatest economy of time was heavily stressed by Cushing when dealing with a cranial wounds: have one patient under the knife while another is being prepped, shaving of the scalp is indispensible and at the same time an injection of morphine is given as a local anesthetic. Cushing abandoned the inhalation of anesthetic and substituted a local as a cooperative patient could express clots and debris from the wound track (Lepore 1994, 714). These patients could not be returned to the battle and were often seen as an encumbrance by the British Army, so he suggested that a specialty centre be established "where neurological cases could be congregated and surgical problems relating to lesions of the brain, spinal cord, and peripheral nerves could be worked over on a large scale by the concentrated efforts of the abler men" (Cushing, 1919, 551). In his article *Neurological surgery and the war,* Cushing lamented the fact that the British Army did not consider this early in the war as such a facility could have served as an example for the US Army Medical Corps.

Back to Camiers in late June, Cushing set to work on numerous cranial cases. He reported using the magnet, similar to the one used at the American Ambulance, to locate foreign objects propelled through the skull. Not always easy, as the electrical connections were at times unstable. In late July, Cushing received orders to report to CCS 46 and experienced one of the biggest battles in history, Passchendaele, with about a million troops concentrated in the area. With nearly 2000 casualties a day, Cushing saw his fair share of head and spinal injuries. His diary reveals very few details on the specific treatments he used on these cases. A tell-all passage on August 2nd during the final siege on Ypres: "Operating from 8:30am one day till 2.00 a.m. the next: standing in a pair of rubber boots, and periodically full of tea as a stimulant, is not healthy. It's an awful business, probably the worst possible training in surgery for a young man, and ruinous for the carefully acquired technique of an oldster. Something over 2000 wounded have passed, so far, through this one C.C.S. There are 15 similar stations behind the battle front" (Cushing

1936, 176). The expertise provided by Cushing was invaluable to the hospitals he was assigned to. By the end of the war he had operated on thousands of head injuries saving an impressive number of lives.

Throughout the war Cushing's expert hands were requested at stations and hospitals along the Front. The last entry in his diary is one of reflection. He cited statistics gathered by the Medical Corps as to casualties from wounds, disease and non-war related injuries. The six original units serving with the British Expeditionary Forces exceeded the total casualties of the American Expeditionary Forces. He notes that Base Hospital 4, under Crile's command treated 67,591 patients.

With the end of the war on November 11**,** 1918, Crile and Cushing prepared to return to their civilian lives. Crile returned to Cleveland and rejoined his research groups in investigating shock and exhaustion. Cushing returned to Boston and proposed a national institute of neurology to aid the government in supervising further treatment of neurological disorders among US soldiers. This unfortunately didn't materialize and Cushing resumed this position as Surgeon in chief at Brigham Hospital

Medical Preparedness between the Wars

The World War had shown the need for trained medical personnel. The introduction of new weapons, such as gas, airplanes, tanks, submarines, and barbed wire changed the severity of injuries presented to the base hospitals. The medical service had to adapt to these changing conditions if it hoped to provide adequate medical care to the soldiers and was better prepared for a conflict than at any other time in our history. The experiences of Crile and Cushing at the American Ambulance were very valuable to Surgeon General Gorgas in developing his plans for preparing the country for war (Hume 1943, 34). The US had a large well-trained medical profession, but almost without any military training or experience. Crile and Cushing were influential physicians who could, from their recent experience in France, speak with authority regarding war hospital organization and how to utilize medical personnel to the best advantage. They wrote articles for medical journals that were widely read and presented papers publicizing the need to prepare for the eventuality of the US entering the war. These distinguished medical warriors learned first hand the complexities of medical organization, and the delays in securing adequate equipment under war conditions. Based on Crile's Unit plan and in cooperation with the Red Cross, more than 50 base hospitals were organized and dispatched to France by the war's end. Having the base

hospitals organized in advance allowed the prompt mobilization when war was declared. [8]

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[8] When WWII started, the US Surgeon General's Office notified University Hospitals that Old Base Hospital No. 4 was to be reactivated as a General Hospital. The Unit left Cleveland in January 1942, arriving in Melbourne, Australia in February. Fifty four doctors and 72 nurses from University Hospitals, Cleveland City Hospital, Western Reserve University School of Medicine, St. Vincent Charity Hospital and the Red Cross Nursing Service formed the nucleus of the Unit. The reactivated 4th General Hopital served with distinction in Australia, New Zealand and the Phillipines.

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Photographs of the Harvard Unit are courtesy of the Francis A. Countway Library of Medicine, Harvard Medical School

Photographs of the Lakeside Unit are courtesy of the Dittrick Medical History Center of Case Western Reserve University and the Stanley A. Ferguson Archives of University Hospitals Case Medical Center

CHAPTER FIVE

AEF MOBILE HOSPITAL NO. 1

WILLIAM MONTGOMERY

The conditions of the First World War necessitated a new type of military hospital, one that would persist and mature throughout the rest of the twentieth century. The United States followed the Allies in adopting forward surgical hospitals, which they called mobile hospitals. The British and especially the French had realized the utility of such hospitals to treat severely wounded soldiers closer to the frontline. Under the watchful gaze of snipers and machine-gunners, the nature of trench warfare prevented the prompt evacuation of wounded from the battlefields. Additionally, new military technology, especially explosive shells, created irregular shaped wounds prone to infection on bacteria-laden battlefields. Forward surgical hospitals reduced the interval of time between wounding and surgical treatment. They preserved delicate lives and removed infected tissue before evacuating patients to hospitals in the rear where more extensive surgery was likely to take place. These hospitals saved lives and therefore returned more men to the fighting lines (Marble 2012).

Inspired by the French a*utomobile-chirurgical* unit, the United States mobile hospital of World War One became a roving hospital, transported by trucks on the battlefield. It allowed the surgeon, his equipment, and a small ward to operate on wounded patients closer to the frontline. Dr. Joseph Flint, a Yale physician who had observed the *autombile-chirurgical* unit, or *auto-chir*, before the United States entered the war, initiated the first of these hospitals. Flint raised private funds and recruited Yale physicians and staff to create his own hospital which briefly served the French as *Auto-Chir* No. 39 before it transferred to the United States Army as Mobile Hospital No. 39. Ten mobile hospitals would ultimately serve in Europe and several others would be in various states of readiness when the armistice ended the fighting (Cushing 1936, 403; *Medical Department in the World War* 1927, 8:192, hereafter cited as *MDWW*).

Though the history of U.S. mobile hospitals begins with No. 39, Mobile Hospital No. 1, more than any other, demonstrated the value of this new type of hospital. During the German Spring Offensive of 1918 Mobile Hospital No. 1 handled thousands of patients when few U.S. surgical hospitals were in France or equipped for service. Mobile Hospital No. 1 remained behind the front lines for the rest of the war, moving more frequently than any other mobile hospital, and evacuating its patients by sometimes novel means. As a prototypical medical unit, Mobile Hospital No. 1 faced challenges both unprecedented and unforeseen. Its staff endured a punishing workload, abysmal living conditions, and constant threat of destruction by shelling, gas attack, and aerial bombardment. Nonetheless, it proved to be a valuable asset to the Army's over-stretched Medical Department and also that highly mobile forward surgical hospitals had a place on future battlefields.

Hospital Unit K from Council Bluffs, Iowa, provided the bulk of officers, nurses, and men who ultimately made up Mobile Hospital No. 1. Smaller than the conventional base hospitals raised by the American Red Cross at the beginning of the war, the U.S. Army Medical Department envisioned these hospital units for use on ships, trains, or in other supplementary purposes. Unit K was fortunate to stay intact since most hospital units were absorbed into larger hospitals entirely or else broken up to provide personnel to other overwhelmed hospitals. Dr. Donald Macrae Jr., a strong-willed Council Bluffs resident, recruited local physicians and surgeons to serve in Hospital Unit K. Twenty nurses and one chief nurse joined the unit, nearly all from Jennie Edmundson Memorial Hospital, and they were sworn into the Red Cross. Fifty enlisted men completed the unit. After spending several summer and fall months training at Council Bluffs and Medical Officer Training Camps across the country, Unit K reported to Fort Porter, New York in November to await transportation to Europe (Macrae n.d., 2-4; Dock, Pickett and Noyes 1922, 340).

On January 15, Unit K personnel arrived at the Cunard Line pier wharf in New York City. Rain and snow slowed the process, but determined Unit K personnel moved their hospital supplies from train to ship despite high tide and flooding. By noon, all their equipment was aboard the *R.M.S. Carpathia*, the same ship which had rescued *Titanic* survivors and brought them to New York just six years before. Accompanied by several other hospital units, Unit K sailed on January 15 and after a brief stop at Halifax to group the convoy, they arrived in Glasgow Scotland on January 30th. The voyage was a mix of boredom, seasickness, and anxiety for fear of submarine attack (Bellinger n.d., *Diary*, 27-28).

Unit K disembarked and boarded a train for "Winnel Downs" in Winchester, England. There, they rested for three days, received good quarters and meals, and recuperated after their arduous voyage. For those who had caught colds in America or en route, the reprieve at Winnel Downs allowed them to mend. However, this was only a brief stop in their journey, as they boarded a steamer on February 3, 1918, crossed the English Channel and arrived at Rest Camp No. 2 in Le Havre, France. After another brief stop, they boarded a train and arrived at Angers, France on February 6, where they were attached to American Base Hospital No. 27. The facility occupied a picturesque old monastery complete with vine clad stone walls and a meditation garden. After some idle time and a threat of Unit K being absorbed into Base Hospital No. 27, Major Macrae ventured to Tours, France to discuss the disposition of his unit with the Medical Headquarters. He received assurance that Unit K would remain intact and autonomous, though for the duration of the war, Macrae frequently fought efforts by other units to absorb Unit K and later Mobile Hospital No. 1 (Macrae n.d., 5-6).

Many American medical officers who landed in France had little experience in military medicine. For most, the few weeks of hastily assembled lectures and hands-on training at the Medical Officers Training Camps represented the extent of their knowledge. The Army, therefore, needed to acquaint these new officers with medicine's uniquely military aspects, and for that, they turned to physicians and nurses at French and British hospitals who had acquired an abundance of hard-learned knowledge. These lessons in field service were delivered at the American Sanitary School, part of the American War College at Langres, France. Part of their training consisted of first-hand experience in Allied hospitals from the frontline all the way back to hospital ships in the rear. In late February Major Macrae and three other officers of Mobile Hospital No. 1 received orders to report to the Sanitary School. What they learned, they passed along to other Unit K members and eventually Mobile Hospital No. 1 personnel (Ashford 1919; Bellinger n.d., Diary, 66-68).

Mobile Hospital No. 1

While Major Macrae and his officers attended the American Sanitary School, the other seventy-four members of Unit K moved from Angers to Tours, France. Surprised by the news of the transfer, Macrae's train chugged into Tours where he found Camp Hospital No. 27, run by Unit K and temporarily commanded by Major John H. Trinder. Camp hospitals often served as the terminus for ill servicemen needing advanced treatment

or time for recuperation. Division surgeons sent these men to the rear to relieve the burdens on their own staff and to make room for the never ending stream of wounded soldiers. Duties at Camp Hospital No. 27 lacked the intensity that Major Macrae desired, though some of his colleagues found the slower pace pleasing (Macrae n.d., 7; *MDWW* 1927, 8:86).

For the assiduous Major Macrae, the Camp Hospital must have seemed like a prison sentence rather than an assignment. He agitated with the Medical Department to obtain a more active assignment for Unit K. Captain Bellinger observed on April 24, that "Major McCrae is working hard for a Auto hospital in Paris to go to the Front. While we are fairly busy here. And satisfied but Major McCrae wishes to get to the front where there is more activity." The next day, however, Bellinger changed his tune, writing that Macrae had secured the desired appointment and that, "I'm glad to hear this as it is one of the best things in France. We'll get some active work the Hospital will be called Hospital No 1." On the same day Major Macrae left Tours for Paris to oversee the equipping of Mobile Hospital No. 1 (Bellinger, *Diary*, 102-103; Macrae n.d., 10).

On April 26, 1918 Lieutenant Moth and eight enlisted men followed Major Macrae to Paris to work on equipping the mobile hospital. They shuttled the equipment from French facilities to United States army repair shops. While these men worked on the equipment, the remaining members of Unit K began their transition to new assignments. On May 15, twenty-three members of Unit K under the command of Lieutenant Robert Crumpton, reported to Major Joseph Flint for training at Mobile Hospital No. 39. They remained there until June 3 when they received orders to report to Mobile Hospital No. 1. Some Unit K personnel, including a few officers and all the nurses, lingered at Camp Hospital No. 27 at Tours. A persistent Major Macrae finally won their transfer to the mobile hospital, though the nurses did not arrive until after the hospital was already receiving wounded (Macrae n.d., 11-13).

Equipment arrived piece by piece, mainly from the French Army, the American Quartermaster, and the Medical Department supply divisions (*MDWW* 1927, 8:188). Major Macrae had the bulk of the Unit K equipment transferred to the new hospital. He also procured a typewriter and field desk, items in short-supply. While still assembling this equipment, Mobile Hospital No. 1 received permission to expand its bed capacity from one hundred to two hundred. This surely increased their need for supplies, and the Red Cross furnished those that failed to arrive through the normal military channels. The hospital's novelty sometimes hindered obtaining supplies. Macrae noted that "in making up the

requisitions, difficulty was encountered owing to the fact that the Mobile Hospital was new to the American Army and there was hesitancy on the part of authorities to O. K. the requests for supplies (n.d., 20)."

American mobile hospitals travelled with all medical equipment needed for independent operation. Aside from consumable supplies of bandages, ointments, and pharmaceuticals, the hospitals also moved the seemingly stationary items including x-ray machines, operating room tables, laundry machines, sterilization equipment, and even electric lights for the operating room. Ordinary military trucks moved the less-delicate supplies and equipment of the hospital, while the U.S. Army purchased specialized x-ray and sterilization trucks from the French (*MDWW* 1927, 8:186-187).

To practice aseptic surgery in the field, a mobile hospital required a continual supply of sterile instruments, ointments, and solutions. The sterilizer truck, therefore, proved indispensible as it contained various drums, tanks, and at least one autoclave (steam pressure sterilizer). During field operations, tents enclosed most of the truck. Only the back half containing the autoclave remained outside. Despite its efficiency, periods of prolonged activity required the sterilizer staff to boil surgical instruments rather than disinfect them through the autoclave. The steam heat from the equipment also warmed the operating room (Anderson 1919; *MDWW* 1927, 8:197-198).

Pioneered by the French, the x-ray truck included equipment necessary to outfit a hospital with x-ray services. The fluoroscope, dark room, and incidental equipment were all packed to travel in and be setup from a single truck. Just as the sterilization truck produced heat to a mobile hospital, the x-ray truck provided electric lighting with a generator mounted on the engine. Rather than being parked within the hospital walls, the truck remained just outside the x-ray room (*MDWW* 1927, 8:185-187, 196).

While at Auteuil, the hospital staff reached the prescribed strength of twelve officers, eighty enlisted men, and the twenty-two Unit K nurses whom headquarters had promised to reassign to Mobile Hospital No. 1. While near Paris, hospital personnel coped with nightly air raids and the Paris gun, which had resumed its sporadic shelling. Dr. Macrae was still requesting operating surgeons and nurses when orders came to report to Coulommiers, France. A field laboratory did not arrive until after Mobile 1 personnel had erected their tents and had received wounded men. A requisitioned water cart never arrived, which forced the personnel to shuttle water to the hospital in any available container (Macrae n.d., 16,20,23; Macrae 1927, 64).

Belleau Wood and Chateâu Thierry

On May 27, 1918, the German army unleashed a devastating artillery barrage across the Aisne River near the Chemin des Dames, France. Pummeled and disorganized from the attack, the French Army failed to stop the Germans from crossing the Aisne. Allied defenses disintegrated as the Germans crossed yet another river, the Vesle, on the same day. In light of this desperate situation, General John Pershing ordered green American troops, not yet a full army, to join the French in repelling the German offensive. Together, they crossed the Marne and blunted the German juggernaut driving toward Paris. The stunning German advance had already swallowed up thousands of Allied prisoners, munitions, and stores of various kinds. Most importantly, the German drive toward the Marne River overran essential French medical facilities totaling 45,000 beds (Stallings 1963, 78-81).

The AEF's involvement in holding back the Germans at the Third Battle of the Aisne, and later at Belleau Wood, presented an enormous challenge to the American Medical Department. According to previous arrangements, any American soldiers wounded while helping an Allied army received medical care from that army. In this instance, the responsibility fell upon an already overtaxed and devastated French medical system. Realizing the medical emergency, Americans improvised by turning field hospitals into triage and surgical centers while evacuating wounded men over long distances on shattered roads to Paris. Born of necessity, these modifications did little to alleviate suffering and save fragile lives (*MDWW* 1927, 8:24; Stark 1920).

The American Medical Department, lacking evacuation hospitals at the outset of the battle, relied heavily upon field hospitals. Beginning with the first week in June, a field hospital at Bezu-le-Guery triaged patients, sending them to other field hospitals at Luzancy and La Ferte-sous-Jouarre which served as impromptu gas and non-transportable hospitals. Though La Ferte-sous-jouarre had been reinforced with additional personnel and equipment, the situation still called for additional surgical and evacuation services. Amidst the furor of the battle, Evacuation Hospital No. 8 arrived in France and was rushed to Juilly to reinforce an American Red Cross hospital there. Though the addition of personnel at Juilly relieved the beleaguered staff of the Red Cross hospital, the equipment of Evacuation No. 8 arrived long after its staff. Red Cross and Army medical officers staffed another improvised surgical hospital at Jouy-Sur-Morin (*MDWW* 1927, 8:313-318; Pottle 1929, 91, 96, 101).

Despite the additional surgical hospitals run by the Red Cross and Evacuation No. 8, the influx of wounded still overwhelmed the medical services and long ambulance runs into Paris continued as the primary method of evacuation. Realizing the deficiencies of this system, the AEF's Chief Surgeon located a suitable evacuation point at a rail junction in Coulommiers, France. He ordered Evacuation Hospital No. 7, recently arrived in France, to advance to Coulommiers and prepare to receive wounded. Similarly, he ordered Mobile Hospital No. 1, now fully equipped, to report to the same place and to work in conjunction with the evacuation hospital. The rail junction ultimately served as the chief evacuation point during Belleau Wood and Chateâu Thierry (*MDWW* 1927, 8:331-332).

The move from Paris to Coulommiers exposed one large weakness in First World War mobile hospitals. Although mobile in the sense of having specialized x-ray and sterilizer trucks, these hospitals still depended on ordinary trucks to move the larger part of their equipment. When headquarters ordered Major Macrae to move the hospital on June 10, transportation problems arose immediately. The German offensive had frightened Parisians who commandeered trucks as the city edged toward evacuation. Eventually an aviation camp agreed to loan enough trucks, but lacked the drivers to move them. After a search, the Medical Department scrounged some French drivers for the job (Macrae 1927, 64; *MDWW* 1927, 8:332-333).

The fifteen trucks and trailers promised to Mobile 1 arrived so late on June 11th that the first convoy of equipment did not leave until dawn on the 12th. After unloading at Château Montanglaust, near Coulommiers, it returned to Paris for the second and final convoy of equipment which did not arrive until the next morning. The personnel of Evacuation No. 7 arrived at Montanglaust on June 12th, the same day that the first convoy of Mobile 1 equipment reached the château (Macrae n.d., 24). The mobile hospital established itself in a clearing east of the château while the evacuation hospital headquarters settled into the old French mansion. Just as the mobile hospital had encountered difficulties in moving from Paris to Montanglaust, the evacuation hospital faced a dilemma of its own. Only part of the equipment for the evacuation hospital had arrived with its personnel. For more than a week this missing cargo handicapped operations. In such trying circumstances, Evacuation No. 7 personnel marveled at the readily portable equipment of Mobile 1; the x-ray and sterilization trucks particularly impressed them (Evacuation Hospital No. 7 n.d.).

The action at Montanglaust proved to be a hectic and exhausting first experience for both hospitals. Until the missing equipment for Evacuation No. 7 was located and delivered, Mobile No. 1 conducted the majority of surgical operations, sterilization, and laundry tasks at the château. Until June 20th when the equipment arrived, Macrae ran the operating tables of the mobile hospital around the clock. He also became Chief of Surgical Services (Macrae n.d., 32). An enlisted man of the operating team detached from Evacuation No. 8 to serve with Mobile No. 1, described the mobile hospital's operating room as having been set up in "a long tent with twelve tables in a row. A person who had not seen it would be unable to believe that so commodious and efficient an operating room could be set up in a tent (Pottle 1929, 180)."

The hospitals at Montanglaust received patients almost immediately after they arrived, which positively affected the Allied medical services. The Medical Department assigned one of the few available ambulance sections to Montanglaust to expedite transportation to this evacuation point. Soon, this hospital received the non-transportable patients from the overtaxed field hospital at La Ferte-sous-Jouarre. Likewise, personnel at Montanglaust relieved some of the burden of the American Red Cross Military Hospital at Juilly. When evacuation by rail began, long ambulance runs decreased in number (*MDWW* 1927, 8:325-333). Evacuation Hospital No. 7 and Mobile Hospital No. 1 restored the proper flow of patients from the battlefield to the base hospitals in the rear.

When the first patients arrived at the Montanglaust hospital on June 14th, Mobile No. 1 treated them in their operating room. A team of both Evacuation No. 7 and Mobile No. 1 personnel performed the first operation. Major Don Peters of Evacuation No. 7 and Major Macrae of Mobile No. 1 headed the first two operating tables and worked there for thirty consecutive hours before yielding to other surgeons. The nurses of Unit K finally arrived on June 14th after the hospitals began receiving wounded soldiers. The rest of the evacuation hospital staff members prepared wards in the château but their first patients, post-operative and light cases, did not arrive until the next day. In fact, many of the evacuation hospital's enlisted men received passes to explore Coulommiers on the evening of the 14th (Evacuation Hospital No. 7 n.d.).

The Medical Department complied with Major Macrae's request for additional surgical teams. To accommodate the additional surgeons, nurses, and orderlies, Macrae ordered another tent erected as a surgical ward. Throughout June additional teams cycled through the hospital as they could be spared elsewhere. That included teams from Evacuation Hospital No. 8, who, like Evacuation No. 7, had arrived ahead of their

equipment. The hospital erected more tents for surgical teams as they arrived (Macrae n.d., 25-28; *MDWW* 1927, 8:326,354; Anderson 1919).

Evacuation of the wounded from Coulommiers by train began on June 17th, just a few days after their arrival. The distance between the château and the train depot required a short ambulance trip. Trucks moved the wounded during shortages of ambulances. On at least one occasion, the sheer volume of wounded men required their immediate evacuation by hospital train without their having received any advanced treatment at the Montanglaust hospitals. Nonetheless, evacuation by rail probably obtained quicker treatment for them than if they languished on the château's lawn. Over the course of July 16 and 17, the hospitals evacuated 3,654 patients.

Aside from missing medical equipment, the hospitals dealt with other supply issues. The hospitals at Montanglaust consumed an enormous amount of scarce clean water. One of the trucks permanently attached to the hospital made regular runs to nearby wells until they ran dry. Lieutenant Hanisch, the supply officer for the mobile hospital, ventured away from Montanglaust and returned with a watercart. He had "borrowed" it from a field hospital that had previously "borrowed" it from the infantry. Meanwhile, gasoline was also scarce since obtaining it required a long trip by automobile to receive authorization from French authorities who controlled the distribution of gasoline. Eventually, the Medical Department expedited the process. Fortunately, the hospitals already had plenty of medical supplies. A nearby supply depot moved to another location after donating surplus supply to the Montanglaust hospitals with instructions to distribute them to others in need of them.

In late June 1918, Evacuation No. 7's missing equipment arrived, bringing the two hospitals up to full strength. Eight operating tables became operational in the château and another eight in a tent. Among the two hospitals and detached surgical teams, a full twenty-eight operating tables served the wounded at Montanglaust. On June 26, ten nurses from Base Hospital No. 26 arrived to serve with Mobile Hospital No. 1, just in time for a large influx of wounded on the same day (*MDWW* 1927, 8:327,354; Macrae n.d., 27-31).

The hospital's heavy workload affected the entire staff, including the surgeons. One of them, Captain Bellinger, found the time to write a letter home on July 9. In noticeably less careful handwriting than his previous letters, Bellinger wrote that the hospital had treated 1,200 cases in eighteen days and that twelve men had operated day and night. He also felt guilty for his living conditions, which he perceived to be better than those of ordinary soldiers. In his letter of July 18, he indicated that 4,000 wounded had passed through the Montanglaust hospitals during their four weeks of

operation. At this stage, shifts of ten surgical teams operated around the clock.

On July 14, the Allied armies had experienced some good fortune when troops searched a captured officer and found the plans for a future German offensive. The intercepted papers allowed the Allies to prepare for an attack slated for the next day. Following an extensive artillery barrage, the Germans tried to cross the Marne River where stubborn doughboys resisted them fiercely, and stalled the last of Germany's five drives toward Paris in the spring of 1918. Though halted, the German attack had left a salient that bulged from Soissons in the north to Reims in the south and bulged out to Château-Thierry and the Marne River in the center. Allied generals planned a counterattack at Soissons to cut-off the German army. During the night of July 17-18, the Americans spearheaded the Allied counterattack near Soissons, France. The ensuing struggle became the Battle of Château-Thierry (Stallings 1963, 114-138,142).

When the German army tried to cross the Marne, it prepared its objective by firing artillery shells and dropping aerial bombs. Unfortunately, the shells fell among medical facilities, and German aviators disregarded or did not see the red crosses marking the hospitals. In accordance with the Geneva Convention, the Army Medical Department required all its hospitals to be marked with a large red cross set on a white background, and visible from the air (*MDWW* 1927, 8:236-327). Despite this clear marking, German aviators attacked several Allied hospitals at the Château-Thierry battle's outset, including those at Montanglaust.

Around 11:00 p.m. on July 15, two bombs fell on the Château Montanglaust grounds. Wounded patients and surgical teams filled the operating rooms, and everyone worked strenuously. Most surgeons and staff members had felt a shell's impact in operating rooms before, but Montanglaust was relatively far from the front and the Germans had never clearly tried to shell the hospital before (Bellinger n.d., *Diary*, 109). Antiaircraft guns fired at the German plane and then ceased, leading some observers to believe that the German threat had passed, but another plane swooped down and dropped bombs thirty yards from the hospital tents. In the château, where Evacuation No. 7 surgeons were operating, the concussion shook the building and shattered windows (Evacuation Hospital No. 7 n.d., Anderson 1919). An enlisted man with a surgical team from Evacuation No. 8 had just left the château when the bomb's shock wave struck him. Afterwards, he clung to a tree as the antiaircraft guns fired at the airborne German attacker (Pottle 1929, 178-179).

In the operating room tents of Mobile Hospital No. 1, the surgical teams heard and felt the shock. Major Macrae later recalled that the officers, nurses, and men remained calm during the attack and continued their duties. Captain Bellinger, working in the operating room at the time, observed that "Our commanding officer came in the operating room, and gave the order for every man to remain at his post and continue with the operations. I tell you every man, and nurse, continued with their work like brave soldiers but it takes just a little nerve and plain guts, to carry out difficult operation when d-d bombs, and machine guns are filling the air about you with dedly[sic] missils[sic] (*Letters*)." Bellinger also praised Macrae in his diary as having been as "cool as a man Could be" and producing "a great Effect on the officers, nurses and men present (109)." Despite the attack, surgeons continued to perform operations, but did so by candlelight and flashlight rather than using electric lights (Anderson 1919).

This German bombardment equally shocked patients recovering in the wards. Immediately after the explosions, the wards fell completely silent. Soon thereafter, the seriously wounded began to shout while other patients yelled and taunted the attackers. Despite their best efforts, the patients failed to learn anything about the bombing from ward nurses. Instead, patients speculated that a ward had been hit and an orderly killed. One patient overheard the nurses the next morning express disbelief that the Germans had attacked a hospital so clearly marked with a large white cross (Wunderlich 1919, 69-70).

Although Mobile No. 1 and Evacuation No. 7 at Château Montanglaust escaped the bombing relatively unscathed, other hospitals suffered more damaging attacks that evening. The simultaneous attack on the American Red Cross Hospital No. 107 at Joy-sur-Morin had killed one and wounded eighteen other personnel and patients. Both of these aerial attacks incensed the Chief Surgeon of the Paris group in charge of the hospitals. He believed that the German attackers specifically targeted these hospitals whose large red crosses were visible. Moreover, German aviators had seen these hospitals on other occasions, and the hospitals were some distance from other potential targets. The Chief surgeon called these attacks an "assassination" of the wounded (*MDWW* 1927, 8:354). Despite his beliefs, it was only a first quarter moon the evening of July 15, which would not have made targeting simple for German aviators. It is possible that they saw some light escape from these hospitals and unwittingly dropped bombs in violation of the Geneva Convention.

Mobile Hospital No. 2, recently deployed to Bussey-le-Chateau, suffered from the German artillery barrage on July 15. Shells demolished

the shock ward, killing patients there and others being unloaded from ambulances. Further shelling damaged other structures at the hospital. The staff moved the patients to dugouts and eventually evacuated them further to the rear. The attack killed both patients and personnel, and the Chief Nurse, Jane Rignel, received a citation star for her steadfast attention to the wounded during this action. Congress later allowed citation star recipients to exchange their award for the Silver Star Medal, which made Jane Rignel one of the first members of the Army Nurse Corps to receive the decoration (*MDWW* 1927, 8:353; Pryor and Marble 2008).

The hospitals at Château Montanglaust handled approximately 26,000 patients between June 14 and July 28, 1918. While not all of these men received the surgical treatment they needed, Mobile No. 1 performed 3,869 operations during that time. Base Hospital No. 3 received many of the wounded from Montanglaust and its commander wrote to Evacuation No. 7 and Mobile No. 1 to say how pleased he was with the condition of these wounded men as well as with the high quality of care they had received. General Pershing issued a commendation to Evacuation No. 7 and Mobile No. 1 for their work at Montanglaust long after they had moved to a new station (Macrae n.d., 35-37).

Chateâu Thierry (Chierry)

Several days of fighting along the Marne River at Château Thierry necessitated additional medical support. Therefore, on July 28, headquarters ordered Mobile Hospital No. 1 to report to Chierry, a small French town across the Marne from the fighting. While the Battle of Belleau Wood had taxed the medical personnel heavily, Château Thierry proved more dangerous. Litter-bearers often risked death and injury removing wounded soldiers from the battlefield. Medics administered dressings, strychnine or morphine, and antitetanic serum to wounded soldiers on the battlefield and at the dressing stations. Under cover of darkness, litter-bearers and ambulance companies evacuated the wounded to mobile and evacuation hospitals (*MDWW* 1927, 8:362).

The wet and cool weather of the last few days at Château Montanglaust gave way to hot and uncomfortable weather as Mobile No. 1 arrived at Chierry to serve in conjunction with Evacuation Hospital No. 6. Mobile No. 1 required over forty large trucks and two trips to move from Montanglaust to Chierry. They left behind 1,200 wounded soldiers to be treated and evacuated by Evacuation No. 7. After an uneventful trip on the 29th, the last convoy arrived at Chierry to find evidence of fighting, in the destroyed homes and trees around the hospital. Mobile No. 1 set up its

equipment along a busy road that led to Paris (Bellinger n.d., *Diary*, 113; Macrae n.d., 38-40).

Immediately after Mobile One's arrival at Chierry, Colonel Frank Baker, commanding officer of Evacuation Hospital No. 6, insisted on integrating Mobile One's personnel with his hospital, just as he would have done with any other temporary surgical teams. Major Macrae contested that policy, insisting that the mobile hospital retain its autonomy and assist the evacuation hospital only by helping it care for large numbers of wounded. The disagreement ended when Macrae showed Colonel Baker an order from the AEF supporting his viewpoint. Despite winning the argument, Major Macrae later regretted the great extent to which the two hospitals' operations blurred. Since Evacuation No. 6 lacked much of its equipment, Mobile No. 1 did the sterilization and x-ray work for both hospitals and handled most of the surgeries. Additionally, Mobile No. 1 officers assumed positions of authority over both hospitals (Macrae n.d., 39-40; Bellinger, *Diary*, 114).

In volume and in severity of wounds, the men received at Chierry differed from those cared for at Montanglaust. A surgeon with one of the operating teams claimed that these wounds were more severe than those anyone had seen previously. The bessonneau tent operating rooms bustled with activity. On several occasions, the surgeons worked for eighteen to twenty-four hour periods. This also meant extended duties for the enlisted men and nurses who probably worked the same long hours. Dr. Elliott Cutler, temporarily assigned to Mobile No. 1, wrote afterwards that "the pressure of work was great and excessive almost without respite (1919)." On August 9, Captain Bellinger echoed Cutler's tired grousing when he wrote a letter to his parents stating that he had "been on duty continuously for two months almost day, and night. Have to get some relief soon."

Service at Chierry included annoyances from excessive heat, flies, a heavy workload, and German airplanes. Fortunately, Allied antiaircraft gunners kept German planes from inflicting damage on the hospital. Several bombs did land within the hospital and one "lit" outside the nurses' tents, but thankfully did little more than throw dirt in the air. Chierry did have one advantage in its proximity to the Marne River. Wounded troops were loaded onto canal boats bound for hospitals in Paris. These boats proved so successful that the Medical Department officially adopted their use and had sixty under construction at the time of the armistice (Macrae n.d., 40; Bellinger, *Letters*; Harbord 1936, 491). A substantial reinforcement of thirteen officers and a chaplain joined the mobile hospital at Chierry. By the time headquarters ordered Mobile No. 1

elsewhere, its personnel had treated 900 patients and performed 1,711 operations (Bellinger, *Diary*, 114-115; Macrae n.d., 40-41).

St. Mihiel

Mobile Hospital No. 1 entrained on August 19 under vague orders to proceed to Neufchateau, France. On arrival, Major Macrae sought clarification at the Medical Headquarters, which happened to be in that city. Meanwhile the hospital and its equipment remained on the train, causing some irritation for the train operators. Finally, Macrae returned and the hospital personnel unloaded its equipment. The original orders called for the hospital staff to be quartered in local barns. Believing a tent camp would better secure the equipment, Macrae requested and was granted permission to encamp in a pasture near the village of Rouceaux. Camp conditions facilitated good sanitation and fewer flies. For most hospital staff members, this idle time was a welcome respite after the frenzied activity of Montanglaust and Chierry. By August 24, Evacuation Hospitals No. 6, 7, and 8, as well as Mobile Hospitals No. 1, 2, and 3, had assembled at Neufchateau, and rumors emerged that they assembled as preparation for another engagement (Macrae n.d., 41; Bellinger, *Diary*, 121-124).

Orders finally came to move the hospital and on August 26, a French truck convoy arrived for that purpose. The hospital destination was secret and Major Macrae only told select officers of their destination before their arrival at Petit Maujoy, a location named after a French military hospital that once occupied the site (Macrae n.d., 42; Pottle 1929, 202). Mobile No. 1 settled across the road from Evacuation Hospital No. 8 and just south of Verdun. Only a fraction of the hospital's tents were assembled and most of the men lived out of "pup tents" in the nearby woods. Their orders called for maximum secrecy and authorities feared that an entire tent hospital set up and visible from the air would tip off the Germans to the impending attack (Bellinger, *Diary*, 125-131; Macrae n.d., 42-43). Hospital personnel had little activity except to watch the tell-tale signs of a coming battle. Observation balloons and squadrons of airplanes dotted the sky and at night soldiers and equipment crept over the local roads headed for the front. Local antiaircraft guns kept German observation planes at a high altitude. On August 31, a heavy barrage rang out across the line, and Major Macrae immediately sprang to work assembling the hospital and preparing for wounded. The barrage was a false alarm, though, and headquarters ordered Macrae to immediately remove his tents or risk giving away their position. Accordingly, the hospital removed some tents

and camouflaged others. Perhaps influenced by this ordeal, Lieutenants Hanisch and Moth took Major Macrae to a "French Automobile Camp" near Ancemont to investigate the possibility of moving the hospital there (Bellinger, *Diary*, 131-133).

Macrae was aware that his officers favored LaMorlette because of its relatively comfortable wooden buildings. He preferred that his staff live in tents, fearing that the hospital might become immobile once its personnel moved into the frame buildings. LaMorlette, however, had advantages that appealed to Macrae. There were permanent roads, electricity, and a water system, making it an ideal location for the hospital. The heated wards held 250 patients and included a separate operative ward. Occupying the site would also detach Mobile No. 1 from Evacuation No. 8, something that the fiercely independent commander favored. Headquarters granted permission to move on September 2 and the hospital moved with the assistance of a labor company and borrowed trucks. For the rest of the war they were never attached to another hospital, though they often worked alongside others.

While at LaMorlette, German planes continued to search for photographic targets, and French planes frequently drove them off, to the hospital staff's delight. Observation balloons also bobbed in the sky. Numerous German aviators wielded bombs as well as cameras, so the hospital staff built bomb proof shelters and dug trenches. All personnel carried helmets and gas masks whenever they were outside the hospital at night. Gas drills prepared the staff to react to and survive poison gas attacks (Macrae n.d., 43-45; Bellinger, *Diary*, 133-134).

U.S. troops began their attack along the St. Mihiel Salient at dawn on September 12. The Germans, already pulling out of the area, failed to anticipate the attack and struggled to hold off the doughboys. Following a four hour artillery bombardment, troops straightened the salient in 24 hours. Weeks of preparation for the attack allowed time for the medical headquarters to bolster overtaxed units with additional men, plan routes of evacuation, and pre-position hospitals. Planned in complete secrecy, even the Assistant Surgeon General in France, Meritte Ireland, did not know the exact day of the attack. Despite still being short 60,000 men and half of their ambulance sections, the medical corps shuffled its meager resources in anticipation of 33,000 casualties (Stallings 1963, 207, 213-214; Gillett 2009, 319-321).

During the artillery barrage, which began on the evening of September 10, the mobile hospital hurriedly set up its tents, anticipating a stream of wounded, but only a trickle appeared on the morning of the 12th. Twenty-five patients arrived, and fifty more the next day. Most were German

prisoners with serious injuries. Despite the rainy weather, the hospital continued to receive and care for its German patients until September 14 when wounded troops ceased to arrive at the hospital. Surgeons worked twelve hour shifts, but they could not save many serious cases, so the death rate climbed higher than that at any previous locations. By September 18, the flow of wounded to the hospital stopped completely. During the entire time at LaMorlette, the hospital treated only 141 patients (Bellinger, *Diary*, 139-141; Macrae n.d., 45; Bellinger, *Letters*).

On September 21, Major Macrae received verbal orders to move Mobile Hospital No. 1 to another old ambulance hospital at Les Claires Chenes. Between the time Macrae received verbal orders and the day the hospital moved, at least two members of Mobile No. 1 became ill. One of the enlisted men, Elwynn W. Mannhart, became too ill to move, and when the rest of the hospital left for Les Claires Chenes, an officer, two nurses, and a few men stayed to care for him. After a few days, Mannhart died on September 26, the first casualty for Mobile Hospital No. 1 (Macrae n.d., 45-46). Major Macrae also became ill while at LaMorlette. He did not allow other officers to examine him and he tried to carry on as before. Captain Bellinger noted in his diary, "Major MacCrae don't look well. and is the talk of the camp. We all think he ought to take a rest but He won't do it. I spoke to Him about going away for a rest but he would not listen to it. Say if He get down these fellows will send Him Home (144)."

As before, a truck shortage delayed the move to Les Claires Chenes. Lieutenant Hanisch had difficulty locating trucks and this may have been a blessing as German artillery shelled the new hospital site, postponing any move until September 23 and 24. Cool temperatures and rain made the move along congested roads more unpleasant. On first sight, Les Claires Chenes hardly pleased the hospital staff. Captain Bellinger concluded it would be "very unhandy to work there." In contrast to the facilities of LaMorlette, Les Claires Chenes had only a few dilapidated buildings built into a hillside, which promised to overtax the litter-bearers (Bellinger, *Diary*, 143-146; Macrae n.d., 46). The weather, a wearisome move, and the unsatisfactory hospital site foreshadowed an altogether unpleasant experience for Mobile Hospital No. 1 at Les Claires Chenes.

Meuse-Argonne

Immediately on the heels of their success at St. Mihiel, the U.S. First Army lumbered away to spearhead the next major Allied Offensive. The plan involved the U.S. forces fighting northward through the Argonne Forest and down the Meuse Valley, while immediately to their west, the

French advancing toward Mézières on the Meuse in close coordination with them. In the north, the British drove northeastward toward Valenciennes. The Meuse-Argonne offensive was part of Marshall Ferdinand Foch's Grand Offensive that led to the Armistice in November. The U.S. Army advanced in three phases, the first of which lasted from roughly September 25 to October 3. During this phase, Mobile Hospital No. 1 served III Corps of the U.S. First Army as a hospital for nontransportable wounded.

The III, V, and I Corps made up the U.S. First Army during the first offensive phase, and they occupied a line stretching from the Argonne Forest to the Meuse River. I Corps, along with the French to its left, advanced through the Argonne Forest. Meanwhile, V Corps fought through the Bois de Montfaucon and the Bois de Cheppy, with the ultimate goal of taking the fortified town of Montfaucon. III corps kept on V Corps's flank, advancing up to Montfaucon while reestablishing a line along the Meuse River as it advanced. Wet weather and stubborn German defenders made the attack difficult and costly (Stallings 1963, 227; *MDWW* 1927, 8:527-529).

On September 24, Mobile Hospital No. 1 moved from the relative comfort of La Morlette to shabby wood huts at Les Claires Chenes, near Blercourt, France. A near constant cold rain and frequent aerial activity overhead created a gloomy atmosphere made worse by deafening artillery bombardments. A field hospital for the 79th Infantry Division of the III Corps settled in near the mobile hospital, which allowed for the quick and easy conveyance of nontransportable wounded from the triage field hospital to the mobile hospital's surgical hut (Macrae n.d., 49-50; *MDWW* 1927, 8:601-603, 613, 810).

The wood huts had been built into terraces on the side of a hill to shelter them from artillery attacks. While relatively safe, this precluded a normal mobile hospital arrangement. The x-ray and sterilization trucks, normally incorporated into the hospital or parked alongside it, had to be parked away from the huts with electric cables and duck boards running up the hill. Separate huts housed the wards, operating rooms, and x-ray equipment. To enter wards, litter-bearers had to ascend a staircase, consuming valuable energy. Finally, the staff had to make repairs to the surgical hut. Aside from a thorough cleaning, they covered the floor with an oil cloth and the walls and ceiling with corrugated paper. The small hut could only accommodate eight operating tables (Macrae n.d., 47).

On September 25, the Meuse-Argonne Offensive opened with an enormous artillery barrage that lasted into the next morning. Captain Bellinger wrote in his diary that "the moon was shining bright and the

skies in the North was light [sic] up like the lights from Aurora Borialis, one Continual flash (147)." The mobile hospital sprang to life as personnel erected additional tents, prepared the operating hut, and readied the wards. Despite his weakened state, Major Macrae stubbornly clung to his position as the commanding officer. Outside, observation balloons and airplanes filled the morning sky as the offensive continued.

Wounded were slow to arrive at the hospital. A combination of rainy weather and poor logistics had turned the pummeled French roads into impassable muddy quagmires. Long ambulance runs quickly caused overcrowding at field hospitals ill-equipped to handle such numbers or the surgical procedures the men needed. Despite being so close to the front, Mobile Hospital No. 1 received patients long after they were wounded. Some had lain on the battlefield for two or three days before their removal. The congested roads caused some to languish in ambulances for 24 to 36 hours. Mobile No. 1's records indicated that a few patients even entered the hospital 72 hours after being wounded. Major Macrae observed some ambulances hauling dead men. Horse-drawn ambulances proved better suited for the wrecked roads and rough terrain. The situation improved when empty ammunition and supply trucks took the slightly wounded and sick men to the rear (Macrae n.d., 49; *MDWW* 1927, 8:617). The terrible wounds, length of time before arrival, and poor treatment from forward medical facilities left the Mobile No. 1 personnel aghast. Even Major Macrae felt that "some of the most dreadful and horrifying experiences of the war were encountered at this station (n.d., 49)."

The hilly terrain and high death rate exhausted many litter bearers and grave diggers. To lessen their burden, the hospital received twenty-five German prisoners to handle those two tasks. Under the command of Chaplain John Lewis, the prisoners performed their duties well. Macrae later recalled that Chaplain Lewis steadfastly attended to both the wounded and the dead (Macrae n.d., 49).

In the midst of this difficult situation three automobiles appeared at the hospital and a colonel emerged from one with an order to release ten nurses for a nearby dance. This request struck a nerve with Macrae who demanded to know where the colonel's men were. The officer perhaps thought he had the perfect response when he replied that his men were in the trenches, but Macrae growled back, "So are my nurses in the line waiting to take care of your wounded men. My respects to your general and tell him to go to hell! Not a nurse leaves the reservation tonight, sir! (*The Daily Nonpareil* [Council Bluffs, Iowa], 11 January 1932)."

By October 3, the flow of wounded lessened and eventually stopped. The nearby field hospital moved forward and the aid posts and ambulance

sections evidently re-routed the wounded, unaware that Mobile Hospital No. 1 remained at Les Claires Chenes. The only activity occurred overhead, where dogfights raged. By this time, the First Army had succeeded in the first phase, as the three corps had driven up the Argonne, captured the city of Montfaucon, and established a line along the Meuse River. Success increased the distance between the front line and Mobile No. 1, making it impractical to serve as a hospital for the nontransportable wounded. On October 7, Macrae received orders to move the hospital forward. During their sixteen days at Les Claires Chenes the hospital received 494 patients and performed 411 operations (Bellinger, *Diary*, 150-152; Macrae n.d., 50; *MDWW* 1927, 8:528-530).

The hospital personnel faced a familiar transportation obstacle when they moved from Les Claires Chenes to Fromereville. The Medical Department promised trucks to haul the medical equipment to the next station, but they arrived late. Lieutenant Hanisch again borrowed trucks from nearby units, but the hospital had grown so much that it needed 105 truckloads to move as opposed to the 30 earlier. Finally on October 9, 1918, Mobile Hospital No. 1 arrived at Fromereville, three miles northwest of Erdere. Hospital personnel assembled the tents and equipment on a hill overlooking the pockmarked village of Fromereville. A field hospital occupied a site within carrying distance of the mobile hospital, making the village an ideal place to triage III Corps wounded and deliver the nontransportable patients to Mobile Hospital No. 1 (Macrae n.d., 50-51; Bellinger, *Diary*, 153).

As soon as Mobile Hospital No. 1 reached Fromereville, the III Corp's Chief Surgeon assumed tactical command of the hospital. The corps surgeon, itself a recent innovation, also received considerable freedom from the Medical Department on where it positioned medical resources within corps sectors. From this time onward, Major Macrae and Mobile No. 1 took orders from both the medical headquarters and Colonel James Bevans, the III Corps Chief Surgeon. In fact, the medical headquarters attached Mobile No. 1 to the III Corps after Colonel Bevans requested it. Some differences of opinion occurred over the next month, but Mobile No. 1, the Corps Surgeon, and the Medical Headquarters cultivated a good relationship (*MDWW* 1927, 8:105, 612-613; Macrae n.d., 51).

Mobile Hospital No. 1 at Fromereville, France. *Image Courtesy of the National Library of Medicine*

The second phase of the Meuse-Argonne Offensive began on October 4, when First Army resumed their drive northward through the rest of the Argonne Forrest and toward the Cunel and Romagne heights. Mobile Hospital No. 1 moved from Les Claires Chenes to Fromereville during the second phase's opening days. III Corps advanced through the Bois du Fays and entered the Bois de Foret as Mobile No. 1 began accepting patients. Stiff German resistance and Allied exhaustion slowed the attack. The roads remained nearly impassable for First Army. In conjunction with rough terrain, V Corps had no choice but to evacuate wounded through the sectors occupied by I and III Corps sectors (*MDWW* 1927, 8:629-634; Gillett 2009, 337). The muddy roads and constantly advancing front line continued to hamper the mobility of American and French ambulances as well as transport trucks hauling wounded men to the rear. Eventually, III Corps triage shifted to Bethincourt from which the trucks hauled men to either Fromereville or Sirvy-la-Perche which became "relay stations" where medical personnel treated men before evacuating them further to the rear. This improvised evacuation system cleverly used field hospitals,

supply trucks, ambulances and trains to move the wounded (*MDWW* 1927, 8:695-696, 712).

Heavily engaged in treating and evacuating the wounded, the medical services encountered a potentially overwhelming problem in October. Influenza sickened men in combat units, dramatically increasing the number of sick evacuations. As often as possible, frontline medical staff placed masks over these men's faces and then evacuated them to a special hospital at Revigny (*MDWW* 1927, 8:634). Influenza appeared in Mobile Hospital No. 1 by October 9 when Captain Bellinger wrote that quite a few cases had passed through the hospital. Not long thereafter, one of the nurses, Lydia Whiteside, contracted influenza. After a ten day struggle, she died late in the evening of October 21. The next day, most of the hospital personnel attended her funeral. Booming guns and buzzing planes formed an aggressive backdrop for the solemn ceremony (Bellinger, *Diary*, 151-156). Major Macrae later wrote that "No soldier ever deserved more honor, no soldier ever performed his duty better than this devoted woman." The hospital sent her remains to Souilly, France, for burial with other nurses (Macrae n.d., 58). AEF influenza deaths peaked a few days later on October 25 (Harbord 1936, 493).

Perched atop a hill overlooking Fromereville, Mobile Hospital No. 1 made an easy target for German aircraft. The hospital staff frequently experienced air raids, and this prompted considerable anxiety. One occurred nearly every night, and always when conditions were clear and the ground well-lit by moonlight. On the morning of October 10, the personnel watched as German airplanes shot down two observation balloons, though the crewman reportedly parachuted to safety (Bellinger, *Diary*, 152).

Evacuating the wounded from Fromereville quickly presented challenges. Congested roadways continued to hamper evacuation by ambulance, so Mobile Hospital No. 1 exploited a narrow-gauge railway that ran alongside the village. The staff thereby evacuated wounded men to several base hospitals in Souilly. The railway's presence may also have influenced the III Corps Surgeon's decision to emplace Mobile No. 1 at Fromereville. Unfortunately, several challenges kept the hospital from making full use of the railway. The Americans had to modify the railcars to enable them to carry patients. Afterwards, each car carried eight wounded men and one orderly. Five cars, under a medical officer's command, constituted one full train. Major Macrae later reported on the train evacuations to the Chief Surgeon of the American Expeditionary Forces. After a poor rail right of way caused several derailments, the Medical Department temporarily abandoned the train with hopes of

resuming its use after repair (*MDWW* 1927, 8:697-698; Macrae n.d., 52-53; Bellinger, *Diary*, 155).

Around October 12, 1918, a brief lull in the fighting lessened the flow of wounded and the physical and mental stress of the previous weeks began to show among the medical officers. Some elected to sleep in dugouts over a mile away from the hospital. One officer suffered a breakdown and Macrae had to ship him to the rear. Illness obliged another officer to return to the rear. Vermin and insects compounded the hospital personnel's hardships. On October 18, Captain Bellinger wrote, "this Army game is fine. Most of the men and officers have a good crop of crabs. So we have a good time fighting the Huns, Crabs, Itch, and fleas, don't know which keep us the most busy. All goes in war (*Letters*)."

On October 14, the Allies resumed the offensive, and III Corps set its sights on Cunel Heights. After three days of hard fighting, it became clear that U.S. troops needed rest and reorganization before undertaking another major push. This mid-October drive produced a new stream of wounded for Mobile Hospital No. 1. The hospital increasingly saw gassing cases and other injuries severe enough to require amputations. The death rate remained high in comparison to earlier locations. The weather likewise continued its gloomy pattern of rain and cold temperatures. During this drive, Mobile Hospital No. 1 ran short of blood for transfusions, obliging Major Macrae to ask nearby fighting units to donate blood. Countless donors responded.

Late October's cold and damp weather caused the hospital staff to modify its operating room. They insulated the tent by tacking corrugated paper to the tent poles and placing blankets over the entrance and exit. They also covered the vents in the tents with heavy black tarps. With the addition of two stoves, the operating tent remained warm on the inside and dark from the outside to protect it from air raids. The flow of wounded kept the operating room tent busy at all times of the day and evening operations required improvised lighting. Candles placed in cut out bacon tins provided light free of electricity and safe for use in the tents during air raids (*MDWW* 1927, 8:631; Bellinger, *Diary*, 154-156; Macrae n.d., 55-57).

During the time that Mobile Hospital No. 1 was at Fromereville, two field hospitals for the 80th Division operated nearby. Field Hospital No. 317 served as the division's gas hospital, while Field Hospital No. 318 triaged its wounded. This worked well, as the triage delivered gas patients and nontransportable wounded to the appropriate local hospital and evacuated less seriously wounded men further to the rear. On October 24, German artillery struck one of the nearby field hospitals, killing one nurse

and two patients. Mobile Hospital No. 1 treated four of the wounded from this attack.

The attack on the field hospital occurred two days before III Corps Headquarters ordered Major Macrae to move Mobile Hospital No. 1 to a new location. The volume of patients flowing into the hospital had lessened by October 25, and several officers ventured north to observe the Verdun battlefield, but the German shelling there quickly convinced them to return to Fromereville. The smaller number of wounded being daily received in the hospital signaled an impending move long before the actual orders arrived. During their time at Fromereville, the hospital personnel received 658 nontransportable patients and conducted 627 operations (*MDWW* 1927, 8:705, 811; Bellinger, *Diary*, 156).

On October 26, the III Corps Surgeon, Colonel Bevans, summoned Major Macrae to his headquarters to ask whether Mobile No. 1 could move to a new location and be operational within a day. Macrae accepted the challenging orders on the condition that trucks be provided. Perhaps surprisingly, half a dozen trucks arrived on October 27. Leaving nothing to fate, Lieutenant Hanisch had already borrowed trucks for the move. Remarkably, Hanisch did this while he was ill and could not accompany the rest of the hospital staff when they moved. After several days of recovery, he rejoined Mobile Hospital No. 1 at its new location.

Packed with medical equipment and personnel, the trucks arrived at the intended hospital site at Esnes and discovered an unusable field, previously no-man's land. Major Macrae would not consider establishing the hospital on this pock-marked, debris littered field that may easily have held unexploded ordnance. Still fuming about the now comparatively better conditions at Les Claires Chenes, Macrae discovered a suitable hospital location nearby. The relocation initially enraged the corps surgeon, though when Macrae showed Bevans the ground specified in the orders they both agreed on the new location (Macrae n.d., 58-59; Bellinger, *Diary*, 159).

Mobile Hospital No. 1 moved from Fromereville to Esnes by the morning of October 28. As requested, the hospital had changed locations and prepared for patients in less than twenty-four hours (Macrae n.d., 61). Esnes, however, was a troubling sight, as a nurse later recalled that "the gas had burned the bark from the trees, [and] the earth looked as though it might have had smallpox, there were so many shell holes (Anderson 1919)." As the staff set up the hospital an ordinance team established a poison gas shell dump fifty yards away. The officer in charge of the gas ammunition told Macrae that if the Germans shelled the dump, gas would spread over the hospital within five seconds. Macrae, therefore, required

the entire hospital staff to have their gas masks "at-the-ready" at all times (Macrae n.d., 61). On October 31, Captain Bellinger recorded matter-of-factly in his diary that "Camp was Bombed last night (159)." Because of this danger to life and limb, many of the officers chose to live in nearby dugouts even though there they faced a higher risk of encountering insects, vermin, and disease. At this stage in the war, the horrendous conditions and heavy workload sapped the strength and patience from hospital personnel, causing tensions among the officers, nurses, and men.

Mobile Hospital No. 1 did not spend very long at Esnes as the Allied front line moved rapidly forward, necessitating another change. The first several days at Esnes consumed everyone's energy, as the surgeons spent sixteen hours a day in the hospital operating on wounded men who were arriving in progressively worse shape. Despite the heavy burden on the staff, Major Macrae wrote the Chief Surgeon on November 9, 1918, requesting permission to move the hospital forward or to detach the surgical department and a few beds for service at a forward field hospital. Between October 28 and November 9, Mobile Hospital No. 1 received 419 wounded patients, performed 367 operations, and recorded 79 deaths (Bellinger, *Letters*; Macrae n.d., 62-64).

By November 14, the hospital had completed its move forward to Bantherville, but the Armistice had gone into effect on November 11, 1918. The cease-fire brought cheers and excitement to everyone along the lines, including those in Mobile Hospital No. 1. Nurse Ida Anderson expressed her joy for this moment, stating that "an unearthly silence settled over the fighting world… the big guns stopped roaring forth death and destruction. That evening camp fires were seen on the hillside, and flares were sent up; it was a situation that went almost beyond human comprehension; it was almost too large for us to grasp, that the war was really over (1919)."

During the days following the armistice, the burden of caring for wounded soldiers shifted from the front line hospitals to the base hospitals in the rear. Temporary operating teams left and returned to their base hospitals as the others in Mobile No. 1 pondered their future. The area around the hospital quickly emptied of fighting units and finally on November 24 Mobile No. 1 received orders to report to Varennes. There, Mobile Hospitals Nos. 4, 6, and 8 joined them. After some idle time, demobilization orders arrived on December 16. The orders were disappointing as most people had assumed that they would enter Germany for service there. Nonetheless, Mobile Hospital No. 1 shipped out first on Christmas Eve, 1918. By January 6 the remaining mobile hospitals had

also departed Varennes and demobilized (Macrae n.d., 68-69; Hoeber 1921, 183-184).

Mobile Hospital No. 1 served with distinction from Belleau Wood to the Meuse-Argonne. It received two citations from American commanders and one from the French government. The first citation, signed by General John Pershing, commended Evacuation Hospital No. 7 and Mobile Hospital No. 1 for their service during Belleau Wood and Château-Thierry. A second citation signed by Major General C. P. Summerall, who commanded V Corps, commended Mobile Hospital No. 1 for the excellent and "self-sacrificing" care its members provided for the wounded during the St. Mihiel and Meuse-Argonne battles. Following the war and the unit's dissolution, Donald Macrae, Jr. received a citation from the French government awarding Mobile Hospital No. 1 the Croix de Guerre for their service at Coulommiers (macrae n.d., 77, 84). In contrast, no other U.S. mobile hospital received a Croix de Guerre, though the commanders of Mobile Hospitals No. 39, 1, and 2 received the Distinguished Service Medal, and nurses from Mobile Hospitals no. 2 and 9 received other citations (War Department General Orders No. 59 (1921), No. 19 (1922), No. 9 (1923); GHQ, AEF, Citation Orders No. 4).

Mobile Hospital No. 1 contributed markedly to the performance of the U.S. Medical Department in the First World War by helping to avert a medical crisis at Belleau Wood and Chateau-Thierry and by improving the system of medical evacuation during the Meuse-Argonne offensive. Had Mobile Hospital No. 1 not existed to provide the surgical services for Evacuation No. 7 at Coulommiers, the medical services might have proven woefully insufficient causing additional loss of life and embarrassing the Medical Department in a way it had not experienced since the Civil War. During the Meuse-Argonne offensive, Mobile Hospital No. 1 often operated within yards of the triage hospital. The two-fold benefits of this arrangement included quicker surgical attention to the severely wounded as well as diminished need for ambulances, as Mobile No. 1 often evacuated their own patients straight to base hospitals rather than transporting them first to an evacuation hospital.

Finally, Mobile Hospital No. 1 proved the value of forward surgical hospitals on modern battlefields. This was the first war in which a small U.S. surgical hospital was motorized and placed behind the frontlines. Mobile Hospital No. 1 followed the quickly moving Allied armies at a pace more similar to a field hospital than to an evacuation hospital. Though its achievements may not have impressed the authors of the official record, who undervalued the role of the mobile hospital, it left an indelible mark on all those personnel who were attached to it. Dr. Elliott

Cutler served with Mobile No. 1 during Belleau Wood and Chateau-Thierry. During the Second World War Cutler served as the chief consultant of surgery for the Medical Department and encouraged the adoption and use of mobile surgical hospitals (Woodard 2003). These hospitals persisted into the last half of the twentieth century as Mobile Army Surgical Hospitals (M.A.S.H.), serving the Army in Korea, Vietnam, and elsewhere until they became obsolete in the twenty-first century.

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SECTION III.

INJURY AND DISEASE

CHAPTER SIX

THE SHADOW LAND: BRITISH GUARDIANSHIP AND CARE OF THE MEDICALLY INTERNED DURING THE GREAT WAR, SWITZERLAND 1916-1919

EMILY MAYHEW

"They… live in a shadow land."
—Lt Col Henry Picot, British Officer in Charge of the Interned.

British Red Cross records state that 67,726 soldiers were interned in Switzerland on medical grounds during the Great War.[1] The vast majority of these were Allied servicemen, although there were a few hundred German officers sent from French PoW camps. Slightly fewer than half of the total (30,000) were British. Each man shared the same fate: capture, transport to a PoW camp, need of medical care. They were interned under the terms of Article 2 of the second Geneva Convention of 1906, a modernisation of the original, which stated that the sick and wounded of

[1] Reports by the Joint War Committee and Joint Finance Committee of the British Red Cross (London: HMSO, 1921), pps. 530 – 540. These reports are available in the original 1921 publication or in a paperback reissue of one volume (Naval & Military Press: 2008). They are the only significant primary source relating to internees in Switzerland. There are only four pages specific to the medical internees and most of them are taken up with plans for training and occupational therapy. Most material in Britain's National Archives is miscellaneous correspondence between the War Office and individual families of internees seeking information. In contrast, there is more attention paid in both primary and secondary literature to the wartime experiences of civilian (non-sick) internees in both Germany in Britain. The civilian camp at Ruhleben in Germany was a particular focus. For details on Germany civilian internees in Britain in a recent publication, see Panos Panayi, "Forgotten Prisoners of the Great War." Caroline Whitehead's Dunant's Dream is the most accessible and efficient general history of the International Red Cross.

an enemy nation could be sent "to a neutral state, with the consent of the latter and on the condition that it shall charge itself with their internment until the close of hostilities."[2]

Internment had a specific meaning within the diagnostic spectrum. It assumed that some kind of cure, a resumption of "solid contribution to National Efficiency" would be possible (Jones, 1917, 4).[3] Each captured soldier had the official designation of "petit blesse" (the best translation is "somewhat injured" rather than "a little injured"). Some of them were suffering from disease, primarily tuberculosis, which was endemic in German and all other European PoW camps (Daniel, 1997, 94).[4] None of them were "grandes blesses," who were so damaged as to be militarily valueless and therefore able to be sent home to be a burden on their family and on the warfare state (McCarthy, 1953).[5]

By the end of 1915, as numbers of petits blesses grew, it was clear to all combatant nations that Article 2 would need to become a reality. The obvious "neutral state" was Switzerland. Not only was it the host nation of the International Committee of the Red Cross (ICRC), it was close to all three Fronts, Western, Eastern and Italian. Internees could be transported relatively easily and in numbers across its borders. It was, however, not just a question of convenience that decided the location for the internees. Switzerland itself was a willing partner in this process beyond being the host nation of the ICRC and authors of the Geneva Convention. They had declared their neutrality on the first day of the war yet there was concern amongst their military and politicians that any neutrality might not be respected (Whitehead, 1998, 203). To counteract any possible threat, Switzerland took the initiative and offered to become the guardians of the medically interned.

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[2] For the full text of the relevant paragraph from Article 2, see www.icrc.org/ihl.nsf/FULL/180? OpenDocument.

[3] Colonel Robert Jones, Notes on Military Orthopaedics (London: Cassell 1917), from the Preface by Sir Alfred Keogh, p.4.

[4] Although there had no formal scientific establishment of the airborne nature of TB, 19th century medics understood that the kind of close confines typified by a PoW camp created micro-epidemics of the disease. The Tubercle bacilli are killed by daylight and good ventilation, both of which were in short supply in any kind of prison camp system whatever the country.

[5] This paper applies the term "warfare state" in its Edgertonian sense: the British State at war integrates social, medical, technological and military policy rather than clearly demarcating along warfare and welfare lines. Here the term is adapted to include the Great War in Edgerton's model although Edgerton's work focuses on the period 1920-1970. See David Edgerton, Warfare State: Britain 1920-1970 (Cambridge University Press, 2006).

They were ready to make the offer. Because of its political concerns, the Swiss government had begun to prepare for a possible role in the internment process since the very beginning of the war. The Swiss Army, primarily the territorial force as it remains today, had formulated a set of practical proposals for both the reception and care of the interned. A Chief of Staff was appointed, with the rank of Surgeon General. The medical department of the army was mobilised to assume guardianship of the internees, with responsibilities for their care, discipline and full medical treatment (Picot, 1919, 42). Swiss army medics, from surgeons to orderlies, would comprise the majority of medical professionals dealing with the internees, with gaps filled by civilian practitioners only where absolutely necessary. Language would not be a problem: all the military medics spoke French and German and most had very good English. In Geneva, the ICRC formalised the practical and financial arrangements. All sides agreed to pay for their own internees with the Red Cross committees in each country meeting any unexpected costs. Funds would be channelled through the ICRC and from there to the relevant Swiss service. Staff from other neutral countries was recruited to become medical inspectors, including doctors from Sweden, Denmark and the United States, until its entry into the war in 1917. Each joined a team, led by a Swiss doctor, and each team was allocated camps to visit. In return for guaranteed neutrality and safety, Switzerland became, in the words of the ICRC's own Bulletin, "the little cushion of Europe" (Picot, 1919, 17,[6] Whitehead, 1998, 203).

It wasn't just political concerns that motivated Switzerland's involvement with the internees. Economic factors were of equal importance in the decision (Picot, 1919, 19).[7] Back in the 1860s, a number of Swiss towns in the Alps started to think strategically about the economic potential of both summer and winter services to tourists. St Moritz was typical. It had a small tourist

[6] Henry Picot cited a popular newspaper article by Louis de Ischarner that proposed the idea of neutrality for services rendered. See Picot, The British Interned in Switzerland, p.17.

[7] Picot refers to the hotels and private clinics lying empty at the beginning of the war, p.100. For details on the development of the Alps in the years prior to 1914, I am indebted to the work of Susan Barton, Healthy Living in the Alps (Manchester University Press, 2008). This excellent study focuses on infrastructure and utilities, thereby placing the development of Swiss tourism in a broad historiographical context of value to economic, social and medical historians. Barton's work reflects the overall rigour and range of histories of mountains and mountain related activities including Fergus Fleming's Killing Dragons and Wade Davis' Into the Silence. For literature on the British influence on mountain sports see Jim Ring, How the British Made the Alps (London: Faber & Faber, 2000) and Robert Macfarlane, Mountains of the Mind (London: Granta Publications, 2003).

economy, mostly made up of a few walkers.[8] Its civic authorities decided to lengthen its tourist season and sought out new markets for the picturesque mountain town. A few visitors suffering from TB had already been sent to the town to take advantage of the long sunny days (prescribed as heliotherapy by their doctors) and the high altitude fresh air. These "cures" had been deemed successful and the numbers of patients were growing.[9] Medical tourism, therefore, seemed an excellent prospect. Thus St Moritz and a growing number of other towns decided to take advantage of their growing reputation for healing by building sanatoria so that greater numbers of the tuberculose could visit and take the cure. Davos was one such town that grew rapidly, from 100 to 3,000 by 1887, with the building of sanatoria, health clinics and medical facilities, and "offering not just facilities for the sick but career opportunities for carers and medical professionals" (Barton, 2008, 13).[10]

Both Davos and St Moritz also sought to develop sports tourism alongside their medical offering so their offering to visitors would be year-round. Every year brought something new. In 1885, St Moritz built the Cresta Run, a toboggan route that would become the prototype for all modern sled sports. In 1904, Davos built a ski jump above the town (Ashburner, 2002). Winter sports, however, were not always the priority everywhere in the Alps. Some towns sought out the exclusively medical market to appear more serious in its participation in the curing process. Leysin was one of these. In 1870 they built a health resort in the town and actively tried to prevent a winter sports season from developing so they would get a reputation for professional medical care (Barton, 2008, 79). This would be hard and ultimately impossible for any town with half-decent winter facilities and proximity to the Alps. Mountaineering was

[8] Sherlock Holmes and Dr John Watson are some of those who chose the Alps for their walking holiday, staying chalets along their route. See Arthur Conan Doyle, "The Final Problem" in The Adventures of Sherlock Holmes (London: John Murray, reprinted 1949).

[9] Heliotherapy was relatively successful in treating TB, provided the sufferer was in the early stages of the condition. Rest, sunlight and fresh air strengthened the immune system and provided greater defence against the effects of the bacillus. TB could be arrested by a sanatorium cure for years although it never completely eradicated the condition.

[10] Davos became the most fashionable of the sanatoria towns in the Alps. Arthur Conan Doyle sent his wife there; Robert Louis Stevenson was sent there when his TB was diagnosed; he wrote Treasure Island during his cure. Thomas Mann accompanied his wife there on her diagnosis. He had an X-Ray at the chest clinic and found that he too was a sufferer. He wrote The Magic Mountain based on his experiences in Davos.

becoming increasingly popular, with the first ascent of the Matterhorn by James Whymper in 1865. The Alpine Club, founded in 1857, had published its first journal in 1864 and had three hundred members. The Alpine Journal reported on the climbs made in the Alps and also recommended inns and routes. By the 1870s Thomas Cook's Tours to Switzerland included trips to view the Alpine peaks and the attempts of mountaineers themselves (Fleming, 2000, 296). Alongside walking and mountaineering, the relatively new sports of skating, skiing, and tobogganing brought tourists by the thousands to the slopes from the 1870s onwards. Behind them came the surgeons to mend the inevitable broken limbs. Soon the TB and sun cure clinics were joined by some of the earliest specialists in orthopaedic repair. Both kinds of patient care required X-rays so the radiology clinics were advanced and always busy (Barton, 2008, 79).[11]

The creation of an industry catering to the sick and health seeking meant more than just extra hotel rooms and employment for therapists in the Alps. The health tourist of the late 19th century was a demanding visitor. They wanted to experience the benefits of nature but with all the latest technological comforts (Barton, 2008, 134). So small, isolated Swiss towns, often reachable only by sled in winter, hurried to catch up. First came the railways: efficient national and international lines, capable of going to London or Paris in two days to collect tourists. Alpine towns raised money to have their own rail line link up to the national network, often running the rails right up to the door of the new grandest hotel or clinic in town (Barton, 2008, 114). Funicular railways were built, allowing tourists higher up the mountains than ever before, to the disgust of serious mountaineers (Fleming, 2000, 324). They laid good quality roads that resisted freezing weather from the lowlands as far as they would go up the mountain. Ambitious towns put in telephone and telegraph lines so their guests might always be connected to the outside world. Switzerland had only one time zone for the whole country so the train timetables ran with what would become their legendary efficiency; clients booking their visits in London could be sure they would not waste a minute of their expensive cure waiting on platforms.

Clinics had to be comfortable for their patients so this meant good lighting, hot water and cleanliness. Sewage facilities were modernised.

[11] The role of the growth of winter sports in the development of orthopaedics has yet to be explored in detail in the English language. Accounts of the development of orthopaedics have focused almost entirely on its military and industrial context. See Roger Cooter, Surgery and Society in Peace and War (London: Palgrave Macmillan, 1993).

Most Swiss towns had a local gas supply so lights were installed in all the rooms in all the clinics and hotels, and along the promenades built so that tourists could walk in comfort. Hot water for baths and bathing pools was essential, as it was for laundry. Clean sheets were assumed so large laundries were built everywhere to boil wash an endless supply of linen and guest clothing. There was central heating and double-glazing. Employment opportunities in all of the towns grew every season. Everyone who could claim their guesthouse was a clinic did so. The investment paid off as guests stayed for longer and longer periods. Some of them even sought a little hobby or craft work to interest themselves during their cures. Clinics designed adjacent workshops with light manufacturing to give their stronger patients something to do when they weren't taking in the sun or breathing deeply of the mountain air (Barton, 2008, 83). All their investments paid off, one way or the other. Even their dairy farmers saw the benefit. Before the antibiotic revolution, doctors sought all manner of cures for TB. Switzerland already provided what they saw as some of the most effective (sunshine and fresh mountain air); now the "milk cure" could be added to the list. Milk therapies offered by Swiss hotels offered a diet consisting of vast quantities of milk, guaranteed bacillus free by the local laboratory (Barton, 2008, 123).[12]

By the early years of the 20th century, Swiss tourism was an established part of middle and upper class travel, either for health or sport. Swiss spas were popular and successful, and the excellent modern infrastructure assured continued expansion. Their hotels were full year round and tourism was the most labour-intensive industry in the country (Fleming, 2000, 329). It had become, most profitably, "the playground of Europe" (Barton, 2008, 170). Then, in 1914, the playground emptied. Men like Geoffrey Winthrop Young came down from a climb in Zermatt to hear the news of war's outbreak and came home immediately. He would attend the very last Peace Rally in Trafalgar Square, go to the war as a journalist and eventually join up as a Medical Transport Officer (Davis, 2012, 7).[13] Everywhere it was the same. A few hardy (older) sports tourists came in the winter season of 1914, and fewer still the following one in 1915, but almost all the trade in medical visitors ended in a matter of

[12] The milk cure had been recommended for hundreds of years but it reached its peak in late 19th century Switzerland. Herr Nestle began his career here, along with the pioneers of milk chocolate and powdered milk, both of which were developed as a way of getting yet more milk into TB patients. See Barton, Healthy Living in the Alps.

[13] See Wade Davis, Into the Silence: the Great War, Mallory and the Conquest of Everest (London: Vintage, 2012).

weeks. Expatriate communities that had grown up around the winter sports crazes dispersed. In Davos, what had once been a thriving British skiing and tobogganing outpost of several hundred became a small group of sixty-two. Many of the trained medical support staff, such as physiotherapists and massage therapists went back to their home countries where their specialist skills would be needed, or for fear of the war and its consequences (Picot, 1919, 100). The infrastructure created in the previous thirty years remained. There was a network of towns, oriented towards the provision of medical care, with plenty of empty beds, welcoming populations used to dealing with the sick, excellent facilities and linked to the main Swiss cities and the rest of Europe by railways.

Britain was one of the combatant nations grateful for Swiss readiness in the matter of its internees. It wouldn't even have to arrange for bed linen or general medical supplies, although it would have to pay for them. The Red Cross Finance Committee in Britain recorded that it paid out FF 10,000 per calendar month from January 1916 to the ICRC (Joint Committee Reports, 1921, 537). It did however need a liaison in Switzerland to co-ordinate between the Red Cross, the Swiss authorities and the various authorities back in Britain. They chose a diplomat with military experience, rather than a military man with medical experience, and one who was on the spot. Lt Col Henry Picot was military attaché to the British Legation in Berne when war broke out in 1914.[14] From his memoirs, it would appear that Picot had no interest in winter sports and was in very good health, so he would be entirely focused on his new post. He was aware of the problem of medical internees and knew from the newspapers of the Swiss initiatives to solve it. He was well connected with the Swiss Army hierarchy. All of this ensured he was given the post of Special British Officer in Charge of the Interned early in 1916. He immediately communicated with his contacts in the Swiss Army's medical department to make himself familiar with the facilities for his charges. Privately he began to take notes, writing them up after the war in what is the only significant memoir of the British medically interned and their guardians in existence.

Picot's appointment coincided with the arrival of the first neutral medical inspectors in the PoW camps. Their mandate was to see every prisoner sent to them by the camp Medical Officers. From this group they would select the "petits blesses" using one of eighteen separate categories.

[14] NB. Henry Picot should not be confused with Georges Picot, a senior French diplomat who negotiated the Sykes-Picot agreement that led to the formation of modern Iraq. See Margaret Macmillan, Peacemakers: The Paris Conference of 1919 and its Attempt to End War (London: John Murray, 2001).

There is no extant list of these categories in the primary sources but it is possible to determine some of them. Tuberculosis was an instant internment ticket, as was "severe injury of the face and severe injury of the oral cavity" (McCarthy, 1953, 169). Their selections would be made regardless of rank. Once internment had been confirmed, the PoWs were loaded on to trains. They were frequently nervous as they travelled through the territory of their captors. There were Commissions of Review that waited at the border post and had the power to turn back those that were deemed to be insufficiently sick (McCarthy, 1953, 169). The first load arrived in February 1916, a kind of test group made up of 1267 French PoWs almost all of whom were tuberculose. The process was judged effective, so the regular transports began.

Picot, the British Special Officer sought to be as well prepared as possible. Although no British internees had yet arrived, he went to the main station in Geneva to see for himself the conditions of the men on those very first trains. In March 1916 he observed one train carriage full of late stage tubercular patients and the next whose passengers were "twenty seven men with only three legs between them" (Picot, 1919, 48). The first significant group of British internees who would require Picot's attention arrived on 28th May 1916. Most had been allocated space in Chateau D'Oex and a few in the nearby town of Murren. Chateau D'Oex was a small Alpine town was set in a valley above the left end of Lake Geneva, in the Swiss canton of Vaud. Its location meant it had an excellent micro-climate for health tourism. It was everything a Swiss town should be, full of wooden chalets with carved balconies, a friendly population and in summer, large herds of brown cows with bells round their necks in the high Alpine pastures. All of this remains true for tourists visiting Chateau D'Oex in the 21st century. According to a neutral medical inspector who visited the town in 1917:

> Chateau D'Oex was [primarily] a summer resort with hotels, boarding houses. [It was a] village in one of the most beautiful valleys in Switzerland, without even a suggestion of a guard. This was true not only of the village but of the entire valley in which is was located. The enlisted men lived in the smaller hotels, one or at most, two to a room – quarters equal to, if not better than those assigned to the officers in prison camps in Germany. They were treated both as to food and quarters on the same plane as the usual summer tourist. Officers occupied cottages and might have their families with them…the whole atmosphere of freedom and contentment was in sharp contrast to the ever-present bayonet, the soup and the swaggering pompous officer of the German prison camp (McCarthy, 1953, 168).

The town had been inspected by the Swiss Army planners. They found that its medical facilities were acceptable for the normal conditions of internees but that more advanced facilities would be needed for those with more serious medical problems or those in need of ongoing treatment. So Chateau D'Oex was connected up to two fully equipped hospitals staff by Swiss army medics, in Leysin (with its cluster of clinics) and Lucerne. Picot visited the designated facilities and thought that there were so many army medics working in Leysin it "looked like a garrison town"(Picot, 1919, 49).

Picot had decided to meet his first internees at their ultimate destination rather than at a border post, so he was at the train station in Chateau D'Oex when they arrived. He approved of the enthusiasm of the townspeople who waved flags and sang as the internees were unloaded. He also noted how they efficiently had mobilised their Boy Scout troupe to assist the Red Cross with stretcher cases. The walking interned were escorted straight to their billets in the town, and those too ill, mostly tubercular, went as planned to the hospital in Leysin. Another diplomat might have been satisfied with such well-organised arrival and got on the next train back to Berne, but Picot was taking his brief as Special Officer in charge of the Interned seriously. He stayed in Chateau D'Oex and paid attention to as many of the internees individually as he possibly could. It seemed the only way he could do his job. He had been given little guidance for the role and was left to decide how to define and discharge his responsibilities. For both the British authorities, Picot and the internees, this was an entirely new kind of war experience, with none of the traditional boundaries that usually defined a military-medical administration. Nor would guidance be forthcoming for the remainder of the war. British Red Cross records mention that "the work [of those with responsibility for the internees] … varies considerably from that carried out elsewhere" (Joint War Committee, 1921, 534) but that was all.

Picot's response to this lack of guidance was to set the terms of his brief and his responsibility as widely as possible. Although he had no medical knowledge, no detail of his internees' lives or care would be beyond his notice. He began almost as soon as he had a chance to study his first group at Chateaux D'Oex, blinking in the sunlight, undernourished and grey from their confinement, and mostly with no more clothing than the tattered uniforms they had when they left the train. They had no pyjamas, no underwear and no warmer clothes for the coming winter months. Picot knew that standard issue internee uniforms were available to replace worn uniforms, but that there was very little else in the Swiss stores. Using his status as Senior Officer, Picot activated a network

of British expatriates in Berne and Geneva. A British Legation of the Red Cross (BLRC) was formed, led by Lady Grant Duff, wife of the most senior British Red Cross delegate in Switzerland. This ICRC offshoot would be a kind of supply "fast-track" for Picot who simply asked its various committees for whatever he felt the internees were missing. Quickly a system was established whereby every arriving internee got a bag containing a uniform, shirts, slippers, pyjamas, several sets of underwear including thermals for the winter, and a washbag. Stores were set up for replacements. When the first winter came, Picot's internees were properly equipped. The system continued throughout the period of internment until the end of the war. There was no interference with the provision. Elsewhere at the war, at the Front and in the PoW camps, there was wide-scale reliance on the Red Cross to fill the supply gaps where they could.

Picot's sense of responsibility grew throughout 1916 as he became more familiar with the needs of his internees. He was rarely in Geneva or Berne, instead preferring to visit his charges wherever they were, whether it was a guest house in Chateau D'Oex or the hospital at Leysin and Lucerne. Some of the first and most frequently asked questions were from the sick. They were all worried that if they recovered fully, they would be sent back to PoW camps in Germany. Picot noted this as a considerable cause of stress for the patients and was able to assure them that their status as interned was irreversible, and that "the next move, when the time came, would be homewards…"(Picot, 1919, 79). This was only a preliminary problem for Picot, however. He was beginning to notice other problems with the medical provision he had once thought would be entirely sufficient.

The medical unit in Chateau D'Oex itself fell far short of his expectations. Any emergency surgeries that could not wait for a journey to Leysin or Lucern would be done in an improvised area in the clinic that did not meet Picot's standards. It prompted his visit, the first of many, to Colonel Hauser, principal medical officer of the Swiss Army. Picot asked that a full operating facility be installed in the unit. Hauser refused. Picot pressed again, then an internee got appendicitis and almost died because he could not be got out of Chateau D'Oex in time (Picot, 1919, 103). Hauser gave in and a full time operating theatre was installed. This would be the pattern for the remainder of the intern period: Picot's "repeated insistence" met with "considerable opposition" then finally, Swiss acceptance. The issue of female nurses was next and followed the same pattern. Picot noticed there were no female nurses in the Swiss medical facilities as Swiss military doctors refused to have them in their

institutions. Picot simply ignored their objections. It was ridiculous not to have female nurses in military medical facilities. For over a year it had been standard practice in British facilities in France to have a full complement of female nurses with considerable responsibilities for medical care (see Hallett, 2009). Using only male orderlies meant the Swiss facilities were understaffed and could be lacking in elements of everyday medical care. Picot badgered away at Hauser until he agreed to allow vacancies in hospitals and clinics to be filled by women. Picot would have to find the money from British funds but at least there were now sufficient staff and the right kind of care.

Picot noticed a different set of problems once his internee charges no longer required hospital based care. Many of the wounded needed physiotherapy and orthopaedic massages for missing or damaged limbs. Pre-war health tourism meant there were many gyms and physiotherapy centres full of the latest equipment such as electro-therapy machines, just no-one working in them (Picot, 1919, 105). More should be trained, as fast as possible, Picot told Hauser. The Swiss agreed and training programmes were accelerated but it took a long time for the improvements to filter down to the internees. It wasn't just therapies for orthopaedic patients that were deficient. Picot was also greatly disappointed that the standard of prosthetic limb manufacture in Switzerland was far behind the rest of Europe (Picot, 1919, 117). Many of his men were amputees but they were issued with heavy, poorly shaped prostheses that didn't fit their boots and made walking almost impossible, especially in hilly Alpine towns. So poor was the provision that most amputees preferred to manage without on crutches or got themselves a "peg leg" made by one of the BLRC committee carpenters. Even these crude stumps were considered superior to the official allocation. Solving this problem was beyond Picot, however, and he agreed with his men that the best thing was to struggle on and wait until they got home where they could have the specialist limb made bespoke and fitted properly. The system of prosthetic limb manufacture and fitting was far more advanced in Britain. Twenty specialist military orthopaedic centres had been set up. Limbs were manufactured to high standards for each amputee. Many of those amputees went on to work in limb workshops themselves and bring their personal experience into the manufacturing and fitting process for those casualties who came after them. Internees that suffered limb loss also suffered from perhaps the greatest disparity in care between Switzerland and Britain.[15]

[15] See Cooter, 1994 and the Oxford DNB entry for Robert Jones, also by Cooter. It should be noted that in neither of these works does the author refer to Jones' inspection of the internees medical facilities in 1916.

At this point it is worth noting the value of Picot's memoirs in compensating for the scarcity of official primary sources, particularly for detail on the selection process by the medical inspectors in the PoW camps. Picot's account is evidence for the range of conditions that ensured that petit blesses status was applied. Picot's concern about the quality of prosthetic limbs for his internees with limb loss implies that there were significant numbers of men with this disability. Therefore, the loss of one limb was not deemed sufficient to repatriate a PoW all the way home because this class of casualty was however still deemed capable of making a contribution to the war. However, internees could also be classified as "Active" once they were in Switzerland, even though they had a single limb loss. This "active" designation appears to have been applied to those not chronically sick or regularly hospitalised by their wounds and was interpreted to mean that they might be fit for some kind of occupational therapy or light work.

After six months, the system of medical care for Britain's interned soldiers in Switzerland had established itself. Although the system of care for the interned was something of an anomaly, it was not insubstantial. By the end of 1916, after the arrival of several more despatches of petits blesses from the PoW camps, Picot had 30,000 men in his care, all of who were injured or sick, some chronically, and who would be with him for the next two years. Despite its relative numerical stability, the system set up for its care was often improvised, dependent on voluntary groups and one man's non-medically informed instincts. Picot himself characterised the first six months as being that of a "transition period of trial and evolution, during which many mistakes were made, but which ended in the development of an efficient organisation capable of meeting all demands" (Picot, 1919, 109). However, the end of the transition period did not indicate an end to Picot's demands on Colonel Hauser and the Swiss Army medical department.

One particular injury class demonstrates Picot's growing understanding of the operative and post-operative demands of trauma. As we have seen above, facial injury, of both soft and hard tissue, qualified the sufferer for internee status. For those men arriving needing surgical reconstruction of their jaw and face, there were surgeons in Geneva and Berne (Drs Julliard, Machard and Matti) who already had civilian practices and who could incorporate injured internees into their existing facilities. The problems occurred when those patients left hospital and joined other internees in towns like Chateau D'Oex. Post-operative care of such patients required specialist dentistry to keep the trauma site healthy and undamaged. Swiss dental facilities were unable to provide the level of expert care required by

facial casualties. It was a condition that was seen primarily in wartime and therefore a rarity for a civilian dentist. Picot realised that such a patient load was a considerable strain and that no means existed for its relief (Picot, 1919, 113). He was therefore extremely grateful when a solution presented itself. Joseph Woods, a senior dental surgeon from Liverpool wrote to him in Berne offering to come to Switzerland to attend to the internees who required expert dental care. No record remains of how Woods knew of the great need and how he made the connection with Picot (who noted only that Woods, a Quaker, "felt an overwhelming desire to offer a dental service to [the internees]"). However it should be noted that Picot had taken care to ensure that press coverage was given to the arrival of the internees in Switzerland (Picot, 1919, 72-73). Furthermore the complexity of the injury and its aftercare was well understood by both British and European dental specialists. It is probable that Woods, like his European counterpart, Charles Valadier, realised the potential emergency and decided to resolve the issue himself (Cruse, 1987, Hartson, 1974).

Woods' initial proposal to Picot was for him to work at a suitable centre in Switzerland for a month. He would bring all the instruments and equipment that would be required by the internee patients. He would be prepared for all kinds of operative conditions and would be able to make or repair any prosthetic devices (Woods' letter to Picot, cited in Picot, 1919, 114). In addition he would offer dental services to the general internee population. f almost equal important was Woods' ability to get to Switzerland without relying on Picot to make his travel arrangements. He drove himself all the way there, accompanied by his wife, Margaret, who acted as both his mechanic and dental assistant. Approval from both Picot and the Swiss military authorities was instantly given. Woods had closed down his dental practice for the duration and arrived in Switzerland. It was obvious to everyone that he would be there for longer than a month when 200 men immediately registered as requiring dental care. He extended his stay, first for three months, and then indefinitely, agreeing to remain there as long as there were internees.

The situation Woods found was, as Picot had suspected, very serious. Dental supplies were running out, so the contents of his car boot were used up almost immediately. Resupplying continued to be difficult and Woods himself would replenish his own stores from Britain via the Red Cross rather than wait for the Swiss to catch up. The need for Woods' full range of technical skills was even greater. He took responsibility for men who had complex reconstructive work in Germany as PoWs or in Switzerland as internees. Many did not understand or have the ability to maintain their surgical repairs, particularly those who had dental prosthetics. In their

surgery in Murren (the next town along from Chateau D'Oex) Mr and Mrs Woods came to the rescue. He treated local infections. He manipulated loosened prosthetics and showed their owners how to care for their new mouths. Using his own supplies, he rebuilt splints, denture sections and other appliances for his patients, and installed them under local anaesthetic.

Although Woods was now practising in Picot's shadow land, it did not mean that his work was disconnected from the significant developments in facial reconstruction and dental surgery happening elsewhere in Europe as a result of the war. The reverse was true. Woods was providing post-operative care to patients of the greatest pioneer in jaw surgery, the German, August Lindemann. In this respect, he was working in advance of some of the more celebrated surgeons in Britain and France, such as Harold Gillies and Charles Valadier (Hartson, 1974; Cruse, 1987, Pound, 1964). Many of Woods' patients had received treatment in Germany for their injuries, moving between PoW camp and the German specialist jaw repair facility in Dusseldorf, run by August Lindemann and Christian Bruhn.[16] Lindemann had been acknowledged as the leader in the field by many in the surgical community before the war. The unit he co-founded with Bruhn in August 1914 offered a pioneering approach to the organisation of facial repair, in addition to its surgical excellence. It had

[16] August Lindemann is recognised as being the father of facial surgery by both historians and other facial surgeons, including Harold Gilies, the British father of facial surgery. In his book, Gillies notes the continual influence of Lindemann, even after the war had begun: "my American dental friend "Bobs" Roberts who had just returned from six months' jaw surgery in the American Hospital in Paris, brought back a book by Lindemann which he had received from Germany. It being a rather informal war, the enemy did not seem to mind our learning of the good work they were doing on jaw fractures." Later, once Gillies had started work at the Queen Mary's hospital in Sidcup he wrote of the trouble they were having with particular types of bone grafts. They were able to resolve the issues after reading that "Lindemann reported a series of bone grafts fixed with wires…". See Gillies and Millard, Principles and Art of Plastic Surgery. Lindemann's West Deutsch Kieferklinic was the first dedicated facial surgery unit in the world and he pioneered many of the standard surgical procedures there, as well as providing equally ground-breaking non-surgical treatments. Much of the literature on Lindemann is in German but he receives a few mentions in English. In German see Susan Mayer, Professor Christian Bruhn und die Begründung der Westdeutschen Kieferklinik (Dusseldorf: M.Trilitz). See also Harold Gillies, Plastic Surgery of the Face (London: Frowde, 1920). There is also film of Lindemann operating to rebuild a jaw, in much the same way as he rebuilt James Grey's face, in the British Film Institute.

state of the art x-ray facilities and medical records department. It offered both hard and soft tissue repair along with specially trained nurses who were able to cope with the feeding and hygiene requirements of facial casualties. It even had speech therapists, hired from the local dramatic academy, who retrained men with new jaws and damaged muscles to speak once again. Referral to the West Deutsch Kieferklinic was a matter of severity, not nationality, so there were German, French, and British patients in the wards. One such patient was James Grey, captured during the retreat at Mons on 29th August 1914, was sent to Dusseldorf in October 1914 and, from May 1916, an internee at Chateau D'Oex.

Grey's injury was emblematic of the kind of havoc wreaked by the new weaponry of the Great War.[17] He had had been hit in the face by a rifle bullet. It had smashed the left hand corner of his mouth, ripping open his lower lip and hitting his jawbone. The jawbone fractured and the pieces were jammed back down into his chin and cheekbone. The lower half of his face was being held on only by the flesh and skin of his chin. Lindemann's repair was emblematic of modern facial reconstruction. He took out the remainder of Grey's lower teeth and put his jaw back together using a combination of wire and bone grafting. It took a year for him to fully recover and then he was sent back to the PoW camp, Lager Dulmen in Wistoff. Lindemann's x-rays and medical notes were sent with him and he kept them close. The camp's strict diet of mostly soup suited Grey, but it was a relief to be selected for internment when the medical inspectors came in the spring. At Chateau D'Oex Grey was sent to live in a chalet, in a shared room with Private John Silvester of 2nd Wiltshires, looked after by a Swiss family used to caring for the sick. Grey still had all his medical notes and x-ray films from Dusseldorf, so when it came to his post-operative care, he was better prepared than most others. Regular appointments throughout Grey's internment ensured that Lindemann's prosthetics functioned well and cleanly. Grey's recovery, begun in Dusseldorf, was consolidated in Chateau D'Oex.

Post-operative care on patients like James Grey was only a part of Joseph Woods' work in Switzerland. He also treated ordinary dental conditions of men left malnourished by their imprisonment in PoW camps. He lectured in dental hygiene to groups where it had never been a priority. He saw, in total, 1229 patients, in more than 6,000 visits (Picot, 1919, 109). He performed almost 10,000 dental operations and built 673 new appliances. Even with the Woods' extraordinary commitment to their

[17] See David Nash, German Artillery: 1914-1918; Joseph Jobe (ed), Guns; William Reid, The Love of Arms. Also, Rich and Dimond, "Shrapnel a Misnomer" in Military Medicine.

internee patients, one dental surgeon plus an assistant was never going to be enough. A year later, Mr William Wall also volunteered to work in Switzerland and, like Woods, had a full workload for the remainder of the war."[18] Neither man cost Picot a penny. Wall's service was paid for by the British Dental Association and Woods the Quaker, paid for everything, including the endless resupplies, himself. In the meantime, the more Picot learned about military surgery, the greater were his concerns about the very nature of surgical provision in Switzerland. Early momentum to perfect the care of the wounded had been slowed. Picot felt that pressure on army expenses was causing surgeons to withhold operations from internees who badly needed them. Rumours about Swiss surgeons' attitude to their patients were rife: some of the soldiers were even referring to themselves as "lapins de laboratoire" for the surgeons to experiment on with new techniques or by withholding of treatment (Picot, 1919, 172). When Picot met with Colonel Hauser to discuss the matter, he felt that his fears were, in part, confirmed. Hauser said that treatment was often delayed for medical reasons, so that "the effects of good food and change of climate" might be observed (Picot, 1919, 123). He also explained how specialists were only called in when deemed medically necessary to save on costs. Picot was having none of it. He asked Hauser asked for a rethink of the policy and when it was denied him, he made a formal request to the Army Medical Service (AMS) back in Britain "for a surgeon of standing [to] be asked to inspect and report" on the situation (Picot, 1919, 124).

It is evidence of the profile of Picot and his internees that his request was taken as seriously as it was. Picot's report wasn't shuffled away or ignored. Instead it became a priority for a man whose other medical priorities were many: Alfred Keogh, Director General of the Army Medical Service (This was one of two posts which ran the entire military effort, Keogh at AMS in London and Arthur Sloggett who directed medical services in France). Keogh had always had close ties with the Red Cross; he had chaired the committee which co-ordinated voluntary medical aid in France on the outbreak of war and he believed

[18] There are a number of sources for the work of Joseph and Margaret Woods in the Friends Library at Quaker House in London. These include his obituary and various articles in The Friend (see 1st November 1918, "Current News of Friends." His experience in the shadow land of internment clearly made a great impression on him and he offered his services in the Second World War to the staff of the Alien Internment Camp outside Liverpool. Although retired from active practice, he became a teacher and spiritual counsellor at the camp where, according to his obituary notices in the Friends House bibliography, his charm and sense of humour made him a much-loved visitor.

wholeheartedly in the role for voluntary and territorial medics in wartime (a view not shared across the British military or medical spectrum).[19] At the time of Picot's report, Keogh was dealing with the medical consequences of the Battle of the Somme, and fighting demands from the Army that the AMS cut costs. Indeed, Picot's report may not have been the only one on his desk regarding the internees in Switzerland. There had been complaints from the British soldiers about rations and from the Swiss army about British drinking (Watson, 1980, 196). There was no attempt by Keogh to defer his reaction to the reports until after the offensives of 1916. He clearly believed the issues raised were ones of importance and worthy of proper attention. Accordingly he despatched the best surgeon he knew to inspect the surgical facilities in Switzerland (and to note other problems that might be outstanding), Robert Jones.

Robert Jones had both a national and international reputation in the field of orthopaedics. It was something of a hereditary feature. He had apprenticed with his uncle, Hugh Thomas, who had invented the Thomas Splint, the prototype of the splint still in use with limb injuries today (Robinson & O'Meara, 2009, 540). His nephew shared his commitment to the field and, by the end of the 19th century, had been able to establish orthopaedics as a discipline in its own right. At his practice in Liverpool he had established the first outpatient clinic for orthopaedic cases in Britain. The clinic could treat both children and adults, of which there were plenty: the former with disabilities related to polio, the latter provided by accidents in the heavy industry and construction projects of Liverpool and Manchester. Like Lindemann, Jones didn't just have surgical excellence to offer his patients. He had also instigated a new system of administering the staff and systems that dealt with the injuries including teams of limb-fitters and physiotherapists (Cooter, 1994). The result was a huge improvement in the number of patients who were treated at the clinic, far greater than any other in the country. Jones rolled his system out nationally to equal success. When war came, he repeated it for the Army and was appointed Director of Military Orthopaedics in March 1916 by Alfred Keogh. He was in the process of organising the network of military orthopaedic centres in Britain when another call came from Keogh, asking him to go to Switzerland (Watson, 1980).[20]

Jones protested to Keogh that the orthopaedic centres were in need of his careful supervision but Keogh insisted. Not only did Jones have the

[19] See Keogh's entry in the Dictionary of National Biography by Mark Harrison.

[20] See Cooter, Surgery and Society in Peace and War, (London: Palgrave Macmillan 1994). Frederick Watson, Sir Robert Jones (London: Ayer Co. Publishing, reprinted 1980) pps 196 – 200.

right surgical qualifications to assess the situation as raised by Picot, but he was also a fine general organiser and administrator. While he was there, he could also look at all the other problems that had been reported. He arrived in Switzerland on December 22, 1916 and commenced his inspections at once (Picot, 1919, 125). There was a newly-arrived contingent of internees and Picot felt this would give Jones an excellent opportunity to compare them with men who had been under Swiss care for some time.

His first task was in to investigate the domestic complaints of both the internees and Swiss authorities. He found the locations such as Chateau D'Oex to be "delightful" and completely appropriate for the task of medical internment (Jones, cited in Picot, 1919, 128). He found Swiss food to be excellent and concluded that most complaints were made on the grounds that the carbohydrate content (mostly macaroni and polenta) didn't suit the British palate. British soldiers weren't used to Gruyere cheese (it was too white) or Swiss soup (too thin). Jones suggested they thicken the soup and offer more sausage. The problem of drunkenness was more complex. British internees were not allowed to use Swiss cafes and bars but there was no penalty for café owners who let them in to spend their small military stipends there. Jones initially suggested Picot to try for some kind of penalty system whereby café owners were fined but both men were reluctant to install punitive methods on men who were recently kept in PoW camps (Watson, 1980, 198). Jones would also have been aware that for Swiss Army medics, alcohol was more than just a problem with social consequences. It was also believed to be "the most powerful propagator of Tuberculosis." Preventing TB was a significant platform of all Europe's temperance leagues during the period, as well as a priority for the medical authorities in dealing with the internees. There was quite enough TB in Switzerland by 1917 and they did not want it to spread.[21] So café-keepers were reminded of the rules once again, and Jones urged more yet more training and occupational therapy on Picot's internees to keep them busy and off the sauce.

Jones' primary interest was in the investigation of Picot's complaints against the surgical units of the Swiss army medical service. He attended emergency surgeries in the hospital at Leysin and spent several days at the main hospitals in Lucerne, Berne and Interlaken. He took the plight of the men he found there every bit as seriously as he did those at home. He did indeed find that Swiss surgeons were conservative in their approach but, as he told Picot, this was as it should be. Too many surgeries too early

[21] See various posters in the Imperial War Museum (London), eg. No.12732.

caused infections and these could kill just as quickly as any wound, and spread to other patients in the ward.[22] He wasn't sugaring the pill in order to get home quickly. Jones was quite capable of stern criticism of other surgeons, particularly those in British general hospitals that he felt "were not competent to handle a large percentage of the wounded" (Cooter, 1993, 114). But this was not the case in Switzerland. Wherever he went, Jones made it clear to the patients waiting in the wards that they were getting much the same treatment as they would at home. Swiss surgeons were not neglecting them, as it had been rumoured, but were doing exactly what Jones himself would have recommended. The patients were "as well off in the matter of expert opinion as if they lived in London" (Jones in Picot, 1919, 117).

Overall, the range of operative work done in the larger metropolitan hospitals where British internees were sent impressed Jones. He examined every British officer in the hospital in Leysin and emphasised to each one the quality of their care. They in turn were to pass on the message to their men, so the concerns might cease. His final report wasn't entirely positive. Jones, for whom physiotherapy was an essential component in orthopaedic practice, noted that the deficiency in massage therapy had not yet been made up. He urged the Swiss to speed up training and to train suitable internees to join the programme and become massage therapists themselves. After nine days, Jones came home. He had found nothing to support Picot's concerns or those of the internees and he had decided that the drinking problems were beyond his concern. He submitted a detailed report concluding:

> The sanitation and housing were excellent; the feeding good in quality and plentiful; the Swiss doctors in charge well-trained and attentive, and quite competent; the specialists extremely good, and every reasonable facility afforded for consulting them; the General Hospitals for serious cases were staff by competent and often distinguished surgeons…" (Jones cited in Picot, 1919, 118).

In his short visit, Jones had recognised that at the heart of many of the complaints and concerns was a need for reassurance in an English accent by someone from Home. That there was a great need to understand that one of their own experts approved of what was happening to them, and that they would not be further injured or die from neglect. Jones restored

[22] Harold Gillies makes the same point in his Principles of Plastic Surgery(p.23): "Never do today what can honourably be put off till tomorrow….Time … is the surgeon's greatest ally."

trust in the Swiss system for both its patients and for Picot (Watson, 1980, 199). He also must have made an impression on Colonel Hauser and his staff. After he left, the number of Swiss civilian surgeons inspecting the medical facilities regularly was increased from one to four. They reported back to Picot and he never complained again (Picot, 130).

Jones had recognised perhaps the most significant problem faced by Picot and the other guardians of the interned. Physically they were as well cared for as any casualty group from the entire war. They lived in comfortable surroundings and were in no physical danger. But psychologically the group was far less stable, and it was difficult for anyone to improve their mood for very long. They were in a world of their own, confused by internment and most never stopped wondering why they had not simply been sent home. Picot saw that they were "mostly very apathetic" with very little interest in the wider war. They lived, he concluded "in a shadow land" (Picot, 1980, 172). It wasn't every single man, but the majority seemed to develop collectively a series of symptoms that reflected their status. They were herded together with others in the same state, deprived of their liberty and with no idea how long the situation would last. Among these symptoms noted by Picot were an inability to concentrate, memory loss, insomnia, passivity, quiescence and great gullibility. Some of the internees even complained about Chateau D'Oex itself. Its streets were, according one soldier, often "slushy" (Whitehead,1998, 40). However negative their thoughts, there was no need for guards at Chateau D'Oex; most internees were too drained to think of escaping (McCarthy, 1953, 168). There were always rumours buzzing around internee towns about the arrival of the Germans, of the cutting of rations, of the loss of the war, any small thing – it was in the rumour machine that the "lapins de laboratoire" story had begun. The bored men seized on anything and discussed it to death, only stopping when Picot or other staff members quashed the rumour (Picot, 1919, 178).

Picot spent much of the remainder of the war trying to resolve this problem of the internees' psychological state. He tried out a range of remedies. After a complex negotiation, the YMCA opened one of their Huts in the town.[23] The Grey Hut provided a range of activities, including

[23] The single source for the Grey Hut, available on the internet and via the Red Cross website details religious tension in Chateau D'Oex that delayed the construction of the Hut. However it has been impossible to find a second source for this tension and may have been only related to the different denomination of chaplains working in the valley. Picot, who talks about the Hut extensively makes no mention of the religious tension, save to state that "among the soldiers, the religion without label is the most respected (Picot, 169).

language classes and offered good hot cheap meals to supplement rations (although no alcohol). In particular, the Hut sold British-style cakes and puddings that were extremely popular and could be taken back to internees' residences for later. There were entertainments that drew large audiences, although Picot realised that a screening of the cinema film "The Battle of the Somme" went too far. He had attended a showing and noted how the audience of soldiers were silent throughout, trooping out at the end without saying a word (Picot, 1919, 185).[24] The only thing that seemed to cheer them up was a letter from home or the prospect of a visit by a loved one. Six hundred family members would come during the course of internment, beginning in September 1916, so relatively few of the 30,000 internees were able to benefit from such visits (Picot, 1919, 174).

The YMCA was only one of the voluntary groups relied on by Picot to help solve the problems of the shadow land. The various BLRC committees were the most useful especially when they took on the organisation of the visits by families. Where necessary they helped with travel expenses and their members put up families who couldn't afford the few empty hotel rooms left in the Alps. By 1917, there were 46 separate volunteer organisations based in Geneva who sought to provide care for the internees, many of them made up of British expatriates who had stayed in Switzerland during the war. They provided everything from bread baking to clothing to extra emergency funding for Picot's projects (Whitehead, 1998, 205). Mr and Mrs Woods volunteered the few spare hours they had outside the dental surgery by organising entertainments and lectures for the internees. Then there was Miss Simpkin of Manor Farm Chalet at Interlaken. She had previously run a small hotel for visitors to the area. When war broke out she turned it into a convalescent home especially for mental cases. She provided 20 beds for the treatment of psychological patients who had arrived as internees with psychological injuries (Picot, 1919, 107). Once again, it is worth noting that this was a category of petits blesses also not covered in the primary source record. Shell shock or neurasthenic disorders did not necessarily mean repatriation and therefore there was a class of men suffering from these conditions who found themselves in Switzerland. There was no dedicated space for them in the Swiss hospitals or in the towns so Miss Simkin's chalet was

[24] Picot, p.185. For the work of the Grey Hut in Chateau D'Oex, see www.scarletfinders.co.uk/163.html. Accessed 16/08/2012. For an overall history of the work of the YMCA in the Great War, see Michael Snape, The Back Parts of War: The YMCA Memoirs and Letters of Barclay Baron, 1915 – 1919 (Birmingham: Boydell Press, 2009).

always full. As one group of internees grew steadier and were able to take up places in the towns and villages, they were always replaced by other fragile PoWs from the transports.

For those internees whose injuries were of the sort classified as "active," apathy was a particular problem. Picot organised for a range of training courses to be set up where they could learn skills and trades that might benefit them in peacetime. Chateau D'Oex was one of the towns where workshops already existed as occupational therapy for their health tourists, so facilities and trainers were easy to find. Soldiers, few of them educated beyond elementary level, could learn motor engine repair and corsetry. They could take courses in carpet making at a nearby carpet factory. The Berne College of Art offered bookbinding. They could even take courses in hotel management, an education developed to a very high level in Switzerland and empty during the war years. Despite Red Cross support of these "social and alleviating activities," Picot recorded that take-up was never very high (Joint War Committee, 1921, 535). Men worried about working too much as being seen as too fit or too active, which meant (mistakenly) there was absolutely a chance they might be sent back to the PoW camps in Germany (Picot, 1919, 165).

Although Picot felt he was never able to make much difference to the general mindset of his internee charges, there were some positive achievements. Sport was popular and participation varied according to the season, as internees used some of the facilities left behind by the tourists. Guides taught basic mountaineering skills to those who were sufficiently mobile. There were football tournaments and Chateau D'Oex hosted a boxing competition. There was ice hockey, tennis and fencing. Some of the internees put together a team for the Swiss Military Tournament of 1917 although "success was practically limited to the bayonet competition, where [the British team] beat all comers…" (Picot, 1919, 187). It wasn't just sports teams who did well. James Grey was one internee who had thrived during his time in Chateau D'Oex. His regular medical appointments gave his life structure and he was able to eat the nourishing food prepared for him by the family who housed him. He grew a moustache to cover his scarred face. He put on weight and took up hiking in the mountains around the town, taking the family dog with him on his treks. He even tried some of the winter sports the area was famous for, getting hold of a pair of snowshoes so he could go higher up the mountains. His photograph album tells the story of his time in the shadow land, and the daughter of his hosts appears in many of the images, so he

must have formed a particular bond with her.[25] Chateau D'Oex gave Grey time to heal and strengthen without cares and responsibilities. There was no equivalent back in Britain to this kind of medical space, so this was a particular advantage to internment for the facial casualty.[26]

The final months in the shadow land were strange and confusing. In June 1918, as with many other places, a significant outbreak of influenza hit first the Swiss army and its medics, and then one internment town after another. So many staff were taken ill that the movement of basic supplies was affected. It fell to the volunteers to help out. Despite having several staff members also seriously ill, the Grey Hut made a significant difference in what were now flu wards in Chateau D'Oex, Murren and Leysin by supplying them with regular hot food. The BLRC went to the Swiss dairy farmers to reactivate supplies for the milk cure. Milk puddings and other kinds of dairy-based meals were sent to whoever could take delivery in the hospitals and clinics (Joint BRC reports, 1921, 539). Not everyone had recovered by the time of the Armistice, but those who had attended an impromptu celebration organised in the Grey Hut in Chateau D'Oex. There was music for dancing and gallons of tea (no alcohol) but for that one night, the internees probably didn't need it. The internment system was dismantled immediately and British internees were returned home by Christmas, except for a very few still in hospital. The last man left in February 1919.

Picot returned to his normal diplomatic post in Berne. He had spent four years in charge of the Interned and had found himself a kind of medical administrator by default. He had never reverted to military organisational modes, as his pre-war experience might have dictated. Instead, he learned from scratch what it was to take responsibility for the sick and injured. He mastered all aspects of their care, from primary through surgical. He was prepared to clash with the Swiss military authorities if they failed to live up to their responsibilities as he had come

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[25] James Grey's archive can be viewed at the Imperial War Museum: Record no.04/3/1.

[26] "A thoroughly reliable and trustworthy man with a blameless record. He went overseas with the original BEF and was wounded and taken prisoner at Mons. He was subsequently interned in Switzerland and eventually repatriated. Formerly employed as a postman." From James Grey's records, copied in his IWM archive, 04/3/1. Grey's archive is notable as it consists of medical records, a few Army documents and carefully kept photographic albums from both his time in Dusseldorf and in Chateau D'Oex. The Grey archive is a useful reminder of the importance of visual primary sources both alongside or in the absence of written primary material.

to understand them. He impressed some of the most important medical men at the war, and made the Shadow Land a bearable place for its inhabitants. Picot would receive the Legion d'Honneur and a CBE in Britain, and wrote his memoir in 1919. Without it, there would be no record of the Shadow Land at all.[27]

When the days brightened once the war was over, there were no guarantees that Swiss tourism would resume its pre-war level of success. Although no cure for TB had been found (French biochemists had begun work on what would evolve into the BCG vaccination), drug therapies were slowly replacing rest, altitude and heliotherapies (Daniel, 1997, 134). There were still some who came back to Switzerland and lay on the covered sun terraces of the grand hotel-clinics but there were very few British among them. Switzerland had become too expensive for most of the TB patients and it was considered rather unpatriotic to try and recover abroad when there were so many British doctors ready to help just back from the War (Daniel, 1997, 156). Overall, this decline no longer caused fear in the Swiss commercial sector. For every missing health tourist, came a skier, a skater, a tobogganer, a curler, and a mountaineer, men and women. This wasn't just a question of picking up old hobbies where they were left off before the war. Alpine sports had been rejuvenated. Industrial R & D that produced the instruments of modern warfare was now producing modern winter sports technologies. Metal alloys were lighter and stronger. Skis, still wooden, were faster, and skate blades were thinner. Pitons and karabiner clips were strong enough to hold the weight of a man or even several men, which meant that British and European climbers could cross previously impossible faces of the Alps, or at least they could try (Fleming, 2000, 345). Although a section of their community had left for the Himalayas, including George Mallory, Alpine mountaineering got a new lease of life in the 1920s. Mallory's mentor, Geoffrey Winthrop Young survived the Great War, although he lost a leg in 1917 on the Italian Front. He would climb the Matterhorn after the war in a prosthetic of his own design (Davis, 2012, 9). Winter sports across the board had all become extremely competitive, all of which was highly beneficial to the Swiss tourist economy. The mountains filled up with competitors, not patients. In 1921, the British Ski Championships were held in the Alps, and the Winter Olympic Games came to St Moritz in 1928. The north face of the Eiger was the last great Alpine conquest still to

[27] Picot's memoir was published by Edward Arnold, the literary firm that was almost the house publisher for British mountaineers. Arnold published all the official and personal reports of the British expeditions to Everest during the 1920s. See Davis, 74.

be made. The hotels at the foot of the mountain filled up with spectators for every attempt. The new Nazi government of Germany made it a point of national honour for its own mountaineers to claim the prize but the mountain gave a deadly shrug and killed everyone who tried. In 1938, two Austrians, Heinrich Harrer and Fritz Kasperek climbed the Eiger's north face and, in a journey just as dangerous, made it back down. Switzerland would keep her neutrality in the Second World War although the Swiss Nazi party opened up its head office in Davos, just in case. It was a different war, without the fixed fronts that had resulted in the hundreds and thousands of PoWs being taken, so there was no medical internment on the Great War model. The only injured Allied servicemen in Switzerland had been brought there unofficially and were mostly aircrew. There were long networks of German and Austrians prepared to risk their lives hiding escaped PoWs and passing them along to safety in Switzerland. One such reseau ended in Klosters, near Davos. Paul and Hans Guler had honed their skills guiding the most daring of winter tourists during the 1930s. During the war, they put their knowledge of the mountains to more important use. When word came, and the nights were sufficiently moonlit, they skied the Silvretta Glacier which formed the border between Switzerland and Austria, and guided groups of Allied PoWs to safety in the village. These small groups that formed in Klosters and other border Alpine villages were themselves shadows of a shadow land, once again saved by the Swiss, waiting for a war to end.[28]

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[28] The journey made by the Swiss guides on the reseau over the Silvretta was extremely dangerous both for its crevasses and the conditions. In 1944, Paul Guler would be delayed on the glacier in freezing temperatures and die several days later of hypothermia. Conversations by author with Ruth Guler, Beryl Tylden-Wright, Robert Mayhew, 1967-1979.

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CHAPTER SEVEN

ALEXIS CARREL'S CONTRIBUTION TO THE CARE OF THE WOUNDED: 1914-1918 AND THE ROLE OF ROCKEFELLER INSTITUTE IN MEDICAL ADVANCES IN WORLD WAR I

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World War I began with improved weaponry and military equipment from earlier wars. Medical care of the wounded lagged behind. Sir Berkeley Moynihan described the dilemma faced by military surgeons. He said, "Neither the civil experience of the last forty years, nor any recent military experience, had prepared us for the kind of work which the outbreak of the campaign it was our duty as surgeons to perform . . . The character of the missiles in respect to the mode of flight and velocity was not that with which former wars had made us familiar. The damage inflicted upon the tissues was far greater then and different in quality from that commonly, seen in South Africa" (Moynihan 1916, 333-37). Perhaps Moynihan as a civilian surgeon was incompletely aware of the experiences of military surgeons in the more recent wars, namely the Second Boer War (1899-1902) and the Russo-Japanese War (1904-05), where increasingly more powerful weaponry had already been used; however, nothing on the scale of medical catastrophes had ever been seen before by military surgeons, many of whom came directly from civilian practice. This chapter will address how important advances in military medicine were made by heroic surgeons and dedicated laboratory scientists working near the front lines in France. Special attention will be directed to the work of surgeon Alexis Carrel. Also, the support given him and other scientists by the Rockefeller Institute and its parent organization, the Rockefeller Foundation in New York, will be noted.

Prior to the Great War, Alexis Carrel had achieved international recognition as an experimental surgeon. Born in Lyon, France, in 1873, and educated there, he had published a triangulation technique for blood vessel anastomosis in France in 1902 (Carrel, 1902, 859).[1]

Carrel, lacking opportunities for career advancement, had come to the United States by way of Montreal where he attended a surgical congress in 1904. There he met Dr. Carl Beck who invited him to come to Chicago and work with him in animal research on an esophageal replacement fashioned as a tube from the greater curvature of the stomach (Baader 1986, 85-88). Beck introduced Carrel to Dr. George Stewart, physiologist at the University of Chicago who hired him to work with Charles Guthrie in the Hull Physiology Laboratory on blood vessel anastomosis in 1905. It was there that he began work in the United States on organ and limb transplantation on dogs.

This work drew the attention of the medical profession in the United States as well as the public at large by its sensational nature. Carrel was transplanting a dog's own kidney into its neck and demonstrating normal flow of urine and grafting dogs' limbs from one dog to another. An invitation to speak at Johns Hopkins Medical School in 1905 probably was instrumental in Carrel being invited to organize a laboratory of experimental surgery at the new Rockefeller Institute in 1906 in New York. The Institute was a philanthropy conceived by John D. Rockefeller, Sr. with the aid of personal friend and advisor, a Baptist minister, Fredrick T. Gates. Gates recognized how inadequate medical treatments available were to the sick at the turn of the twentieth century in America and the need to place therapy on a more scientific basis. Rockefeller was taken with the idea after receiving a memo from Gates and became a pioneer in the development of one of the first research institutes for medicine in the United States. Two close friends of John D. Rockefeller, Jr., Dr. Emmett Holt and Dr. Christian Herter, met with him to advise how to proceed on this major endeavor (Corner 1964, 31). Later deans and faculty from Johns Hopkins, Harvard, Yale, Pennsylvania, and Columbia universities were consulted. Thus, the Institute was founded in 1901. Simon Flexner, who had trained at Johns Hopkins under Professor of Pathology William Henry Welch and was currently professor of pathology at the University of Pennsylvania, became the first director.

[1] This method involved using very small needles to place three equidistant fine silk sutures around the circumference of the blood vessels thus fixing together the two vessels at three points forming a triangle. He then ran sutures between the three points. This technique prevented narrowing which occurred when suturing directly around the vessels and thus lowered the risk of blood clots and failure.

Actual work began at Rockefeller Institute on November 1, 1904. Initially, three departments were organized: pathology and bacteriology; physiology and pharmacology; and chemistry. Although the Institute had not planned for a laboratory of experimental surgery, Alexis Carrel's spectacular work in France and Chicago led to his invitation to join the investigators in 1906. Rockefeller Institute was to take a major but unexpected role in the advancement of wound care and transfusion of blood in the war less than a decade away. Four years later, Peyton Rous, a Johns Hopkins medical graduate and instructor at the University of Michigan, joined the staff at Rockefeller Institute. He was able to demonstrate the transmission of fowl sarcoma by a filterable agent even before the war and he would later receive the Nobel Prize for this work. At first it was a filtered extract but Corner states in A History of Rockefeller Institute that "without doubt, a virus, too small to be seen with the microscope was causing the tumor, just as similar viruses were already known to cause foot-and-mouth disease, rabies, and as Flexner had recently shown – poliomyelitis" (Corner, 1964, 110).

A friend of Carrel, Dr. George Crile of Cleveland, one of the leading surgeons in America, was invited by the American Ambassador to France when the war began in 1914 to assist in the new American Hospital or Ambulance Americaine at Neuilly-sur-Seine. He quickly developed a plan to bring a university service consisting of surgeons, nurses, and ancillary personnel. Other university services were to follow in rotation. By January 11, 1915, Crile and his team were on duty in France (Crile 1947, 247-52). Dr. Crile told in his autobiography that "early in the twentieth century, blood vessel suturing was being developed in France and further perfected by Alexis Carrel at Rockefeller Institute. From Carrel I learned the technic; then on dogs I mastered the technic of suturing arteries to veins. At long last I believed that I had found a substitute for the disappointing saline infusions and could establish an effective method of treating hemorrhage and shock" (Crile 1947, 162). Crile attempted, but failed on his first human transfusion in December 1905. His second succeeded on 8 August 1906, in a patient with post-surgical hemorrhage from a nephrectomy. After problems with clotting when using Carrel's suture technique he began using a small mechanical tube devised by Mixter to connect the vessels with improved results. By 1907, Crile and his associates had performed 225 experiments with blood vessels in animals at Western Reserve Medical College and 32 in clinical cases (Crile 1907, 329-32). In the clinical cases he connected the radial artery of the donor to any superficial arm vein available in the recipients.

Under adverse conditions, Carrel performed the first blood transfusion in New York City on Sunday, 8 March 1908, at the home of the patient, a newborn infant who was bleeding to death from melena neonatorum, a condition now known to be due to vitamin K deficiency and characterized by the passage of black tarry stools due to blood in the intestines (Walker 1973, 494-96). Carrel was called in by the father, Dr. Adrian V.S. Lambert, clinical professor of surgery at the College of Physicians and Surgeons, Columbia University, who had frantically searched the medical literature hoping to find something to save his child's life when he discovered Carrel's work on blood vessels. Carrel reluctantly performed a direct transfusion joining the father's left radial artery to the infant's popliteal vein. The risky procedure saved the child's life.

The next year Carrel and Dr. Adrian Lambert saved the life of another infant with the same condition. (New York Evening World, Feb 8, 1909) It was about this time that Carrel's name was being placed in nomination for the Nobel Prize by Dr. Carl Beck of Chicago, with whom he had worked earlier.

Although Karl Landsteiner had discovered three blood types in 1901, A, B and O and the fourth, AB, discovered in 1902 by Sturli and Dr. DeCastello, there were no clinical methods in general usage for easily determining at the beginning of World War I if a transfusion might lead to a hemolytic reaction and death. Up until that time in the rare instances when blood was transfused, it was often a matter of chance that a death might occur.[2]

Carrel reported his first studies on wound healing in 1910 (Carrel 1910, 21-48). In this paper he stated, "From a metaphysic standpoint it would be interesting to discover why a wound heals". By delving into this question he asked, "Would it not be feasible to act on the processes of reparation themselves and to activate them? The wound which now heals in a few days could possibly be caused to heal in a few hours" (Carrel 1910, 2148-2150).

Speculation by Carrel on this subject no doubt had its origins in his own experience as a young doctor in France where he had accompanied a train load of pilgrims to Lourdes. There he believed he had seen a miracle healing under the influence of the spiritual setting (Carrel 1950, 38). It was this early interest in wound healing that probably led to his further investigations in wound biology while caring for the wounded in the war. Since he saw no reason why tissue reparative processes in wound healing

[2] Landsteiner who had made his important discovery in Vienna would later join the staff at Rockefeller Institute in 1922 and later receive the Nobel Prize in Medicine for this work. (Corner 1964, 205)

could not be expedited, he sought ways to promote them. This proved to be a very difficult challenge.

As an example of Carrel's interest in wound healing before the war, Carrel explained to a colleague a procedure he was using with a preparation that originated in France called Ambrine.[3] Using a warm mixture of Ambrine, paraffin, bee's wax, and castor oil, he applied it on top of small grafts of skin preserved in cold storage. He noted. "In cases of painful ulcers, I have seen the pain disappear quickly and the proliferation of epithelium was rapid" (Carrel to Bordley, 1913, Apr. 18).

In early 1912 Carrel had the following projects at Rockefeller underway: preserved skin tissue from a still-born infant to be used as a graft on a patient with a leg ulcer, identifying individuals between which organs could be "interchanged," replacement of the aorta in patients with aneurysms with tubes of metal or glass or tubes lined with veins, studies on "the growth of entire organs and systems of organs outside of the organism," pure culture of cells, evaluation of media for cell culture, and artificial activation of tissue growth (Carrel 1912, Experiments).

Carrel's work opened new and undreamed of possibilities in surgery. Blood vessels could be safely and effectively sewn together saving both life and limb. Previously where major vessels were disrupted, the loss of circulating blood had proved devastating. Another option, never before available and seized upon by Carrel, was the ability to take organs from one individual or animal and transfer to another. Immune suppression by drugs to prevent rejection of the transplanted organ by all those except identical twins would wait until the latter half of the twentieth century. But Carrel's work anticipated this advance. On October 10, 1912, when Carrel learned that he had been awarded the Nobel Prize in Medicine and Physiology for his work on blood vessel anastomosis and transplantation, he received congratulations from many of his colleagues and friends. One such note was from Walter B. Cannon of the Department of Physiology, Harvard University, who wrote that he was "much pleased on picking up the newspaper yesterday to learn that you are this year the honored recipient of the Nobel Prize in Medicine. . . I was especially glad that after years of detraction and incredulity and from some quarters ridicule, the importance and the stimulating quality of your researches has been recognized" (Cannon to Carrel, 1912, Oct 13). Cannon, however, would turn down an offer in 1916 to join Carrel in France to study shock, only to

[3] Ambrine is the trademark for preparations of paraffin, rosin, and wax introduced by Barthe de Sandfort in 1913. (Dorland's Medical Dictionary, 27th edition).

take up the study as part of Base Hospital #4 in the Harvard Unit in France in 1918.

In March 1914, five months prior to the onset of hostilities, Carrel was working on an antiseptic for tissue infections in his laboratory. In a note to another scientist at Rockefeller Institute he wrote, "I have heard that you have made a very strong antiseptic for streptococci. As we are again starting work on the eye, it would be very important for us to have an antiseptic which is not irritating and if agreeable to you, we should be very glad to make a trial of your antiseptic, in order to decide whether or not is irritating to the cornea" (Carrel to Jacobs, 1914, Mar 3).

Dr. W.A. Jacobs, the scientist, readily offered to go over the disinfectants with Carrel. He had not one but many that were active against streptococcal infection. Carrel then requested a few cubic centimeters of his most active antiseptic solution (Carrel to Jacobs, 1914, Mar 6).

Thus, Carrel was already thinking before the war about the use of antiseptics to treat infected wounds when most experts in the field, namely bacteriologists, pathologists, and leading surgeons were opposed to the idea. I emphasize infected wounds. Following the work of Lister in the 1860s, British surgeons had initially hoped that antiseptics would kill bacteria in open wounds but gave up when they proved ineffective and were in some cases dangerous. While theoretically promising where antiseptics were "brought in contact with albuminous substances, e.g., blood, serum, or lymph, they were 'quenched,' as Sir Almroth Wright put it, owing to chemical combination with proteins" (Colebrook, 1954, 72-73). Bacteria were also driven deep into tissues by powerful projectiles creating irregular and jagged wounds and this further limited contact with antiseptic agents.

When the war began in August 1914 Carrel was in France on vacation. Still a French citizen, he was called by French law to active duty in the French Medical Corps with the rank of aide-major, second class. Authorities assigned him immediately to care for the wounded at a base hospital in Lyon. The first casualties had only minor injuries. The more seriously wounded must have been sent to other hospitals. Carrel's optimism remained unrealistically heightened at the beginning of the war. Carrel wrote to a friend,

> France has been transformed in miraculous fashion. Individuals have changed. I could never have believed it had I not seen it with my own eyes; most perfect order prevails and enthusiasm grown daily. I am more and more convinced that men are animated with the spirit that can never be

> vanquished. I am seeking men ready literally to give their blood for transfusions to wounded soldiers (New York Times, 1914, Aug 6).

To a reporter in September, Carrel, who notoriously was given to exaggeration and hyperbole, said,

> The sanitary department is doing wonders. Americans could not improve it. Infection is prevented by temporary bandaging on the battlefield. Then the wounded are removed to the hospital with amazing celerity which serves thousands. At Des Genettes Hospital here we have not lost one man in five hundred; at Hotel Dieu twenty at most of two thousand. Heavy artillery produces horrible wounds, while ricocheting pieces of shrapnel sometimes cause infection, but they represent only a trifling problem. As for Mauser metrailleuse wounds [That is, caused by a repeating rifle] . . . I know soldiers who have absorbed six without being in a very bad state. In fact, unless they strike an essential, only a slight scar remains after a fortnight to warrant the bearer to declare proudly, "you see, I was there" (New York Times, 1914, Sep 20).

These comments echo his earlier unrealistic expectations and are based upon his limited experience at this point in the war and his natural optimism.

About the same time, he wrote to a friend with similar information and sentiments. The letter was published in the British Medical Journal:

> I am in my city. Mobilized naturally. I am in Hotel Dieu in the department of surgery. I have more than a thousand wounded to look after. My patients are the first who came under fire. They are those who in haute Alsace competed with the bayonet the work of metrailleuse. Fortunately the wounds are not very serious. In all, the wounded in Lyon are about twelve thousand distributed among forty-two hospitals; in the district here are twenty-five more. Having regard to the tremendous number of combatants, the number of wounded up to the present is not, so far as our army is concerned, very heavy, and the mortality is very low. In my hospital of two thousand men, hardly twenty have died of wounds. Besides, our wounded go back to the front, and thus our army goes on acquiring as time goes on, soldiers who know what taking cover under fire means (Carrel 1914, British Medical Journal, 2:689).

This early excessive optimism was sure to fade and did in a short time as casualties increased and horrible wounds and infections presented major problems to medical personal. Carrel and his fellow military surgeons initially saw firsthand that new methods for the treatment of wound and infections were greatly needed. Carrel stated,

> It is very probable that the [military] hospitals of forty-four years ago did not present an aspect very different from the hospitals we have just inspected . . . We surgeons may well asked ourselves what advance has been made in the last forty years in the treatment of infected wounds. We must admit that the progress has not been very great. In fact, the only progress we can claim is the possibility of making incisions without aggravating the condition of the patient but we have not yet succeeded in preventing or stopping infection in several forms of wounds (Carrel 1915, Surgery, Gynecology and Obstetrics, 710-11).

On October 20, 1914, Carrel performed the first blood transfusion of the war in Lyon using one of his fellow surgeons as donor and a private wounded in early September in Alsace as recipient. The wounded man was said to have been seriously ill following removal of shell fragments from his right shoulder (New York Times, 1914, Oct 22). Although Carrel had performed transfusions in New York in 1908 and 1909 as part of his surgical research, he had never practiced as a clinical surgeon. In Lyon he now became a clinical surgeon deeply involved in daily patient care.

In November 1914, James Hazen Hyde, a wealthy American philanthropist and Francophile who was living in Paris at the time, visited Carrel in Lyon and found him performing routine medical care for the wounded. Believing that his talent for investigative surgery could be better utilized in the war effort, he interceded successfully on Carrel's behalf with the higher French authorities in the Ministry of War and at the same time contacted the Rockefeller Foundation for financial support to permit Carrel to have a special hospital to combine research and treatment (Soupault, 1951, 113). As a result of Hyde's action Carrel was directed to begin an inspection tour of battlefield hospitals in Meaux, Senlis, and Chantilly in late November and thence to Paris. From there he went to Dunkirk, then 10 kilometers north-east to Zuydcoote in France, then to Belgium, and last to the Eastern Sector (New York Times, 1914, Dec 18). On this tour he visited many English, French, and Belgian facilities where he found appalling conditions. Poor wound dressing techniques, and many foul smelling gangrenous wounds had led to amputations and often death (Soupault 1951, 116-17).

Carrel returned to Paris in late December where in the laboratories of his friend, Professor Theodore Tuffier, he resumed his work with antiseptics. Carrel requested from his colleagues in New York a recommendation for a skilled chemist. They suggested Henry Drysdale Dakin, an Englishman. He joined Carrel in December. Dakin, an accomplished biochemist, had earlier studied and worked in Leeds where he held a PhD. He also had worked at the Lister Institute of Preventive

Medicine, Jenner Institute, and in Heidelberg before coming to Dr. Christian Herter's laboratory in New York. He co-discovered arginase and was partially responsible for determining the nature of the inborn metabolic disorder, alkaptonuria[4] (Rezayat 2006, 194-96). Carrel was fortunate to have such an extremely capable associate to assist in his search for a wound antiseptic. They began immediately analyzing antiseptics against specific bacteria.

On February 5, 1915, Dr. George Crile, founder of the Cleveland Clinic, and as mentioned above an early researcher in hemorrhagic shock and blood transfusion, organized a symposium in the Paris suburb, Neuilly, site of the American Ambulance where he was working, to discuss management of war wounds. Leading military surgeons from France, Great Britain and the United States attended and presented their various philosophies of wound treatment. The differences of opinions were surprisingly varied in their approach to wound care, specifically, the use of antiseptics versus physiological methods. Carrel stated:

> Old methods of treatment have proved ineffective, and the only hope for the future is to find new methods. No doubt in our researches and study of these problems we shall arrive at different conclusions, but no matter from what direction we approach the problems their solution will be found only by the combined labors of trained men working together to this end (Carrel 1915, *Surgery, Gynecology, and Obstetrics*, 710).

Carrel's talk to the group called for a more scientific approach to the wound care than presently in practice. His paper referred to his recent tour of the battlefields and described what he had seen. "If," Carrel said,

> One studies, as we have done, the conditions found in the field ambulances and hospitals, he is led to ask if we surgeons have really progressed with rapidity at all comparable with that of armaments makers and engineers. In our rounds of inspection of hospitals situated within a few kilometers of the firing line, although the service is very effective, yet we were very much impressed by the frequent occurrence of gangrene, suppuration, and infections of all kinds (Carrel 1915, *Surgery, Gynecology, and Obstetrics*, 710).

Referring to the Franco-Prussian War of 1870, he said,

> It is very probable that the hospitals of forty-five years ago did not present an aspect very different from the hospitals we have just inspected …We

[4] alkaptonuria – dark urine on standing, scleral pigmentation, and arthritis.

> are powerless to prevent gas gangrene, for it is impossible to sterilize the wounds (Carrel 1915, *Surgery, Gynecology, and Obstetrics*, 710).

In addressing the problems he made the following recommendations.

> In the first place, the wounded should be brought to a place where they can be cared for as soon as possible after being wounded. This would diminish the need for amputations and would reduce the death rate. . . What is needed is to study the conditions and cases carefully in order to find new methods by which one may be able to handle these cases successfully (Carrel 1915, *Surgery Gynecology, and Obstetrics*, 710).

Professor Tuffier, Carrel's friend of many years, seconded Carrel's call for rapid evacuation to a hospital and a better wound antiseptic. He commented,

> The antiseptics we have at present are wholly inadequate-they are very superficial. We must find a new antiseptic which will effectually penetrate the deepest part of the wound" (Tuffier 1915, 713-15).

Some British surgeons had other ideas about wound care. Lord Berkeley Moynihan of Leeds whom Crile considered easily the "first surgeon of the British empire" differed from Carrel and Tuffier in fundamental ways. Moynihan condemned dressings as "Putrefactive poultices" and said that, "as far as our experience goes, the wounds which do best are either those treated by constant [saline] irrigation or better still by immersion" (Moynihan 1915, *Surgery, Gynecology, and Obstetrics* 20:715). He advised giving up dressings while covering the wounds with a little lint or a little gauze saturated with the salt solution.

Sir Almroth Wright, who, had been knighted for his work developing typhoid immunization at the Army Medical School at Netley before the war, was professor of pathology at St. Mary's Hospital, Paddington. He was appointed as a Colonel in the Royal Army Medical Service and sent to establish a laboratory in Boulogne in October 1914. There he improvised a laboratory on the roof of the local casino. Wright also recognized the urgency of controlling wound infections but took another approach. He and his able assistants that he had brought with him to France, one of whom was Alexander Fleming, identified three important species of microbes in wounds, streptococci, *Clostridium tetani*, and *Clostridium perfringins* or Welch's bacilli.[5]

[5] Fleming later discovered penicillin.

Back from Boulogne, Wright told a crowded audience on March 30, 1915, at the Royal Society of Medicine in London that there were three methods to treat war wounds. First, by antiseptics; second, by physiologic methods that included opening the wound and allowing drainage so as to promote the antibacterial powers of the blood and lymph into full play; and third, vaccine therapy to enhance "antibacterial powers of the body," or what now might be called stimulation of the immune system. Wright concluded that of the three options, the second was best and that antiseptic treatment was only "an ancillary method of treatment" (Wright 1915, 8:43).

Although most British surgeons appeared to be following Wright's precepts at this time, Sir Watson Cheyne, president of the Royal College of Surgeons, and once assistant to Lord Joseph Lister, aligned himself with Carrel by advocating the use of antiseptics in treating battle wounds in the annual Hunterian Oration of 1915. Reaction came from the editor of the British Medical Journal.

> With his [Wright's] strictures on the use of antiseptics, however, many surgeons will join issue. We do not feel it our duty to take one side rather than the other in this matter, but we do think it right to point out that there is much to be said on both sides and to state fairly the opposing claims (Editorial: British Medical Journal, 1915, 1:812-13).

Wright, notably contentious, and described by some as a "savage controversialist," joined battle publicly with Cheyne and the dispute became very personal (Colebrook 1954, 145-60). "To this whole problem," wrote Wright, "Sir W. Watson Cheyne is . . . blind. Of the city we seek he has not even sighted the tower" (Colebrook 1954, 152). A follow-on paper to the British Medical Journal was declined by the editors as it ridiculed Cheyne in 170 places.

While Dakin and Carrel continued their studies of chemicals evaluating their action on tissues and microorganisms, the British continued to follow Sir Almroth Wright's recommendations for wound care. Wound infection continued to be recognized as a far more serious problem than in previous wars.

The *British Medical Journal* commented on the source of these infections in late April 1915.

> The novel feature to which we allude depends upon the extensive implantation of fecal bacterial deep in the tissues from polluted soil, water, and clothing. During the fighting at Ypres, the hospitals at Boulogne were crowded with wounded and nearly every wound exuded a foul brownish

> frothy discharge, not unlike feces. So unlike have been the conditions to any seen in other modern wars – notably so unlike those which prevailed in South Africa – that the pathology and treatment of these fecally infected wounds have demanded close study (Editorial: British Medical Journal, 1915, 1:727-28).

Dr. Henry Dakin had tested over two hundred chemicals against bacteria and found that buffered sodium hypochlorite was the antiseptic most effective in treating serious wound infections. He had presented his findings to the Academy of Sciences in Paris on August 2, and his paper was published in the *British Medical Journal* 28 August 1915.[6]

Dakin found many agents effective against bacteria when suspended in water, but much less so when mixed with blood serum, pus or other exudate. Other agents were effective but irritating to the tissues and thus were of no use. Sodium hypochlorite had high germicidal action but as ordinarily prepared could be irritating due to free alkali and at times free chlorine. The advance of Dakin's was to buffer the hypochlorite with a weak polybasic acid, boric acid, in order to maintain a neutral solution under all conditions. Carrel developed a delivery system of rubber tubes and stopcocks that irrigated wounds every two hours for as long as necessary, often over a week's time. Treatment began as early after wounding as possible and it was in these cases that the best results were seen. Of course, sodium hypochlorite was not a new antiseptic and a flurry of prior claims to its use appeared in the press at the time, however, Carrel's and Dakin's contribution was a tested, buffered solution with a new delivery system that irrigated wounds on a regular schedule.

British surgeons had earlier tried antiseptics to control infected wounds and were unsuccessful. Friend and pupil of Wright, Leonard Colebrook, stated:

> Those were bad days for British surgery. The great advances which had followed the introduction of the methods of Lister and von Bergman in the operating theatre seemed to have gone overboard. Inevitably the surgeons thought first of antiseptics as the way out – antiseptics chosen almost at random from among the many chemicals which would kill microbes in watery solutions in the test tube, and which were not so poisonous as to make them manifestly dangerous to the patient. Pastes of carbolic, of boric and of salicylic acids were devised for packing into the wounds. But they were soon given up. They did little if any good; and sometimes were

[6] A reprint of the paper may be read in Diseases of the Colon and Rectum 1983, 26:354-58.

> harmful because they blocked the exits from the wounds (Colebrook 1954, 72).

Carrel surmounted these problems by producing a non-irritating antiseptic, developing an intermittent system of wound irrigation, and never packing the wound to trap dangerous bacteria and allowing them to proliferate and flourish in the wound. This was Carrel's signal innovation.

By May 1915 Carrel was telling friends that they had begun to obtain interesting results. To much fanfare, the breakthrough was announced in the *New York Times*, August 6, 1915, in a headline, "Drs. Carrel and Dakin Find New Antiseptic, Remedy Tested in French Hospital, Said to Make Infection Impossible." The article stated that after "exhaustive experiments, the most powerful antiseptic known to science" had been found and that it was hypochlorite of lime.

In November 1915 Carrel was visited by a news reporter at the Compiegne hospital, situated in a pleasant village on the banks of the River Oise about two hours by rail north of Paris. With the sound of artillery echoing in the distance, he told the man that almost all war wounds were grossly infected and this fact was responsible for the need for surgical intervention and the high mortality. Moreover, Carrel noted that, in general, hospitals were too far from the front to allow for rapid treatment (*New York Times*, Nov 20, 1915).

The reporter described glass bottles three feet above the beds with rubber tubes descending to the patients. The wards at Compiegne were dark and silent in contrast to other hospitals that were "forcedly cheerful." It was Carrel's quirky idea that

> until convalescence becomes marked the patient must maintain a passive attitude. Nothing is demanded of the wounded man; he is considered to exist merely as part of his wound, which claims the sole and undivided care of his attendants. How advantageous it is to be able to disregard the patient as a person, in order to give the wounded individual undivided attention is evident. The peace and silence in these semi-darkened wards must be very soothing to the tired and wrecked nervous system, recovering from the first shock of wound (New York Times, Nov 20, 1915).

In the fall of 1915 Carrel's method of wound management attracted support from Professor Charles A. Morton of Bristol in the British Medical Journal who stated,

> Sir Almroth Wright tells us that they [antiseptics in war wounds] because the resistance of the tissues are sufficient to deal with the infection, if the wound is kept by the surgeon in a favorable condition, by adequate

> drainage and other means; and that, although antiseptics have the power to kill micro-organisms in the laboratory, they cannot act efficiently in contact with the tissues of the body. . . Judging by the results of Dr. Alexis Carrel's work at the hospital at Compiegne, it seems to me that the clinical results of the treatment of infected wounds with an antiseptic have been most encouraging, and should certainly lead to a wide adoption of his thorough methods. With the results of Carrel's work before us, I venture to think Sir Almroth Wright is not in the least justified in stating that the antiseptic treatment of wounds has completely broken down (Morton 1915, 2:778-79).

Professor Tuffier continued his support of Carrel as he served as a special Inspector of the Health Service for the French Ministry of War and inspected hospitals and taught surgery. He "reputedly received the 'cold-shoulder' from many French Army surgeons for his sympathy for Carrel" (Malinin 1979, 83).

Dakin attempted to clarify the confusion engendered by the *New York Times* article in a paper entitled "The Antiseptic Action of Hypochlorite: The Ancient History of a New Antiseptic." He wrote on December 4, 1915, in the *British Medical Journal*, "The 'new antiseptic' announced in *The Times* of August 8, and subsequently by many newspapers was discovered in 1788 by the French chemist [Claude Louis] Berthollet" (Dakin 1915, 2:809-10). It might have been thought and hoped that the absurd and extravagant statements made in the lay press would have sunk into oblivion but this was not the case.

The *British Medical Journal* claimed that Professor J. B. Cohen of Leeds had in the previous autumn recognized

> the importance of studying antiseptics for surgical use, sketched out a plan of research, and entered into communication with a former pupil, Dr. Henry Dakin, Director of the Herter Laboratory New York, who is acting as bacteriologist to the hospital and laboratory established at Compiegne, and with the approval of the French War Office by the Rockefeller Institute. The arrangement was that the substances produced by Professor Cohen in Leeds should be tested bacteriologically by Dr. Dakin, and that the most promising should be tried clinically by Dr. Alexis Carrel of the Rockefeller Institute, who is acting as surgeon to the hospital (Editorial: British Medical Journal, 1915, 2:216-62).

Cohen quickly sent in the following disclaimer:

> Sir: The statement which you make of my part in the discovery of the new antiseptic is entirely misleading. Dr. Dakin is a chemist and physiologist, and not a bacteriologist. The scheme of research was planned exclusively

> by him, and my part has been to act as his chemical assistant. I can claim no further share of his researches (Cohen 1915, 2:312).

Thus, the year 1915 ended with the controversy over wound management unsettled; however, British surgical thought was beginning to shift toward the use of antiseptics in infected war wounds. Surgeon-General Sir Anthony Bowlby, Surgeon in Ordinary to his Majesty the King, gave the Bradshaw Lecture on "Wounds in War" before a large audience at the Theatre of the Royal College of Surgeons in London on December 20. In commenting on the two schools of thought, he suggested that "neither school is right" and that "the badly injured men can seldom be completely sterilized at a single dressing" as was advocated by Sir Almroth Wright. "I am quite certain," Bowlby continued,

> that antiseptics are useful and necessary for the proper treatment of the wounds of war and that they have been of the utmost service . . . It is, however, my very decided opinion that the hypochlorus acid [sic] treatment is an important advance, more especially when used in recent wounds and before suppuration has occurred, and I find that it has displaced all other forms of treatment in many of the casualty clearing stations (Bowlby 1915, 2:919-21).

Bowlby complemented Flemings' bacteriological investigations. He stated that "no more interesting work on the matter has been recorded than that done by Mr. Alexander Fleming in Colonel Sir Almroth Wright's laboratory, and his whole paper is well worth study" (Bowlby 1915, 2:918). Maurois in his biography of Sir Alexander Fleming refers to the controversy:

> Once more the question was, what was to be done? Wright's answer was – leave the natural defenses of the body to do their work and help them. The leucocytes which flocked through the walls of the blood vessels formed pus, the action of which was powerfully beneficial. Wright and Fleming had demonstrated by experiment that fresh pus destroys the colonies of microbes. To this bactericidal power of healthy leucocytes there is no limit, provided they are present in sufficient number, etc (Maurois 1959, 88).

Meanwhile, the Rockefeller Foundation had granted $20,000 to the Rockefeller Institute to assist in the war effort, most of which went for Carrel's work at the Rond Royal in Compiegne to convert a resort hotel into a research hospital near the front so that the wounded could be treated and studied more effectively. His head surgical nurse from his department at Rockefeller Institute arrived in France on February 20, 1915, to assist

him at the new hospital (Corner 1964, 136). The French provided administrative support for the hospital and it was ready to receive approximately a total of one hundred patients by the week of March 8, 1915.

On April 13, 1915, Dr. Harvey Cushing of the Harvard unit serving at the American Ambulance, a hospital in a Paris suburb, visited Carrel's hospital and described it in some detail.

> What is known as Hospital Complementaire 21 is in a once fashionable hotel, the Rond Royal – on the very edge of the Forest of Compiegne – an ideal spot and one which Carrel chose for his purposes after a careful survey after he got free of his miserable detail, first in the Lyon hospital and then at the War Office. Here backed by Rockefeller money and with an admirable staff, a great opportunity lies open for special studies of wound treatment. The lines along which they have started to work include the suction treatment of suppurating wounds without dressings; the employment of irrigation with bactericidal fluids which are being worked out by Henry Dakin; methods of increasing resistance to pathogenic organisms by turpentine injections, etc. etc (Cushing 1936, 33).

Cushing noted that Carrel's assistant, Dr. Dehelly, did a number of dressings rather badly in his opinion and caused unnecessary pain to the patients. Although bed capacity was up to 80 beds at the time of Cushing's visit, only 51 were occupied (Malinin 1979, 74). The time consuming research may well have prevented more occupied beds. There were 86 attendants that included eleven scientific, medical and administrative officers, thirteen experienced Swiss nurses supplied by Dr. Theodor Kocher, secretaries, laboratory technicians, linen room people, scrub women, ambulance men, and a detail of 47 soldier orderlies. "It is indeed a research hospital deluxe . . . Madame Carrel, a trained nurse, served as superintendent or as Carrel told Cushing, "general tyrant" (Cushing 1936, 33).

As the year ended work continued at the Rond Royal, now with a bed capacity of 75 with six American nurses added to the staff. Dakin, having accomplished his goal of finding a safe and effective antiseptic, departed for the Dardanelles to assist the British in the Gallipoli campaign. Aboard the hospital ship *Aquitania*, he oversaw a project to convert seawater by electrolysis into hypochlorite for a plentiful supply of Dakin's solution (Rezayat 2006, 194). Carrel continued to study the biology of wound repair and described his results with antiseptic treatment as very successful, although he continued to have trouble with the industrial production of the hypochlorite solution.

In the summer of 1916 Dr. Fred H. Albee, a New York orthopedic surgeon noted for his work on bone grafts, visited Carrel at Compiegne. He found Carrel "working tirelessly in the hospital wards by day and in his laboratory at night" (Albee 1943, 70-130). Albee found Carrel's patients, although wounded just as severely as in any other sector, to be in better condition than those that he had seen in hospitals farther from the front. He was also impressed by the great care taken by the staff in dressing the wounds. Albee wrote, "If a patient has several wounds, fresh forceps were used for each wound, to avoid the danger of cross infection" (Albee 1943, 127).

Albee was very interested in the methods of wound care used at the hospital. Dakin's solution was instilled from flasks with rubber tubes, glass connectors and pinch-cocks to regulate the flow. When a newly wounded soldier was initially seen, tissue fragments and foreign bodies were surgically removed and the wound was thoroughly opened and cleaned. Albee noted that,

> To insure the proper concentration of the solution, the pinch-cock on the rubber conducting tube was opened from one-half second to three seconds every two hours, both day and night in order to soak the dressings and fill the wound. Sterile gauze compresses and tampons, moistened with Dakin Solution were then inserted in such a way as to cover the entire wound surface and hold the tubes in place. Vaseline compresses were placed over the skin at the margins of the wound to prevent irritation (Albee 1943, 128).

Carrel told Albee that since September 1915 it had been possible to do away with practically all suppurating wounds by use of the technique. Carrel said,

> However, my method has met with so much opposition from certain individuals at the head of the medical profession in France that it has been applied scarcely anywhere outside of Compiegne and La Penne, where Dr. DePage, a noted Belgian surgeon is using it and is most enthusiastic (Albee 1943, 128-29).

Suppurating wounds had not been done away with, but care of wounds had improved over that seen by Carrel in other hospitals on his earlier inspection tour.

Dr. Antoine DePage of Brussels, referred to by Carrel, reported on his experience with war wounds in a paper read before the American Surgical Association on June 16, 1919:

> Observation has shown us in the first place, contrary to what had seemed to be established by previous wars, that in the great majority of cases wounds are infected or at least contaminated . . . Since January 1915, we have followed at l'Ambulance de l'Ocean debridement and e´pluchage,[7] with primary suture, when the cases appeared to us favorable, or we have resorted to secondary suture, as soon as after their dressing the surfaces of the wounds appeared to be clinically aseptic, although we did not possess at that time any formal index as to the evolution of the microbian flora in a wound, so that it was not possible for us to build up a systematic method of procedure. The merit of having systematized scientifically the secondary suture of wounds belongs to Alexis Carrel . . . With the help of the chemist Dakin, Carrel sought for an agent capable of destroying microorganisms in the depths of wounds, more efficient than any of the agents which had up to that time been recommended.
>
> After a very minute study made by Dakin as to the relative value of a large number of antiseptic agents, Carrel chose the hypochlorite of soda which even in dilute solution has the great property of conserving the proteins and of preserving also its antiseptic power in the presence of blood serum and organic exudates . . .
>
> However, it was not possible for us to judge the method of Carrel at its true value and to derive from it all its benefits until we were able to follow the evolution of the wound by methods of bacteriological control.
>
> This control was the most valuable element in the method of Carrel. It consists in the regular determination of the abundance of the microorganisms in the wound exudates (DePage 1919, 575-76).

Carrel and his associates studied other antiseptics but found nothing better than buffered sodium hypochlorite. They found that ultraviolet light had no effect on the rate of healing and that the dye flavine, an antiseptic and germicide, actually retarded healing (Carrel: Report, 1917). Rate of healing of wounds was measured by using a planimeter, an instrument used in measuring the area of surfaces, by Carrel's assistant, Pierre Lecomte du Nouy.

In addition to irrigating wounds with buffered sodium hypochlorite solution, Carrel determined progress of treatment by quantifying the bacterial count in the wounds. Admittedly by Carrel, the technique gave only crude results, but his was probably the first attempt ever to measure bacterial colonization and use the information to determine when it might be safe to close the open wound with sutures. Specimens were taken from the wound with a rigid platinum wire mounted on a glass rod, the material was spread out on glass slides, fixed and stained, and the number of

[7] Wound excision; the cutting and paring away of the contused and contaminated tissue of a wound. Dorland's Medical Dictionary, 22nd edition.

microbes counted using a microscope. The decline in bacteria per slide was plotted over time on a graph. Specifics of the technique are available in Infected Wounds by Carrel and Dehelly (Carrel and Dehelly 1919, 181-215).

Another major clinical problem that military surgeons encountered with overwhelming frequency was hemorrhagic shock. Prior to World War I shock was poorly understood. As an example, in the 1908 textbook, Principles of Surgery by Stuart McGuire, the author, in his chapter on shock admitted that the condition had been studied and a large body of literature had accumulated, but "There [were] yet some contradictory facts to be explained, and certain problems to more fully elucidated . . ." (McGuire 1908, 191-93). He listed as causes of shock.

1. Loss of blood
2. Loss of heat [hypothermia]
3. Loss of time [prolonged operations]
4. Mechanical injuries [trauma]
5. Burns
6. Perforating injuries [perforated abdominal organs]
7. Mental emotions [shell shock would later fall in this category] (McGuire 1908, 190-93).

Carrel became interested in the problem after seeing many severely wounded patients and began studies on hemorrhagic shock. As will be noted, leading physiologists had a wide range of theories about the cause of shock and all were wrong (Benison 1991, 219-20). Carrel "was convinced that in the majority of cases a drop in blood pressure was a direct result of blood loss and set out to prove this in the laboratory" (Malinin 1979, 91-92). His initial experiments were with blood replacement by blood serum and gum solutions in animals utilizing isolated hearts. Perfusion was by gravity. He determined that the relationship between the volume of blood loss and changes in blood pressure depended on quantity of blood loss and other factors as well. He found that either whole blood or washed red cells provided the best results in treatment and that saline or lactated Ringer's solution could be used initially for temporary restoration of the blood volume (Malinin 1979, 91-92).

When the war began Dr. George Crile of Cleveland knew more about the subject of shock than anyone else having studied the problem experimentally on animals almost obsessively since 1889 when, as a young house officer, he had seen a young man die of shock after a

streetcar accident (Crile 1947, 27-28). Nevertheless, in 1914, neither Crile nor anyone else really understood shock and its management.

Crile's early studies had led to his first published book, *An Experimental Research into Surgical Shock*, 1897, and then to *Hemorrhage and Transfusion*, 1909. To counteract shock, he tried a number of stimulants including digitalis, alcohol, and even minute doses of strychnine without success. He invented a pneumatic suit that Goodyear Tire and Rubber Company produced for him to be inflated in the shocked patient in an attempt to stabilize the blood pressure, but this too failed to solve the problem. Crile explained, "Although this method accomplished its purpose from 1902 until 1907 and in my own experienced saved many lives, it was not an easy one. The pneumatic suit was cumbersome and uncomfortable and consumed valuable time in making adjustments" (Crile 1947, 146-47). It was apparently not used by Crile in World War I.

From his experiments Crile had concluded that, "in shock the entire organism is in a state of prostration and that there is no reserve available to be mobilized by stimulants" (Crile 1947, 144). This failure led, he thought, to pooling of blood in the veins draining the abdominal organs and a consequent fall in blood pressure. This led to his unsuccessful use of stimulants.

Physiologists had other ideas. Walter B. Cannon of Harvard after earlier declining an invitation to join Alexis Carrel in attacking the problem joined Harvard Base Hospital No. 5 when it sailed for France on May 11, 1917. Having no clinical experience, he reviewed the medical literature on shock and began searching for the blood lost in the circulation (Benison 1991, 217-49). His earliest notion was that shock was from the acidosis that occurred, but he failed to recognize that acidosis was a result of shock, not a cause.

William T. Porter, Harvard physiologist, based on his own studies, theorized that shock was due to fat embolism. Yandell Henderson, Yale physiologist, believed that shock was due to a loss of carbon dioxide after hyperventilation of the lungs. Samuel J. Meltzer, physiologist practicing medicine in New York, had a theory that shock resulted from disruption of a physiological balance in the body by injury that favored the inhibitory side of the equilibrium over the excitatory side (Benison 1991, 219-20).

W. M. Bayliss, professor of physiology at University College, London, after learning of Cannon's research on shock and his attempt to treat it by correcting the consequent acidosis by intravenous sodium bicarbonate invited Cannon to join a special committee of The British Medical Research Committee on shock. In addition to Cannon's idea that acidosis was the cause of shock, the committee decided to pursue other lines of

inquiry as well. Bayless developed an intravenous infusion of gum acacia to replace the lost plasma from the circulation in shock, but its effect was temporary. By the end of the war, Crile lamented the status of shock management, "Thus in my endeavor to aid the wounded soldier, I have found myself precipitated into the same problem that I glimpsed so long ago. Strange that the quest started then should still be my quest" (Crile 1947, 356-57). In Paris on 18 November 1918, where the British and American Physiologic Committees on Shock were represented at a meeting of the Research Committee, with Crile attending, he wrote, "As the net result of four years of research on shock these two groups had produced but one idea, viz. the use of gum acacia infusion in the treatment of shock." He recalled later that the physiologist sang a hymn of praise for gum acacia but "the practical surgeons from the Argonne fight who in the crucible of experience had tried out gum acacia and [had] condemned it; they sang its swan song" (Crile 1947, 356-57). The solution to the shock problem would be recognized by others as the prompt replacement of whole blood.

In his annual report of September 1917 to Rockefeller Institute of work done at the hospital at Compiegne, Carrel described the organization of the staff, the work of the hospital, along three lines, surgical, teaching, and research for new methods of treatment of the wounded (Carrel, Report, 1917). Under the later he observed that "one of the main causes of inefficiency of hospital workers is their lack of system and the lack of mechanical appliances" (Carrel, Report, 1917). He directed his staff to "to perfect apparatus to decrease labor and thus make greater accuracy and efficiency of doctors and nurses" (Carrel, Report, 1917). Out of this directive came a heater for the operating table, a bed heater, a special bed for patients with peritonitis, a frame for suspension of fractured limbs, an electrical system for keeping saline at the proper temperature, and an automatic distributor controlled by an electric clock for flushing wounds with antiseptic solution. Most of these innovations became available to surgeons elsewhere much later. Carrel was far ahead of his time in developing systems of efficiency and treatment of the hospitalized patient.

In early 1917 Carrel returned to the United States to establish a War Demonstration Hospital on the grounds of Rockefeller Institute in New York. His work was widely hailed and appreciated by many leaders of American surgery. Dr. William Stewart Halsted, professor surgery at Johns Hopkins Hospital, commented to Simon Flexner, Director of Rockefeller Institute, "Carrel is on top! It is fine. He has made a momentous contribution with very far-reaching application" (Halsted to Flexner, 1917).

While in the United States, Carrel went to Washington on the invitation of Secretary of War Newton Baker to speak before the National Defense Council Medical Committee. There he told of his fight against wound infections by using intermittent irrigation of wounds with Dakin's solution to great effect and saving lives and limbs and decreasing suffering (Martin 1933, 96).

Three days before President Woodrow Wilson called on Congress to recognize the existence of a state of war involving the United States, the *New York Times* on April 2, 1917, reported that the Rockefeller Institute would erect a military hospital where Carrel would teach his method of treating wounds. He would direct the one hundred bed unit to be built at 66th Street and Avenue A in New York City to instruct army surgeons, public health officers and Red Cross nurses. The hospital was funded by a grant of 200,000 dollars from the Rockefeller Foundation.

The sixteen portable wooden buildings were designed by architect Charles Butler to simulate conditions near the front and could be assembled in fourteen days. This concept prefigured the mobile army surgical hospitals, MASH, units later effectively used in the Korean War. Carrel, Pierre Lecomte du Nouy, and George Loewy, all from the French army, and Dr. George A. Stewart of the U.S. Army staffed the hospital. Instruction courses for doctors, nurses, and Red Cross workers of two weeks duration began on August 2, 1917 and would continue until March 20, 1919.

During 1917 Carrel's work was made available in two books-*Infected Wounds* by Carrel and Dehelly and *Technic of the Carrel Method* by Madame Anne Carrel and Dr. J. Dumas. A motion picture filmed at the War Demonstration Hospital was also made available to teach the wound irrigation technique of Carrel and Dakin.

Carrel spent much of 1917 in New York directing his laboratories. Madame Carrel remained in France. On February 9, 1918, Dr. Daufresne notified Carrel that it was urgent that he return. As he was leaving, he wrote Dr. W. T. Porter, physiologist at Harvard, "I read with a great deal of interest your articles in the *Atlantic Monthly* on 'Shock at the Front' and am taking the book with me to France" (Carrel to Porter, 1918). He sailed on February 17, 1918. Hospital 21 at Compiegne came under attack on March 21, 1918 as the German spring offensive began. On the night of March 22-23 the hospital was totally destroyed by air bombardment. Carrel cabled his secretary at Rockefeller Institute telling her of the forced evacuation and that two of his doctors at the hospital had been wounded (Walker 2002, 874).

Carrel moved to Paris until a new base hospital could be organized at Noisiel where he was to remain until the end of the war treating the wounded and studying infections. He was honored in 1918 by promotion to the rank of Commander of the Legion of Honor of France. The Armistice was signed near Compiegne on November 11.

A significant chapter in Carrel's life had come to a close. War-weary and incapacitated at times by depression, Carrel had worked heroically for four and a half years of selfless service. Now he was ready to leave forever the clinical problem of infected wounds for his basic studies in tissue growth, aging, and organ preservation.

In the end, Carrel's method using an antiseptic, buffered sodium hypochlorite, very similar to what we know as Clorox®, and a drainage system that thoroughly cleansed wounds prevailed over the British so-called physiologic method of "lymph lavage" advocated by Sir Almroth Wright. Carrel-Dakin Solution continued to be used up to the antibiotic era for grossly infected wounds in the United States. Even today the antiseptic solution is sometimes used as an adjunct to treatment. One point not to be overlooked is that attention to detail in wound care such as thorough wound irrigation, careful removal of foreign bodies and adequate drainage of infection are factors that were partially responsible for the success of the Carrel Dakin Method. In any case many limbs were spared and many lives were saved by the tireless work and attention to detail of Alexis Carrel and Henry Dakin in the pre-antibiotic era. Battles had been fought on the cow pastures of France and contaminated wounds plus more destructive weapons had posed challenges to surgeons as never before.

Carrel should be credited with far more than co-developing an antiseptic solution for irrigating wounds in World War I. Nearly a century ago he saw the need for a research hospital to treat and study war wounds in great detail. He recognized the urgency of early treatment of the wounded and the availability of definitive care near the battle front. These precepts would be applied more fully in later wars. He also recognized the importance of developing systems and special equipment for treating sick and injured patients such as heaters for the operating table and special beds and bedframes for those with fractures or paralysis. With special attention to wounds, he is probably the first to quantitate bacterial colonizations in wounds and correlate this information with timing of secondary wound closure.

We readily associate him with Dakin but as Dakin said of himself, he was best known for his antiseptic work but it was "the least important thing that [he] ever did chemically" (Rezayat 2006, 194-96). Something similar might be said of Alexis Carrel and surgery. His work in vascular

surgery and transplantation has had more lasting importance than his contributions to the care of the wounded in the war. These contributions, however, should not be minimized. By his work, limbs were spared and lives were saved. What more can be asked of a surgeon?

Finally, the role of Rockefeller Institute and Rockefeller Foundation in the war effort and in the medical advances from its staff and laboratories must be emphasized. In addition to providing Carrel a research hospital near the front to carry on his work, the Institute funded another scientist, Peyton Rous, who contributed knowledge on blood preservation and devised a simple test to type blood. One of his trainees, O. H. Robertson of the Harvard Unit, made practical advances in the storage and usage of blood near the battle lines. Rockefeller Foundation supplied 200,000 dollars in 1917 to build a temporary hospital on the grounds of the Institute to allow Carrel and associates to teach his methods of wound care. Therefore, much credit is due to John D. Rockefeller, Sr. and John D. Rockefeller, Jr. and the Rockefeller Institute founders for making it possible for its scientists to make these major advances in wartime and in so doing, save many lives.

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CHAPTER EIGHT

A WHITE SMOKE RISING: THE ADVENT OF GAS WARFARE IN THE FIRST WORLD WAR AND THE RESPONSE OF THE ROYAL ARMY MEDICAL CORPS

PETE STARLING

Introduction

On 22nd April 1915 the area to the north east of Ypres was held by the 1st Canadian Division from just south of Poelcappelle to Polygon Wood and on their left by the 45th Algerian Division and the French 87th Territorial Division. (J.E.Edmonds 1927, 177) According to the Official History it was a glorious spring day, just the weather for aerial reconnaissance which detected considerable activity behind the German lines, especially in the area of the Houthulst Forrest, North of Langemarck. (J.E.Edmonds 1927, 176) Intermittent shelling had occurred throughout the day which intensified at 5pm and was accompanied by greenish yellow clouds. (J.E.Edmonds 1927, 177)

The officers of the 3rd Canadian Field Ambulance had just finished their dinner when they became aware of a great commotion outside their Headquarters which proved to be a large body of Algerian troops devoid of all equipment and weapons. (W.H.Watt n.d.) The Algerians were followed by horses, some rider less, some pulling wagons and guns and then crowds of refugees, burdened by their household possessions; all in a state of panic and anxious to escape the noxious gas. At about 8p.m. the casualties began to arrive at the 3 Field Ambulance location at Vlamertinghe, all suffering from the effects of being poisoned by asphyxiating gases.

What had caused this rupture of the allied line accompanied by utter panic and numerous casualties?

Fig 8.1 A Poisonous gas attack on the Canadians in Flanders April 1915 by Louis Raemaekers. Credit - Wellcome Library London

Captain Bertram, an officer of the 8th Battalion of the Canadian Expeditionary Force, with engineering and chemistry experience described what happened. Bertram was sat in his trench some 600 yards from the German front lines, when he saw a 'white smoke rising' from the German trenches. It rose to about three feet and then in front of the white cloud appeared a greenish cloud which drifted along the ground and over the allied trenches, not rising more than seven feet above the ground. (Information with regard to the use of noxious gases by the enemy obtained from two officers of the candian Division n.d.) This cloud of white smoke was the release by the Germans, over a period of ten minutes, of 150 tons of Chlorine Gas from 5500 cylinders. (L.F.Haber 1986)

It was not only the allies who were caught unawares; the German's were unprepared for the devastating effect of this gas. Although they consolidated much of the broken allied line they did not have sufficient troops to occupy all of it.

Why were the allies so unprepared for gas warfare? The Haig Conference of 1899 banned the use of gases, 'The Contracting Powers agree to abstain from the use of projectiles the object of which is the diffusion of asphyxiating or deleterious gases'. (Declaration on the Use of Projectiles the Object of Which is the Diffusion of Asphyxiating or Deleterious Gases; July 29, 1899 n.d.) Lachrymating or Tear Gas had been used in the past but was not considered to be governed by the Haig Conference because it was not an asphyxiating gas.

Of course it was not just the men in the front line who suffered from this first gas attack. The doctors and nurses back in the dressing stations and Casualty Clearing Station's (CCS) were also affected as Sir Wilmott Herringham recounted:

> *It was on April 23rd that Bowlby and I were at Vlamertinghe at the Canadian Field Ambulance and whilst in the dressing room in was brought a man whose clothes had a curious smell. He was wounded in the leg so they took off his clothes. In three or four minutes no one could stay in the room as everyone's eyes were watering badly although the man had been lying out for four hours on a windy day. (Herriingham 1920)*

Almost immediately after the first gas attack, eminent physicians such as Sir Wilmot Herringham and Sir Arthur Bowlby made their way to the medical units near the front to find some of the casualties. On reaching one of the hospitals Herringham found between 6-700 cases and said it was the most horrible sight he had ever seen. The men were blue, coughing and hawking up a yellow thin frothy fluid. (Herriingham 1920, 32)

It is generally accepted that it is near impossible to ascertain an exact number of casualties for this first gas attack. (Macpherson 1923, 274) The 3rd Canadian Field Ambulance War Diary for April 1915 states that on 22nd April they received 149 casualties; 885 on 23rd and 1204 on the 25th. (War Diary of the No. 3 Canadian Field Ambulance n.d.)

Protection

From the protective point of view the response was immediate.

Soldiers did what they could and covered their mouths and noses with whatever was available - socks, field dressings and handkerchiefs. Some troops knocked the bottoms of bottles and filled them with earth or charcoal in the hope that breathing through the neck would filter the gases. (P.S.Lelean 1920)

Four days after the attack Dr JS Haldane and Professor HB Baker were sent to France to investigate this new horror and found casualties still lying in the CCS's. (Macpherson 1923, 273) Haldane found that these men were suffering from acute Bronchitis caused by the inhalation of the irritant gases. (Macpherson 1923, 273)

Anti Gas organisation started immediately. It was decided that the organisation of defence against gas would come under the Adjutant General. (Macpherson 1923, 324) The onus for providing protective equipment and the instructions for their use came under the Army Medical Services. The Anti Gas Department was established at the Royal Army Medical College at Millbank and laboratories were set up and staffed to explore and control the design of a respirator. This department was under the direction of Colonel WH Horrocks and included amongst its staff Major PS Lelean and Lieutenant Colonel EH Starling. William Heaton Horrocks had joined the Army as a Surgeon in February 1887. He served mainly in India and Gibraltar gaining his reputation in the field of Hygiene but when war broke out, in the rank of Colonel, he was a member of the Army Medical Advisory Board as the expert in sanitation and then became Chairman of the Anti Gas Committee. (Peterkin 1968, vol. 1 entry 7220) Percy Samuel Lelean joined the Royal Army Medical Corps (RAMC) in 1900 and in early 1915 was Assistant Professor of Hygiene. He went to Gallipoli in 1915 but came back to Millbank in the 1920's as Professor of Hygiene. (Peterkin 1968, vol.2 entry 181)

Ernest Young Starling was a physiologist who joined the RAMC at the start of the war, initially working at Royal Herbert Hospital. After Millbank he went to Italy in 1917 to convince the Italian army of the need for better respirators. (Dictionary of National Biography 1997) By 1916 all

development work was transferred to Starling's laboratory at University College. Later Starling replaced Lelean but working alongside him in respirator design was JA Sadd and in Chemical Research was EF Harrison. Harrison was a pharmacist in his late forties who had worked for Boots. He took over the SBR development in 1916, then directed the anti-gas department and was later promoted to Deputy Controller, then Controller. He died of overwork and flue just before the Armistice.

The Army Medical Services (AMS) were called upon to devise and supply a means of protecting troops against chlorine gas for twenty minutes exposure to a concentration on .1% in air. (Anti-gas Departmdnt Files n.d.)

But all was not well in the anti-gas department. Two Professors, Frankland and Pope were invited to France to report on the work of the anti-gas department there. They stated in their report that the lack of efficiency and energy was not applicable to France but rested in the War Office and Millbank, especially the supervision of Horrocks. (memorandum by Professor Baker and Dr. L.E. Hill n.d.) One thing Horrocks did in the department was dispense with elaborate committee procedures; it was far better to get on with the research than talk about it. These statements were eventually found to be devoid of any truth.

In October 1917 the anti-gas department ceased to be under the control of the medical services.

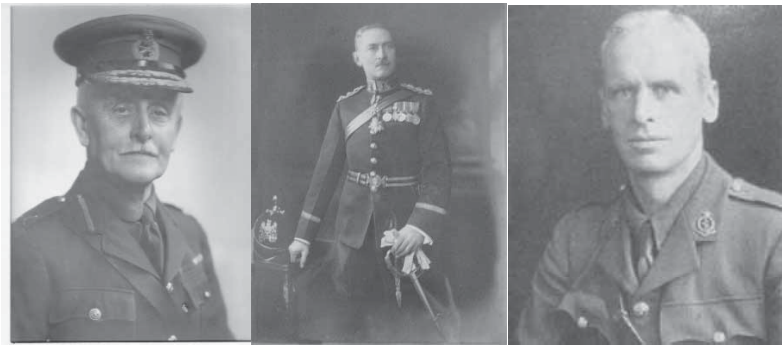

Figure 8.2 William Horrocks (as a Major General after the war), P.S. Lelean, and Ernest Starling. Horrocks & Lelean courtesy of the AMS Museum; Starling from the Physiological Society collection.

Gas Protection and the Early Respirators

The work done at the Royal Army Medical College, Millbank on the early forms of gas protection deserves examination

The Pads

How did the idea of a mask or pad come about? A German prisoner of war, being treated at Vlamertinge, was found to be in possession of a pad impregnated with some form of alkali and glycerine. This pad was sent by the Commanding Officer of the Field Ambulance down to Colonel Goodwin in the laboratory at St Omer where it was tested and passed on to the authorities.

Back in UK the response was immediate. The national press appealed to the women of England to protect their men folk by making pads out of cotton wool. On 28th April the War Office published an appeal for this type of protection to be made. These pads reached the troops in 72 hours but they were deemed to be useless because cotton wool is very difficult to breathe through so cotton waste was substituted and held in place by black cotton netting as used in ladies veils. The veiling was of 1.5mm mesh folded to form a pocket for the pad to be inserted into. (Form of Protective devices n.d.) This latter material was readily available. The pad had many drawbacks not least that its absorbency was poor; it was not easy to adjust and necessitated the pad being held firmly in place.

Lelean in a paper he gave in 1920 states that 98,000 pads were available at the front within 60 hours, 300,000 within a week and two million within a month. (P.S.Lelean 1920)

With chlorine attacks of more ferocity expected it was essential that the area of filtration be enlarged and the absorbency of the gas improved.

The Helmets

The workers at Millbank worked like Trojans and in some periods did so with little rest until a solution was found. This they did by substituting the pad for a helmet. The idea being that this could be pulled quickly over the head and tucked in the jacket collar. (P.S.Lelean 1920) It has been said that the idea came from a Canadian Sergeant who saw a German soldier pull a bag over his head during a gas attack. (Macpherson 1923, 196)

The manufacture of these helmets was not without its problems not least a shortage of khaki woollen textile. Not just any colour of materiel

could be used; light coloured helmets were no good because it would make the men at the front easily spotted by the enemy. Lelean was concerned that by dying the helmets it might affect the impregnation of them. Once again much burning of the midnight oil was carried out to find the solution to the problem. (P.S.Lelean 1920)

Testing of these helmets from the point of view of breathability was not initially done in a gas environment but by running around the college drill square. Some of these tests were carried out on helmets without eye pieces so the wearer, usually a soldier ran or tried to run around the square being guided by another person not wearing a helmet. Eventually a machine was devised to carry out these tests. (Ministry of Munitions and trench warfare Department Files n.d.) There was some upset by the authorities that no test had initially been carried out in the chamber by a human being in a concentration of the gas expected on the battlefield. The concentration used was one tenth of that expected on the battlefield

The helmets themselves were impregnated with sodium carbonate, thiosulphate of soda and glycerol to absorb the gas.

The next problem was the eye piece; initially made of Mica which proved too brittle, then of celluloid which was too inflammable and in some cases was sewn in with needle holes too large allowing the gas to penetrate and finally made from non-splintering glass. (P.S.Lelean 1920)

The daily output of protective helmets in factories in England was 108,000.

Figure 8.3 Officers donning their PH Gas helmets. Credit - Wellcome Library London

More Dangerous Gases

Things were about to change, not only in the type of gases used but the method of delivery. Cloud gas attacks, dependent on the wind direction for delivery, gave way to delivery by shells.

When intelligence brought word of possible use of new, even more dangerous gases the British Museum were requested to find out anything and everything they could and then Imperial College of Science and Technology were requested to try and re-produce the gas. Until this was done and only when this was done could the work begin in trying to find an absorbent. Once an absorbent had been manufactured then testing in a chamber could be carried out. Testing was initially carried out using a rat and if the rat survived then a helmet was tied on a pig's head and the pig put in the chamber. If the pig survived then a soldier wearing a helmet was sent into the chamber. This was then termed the lethal chamber and the poor soldier in there, without any lights because the gases had over time corroded all the light fittings, counted down the minutes until it was time to come out. In many cases the gas committee themselves went into the chamber. (P.S.Lelean 1920) It was not without its problems; in one case the pig survived so a soldier was put in and then a few days later the pig died. All eyes were on the soldier who started vomiting black pellets but after a few days recovered. (P.S.Lelean 1920)

Eventually it was decided that all future testing should be done on humans. Lelean himself spent a lot of time in the chamber and Horrocks stated: 'he almost lived in the gas chamber and without his help the troops would not have been efficiently protected in the period before the small box respirator was designed'. (Obituary 1920)

All those working at Millbank felt that they had to do their utmost to ensure that before these helmets went to the front they had been tested to their utmost to afford their comrades the best protection available.

There needed to be work done to afford protection to the newer gases used by the Germans and a further absorbent was needed. Sodium Phenate was used to soak the helmets in but initially it was found that the solution rotted the woollen fabric of the helmets. Also the women dipping the helmets suffered burns of their arms and the mixture of carbon dioxide breathed out, mixed with hydrocyanic acid caused major non-absorption problems with the helmet. This was counteracted by fitting an expiration valve in the helmet for the wearer to breathe out of. (P.S.Lelean 1920)

A total of 26,800,000 helmets were made from July 1915-February 1918. 880,000 gallons of solution were used in the dipping. (P.S.Lelean 1920)

Small Box Respirator

The first experiments on a form of absorbent filter were carried out in July 1915 and the first box respirator with a filter containing mainly charcoal, being issued in February 1916. There were various problems with absorbance of the gasses in the filter and these were eventually worked out by hard work and experimentation.

Weekly output of Small Box Respirator (SBR) reached 70,000 in September 1917 and 200,000 per week in August 1918. In total by the end of the war some 16,000,000 SBR.'s had been manufactured. (P.S.Lelean 1920)

Figure 8.4 Officers donning their Small Box respirators. Credit – Wellcome Library London

Early Treatment of Gassed Cases

Chlorine Gas

It was not long after the April gas attack that something was put in writing about treatment and this was followed in 1916 by a dedicated publication on the treatment of gassed casualties.

In the case of Chlorine poisoning which is a lung irritant and did not affect any other part of the body, the effects are immediate: (Macpherson 1923, 383)

- Burning sensation in the throat with a dry mouth.
- Irritation of the sensory nerves of the respiratory passages
- Immediate choking sensation followed by coughing and possible vomiting
- Pulmonary oedema and congestion of the lungs rapidly follows. The bronchioles rapidly fill with serous exudate resulting in
- Spitting of frothy fluid.
- Cyanosis

The cases were divided into three groups: (Herriingham 1920)

- The Grey cases – collapsed from the start with a very weak pulse. Nothing could be done for them.
- Those very slightly affected who recovered spontaneously.
- Intermediate class – cyanosed with a good pulse but if not treated they would get worse.

The gas also causes inflammatory irritation of the trachea and bronchi with the resulting secondary infection of bronchitis and broncho-pneumonia. (Macpherson 1923)

Death would occur in any one of three ways:

- Directly in the field where they adopted a greenish white colour to their face
- Up to the fourth or fifth day when the patient was overwhelmed by asphyxia due to oedema of the lungs but this happened in very few cases
- Any time up to the end of the second week from inflammatory complications such as bronchitis or bronchopneumonia with pleurisy and heart failure.

One of the earliest post mortem examinations of a gassed casualty was carried out by Dr. McNee of Glasgow University and he found that the lungs were voluminous and congested; a large quantity of Albuminous liquid could be squeezed from them; the bronchi and alveoli were inflamed and emphysema present. (J.S.Haldane 1919)

In the field ambulance restless cases could be given ¼ grain of morphia and Ammonia as a respiratory stimulant.

It was felt that rest, warmth, oxygen in high concentrations and venesection of 15-20ozs was necessary as part of the treatment. To ensure that the casualty was rested he was transported by stretcher throughout his

evacuation but it was essential to get the casualty back to the CCS as soon as possible. Another reason for getting the casualty back to the CCS at the earliest was because in the early days Oxygen was not available in field ambulances. Eventually more lightweight cylinders and equipment became available enabling this to happen. (Macpherson 1923, 505) Oxygen was initially given by a funnel and but this was found to be of not the slightest use so the method of administration was changed to administering via a rubber tube into the mouth or a nasal cannula. (Macpherson 1923, 505)

In the case of venesection it was only recommended for those with a full pulse and a high venous and arterial pressure, often described as 'bursting with blood'. By bleeding the patient the venous pressure was reduced as was the tendency for oedema forming in the lungs. In gas poisoning the blood became concentrated so needed thinning with Saline but very few people tried this because it was felt that it would increase pulmonary oedema.

The RAMC eventually carried out further work on venesection and it was found to:

- Relieve cyanosis
- Relieve congestion of the lungs
- Relieve acute headache and also promoted sleep.

Rest was essential because exertion raised the oxygen requirement and warmth was essential to help counteract shock but back at the CCS fresh air was a major requirement, so there had to be a fine balance between the two. (Hebblethwaite 1916)

Phosgene Gas

Introduced by the Germans in May 1915, Phosgene was a pulmonary irritant initially delivered by 'cloud gas' and eventually fired in shells. It caused respiratory problems accompanied with coughing, vomiting, cyanosis, pains in the chest which could possibly lead to delirium, unconsciousness and death. It was also noted that in some cases there was profound circulatory collapse. Noted at the post mortem of Phosgene gassed cases was thrombosis of the blood vessels of the brain and kidneys. (Meakins 1918) Its treatment mirrored that for Chlorine gas poisoning.

Mustard Gas–Dichlorethylsulphide

This is a vesicant, so named because of its odour. It produced a chemical burn on any area of contact. Patients presented with a scorching of the air passages and skin and in some cases inflammation of the eyes which left little permanent injury. The long term danger was septic bronchopneumonia produced by the sloughing of the mucous membrane of the trachea. If present, the patient usually died within ten to fourteen days.

Treatment of Mustard Gassed Cases

The problem with Mustard gas was that it contaminated the ground and everything that it came in contact with and this contamination was residual so it was essential that clothing was cut off as early as possible. Slight skin contamination could be treated by boracic ointment but those with deep burns were immersed in hot alkaline baths so that any old dressings would eventually float off. This procedure could be repeated twice a day but was both manpower and equipment intensive resulting in the need for specialised treatment centres and medical personnel trained to treat these cases. Those patients suffering from conjunctivitis initially wore dark glasses or shades to protect the eyes from light and liquid paraffin drops were installed four times a day. (Meakins 1918)

Staff Nurse C Macfie recorded the effects of treating Mustard gas cases at No 11 Casualty Clearing Station:

> *....It was just a couple of nights later that the mustard gas cases started to come in. The poor boys were helpless and the nurses had to take off these uniforms, all soaked with gas, and do the best they could for the boys. Next day all the nurses had chest trouble and streaming eyes from the gassing. They were yellow and dazed. Even their hair turned yellow and they were nearly as bad as the men, just from the fumes from the soldier's clothing. (MacFie 1980)*

Whatever the type of gas used it should be remembered that many of those affected experienced chest problems for the rest of their lives, especially during the winter months and in many cases this would lead to an early death post war.

Conclusion

Lelean had this to say about gas warfare.

> *The adoption by the German Army of poisonous gases as an adjunct to their military operations has introduced into war a new weapon, which the other belligerent armies have thus been forced in self-defence to adopt. The results indicate that no army can in future afford to be unprepared to meet this method of attack. (Lelean n.d.)*

Little did Lelean know what he was saying and how, almost one hundred years later some nations would still have stocks of chemical weapons and the capability to use them.

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SECTION IV.

CIVILIANS AT WAR

CHAPTER NINE

AMERICANS UNDER FIRE ON THE EASTERN FRONT: THE AMERICAN RED CROSS IN SERBIA, RUSSIA, AND ROMANIA DURING WORLD WAR I

BRADFORD WATERS

American medical personnel served with the British, French, and American Red Cross efforts on the Eastern Front during World War I. This study will focus on American medical volunteers who served in Serbia, Russia, and Romania. Americans served prior to the U.S. entry into the conflict and continued to serve after much of the Eastern Front had collapsed. Contingents of American physicians and nurses served with Russian troops in northern Persia. U.S. military medical and Red Cross personnel served with the American Expeditionary Forces in Northern Russia and Siberia. Their few numbers were offset by the magnitude of care they provided. Although technically part of the Eastern Front, American Red Cross assistance provided to Germany and Austria-Hungary early in the conflict will not be included (Dock 1922, 161-74). Likewise American Red Cross relief efforts within the Ottoman Empire are beyond the scope of this study (890-910). The American medical experience offers a glimpse of the medical crisis and massive epidemics confronting the Eastern Front allies. Unlike most Western Front medical literature, many of the descriptions were written when the United States was neutral. American medical personnel worked with both sides of the conflict in Eastern Europe. Their experiences provide a valuable window into the military and medical catastrophes of the Eastern Front.

Few primary historical sources are available on the medical experience on the Eastern Front. Few Russian sources on Russia's casualties were available to Western researchers following World War I (Shumsky-Solomonov 1920, 31-5; Wanke 2005, 30-41; Kohn and Meyendorff 1973,

133-41). Likewise, few Romanian and Serbian World War I sources were available (Săndulescu 1940, 15; Mitrović 2007, 110-3; Negulesco 1918, 160-74, Antonesco 1919, 129-151, Kiriţescu 1989, 496). Small contingents of physicians and nurses from Western Europe provided extensive descriptions and photographs of combat casualties, epidemics, and sacrifices on the Eastern Front. Their experiences provide personal descriptions of the medical crisis of the Eastern Front Allies (Ross 1988, 31-5; Farmborough 1974, 217-9; Fedunkiw 2007, 53-7). British medical personnel, including the Scottish Women's Hospital, served in Russia, Serbia, and Romania (Leneman 1998, 47-56; Ross 1988, 43; St. Clair Stobart 2004, 145-52; Powell 2009, 99-111). Much of the Western knowledge of the Eastern Front medical experience was acquired from the memoirs of British and French personnel. This research focuses on the experiences of American Red Cross medical personnel serving in Serbia, Russia, and Romania during World War I.

Serbia

With the outbreak of World War I, Britain, France, and Russia sent medical teams to Serbia. Neutral nations such as Sweden, Denmark, Holland, Greece, and the United States additionally sent medical teams (Dock 1922, 191; Strong 1920, 88; Downer 1916, 19). Russia sent two field hospitals, a 350-bed surgical hospital, and a 120-bed epidemiological facility. The British Red Cross sent 30 medical personnel. The British later sent 16 field hospitals, 8 ambulances, and 230 tons of medical equipment. Mrs. Mabel St. Clair Stobart of Great Britain was asked to form the Women's Sick and Wounded Convoy Corps in 1907. She was active in Serbia during World War I (Powell 2009, 18). Mrs. Stobart sent 50 women physicians and nurses to Serbia. France sent "at least one hundred" physicians. Mitrović estimated that at least 2,000 people came to Serbia during the war as part of medical and relief efforts (Mitrović 2007, 111-3).

The first American Red Cross unit of 3 surgeons and 12 nurses departed for Serbia on September 9, 1914 (Gardner 1916, 36-40; Dock 1922, 177. They were transported on a merchant ship to Salonica, Greece, and then travelled to Niš (Nish), Serbia. The American Red Cross Unit Number 1 was assigned to the Military Hospital at Belgrade on October 15, 1914. The Americans assisted 8 Serbian physicians and 150 Serbian nurses (Murray 1916, 19).

Upon the arrival of these medical personnel, Austro-Hungarian forces were shelling the city, and the hospital was filled with Serbian casualties. During the first 17 days, the 15 Americans helped treat approximately

1,000 wounded Serbians. The supervising nurse, Mary E. Gladwin, described continuous shelling during the first 6 months in Belgrade (Dock 1922, 177-9).

The American Red Cross medical personnel in Belgrade described the Austrian attacks, Austrian occupation, Serbian recapture of the city, and subsequent recapture by Austro-German forces. Due to their neutrality, the American medical personnel worked closely with physicians from both sides. The American Red Cross unit remained in Belgrade to care for casualties when the combatants from each side were forced to retreat (Downer 1916, 58-80).

During the Austrian occupation, the Belgrade hospital was inundated with casualties. Dr. Edward W. Ryan, of the American Red Cross Hospital Unit One, wrote

> We worked day and night until we could no longer continue. We had wounded men everywhere. Starting at six o'clock in the morning, we would dress wounds all day. About nine o'clock at night we would start to operate and work until five or six in the morning. Many nights we got no sleep and never more than three hours. Halls, floors of wards, and every place man could fit in, we had filled. We had in this hospital for several days three thousand wounded and one day we had nine thousand in the grounds (Dock 1922, 178).

Under Austrian control, the American Red Cross provided up to 6,000 loaves of bread to civilians, as well as rations of bread and soup to patients and staff of the military hospital. The Americans described hundreds of Austrians suffering from "frozen hands and feet, dysentery, recurrent fever, typhus and typhoid." They reported patients suffering from "every type of rifle, shrapnel, grenade and bomb wound" (Dock 1922, 178). Casualties were brought to Belgrade in "ox-carts and hay wagons," often "without even First Aid dressings on their wounds, from remote mountain towns" (178). With such limited care given to the wounded prior to admission, the nurses described overwhelming casualties with advanced complications of gangrene (178-9). During the Austrian occupation, the American Red Cross hospital in Belgrade served primarily as an evacuation hospital. The German and Austrian wounded were treated and transported by hospital ships on the Danube River. The hospital ships were described by Dr. W. A. Jolley of the American Red Cross in Belgrade as steel barges placed on each side of a river passenger steamer (Jolley 1916, 120-33).

Dr. Edward W. Ryan described the retaking of Belgrade by the Serbs in December 1914. He wrote of shells "bursting everywhere" and 500

Austrian casualties "left in our care" (Dock 1922, 179). After the retaking of Belgrade by Austrian troops in October 1915, American medical personnel cared for 4,000 Serbian and Austrian casualties (Murray 1916, 22-3). Few medical records were kept in the American Red Cross Hospital in Belgrade. In a review of 222 patients on June 1, 1915, there were 73 patients with post-typhus complications such as gangrene, abscesses, and ulcers. There were 53 patients with gunshot wounds, and 46 of these were described as infected. Twenty-five had adenitis ("tubercular predominating"). Ten patients had ulcers from cold injury. Eleven patients had fractures. Fifty had "miscellaneous, lacerations and contusions" (Jolley 1916, 124). The Serbian Army lacked efficient casualty evacuation, and access to rail transportation was very limited. The Americans described shortages of food, water, and electricity (Jolley 1916, 120-33; Szymanski Schmitt 1916, 518-24). Due to the lack of backup generators, for 2 weeks the Americans were forced to perform operations with "coal oil lamps and candles" (Downer 1916, 164-5).

In December 1914, the American Red Cross Units Number 2 and 3 arrived in Salonica, Greece, and were transported to Gevgeli (Gevgelija), Serbia. The units consisted of 6 physicians and 12 nurses (Murray 1916, 21; Dock 1922, 21; Downer, 1916, 30). They were assigned to an improvised hospital located in a cigarette factory in Gevgeli. The hospital was without heat, water, or drainage but housed 1,200 surgical patients. Two days following the arrival of the two American units, 500 additional wounded entered the hospital. Bedding consisted of "straw mattresses laid on the tobacco-littered floor." The basement was "filled with an accumulation of soiled clothes and linen over which thousands of body lice crawled." The diaries of the American nurses described the severe shortages of medical supplies, food, and sanitation. In addition to casualties with severe and unattended wound infections, the medical staff struggled to treat patients with complications of dysentery, typhoid, and other intestinal diseases" (Dock 1922, 189). The Americans in Units 2 and 3 were generally responsible for the care of 1200-1400 patients. During January 1915, the two units cared for 850-1050 patients daily. One day, they received a train with 600 casualties (Murray 1916, 21).

Dr. Shadwood O. Beasley served as an assistant surgeon with the American Red Cross Hospital Unit 3. He published extensive descriptions of his experiences in Serbia. He wrote that they treated

> every variety of gunshot wounds from rifle bullets, shrapnel slugs, shrapnel fragments, hand grenades and great contused lacerated pulpified wounds involving the entire cross section of a limb, caused by high explosive shells. We were in the unique position of being a first aid, field and base

> hospital, all in one, in the center of a terrific bombardment (Beasley 1917, 45).

Dr. Beasley described neurosurgical injuries with extensive brain exposure and rare survival. He described casualties whose abdominal wounds were explored. These patients were usually found to be "almost hopeless" with the intestines "often torn severely and in several places and the blood vessels were found bleeding freely. These cases almost, if not quite, all died" (Beasley 1917, 45). Dr. Beasley described performing a large number of amputations "as many of the wounded were so horribly torn by high explosive shells, which pulverized extremities." He described the difficulties with evacuation with the wounded often lying for 3or 4 days without dressings, food, or water. Significant delays frequently occurred in transportation to Belgrade. He wrote that, with the delays, "the amount of pus in these cases was terrible." He described large numbers of patients requiring amputation for gas gangrene. During the Austro-German occupation of Belgrade, Beasley wrote that the Germans had adequate medical personnel and equipment to care for their own casualties. The Austrians had the bulk of the casualties and shortages of medical staff and equipment, so the numerous Austrian casualties were directed to the American hospital (45-51).

During February 1915, Dr. Edward W. Ryan, the medical director, wrote that the American Red Cross Unit in Belgrade was caring for 1850 patients. He stated that typhus had overrun Serbia. He reported that there were 100 deaths per day from typhus in the town of Niš and at least 50 per day in Belgrade and that many casualties were dying from relapsing fever (Dock 1922, 180).

Dr. Reynold M. Kirby-Smith, of the American Red Cross, stated that, upon his arrival to Belgrade in March 1915, there were 900 typhus patients in separate typhus pavilions. Subsequently, the disease became epidemic throughout the military hospital (Dock 1922, 182).

The American Red Cross physician, Dr. James F. Donnelly, died of typhus and was buried in Gevgelia (Gevgelija), Serbia. Dr. Earnest P. Magruder also died of typhus and was buried in Belgrade. Dr. Earl B. Downer wrote of his colleagues, "I sometimes wonder if the world will ever appreciate the services of the above named physicians whose bodies lie in Serbian soil. Martyrs are they of the noblest type, who gave their lives endeavoring to alleviate the sufferings of others" (Downer 1916, 40-7). The American Red Cross Units Number 2 and 3 were later transferred to join unit Number 1 in Belgrade (Dock 1922, 193).

The Americans witnessed the most severe typhus epidemic of the war. Serbian medical staff were decimated during the epidemic. Miloseć

reported that approximately 200 of 440 Serbian military and civilian physicians died of typhus (Mitrović 2007, 113). Dr. Downer of the American Red Cross Hospital in Belgrade estimated that 240 of 300 Serbian physicians died and reported a patient mortality rate as high as 80% (Downer 1916, 3). Seventy-five percent of the population of Gevgeli died during the epidemic (Downer 1916, 41). Dr. Downer wrote that the "hospitals were a giant mill grinding out the dead" (Downer 1916, 41). Of an estimated 60,000 Austro-Hungarian prisoners, half died of typhus in the setting of malnutrition and exposure (Downer 1916, 39). Approximately 150,000 to 165,000 Serbs died from typhus during World War I (Strong 1920, 3; Mitrović 2007, 111).

Dr. Earl B. Downer wrote that, of the 18 American Red Cross physicians and nurses in Belgrade, 13 had typhus—1 died and 12 were ordered home. The medical personnel refused to leave and remained in Serbia. All 10 of the Greek medical team died of typhus (Downer 1916, 18-20). Dr. Ryan wrote of the American Red Cross Units 2 and 3 in Gevgeli that 8 of 12 nurses and 4 of 6 physicians had typhus. One surgeon and three nurses from a French unit were transferred to assist the devastated American unit (Dock 1922, 181).

Dr. Downer estimated that, in a little over a year, the American Red Cross cared for 20,000 sick and wounded. He reported that American medical personnel provided care for 4,000 wounded within 1 month of the Belgrade surrender. After serving "on the firing line for a year, during three invasions, we had a chance to observe every variety of wound inflicted by various instruments of modern warfare" (Downer 1916, 166). In addition to casualty care, the Americans were responsible for the medical care of an additional 20,000 refugees suffering from exhaustion and malnutrition (Downer 1916, 165-6).

Language barriers were a constant challenge. Fortunately, Dr. Jolley reported that Americans in Belgrade "frequently knew some German" (Jolley 1916, 120-32). Austrian prisoners of war were used as hospital attendants or "sanitats". Some of the Austrian prisoners also served as interpreters for Serbian patients.

Dr. Downer wrote of the retreat of Serbian troops to Albania and described the thousands of Serbs who died of malnutrition and exposure (Downer, 1916, 191). A book he published on his experiences included many photographs of Serbian medical facilities, casualties, and American personnel. In his photographs, American Red Cross physicians wore civilian clothing with Red Cross armbands. The nurses wore American Red Cross uniforms (66-7).

The American Red Cross and Rockefeller Foundation sponsored the American Sanitary Commission, which included a talented team of 42 physicians, bacteriologists, sanitation engineers, and administrators (Beasley 1916, 634-43; Strong 1920, 88-9; Davison 1919, 80). The Americans provided supplies for disinfection efforts of Serbian troops, Central Powers prisoners, and civilians. They disinfected hospitals and set up tents and buildings for mass disinfection efforts. Fumigation was performed with sulphur dioxide. Soldiers and civilians were disrobed and had their hair shaved. Clothes were heat treated. Soldiers and civilians underwent extensive bathing and applications with petroleum and phinotos oil (a lysol-cresol preparation). Mercury bichloride was used to clean the hospitals. Naphthalene was used as a "disinfectant" and for individual prophylaxis (Strong 1920, 34-7). An American Red Cross team used freight cars as mobile disinfection units (30-1). The international assistance helped to combat the decimating epidemic. With their constant exposure to typhus patients, five American physicians died of typhus while serving in Serbia (10).

Dr. George C. Shattuck of the American Red Cross Sanitary Commission to Serbia documented extensive descriptions of the cardiovascular, pulmonary, gastrointestinal, hematological, and renal complications of typhus. The clinical and laboratory presentations were presented in great detail and in photographs (Shattuck 1920, 111; Sellards 1920, 243-52).

The results of 20 autopsies were published along with findings on treatment including the surgical care for the severe cutaneous infections and gangrene in patients recovering from typhus (Shattuck 1920, 111).

Extensive microbiological studies were performed by Dr. Hans Zinsser and Dr. J. Gardner Hopkins of the American Red Cross Sanitary Commission. Because of the concentration of typhus in Skoplje, bacteriological work was set up in a laboratory of the Sixth Reserve Hospital. Cultures were performed of blood, pleural fluid, ascetic fluid, and tissue specimens from autopsies. Research studies included animal models for typhus infection. Guinea pigs were transported from New York to Serbia. Body fluids from typhus patients were injected intra-peritoneally into guinea pigs in an attempt to better understand the pathogenesis of typhus. Macroscopic and microscopic agglutination studies were also performed on serum of patients in the convalescent phase of typhus (Zinsser 1920, 261-8; Hopkins 1920, 269-73). After returning to the United States, Dr. Zinsser continued his research in fighting typhus throughout the world. In addition to his studies on pathogenesis, he was active in immunization research against typhus (Zinsser and Macciavello 1936, 673-87; Mueller 1940, 747-53).

American preventive medicine efforts additionally helped decrease the incidence of malaria and provided vaccinations against typhoid fever and cholera (Strong 1920, 37-8). The American Red Cross also provided relief efforts to Serbian refugees near the Greek border, as well as to Serbian prisoners of war in Austro-Hungary and Bulgaria. American dentists with 10 equipped dental ambulances served with the Serbian Army (Davison 1919, 256).

The extensive descriptions written by Americans and British serving in Serbia provide the few available historical records of Serbia's suffering and sacrifice (St. Clair Stobart 2004, 145-52; Farnam 1918, 57-65; Downer 1916, 41). Much of the Western understanding of Serbia's typhus epidemic is due to the publications of the international medical teams serving from 1914 to 1916.

Russia

From December 1914 to September 1915, six American surgeons and 24 nurses served in the American Red Cross continent assigned to Russia. They assisted in staffing the 750-bed hospital in Kiev (Snively 1916, 623-38; Patterson 1915, 21-2). While in Kiev, they treated 6,750 patients. They reported 983 major operations, 52,017 minor procedures and redressings, and 96,922 patient-days (Snively 1916, 623-38). Among the recorded casualties were 3,760 gunshot wounds, 1,711 shrapnel wounds, 7 bayonet wounds, and 177 patients with cold injuries. Most of the casualties were wounded while fighting in Poland and Galicia (southeastern Poland and western Ukraine).The medical contingent reported only 151 deaths for an estimated mortality rate of 3.7%. In a setting where 80-90% of the casualties presented with infected wounds, often following 1- to 2-week delay in care, such a low mortality rate is remarkable (Snively 1916, 623-38; Murray 1916, 18).

The Americans published their experiences in the journal *Military Surgeon* in 1916. They provided extensive descriptions of casualty care, as well as photographs of the Russian casualties and medical facilities (Snively 1916, 624). The photographs of the hospital show American Red Cross physicians wearing Russian Army uniforms to avoid foreign physicians from being mistaken by Russian troops for the enemy. The American nurses wore American Red Cross uniforms. Photographs of American and Russian physicians and nurses were taken in the entrance of the hospital in Kiev (Thompson 1918, 74). The massive 1915 hospital utilized the facilities of the Kiev Polytechnic Institute (Snively 1916, 625).

Figure 5-1 Kiev Polytechnic Institute in Kiev, Ukraine, utilized as a hospital by the Russian Army and the American Red Cross in 1914-1915 (photograph taken in 2011 by Lance Waters)

In addition to serving in a base hospital in Kiev, American physicians visited the dressing stations in Galicia, which were staffed with physicians, nurses, sanitars (medical orderlies), clerks, and a priest. They reported that the dressing stations received 1,700 casualties in one night in July 1915 (Snively 1916, 623-38).

For the Russian Army, the Eastern Front of World War I extended from the Baltic Sea to Persia. The Russian Army confronted Turkish incursions into northern Persia (Cornish 2006, 86-8; Atabaki 2006, 1-27). Two American Red Cross physicians and five nurses originally assigned to Kiev were deployed with Russian troops to northern Persia in 1915. Americans serving in Persia 1915-1916 treated 2,000 patients. In addition to combat injuries, the Americans described complications of typhus, malaria, and scurvy (Snively 1916, 623-38; Hazlett 1917, 445-9). Their descriptions and photographs of Russian medical evacuation and facilities in Khoi, Persia, provide some of the few glimpses of the medical challenges in this isolated portion of the Eastern Front.

Dr. Malcolm C. Grow served in Russia from 1915 to 1917. He rose to the rank of Lieutenant Colonel in the Imperial Russian Army Medical Corps and wrote extensive descriptions of Russian care of casualties. He witnessed combat on the front lines and served in field hospitals. He described the German shelling of Red Cross dressing stations and ambulance columns and firing on the wounded Russians crawling back to

their lines (Grow 1918, 273). Dr. Grow was awarded the Russian Army St. George's Cross for his medical services. In 1918, he published a book detailing his medical experiences on the Eastern Front. His book contains numerous photographs of Russian medical evacuations with stretchers, carts, and motor vehicles. His photographs include field hospitals, the care of casualties on the front lines, gas casualties, and dogs used by the Russian Army to locate wounded and guide rescuers to evacuate the wounded (169-76). After serving in Russia, Dr. Grow joined the U.S. Army Medical Corps. He subsequently became the first Surgeon General of the U.S. Air Force (Greenwood 2005, 117).

The American Red Cross provided 125 ambulances for service in the Russian Army. During the winter and spring of 1918, the American Red Cross mission in Russia distributed 450,000 cans of condensed milk (Davison 1919a, 82).

Field hospitals, dressing stations, and aid stations for the American Expeditionary Forces in North Russia and Siberia were provided by the U.S. Army Medical Department. By November 1918, the U.S. Army had a 1,260-bed capacity in North Russia (Ireland 1925, 945-55). In July 1918, the American Red Cross sent personnel to Archangel (Arkhangelsk) to support American Expeditionary Forces (Davison 1919a, 82-3). By September 1918, the American Red Cross in Archangel provided 85 hospital beds and 30 beds in the annex (Ireland 1925, 952).

From June 1918 to February 1919, approximately 350 American Red Cross personnel served in Siberia. There were 22 Red Cross stations and 5 American hospitals. These facilities provided 1,450 beds and served 3,095 patients (Davison 1919a, 83-4). One hundred and fifty-six nurses and 43 nurse's aides were recruited (Dock 1922, 930). Multiple Red Cross hospitals were set up in Omsk, Irkutsk, Manchuria, Vladivostok, and Russian Island. The American Red Cross hospital, organized in November 1918 in Omsk with 250 beds (Dock 1922, 926), had 6 physicians and 12 nurses (Willett 2003, 254) who provided care to American, Czech, and Russian casualties, Russian civilians, and prisoners of war. The Red Cross sponsored smaller hospitals with Russian nurses in Novo-Nikolaevsk, Petropavlosk, and Cheliabinsk (Dock 1922, 926). In September 1919, the Red Cross sponsored three hospitals in Omsk, Tomsk, and Novo-Nikolaevsk. By 1919, the hospital in Omsk had increased to 1000 beds and was staffed by American physicians and Russian nurses. Four

American Red Cross hospitals were established at Irkutsk with 900 beds (Dock 1922, 943-4).

The Siberian medical facilities were overwhelmed by the typhus epidemic. An estimated 25,000 Russian soldiers in the Irkutsk hospital had typhus. The American Red Cross set up a 600-bed hospital and an additional 1600-bed typhus hospital in Verkhune-Udinsk (Dock 1922, 947). One American nurse, Nettie Grace McBride, died of typhus in Tumen (Tyumen), Siberia. U.S. soldiers buried her in a Russian cemetery in her Red Cross uniform with an American flag-draped casket (924, 1483). Seven American Red Cross personnel died during the Siberian campaign (Willett 2003, 256).

The American Red Cross contingents provided descriptions of the medical crisis within the prisoner of war camps in Russia. In 1916, eight American surgeons and 37 nurses provided assistance to German prisoners of war in Russia. The medical staff distributed medications and supplies to German prisoners in Moscow, Ugresh, Ryazan, Penza, Saratov, Astrakhan, Samara, Orenburg, Omsk, Novo-Nikolaevsk, Tomsk, Irkutsk, Tashkent, and Kazan. One American nurse described the challenge of providing medical assistance to 788 German officers and 24,466 enlisted "wounded, ill, bedridden and helpless" (Dock 1922, 225). In addition, care was given to 78 officers and 8,436 enlisted soldiers described as "incurables." The American Red Cross communications documented the dreadful conditions within the prison hospitals. Evacuation hospitals were "overcrowded with victims of advanced tuberculosis" (225). Sister Anna L. Reutinger, an American Red Cross nurse, estimated that 80% of the prisoners had complications of tuberculosis. She wrote that scurvy "worked great havoc among the captives" and described treatment of 856 prisoners of war with scurvy. She also described psychiatric casualties among the German prisoners, as "usually from melancholia or [they were] the busy chattering type, the subject of their mania being invariably the horrors of war" (225-6).

Romania

Romania entered World War I in August 1916 (Torrey 2011, 13). In September and November 1916, Americans began serving in Romania as volunteers in French and British medical units (Dock 1922, 878; Bayne 1944, 33). During 1917 and 1918, the American Red Cross Mission worked in the cities of Iaşi and Roman in the region of Moldova (Moldavia) in northeastern Romania.

The American medical personnel described a humanitarian disaster in Romania—starvation and severe devastation from epidemics. The Chairman of the War Council of the American Red Cross, Henry P. Davison, wrote that, in 1917,

> The need of Romania was a nightmare. Its voices are never silent. It stared in the streets; it prayed from the cadaverous faces of a misery-marked populace; the sick, the naked and the starving were on every hand and the winter was at the door (Davison 1919, 239).

The Romanian Army and civilian population was devastated by the typhus epidemic. Among 60,000 Romanian troops in three divisions in February 1917, there were 16,547 typhus patients with 4,322 deaths. In March 1917, there were 17,387 typhus patients and 5,500 deaths. An estimated 25% of troops "eventually perished" (Torrey 2001, 187).

The Romanian Army Medical Corps in 1916 had 397 active duty and 1,532 reserve physicians (Săndulescu 1940, 15). Of the approximately 2,000 Romanian physicians in 1916, 200 died of typhus, 300 were taken prisoner, and 200 others were in German and Austrian occupied areas. Approximately 1,200-1,300 Romanian physicians were serving in the unoccupied region of Moldova where 60-75 French physicians and 25 British, American, or other physicians provided a significant portion of the available medical care (Bryan 1917, 8).

Dr. Joseph Breckinridge Bayne, an American surgeon with the British Red Cross in Bucharest and southern Romania, estimated 800,000-1,000,000 deaths among the Romanian population of 7 million during World War I (Cook and Preda 2010, 163-6), while the Romanian historian Dumitru Preda estimated over 1 million Romanian deaths, injured, and missing, including 330,000 military deaths (Cook and Preda 2010, xiii-xxviii). Dr. Bayne traveled from Newcastle upon Tyne, England, to Bergen, Norway; Petrograd; and Bucharest. He worked in the Romanian Army hospital in Bucharest and the improvised hospital within the Royal Palace (Bayne 1944, 33-4). The Bucharest military hospital had 2,000 beds. During 2 months in 1916, Bayne's section performed 271 operations under general anesthesia, an uncounted number of local procedures, and applied 11,000 dressings (50, 93). Dr. Bayne wrote extensively of the medical and surgical challenges of the Romanian Army and civilian population in World War I. The Romanian monarchy evacuated Bucharest and retreated to Iaşi in 1916. The British medical contingent evacuated with the Romanian troops. Due to American neutrality, Dr. Bayne chose to remain in Bucharest and care for the remaining sick and wounded. He placed an American flag above the hospital and waited for the German

advance (8-9). Dr. Bayne was captured by the Germans but was allowed to continue to treat patients during the typhus epidemic in southern Romania. He was released by the Germans in 1918 and travelled to Austria-Hungary, Switzerland, France, and Great Britain and then returned to the United States (172-182).

Dr. Bayne published extensive descriptions of casualty care in Romania. He described the long delays in transport of casualties, maggot infestation of purulent wounds, and fecal drainage from abdominal wounds. He reported that he saw a few bayonet wounds as "no quarter was given and no quarter was expected" (Bayne 1944, 75). He described the massive outbreaks of cholera and typhus in Romania and his care of Romanian, Russian, German, and Austrian casualties. He provided extensive descriptions of the suffering of Romanian civilians during the conflict. He wrote, "if there is any romance in war, unfortunately it does not fall to the lot of the nurse or surgeon to experience it" (75). He published photographs of Romanian soldiers and civilians with combat injuries and typhus. His photographs documented neurosurgical procedures and orthopedic surgical care. He additionally provided descriptions of psychiatric complications among Romanian casualties (75-8).

After the war, Dr. Bayne served as a Major with the American Red Cross unit and returned to Romania to provide additional humanitarian assistance. Bayne was awarded the Star of Romania with the Order of the Crossed Swords for his heroism by King Ferdinand, as well as the Order of the Regina Maria, First Class (Bayne 1944, 244, 248). His citations and awards are stored in the J. B. Bayne Collection of the Hoover Institution Library and Archives at Stanford University in Palo Alto, California.

Pauline Jordan, a graduate of New York Hospital, served as an American Red Cross nurse. She worked with the American Ambulance program in Neuilly, France, in 1914 and as a nurse anesthetist with the French Carrel Mission to Romania in September 1916 (Dock 1922, 878-9). By April 1917, 104 French physicians were serving in Romania. They assisted in 26 hospitals. French medical personnel brought improved aseptic techniques, radiological equipment, and newer methods of burn and cold injury care. Eleven French physicians and two nurses died in Romania; the majority of the deaths were attributed to typhus (Ionescu 2001, 79-84). Jordan's letters described malnutrition, cold, and suffering of the wounded during the Romanian and Allied evacuation to Iaşi. She also wrote of the massive typhus epidemic.

Jordan returned to Paris in August 1917 and was transferred to work with the Red Cross in Italy in December 1917 (Dock 1922, 860, 878-83). Pauline Jordan had the unique distinction of being awarded medals from

both the Western and Eastern fronts of World War I. She was awarded the Médaille d'Honneur des Epidémies from France and the Crucea Regina Maria, Class II-a (Cross of Queen Maria, Second Class), medal from Romania (Dock 1922, 860, 878-82, 1475). Her awards are stored in the Pauline Jordan Rankin Collection in the Hoover Institution Library and Archives, Stanford University, Palo Alto, California.

The American Red Cross sent a medical unit in July 1917 to Romania. The unit was led by Lieutenant Colonel Henry W. Anderson. During World War I, officers in the American Red Cross were given commissions. The unit consisted of 15 physicians, 11 nurses, 1 dentist, 1 preventive medicine specialist, 1 engineer, 1 sociologist, and 8 administrators. From July to September 1917, they travelled from Chicago via Vancouver, Canada; Yokohama, Japan; Vladivostok, Russia; Harbin, Manchuria; and Moscow, Russia; to Iaşi, Romania (Anderson 1918, 62-75; Paul 1991, 56-62).

The Americans took over the Prince Mircea Hospital in Roman, Romania, on October 6, 1917. The hospital was transferred from the British with 400 patients. The American Red Cross managed the hospital until March 8, 1918. Roman is a town in the region of Moldova in northeastern Romania and was 30 miles from the German lines (Davison 1919, 247-8).

The Prince Mircea Hospital included 500 beds, two ambulances, two operating rooms, X-ray, laboratory, and ocular and dental facilities. There were wooden barracks for up to 100 orderlies. The hospital had a disinfector, large laundry, machine shop, and carpenter's shop. During the American tenure, the patient census ranged from 380 to 500 patients (Davison 1919, 247-8). Dr. Orrin S. Wightman of the American Red Cross Commission in Russia travelled from Petrograd to Romania. He visited the American Red Cross hospital in Roman and met with Romanian troops. His photographs documented American physicians wearing American Red Cross uniforms, which were similar to U.S. Army Medical Corps uniforms. The American nurses wore American Red Cross Overseas uniforms. While Dr. Wightman wore a Romanian Army helmet, he took photographs of the Romanian front lines in Mărăşeşti. His descriptions and photographs from 1917 provide rare views of combat zones and medical facilities in Romania (Wightman 1928, 193-206; Wightman 1918, 350).

Figure 5-2 American Red Cross Hospital in Roman, Romania, 1917 (Orrin S. Wightman collection, permission provided by the New York Historical Society)

Dr. Robert C. Bryan, of the American Red Cross Hospital in Roman, described casualties as having a few burns or gas injuries. The gas injuries were more frequently conjunctivitis rather than laryngeal injury or pulmonary edema. There were a few patients with tetanus, as "all wounded received inhibitory injections and the mortality is negligible." Among chest wound casualties, 30% died in the field, and 23% died as inpatients. Patients with abdominal wounds had the highest mortality and were often treated expectantly. Head trauma patients often had neurosurgical procedures "requiring large loss of brain substance but ultimately succumbing with regularity if there has been infection" (Bryan 1917, 15) The American hospital had spinal and general anesthesia (Bryan 1917, 14-5).

Although the hospital predominantly provided combat wound care, an American nurse reported that 180 patients presented for hernia repair within 3 days in December 1917 (Dock 1922, 885). More than 20,000 operations and treatments were performed between October 1917 and March 1918 (Davison 1919a, 80). Most patients in the American Red Cross Hospital were Romanian or Russian soldiers, but Romanian

civilians including women and children were admitted to empty beds (Dock 1922, 883-4). In addition to Romanian casualties, Serbian and Montenegrin patients and German, Hungarian, Bulgarian, and Turkish prisoners were treated (Williams 1917, n.p.).

Revolutionary activity increased among Russian troops deployed to Romania and throughout the Eastern Front in 1917. In Roman, the Russians tore down the Romanian royalty's portraits "declaring there were no more kings and queens" (Marie 1935, 165). In Iaşi "red flags flew all over town," and Russian soldiers had mass meetings (Kennard 1918, 183). Florence M. Patterson, the chief nurse, wrote that "we were always sitting on the edge of a volcano which never erupted. We had to be ready to move within an hour provided the Huns came or the Russians signed peace or (much more probable) if the Bolsheviki attacked us for food supplies" (Dock 1922, 884).

Medical supplies were shipped from the American Red Cross through Russia and arrived in Romania in November 1917. The Americans were additionally supplied by the Russians and the British Red Cross (Davison 1919, 245).

The American Red Cross appropriated $2,714,610 for Romania (American Red Cross 1918a, 7) and organized orphanages and provided humanitarian assistance. Two trains with 58 carloads of food were delivered within 2 weeks. With Bolshevik protection, the trains travelled 1,800 miles from Archangel, Russia, to Romania. The trains transported 110 freight carloads of food from Archangel to Iaşi, Romania. These shipments provided food weekly to 30,000 people (Anderson 1918a, 1-2; American Red Cross 1918a, 3; Salzman 1991, 208).

The Americans distributed food to multiple communities in the northeastern region of Moldova. In Putna, Tecuchin, and Bocan, 40,000 were fed daily by the American Red Cross (Dock 1922, 883; Davison 1919a, 80).

In Iaşi, the American relief station provided food, clothing, disinfection, and medical care to 13,200 people from February 25 to March 9, 1918 (Davison 1919, 246). The Americans set up a civilian hospital at the Roznovanu Palace in Iaşi. The hospital was to provide 150-250 beds. Due to military requirements during the war, the civilian hospital was converted to a Romanian Army barracks (Anderson 1918, 86; Davison 1919, 241-8).

Near the National Theatre in Iaşi, the American Red Cross opened and equipped a dispensary. Disinfection, outpatient care, and distribution of food and clothing were provided, and up to 1,200 patients were treated daily (Davison 1919a, 80; Davison 1919, 241-8).

Dr. H. Gideon Wells and Dr. Roger G. Perkins, members of the American Red Cross Commission to Romania, wrote an extensive review of the overwhelming civilian and military medical crisis in Romania. The review was published in the *Journal of the American Medical Association* in 1918 (Wells and Perkins 1918, 743-53). This article contained photographs of Romanian military hospitals, disinfection units, casualty evacuation, and medical care. Drs. Wells and Perkins described severe malnutrition and the efforts to fight the typhoid, cholera and typhus epidemics in Romania. They published photographs of Romanian children with beriberi and pellagra.

Despite shortages, transportation challenges, and the Russian revolution, American medical personnel successfully treated casualties and provided food and humanitarian assistance to thousands in Romania. The efforts to transport American Red Cross ambulances from Petrograd created an early confrontation between American diplomats and Bolshevik leaders. Leon Trotsky accused the Americans of planning a diversion of ambulances to counterrevolutionary forces. Andrei Kalpaschnikov, (Kalpaschnikoff) a Russian government attaché working for the American Red Cross, was accused of treason, imprisoned, and threatened with execution. He subsequently was released and escaped from Russia (Salzman 1991, 238-9; Kalpaschnikoff 1920, 62, 76, 246-73).

Romania capitulated in March 1918 (Torrey 2011, 291). As part of the treaty, Allied forces and medical units were forced to evacuate from Romania. On March 9, 1918, the Americans, British, French, Italians, and Serbs departed from Iaşi. The Allied evacuation was led by the French General Henri M. Berthelot and accompanied by 1,000 French troops. Five trains were used to evacuate the Allied forces (Torrey 2001, 232; Anderson 2003, 23). The Americans were transported 2,500 miles by train from Iaşi through Odessa and Moscow to the northern port of Murmansk. The German forces entered Odessa 36 hours after the Allied trains left. The Allied trains experienced German shelling 200 miles north of Odessa (Mills 1918, 3-10).

The Americans were transported from Murmansk to Newcastle upon Tyne, England, on the British transport HMT Huntsend (Torrey 2001, 237; Mills 1918, 3-10). The majority of Americans who served in Romania remained in Britain or were deployed to France (Dock 1922, 887).

American Red Cross personnel in Roman and Iaşi were awarded the Cross of Queen Maria medal. Their manuscripts are among the few available medical descriptions that survived the war on the Eastern Front. Several Americans returned to the Eastern Europe after the war to provide leadership for American relief efforts (Dock 1922, 1126, 1476).

While the medical crisis and sacrifices of the Eastern Front are often forgotten in the West, they are remembered in Romania. The country has numerous monuments dedicated to Romania's heroism and sacrifice in World War I (Bucur 2010, 123, 164). Two war monuments in Bucharest are unique, as they are dedicated to the medical heroes of World War I. One monument is located within the Romanian Army Medical Center. A much larger monument to the medical war heroes is prominently located at the Piaţa Victor Babes in Bucharest (Caloianu and Filip 2009, 72-3).

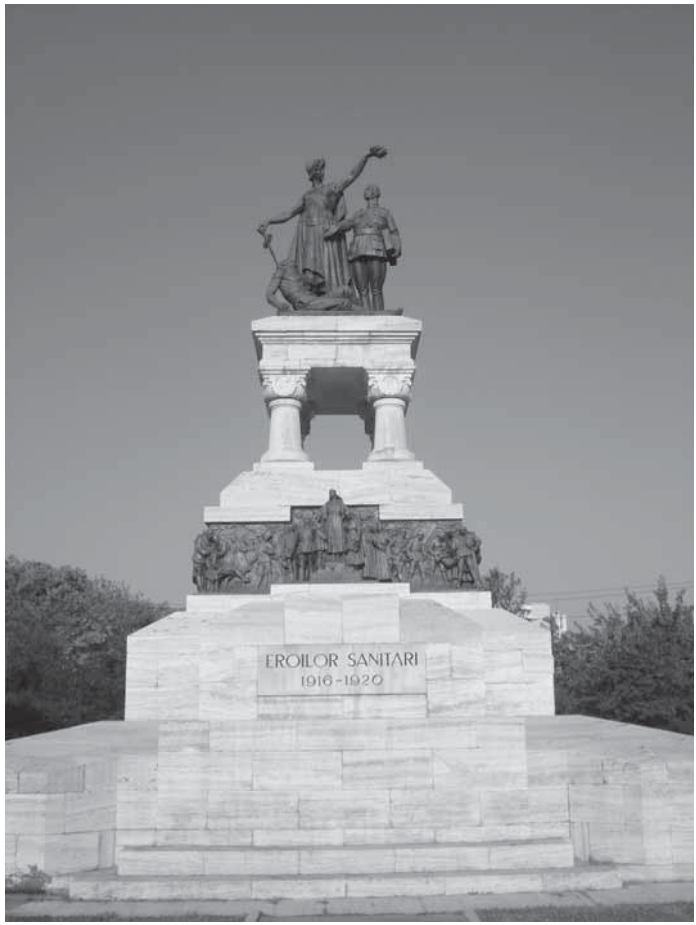

Figure 5-3 Statue dedicated to the Medical Heroes, 1916-1920, Bucharest, Romania (photograph by author).

The American medical efforts illustrate how a few individuals made a significant impact. In addition to their medical services, their extensive memoirs and photographs provide windows into the medical crisis of the Eastern Front Allies.

The medical experience on the Eastern Front represents a unique chapter in the history of World War I. The physicians and nurses on the Eastern Front witnessed a civilian crisis with massive epidemics and malnutrition. They were confronted with the disintegration of the armies of the Eastern Front allies. Their medical efforts were often overwhelmed by invasion and revolution, but their records remain as testaments to the heroism and sacrifice of the Eastern Front allies.

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CHAPTER TEN

"WE ONLY DRIVE OFF TO HELP THE WOUNDED": DUTCH AMBULANCES AND MEDICAL NEUTRALITY, WITH AN EMPHASIS ON THE EASTERN FRONT

DR. LEO VAN BERGEN

Introduction

Medical care is influenced by all kinds of things, but medical knowledge and medical techniques are not always first among them. Politics, economy, ideology, culture, religion, the ideas of society and the individual, ideas on what life in fact is: they all determine the outcome of and reasons behind medical interference. The consequence is that there is no such thing as a single type of medical care. Medical care has a myriad faces. So does war. War differs from time and place, depending on weaponry, geography, climate, strategy and tactics, political and economic circumstances, etcetera. Furthermore, war tends to multiply the importance and consequences of these influences and circumstances, with the possible exception of individual reflections and actions. It multiplies the faces of military medical care over and over and over again. One example: Austrian psychiatrists used electricity more, harsher and longer than others. The reason: the Austrian-Hungarian army was multi-lingual and therefore a non-lingual therapy came in mighty handy (Hofer 2011).

One of the faces of military medical to be discussed is the difference in care for sick and wounded soldiers between ambulances coming from warring countries and those from neutral countries, such as in World War I the Netherlands, and the influence this did or did not have on the medical and/or political neutrality of these ambulances. Medicine in itself is often

considered to be a neutral activity and coming from a neutral country it in fact should be the epitome of neutrality.

This seems to be acknowledged in existing literature. Although indignation was sometimes expressed, especially after gas had come to the field of battle, the writings of Dutch doctors and nurses on their war-experiences was commonly non-judgmental. The memoirs of Dutch caregivers, and those of so many of their colleagues from belligerent countries as well, were usually limited to describing symptoms and offering solutions wherever possible. This certainly was in part ~~is~~ caused by Dutch as well as medical neutrality, or how these were interpreted. While undoubtedly many Dutch doctors and nurses developed sympathies for the side of the frontline they were working on, or already had such sympathies from determining their choice of the side they wanted to assist, more than their counterparts from warring countries, they saw their patients as pitiable victims of war rather than military and scientific opportunities. As a result, at least according to Marion Girard, in her book on gas-warfare, *A Strange and Formidable Weapon*, they tended not to treat their patients with the same "objective" and "controlled approach" that characterised German and Allied physicians' behaviour (Girard 2008, 76).

Let us take this opinion under further consideration, starting with the organization which in principal should be responsible for sending neutral ambulances abroad: the Dutch Red Cross.

The Dutch Red Cross

> The war has only just begun. How long will it last; how many human lives will be wasted? Who can tell? How is it possible, that in an age of so much civilization and progress such inhuman scenes can be witnessed. It's horrible! (Een oorlogsverhaal, no date, 26)

These were the anonymous words of one of the first Dutch nurses coming to assist wounded soldiers in August and September 1914, just across the Dutch border. She was to precede many others, none of them, however, sent off by the Dutch Red Cross (DRC) (Van Bergen 1994, 210).

Around 1900 the DRC-erected in 1867 by a Royal Decision of King William III, after a whisper from his minister of War-was as good as dead. According to its own regulations aid could only be given in times of war and only to sick and wounded warriors. Peacetime therefore made the organization invisible. So it was decided to take up 'peace work', in the hope visibility would boost the organization's popularity. However, the main reason was that without 'peace work' the DRC could never be ready

for its task in times of war. Although interest in Red Cross-work certainly grew in the years thereafter, all in all it remained rather small and so, when in August 1914 cannons began to howl south of the Dutch border, the DRC was prepared for anything but a war on Dutch soil. It has to be said no country and no Red Cross-organisation would show itself prepared for the long, extremely bloody trench war World War I would become, but in contrast to the DRC failure their problems lay in the future. Therefore, before the end of August criticism on DRC-functioning had already been heard by the Dutch nursing union Nosokomos (We Care), established in 1900 as the radical sister of the more moderate Bond voor Ziekenverpleging (Union for Nursing). In its struggle to uplift the nursing trade, not fleeing from societal critique and pacifistic utterances, Nosokomos propagated state interference. This was necessary if the profession ever would become of interest for young, civilised women (Bakker-Van der Kooy 1983, 456, 466-467).

In two articles in *De Nieuwe Amsterdammer* (New Amsterdam) the board of Nosokomos gave air to its frustrations. In December 1913 the DRC central committee had sent Nosokomos a letter asking how many nurses could be available for the DRC within 48 hours after mobilisation or actual battle. One hundred-fifty nurses responded positively. But when on July 31, 1914 mobilisation was announced the DRC central committee remained silent. After a few days Nosokomos asked for clarification, whereupon the committee responded that the nurses should turn to the local DRC branch. But there was no mention of what to do if a local branch was absent, although there was a fair chance this would be the case. A survey by the Nosokomos board held in December showed that only a handful of nurses had found its way to the Red Cross. For this Nosokomos stated, the nurses were not to blame, but only the DRC board. This board had gravely failed to accomplish and organize its main task: the lending of voluntary aid to sick and wounded soldiers, although this was the one reason it was erected half a century earlier. Nosokomos could only conclude that if the Netherlands would have gotten involved in the war in August 1914 “the nursing of our sick and wounded by means of the Red Cross would have been total disaster”. Not only had the DRC ~~had~~ not finished its preparations, “it had not even started them” (Het Roode Kruis Staatszorg 23-1-1915, 10; Kuiper 1914).

It was not until after the outbreak of war, so Nosokomos said, that the DRC went to work and even then not the members of the central committee, but only the few local branches and some individual members. The board in The Hague had written the nurses’ union that it “wanted to decentralize as much as possible, instead of taking the lead itself”, an

utterance not approved by Nosokomos. The diligence of the local committees could only be praised, but because of the lack of direction and coordination the results were more often negative than positive. It was, however, highly unjustified to blame the local committees for this and for not having ready a detailed 'mobilization and war'-scenario, as board-member O. J. A. Repelaer van Driel had done, and which would be done again somewhat later by his colleague M. B. Rost van Tonningen. It had been the central committee itself that had deliberated for many years on many a subject, but not on the one most important. Therefore the central committee had proven it was unable to live up to its task and this would still be the case when ~~the~~ next war would break out. That there would be a war after this one, was, as far as Nosokomos was concerned, an undeniable future scenario because in spite of Peace Conferences and Peace Palaces states kept on arming themselves instead of taking disarmament seriously. Armament does not lead to peace, as the saying goes, but can only have one outcome: another war. However, if war came nursing the sick and wounded was a medical and humanitarian duty, a duty that should not be fulfilled by charity such as the Red Cross, but by the state. (Het Roode Kruis staatszorg 23-1-1915, 10)

When talking to the secretary of the central committee, squire M. Mazel, it had become clear how much the DRC depended on good will and charity. As far as the nurses were concerned this meant that they were expected to do their job out of sheer devotion to Red Cross work. In other words: they had to be prepared to do their bit for God and country unpaid.

> We were struck by the peculiar announcement, done in the midst of conversation, that the secretary himself received a wage; is he not expected to be devoted, or does difference in sex play its part? (Het Roode Kruis staatszorg 6-2-1915, 1)

This again meant that the Red Cross would first of all be in need of nurses who were financially independent. Capability was only a secondary demand. If money given out of charity flowed in abundance, maybe some compensation could be given, if not there would be none. Nursing salaries were considered the least important item on the budget, and therefore the beginning of cutbacks. But capable treatment of wounded men who had fought to defend their country, called upon and forced to do so by the state, should not depend on the budget of the nursing organisation. Nursing was not an act of charity, but an act of duty coming out of the right of men to be taken care of after having done their bit, and therefore a state's task (Het Roode Kruis staatszorg 6-2-1915, 1). It was a point of view showing Nosokomos, at least as far as its view on war and medicine

was concerned, to be a true follower of Florence Nightingale, who in the 1860's had criticized Dunant's idea of voluntary aid. If states asked men to fight, states should also take responsibility for the medical aid needed if these men were wounded.

A critic, most likely military, of the Red Cross named Tribunus, wholeheartedly agreed with Nosokomos. "The promotion of an Army, a state interest of the highest order" should not be left to volunteers and thereby to chance. Tribunus furthermore advised the main board to finally take into its midst real capable men and depend less on (conservative) political persuasion, class and gender. Up to that moment-and for several decades to follow-the DRC board could only be called a non-medical, royal, male stronghold. (Tribunus 3-10-1915)

Tribunus called for a necessary reorganisation and this indeed came in 1917. The main point of it, however, turned out to be not one of democratisation, which actually had been the starting point of the reorganization-process and of feminization, but rather the formalization of a situation already there in practice. From 1917 on the DRC officially became a cheap extension piece of the Dutch military health service (MHS), acting only on behalf of the Dutch army and acting only if the MHS asked for it. This hierarchy already had been clear in 1914 when little or no Red Cross aid was rendered to fugitives from Belgium because no man, woman, or band-aid could be missed should the Dutch army become involved in the fighting; and it was shown again in 1918 after the reorganisation. This time help to civilians fleeing across the Dutch border was given, but only after the armed forces had asked for it, because war refugees had become a military problem (Archive Hoofdbestuur Nederlandsche Roode Kruis, inv.nr. 1, box 2, extraordinary meeting 1-10-1914; Handelingen van het NRK XXIV, part 1, 1916, 87-90; Van den Mandere 1920, 44; Nederlandsche Roode Kruis 1923, 7; Het Nederlandsche Roode Kruis 1937, 41). In other words: military necessity again and not humanitarian need was the deciding factor. But most of all this was shown when, contrary to the Franco-Prussian war and Boer war, the DRC decided not to send ambulances to the WWI battlefields.

Germans and Belgians were engaged in fierce battle at the town of Visé, just south of the Dutch border. Wounded soldiers were brought to Maastricht, whereupon General C. J. Snijders, supreme commander of the Dutch army, pointed out they had no choice but to be interned in the Netherlands for the duration of the war. The wounded protested. They had not been told their voyage into neutral territory would have this consequence. Diplomatic council became necessary. Member of the DRC board squire E. B. F. F. Wittert van Hoogland thereupon came to an agreement with German and

Belgian authorities. DRC departments at the southern border were allowed to give aid. But only severely wounded soldiers within five kilometres of the border could be brought to Dutch hospitals, and even then only after they themselves had agreed with the following internment. The soldiers who previously had protested were released and could go back to their units. The Red Cross departments, so it was argued, had acted in defiance of the Geneva Conventions when failing to point out the consequences of their treatment on neutral soil (Archive Hoofdkwartier veldleger, dossier 719, Snijders to mil. authorities, 21-8-1914; Verspijck 1967, 112-113; Rombach 1992, 69; Bosboom 1933, 325; Handelingen Nederlandsche Roode Kruis, XXIV part, 1, 1916, 68-77).

This remained the only direct DRC aid the war has seen. The main committee was of the opinion that as long as it was not certain the Netherlands would not get involved in the fighting, not one Red Cross employee or even one piece of Red Cross material should get outside Dutch borders (Kooiman, no date, 392). This of course led to the question of when it would be certain the Netherlands would not get involved in the war. Rost van Tonningen's statement was firm. In his view this could not be the case before peace was signed (Archive Hoofdbestuur Nederlandsche Roode Kruis, inv. nr. 1, box 2, exceptional meeting, 1-10-1914). In the beginning of the war the Dutch government did not even give its consent for sending out private ambulances. But as the war progressed this measure was liberalized and the ambulances that left were, at least according to DRC historian H. Ch. G. J. van der Mandere, backed up by the DRC as much as possible. This however does not take away the simple fact that they had nothing whatsoever to do with the DRC organization (Van der Mandere 1920, 29; Rombach 1992, 72). But, forced by Geneva Convention rules the doctors and nurses of these ambulances did wear the Red Cross insignia and by doing so, although unjustified, helped raise DRC popularity. This for instance can be seen in the title of the 1915 poem *Het Roode Kruis. Ter eere van de Nederl. ambulance* (The Red Cross. In honour of the Dutch ambulance) in which the Red Cross is hailed as an apostle of peace and the one hope for humanity in the midst of horror and bloodshed (Het Roode Kruis 1915).

The Dutch Ambulances

But DRC aid or not, several ambulances and several individual doctors and nurses, left Dutch safety to be of assistance to military health services or Red Cross-organizations of warring countries. They were at the Western Front, from Brussels to Paris. Probably even more went to the Eastern front, from Budapest to Petersburg (Van Bergen 2005; Van

Bergen 2011; Kramers 2012). As far as the Central Powers were concerned, they were organized by the 'Committee for Dutch Ambulances on behalf of Germany and Austria-Hungary', in which a number of well-known and influential Dutch men and women were gathered, most famously Abraham Kuyper, nicknamed 'the Magnificent'. He was the leader of the Dutch Calvinistic, politically conservative community, chief-editor of one of the leading Dutch newspapers, founder of the first Dutch political party, founder of the Calvinist Free University at Amsterdam and most of all, former prime-minister. This immediately raises doubts, if indeed all of the ambulances were as neutral as one would expect, concerning a medical team coming from a neutral country.

Many of the doctors and nurses participating were said, as the anonymous nurse quoted above, to be shocked by the sights they had to witness. In general this only strengthened their conviction that they had made the right decision. Already at the beginning of the war physician Jan Kuiper had put into words this inner sense of duty to give medical aid where and whenever needed.

> We, doctors and nurses … [and] all those who are non-combatants, feel the urge within us to help, to ease the sufferings that war makers now have spread all over Europe (Kuiper 1914, 605).

However, this medical sense of duty should not be exaggerated. Doctors and nurses often had more earthly, more human reasons to take their pack and go to war. Take for instance Nurse Rosa Vecht. Shortly after the German invasion, Vecht volunteered at the British Belgian Field Hospital in Antwerp. Travelling through the Netherlands and England she again managed to join this ambulance unit at the Bishop's College in Veurne, after Antwerp had fallen. She was hit on January 23, 1915 by a "bomb thrown out of a flying machine" and died in the famous hospital L'Ocean in De Panne. As far as is known, she was the only Dutch nurse to die in the war. After the war she was reburied at the Dutch-Israelite cemetery at Muidersberg. What is interesting is that Vecht went to Belgium at least partly because her father had forbidden her to marry her non-Jewish lover. Getting away from home, a longing for adventure, and, for the female nurses, the wish to go where the men had gone. Those too are reasons for joining an ambulance and they make the female nurses, often pictured as either chaste saints or sinful whores, much more human and interesting (In Memoriam 1915, 107; Summers 1988, 2; Layton 1987, 70-83).

This goes for the doctors too. For instance A. van Tienhoven in 1915 worked in a hospital in Vesoul, Haute-Saone, about forty kilometers above Besançon. But being a surgeon it was much too quiet to his taste. Not

enough fighting going on. So he asked to be sent nearer to the front, to a spot a bit more exciting, and his request was fulfilled (De Nederlandsche Ambulance te Parijs 1915, 858).

The task Van Tienhoven and his Dutch colleagues would have to fulfill would not be an easy one, because of trenches and artillery, machine guns and mud, gas and vermin. In 1915 this was noticed by the Paris correspondent of the *Nieuwe Courant* (New Magazine). He wrote that of all the sad sides war knew "one of the saddest" was the way the war was waged on both sides of the front that led to "extreme difficulties when looking after the wounded", certainly in the frontline. This, in spite of the fact, so enormously contradicting a reality not long past, that "all the armies of civilized countries were abundantly equipped with everything, man and material, needed to assist the fallen as soon as possible". (Het lot der gewonden 1915) This was exacerbated by the fact that the war had hardly ever experienced enough of a pause to carry the wounded away from the battlefield. "Is it not a sad thing", so he ended, "that in this war things have to go this way after all the improvements made in modern armies beneficial to the fate of the wounded" (Het lot der gewonden 1915)?

Nevertheless, all these ambulances, in the East as in the West, in general were popular in the Netherlands during the war. Not for nothing the author P.H. Ritter would write in 1931 in his *De Donkere Poort* (The Dark Gate) that they were "a new diamond in the Dutch crown". Ritter was one of those Dutch intellectuals and journalists who shortly after the war criticized Dutch indolence. However, the ambulances proved that it was not always necessary to feel ashamed the Netherlands had not gone to battle, exposing it as the weak country it was. They had shown that neutrality was not necessarily ~~is~~ a synonym for weakness and passivity, but could be a positive, sacrificing force. Neutrality could be "a stimulus to be heroic and stubborn while working for peace" (Ritter 1931, 89; Heijster 1998, 19).

Firstly, this shows that in general medical aid was not seen as a contribution to war, but as a small oasis of humanity in a vast desert of violence and darkness. Secondly, the shame of neutrality was striking and only lifted a bit by Dutch medical aid. This was an opinion also seen in an article on Dutch medical aid at the Western front by the Paris correspondent of *Het Handelsblad* (The Trade Magazine).

> Everywhere Dutch men and women are doing whatever they can to ease the sufferings of the victims of war, to treat the wounded, to cure them, to keep them occupied. In service of humanity many of our fellow countrymen keep their post. And we will have to thank all of them if, when

> peace has come, even the most fervent of war-mongerers have to admit that in the dreadful days of war some of these much maligned neutrals have made themselves useful and deserving (De Nederlandsche ambulance te Parijs 1915, 858).

Nevertheless, as the war went on, questions were raised about the necessity *and* humanity of medical wartime aid. Some doctors and nurses asked themselves, partly out of an already existing pacifist conviction, partly triggered by the stories of medical horror told by the ones who had gone abroad, if it would not be better just to stop. This manifest by the fact that many cured soldiers were returned to the front after care and obvious by the fact that this was the preconceived purpose of medical aid: to support more the military need rather than the medical character of aid. Would it not be better to withhold help instead of healing the wounded to be fit for battle again, only to see them back a couple of days or weeks with either even ghastlier wounds or as a corpse? And, by extension, certainly all aid in the service of the military should be refused because clearly this served a national military goal instead of an international humanitarian one.

It is an opinion that raises questions at the term 'neutrality'. If it is seen as neutral to help *all* the wounded, it can also be seen as neutral to help *none* of them. The DRC was not accused of being partial, although it evidently was: it choose to serve Dutch interest. But in general the pacifists, who in 1938 would get a follower in Cambridge Professor of Social Medicine John Ryle, (Joules 1938, 8-9) were accused of severe partiality, not because they favored a side of the conflict, but because they took a political stand and medicine and politics were said not to go together. But how about neutrality and politics of those who did go to war?

Largely I will focus on two ambulances working at the Eastern front. But also at the Western front neutrality questions can be raised. For instance, besides Vecht there were several other individual Dutch nurses who had crossed the border into Belgium. One of them was A. J. van Rossum, who worked in Antwerp before and after its fall at October 10, 1914. She wrote about transporting wounded to the basement of the hospital, in which she was working, as well as about receiving wounded from other hospitals to her facility because the personnel in those hospitals had fled. Sleep, she acknowledged, was rare, but when she slept no bombardment could wake her because "such was the need of shut eye". But Van Rossum did not stick to nursing. If the rumors are true, she also helped a British nurse, whom the Germans had forbidden to leave after the city had fallen, to cross the border. Shortly thereafter, she left as well and

offered her services to the Belgian government. She was put to work in the Belgian hospital at Dinant, and after that she went to work in a nursing home for Belgian and French soldiers (De Nederlandsche ambulance te Parijs 1915, 857-858). Even if the Edith Cavell-like story is only partially true, it is clear Van Rossum was anything but on German side.

The Eastern front

On the Eastern Front the most well-known individual was plastic surgeon Johannes Esser, who worked in Vienna, Budapest and Berlin. Most Dutch recognize him, not his allied colleague Harold Gillies, as the 'father of plastic surgery'. I do not agree, not because Gillies was a more eminent surgeon, he was not, but because Esser did not establish a school. For that he was too egocentric. To be a father, one must have children (Neelissen 2002; Haeseker 1983; Bamji 1998).

But there were many more individuals and ambulances. I want to highlight two of them: one working on the Serbian side of the front and the other on the Austrian side (Van Bergen 2010 [FWWS]). How was their medical neutrality defined, if defined at all? How did they try to live up to their neutral status, self-defined or not? I hopefully will show the total neutrality as defined by one of the Dutch nurses, A. J. P. Van Schermbeek, who worked in Nisj and Kragujevac, was not adhered to by the physicians and nurses of these ambulances. Van Schermbeek sympathized neither with the Central nor the Allied forces. She reserved her sympathy solely for the victims, regardless of their nationality. She believed the main responsibility of physicians and nurses was not just to restore their health, but to restore humanity within them, to make them human again, certainly after the war, but if possible while it continued. Van Schermbeek stopped writing her account of the war, just before she saw action herself, so it is unknown if she was able to hold on to this attitude in the heat of battle. Certainly the two ambulances I want to describe did not although one less than the other.

A. van Tienhoven and his work for the Committee to Investigate Austrian War Crimes

Van Tienhoven, mentioned earlier, was working in Serbia in the first year of the war and participated in the Committee of Investigation into Austrian War Crimes. His experiences were put down in a thin book, *De Gruwelen van den Oorlog in Servië* (The Horrors of the Serbian war), enriched by a number of pictures taken by Van Tienhoven himself. As a

doctor and a member of the Committee he did not shrink from horrific scenes, which makes the book a forerunner of the 1924 picture book *Krieg dem Kriege!* (War against War!) by German pacifist Ernst Friedrich, founder of the first and still existing Anti-War Museum. Book and museum were the result of the idea that showing the gruesome result of warfare as much as possible, would stop war as an instrument for solving conflict. Although he did not used his pictures to attack particularly the war itself, but to show Austrian human rights violations, Van Tienhoven also believed "the horrible pictures of cruelty, of violence" were considered to be "just as many accusations against war's insanity" (Brusse 1915, 17).

This, by the way, is not an extinct idea for it was a couple of years ago that it provided one of the arguments against publishing the medical instruction book *War Surgery in Iraq and Afghanistan*, which is loaded with horrendous photographs. This shows the idea has made an interesting double historical twist. Firstly the gruesome pictures in *War Surgery* were not intended anymore as an accusation against war, but as medical information and teaching material for future military doctors, and secondly the gruesome nature turned from pacifist hope on abolishing war into military fear that they would undermine war support (Van Bergen, De Mare, Meijman 2010).

The fact that Van Tienhoven worked in Serbia, was not a coincidence. He already had tended the wounded there in the two preceding Balkan wars. Besides, it was abundantly clear to him that Germany was to blame for starting the war. In the summer of 1914 she was, he said, "ready at last and only had to look for a casus belli". Furthermore, in the years 1912-1914 he had become fond of the Serbian people. To him the Serb represented the 'noble savage', so loved in anthropological circles in those days. The Serb still knew the honesty, clarity, and simplicity that the so-called civilized Western European countries, above all Austria and Germany, had long since lost. He was convinced the more common Serbian people were a stronger people as than the Austrians, which demonstrated itself clearly when testifying he had managed to save relatively more Serbian than Austrian lives. Serbs never complained and recovered much easier (Brusse 1915, 7, 10, 17).

Together with nurse De Groote, the woman who stood beside him during the Balkan wars and would stay beside him during the rest of his life, giving extra meaning to her being described in a Dutch newspaper as one of the 'sisters of love', Van Tienhoven immediately left for Serbia on 29 July 1914. On his journey he saw scenes of war-enthusiasm, but immediately nuanced them. "Those who had to go to war themselves and

their families were much less inspired. Those who cheered mostly were high-grown young, scum" (Brusse 1915, 10-12).

Van Tienhoven's destiny was Valjevo, one hundred kilometres southwest of Belgrade, where he became first surgeon at the provincial hospital. Work began as the Austrian army crossed the Drina on 16 August and marched towards Valjevo. In the week following eight to ten operations a day were the norm. On August 21 however, the Austrians were forced back which brought a bit of rest. However, Van Tienhoven commented

> While on the run, the Austrian army, mostly consisting of Croats, Hungarians, Czech and Poles, destroyed, murdered, robbed and maltreated women and children wherever it went - horrible (Brusse 1915, 16-17).

It was this horror which gave cause for the creation of the Committee on Investigation of Austrian War Crimes, on which, besides Van Tienhoven, the head of the district of Valjevo, the Swiss engineer Julius Schmidt, and, remarkably enough, an Austrian physician in Serbian service, took part. Later on a Swiss professor in criminal anthropology, R.A. Reiss, was added. Van Tienhoven did not doubt the horrors were not merely individual cases committed by undisciplined soldiers in the heat of the moment. One certainly had to point at the Austrian government as well, who had equipped its army with "the most terrible explosive bullets, forbidden in the Petersburg declarations of 1868" (Brusse 1915, 5, 17, 19, 53).

Van Tienhoven was anything but enthusiastic in employing the harsh methods of war surgery, but however modern he considered himself to be, he admitted that from time to time he had to use the saw, particularly in the case of frozen feet. These injuries were especially seen in Austrian soldiers. Therefore, he condemned their "heavy boots covering cotton socks", as totally insufficient. As a result, when passing Vienna while returning to the Netherlands, he told the Austrian authorities to equip its soldiers forthwith with "small socks to be worn over thick woollen ones" (Brusse 1915, 24, 26). Apparently his pro-Serbian convictions did not stand in the way of protecting the soldiers of the Central Powers from unnecessary suffering.

The withdrawal of the Austrians provided some relief, but only for a short while. On September 2 no less than 800 wounded prisoners of war were brought in. They were accommodated in a nearby storage house. His account on the following days is a tale of despair:

> Heavily wounded everywhere, without bandages, or blind, intestines hanging out-the dying, the already dead. How dreadful it is I can operate only ten of them each day; so many more have to stay there in agony, that we even do not have the time to bandage them (Brusse 1915, 43).

One day later Van Tienhoven announced: "Endless is the stream of wounded coming from battle. It drives you mad". No wonder the assistance from the Netherlands arriving on September 7 was most welcome, although they too soon turned out to be a drop in the ocean, lifting only a little of the hardships. And the stories they told, for example of the destruction of Louvain and its famous library, only increased Van Tienhoven's antipathy against the Central Powers further (Brusse 1915, 43-44).

On October 26 Van Tienhoven and his team were given the order to transport to the railway station all the wounded stable enough for some travel. Based on troop movements Van Tienhoven concluded that their evacuation was absolutely necessary; but not for him. He could not imagine that he and his helpers, as citizens of a neutral country and working under the neutral Red Cross insignia, would be made prisoners of war. In theory he was right, but in practice war teaches differently. Although he obtained official permission to stay, he awoke the next morning to see all of the supplies of the ambulance packed in trucks. He gave orders to have it all unloaded but discovered almost all of his personnel, including the hospital's director, had already fled. As a result the order given on November 1, directing everyone leave the city were not contradicted again. "Under no circumstance" was Van Tienhoven to fall into Austrian hands. (Brusse 1915, 61-65) They too were in need of surgeons desperately. This means that medical work was considered of great military importance, and that tending wounded enemies was at best an activity undertaken in quiet times-which were rare. It was not the only time Van Tienhoven and his staff had to break up and leave due to movements at the front.

Meanwhile typhus began to spread and the Dutch colony did not escape. Nearly all, including Van Tienhoven himself, fell ill. Returning to the Netherlands was inevitable. As a consequence the care for 33 surgical patients completely fell on the shoulders of one Austrian POW medical orderly and two teachers. The last Dutchman who contracted the disease, shortly after arriving in the Netherlands, was at the same time the only one who did not survive. From the medical team as a whole-mostly consisting of local personnel-14 died within 10 days (Brusse 1915, 103-107).

H. S. S. Kuyper and the Committee for Ambulances for Germany and Austria-Hungary

Let us now turn to the other side of the Eastern front. The *Berufsorganisation Deutschlands für Krankenpfleger* (German Nursing Organization), had put an advertisement in Dutch newspapers asking for nursing assistance in quarantine stations in Bohemia, Silesia, and Moravia. Approximately 30 female nurses answered this call. One of the last ones, nurse N. C. Quack, went to Berlin in 1915 where the sight of the wounded touched her deeply. A feeling of abhorrence came over her when thinking "what this terrible war in such a short time had done to these otherwise so fine and strong men! It was, however, only a sample of what was yet to come" (Quack 1915, 648).

After a time of physically and psychologically hard labour, the exhausted nurse decided to head home again. She passed through Budapest, where an institute for blind Jewish children had been turned into a military hospital (Quack 1914, 720). It was the building in which the so-called Budapest ambulance had settled itself. The ambulance was headed by the retired army doctor A. van der Moer. The head-surgeon was F. Hijmans, surgeon and urologist in The Hague, who, like Van Tienhoven, had earlier been active in the Balkan wars (Nederlandsche ambulances voor Duitschland 1916, 321). It was a very special ambulance because one of the nurses as well as the head of household, were daughters of Abraham the Magnificent mentioned earlier. As a consequence the book Henriette Kuyper, the head of household, wrote on the ambulance, was filled with references to God and all the good He brought also in difficult times like these.

Typical for the 'non-political', pro-Austrian attitude of the author is that the book nowhere mentions any tension between the Austrians and Hungarians. Surely, Kuyper wrote, there will have been some in the years before August 1914, but not during the war. The Danube Monarchy was a kind of miniature Europe, giving room to Germans, Rumanians, Slaves, Hungarians and even Gypsies, who "belonged nowhere" (Kuyper 1918, 65). Everywhere these peoples fought with each other and therefore, it was even more beautiful to see them fight "shoulder to shoulder" now (Kuyper 1918, 65).

Typical too was that Kuyper, contrary to Van Tienhoven, hardly paid any attention to the horrors of war. First of all, she explained, this was the consequence of her doing no medical work, as her sister Johanna Kuyper did. She only fleetingly came into contact with the wounded and did not want to write on issues of which she had no knowledge. However, even if

she had been a nurse, she still would have spent few words on "horrible stories on wounds and mutilations" (Kuyper 1918, 7). And even if she would have, she would have done so with restraint. Nurses do not tell "gruesome tales". "The heavier the suffering" they try to ease, "the less they speak of it" (Kuyper 1918, 7). On top one should not forget "that a foreign ambulance in a warring country has a great responsibility'. Certainly each ambulance-member heard or saw his part of the misery. But at least until war's end it should remain the secret of the country 'of which it tries to lessen the suffering" (Kuyper 1918, 7, 37).

Nevertheless Kuyper's book had some aspects which were unlikely to come from an average kitchen-girl. Besides that she regularly gave insights into the heart and soul of Hungary and its people, she also was introduced to Hungary's upper circles. Kuyper explained this out of her membership of the daily board in charge of the ambulance, and from the fact that after all she was her father's daughter. In the predominantly Calvinistic Hungary, in spite of all the Austrian attempts to catholicise it, this opened doors that stayed closed for others. That above all the Hungarians were sympathetic to her will have had to do with this shared religious, protestant conviction. Hungarians did not know "hate, only love. There is no rage, no bitter feelings against the enemy" (Kuyper 1918, 8, 82). They only felt some hostility towards the Italians. Otherwise the Hungarian had "an innate attitude of chivalry against his enemies" He spoke "without hate" of Russians and French, and "even of Englishmen". (Kuyper 1918, 82).

Although she was afraid the Netherlands could still become part of the war and fall victim to its destructions, Kuyper had a highly ambivalent attitude toward it. War brought more than misery, just as peace brought more than blessings. In fact peace had made mankind "lightheaded, lazy and dormant" (Kuyper 1918, 198). The fact that Hungarian art, which could not be praised enough, was close to oblivion, was, therefore, not the consequence of war, but of

> peace, prosperity and luxury, the consequence of railroads and travels, of general development and the entwinement of peoples and tribes ... I see Hungary bleed from two large wounds: the one struck by war and the one caused by peace. It is the last that is worst because it is incurable (Kuyper 1918, 100, 150).

On 5 December 1915 Kuyper was asked by Mrs. Van Riemsdijk-van der Leeuw, the president of the main committee of the Dutch Ambulances for Germany and Austria-Hungary, whether she wanted to take charge of the household-department of a new ambulance. She

accepted wholeheartedly because "the idea to bring some easement in the excessive misery that has come over Europe, brings joy" (Kuyper 1918, 13). Besides she looked forward to working together with her sister, who had already enlisted, and who had been on an ambulance before at Constantinople.

The ambulance to Budapest was to be led by the Swiss born Otto Lanz, professor in medicine at the University of Amsterdam. In 1915, Lanz had written that the steel of the sword of war was "forged by England", although "with a watchful eye kept sharp by Germany' (Lanz 6-2-1915, 422). Immediately after the outbreak of hostilities he had driven off to Alsace to offer his assistance. After it became clear to him that neither Switzerland nor the Netherlands would be drawn into the war, he put himself at the disposal of the German army. He was asked to go to the military hospitals at Trier to act as consulting physician. Once arrived he remarked that the plural of military hospitals was incorrect. In reality, Trier was one big military hospital. During the following months Lanz concerned himself with every possible injury war can inflict, and so he was not sad to leave for Amsterdam again at the beginning of 1915. "The travel back into the old days of surgery" (Lanz 1915, 422), as he put it, the old days of wound infection and absence of anaesthesia, had been difficult. Nevertheless, he would make the journey a couple of times more and after the war, as Van Tienhoven did, and would write passionately on the progress medicine had made because of the war, (Lanz 1925) an opinion, by the way, that has been disputed vigorously. (Van Bergen 2010 [MCS]) It is however remarkable, that a journey back into the medical dark ages nevertheless apparently had resulted in medical progress.

On 27 December a farewell evening was organised in Amsterdam in honour of the 74 members of the two ambulances leaving the next day, the one to Budapest and another one to the German town of Gleiwitz (today the Polish town of Gliwice east of Katowice). In her speech Van Riemsdijk said:

> All of you will feel what I deeply feel, that we are gathered here this evening for a good, but also very serious cause. Because it is a melancholic thought that you drive out to heal, to save, what others have maimed and destroyed. This is what makes war so terrible (Kuyper 1918, 21).

Lanz also made a comment at this farewell party. He felt that the Netherlands had an obligation to be a part of the war as well. However, not with the sword, but with the scalpel. "Not to hate, but to help". (Kuyper 1918, 23) He particularly emphasized that, although working on the Central Power side of the front, it was not the intention to take sides.

> As neutral Dutchmen we only drive off to help the wounded - not the German or Austria-Hungarian army, but the victims of war (Kuyper 1918, 24).

At that same ceremony, also Herman Bavinck, prominent member of the Committee for Dutch Ambulances for Germany and Austria-Hungary and the successor of Kuyper as the dean of the Free University, spoke some words of goodbye. He juxtaposed "the agony of war" to the clearly Christian sign of the Red Cross,

> with its telling symbolism ... The cross speaks of debt and forgiveness, of misery and mercy. The mercy brought us together, for it is the heart and the soul of our ambulances ... Their work is a work of peace. I hope that they will be blessed - but also hope they will not be needed long. And I hope that when they return it will not be in the sign of the Red Cross, but in the White Cross of peace (Kuyper 1918, 24-25).

It was not to be.

Despite all these soothing words on medical neutrality spoken by the Committee for Dutch Ambulances, it was completely on the Central Powers' side, as could already be derived from Lanz's words about the sword forged by England. The ambulance consisted of men, like general H.P. Staal, and women as well who admired the German military system. There were also some, like Abraham Kuyper, who hated England because of the former Boer War. And then there were those who in the years before or during the Second World War made political choices that in hindsight could be marked as somewhat unfortunate, like the famous conductor Willem Mengelberg, or, and most prominent, the Delft professor J.H. Valckenier Kips, who would become head of 'Zwart Front' (Black Front), a Nazi-organization. (Tweede Jaarverslag 1918; Kramers 2012, 18-19) But in the days of the First World War all these men still were highly respected.

Also Henriette Kuyper's political sympathy was with Germany. This became evident when the Dutch-German border was crossed at Bad-Bentheim. Without a trace of irony or cynicism she described a station completely

> decorated with green garlands, with palms and flowers, with Dutch and German flags. On a place of honour, even more richly decorated, there were white busts of our queen, our prince, our princess and of the German Kaiser ... [We] listen to the speeches. I was able to write this sentence down: "As long as there is a German left, even if he's very old or very young, we will fight. For we rather die than become England's

> slave." It is our first contact with the country and its inhabitants, who are engaged in such a terrible fight on life or death. It is very moving to see and hear them in their own country for the first time (Kuyper 1918, 27).

In a letter to her father, written shortly before leaving, she had said that of course the Dutch country and people were neutral "in the market of public life". "But in our personal life and private correspondence? Le coeur n' est pas neutral"(Kuyper 1918, 15-16).

Utterances like these explain that not only ideological questions can be raised at the medical neutrality preached by Lanz. In August 1916, Hijmans wrote Snijders that the ambulance to Hungary "is *not* sent out to do neutral, charitable work ... but mainly as a means to transport supplies to Hungary". It was used to bring "goods, of which export was forbidden, over the border". Hijmans had approved of this, but only under the condition that the goods would be used for charitable means only, and not as "proofs of sympathy for the Central Powers" (National Archive The Hague, index 2.13.70: Generale Staf nr. 3: Hijmans to Snijders, 30-07-1916). However, that Hijmans immediately thereafter judged the ambulance as completely unqualified to perform its medical-humanitarian work decently-he was the only surgeon, many nurses were not qualified, and the medical material was insufficient and useless-makes it doubtful that this condition made a strong impression. Hijman's doubts were strengthened by the fact that he had seen Lanz, before starting his medical work, present much of the supplies to German military authorities. He later on saw these same supplies for sale in different shops. (National Archive The Hague, index 2.13.70: Generale Staf nr. 3: Letters Snijders to Ministry, August 1916; Hijmans to Snijders, 30-07-1916; Kramers 2012, 19)

In Gleiwitz, where, as said, the other ambulance would stay behind, Henriette Kuyper met a 23-year old widow from East-Prussia of whom she heard "the most horrible stories of Russian bestiality" (Kuyper 1918, 35). Even so her real hatred was only heard when England was the subject of conversation. To her England alone, and no-one else, was guilty for the war. Nothing English had her approval, and this caused Kuyper some hurt. No matter how much she despised England's foreign policy, she loved the country. She therefore quoted with full approval the words of Emanuel Kant who had said that the English people were amongst the best he knew, but the English state in its relations with other states "the most rotten, violent, imperialist and war-mongering of all" (Kuyper 1918, 35-36). Cleverly, or unknowingly, Kuyper concealed the fact that Kant had written his words in defence of French revolutionary ideals. For these ideals probably had even less her sympathy than the English foreign policy.

There was a reason the political party her father had called into being was called the *Anti-Revolutionary* Party.

On 7 January the Budapest ambulance continued its journey, under the direction of Lanz, but he would return to the Netherlands shortly thereafter. The ambulance in Gleiwitz remained there for nearly the entire war, nursed approximately 2,500 soldiers of whom only 28 died, of these only five from sepsis and five by illness. As was the case at another ambulance, in Olmütz, this was a very low number, (Tweede Jaarverslag 1918, 7, 17; Duitsch-Oostenrijksche ambulance 1916) confirming the assumption that heavily wounded were as a rule not assigned to ambulances of neutral countries, at least not on the Central side.

In Budapest, the ambulance became part of the Hungarian Red Cross, an organization that was anything but neutral. The ambulance was accommodated into the Institute for Blind Jewish Children that had been converted into a military hospital after the war began and named the Imperial and Royal Reserve Hospital nr. 4 (Kuyper 1918, 25, 48-49, 53-56, 127).

On January 25 the first transport arrived full of helpless wounded who recently had been strong and healthy. However this also meant:

> We can help them. That is the wonderful thought that soon blows away every sad mockery and makes us go to work enthusiastically (Kuyper 1918, 72-73).

Although the wounded had "a wonderful life in the Dutch ambulance" (Kuyper 1918, 76), naturally they could not remain there eternally and, according to Kuyper, most did not want to. They went back to the front. Many "merrily, full of courage and eager to fight again. Long live the war" (Kuyper 1918, 76)! But there were others. Just as healthy, but not longing for war. Kuyper wondered whether either the willing or unwilling would survive.

> Yes, it is very hard. To watch wounded who have been tenderly nursed go back to the battlefield, the cause of their misery. One asks, is this what I worked for? And bitter reality says: 'Yes, for that too (Kuyper 1918, 76).

In Kuyper's ambulance the work constantly grew and the number of people having to do the job constantly shrunk. Consequently illness caused by exhaustion struck doctors and nurses, leaving the others with an even greater workload and even greater exhaustion. Illness as *perpetuum mobile* and self-fulfilling prophecy (Kuyper 1918, 132).

Nevertheless, however much Death conquered Europe, he was almost mute in the Dutch ambulance. As was the case in the ambulances to Gleiwitz and Olmütz, patient deaths were rare. Five months after arrival Kuyper mentioned the second death. And so, in spite of all the hard work, shortly before departure Kuyper had to admit it had in fact been a quiet ambulance. This had become evident after she visited the large and overcrowded hospital for the Austro-Hungarian army, to which "her" wounded were transported. There the wounded only were bandaged twice a week, rather than once or even twice a day in the Dutch ambulance (Kuyper 1918, 188, 218, 235).

Looking back on the time in Budapest Kuyper noted it had been noticeable with how much pleasure doctors and nurses had done their job. Certainly for the nurses this was not difficult to explain, because:

> The strongest instinct of woman is motherhood. Woman is made for looking after all that is little, weak, needy. Her deepest longing is caring, loyalty, aid. And the more care the subject of her dedication needs, the happier woman is, because the more she can deploy all the miraculous caring gifts God has gave her ... Like a mother who is delighted when she sees her child grow stronger and more independent ... so the nurse takes enormous pleasure in her slowly healing patients (Kuyper 1918, 245-246).

It is a picture completely in agreement with the one her father drew in a lecture to nurses in 1915: the strength of womankind is in her heart, not in her head (Kuyper 1915). An emotional and economically practical argument, for work done from the heart, as nursing, will be done whether poorly paid, or not paid at all.

Conclusion

From the Netherlands a variety of ambulances and individual doctors and nurses drove off to both fronts of the war in Europe. They were not sent by the Dutch Red Cross, who had decided that Dutch political and military interests came first. They were generally loved in the Netherlands also because they showed neutrality was not per se a sign of weakness. There are, however, questions as to whether the ambulances were truly neutral, for instance when comparing two of them, those of the physicians Van Tienhoven and Hijmans, working at the Eastern Front. In spite of both being Dutch ambulances, the differences could hardly have been greater. They worked on different sides of the front; their beliefs of who was to blame for the war were different; the horrors of war were openly demonstrated and expressed in the Van Tienhoven ambulance, while in the

other, at least in the account Henriette Kuyper has made, they were concealed as much as possible. In part this last difference must be subscribed to different circumstances. Van Tienhoven's team had to break up again and again to continue its work elsewhere, often where medical conditions were even less favourable. On the other hand, Hijmans' ambulance worked in a fixed location that was both a beautiful and spacious building. In addition, although indirectly the chronicler of the Serbian ambulance was its main physician, Van Tienhoven, while at the Budapest ambulance the head of the household service related the tale. But there are two similarities between the chroniclers as well.

Firstly, Van Tienhoven and Kuyper shared an aversion to modern, Western civilisation. Secondly, although both ambulances came from a neutral country, and performed a job often called neutral in itself, neutrality in its strictest sense-absent ideological and/or political prejudice-was absent. Neither of them ever mentioned the word, let alone give a description. Neutrality seems to have been self-evident, but, in fact, it was anything but. In the team of Van Tienhoven-in any case with Van Tienhoven himself-the preference expressed itself mainly politically and ideologically. From a medical perspective, however, the available sources relate these had little consequence. The medical team had already developed its Serbian sympathies while working in Serbia before the war, but its sympathy did not go so far as to deny medical care and advice to Austrian adversaries. But why did Van Tienhoven constantly point to the general differences between the multi-cultural, multi-ethnic Austrian army and the Serbs to explain differences in health and recovery? This poorer recovery rate for the Austrians could, of course, have had some other reason besides an 'objectively discovered' difference in natural strength. Perhaps, consciously or unconsciously, Van Tienhoven did not try as hard. Or, and more likely, he simply observed what he wanted or expected to see. Furthermore, why was everything done to prevent him from falling into Austrian hands? This may indicate that medical assistance in itself was not seen as a neutral, but as a militarily important activity.

Nevertheless, the difference between the Van Tienhoven ambulance and that of Hijmans and Kuyper is clear. The Kuyper ambulance sympathized with the war aims of the Central Powers, and assisted those powers by using the ambulances of the Dutch Society of Ambulances for Germany and Austria-Hungary to smuggle non-medical, militarily important supplies to the front. In other words: it certainly did *not* only drive off to help the wounded.

By not sending ambulances, the Red Cross was not neutral or on the side of humanity, but rather on the side of Dutch political and military

interests. The ambulances that did go, usually pictured today as a phenomenon showing the moral and courageous side of neutrality, could just as well have turned out to be a phenomenon perceived as endangering neutrality.

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CHAPTER ELEVEN

IN RESPONSE TO CIRCUMSTANCES: MEDICAL EVACUATION AND FRENCH AMBULANCE TRAINS IN THE GREAT WAR[1]

NATALIA STAROSTINA

The Great War claimed the lives of 1,397,800 French military personnel and at least 4,266,000 more men were wounded; without ambulance trains and their help in bringing wounded soldiers to hospitals on the home front, the number of French casualties would have been much larger. In the course of the war, trains had brought more than five million wounded and sick soldiers and officers from the front (Fischer 1925, 16), and it was the ambulance trains that played an essential role in evacuating the wounded from battlefields. I shall address their use and evolution; the trains saved many lives, yet, their story and assessment of their effectiveness generate contesting interpretations among researchers and war veterans. French scholars highlight the fact that even though the French army had several specialized equipped trains for medical evacuation in its disposal by 1914, the functioning and the service of ambulance trains underwent dramatic changes during the war. The military did not expect an unprecedented number of casualties and did not prepare enough trains. Regulations about medical evacuation which were

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elaborated before 1914 were drastically revised in the first months of the war because a high volume of wounded soldiers and officers made the adherence to strict regulations more difficult. The design and the interior structure of ambulance trains proved to be far from perfect: nurses and doctors who worked on board often redesigned some interior details of such trains. To make ambulance trains a valuable aid in saving soldiers' lives, the various groups in the French society improvised and redefined a role of ambulance trains in the war: scholars approach this necessity to improvise as a sign of flexibility on the part of individuals and certain conservatism of the French headquarters in envisioning French strategy during future military conflicts.

My article will also consider the responses of two individuals, Robert Graves (1895-1985) and Albert Bessières (b. 1877, the date of his death is unknown) who traveled on ambulance trains during the Great War and left first-hand accounts of their respective experience. Their stories reveal that despite the positive role ambulance trains had in saving thousands of lives, contemporaries often developed a dark view on the trains. Bessières, a nurse, a priest, and a French ambulance train worker, considered the war as the greatest tragedy and described many people, especially, the young, who died in front of his eyes on board the ambulance train. Bessières recorded how the first months of the war revealed flaws in the organization of mass medical evacuation. In haste, ambulance trains were built out of trains cars originally designed for cattle and luggage transportation. He also depicted the tragedy of hurried evacuation during which soldiers who should not be put on trains, nevertheless, were loaded to trains. He described a shortage of staff and medical supplies, a lack of basic comfort and some regulations which made the effective assistance to soldiers more difficult. On the one hand, Bessières viewed ambulance trains as the potent symbol of the tragedy of the Great War which took the lives of millions of people. Yet, the author also described the Red Cross, its trains and its hospitals, as the asylums of hope and the refuge of humanity in the ocean of suffering.

Indirect references to ambulance trains as "the accomplices of the war" are in the poetry of contemporary French poets and writers: too often healthy and young recruits left French train stations to the battlefields only to return from the war as physically and morally disabled invalids on board ambulance trains. Robert Graves, a British writer and poet who volunteered to join the British army in 1914 and was badly wounded in the battle of Somme, critically described his experience at a field hospital and on board an ambulance train. In Graves's description, his evacuation on board an ambulance train was such a traumatic experience that, as a

consequence, Graves actively avoided train travel for the rest of his life. In sum, contemporaries were less inclined to see an evolution of ambulance trains in the first months of the war as a sign of resourcefulness and the capacity of the medical personnel to change regulations; on the contrary, they tended to consider it as the sign of chaos and a lack of preparation to the war.

The Evolution of French Ambulance Trains

The history of the Great War is a significant theme in French historiography (Becker 1994; Becker 1998). According to François Caron, a leading French scholar of railways, the managements of railways encountered an immense number of challenges during the course of the war (Caron 2005, 546-585). The French military headquarters, GCG (General Communications Headquarters), had imposed many new regulations on French railways, but they often failed to understand the peculiarities of how the French railway networks operated. For instance, before the war, the French railways were not nationalized and used different signalization systems. The French GCG did not understand these intrinsic details, and these peculiarities resulted in accidents and traffic jams on French railways. From 1916 until the early 1920s, the Northern Railway and the Eastern Railway Networks encountered a serious crisis: the military action in the north and east of France damaged a great deal of rail, resulted in the full-scale destruction of the property, took the lives many railway workers (*cheminots*), and threatened the economic survival of the railway networks. However, the crisis was far from over at the moment when the armistice was signed in 1918. In her Ph.D. thesis, French historian Anne Desplantes investigates the performance of French railways during the war and argues that everyday efforts of railway networks came to play an ever-increasing role in sustaining military efforts and the morale of the troops. (Despantes 1997). The French railway companies ensured that a French *poilu* (an infantryman) had good nutrition and a plenty of ammunition, kept touch with his family, and had enough warm, clean clothing. Desplantes also highlights the negative financial consequences of the war for French railways (Despantes 1997, 353). Two unpublished dissertations on the history of ambulance trains illuminate important points about the history of ambulance trains (Blain 1994, and Labbez 1994).

In comparison with other wars in which France was involved, it was the Great War in which ambulance trains played the most important role in the rescuing the wounded. The origins of the ambulance trains go back to

the mid-nineteenth century when wounded soldiers were evacuated on board of trains from battlefields of the Crimean War, American Civil War, and other conflicts. Before the army became interested in the development of ambulance trains, wounded soldiers were taken on commercial trains to hospitals in the rear. The first ambulance train was built in the U.S., but soon the French created their own ambulance train at the depots of la Compagnie de l'Ouest in 1886. This specially designed train had twenty-three wagons, including sixteen for injured soldiers and officers. A novelty and a technological wonder, four wagons of the ambulance train were proudly displayed at the Esplanade des Invalides at the International Exhibition of 1889 in Paris. The French leading mass circulation illustrated journal, *L'Illustration*, published a detailed and well-illustrated article that described the new innovation and introduced it to the French ("Le Train Sanitaire" 1887).

As many European states, France made steps to prepare for a war and a possible invasion; considering the memory of the Franco-Prussian war of 1870-1871 and the militarization of Germany under Kaiser Wilhelm II, the French military headquarters viewed Germany as the most likely aggressor. The French secret plan, Plan XVII, made provisions for the future war: the French generals expected the Germans strike from the east, from the provinces of Alsace and Lorraine which the Germans had taken in 1871, after their victory in the Franco-Prussian war. The plan organized defense, mobilization and concentration of French troops (Archives 7 N 7737; Caron 2005, 540-3.)[2] Yet, the French military headquarters did not anticipate the German invasion to Belgium and, then, from the north of France. Also, during the Franco-Prussian War, the process of national mobilization proved to be flawed. In the nineteenth century, French railway companies selected Paris as the central communication hub. It meant that in order to go from one region city to another, a recruiter, most

[2] The plan had named six major sectors: from the Hautes-Vosges to Belfort, from the Haute-Meurthe to Rambervilliers, Basse-Meurthe to Nancy, from Southern Woêvre to Vigneulles, from northern Woêvre to Jametz and from Ardennes to Givet. The plan was aimed at delivering combat troops – military units, responsible for repelling attack—in the first two days of the war. During the third and fourth days, the cover troops had to receive reinforcement; other means of transportation were to be utilized. From days four to eleven, the railways were going to deliver more combat troops to the front. According to the plan, the train stations of Besançon, Gray, Is-sur-Tille, Bricon, Troyes, Reims, Laond, and Hirson were major transportation hubs that ensured the delivery of troops to the front. Two transversal routes, those from Dole to Laon and Chagny to Busigny, were destined to facilitate the movement of troops between northern and eastern directions.

likely, needed to change a train in Paris. In the first weeks of the mobilization, Parisian trains stations were overflowing with a number of soldiers and officers who tried to reach their military units. There were expectations that the French state needed to invest heavily in the construction of transversal rail routes directly connecting different French regions.

Even though the Franco-Prussian war was relatively brief, it offered sufficient lessons on the importance of medical evacuation to the French army. In the 1900s, the French military headquarters developed detailed guidance on the evacuation of the injured. There were three bodies that were in charge of evacuation: *Service de Sante de l'armée en campagne*, *Transports stratégiques par chemin de fer*, and *Services de l'Arrière aux armées*. Before 1914, the French command envisioned the creation of permanent hospitals at the front. The guidelines described a procedure according to which the wounded were to be evacuated. After battles, doctors and nurses were supposed to sort out injured men: the severely wounded were to stay at the hospitals near the frontline while the rest were to be transported to evacuation hospitals on the home front (*hôpitaux d'évacuation en arrière)* (Fischer 1925, 62-68). A doctor needed to examine each injured soldier and gave him a card, red, yellow, blue, or white one, depending on the character of injury. (A red card was for serious injuries and suggested a necessity of a surgery, a yellow card indicated illnesses of specific body systems (such as urinary tract infections or illnesses of nervous systems), a blue one was a sign of injuries of medium gravity, and a white one for light injuries.) Nonetheless, despite these steps, the French army did not accelerate the building and acquisition of ambulance trains before the beginning of the Great War. It is a well-known paradox in the historiography of the Great War that regardless of the alarming lessons of colonial wars in which France and Great Britain were involved at the fin-de-siècle, the French military headquarters did not anticipate how new technologies such as machine-guns were to augment a number of military casualties, nor how the use of machine-guns and artillery were to make much serious the severity of wounds.

In August 1914, the war began and many pre-war arrangements and plans had to be redefined and reinvented (Starostina 2010). In an article published in 1922, Colonel Le Henaff, the director of military railways, evaluated the service of French railways to the French nation as satisfactory but not outstanding (Le Henaff 1922). According to Colonel Le Henaff, in the years before the war, there was a false perception that the French railway companies employed enough staff and enough resources to

handle the needs of the army. Nonetheless, the increasing development of commercial traffic--a matter of pride for French railway companies before 1914--did not become a factor, which facilitated the mobilization and concentration of the French army. Moreover, the managements of the réseaus du Paris-Lyon-Méditerranean, Paris-Orleans, and *d'Etat* [networks Paris-Lyon-Mediterranean, Paris-Orleans, and state-operated railway network] were little prepared for handling mobilization.

The same was true about medical evacuation. Detailed instructions on this subject proved to be very difficult to implement because of the unexpected number of the wounded and because of gravity of their wounds. The Great War had presented an enormous challenge for French railways to ensure the timely evacuation of wounded and sick soldiers. The system of evacuation, which the Health Service (*le Service de Santé)* had elaborated for French railways before 1914, proved to be inadequate and during the first weeks of the war, this system collapsed. The heavy casualties during battles made difficult, if not impossible, the separation of wounded into three categories. Moreover, the armies of the Central Powers had captured several hospitals located near the frontline and imprisoned the wounded soldiers and officers. These grave realities of the war revealed the strategic disadvantages of locating hospitals close to the military action The idea of permanent hospitals was discarded. In the first months of the war, rules changed: three stages of medical evacuation depending on the gravity of the wound were introduced. First, a soldier was put on board of an ambulance train from a train station closest to the frontline; second, wounded were delivered to a hospital in a railway hub [*gare régulatrice et hôpital evacuation],* and, third, severely wounded were taken to a hospital on the home front.

In cooperation with military authorities, French railway companies had drastically changed the system of evacuation. In doing so, they integrated the principles of modern ambulance service that were articulated by Professor Lecène. Lecène argued that one doctor rather than several ones would provide the best treatment to a wounded man. Having integrated these principles, the managements of railway companies now wanted to provide medical care to injured men as soon as possible. A solution, on which the railway companies relied, was to ensure fast transportation of wounded soldiers to the home front. To do so, railway companies needed to create new facilities and new regulations for transporting wounded soldiers and to provide comfortable conditions for such transportation. Only in urgent cases were wounded soldiers to undergo surgery before their evacuation by train. Military authorities had built new hospitals, designated for three thousand people, and provided such medical

establishments with X-ray rooms and all other modern amenities. The new hospitals were capable of receiving a large flow of patient.

In the beginning the wounded were transported on commercial trains, but soon ambulance trains were accepted as the primary means of transporting passengers. The capacity of ambulance trains to transport wounded was 396 people, that was, twelve people per wagon (Blain 1994, 51). (Each wagon took 12 lying–down cases, i.e., the "Brechot apparatus.") The passengers of the ambulance train were under supervision of a chief doctor, a pharmacist, and forty-five nurses (Blain 1994, 51). It took five hours assisted by railway workers to prepare an ambulance train and two other hours to load the wounded soldiers and officers to the train (Blain 1994, 51). Blain describes a process of medical evacuation on an ambulance train as only partially efficient and sometimes traumatic (Blain 1994, 47). In some cases, evacuation train stations [*gare d'evacuation*], from which ambulance trains left, provided no shade and no proper embankment. On occasions, wounded soldiers on their stretchers were left waiting on the ground to be put on trains. After major battles, being overwhelmed with a large number of wounded, doctors simply did not have time to examine carefully soldiers and officers and classify their injuries according to the system of color cards. Loading the wounded to trains required a significant physical strength on the part of nurses because there were no embankments. The staff of ambulance trains usually had a very short amount of time to load trains. In addition, the doors of such ambulance trains were barely wide enough to pass a stretcher (Henniker 1937, 58). Trains had to stop periodically to examine the conditions of the injured: usually, such stops happened every twenty or thirty kilometers (Blain 1994, 47). Nurses checked their bandages and provided medicine, water, and food. It was impossible to circulate between wagons because the majority of wagons were those taken from commercial trains, or, as Bessières colorfully described, from cars that transported cattle before 1914 (Bessières 1916, 10). Ambulance trains needed to be readjusted and modernized (Fischer 1925, 70).

A new infrastructure was created to support and to facilitate medical evacuation. Some French train stations were equipped with train station hospital [*infirmerie de gare*] which were created for wounded soldiers whose condition deteriorated en route. Blain mentions that such hospitals at train stations usually employed two doctors and fifteen nurses, often women who worked as the members of *Société de Secours aux Blessés Militaires* (S.S.B.M.) [Society of Assistance to Wounded Militaries], *L'Union des femmes de France* [The Union of French Women], and *l'Association des Dames Françaises* [The Association of French Dames.]

Regulatory train station, or train hubs [*gare régulatrice*] which were located at the line of demarcation, close to the front, were, as a rule, a necessary stop for trains carrying wounded soldiers. A bigger evacuation hospital, *hôpital d'evacuation*, was located at such a regulatory train station and accepted wounded whose condition deteriorated. After leaving a regulatory train station, trains were entering the interior railway networks and taking wounded soldiers to city hospitals.

As Blain mentions, the last destination points for ambulance trains were the regulatory hub [*gare Régulatrice*] and disinfecting station in Paris, where the interiors of such trains were cleaned from blood, puss, urine, and other impurities (Blain 1994, 50). The smell of the disinfecting agent was very strong. In his *Civilization, 1914-1917* a French doctor, war veteran, and writer Georges Duhamel described the smell of ambulance trains:

> "At that time many of them (ambulance trains) were far from comfortable, and as they passed they would send us a broadside of racking coughs and whiffs of chlorine that smelled horribly of the hospital." (Duhamel 1919, 11)

One of the most striking impressions from an ambulance train for a contemporary was this overwhelming smell: the smell of chlorine, blood, urine, even feces if a car carried passengers sick with dysentery. Albert Bessières mentioned in his description how several of his patients sick with dysentery defiled the car, and how an empty box was used as a urinal by soldiers (Bessières 1916, 34).

The first months of the operation of ambulance trains demonstrated several flaws in their operation:

> "There was no inter-communication between vehicles to permit of attention to patients by the medical personnel while the train was running; there were no means of heating the vehicles, and experiments with stoves showed considerable danger of fire; loose couplings between vehicles and the application of hand-brakes gave rise to most injurious jolting of the patients" (Henniker 1937, 58)."

The most frustrating aspect for the military personnel and the wounded was the fact that the trains lacked inner circulation: for the wounded, it meant there was no one to attend to them between stops (Blain 1994, 53). For the personnel, it was also an exhausting physical exercise to go up and down at each train's stop to examine the conditions of the wounded soldiers and to carry with them bandages, medicine, food, and water. There was no sidesteps on such trains: nurses and doctors needed to jump

thirty-three times to a wagon to see all wounded during just one visit. Voyages on board such trains were not comfortable: suspension was of inferior quality, and wagons violently lurched during stops. A doctor who worked on the semi-permanent ambulance train number 30 described the difficulties giving medical attention to wounded:

> "I was forced to do more than heal the wounded during the complete stop of the train, very violent lurching of the car making the dressings too difficult and painful ... The suspension this car so bad…" (Blain 1994, 59.)

The doctor also complained that he had to affix stretchers to the table because they moved constantly; liquid drugs such as liquid antiseptic were easily poured out on the floor because of train's lurching (Blain 1994, 59). Wagons were cold and dark, despite the necessity for doctors and nurses to have a well-lit space to examine patients. Patients also needed to wait until stops to get food, water, and medication, as there was a shortage of staff.

In the course of the war, ambulance trains underwent many changes. The Decree of 9 October 1914 declared the creation of the *Direction Générale du Service de Santé* [The General Direction of Health Service] under directorship of Justin Godard; one of the concerns of this unit was the improvement of ambulance trains (Blain 1994, 55-57). Their operation and design underwent positive changes, especially, concerning the heating and the introduction of lightning by gas in wagons. Also, some trains now had inner circulation. To ambulance trains, new wagons were added, including a dining car and wagons with a toilet.

The drastic improvement came with the incorporation of five dining cars which were built at depots of the *Compagnie Internationale des Wagons-Lits* (C.I.W.L.), the company whose name was rightly associated with the most comfortable train travel in the years of the Belle Époque (Blain 1994, 57). The cars of the C.I.W.L. had superior suspension which made voyages very comfortable and included the softest carpets; additionally, the dining cars were decorated in the style of Louis XV's rococo and featured bronze and crystal chandeliers and exquisite upholstery. These cars were redesigned to include a small kitchen (*cuisine-tisanerie*), drugs storage space and [*pharmacie*] pharmacy, an office and a refectory for the staff [*bureau-refectoire*]. (This solution was not ideal, because the CIWL charged a very heavy rental fee.) In addition, in February 1915, a former American ambassador in France, Robert Bacon (1860-1919, served as ambassador from 1910 to 1912), secured a valuable gift: thirteen wagons of C.I.W.L. originally designed for luggage transportation joined ambulance trains (Blain 1994, 59-60). Among wagons given by Robert Bacon to the French army were eight sleeping

cars, one wagon-restaurant, and one car for the use of staff. The staff received the most comfortable cars. (Blain 1994, 59-60). The cars had a capacity to transport two hundred and forty places and were equipped with heating devices. This "American ambulance train" [*train d'ambulance américaine*] assisted in taking the wounded from the battlefields of Verdun and Somme and brought them to cities close to Paris and the *Midi* region of France (Blain 1994, 59-60). Also, some ambulance trains took wounded soldiers to the Riviera: Bessières described a trip to Cannes where the wounded were taken to hospitals (Bessières, 54).

In the first months of the war, the staff of the ambulance trains had undertaken a number of initiatives to improve such ambulance trains: nurses and doctors removed the inner walls in the wagons, added a dining car, cars with medical facilities, and a car with extra blankets and stretchers. Such improvised measures made ambulance trains heavy and bulky to the degree that trains became unsafe. Eventually, the Health Service ordered uniform ambulance trains; even though their design also had some shortcomings, they were more suited for the transportation of wounded soldiers. Blain sums up his description of ambulance trains with impressive statistics: by 15 December 1916, there were one hundred and sixty-eight ambulance trains in operation in France, including six permanent ambulance trains transporting bed-patients with inner circulation, one hundred and twenty-seven trains (seventeen trains offered inner circulation, thirty-three partial circulation among cars with bed-patients, and seventy-seven without circulation), and thirty-five improvised trains, including twenty-nine for bed-patients and six for wounded with partial mobility (Blain 1994, 60-62). In 1917, the French army added another fifteen semi-permanent ambulance trains with inner circulation, and in 1918 one hundred and eighty-nine ambulance trains in total. More than five million wounded were brought from battlefields to hospitals on board of ambulance trains. An impressive number. Yet, contemporaries expressed a great deal of criticism in their assessment of the ambulance trains and their convenience.

Adding to trauma: Evacuation on board ambulance trains from the testimonies of wounded war veterans

Paradoxically, despite playing the truly revolutionary role in medical evacuation and saving lives during the Great War, ambulance trains received a mixed response from doctors and patients alike. A detailed and interesting account of the organization of medical evacuation and an ambulance train comes from the memoirs *Good-bye To All That* by a

British writer, poet and scholar Robert Graves. Robert was born into the large family of a school inspector in London: thanks to the dedication and efforts of his parents, Robert developed a love for reading and learning from early age. Robert faced a difficult time in a private boarding school due to his scholarly pursuits, but it all changed when he learned boxing and became school champion. After the war began, Robert almost immediately enlisted as the volunteer officer to the Royal Welch Fusiliers. He was gravely injured during the Battle of Somme and subsequently evacuated to London. His memoir portrays many aspects of medical evacuation and ambulance trains (Graves 1995, 196-201). Robert was badly wounded through the lung: mistakenly, his name was included in the list of casualties and his family mourned his death for several days. It was one of the commanding officers who wrote a sad note to Robert's family mentioning that he died as a hero. The major wound which Graves suffered was in his lung; however, in a haste to examine other wounded, the doctor failed to take note a minor wound in Robert's finger. If the wound in the lung was treated, the finger was certainly not; it was about to start a gangrene and put Robert's life in more danger than the lung wound when, luckily, it caught a doctor's attention. Robert's memoir describes hospitals which were located near train stations:

> "Close to the station stood the hospital tents with the red cross prominently painted on the roofs… Fine July weather made the tents insufferably hot. I was semi-conscious now, and aware of my lung-wound owing to a shortness of breath… The doctor came over to my bed. I felt sorry for him; he looked as though he had not slept for days… I said: 'You must send me away from here. This heat will kill me.' It was beating on my head through the canvas (Graves 1995, 220).

Robert also described how he requested water or fruits from a nurse, yet a nurse could not deliver any of them because such items "were not seen for days".

Robert's voyage on board an ambulance train was one of the most painful and terrifying experiences of his life (Graves 1995, 196-201). He wrote:

> "That evening, the R.A.M.C. orderlies dared not lift me from the stretcher into a hospital train bunk, for fear of starting hemorrhage in the lung. So they laid the stretched above it, with the handles resting on the head-rail foot-rail. I had now been on the same stretcher for five days. I remember the journey as a nightmare. My back was sagging, and I could not raise my knees to relieve the cramp, the bunk above me being only a few inches away. A German flying-officer, on the other side of the carriage, with a compound fracture of the leg from an aeroplane crash, groaned and wept

> without pause. Through the other wounded men cursed him, telling him to stow it and be a man, he continued pitiably, keeping everyone awake." (Graves 1995, 222)

Robert also added some disturbing details about ambulance trains: one of the nurses was a thief who took personal possessions from pockets. Unfortunately, Robert did not describe any details of how the wounded on board of ambulance trains were transferred to ferry-boats across the English Channel. As a result of this five-day journey he developed an intense phobia of trains: he confessed that he "felt sick every time I travelled by train." (His postwar benefits allowed him to travel by a first class on train, and it made possible his train voyages.) Robert also described the efforts of civilians to give a warm welcome to wounded soldiers. He sent a wire to his parents about his arrival to Waterloo Station:

> "I had sent my parents a wire that I would be arriving at Waterloo Station the next morning. The way from the hospital train to the waiting ambulances was roped off; as each stretcher case was lifted off the train a huge hysterical crowd surged up to the barrier and uttered a new roar. Flags were being waved." (Graves 1995, 226)

For Graves who suffered from pain, developing neurasthenia as a result of post-traumatic syndrome, he, generally, felt more and more alienated from the war which he and his friend Siegfried Sassoon considered evil, unjust, and the slaughter of the young generation. Even these efforts to greet the wounded were offensive.

Civilians were hardly aware of the ordeal that injured soldiers went through: in the description of Graves, when he arrived in Britain, his father along with other patriotically-minded Londoners had cheered wounded officers by delivering them flowers. Londoners had also expected to hear from such officers the tales of heroism; Graves characterized this atmosphere as that of "war-madness." (Graves wrote: "We [Graves and Siegfried Sassoon] decided that it was no use making a protest against the war. Every one was mad…" (Graves 1995, 227-8)). Robert has not indicated in his memoir on which kind of an ambulance train he was transported, whether a permanent or semi-permanent one. He was clear, however, that his experience of medical evacuation on an ambulance train left the most negative and traumatic memories; Robert, apparently, did not view the train as the essential means of transportation that helped him to survive and to recover from his grave wounds. It was not entirely just interpretation, but it was the one which was shared by another wounded French veteran.

A somehow similarly negative assessment of ambulance trains is in the words of another veteran of the First World War, Maurice Genevoux (1890-1980) (quoted in Blain 1994, 59-60). After Maurice was wounded in Eparges in the April of 1915, a doctor classified his injuries as serious: he had been struck by two bullets to his left arm, one to his chest, and another to his brachial artery. At first he was evacuated on the road and then was put on an ambulance train in Verdun. There are several strong expressions which Maurice used to describe his experience. The train itself was as hot as an oven ("I was baked at the train" ["*on m'a enfourné dans un train sanitaire"*]) (Blain 1994, 59). Maurice described a wagon in which he traveled as a car for the transportation of cattle now redesigned to carry wounded soldiers on stretchers stuck at multi-levels. Maurice also described the atmosphere in the car as "unbreathable" (Blain 1994, 59). Maurice's walking on the platform failed to go unnoticed by the train station master who ordered him to either lie on a stretcher if he was indeed hurt, or to go to a car for people with light wounds.

The two accounts show that the wounded tended to consider ambulance trains as an additional factor in making the consequences of their injuries more painful and more traumatic. Neither Robert Graves nor Maurice Genevoux noted in their accounts the attentiveness of the staff, a possibility to be delivered from the frontline to home front, or the timely manner in which they were evacuated. Pain from wounds, post-traumatic syndrome, and shock appear to contribute to rather negative descriptions of ambulance trains.

"The Red Train": Blood and suffering versus faith and humanity in the memoir of Albert Bessières

One of the most useful and detailed sources about the ambulance trains is the memoir by Albert Bessières, *The Red Train,* that was published in 1916 (Bessières 1916). The memoir is a kind of diary which contains daily notes of Bessières's service as a nurse on board an ambulance train. Albert was born on February 2, 1877 (the date of his death is unknown). Before the war, he was a priest. In 1914, he volunteered to serve in the army and was assigned to work as a nurse. He made his first trip on board the ambulance train on August 20, 1914, and the last one on November 23, 1916. In 1916, Albert published his account of the work as a nurse-priest on board the ambulance train; he signed his name as "Abbot Albert Bessières." After the war, Albert pursued a scholarly career: he was the author of a 480-page monograph on two seventeenth-century religious activists, Gaston de Renty and Henri Buch; for this work the author used

archival collections in Lille and other parts of northern France. The monograph was published in Paris in 1931 (Bessières 1931). None of the sources I have found contains any information on the biography of Bessières.

Albert Bessières was assigned to work on board a semi-permanent ambulance train (Bessières 10). His description conveys numerous difficulties and a constant necessity to improvise in the first months of operation on board of an ambulance train. By 10 August 1914, Albert already described how difficult it was to travel on the train under the blazing sun and without air conditioning. Later on 17 August 1914, the first serious assignment came to Albert and his comrades: they needed to clean forty-four cars originally used for cattle transportation and to prepare them for the evacuation of wounded soldiers. Inside the cars, nurses scratched horse manure from floors, disinfected wagons, and built holders for stretchers. Bessières described the mood of the first days as "nobody knows anything, and we improvise, we improvise" (Bessières 1916, 15-16). As the result of their efforts, forty-four cars were ready to accept the wounded by night. The nurses put large red crosses on a white background everywhere: on the armbands, on cars, and on flags that float from field hospitals. Then, from August 17 to 20, there was a short period of lull. Thus, Albert began asking questions as to why nobody would use their ambulance train, even though it was available and wounded were taken on regular trains, not designed for medical evacuation. Albert described how twelve berths in each wagons were white, but in the matter of three months they would be red because no amount of washes and disinfecting agent would be able to clean the berths from the blood of the wounded (Bessières 1916, 16). He later titled his memoir *The Red Train* due to the shed blood of the wounded.

The memoir emphasizes how emotionally trying and overwhelming the duties of a nurse was. There were always too few nurses and doctors to deal with too many wounded. Here is Albert's description of his experience during conducting the first evacuation (Bessières 1916, 23). Peasants brought the wounded on uncovered carts; the soldiers and officers lay on a thin layer of straw soaked with blood, with the hard rain lashing over the faces of the wounded. Unfortunately, there were only two doctors and forty-four nurses, and necessary medical supplies were still in another city. There were no stretchers either, and nurses and peasants were required to load soldiers and officers to the train in haste because of the increasing sound of artillery cannonade and, thus, an increasing danger of being bombarded by the enemy. The train accepted four hundred and fifty wounded; thirteen wounded were in the care of Albert.

Many pages of the memoir contain the heartbreaking description of wounded soldiers. The description of their grave injuries, their sufferings, and a limited ability of the staff of ambulance trains to alleviate their injuries produce the most depressing effect on a reader. Albert described the serious wounds which these men suffered: there was a "child" (probably, a young man) who was wounded to his abdomen and who was consumed by fever, which soon led to his death (Bessières 1916, 24). Another man was in delirium and constantly crying; he was shell-shocked, with bruises all over him, and kept saying that he was already dead. Albert tried to persuade him that he would be fine soon. At the same time, he also highlighted the unprecedented courage and stoicism of his soldiers: many of them went through inhumane pain and suffering without complains. One of the soldiers who was wounded in his heel—an immensely painful injury-- made a joke that it would be difficult to dance with this foot (Bessières 1916, 25). On his entries made in Dijon from the First and Second of October 1914, Albert described the painful (but necessary) treatment soldiers received from doctors (Bessières 1916, 58). Albert witnessed the examination of a soldier who complained that he did not feel anything. Underneath the soldier's bandages, a doctor discovered "a black hole," that was large and gangrene. A doctor soon cauterized the wound: "flesh smokes as metal bitten by metal etching" (Bessières 1916, 58). Albert saw how despite the unbearable pain, the patient remained silent, but his nails drove to Albert's hands. (Bessières 1916, 58). The wounded waited on stretchers; they were half-naked, and rarely had covers. Upon examination of another soldier, it was discovered that infection complicated his grave wound: shrapnel had taken half of the soldier's thigh. "The bloody chasm is exposed," and the soldier who just suffered injury was grateful and kept saying "thank you," "thank you." (Bessières 1916, 35).

Albert also described a hasty evacuation from a train station in the aftermath of the defeat at Charleroi. There were hundreds of soldiers laying on the station's ground. One wounded soldier said that he was dragged from one hospital to another for three days, and if he was going to be put on an ambulance train, he would surely die (Bessières 1916, 29-30). He desperately begged to be left at a train station even though the Germans were to occupy the city in a matter of hours. Albert rushed to explain the situation to a doctor: in Albert's words, "to put him [the soldier] on the train is to condemn him to death" (Bessières 1916, 29). The doctor too agreed that there would be grave consequences of transporting such a patient by a train, but insisted on taking the wounded to the train. The doctor--an intern--did not have the power to make a decision to leave

the wounded. Albert and the doctor did not have choice: if they would have left the wounded at the station, they risked going to prison. Moreover, the doctor bitterly shared that there were hundreds soldiers who should not be put on the train. Some wounded cried that they preferred to die there rather to be moved on trains again (Bessières 1916, 29). One soldier begged to throw him on rails: he was on the ground of the train station for ten days and nobody helped him.

Albert showed the difficult choices nurses were forced to make: there were hundreds of arms stretching to nurses, hundreds of voices shouting "Over here! Over here! Come to me!" (Bessières 1916, 34) Albert needed to put some soldiers on his shoulders to load them onto the wagons. There were only three nurses to take care of this large number of people. Paradoxically enough, these three nurses pondered for a minute whether it would be better if they could go inside of the train and hide: their presence only makes the sufferings of the wounded worse" (Bessières 1916, 34). Bessières bitterly shared that the Germans could not be worse that "sixty agonizing hours" on the train; in addition, he did not even know where the train was going (Bessières 1916, 29). Unfortunately, ten people died on board the train within the next day. On the same day, Albert asked an officer what he thought about the whole business of evacuation, and the officer said: "we learn, little by little, how to conduct a war" (Bessières 1916, 29). In a different record, Albert mentioned how five hundred stretchers were literally squeezed in a train (Bessières 1916, 48). Implicitly and explicitly, Bessières made a point that this price for learning how to conduct a war was high, perhaps, too high.

The memoir by Bessières raises many questions, although the author sometimes evaded providing candid answers to them. On the one hand, the uncomfortable semi-permanent ambulance trains on which soldiers and officers were evacuated make one wonder whether better means of transportation could be given to people whose suffering was deep. Yet, Albert justified this happening by saying that the quality of ambulance trains and of medical care were, to an extent, sacrificed because the army was busy with delivering troops and ammunition to battles (in this particular quote, Albert referred to the battle of Marne (Bessières 1916, 38). Witnessing an evacuation done in haste, with soldiers begging to be left alone on the ground rather than to face a long trip on an ambulance train, Albert pondered about the words of Marshal Ferdinand Fosh (1851-1929). Fosh said that no improvisation could overcome the lack of preparation in a case of war. Then, contrary to his hints that no efficient preparations were made for medical evacuation, Bessières has drawn a different, a much more optimistic and apologetic conclusion. Despite this

difficult beginning, Bessières argued, improvisations proved to be necessary and mistakes could be corrected. Albert wrote:

> "at the price of grave suffering and deep sacrifices, in less than three months, our health service was transformed, and if it did not achieve perfection (which does not belong to the things of our world), it will become equal, it will surpass the organization of our enemies' [service.] Why does it have to be this way that at war all experience is acquired through human lives… improvisation, mourning and tears?" (Bessières 1916, 39)

The priest-nurse tried to justify the fact that soldiers were evacuated in cars which were used for the transportation of cattle and lacked enough staff and medical supplies. Albert also seemed to agree with a notion that it was indeed impossible to anticipate all casualties during the war and that learning by trial and error was unavoidable.

The memoir contains many powerful passages. Albert's description of tragedies happening on board the train includes a comparison: "The train whistles and departs in the night: its red lanterns are like a trail of blood [in complete darkness]." (Bessières 1916, 39). Albert wrote: "From the North Sea to the Mediterranean, the Bering Strait to the Atlantic and Pacific, the cross will be the only sign of peace, an asylum for the suffering in the midst of horrible scrum where millions of men will clash" (Bessières 1916, 16). For the nurse-priest, the ambulance train symbolizes the tragedy of the Great War. Bessières put much hope in religion and in the power of faith to give hope and to stop a mutual slaughter. Bessières gave absolution to many wounded who died in front of his eyes; his power to perform this act of grace to dying soldiers was important to Bessières, perhaps, as important as giving medical treatment to his patients (Bessières, 20, 40, 57). At the same time, Bessières's faith allowed him not to share a nationalistic rage against the Germans. Bitterly, Albert recorded in his note that he was not allowed to treat a wounded German soldier even though gangrene had set in on his body (Bessières 1916, 57).

The memoir by Albert Bessières provides an invaluable source to understand the everyday functioning of ambulance trains in the Great War. The memoir describes a constant necessity to improvise, multiple problems with the functioning of ambulance trains, the unprecedented suffering which the wounded went through, and the limited means of the staff of ambulance trains to alleviate the suffering of such soldiers. The memoir also reveals that working as a nurse on board an ambulance train required a great deal of endurance, physical strength, stamina, compassion, and courage. It was not just the matter of being physically able to lift wounded soldiers on the nurse's shoulders to load them to trains. It was

not just the matter of seeing most atrocious and grave injuries and dying men--many young men--every day. It was also a matter of not being afraid to continue on evacuation when the sound from cannonade was approaching, when shrapnel from enemy artillery attacks was tearing the roofs of cars, and one needed to pretend that everything was fine to calm patients down (Bessières, 49).

Conclusion

I have considered the evolution of ambulance trains in France during the Great War and have demonstrated that many improvised measures needed to be taken to improve the functioning of ambulance trains. Despite numerous steps taken to organize the process of medical evacuation before 1914, many guidelines and recommendations needed to be discarded or significantly readjusted during the first months of the war. The French army did not commission many ambulance trains specially designed and suited for the transportation of wounded soldiers; this lack of specially built trains resulted in the necessity to convert commercial trains to semi-permanent ambulance trains. Designed for the transportation of cattle or luggage, cars were rebuilt to carry wounded.

It is not to say that historians need to blame the French army for not being fully prepared for the needs of medical evacuation. The Great War surprised all armies involved by the unprecedented amount of casualties and by the graveness of injuries due to the use of machine-guns, artillery, mustard gas, and other modern means of killing on an industrial scale. In my article, I wanted to emphasize the important role which ordinary citizens played in the organization of medical evacuation, and in their role in the improvement of ambulance trains. Thanks to the commitment and hard work of nurses and doctors, medical evacuation by the means of ambulance trains saved many lives. Even though a French writer Jules Romains (1885-1972) portrayed trains as the accomplices of the war (Starostina 2008), ambulance trains drastically reduced the amount of casualties. The Great War brought significant changes in the philosophy and practice of war medicine, and ambulance trains were of paramount importance in implementing such changes. War veterans such as Graves and Genevoux remembered evacuation on board ambulance trains as traumatic and painful; however, on the contrary to their negative assessment, such trains helped them to stay alive.

The Great War also brought about the creation of ambulance cars, that is, ambulance trucks on which wounded were evacuated to hospitals. Ambulance trucks integrated many medical advances. Duhamel wrote that

an “A.C.A” [an "autochir," a surgical (chirurgical) room in a car (auto) – N.S.] integrated the latest achievements of science (Duhamel 1919, 273-274.) It was a combination of a scientific laboratory and a modern hospital, and it helped doctors to diagnose the injured. Due to their mobility, ambulance trucks came to play a dominant role in medical evacuation during the Second World War. Between 1914 and 1918 the front line of the Western front did not move much; therefore, rail was able to play an essential role in medical evacuation and, in general, sustaining the military efforts of troops. In 1940, Marshal Pétain signed armistice after five weeks of fighting against the Nazis. Considering the short length of the conflict, French ambulance trains did not play an equally important role in the Second World War (Labez 1994). In his dissertation, Florence Labez argues that ambulance trains can be useful in contemporary society, especially, in densely-populated and well-connected-by-rail Europe if—God forbids—calamity or a large-scale epidemic strikes.

I conclude this article with a deeply engaging description of a nurse’s job, or, mission to save lives. An American-born writer and philanthropist Mary Borden (1886-1968) depicted her work as a nurse in a hospital which she and her husband equipped and staffed during the Great War (Borden 2007, 65-76). From 1915 to 1918, Mary Borden dealt with an incessant flow of the wounded soldiers:

> “It was my business to sort out the wounded as they were brought in from the ambulances and to keep them from dying before they got to the operating rooms: it was my business to sort out the nearly dying from the dying. I was there to sort them out and tell how fast life was ebbing in them. Life was leaking away from all of them; but with some there was no hurry, with others it was a case of minutes. It was my business to create a counter-wave of life, to create the flow against the ebb. It was like a tug of war with the tide. The ebb of life was cold. When life was ebbing the man was cold; when it began to flow back, he grew warm. It was all, you see, like a dream. The dying men on the floor were drowned men cast up on the beach, and there was the ebb of life pouring away over them, sucking them away, an invisible tide; and my old orderlies, like old sea-salts out of a lifeboat, were working to save them. I had to watch, to see if they were slipping, being dragged away.” (Borden 2007, 67-68).

Using the metaphor, ambulance trains served as blood vessels of the First World which sustained the lives of millions of soldiers and officers during the Great War and without which the casualties would have been much higher.

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EPILOGUE

DALE C. SMITH

Modernity is one of those embarrassing words that keeps being used because there is not much choice but which comes back to haunt the user as time passes and that which was the modern is no longer seen as modern. Historians have a long tradition of such self-inflicted wounds, beginning with the chairs of modern history at Oxford and Cambridge in the 1720s. The chair really would not have sounded as impressive if called the chair of non-ancient history, but that is what was meant. (In 2005, after only almost three centuries, the conflicted term was dropped and the Regius Professors became simply professors of history.) Modernist studies today include the period from the 1860s to the 1950s, but the dates vary in many sub fields, e.g. modernism in music is usually associated with the period from 1890 to just after the First World War, while modern art usually is dated from the 1860s. In the humanities the modern seems to be a relaxation of shared standards, i.e. is seen as over and against the classical and romantic. Modern in science is the agreement on shared standards; although philosophers of science have a hard time agreeing on just which standards are shared. Modern biology is dependent on the synthetic theory of evolution which dates from the 1930s and one might argue that modern medicine is a product of the twentieth century when the average patient began to expect to be cured by the encounter with a physician, that is, the natural history of the disease would be interrupted by the medical intervention. Modernism in war is usually defined in terms of industrial technology, railroads and mass produced synthetic explosives, but it can equally date sociologically to revolutionary France and the nation in arms. So what do we mean by *Glimpsing Modernity* as it applies to military medicine in World War One?

First, unlike art and music, modernity has not arrived; we are only "glimpsing" it in World War One. Virtually everyone considers World War One a modern war, despite the horse remaining the prime mover, so it is not the military that is non modern. So, by default, it is the military medicine that is not quite modern, but as our essayists make clear, it was very, very good. Perhaps it is as simple as expectations, military medicine

was in many ways better than almost anyone expected in World War One, while the modern military medical officer is never happy with modern military medicine's very good outcomes.

Military medicine is best defined as the application of medical art and science in a military setting for the purposes of assisting in achieving the military mission. It has tactical components, the care of the sick and wounded; it has operational components, the setting up and ongoing use of medical systems for prevention and treatment in the theater of operations; and it has strategic components, issues of threat assessment, personnel development and deployment, and research are among the most obvious in our essays. The tactical and operational medical expectations, especially those of the regular combatant officers, were low in 1914, but even medical officers had serious reservations about the ability to keep the force healthy and treat the massive damage done by modern arms. The expectant treatment of abdominal wounds from the Boer War experience was simply the most powerful case in point.

In 1875, the year he graduated from United States Military Academy at West Point, MGen Tasker Bliss later said of post surgeons, "they had nothing to do but to confine laundresses and treat the clap" and while Surgeon General G.M. Sternberg clearly expected to reduce disease in the United States' War with Spain in 1898, no other general officer had such expectations. Yet by the time World War One ended, military officers, medical officers and the public all expected camps and campaigns to be conducted with healthy troops. The key concept was not new, it was the command of health seen clearly in Vegitius, but the medicine was new, the medical officer's advice was now consistent and usually helpful if not always practical on campaign.

Even more impressive was the change in expectation regarding care on campaign. The new scientific specialized care of modern deployed hospitals was seen as curative and restorative. From the lifesaving interventions in the forward hospitals to the restorative care in the rear areas and back in the home country, the power of modern medicine was increasingly expected to perform miracles. And even more impressive, the military would support research during war to improve care for the next battle or campaign. The medical officer had become a member of the combined arms team required to sustain modern war. However, the line officer saw him as a team member mostly for the medicine he brought not for his military skill. The military planning, operational art, and evacuation system command and control were military skills that the regular military medical officers in most armies had both acquired and took great pride in maintaining. Every deployed health system showed the tension of

integrating the regular military medical officer, with military knowledge and experience, and the reservists and war time physician volunteer, with special medical skill and knowledge. These issues of professional relationships would show up in future wars as major issues of command leadership.

Part of the modern, democratic western world was the emergence of nonsectarian humanitarian concerns. These concerns were seen in the nineteenth century humanitarian response to war and disaster exemplified by the activities of the Red Cross, the Salvation Army and the YMCA. These organizations, and others, were present on the battlefields of World War One, and, as our authors made clear, the deployment of humanitarian support activates rose to new heights and diversity. At the same time the implementation of the Geneva Accords on prisoners of war and neutrality, seen in Professor Mayhew's discussion, illustrate the growing complexity of the humanitarian concerns surrounding modern industrial war. This too is a glimpse of something to come, the complex role of civilians in modern war zones, suppliers, victims, refugees, humanitarians, partisans, the list goes on and is in part subject to assumptions based on affiliation; what is not subject to debate is they too are part of the modern military medicine equation and must be studied with more care in the future.

In many ways the conference and the papers published in this glimpse of modernity raise as many questions as they answer. How can a military force, a social institution with a primary mission of offensive and defensive war, structure a medical community to both apply state of the art scientific care and maintain standards of care in times of peace and preparation? World War One combatants used civilian academic consultants, like Drs. Cushing and Crile, both in and out of uniform, to meet the emergency; but the lesson learned was, they needed the capacity. Healthcare industries in modern countries are exceedingly diverse, probably more diverse than militaries; the various national configurations of medicine in the military reflect the complexity, the national diversity and the mission driven answers. We need more study of the national understanding of the questions surrounding the interaction of complex social institutions and the variety and choices of the answers, but the experience of World War One makes clear that the questions are meaningful in terms of military mission and real in terms of quality of care.

Every army in World War One had some variant of a field medical system in which patients were evacuated from the field and moved through a system of care in a predetermined and organized way, usually under medical control. This system approach had its origins in the

nineteenth century work of Dominique Jean Larrey and Jonathan Letterman, was refined by the Prussians and used effectively by the Japanese before the war. But the experience of forward hospital care and evacuations illustrated by the contributors also give us a glimpse of the need for new personnel, trained in forward care and evacuation as well as enroute care. Where once the regimental surgeon could apply the first bandage, the experience of the millions wounded in the First World War convinced even the most conservative that some point of injury provider beyond military surgeons was needed for future wars. This role had no actual civilian equivalent. The corpsman, medic, hospitalman, etc. would need to be trained and commanded in future military medical units. Their effectiveness would need evaluation, the standards of care developed and kept current. Nineteenth century surgeons recognized the import of the role, but World War One convinced future personnel managers in the military establishments to create the ratings. Future events would continue to shape nonprofessional pre-hospital care, but World War One illustrated the import of the questions surrounding the scope of personnel in military medicine. Similarly, the challenges of supervision, provision and quality of enroute care were made manifest in the hospital trains of the Western Front. The new military aviation would raise the possibility of aeromedical evacuation and the French would pioneer aeromedical systems in North Africa in the years after the war, but different vehicles did little to provide answers to how to provide effective enroute care. The new military nursing component of military medical systems as well as non-professional providers were the only numerically viable solutions but an independence was required that was not an inherent component of either community. The challenges of World War One again revealed the issues, but in this case the problem was largely ignored until new wars raised the concerns to immediate problem status once again. The obvious question of why one community, the enlisted non-professional provider, would be formally developed by the military while the military nursing community would be restricted in its operational utilization cry out for study. The obvious answer of sex based roles is too simple -- the heritage of military nursing in forward hospitals, as prisoners of war, and in other risky settings, tell us that military nurses were seen at least as much as nurses as they were seen as women.

Military medicine not only sees glimpses of modern roles in World War One, but it finds glimpses of modern weapons as well. Captain Starling reminds us of the challenges and horrors of the new chemical weapons, but the Western Front only saw chemicals. There are reports of veterinary use of biologicals and some reports of biological weapon use by

the Germans against Slavic troops in the east; do we see a glimpse of ethnic disparity in the use or willingness to use the organic weapon on 'the other' but only the inorganic, no matter how horrible and new, on those seen as equal? Lord Jeffery Amherst authorized use of biologicals against Native Americans, the Japanese used them against the Chinese in the Second World War but not against western troops; is there an insight into the perception of weapon's use to be found in differences between the Eastern and Western Fronts in World War One?

Military aviation also illustrated new weapon utilization: the deliberate, strategic attack on the civilian community. Aviation attacks on troops were essentially operational in their orientation, but the dirigibles over London were a glimpse of things to come in the Spanish Civil War and World War Two. The history of medicine in war has not seriously considered the military medical response to the strategic attack on civil populations, but the experience of the Great War starts a modern political discussion. The military leadership wants no part of taking care of the civilian wounded when their defense of the civilians fails, and the political leadership largely concurs. There are studies of the development of civil defense -- the British official histories of World War Two are particularly rich -- but there is much less on the decision to absolve the military of any role in or on the means to transfer military expertise to the civilian community. Given the twenty first century thrust to transfer to an occupying military responsibility under the Geneva Convention to care for local civilians at the standard of the home nation, this early twentieth century political decision becomes more important.

Of course, despite the expectation and expertise of military medicine, restoration and cure was not always the result -- some wounded were saved but not completely restored to fitness for duty. There is a robust and growing disability history literature. The political decision to absolve the military of future responsibilities for the care of the wounded once the damaged soldier reached a point of limited further improvement, to make restoration and ongoing care a civilian medicine issue, was taken in the Great War. In Great Britain, the disabled veteran would become part of the evolving national health system, in the United States a separate veterans hospital system would be developed; but in both cases the original community of military medicine, despite presumptive expertise, was relieved of the charge, at the request of military not medical leaders. There is important historical work going forward on the shift from simply pensioning disabled veterans to an expanded political responsibility, meeting the expectation for public provision of ongoing care, but more

needs to be done on the origins of the shift in this first medically modern war.

These papers have opened a window onto the issues of medicine in the Great War, and we have a glimpse of the issues that surround modern medicine in modern war. But more than the issues we see the initial solutions and the start of the development of political and social answers to the questions those issues raised. It is to be hoped that this work will inspire further study. That through such work, we will come to better understand the differences and significance of the shift from a pre modern, single profession military medicine to a multi profession system of operational healthcare. That we will appreciate the power of the social belief in scientific research on medical problems in theater and the expectation that the scientifically inspired, forced empiricism of military medicine could improve care in the short run as well as the in the future. It may be that the expectation of care was itself changing. Every mature society since Middle Kingdom Egypt has provided for the care of those who defended it, but industrial war consumed trained soldiers at such a rate it needed more who returned to duty than any previous army. The Great War seems to suggest significant additions to the traditional military medicine -- to care for those in harm's way during the campaign. From these glimpses may come research that will allow us to understand the new societal expectation of modern military medicine: from the evaluation of civilians who enter the military for the duration, to preserving the health and treatment of the civilians who supported the war effort in various ways, to the soldier who becomes the disabled veteran in the civilian medical system after the war. Scientific medicine of the early twentieth century seemed to, for the first time, provide real wide spread social belief in the possibility of cure rather than just care. It may be that modern military medicine is the hope that the classic costs of man's inhumanity to his fellow man can be reduced, a hope I believe is glimpsed in these papers and in the stories of medicine of World War One. It is a hope never to be fully realized, but efforts to bring it about are worth studying and understanding, not so much, I submit, for the how as for the why.

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William Hanigan, MD, F.A.C.S. Dr Hanigan is a member of the medical faculty at the University of Mississippi, a board certified and practicing neurosurgeon, and Fellow of the American Association of Neurological Surgeons. He has a long standing interest in medical history and has published numerous papers on the history of neurosurgery and military medicine in the Great War.

Emily Mayhew, Ph.D. Dr. Mayhew is a Research Associate at Imperial College London and works in the field of military medical history, specialising in severe casualty in contemporary warfare. She is an examiner at the Imperial College Medical School and works with the Imperial College Outreach department on projects for school students. She is currently working on Great War Centenary projects with the Science Museum, the Imperial War Museum and the BBC. She received her undergraduate degree with the Open University and an MSc and PhD from Imperial College. Her first book, *The Reconstruction of Warriors*, was published in 2004 and its associated documentary, "The Guinea Pig Club," won the Royal Television Society Best Historical Documentary in the same year. Her second book, *Wounded: A New History of the Western Front* was published in 2013.

William Montgomery, M.A. Mr. Montgomery is presently employed at Clarkson College in Omaha, Nebraska where he teaches the History of Medicine. He holds a Master of Arts Degree in History from the University of Nebraska at Omaha. Previous experience includes work as a civilian volunteer with the Joint-Task-Force Katrina History Group, as well as community lectures on Civil War Medicine. His present interests are medical, military, and military medical history. He received the Distinguished Service Award from Clarkson College in 2010 and the Virginia Dare Shuflata Award from the University of Nebraska at Omaha History Department in 2006.

Jennifer K. Nieves, M.A. Ms. Nieves is the Museum Registrar and Archivist for the Dittrick Medical History Center at Case Western Reserve University in Cleveland, Ohio. After receiving her Master of Arts in History at Wright State University, Dayton, Ohio in1989 she joined the Dittrick Center as Registrar and Assistant Archivist. In 1998 she was appointed Archivist, while retaining her responsibilities as Museum

Registrar. Since joining the Dittrick staff, Ms Nieves has been an active member of the Medical Museums Association and has served as Secretary/Treasurer since 1998. She is also a member of the Archivists and Librarians in the History of the Health Sciences (Local Arrangements Committee Chair, 2009), the Cleveland Archival Roundtable, the Ohio Academy of Medical History (Membership Coordinator) and the Society of Ohio Archivists. Her interest in WWI medicine resulted from the "re-discovery" of a tremendous collection of photographs taken by members of the Lakeside Unit and donated to the Dittrick Center's archives.

Dianne O'Malia, M.A. Ms O'Malia earned her MA in History and an MLS from Case University. She has spent 30 years in health care industry and is currently the archivist at University Hospitals Case Medical Center in Cleveland Ohio.

Steven Oreck, M.A., M.D. Dr Oreck graduated from Massachusetts Institute of Technology (MIT) in 1970. Following active duty in the U.S. Navy he returned to graduate studies at MIT and then attended the Louisiana State University Medical School graduating in 1979. He retired as a Clinical Professor of Orthoapedic Surgery (hand & microsurgery) at University of Wisconsin Medical School in 2008. Following retirement he entered graduate school at the University of Wisconsin-Madison in the department of history where he is currently working on his Ph. D. Dr. Oreck served 37 years in the U.S. Navy, 5 years in intelligence and the remainder as a medical officer, primarily with the Marine Corps. He has deployed as a combat surgeon, and retired as senior medical officer for all Marine Reserve combat service support elements.
He has numerous articles and presentations on clinical and military medicine including the chapter on orthoapaedics in *Aeromedical Evacuation*. He has presented at national meetings on military medicine, and received a fellowship from Marine Corps Historical Foundation for his MA thesis. His current research focuses on the development of military medicine as a profession in the United States.

Dale C. Smith, Ph.D. Dr. Smith is Professor of Military Medicine & History in the Department of Military and Emergency Medicine, F. Edward Hébert School of Medicine, Uniformed Services University of the Health Sciences, Bethesda, Maryland. From 2006 until 2013 he served as the Senior Vice President of the USU. His professional interests include the history of medical education, the history of infectious diseases, the

history of surgery, and the problems of patient evacuation in military operations.

Pete Starling, MA, DHMSA, FRHistS. Pete Starling is a retired Officer of the Royal Army Medical Corps and for twenty years was both Curator and Director of the Army Medical Services Museum. He retired from that post in March 2014. Pete gained a MA at the University of Birmingham with a dissertation on surgical improvements during the First World War and he holds the Diploma in the History of Medicine his dissertation being on recruitment, gallantry and death of medical officers during the First World War. He is a Fellow of the Royal Historical Society.Pete's great interest is in the Crimean War and the First World War, particularly the medical aspects of both wars.He has written various papers on both wars and lectures profusely on the history of military medicine and the Crimean and First World War. He has lead tours to the battlefields of the First and Second World wars, both in Europe, Gallipoli and the Far East and to the Crimea.Pete has also taken part in various TV documentaries about the First World War and has acted as medical advisor to several TV dramas including Downton Abbey, Birdsong and the Great War – The People's Story.

Natalia Starostina, Ph.D. Dr. Starostina is an Assistant Professor of History at Young Harris College. She completed her Ph.D. at Emory University, Atlanta, Georgia in 2007. Her publications include articles in *Proceedings of the Western Society for French History, Review d'Histoire des Chemins de Fer, Southeast Review of Asian Studies*, *Business History Online*, *Dialectical Anthropology*, and other editions in the US and abroad. Currently, Dr. Starostina is working on a book manuscript titled *Engineering the Empire of Images: Advertising Train Travel in Interwar France*, that describes the cultural initiatives of French railway companies in the aftermath of the Great War. In March 2011, she organized an international conference titled *Remembrances: Constructing Narratives of Wars of the 19th and 20th centuries* at Young Harris College, Young Harris, Georgia.

L. G. Walker, Jr., M.D. Dr. Walker graduated from the School of Medicine of the University of Alabama in 1956, interned at University of Virginia, and completed his residency in general surgery at Emory University. He served as a Medical Officer in the U.S. Navy and later on the faculty of Emory University School of Medicine as Assistant Professor of Surgery and Assistant Chief of Surgery, Atlanta Veterans Administration Hospital. He retired in 1997 as Chairman of the Department of General

Surgery and Residency Program Director, Carolinas Medical Center, Charlotte, and as Clinical Professor of Surgery, Emeritus, University of North Carolina, Chapel Hill. He has a special interest in the history of medicine and surgery. His publications include both literary and scientific topics including the book *Dr. Henry R. Porter-The Surgeon Who Survived Little Bighorn*, 2008. He has also co-produced two public television documentaries: "Death at Man Gulch – the Story of Smokejumper Silas Raymond Thompson, Jr.," 2011 and "From Billy to Willi-A Bipolar Artist's Journey," 2012.

Bradford Waters M.D. Dr. Waters is an Associate Professor of Medicine at the University of Tennessee Health Science Center in Memphis, Tennessee. He received his Doctor of Medicine from Vanderbilt University. He is a Gastroenterologist and Hepatologist. He is a retired Captain of the U.S. Navy Medical Corps. He served as a Medical Officer in Afghanistan in 2006. He is a member of the Western Front Association (UK) and the World War One Historical Association (US). He has a long-standing research interest in the medical care on the Eastern Front of World War I. He has made four trips to Romania to perform research on World War I.