WOUND MANAGEMENT IN EXTREME ENVIRONMENTS

WORLD EXTREME MEDICINE
WEM
PUSHING BOUNDARIES

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Expedition & Wilderness Medicine courses

Thank you for reading



WOUNDS

Understanding wound management is vital for safe and successful expeditions.

In remote settings, unexpected injuries can occur, making the ability to assess, clean, and treat wounds crucial.

Prompt and appropriate wound management prevents infection, minimises complications, and promotes healing. By mastering these skills, you become an invaluable asset in ensuring the health and safety of yourself and others.

Within these pages, you'll explore wound classification, the healing process, treatment approaches, and preventive measures.

This e-book combines theoretical principles with practical insights, empowering you to handle wounds effectively in challenging environments.

CLASSIFICATION OF WOUNDS

Determining the incidence of wounds on expedition is challenging. Whilst there is likely to be clinical documentation of serious injury and illness, wounds are often considered minor and either self-treated, or not considered important enough to document. Anecdotally, minor wounds and soft-tissue injuries make up a significant proportion of the expedition medics' workload with retrospective analysis of incident reports suggesting non-athletic soft tissue injuries could account for approximately 30% of all incidents [1].

Wounds can be classified as either acute or chronic. On expedition, the majority of wounds treated are acute (eg. blisters, lacerations, abrasions) which are expected to undergo normal healing and result in wound closure. In contrast, chronic wounds (e.g. tropical ulcers) remain at the inflammatory phase causing an incomplete or un-coordinated healing process.

WOUND HEALING

Wound healing is a complex series of events but broadly consists of two phases:

HAEMOSTASIS

To control bleeding vasoconstriction, plus a platelet and biochemical response, is activated.

TISSUE REPAIR AND REGENERATION

Involves three phases -

1. Inflammation phase (0-4 days) – normal response to injury which activates vasodilatation resulting in increased blood flow, heat, redness, pain and swelling.
2. Reconstruction phase (2-24 days) – the wound is healing with the body making new blood vessels that cover the surface of the wound. This phase includes reconstruction and epithelialisation with the wound getting smaller as it heals.
3. Maturation phase (24 days-1 year) – the final phase of wound healing, when scar tissue is formed [2].



GOALS OF WOUND MANAGEMENT

Understanding what you are trying to achieve when treating wounds provides a framework for the care delivered in the wilderness environment, mindful ‘gold standard’ treatment options are less likely to be available. These goals include:

1.HAEMORRHAGE CONTROL

Wound may be identified and treated during primary survey if catastrophic bleeding or life-threatening implications (eg. penetrating chest injury) result; or identified and treated during secondary survey. A stepwise approach to haemorrhage control should be followed.

2.MINIMISE RISK OF INFECTION

May be achieved with thorough wound cleaning and removal of foreign bodies; application of dressings to prevent further microbial contamination; or the use of antibiotics and tetanus or rabies immunisation/immunoglobulin.

3.PROMOTE OPTIMAL HEALING

Consider use of wound dressing that maintain a moist wound healing environment; ensure adequate nutrition; and attempt to reduce pressure friction and shearing.

4.REDUCE DISCOMFORT AND MINIMISE DISABILITY ASSOCIATED WITH MANAGEMENT

This may include anaesthesia and/or analgesia for wound assessment and closure or dressing changes. Consider your interventions and if they are compatible with continued performance on the expedition. For example, a bulky dressing to a frostbitten toe may give the best protection but may not allow the participant to wear a boot.

5.MINIMISE LOSS OF FUNCTION

Assess underlying structures additional to the wound to minimise the risk of function loss. Remove jewellery near the affected area.

6.OPTIMISE COSMETIC OUTCOMES

Reduce the risk of scarring for cosmetic purposes and flexibility particularly mindful of joints.

7.IMPLEMENT DEFINITIVE CARE (IF POSSIBLE)

Definitive care may include wound closure techniques; surgical debridement; or access to tetanus and rabies vaccination or immunoglobulin. Definitive care will vary depending on the wound and environment, your risk assessment and patient discussion, evacuation times and capacity of the medical team and kit. [3]

RESOURCE LIMITATIONS

In the expeditionary setting there are likely limitations on the availability of medical kit including material to treat wounds. Whilst many wound dressings would be considered light they are often bulky, even a wound of moderate size will rapidly exhaust available supplies.

When a medical kit is limited by size or weight, wound care items should be adaptable for treating multiple wound types.

TREATMENT (CHRONIC WOUNDS)

This topic is beyond the scope of this manual, however if working in tropical environments it is worthwhile identifying the risk of tropical ulcers and further research appropriate antimicrobial treatment and wound management strategies.

TREATMENT (ACUTE WOUNDS)

A wound assessment in the expeditionary context involves wound examination and thorough history taking to understand injury mechanism and possible risks from the environment in which it occurred.

WOUND ASSESSMENT

- Is the patient immunocompromised?
- What is the immunisation status of the patient (tetanus and rabies)?
- Does the mechanism of injury indicate a possibly complex bacterial picture (animal bite/marine or faecal contamination)?
- What is the anatomical area of the wound and is there significant functional or cosmetic concerns?
- Is the wound in an area of the body with a high bacterial count (eg. axilla or groin)?
- What are the underlying structures and do they need assessing? If in doubt – assess!



As well as history taking it is important to evaluate the wound thoroughly. This requires a bloodless field (haemostasis needed) and may require anaesthesia to ensure patient comfort. Anaesthesia (if within your clinical skillset) may involve subcutaneous or intradermal injection of a local anaesthetic agent (eg. lignocaine). This should allow you to assess the depth of the wound and assess tissue loss; measure the wound and identify any foreign bodies or contamination that may be present. With documented consent, consider taking a non-identifiable image of the wound which may allow you to monitor wound healing (mindful of data protection and storage requirements). Assess for underlying fractures, tendon involvement and ensure the distal extremities are neurovascularly intact. Remove any jewellery distal to the injury in case the limb swells [4].

WOUND CLEANING

Wounds occurring on expedition will invariably need cleaning. The two main methods to achieve this are irrigation and debridement.

1.IRRIGATION

Preferred cleaning method and can be achieved with minimal kit. The irrigation solution most readily available and with a good evidence base is potable water. Unlike sterile saline solutions, which are heavy to carry, potable water should be available in the expeditionary environment and studies have shown no increase in the rates of infection when used in wound cleaning.

irrigation with appropriate pressures can be achieved with a wide bore needle (or cannula) and syringe, or a cleaned water bottle or camelbak. Avoid using this method on deeper or larger wounds, however, as human saliva contains a large number of flora that may contaminate and cause infection.

2.DEBRIDEMENT

Gentle debridement can be achieved with water and gauze. In larger or more complex wounds consider dressing and immediate evacuation with delayed closure at definitive care. This includes wounds that are large, deep, contaminated and where there may be large areas of devitalised tissue.[3]

PLANNING

After completing your wound assessment you need to determine how you wish the wound to heal -

1.PRIMARY INTENTION

Wound edges are held together using wound closure methods such as sutures, staples or tissue glue; there is minimal tissue loss and wounds tend to heal with minimal scarring eg. laceration.

2.DELAYED PRIMARY INTENTION

The wound is infected or requires a more thorough cleaning or debridement prior to primary closure. Often used for traumatic or contaminated wounds.

3.SECONDARY INTENTION

The process of spontaneous wound healing which results in scar formation and is used as a method of healing for ulcers and dehisced wounds [5].

WOUND CLOSURE

Your scope of practice, ability to maintain a clean or aseptic field, distance from definitive healthcare, access to wound closure materials, assessment of risk, and the patient's wishes will all inform your decision making process. Confidence and familiarity with wound closure and wound care is a valuable skill set and one that can be of great benefit on expedition.

Working in Minor Injury Units or Urgent Treatment Centres can be an excellent way to gain further exposure to wound care.

WOUND DRESSINGS

There are thousands of wound dressings available on the market and most are sold under trade names which can make working abroad challenging. Common categories of wound dressing you may find in expeditionary medical kits include Hydrocolloid, Non-adherent dressing, Island dressing, Semi-permeable films, and Antimicrobial dressing.[6]

ANTIBIOTICS

Topical antibiotic may be considered to help maintain moist healing environment in superficial wounds. Evidence does not recommend routine use of antibiotics for wounds acquired in expedition environments. Types of wounds to consider prophylactic antibiotic use include open fractures, human bites, mammalian bites to the hand, burns (consideration), and marine environments (consideration).[3]

TETANUS

Tetanus is acquired through infection of a wound with the bacterium Clostridium tetani and is a rare but extremely serious complication of wounds. Most cases occur within 14 days of infection and can be prevented by immunisation. . The disease is characterised by generalised rigidity and spasms of skeletal muscles with a case fatality ratio between 10-90% (highest in infants and elderly).

TREATMENT

The need for active immunisation, with or without passive immunity, varies with the history and assessment of the wound and the patient's immunisation history. Familiarising yourself with Tetanus guidelines and understanding how to assess this risk will determine if further vaccination is required [7].

According to Public health England (PHE) Tetanus prone wounds include those that are:

- Puncture wounds in a contaminated environment
- Wounds containing foreign bodies-compound fractures
- Bites and scratches from animals that are agricultural or have been rooting in soil.

The patient is at risk of tetanus if either they haven't had a full 5 doses of the tetanus vaccine over their lifetime or they haven't received a booster within the last 10 years.

Depending on the level of risk the patient may require a booster jab of the tetanus vaccine as well as in some cases a dose of tetanus immunoglobulin. These drugs may need to be sourced from a nearby health facility as they require refrigerated storage.

RABIES

Rabies is an acute viral encephalomyelitis. Infection is usually via the bite or scratch of a rabid animal, most frequently a dog and almost always fatal. There is a pre-exposure regime for rabies immunisation which alters and reduces the post exposure requirements.

TREATMENT

If bitten by an animal, wash the wound out as soon as possible with copious amounts of water (several minutes) and wash further with soap. Apply a disinfectant such as 40-70% alcohol or iodine and apply a simple dressing with the wound left open. Prophylaxis for suspected rabies exposure is of medical urgency but is not a medical emergency. It does however require definitive medical care with the initiation of post-exposure prophylaxis within 24 to 48 hours [8].

EVACUATION

Evacuation depends on the type of wound and risk to the patient. Wounds that result in significant loss of function, risk of serious infection (such as burns), or require surgical interventions are likely to require evacuation.

WHAT'S NEXT?

To discover the ultimate management strategies for dealing with wounds in remote settings and to experience the full spectrum of expedition and wilderness medicine, there's no better option than joining the World Extreme Medicine Expedition & Wilderness Medicine course.

It's the perfect opportunity to delve into all the elements of this exhilarating field while mastering the art.

Are you ready to gear up and embark on an extraordinary learning adventure that will prepare you for the wildest frontiers of medicine?

EXPEDITION & WILDERNESS MEDICINE COURSES

Embark on an unforgettable adventure in the world of expedition and wilderness medicine by joining our internationally-renowned courses. Our four-day programme is open to medical professionals, including doctors, nurses, paramedics, and medical students in their final two years of study.

Experience a unique blend of engaging lectures and hands-on practical workshops set against the backdrop of the great outdoors. From learning about expedition planning and climate understanding to mastering wound care and mental health support, our course covers it all.

No prior expedition experience is required - just bring your passion for medicine and adventure. Join our vibrant community of like-minded individuals and explore the exciting locations where our Expedition & Wilderness Medicine courses take place:



VIEW COURSES



THANK YOU FOR READING

We hope the World Extreme Medicine guide to wound management proves to be a valuable resource for yourself, supporting your knowledge and confidence that you need to face the challenges of practicing medicine in extreme environments.

If you're hungry for more learning opportunities, we invite you to explore our courses, membership, e-learning, and conference. We believe that ongoing education is vital to your success as an extreme and wilderness medic and we are sure that we can provide you with plenty of opportunities to do so.

Thanks again for choosing World Extreme Medicine and we wish you all the best in your future endeavors!



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