

Basic Disaster First Aid

Wounds & Wound Care

Todd Miner, EdD, FAWM

University of Colorado School of Medicine

Department of Emergency Medicine

Wilderness & Environmental Section

Goals

- Describe significance of wounds
- List and demonstrate ways to stop bleeding
- Describe importance of and demonstrate procedures for cleaning
- Demonstrate dressing/bandaging wound
- List high risk wounds and describe treatment
- Describe signs/treatment for infection
- Describe prevention and treatment of burns

The Good News

All
bleeding
stops...

*(but of course we want to stop it
while the blood is still in the patient!)*



**KEEP
CALM
AND
STOP
BLEEDING**

Stopping Moderate Bleeds

- PPE - use gloves and barriers
- Apply **direct pressure**
 - Only needed for serious bleeds (likely not needed for minor wounds that are merely dribbling blood)
 - Direct pressure may mean having to get fingers inside wound to stop put pressure against vessel
 - Should stop almost all bleeding, even from very large and/or deep wounds

Major or arterial bleeds are rare and are covered later in this presentation

Stopping Bleeding (cont)

- Hold pressure for 10+ minutes
- Use a dressing, adding as needed
- Major bleed may need continued direct pressure or pressure dressing (covered in subsequent slides)
- Elevate
- Compress
- Cold

Cleaning Wounds

- In normal times no big deal, cleaning done at ED; may be more important in disasters
- The longer to definitive care the more important cleaning becomes
- Organic soils (swamp, bog, jungle), clay soils, salt water, all increase need for cleaning
- Debris and skin fragments may have to be picked out first
- Very difficult to clean a wound well and completely in field

Cleaning Wounds

- **Potable water** – any water you are willing to drink. Don't use antiseptics.
- **Copious amounts** – it takes lots of water to adequately clean a wound, minimum 1 liter
- **High pressure** – as high a pressure as you can improvise
- Should be done as soon after injury as possible



Creating Improvised High Pressure Wound Cleaning in Wilderness

- Zip lock bag

Quart or gallon freezer bags best

Fill $\frac{1}{3}$ to $\frac{1}{2}$ full and roll top closure several times

Rip very small hole in one corner of bag

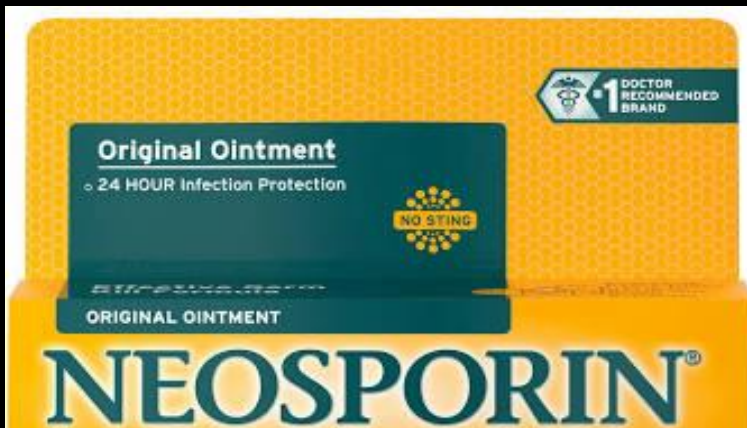
Use two hands for maximum pressure

- Flexible (soft) water bottle



Post-Cleaning Wound Care

- Avoid using disinfectants
- Use **topical antibiotics** (Neosporin, bacitracin, etc.)
- Other substances: Honey can also work



In general wounds should not be closed until definitive care

- Very difficult to adequately clean wounds in disaster situations
- Risk of infection increased with wound closure
- Wound closure can be delayed up to 6 hours; 10 hours for face or scalp
- Wounds may need to be closed in field due to functionality (hand for driving, foot for walking, etc.) or to prevent continued major bleeding (scalp for instance)

Wound Closure

Delayed closure (at definitive care) usually best but if needed for functional use or to stop significant bleeding

- Butterfly bandages
- Steri-strips
- Superglue



Post-Cleaning Wound Care

Dressing & Bandaging

- Apply clean dressing deeply into wound
- Apply wet to dry (moist against skin, dry on outside)
- Dressing against wound can be covered with antibiotic ointment
- Gaping wounds should be firmly packed with dressing
- Bandage to hold dressing in place and to keep clean
- Dressing should be changed at least every 24 hours



Wound Dressing

What To Do If Bleeding Continues

- If wound continues to bleed don't just keep adding more dressing
- May need to start over and ensure dressing is deep enough into wound
- Other steps may be necessary
 - Wound closure
 - Pressure dressing*
 - Tourniquet*

**covered in subsequent slides*

Wound Pain Management

- Cold (water, snow, ice, frozen food, etc.) under appreciated (don't freeze tissue)
- Over the counter analgesics (max dose of Tylenol and ibuprofen simultaneously for significant pain)
- Supportive care and RICE



Wound Management for Specific Injuries

- Impaled objects
 - Leave in place
 - Pad with clothing/tape
- Bloody noses - Pinch soft part of nose for 10 minutes
- Crush injuries
 - If limb crushed for > 2-6 hours use tourniquet before freeing
 - Immediate evac – life threatening
- Eye injuries
 - Get contacts out
 - Rinse with drinking water
 - Cover eye
- Dental
 - Cover broken teeth with sugarless gum or wax
 - Black teabags can help with broken teeth or bleeding gums
 - Put knocked out teeth in plastic bag with patient's spit, get to dentist quickly

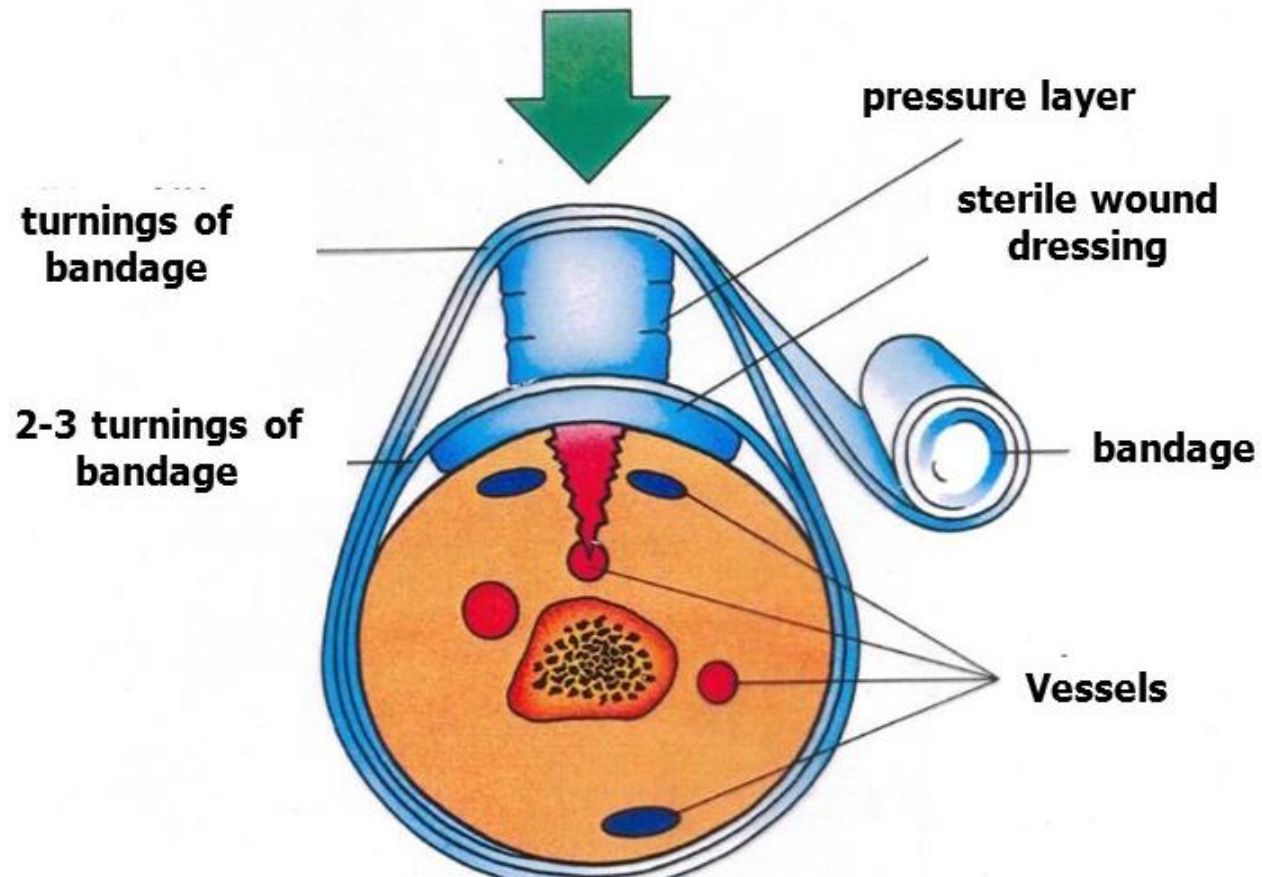
Major Bleeds

- A significant wound with major bleeding may not be stopped by regular dressing and bandaging or even wound closure
- A pressure dressing is a system that replicates hand-held direct pressure
- Hemostatic agents that help significantly increase speed of blood clotting may also be useful
- Very rarely a tourniquet may be necessary

Improvised Pressure Dressing

1. Quickly remove hand-held direct pressure and place clean dressing over wound then some kind of plug or pressure layer on top of dressing
2. Tightly wrap elastic bandage (ace wrap) circumferentially around wound's body part
3. Put a twist in ace wrap every 2nd wrap, with twist directly over wound
4. Tie off or tuck in end ace wrap

First aid (pressure) bandage



Severe Bleeding: Tourniquets

- Direct pressure works huge percentage of time
- If direct pressure doesn't work use tourniquet
- +90% survival rate when used before shock...
- Only work on limbs



Severe Bleeding: Tourniquets

- Better to use and then loosen, than wait too late
- Limb may be sacrificed to save a life
- Under 2 hours, maybe as much as 6+ hours will not harm limb



Tourniquet Application

- Place early and 2-3 inches (6-7 cm) proximal or above wound
- Avoid joints
- Tighten until bleeding stops
- Use two tourniquets if necessary
- Write time of application on forehead or tourniquet

Tourniquet Application (cont.)

Biggest errors

- not putting on soon enough
- not tightening enough
- letting loosen during treatment/transport

Practice before using

- different kinds
- improvised



 **RATS**
Tourniquet



INSERT THE
RUNNING END
THROUGH THE
THREE FINGER
LOOP.

1

RUNNING END AND LOOP
MAKE A HITCH. PLACE ON
INJURED LIMB AND BEGIN
WRAPS.



2

PULL TIGHT AND
WRAP UNTIL OUT
OF MATERIAL.



3

SECURE WRAP
BY PLACING
RUNNING END
IN CLEAT.



4



WWW.RATSTOURNIQUET.COM
FACEBOOK: RATS TOURNIQUET LLC



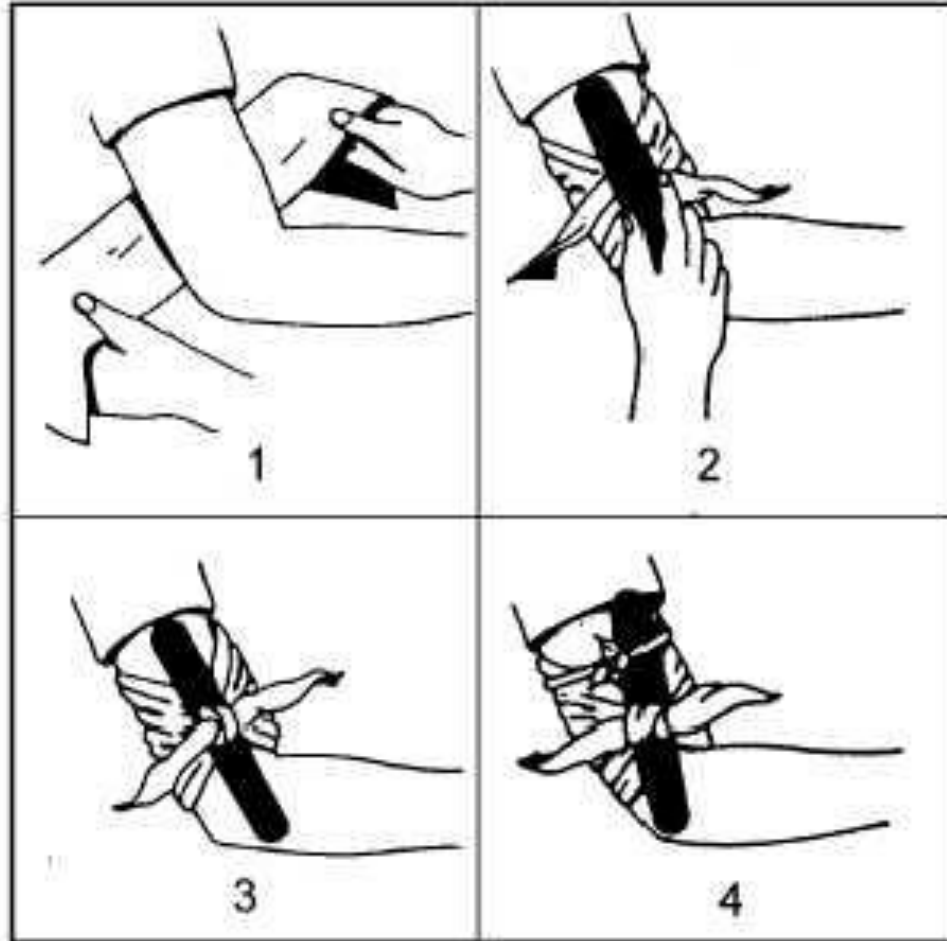
PHOTO CREDIT : QUINTON D. HAPKE PHOTOGRAPHY



Improvised Tourniquets

- Need broad band at least 1.5 inches (4 cm) wide (bandana, ripped t-shirt, etc.)
- Wrap band tightly around limb 2-3 inches (6-7 cm) above wound; tie with overhand knot
- Place stout windlass (stick, Sharpie, tent stake, etc.) on top of knot; tie 2nd overhand knot
- Twist windlass until bleeding stops
- Secure windlass with second band or tape
- Write time of application on forehead
- Do not use cord (causes injury) or belt (can't tighten enough)

Improvised Tourniquets



HM3F0428

Tourniquet Reevaluation

- Remove any dressing to allow good view of potential bleeding
- Clean wound
- Apply pressure dressing and if available, hemostatic agents or dressing
- Slowly loosen tourniquet; if bleeding stopped remove and leave off; if not re-tighten and leave tourniquet tight and secured
- Remember, within 2 hours fine; 2-6 hours gray area, after 6 hours never remove

Burns - Treatment

- Scene safety – don't get burned yourself!
- Remove patient from heat source
- **Immediate dosing or immersion in water or other liquid**
- Continued dousing in water or covering with wet dressing/cloths
- Cover with topical antibiotic or honey and non-adherent moist dressing
- Leave blisters intact if possible
- Treat for pain
- Apply aloe vera if available
- Monitor for infection

Burns - Assessment

- Old days - 1st to 3rd degree
- Still 3 levels but more descriptive

Superficial

skin reddened
no blisters

painful
sun burn good example

Partial thickness

classic blistered skin
burn skin deep

very painful

Full thickness

charred, blackened, leathery skin
no pain on full thickness burn itself, but likely surrounding it

Burns – Surface Area

- Burns over just 1% of surface area (equal to patient's palm area) probably an evacuation due to pain and worry about infection
- Burns over significant part of body (>10%) put patient at risk of hypothermia and dehydration
- Rule of 9s
 - Arms 9% each
 - Chest 9%
 - Back 9%
 - Buttocks/lower back 9%
 - Front of legs 9% each
 - Back of legs 9% each
 - Abdomen 9%
 - Head and neck 9%

High Risk Burns: Very Likely Hospitalization

- Airway (look for singed facial hair)
- Hands and feet
- Genitals
- Circumferential
- Infected
- Lightning, electrical, chemical

Infected Wounds

- Common – up to 10% rate even in hospital setting
- Extremities (hands and feet) most at risk – dirty environments & relatively poor perfusion
- High risk environments
 - Organic soils (swamps, jungle, etc.)
 - Clay soils
 - Salt water
- High risk wounds
 - Puncture
 - Bites
 - Burns
- Other easily infected wounds
 - Blisters
 - Avulsions
 - Abrasions



Infected Wounds - Signs

- **Increasing** (after 24 hours)
 - Redness
 - Warmth
 - Swelling
 - Tenderness and/or pain
 - Pus
- **Later and serious signs**
 - Streaking from wound site towards heart
 - Fever



Infected Wounds - Treatment

- Keep clean; change dressings regularly
- Hot water soaks
- Allow pus to escape
- Rest and support
- Beyond topical infections, antibiotics and evacuation required



Wounds - Review

- Direct pressure key to stopping almost all significant bleeding
- Wound cleaning
 - In disasters important once bleeding stopped
 - Irrigation with copious amount of potable water under high pressure
- Wound closure
 - Ideally delayed until definitive care
 - May be necessary for functional use of hands/feet or to stop significant bleeding
- Severe or arterial bleeding
 - Wound closure
 - Pressure dressing
 - Hemostatic dressing
 - Tourniquet

Wounds – Review (cont.)

- Hemostatic agents
 - Pack deeply in wounds
 - Very helpful on torso, neck, other places tourniquets not appropriate
- Tourniquets
 - Save lives but very rarely needed
 - Place 2-3 inches proximal to wound, avoid joints
 - Improvised tourniquets made from bandana/torn t-shirt & windlass
 - Biggest mistakes: delay in application; not sufficiently tightened
- Infected wounds
 - High risk
 - Hands and feet
 - Wounds in clay, organic soils, seawater
 - Bites, puncture wounds, burns
 - Signs: increased redness, streaking towards heart, fever
 - Evacuate

Wounds – Review (cont.)

- Burns

- Prevention key (sunblock, careful pouring, campfire/stove care)
- Treatment: immediate dousing or immersion in water
- Easily infected
- Airway, circumferential, burns of high value real estate (hands, feet, genitals) cause for evac

- Evacuation

- Uncontrolled bleeding
- Serious wounds of hands, feet, genitals, faces
- Easily infected wounds (puncture, bites, etc.)
- Airway, circumferential, large area burns
- Seriously infected wounds

References & Resources - Wounds

- **BATTLE CASUALTY SURVIVAL WITH EMERGENCY TOURNIQUET USE TO STOP LIMB BLEEDING.** J.F. Kragh, M.L. Littrel, J. A. Jones, T. J. Walters, D.G. Baer, C. E. Wade, J. B. Holcomb. *The Journal of Emergency Medicine*, Vol. 41, No. 6, pp. 590–597, 2011. *Journal of Wilderness & Environmental Medicine*, 2017, 28(2) S25-32.
- **Bleeding Control Using Hemostatic Dressings: Lessons Learned.** B.L. Bennett. *WILDERNESS & ENVIRONMENTAL MEDICINE*, 28, S39–S49 (2017).
- **Cyanoacrylate Glues for Wilderness and Remote Travel Medical Care.** K. P. Davis & R.W. Derlet. *WILDERNESS & ENVIRONMENTAL MEDICINE*, 24, 67–74 (2013)
- **Endemic North American Plants as Potentially Suitable Agents for Wound Cleaning.** AJ Whitehead, NW Nelson, LS Brame, FR Champlain. *Wilderness & Environmental Medicine* 30(4) 401-406.
<https://www.ncbi.nlm.nih.gov/pubmed/24393701>

References & Resources - Wounds

- **Management of Burn Injuries in the Wilderness: Lessons from Low-Resource Settings.** C. C. Bitter & T. B. Erickson. WILDERNESS & ENVIRONMENTAL MEDICINE, 27, 519–525 (2016). [https://www.wemjournal.org/article/S1080-6032\(16\)30216-2/fulltext](https://www.wemjournal.org/article/S1080-6032(16)30216-2/fulltext).
- **Overview of Agents Used for Emergency Hemostasis.** H Khoshmohabat, S. Paydar, H.M. Kazemi, & B. Dalfardi. Trauma Monthly. 2016 Feb; 21(1): e26023. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4869418/>
- **Pressures of Wilderness Improvised Wound Irrigation Techniques: How Do They Compare?** J.B. Luck, E. Campagne, R.F. Banchs, J. Montoya. & S.J. Spano. WILDERNESS & ENVIRONMENTAL MEDICINE, 27, 476–481 (2016)
- **Prospective Evaluation of Topical Antibiotics for Preventing Infections in Uncomplicated Soft-tissue Wounds Repaired in the ED.** D.J. Dire, M. Coppola, D.A. Dwyer, J.J. Lorette, J.L. Karr. 1995, Academic Emergency Medicine (2) 1, 4-10.

References & Resources - Wounds

- **The Care of Thermally Injured Patients in Operational, Austere, and Mass Casualty Situations.** B.T. King & W.C. Peterson. *WILDERNESS & ENVIRONMENTAL MEDICINE*, 28, S103–S108 (2017).
- **They Had Me in Stitches: A Grand Canyon River Guide's Case Report and a Review of Wilderness Wound Management Literature.** S.J. Spano & B. Dimock. *WILDERNESS & ENVIRONMENTAL MEDICINE*, 25, 182–189 (2014).
- **Tropical Hemostatic Agents and Dressings in the Prehospital Setting.** T.E. Grissom & R. Fang. *Curr Opin Anaesthesiol.* 2015, 28(2) 210-216.
<https://www.ncbi.nlm.nih.gov/pubmed/25674988>.
- **Wilderness Medical Society Practice Guidelines for Basic Wound Management in the Austere Environment.** R.H. Quinn, I. Wedmore, E. Johnson, A. Islas, A. Anglim, K. Zafren, C. Bitter, V. Mazzorana. *WILDERNESS & ENVIRONMENTAL MEDICINE*, 25, 295–310 (2014).