Wound Irrigation, “Golden 8 Hours,” Topical Antibiotics and Socks

The new WMS Wound Guidelines\(^1\) provide a broad and solid background for wound management in the austere environment; not only in the wilderness, but also for disaster and tactical settings. However, there are a few topics where additional information would refine and extend the Guidelines.

**Wound Irrigation**

Wound irrigation has a long history, dating back at least as far as World War II.\(^2\)

Back in the 1960s and 70s, Dr. Richard Edlich, a plastic surgeon at the University of Virginia (and one who was deeply involved in EMS and the nascent specialty of emergency medicine), did most of the seminal studies on wound irrigation.

However, over the decades, his recommendation that heavily-contaminated wounds should receive high-pressure irrigation somehow mutated into the idea that all wounds, regardless of the level of contamination, should receive high-pressure irrigation.

Writing in an 1994 editorial in *Annals of Emergency Medicine*, Edlich tells us:

> The benefits of high-pressure irrigation must be weighed against potential side effects. Fears that pressure irrigation will disseminate bacteria into adjacent tissue area were unfounded. In our studies, high-pressure irrigation did not enhance the dissemination of bacteria into soft-tissue wounds. However, the irrigation fluid disseminated into the interstices of the wound, predominantly in a lateral direction. This lateral spread occurred within the loose areolar tissue, contributing to the development of postoperative edema. Concern that high pressure can damage tissue defenses was justified. High-pressure irrigation resulted in trauma to the wound, which
made the wound more susceptible to infection. This finding serves to remind the emergency physician that this technique cannot be used indiscriminately and should be reserved for heavily contaminated wounds.3

Thus, non-contaminated wounds, such as a small laceration caused by blunt trauma to the forehead by a climbing partner’s elbow, should not be subjected to high-pressure irrigation, as it will actually increase the risk of infection.

“Golden 8 Hours”

There is a tradition that wounds should not be closed outside of a “Golden 8 Hours.” The theory, as I understand it, is that nearby skin flora crawl into the wound, after which closure will create a sealed space. Any infection in this area will be under pressure, and the pressure will prevent white blood cells and other anti-infective agents from getting to the infection. At least this is the way I explain it to patients when I recommend they come back for a delayed primary closure at about 4 days from the initial injury, provided the wound is not visibly infected at that time. There is indeed strong anecdotal evidence to support this contention, from clinical experience particularly during World War I4 and World War II.2

In the words of Dr. Gregoire, writing about World War I:

In the first few days following the receipt of the injury there is a sort of stupor of the region involved. The wounded tissues do not react, there is no sign of diapedesis in sections examined under the microscope; the microorganisms are not yet proliferating. In a general way, we may say this period of stupor lasts for seven or eight hours after the infection of the wound. At the end of this time the white blood cells start to invade the wounded region and the system of defense begins to organize itself; but at the same time the microorganisms begin to develop, the anaerobes being the first to proliferate. From the fortieth hour on, both anaerobes and aerobes abound in the wound …

The time elapsing since the receipt of the wound is of prime importance. During the first few hours we must suture; after the twelfth hour we may make the attempt to do so; after forty-eight hours, even though the patient is apyretic and the surface of the wound is red, it would be dangerous to try it. …

This fact of being able to delay suture after the excision has been practised is of considerable interest from a military point of view, for when the wounded are being brought in in large numbers one must act quickly in order to be able to operate on all. After the wound has been closed the patient must be kept under observation for eight days at least, and one can readily imagine that this comports badly with the necessity of rapid evacuations. The French surgeons, Derache, Duval, Barnsby, Alglave, and many others, have shown that one may without harm and even with advantage perform the operation in two stages: in the first the excision is made, and then the patient, whose wound is left wide open, may be evacuated further back to the base hospital, where-24, 48, or even 72 hours after the first operation-the second stage, that of suture, is practised.
This is what is termed delayed primary suture. This mode of procedure has made possible suture of the great majority of war wounds on a mobile front and even during an attack.4

A mention of the justification for this practice and a time-frame when to perform a delayed primary closure would be a worthwhile addition to the Guideline. Based on World War II data, this is 4-6 days. An observational study showed a significant decrease in dehiscence rates when repaired at 4 vs. 3 days: 2.4% vs. 25%; 8 wounds were closed at 3 days and 82 were closed at 4 days. Dehiscence increased again after 6 days from initial injury, increasing to 10% at 7 days, and to 38.5% at over 20 days.2 It is also worth noting that both World War I and World War II recommendations for delayed primary closure also emphasize the debridement of devitalized tissue as soon as possible after the injury.

Even back in 1988, a prospective study found that it was a “Golden 19 Hours” except on head, where it was a “Golden Infinite Hours.”5 A more recent prospective study shows that even for wounds of the torso and extremities, the golden hours are essentially infinite – unless you have diabetes mellitus.6 Perhaps this more recent evidence should be mentioned in the Guideline.

Topical Antibiotics

As the Guideline notes, there is good evidence that topical antibiotic ointment decreases the infection rate for traumatic wounds.

However, the most well-known over-the-counter antibiotic ointment brand, Neosporin®, contains neomycin. And ~13% of the population is allergic to neomycin, which can cause severe, blistering allergic reactions.7,8 I have personally seen two such blistering reactions in the past month, both of which required oral steroids. Therefore, a recommendation to avoid topical antibiotic ointments containing neomycin would be an appropriate addition to the Guidelines. Bacitracin ointment is commonly recommended, as bacitracin allergy is extremely rare.

Socks

Murray Hamlet, DVM, when he was Research Director at the Army Research Institute of Environmental Medicine in Natick, MA in the early 1990s, looked at the problem of foot blisters. He researched the available sock systems, including coarse Ragg wool socks with thin, slippery liners (what he and I learned to hike and climb in), and a variety of commercially-available socks. He and his colleagues developed a new military sock that reduced blisters significantly, based in large part on the trekking-sock design of Rohner of Switzerland. This new design featured terrycloth-type loops, like the padding inside many commercial boot socks, but unlike those socks and like the Rohner socks, on the outside of the sock. This allowed most of the movement between foot and boot to occur between this
“nap” and the boot, rather than against the foot where the movement and friction heating and damage might cause blistering. Although the socks were made from a fairly fine, soft wool, the terrycloth-like loops on the outside were twisted quite tightly.

In 1992, the prototype was tested using Marine recruits at Parris Island. The new design, with an added thin, slick polyester inner liner sock, was tested against standard Marine socks (a blend of wool, cotton, nylon and Spandex), and against a standard Marine sock with the same thin liner. Recruits with the prototype and liner had a lower blister incidence than recruits with the standard sock (risk ratio=1.8, p<0.01) and recruits with the standard sock with a liner sock (risk ratio=2.0, p<0.01).9 Subsequent unpublished testing showed that, with the new design, a liner sock was not needed.*

Such military-style socks may be obtained from military suppliers such as TechSpun. An alternative is to obtain wool socks with a terry-loop nap inside, and to wear the socks inside out. However, the loops in many such socks are not twisted as tightly as those in the military “Hamlet Socks” nor in the Rohner socks that provided inspiration for the new military sock design. This will decrease the incidence of blisters.

Thank you for the opportunity to comment on these important and comprehensive guidelines.

Yours aye,

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References


* Murray Hamlet, DVM, personal communication.