LESSONS FROM HISTORY

The Foundations of Wilderness Medicine: Some Historical Features

George W. Rodway, PhD, APRN

From the University of Utah, College of Nursing and School of Medicine, Salt Lake City, UT.

The surgeons of the navies of the early days of western civilization – Greece, Rome, and the Italian city-states – were most likely the first practitioners of recognizable wilderness medicine. The teachings of Hippocrates and Galen ruled over the practice of medicine in Europe for centuries, but the steady evolution of understanding of the nature and causes of disease was starting to provide a useful foundation upon which to build by the turn of the 19th century. By 1800, nonetheless, the gap between medical theory and knowledge and the real ability to provide effective therapy was still enormous. However, the discovery of anesthesia in the 1840s and Joseph Lister's elucidation and application of the principles of asepsis in 1865 were major steps forward in the history of medicine. Many other improvements in civilian medical care relevant to wilderness medicine, though, have come about as a direct result of military medicine having to determine how to best keep people alive and well, often in very trying combat-related circumstances. The advancement of wilderness medicine has been closely connected to military exploration/operations throughout history, and not surprisingly, this remains in many ways as true today as it was a thousand years ago.

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Introduction

Readers of this article will have a fairly clear and common idea what they consider to be wilderness medicine as it has been known at least since the emergence of the Wilderness Medical Society in the 1980s. Many of us have come to consider wilderness medicine as healthcare that is practiced in the backcountry away from established medical facilities, front country care practiced under conditions of environmental (and other) duress such as the catastrophe—so recently front and center in our consciousness—produced by massive earthquake damage in Haiti, or healthcare provided anywhere (front country or backcountry) in which the physiologic insult has been primarily inflicted by environmental conditions.

However, let us consider what might have qualified as “wilderness medicine” in past centuries: namely, the healthcare that was performed beyond the boundaries of the existing civilized medical infrastructure. Certainly what passed as “civilized medical infrastructure” in ancient Greece or the Roman Empire might appear some-

what rough-hewn, to say the least, through the medical eyes of today. But of course history is most accurately and fairly judged in the context of its contemporary setting—to avoid the classic (and often revisionist) “apples and oranges” comparison of then vs now. As such, I would identify the surgeons of the navies of the early days of western civilization—Greece, Rome, and the Italian city-states—as the first practitioners of recognizable wilderness medicine. In fact, the advancement of wilderness medicine has been closely connected to military explorations and operations throughout history, and, not surprisingly, this remains in many ways as true today as it was a thousand years ago.

Nautical Beginnings

Medicine Under Sail, Zachary Friedenbergs history on the subject,¹ is an often-overlooked aspect of the early history of medicine beyond the support of existing “civilized” medical infrastructure. Homer even used the *Iliad*, book 4,² to make reference to a medical naval incident in the Trojan wars. When Menelaus was wounded by a Trojan bowman, the fleet surgeon,

Corresponding author: George W. Rodway, PhD, University of Utah, College of Nursing and School of Medicine, 10 South 2000 East, Salt Lake City, UT 84112 (e-mail: george.rodway@nurs.utah.edu).

Machaon (son of Aesculapius, god of medicine) was called to treat the wound:

Without delay he drew
the arrow from the fairly fitted belt.
The barbs were bent in drawing.
Then he loosed the plate—the armorer’s work—and
carefully
O’er looked the wound where fell the bitter shaft.
Cleansed it from blood, and sprinkled over it
with skill the soothing balsam of yore which
the friendly Chiron to his father gave.

By the 11th century, barber-surgeons had taken on the tasks of naval surgery in the Mediterranean navies and came to be known as barbariers in Italy. The practice soon spread to English ships because of frequent contact through trade. Thomas Woodall (1569–1643) perhaps deserves the title of “Father of Marine Medicine,”¹ for he was ahead of his time with his observations of scurvy and views on the treatment of wounds, fractures, and amputations. Incidentally, Woodall’s prescient understanding of scurvy was not taken seriously until the late 18th century. Even after James Lind’s 1753 publication of *A Treatise on the Scurvy*,³ many still remained unconvinced for decades.

Woodall had studied the classical works of Galen and other physicians of that era, but unlike many of his day, he trusted the strength of his convictions. Woodall’s long period of practical experience, astute observation, and cautious judgment had taught him that the theories of oracles such as Galen often offered little in the way of useful medical knowledge. As an example, Woodall came to divide all wounds into 3 categories as stated in his 1655 book *The Surgeon’s Mate*⁴: 1) puncture wounds and lacerations; 2) gunshot wounds; and 3) bone fractures. His treatment recommendations certainly have a modern ring about them: “. . . remove unnatural things forced into the wound . . . which should be done with the least pain to the patient and avoiding arteries, nerves, and veins.” The “unnatural things” to which he referred might include wood splinters from spars and masts, fragments from cannon fire, etc. In the case of removal being too difficult or painful—anesthesia being nothing but a pipe dream in this era—Woodall recommended “tarry if you may, while nature helps.” His suggestions of ligating specific vessels contributing to excessive bleeding and placing dressings soaked in wine over wounds (the alcohol acting as an antiseptic) was a significant departure from the usual treatment of the day—cauterization with hot oil and the searing iron!

When limb wounds were severe, Woodall was not in a rush to amputate, which was, needless to say, prevailing custom in that era and for several hundred years after-

ward. Woodall reasoned that specific criteria should be assessed when considering amputation: one half or more of the limb being dismembered, the presence of a chronic suppurating wound, the patient’s life was at immediate risk, or the remaining portion of the limb was not serviceable. His concepts were generally far more conservative (and reasonable) than those of military surgeons as much as 200 years later in, for instance, the American Civil War (when immediate amputation of any limb with a gunshot wound was the customary practice). In fact, Woodall’s conservative principles might not seem unreasonable to a modern trauma surgeon or a physician providing care for a trauma patient in a harsh or remote environment.

Perhaps not surprisingly, it was a senior nonmedical officer in the British Navy, Admiral Horatio Nelson (of Trafalgar fame), who brought about a revolution in “medicine under sail”—particularly in disease control—near the turn of the 19th century. Nelson’s medical history was well documented and provides a window into some typical maladies and injuries of the day for the ocean-going warrior or explorer. His initiation to disease and injury under sail started early, as a midshipman of 17, in 1775. At this young age, sickness contracted in the East Indies induced partial paralysis. A couple of years later he contracted malaria in the West Indies, a disease that recurred periodically throughout his life.

In 1780, during his first command, Nelson headed an expeditionary force up the San Juan River in Nicaragua during the rainy season. The ground covered by this force was a low-lying, swampy coastline where yellow fever was endemic. Within a few days most of the men were desperately ill (including Nelson), probably with yellow fever, but Nelson was among the 380 survivors of this hapless 1800-man force. Then, after a spell under medical care for depression in the late 1780s, Nelson was on active service in Corsica in 1792 where he sustained a laceration of his back and lost sight in his left eye during battles near this island. In 1797, he again needed medical services after he suffered an abdominal wound during a military encounter at Cape St. Vincent. Not long after, during the battle at Tenerife in the Canary Islands, Nelson’s right elbow disintegrated when it was hit with grapeshot. Two surgeons performed an amputation just below the shoulder. His luck ran out at Trafalgar, in 1805, when a French sharpshooter’s bullet delivered a fatal injury.

Largely as a result of Admiral Nelson’s full and intimate understanding of the challenges of providing effective shipboard medical care, in 1805 (the year of Nelson’s death), medical reforms in the Royal Navy became a reality. Much of the emphasis was directed at proper diet and disease prevention—an emphasis, it seems, that

has been in perpetual need of refreshing in the medical world throughout the subsequent years. The success of this Royal Navy strategy is obvious when looking at the historical record—the proportion of men sent sick to hospital from ships between the last decade of the 18th century and the first decade of the 19th century fell from a high of 38.4% (in 1793) to a low of 6.4% (in 1806).⁵

The treatment and prevention of the wounds and other maladies associated with warfare and military expeditions is a theme that binds together much of the history of wilderness medicine. This was quite obvious in the early years of the 19th century when medical practice was undergoing remarkable changes. The teachings of Hippocrates and Galen had ruled the practice of medicine in Europe for centuries. The steady evolution of understanding of the nature and causes of disease was starting to provide a useful foundation on which to build. However, in the first few years of the 19th century, the gap between medical theory and knowledge and the real ability to provide effective therapy was still enormous. Few medications could reliably be used as therapies with which to target specific diseases—mercury for syphilis and cinchona for malaria being two of only a handful that were truly effective—and thus physicians “were like hunters going into the field and shooting blanks.”⁶ President Thomas Jefferson, one known for having a poor opinion of physicians, wrote in 1807:

I have lived myself to see the disciples of [well-known physicians] succeed one another like the shifting figures of a magic lantern, and their fancies, like the dresses of the annual doll babies from Paris, becoming, from their novelty, the vogue of the day, and yielding to the next novelty with ephemeral favor. The patient, treated on the fashionable theory, sometimes gets well in spite of the medicine.⁷

Wrestling With Infection

As the limits of surgery started to change in the mid-1800s with the discovery of anesthesia (in the 1840s), surgeons were able to start to move beyond bleeding, setting broken bones, removing bladder stones, and treating the wounds of war. However, the problem of infection from wounds suffered in times of peace or times of war was still a major problem. At least, that is, until Joseph Lister, professor of surgery in Glasgow, Scotland, applied theory to practice in one particular instance. He treated the compound fracture of a boy's leg in a novel fashion after the child had been run over by a cart in August 1865 on the manure-laden streets of that city. Such an injury was seen as an almost certain death sentence during this era. However, Lister was familiar with the work of Pasteur, and by applying Pasteur's

principles—treating the wound with carbolic dressings—the wound healed well and the boy recovered fully. Before this episode, it had been the remarkable difference in outcome subsequent to a patient's affliction with simple vs compound fractures that led Lister to wonder why certain wounds healed without difficulty and others meant almost certain death. Lister's findings in 1865 opened a new era, but the medical profession did not by and large accept the principles of asepsis with open arms. Many years passed before there was universal acceptance of these ideas. In the meantime, most wounds of this era continued to be treated in the fashion that had long been accepted. This meant dressing an open wound with a topical ointment or a poultice designed primarily to provide a degree of comfort, and then bandaging the wound. Topical agents such as benzoin (then commonly called balsam of Peru) has antiseptic properties, but were not knowingly used as such.

Shortly after Lister's discovery and the close of the American Civil War (in 1865)—whose medical personnel, incidentally, just missed by a slim margin the opportunity to be able to take advantage of the newfound principles of asepsis—the US Army was engaged in a large-scale fight with many Native American tribes in the western states and territories as pressure for land rights intensified in the quickly expanding nation. This meant that military medical personnel and not an insignificant number of civilian practitioners in this region had to quickly acquaint themselves with methods for extracting arrows and other primitive penetrating missiles that had been described with decreasing frequency since the days when Hippocrates had been a military surgeon during numerous campaigns. Instruments devised as early as 500 BC (such as the *belulcum*) for removing arrows were once again invaluable during the 1870s—basically tools that could dilate the point of entrance, widen the channel containing the arrow, and then allow passage down the channel to grab the head of the arrow to remove it. North American Indian arrows were typically fired with great speed and force, and if not stopped by bone, could easily pass through a horse or bison. Not surprisingly, mortality from arrow wounds was high, with one 1871 US Army report suggesting an approximate fatality rate of 30%.

Although infection from nonsterile surgical procures and penetrating missiles was a major challenge to deal with during this era, early explorers had to also contend with infectious diseases that could easily be passed from person to person—and had the potential to bring any voyage to a grinding halt. The pioneering journey of Lewis and Clark's Corps of Discovery across the North American continent in the first decade of the 19th century provides a classic example of the dual nature of this problem. While the Corps traveled across much uninhab-

ited territory throughout the course of their explorations, they encountered native tribes not infrequently. These tribes had been isolated from European-based diseases for thousands of years and were not immunologically capable of effective self-defense. As had often been the case since the Spanish Conquistadores made their way into the Americas in the 1500s, Lewis and Clark found many native settlements that had had contact with Caucasians of European background (especially along the Missouri River) were decimated by devastating epidemics of smallpox. Smallpox had on occasion during this era come close to wiping out entire tribes of North American natives, but for Lewis and Clark's expedition it was just a menacing threat because the immune systems of their men were more able to combat the disease. The concept of vaccination was also starting to gather proponents at this time, and President Thomas Jefferson (who commissioned the Corps of Discovery) actually sent a sample of cowpox out with Lewis in the hope that he could attempt to vaccinate the natives during the course of their travels.⁷

On the other hand, there *were* infectious diseases of regular worry to Lewis and Clark. Perhaps no disease was so omnipresent a concern, though, as venereal disease. It is also not very startling to learn that the native women were often carriers of venereal diseases—but whether it was the white man who also initiated *this* epidemic among the tribes remains a matter of conjecture. What is reliably known, however, is that syphilis had been a common affliction for those of European heritage since 1495. Mercury, already used as therapy for many infections and diseases, became the treatment of choice for syphilis as well, not long after it was recognized as a unique disease entity. Mercury was typically taken orally or used as a topical ointment in very liberal doses, and the patient often succumbed to being poisoned by the mercury before the syphilis did its definitive secondary or tertiary damage.

Of course, infectious disease is generally much easier to prevent and treat in the present day. Modern global sojourners and backcountry explorers must nonetheless still exercise caution when traveling in many parts of the world if they are to avoid calamitous, trip-ending afflictions.

Fast Forward to the Modern “Wilderness” Battlefield

Many references have been made here to military-related operations and expeditions with regard to historical aspects of wilderness medicine. In fact, over time, many improvements in civilian medical care have come about as a direct result of military medicine having to deter-

mine how to best keep people alive and well, often in very trying combat-related circumstances. It is, at closer examination, perhaps the very dearth of resources, significant environmental stressors, and limited access to definitive healthcare that binds combat casualty care and wilderness medicine together by a common thread. Evidence of this wilderness-combat medicine commonality of providing the best possible care with limited resources in a hostile environment has been found on a daily basis in recent and ongoing operations in Iraq and Afghanistan. In an essay titled “Perspectives From the Front,” Hurtado writes about the care of a critically wounded soldier brought to an Army Echelon II primary casualty collection point in Ar Ramadi, Iraq, during a severe (and all too common) sandstorm that limited aeromedical evacuation:

On one particular such day (with visibility limited to less than 100 meters), a young soldier was brought to our facility after sustaining multiple fragmentation injuries from an Improvised Explosive Device (IED). He had a sucking chest wound with a hemopneumothorax, multiple penetrating abdominal wounds, an open left humerus fracture, a closed head injury and multiple soft tissue penetrating fragmentation injuries to the remainder of his body. His resuscitative course included crystalloid volume replacement to maintain a normal mental status . . . the placement of a chest tube yielding 1800 cc of blood, wound care, fracture stabilization, analgesia, and antibiotic prophylaxis. Due to the severe weather, immediate evacuation to a surgical facility was not feasible. Over the next eight hours while waiting for the weather to clear, we titrated his volume replacement to maintain his mental status and adequate urine output without over-resuscitation.⁸

Thus, combat casualty care has provided, and continues to provide, many unique and important lessons for military medicine as well as civilian providers who are faced with caring for patients in a setting removed from easy access to definitive care.

In the modern civilian world, many of the abovementioned techniques and skills honed on the battlefield cannot find a more fertile field for application than disaster medicine. However, events like the recent January 2010 Haitian earthquake—whose epicenter was just a few miles from Port-au-Prince—that cause such massive destruction (in an already poverty-stricken country) may in many respects increase the size and scale of combat casualty care types of challenges. The physical, emotional, and intellectual strain on rescuers and frontline healthcare personnel who volunteer to meet this sort of overwhelming humanitarian crisis might likely make even the most battle-hardened military medic cringe. A member of a team of physicians and nurses from Stan-

ford University Medical Center on the scene soon after the Haitian earthquake, Auerbach relates:

In a country routinely referred to as the poorest in the western hemisphere, the devastation was dramatic and widespread. . . . This is wilderness medicine at its most stark, leaving many who were first to arrive to describe the situation as “practicing Civil War medicine” in the 21st century.⁹

Conclusions

As absurd as the contrast may seem between the foundations of wilderness medicine as practiced in an era as remote in time as that of ancient Greece or the Roman Empire with what we recognize as wilderness medicine in the present day, undeniable parallels clearly exist on close examination and reflection. Being able to apply contemporary scientific knowledge to medical problems in austere environments in thoughtful and creative ways has always been the challenge of wilderness medicine. The ability to successfully “think outside the box” relative to the existing medical infrastructure of the day has historically been (and remains) the hallmark of the evolution of wilderness medicine throughout the history of

recorded civilization—in times of peace as well as in times of war.

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