

TerranearPMC Safety Share

Week of April 4, 2016– Infections

In terms of loss of life, the American Civil War remains the most costly conflict in United States History. Over 620,000 Americans were killed in battle; yet it was not the wounds that the soldiers suffered on the battlefield that caused most of the deaths; rather it was disease and infection that was responsible for over two-thirds of loss-of-life.

According to the Union army surgeon general, “the Civil War was fought, at the end of the medical Middle Ages.” Little was known about what caused disease, how to stop it from spreading, or how to cure it. Surgical techniques ranged from the barbaric to the barely competent.

Contrary to popular myth, most amputees did not experience the surgery without anesthetic. Ample doses of chloroform were administered beforehand; the screams heard were usually from soldiers just informed that they would lose a limb or who were witness to the plight of other soldiers under the knife.

However, once surgery was complete, there was the high risk of infection. While most surgeons were aware of a relationship between cleanliness and low infection rates, they did not know how to sterilize their equipment. Due to a frequent shortage of water, surgeons often went days without washing their hands or instruments, thereby passing germs from one patient to another as he treated them. The resulting vicious infections, commonly known as “surgical fevers,” are believed to have been caused largely by the bacteria, *Staphylococcus aureus* and *Streptococcus pyogenes*. These bacterial cells are known to generate pus, destroy tissue, and release deadly toxins into the bloodstream. Gangrene, the rotting away of flesh caused by the obstruction of blood flow, was also common after surgery. Despite these fearful odds, nearly 75 percent of the amputees survived.

Infection is the invasion of an organism's body tissues by disease-causing agents (i.e. bacteria, viruses, parasites, etc.) and their subsequent multiplication, and the reaction of host tissues to these organisms and the toxins they produce. Contrary to popular belief, infections may or may not cause symptoms. They may remain localized or spread through the blood or lymphatic vessels. Meanwhile, there are microorganisms that live naturally in the body and therefore, are not considered infections. For example, bacteria that normally live within the mouth and intestine are not infections.

In response to infection, your immune system springs into action. White blood cells, antibodies, and other mechanisms go to work to rid your body of the foreign invader. Indeed, many of the symptoms that make a person suffer during an infection—fever, malaise, headache, rash—result from the activities of the immune system trying to eliminate the infection from the body.

Man has known about infections for centuries. The ancient Egyptians were the first civilization to have trained clinicians to treat physical ailments, providing detailed information of management of disease, including wound management with the application of various potions and grease to assist healing. Hippocrates (Greek physician and surgeon, 460-377 BCE), known as the father of medicine, used vinegar to irrigate open wounds and wrapped dressings around wounds to prevent further injury. His teachings remained unchallenged for centuries. It was a few hundred years later



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that Galen (Greek surgeon to Roman gladiators, 130-200 CE) was the first to recognize that pus from wounds inflicted by the gladiators heralded healing. Unfortunately, Galen's observation was misinterpreted, as well into the 18th century, the link between pus formation and healing was emphasized so strongly that foreign material was introduced into wounds to promote pus formation-suppuratation.

World War I resulted in new types of wounds from high-velocity bullet and shrapnel injuries coupled with contamination by the mud from the trenches. Antoine Depage (Belgian military surgeon, 1862-1925) delayed wound closure and relied on microbiological assessment prior to wound closure. Also, during WWI, Alexander Fleming (microbiologist, London, 1881-1955) performed many of his bacteriologic studies and is credited with the discovery of the first antibiotic, penicillin.

Of course from an occupational setting, battle wounds are generally not encountered (not withstanding UXO work). Nevertheless, sustaining an open cut in the workplace can have a wide range of severity, from mere finger pricks to severe body lacerations. According to reports from the Bureau of Labor Statistics, cuts, lacerations and punctures are the third leading cause of lost time/days away from work in the United States. The bureau identifies the following as typical hazards and possible causes of cuts and lacerations in the workplace:

- Improper training
- Lack of established safety procedures
- Employees rushing or taking shortcuts
- Failure to wear proper hand protection
- Missing or improperly adjusted guarding equipment

Good work practices to help prevent cuts include the following:

- Wear proper personal protective equipment, including eye protection, gloves and long sleeves.
- Use the proper tool for the job at hand.
- Keep the work area clear.
- Use a sharp blade; a dull blade means a worker has to exert more force when cutting, increasing the risk of an injury.
- Replace dull blades when necessary.
- Never leave an exposed blade unattended; use self-retracting cutting blades.

Keeping wounds clean and taking the responsibility to report workplace cuts immediately – no matter how slight - is the responsibility of every employee. Without proper treatment, small, minor cuts can develop into big problems. Placing a dirty glove back on a cut hand without proper treatment can result in an infection. And once that happens, your body's defenses will kick in, increasing the risk of severe infection, with the body unable to differentiate as to whether one sustained a minor cut from a hand tool or shrapnel from the battlefield.

My friends tell me I have an intimacy problem. But they don't really know me. - Garry Shandling (1949-2016)

