Frostbite and Immersion Foot Care
Contributors

- Maj Andrew Hall, USAF, MC
- LtCol Jennifer Sexton, USAF, MC
- LtCol Bruce Lynch, USAF, MC
- Maj Felix Boecker, USAF, MC
- Col Edwin P Davis, USAF, MC
- Capt Emily Sturgill, USAF, MC
- LT Mark Steinmetz, USN, MC
- Col Stacy Shackelford, USAF, MC
- LTC Jennifer Gurney, USA, MC
- CAPT Zsolt Stockinger, USN, MC
- COL Booker King, USA, MC

Slides: Maj Andrew Hall, MC, USAF
This CPG provides evidence–based guidance for the treatment of frostbite and immersion foot.
Key Principles of CPG

- Background
- Frostbite
- Immersion Foot
- Performance Improvement (PI) Monitoring

- System Reporting and Frequency
- Responsibilities
- References
- Appendices
Cold Injury/Frostbite

- Can also be described as superficial and full thickness similar to burns
- Extent of injury is not easy to know immediately. The ultimate grade will not be known until treatment has been attempted and a period of time has passed
Patients with frostbite should have the affected extremity rapidly rewarmed in 104-108°F water for 15-30 minutes.

Thrombolytic therapy should be considered if available.

Patients with immersion foot should be treated with dry heat.
Clinical Identification of Cold Injury

Trauma Evaluation
Correct Hypothermia

- Rapid re-warming of affected area in 104-108°F water
- Surgical consultation

Yes
- Full thickness injury?
  - Debride blisters
  - Supportive care

No

Injury of extremity?
  - Delayed surgical debridement
  - Consider hyperbaric oxygen

Yes
- Consider tPA therapy
  *See Thrombolytic Therapy*
Risk factors for cold injury include a combination of:
- Low absolute Temperature
- Duration of Exposure
- Racial background
- Smoking
- Altitude
Evaluation

■ Evaluation for Cold Injury/Frostbite
  ❑ Identification of injury
  ❑ Injury expected to have occurred when there is pain and swelling or gross signs of ischemia or skin injury

■ Evaluation includes
  ❑ Standard trauma evaluation
  ❑ Identifying and correcting underlying hypothermia
  ❑ Preventing refreezing of suspected cold injury
4 Broad Categories

- **1st Degree:** Superficial skin injury; pain on re-warming, numbness, hyperemia, occasional blue mottling, swelling and superficial desquamation (desquamation starts at about 5 days)

- **2nd Degree:** Partial thickness injury to skin; in addition to first degree findings, vesiculation of the skin surrounded by erythema and edema (appears around day 2)

- **3rd Degree:** Entire thickness of skin extending into subcutaneous tissue; bluish to black and nondeformable skin, hemorrhagic blisters, vesicles may not be present, eventual ulcerations can be expected; area will likely be surrounded by 1st or 2nd degree injury

- **4th Degree:** Similar to third degree, but full thickness damage including bone. Area may be cold to touch and may feel stiff or woody.
Treatment of Frostbite

- Rapid rewarming at 104-108°F (40-42°C) for 15-30 minutes
  - Temperature is important. **DO NOT** just place in warm to touch water
  - Warm water and verify temperature; too hot will cause burns

- Liberal pain control is imperative with combination of narcotic and non-steroidal medications as rewarming will be very painful

- No Tobacco or nicotine

- Transfer to higher level of care when able for any full thickness injuries. Mild injury can likely be managed at site of injury.
Treatment of Frostbite

- Thrombolytic therapy
  - Should be attempted within 24 hours of the start of injury for severe injuries with evidence of circulatory compromise (ischemic discoloration of distal digits/absent pulses, etc.)
  - Should only be done at location capable of dealing with bleeding complications

- Additional measures can include
  - Topical aloe vera
  - Hyperbaric oxygen
  - Whirlpool therapy with exercise

- Surgical debridement should not be performed in the operational environment
Presentation

- Immersion foot is also known as trench foot
- Water logging of the foot
- Prolonged exposure results in hyperemic, mottled, painful and edematous foot which can progress into hypoperfusion, ulceration and gangrene

Risk factors

- Continuous moist environment
- Low absolute temperature
  - Cold temperature: approximately 12 hours before onset
  - Warm temperature: approximately 48 hours before onset
Treatment of Immersion Foot

- In contrast to frostbite, air dry extremity at room temperature
- Do not routinely provide antibiotics, but if concerned for infection treat for streptococcal, staphylococcal and *P. aeruginosa* based on local antibiogram
- Pain control and debridement of necrotic tissue may be required
INTENT (EXPECTED OUTCOMES)

- When cold injury is identified, rapid re-warming of the affected tissue in 104-108°F water is expected as early as possible.
- Initiate thrombolytic therapy within 24 hours when appropriate.

PERFORMANCE/ADHERENCE MEASURES

- Re-warming of the affected tissue in 104-108°F water is expected immediately after evaluation.
- Thrombolytic therapy, if available and warranted, within 24 hrs.
- Prevent refreezing of warmed tissue.

DATA SOURCE

- Patient record
- Department of Defense Trauma Registry (DODTR)
References


References
Appendices in CPG

- Appendix A: Clinical Identification of Cold Injury
- Appendix B: Additional Information Regarding Off-Label Uses in CPGs