Traumatic Shock I
Prevention and Treatment of Shock Aggravated by Body Heat Loss in WWI

Shock is a state of inadequate blood flow that leads to abnormal organ function. A defining finding in shock is low blood pressure, usually less than 90 mmHg systolic and mean arterial blood pressure less than 60. Inadequate blood flow stresses and ultimately damages tissues in multiple organs. It leads to a buildup of acid in the blood which causes additional metabolic disturbances. Aside from low blood pressure, the other signs of shock include: rapid heart rate, cool extremities, weak pulses, and an altered mental status. For the purposes of this discussion, I will be describing what was known and done about traumatic/wound shock at the battalion aid station level in WWI.

The problem starts with a wound. The bigger and more severe, the greater the risk of shock. Spinal wounds can lead to spinal shock; head wounds can cause neurogenic shock. Other wounds can cause traumatic shock. Large wounds may cause shock at the time of the injury; these are typically chest or abdominal wounds or major fractures like those of the pelvis. Many wounds don’t cause immediate shock, however.

When a wound doesn’t cause immediate shock, there is still a risk of shock due to blood, fluid, and heat loss. The prior health of the casualty is a shock risk factor. A man who is already dehydrated due to inadequate prior fluid intake will go in to shock with much less blood loss than one who is well hydrated. Dehydration was common in WWI since drinking water was in short supply at the front. Some men had diarrhea due to consumption of unsanitary water in moments of desperation. This caused dehydration and nutritional stress. Most of the men at the front ate poorly, leading to weight loss and malnutrition that affected their physical resilience. Sleep deprivation, stress, and various levels of toxin exposure further weakened the men fighting near front-line areas in WWI.

All of these factors form the context in which preventable or treatable traumatic shock occurred. When a man was wounded, all of the above pre-injury factors came into play. The time from injury to evacuation played an important role as well. Many of the

men wounded during open warfare in WWI remained in the field for long periods before evacuation. The longer he lay in the field, the greater the amount of blood loss, body heat loss, and evaporation through the wound.

Factors that contribute to heat loss include:

1. Sweat evaporation in men previously sweating due to the exertion. After the wound, continued sweating led to heat and fluid loss.
2. The sudden loss of activity, becoming more of a factor the longer the wounded man lies motionless. This decreases heat generation.
3. The wound. Exposed skin and wounded tissue lose heat directly and through evaporation.
4. Heat loss with bleeding.
5. Heat loss with urination, defecation, or vomiting in response to the injury.

Prevention of heat loss from the point of injury through the evacuation and treatment process was one of the few things medical providers could do to prevent or treat battlefield wound shock during WWI. Unlike today, medics and corpsmen didn't carry IV fluids. The only medication they carried was morphine. The first place where an IV or transfusion could be done was many hours away in an era of stretchers and Model T and mule-drawn ambulances moving over battered roads in the midst of artillery barrages.

At the first point of contact in the field, corpsmen and medics did a quick assessment, tried to control bleeding, and dressed the wound. Controlling bleeding preserves body heat and, of course, is critical to the prevention of hemorrhagic shock (shock due to blood loss). Dressing the wound helped control pain and prevented evaporative heat and water loss through the wound.

If a wounded man could walk, he made his way to the nearest aid station on his own feet. He walked through most parts of the evacuation process, until reaching a location where either he was kept for treatment or loaded into an ambulance. Body heat was generated by his walking and helped to prevent shock through body heat loss. The walking wounded were given as much water or warm drinks as practical to help prevent dehydration.

Teams of litter-bearers carried those who couldn't walk on stretchers. When possible, these teams put a woolen blanket over the wounded soldier, though availability of these varied

considerably in the field. When the soldier was on a stretcher in an aid station or during ambulance evacuation, the ideal method of blanketing him was with three woolen blankets as shown below:

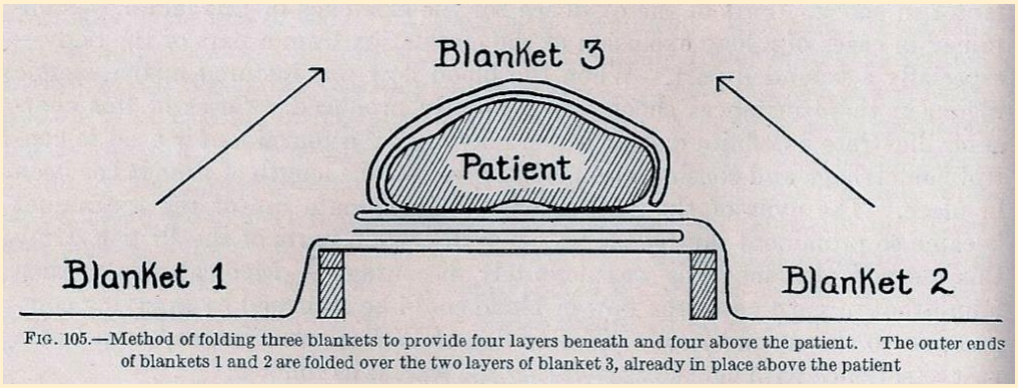


FIG. 105.—Method of folding three blankets to provide four layers beneath and four above the patient. The outer ends of blankets 1 and 2 are folded over the two layers of blanket 3, already in place above the patient

From *Medical Department of the US Army in the World War, Vol. XI, Surgery;*
Ireland, ed. 1927. This reference was used in the preparation of this presentation.

There was no way to rewarm casualties in the field or at small exposed company aid stations. Stretcher cases and the more severely wounded were evacuated to battalion aid stations as quickly as the litter teams could carry them, but delays of many hours were common.

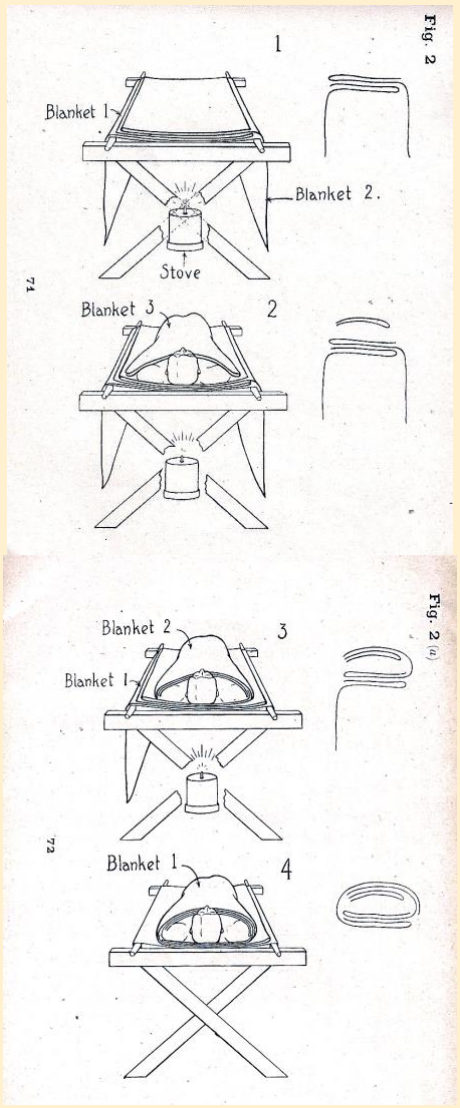
Details about battalion aid stations will be discussed elsewhere on this website. Upon arrival at the battalion aid station, the staff did a quick assessment. If a wounded man was not in shock, blankets were applied and kept on to the greatest degree possible. Men who were conscious and had not sustained head, chest, or abdominal wounds were given hot coffee or cocoa. This was the most immediate and effective method of rewarming, rehydrating, and preventing shock. It was the only means of fluid resuscitation available in aid stations and field hospitals early in the American fighting in WWI. Intravenous gear was available but not commonly used in the evacuation hospitals and base hospitals. Those were also the locations where transfusions were performed. A separate article on transfusions will be posted on this website with further details.

Hot-water bottles (usually rubber, rather than actual bottles) were applied if available and appropriate. One could be laid on the abdomen, with both hands atop it, covered by the blankets. Whenever possible, body contact with both sides of the bottle was desired.

In the Battle of Belleau Wood, the ambient temperature of the aid stations was probably quite high. The factors behind this include:

1. Antigas tarps covering all openings, preventing fresh air inflow.
2. Hot weather.
3. Thick stone walled buildings that trap heat.
4. Crowding.
5. Use of kerosene lanterns.
6. Use of camp stoves to heat coffee and cocoa and their use with shock tables.

Battalion aid stations were the first point in the evacuation chain that a shock table was available. These were made under a stretcher trestle as shown below. The trestle held the litter 3 or more feet above the floor. The same three-blanket arrangement was used as above. Two of the blankets were draped over the sides of the stretcher to create a partially closed space below. A Primus camp stove was lit below the patient, heating the semi-enclosed space, transferring heat through the stretcher above, and into the patient.



From *Manual of Splints and Appliances for the Use of the Medical Department of the United States Army; 1918; Second Edition* American Red Cross.

Shock treatment is an important aspect of the care of wounded people, whether civilian or military. I have prepared two other shock articles for this website. In addition to the sources referenced with the diagrams above, I drew on years of research, training, and experience as a critical care medicine physician in the preparation of the series of articles I wrote for this website.

References:

Ireland, M.W, ed. *The Medical Department of the United States Army in the World War, Volume XI, Surgery, Part One.* 1927, Washington D. C. Government Printing Office.

Manual of Splints and Appliances for the Use of the Medical Department of the United States Army; 1918; Second Edition
American Red Cross

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