The Great War and Emergency Medicine

By Jon van der Hagen

The year is 2014 and the place is Helmand Province in southern Afghanistan. Unceremoniously flopped onto the exam table, the limp twenty-something soldier bore an entrance wound in the left upper abdominal quadrant and an exit wound in the posterior right flank. His initial blood pressure was 50/20, heart rate 130, respiratory rate 4. Working rapidly, he was intubated and two large bore IVs were established with normal saline until two units of O negative packed red blood cells coursed through his veins. Mere minutes passed before staff wheeled him to the waiting operating room where surgeons would repair pulsatile arterial wounds and a torn bowel. He would survive.

Such events were unheard of in 1914. Back then, military medicine had not changed much since the American Civil War. Shot through the abdomen at the Battle of Mons in August 1914, an (un)lucky soldier was carried to a casualty clearing station where he could expect a corner bed, semi-fowler position (head elevated 30-45 degrees), warm oral fluids, rectal saline, and perhaps morphine—before final transport by the Graves Registration Service. If he made it to the casualty clearing station, expected mortality was still 80-90 percent.

Prior to 1914, wound management and shock was poorly understood by battlefield doctors. A popular American theory written in 1901 suggested that a bullet passing through the abdomen was felt to cause the release of noxious stimuli to the brain. The brain was bombarded as a result of wound repair operations and fear. When the brain fatigued, it somehow weakened the control of the peripheral blood vessels, the vessels dilated shock, and death occurred. Surprisingly, the second part of the theory proposed that if a local anesthetic was given along with nitrous oxide, the fear was eliminated. The theory had a small amount of credibility since the patient sometimes survived, and the medications, given at suitable (though sometimes arbitrary doses) did not seem to lower blood pressure, the harbinger of shock and death.

World War One cost more than 20 million lives.
and reaped social and economic upheaval on an unprecedented, worldwide scale. But it also inspired military and medical innovation. It was the first war in which violent combat deaths exceeded loss by disease on or near the battlefield. Humbled and inspired, medical physiologists introduced new ideas—for example, could blood loss and hemorrhage be responsible for battlefield shock and death? Necessity became the mother of invention.

In order to change beliefs, major barriers had to be overcome. Medical authorities in 1914 referenced limited data from the American Civil War, as well as the Crimean and Boer wars. Before 1914, more soldiers were lost to disease than combat. Data was poorly compiled and combat wounds were the result of lower velocity weaponry. But in World War One, with the advent of the machine gun, high-velocity explosives, and improved artillery tactics, complex and horrific injuries were now encountered. Combat deaths skyrocketed. The science of triage, a system of prioritizing wound severity, was matched with available medical resources—hard decisions which required hard data.

British medical researchers discovered that a severely wounded soldier who arrived at a casualty clearing station less than twelve hours after the injury, had a significantly better chance of survival. This was confirmed by later data, and revealed a higher death rate due to sepsis and multi-organ failure in soldiers who arrived more than twelve hours after a wound. Contributing to this loss was the enormous risk of wound contamination. Near Ypres in western Belgium, the ground water level was within two feet of the surface. The blood-soaked battleground was quickly fertilized with horse manure and animal and human remains—a cesspool of bacteria. The British military, and later the American, reorganized the ambulance corps: now stretcher bearers would focus on rapid extraction from the front to waiting motor ambulances that delivered patients to clearing stations and specialized field hospitals in the rear.

IV therapy for cholera was introduced in 1832, with controversy; it was in the 1880s that the Germans discovered use for it managing hemorrhage. Advocates of “shock from hemorrhage” theory now treated their patients with IV normal saline. An extension of this theory played out in Canadian military medical hospitals where, in 1916, the first direct person-to-person blood transfusions occurred. Despite the lack of awareness of cross-matching and blood types (discovered less than a decade before and utilized in civilian hospitals), survival soared despite transfusion reactions. Just a year later, the US Military Medical Services made a breakthrough by adding sodium citrate to donated blood. Now units of blood could be stored on ice for several days, in advance of battle. Within two years, military medical staff had organized a system of rapid battlefield extraction and early stabilizing treatment. Critically wounded soldiers in 1916 might be rapidly moved to a nearby casualty clearing station, warmed, and given IV fluids.

Arriving in a contemporary operating room, a patient in 2016 can expect appropriate and adequate anesthesia. But in 1914 there was controversy: were preoperative preparations really necessary? anesthesia choice? should anesthesia be used at all? As late as 1854, British authorities argued its merits, contending that it was better to hear a man howl from a scalpel rather than succumb silently to drugs! Fortunately, more humane and cool-headed leaders prevailed. Chloroform had been used in the Mexican-American War in 1847. Ether had been used
in Massachusetts in 1846. Ethyl Chloride had come into
general use by 1895. Nitrous Oxide had been generally
accepted for sedation since 1866. All would be available
on the Western Front by 1916. The challenges primarily
were designing a safe means for delivering the agents and
monitoring the effects in a young patient who presumably
was still in shock or septic.

In the nineteenth century, extracts of Coca leaves were
used to develop local “caine” anesthetics, nova Caine
being the most familiar. But Cocaine was the first. Early
anesthetists discovered it could be injected into the spinal
fluid, resulting in regional nerve blocks. Widespread use
was prevented by severe headaches (concern over abuse
came in later years). Military medical research continued
since anesthesia was crude: optimal dosing would eventually
be a consequence of a newly designed anesthesia
mask, but only after much trial and error led to cata-
strophic results and inhumane care. Anesthesia effects
could be monitored by careful observation of the pa-
tient’s pulse and blood pressure (which, for the first time,
when charted, seemed to correlate well with success and
failure).

The stage was set for definitive wound care. High-ve-
locity projectiles that penetrated the torso often dragged
along cloth and dirt. This had to be removed by washing
and debriding the wound cavity. Irrevocably damaged
flesh becomes a nidus for later bacterial growth—the
dead and dying tissue an energy source for bacterial
growth. This also had to be removed. Opening the

A US Army nurse assists with treatment of a patient at a base hospital in 1918. By this time, Americans had introduced the use of bloodanks to help stabilize injured soldiers. (U.S. Army)
lung would fail to expand and the patient would die due to asphyxiation or blood loss hemorrhage.

High-velocity projectiles tumble and yaw. When a bullet or shrapnel missile encounters dense or hard tissue it creates secondary fragments shattering bone and tissue, scattering metal and bone along additional random wound tracts. If safely possible, these too, should be removed. Unbeknownst to surgeons at the time, but accounted for in observations, was the principle of cavitation. Pressure waves produced by kinetic energy disseminate outward from a high-velocity missile as it enters soft tissue. A wide area of tissue is crushed distant from the tract. This causes additional injury, sometimes destroying vital organs without contact with the missile. Similarly, blast waves from artillery ordinance can severely maim, cause morbid or lethal hemorrhage to internal organs without a visible wound. These same violent blast waves can also fling bodies against immobile objects creating injury without direct missile contact. Trauma surgeons learned to anticipate additional sources of injury independent of an evident external wound, based upon known ordinance characteristics.

Rapid evacuation became paramount. Soldiers living in trenches existed in the most horrifically unsanitary circumstances. Wound contamination was virtually guaranteed and needed to be dealt with aggressively at aid stations and in the operating room. Dismal survival rates, nearly pre-ordained by unsound practices of wound observation, blankets, passive wound drainage, bandaging and rectal hydration rapidly gave way to more aggressive and scientifically sound (though naïve) treatments. Anesthesia using Ether, Nitrous Oxide, or Spinal Anesthesia with Cocaine allowed sedation enough for surgeons to perform a long midline abdominal incision, explore and repair the traumatized soldier and close the wound. Post operatively, he could expect tetanus vaccination and morphine for pain control. Blood transfusion (complements of the American Medical Corps at the time) delivered until the pulse was less than 100 (the first discovered vital sign) drove recovery. Surgical success inspired the research mandated by the birth of automatic high-velocity weapons and modern explosive ordinance. Within decades of the Great War, observed wound characteristics associated with missiles that yawed and fragmented, and produced enormous cavitation forces, led to new standards in contemporary wound care and application to the civilian world.

2014 marked the centenary of the Great War in European countries; it will come in 2017 for America. Ambivalent as we may feel about the war itself, many of the great medical advances between 1914 and 1916 are directly responsible for the prevailing emergency wound care strategies we now use in the twenty-first century. We have revolutionized the motor ambulance of 1916 with the helicopter. We have seen the delivery of the operating room and aid station right to the battlefield. Airborne and ground based medics can deliver lifesaving medications, IVs, blood, drugs for pain control, antisepsis and bleeding control to the front line. Debridement and wound closure can be started on site. In the field are medical instruments—designed to help stabilize the wounded soldier—that were unheard of in 1916. These developments can be traced directly to the determination and perseverance of the military medical pioneers of the Great War.

Jon van der Hagen is a family practice and emergency medicine MD in the Brainerd/Baxter area. He is passionate about history, especially military history, and volunteers in a variety of capacities at the museum. He is also on the Board of Directors for the Military Historical Society of Minnesota and chairs the Program Committee.
Following “best practices” and improving operational efficiency for museum management is the goal of the American Association for State & Local History’s (AASLH) Standards and Excellence Program for History Organizations (StEPS). We recently enrolled in this program in an effort to help the Minnesota Military Museum evaluate how we conduct business.

The StEPS program is a self-assessment workbook-based program divided into six assessment areas that ask participants to evaluate and rate their performance. The program provides aids and assistance to improve in each area and allows participants to work through each area at their own pace. Award certificates of recognition for three levels of competence—Basic, Good, and Better—are awarded after each level of competence is achieved. However, the goal is not to garner certificates, but to see how well our museum compares to recognized professional standards and to improve our performance.

StEPS is often the first step to participation in the “Museum Assessment Program” (MAP), which is coordinated by the American Alliance of Museums and serves as the nation’s premier accreditation process for museums of all types. We believe that looking at how we do business and improving museum operations will be good for the organization and eventually lead to full accreditation for the museum. Such accreditation would open additional doors of opportunity, improve our standing in the museum world, and increase our grant potential.

If you have an interest and would like to read more about this program go to: http://tools.aaslh.org/steps/

Today I attended the funeral of Sergeant Major Ed Komac. He is the third Vietnam veteran who was featured in our new Vietnam exhibit (Voices from Vietnam) to pass away. Ed was a really great guy; he will be fondly remembered and greatly missed by everyone who had the honor to know him. Ed had a wonderful gift for telling stories. For a year before the Vietnam exhibit opened I badgered Ed to let me interview him about his military service. He said that he didn’t want to be interviewed, but he would send me some stories about his service. A few days later, Ed sent me five batches of stories, some of which I was able to use in the exhibit. All of his stories will be saved in the museum archive, so Ed’s service won’t be forgotten in Minnesota’s military history. Have you recorded your stories of service? What will be remembered of your service when you are gone? I hope that more veterans will find the time to record the stories of their service.

Too often we receive offers to donate uniforms that have been stripped of their insignia and decorations. The insignia and decorations tell the story of the veteran’s service and can be read like a book. When the insignia and decorations are removed we are often left with just pieces of old clothing. (Not all uniforms have insignia and decorations, such as work and certain combat uniforms etc.) Sometimes, depending on the documentation and history that may come with the uniform, we may be able to carefully restore the uniform, but it can be costly and very time consuming. Generally we won’t accept stripped uniforms.

With the mild weather, work continues on our cannon restoration projects. I’ll be picking up the restored wooden spoked wheels for the WWI 105 Howitzer in Michigan in June. We are still short about $2000.00 in our fund raising effort on this project. Assistance from Minnesota’s thousands of artillery veterans (and anyone else interested in supporting the project) would be greatly appreciated.

We also need to raise about $1800.00 to purchase a large gun safe for some of our weapons in storage. Your financial support would be greatly appreciated.
This winter I’ve been pretty busy finishing up the processing of paper records from the Adjutant General’s Office and writing grants to better preserve and make accessible the archival materials at the museum. Both Jeff and I have been working on starting a summer archives internship program for students taking course work towards an MLIS degree (Master of Library and Information Services) with a concentration in archives. The paper records for the Adjutant General’s Office have been completely rehoused, totaling about 200 cubic feet of materials. This amount includes the Minnesota National Guard payroll records and muster rolls that I processed and cataloged previously. I have created a detailed contents list of the main collection of the Adjutant General’s Office records, but before I can publish the finding aid for public viewing I need to make a few required additions and do a final check of the finding aid.

Once that collection is done I plan to start processing other components of the Adjutant General’s collection, such as the few thousand 35mm slides, photographs, motion picture films, maps, blue prints, and a few thousand photographic negatives. Because these materials require very specific care and materials to meet the best archival practices, the cost can easily exceed my current budget. This is why I have started to apply for various national and state grants to do my part to preserve the military heritage of Minnesota. In January I applied for two Minnesota Legacy grants to fund the rehousing of the maps in the archives and to digitize a series of four black and white, 16mm films of Camp Ripley in the mid-1930s. I did not receive the grant to rehouse the maps, due in part to rushing through the grant application; however, I did receive some excellent feedback from my grant reviewer. I was awarded the Legacy grant to fund the digitization of the films of Camp Ripley and have already sent the films to a professional film conservation vendor. In February I submitted a grant request to the National Film Preservation Foundation to digitize and preserve two other films of Camp Ripley in the 1930s. I will shortly be re-submitting my map rehousing Legacy grant adding all the things that my reviewer suggested.

Volunteer Voices

Volunteers have become indispensable to the museum’s work. Beginning with this issue, we’ll feature one of our many wonderful volunteers. In their own words, here’s how they are making good things happen at the Minnesota Military Museum.

Meet Becky Putzke

Becky has been volunteering at the museum for one and a half years and especially enjoys the team effort.

On getting involved: “I had a chance meeting with Jeff and he asked if I’d be interested. I tried a few times to dodge because I’m not a veteran and have no particular interest in history, but he persisted. I thought, heck, I’ll give them one week and then disappear.”

Museum projects: Becky describes it as “just odds and ends,” but Jeff says, “Becky is far too modest. She has provided insight on grant funding opportunities; helped process a couple of large book collections; assisted curatorial staff with everything from scraping double-faced tape off the walls, to painting exhibit display areas, setting up shelving, and providing computer support for the interpretative side of the exhibits. Her common sense approach to getting things done is always appreciated.”

What she likes most: “The museum does remarkable work with limited resources, so the focus is really on how well the team works together. It’s not about any one individual.”

Her advice: “Service to the community becomes even more important with age. Find a niche and pursue it.”

Becky Putzke at work at the museum office.
DONOR HONOR ROLL, January-March, 2016

Memorials
Given by:
194th Tank Regiment Assn.
194th Tank Regiment Assn.
Richard and Betty Hayes
Doug Bekke
Doug Bekke
Mary Saboe
Lyle Doerr
Lyle Doerr
Jack Johnson
Raymond Lunde
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Laurel Perryman
Allan Meixner
Jim Weber
Raymond Lunde
Richard and Betty Hayes

In Memory of:
Arthur J. Manning
Henry C. Mills
Henry C. Mills
SGM Edward Komac
COL James Saboe
COL James Saboe
Gary Flakne
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SPOTLIGHTED
RECENT DONATIONS

1. The family of Col. Carl Erickson of Brainerd donated, through Lt. Col. Larry Osvold and the 194th Tank Battalion Veteran’s Association, all of Col. Erickson’s uniforms and field equipment. In WWII, Col. Erickson served on the staff of General Douglas MacArthur, and during the occupation of Japan was instrumental in writing the plan for Japan’s post-war government. When he returned to Brainerd he became the first commander of the newly reconstituted 194th Tank Battalion.

2. General Lyle Doerr donated his General Officer blue and green dress uniforms. He also donated a number of unique items related to his time with the 47th Infantry Division. This past winter, General Doerr also donated an outstanding collection of cataloged and identified photographs from the 109th Observation Squadron, Minnesota National Guard, from the 1930s. They had been acquired at a garage sale.

3. Mrs. Marge O’Brien donated the uniforms and flags of her husband, former 47th Division commander, Major General James O’Brien of Stillwater.

Donations
Anakkala Berns, PLLP • Buffalo Lions Club • Carlos Lions Club • GNP Company • Grey Eagle Burtrum Lions Club • Hackensack Lions Club • Hanneken Insurance Agency • Lin Furniture • Paul Melchert • Melrose Lions Club • Mid-Minnesota Federal Credit Union • Mills Fleet Farm • Anthony Nathe • David Newhall • New York Mills Lions Club • Nisswa Lions Club • Osseo Lions Club • Pierz Lions Club • Randall Cushing Lions Club • C. Perry Schenk • Swanville Lions Club • The Office Shop • Fraternal Order of Eagles #2368, Thief River Falls • Thrivent Choice • Underwood Lions Club • Jon Van der Hagen • Verndale Lions Club • Shawn Willy

Artifact donations
Jon Bell • Stan Christenson • Horst Christian • Steven A. Curtis • Lyle Doerr • Greg Farmen • Gordon and Betty Gerling • Mary Heck • Jack Johnson • Gordon Krantz • Marge O’Brien • Mike Rollins • James and Mary Saboe
Does your employer match your contribution to the MMM?

Does your employer match your contribution to the Minnesota Military Museum? Many do. Some employers go a step farther, offering special grants to the nonprofit of choice for current or retired employees.

For example, the IBM Corporation recently gave the museum a $2,000 grant, thanks to IBM retiree and Military Historical Society of Minnesota board member Dean Ascheman. Their grant program recognizes IBM employees and retirees who support non-profit organizations with significant volunteer hours. “We are pleased to support the Minnesota Military Museum and extend our best wishes for continued success of your programs,” stated Heidi Kraemer, IBM Corporate Citizenship Manager. The money will go toward website upgrades needed for the museum’s new Veterans Registry, for a flyer to promote the Registry, and for a stipend to an intern who will work on the Registry and other projects in the archives.

What about you? Find out if your employer has a matching gift program or some other initiative that directly boosts your charitable efforts. It’s a great way to multiply your giving.

You can be part of museum’s new Minnesota Veterans Registry

The museum’s new Minnesota Veterans Registry is a statewide database containing information about the military service of individual Minnesota veterans. A qualified veteran is anyone who once served or is serving in the US military and was either born in Minnesota or has lived in Minnesota.

The website Registry is simple to use and anyone can submit a Minnesota veteran’s story and photo. The general public can easily search the database. The service is free of charge as part of the museum’s mission to preserve records of Minnesota veterans’ service as well as the related artifacts.

Everyone is strongly encouraged to gather and share veterans’ stories by using the Registry. Our goal is to build the largest, most inclusive online database of Minnesota veterans available to the public. If you are a Minnesotan who served in the military, why not put yourself in the Registry, as well as eligible family members? Go to mnmilitarymuseum.org and click on Veterans Registry.