Frostbite and Immersion Foot Care

Part of the Joint Trauma System (JTS) Clinical Practice Guideline (CPG) Training Series
Purpose

This CPG provides evidence–based guidance for the treatment of frostbite and immersion foot.

*Presentation is based on the [JTS Frostbite and Immersion Foot Care CPG, 26 Jan 2017 (ID:59)](https://www.dona.mil/dha/training/cmte/rtp/Frostbite/). It is a high-level review. Please refer to the complete CPG for detailed instructions. Information contained in this presentation is only a guideline and not a substitute for clinical judgment.*
Agenda

- Background
- Summary
- Frostbite (Evaluation & Treatment)
- Immersion Foot (Evaluation & Treatment)
- Performance Improvement (PI) Monitoring
- References
- Appendices
- Contributors
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.
Summary

- 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

Full thickness injury?

- Debride blisters
- Supportive care

Injury of extremity?

- Delayed surgical debridement
- Consider hyperbaric oxygen

- Consider tPA therapy
  See Thrombolytic Therapy

Yes

No
Risk factors for cold injury include a combination of

- Low absolute temperature
- Duration of exposure
- Racial background
- Smoking
- Altitude
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: 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.
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
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