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### Innovations in the Emergency Care of Acute Frostbite: The Sous Vide Rewarming Method

Frostbite is a limb-threatening condition in which tissues undergo freezing damage due to prolonged exposure to cold. Once in an environment where the potential for re-freezing is minimal, the current standard of care for acute frostbite is rapid rewarming of the affected body part using a circulating warm water bath targeted to 37-39°C. In practice, the creation and maintenance of a temperature-targeted, circulating warm water bath is inefficient, challenging, and time consuming. In order to work towards improving frostbite care through innovation, we carried out a pilot study focused on the first documented clinical use of a sous vide cooking device to create and maintain a circulating warm water bath to rewarm acutely frostbitten toes in the emergency department. One patient with acute frostbite was enrolled to have their bilateral toe frostbite rewarmed in a water bath with a sous vide device. The device was attached to a water basin and set to a target of 38°C. Temperatures were recorded every 2 minutes from 2 thermometers. Once target temperature was achieved, the feet were rewarmed for 30 minutes. Subsequent examination determined successful rewarming. Medical providers were surveyed regarding the ease of use of the sous vide method. The water baths required an average of 25 minutes to reach target temperature and maintained the target temperature

within +/- 1 °C for the duration of the rewarming. The frostbitten toes were clinically thawed in one 30 minute session and there were no adverse events. The provider rated this as an easy method of water bath management. A sous vide device can be used clinically to heat and maintain a water bath to treat acute frostbite and is an innovation that should be studied further for broad application.

#### Speaker Biography

Daniel is an Associate Director of the Wilderness and Austere Medicine Fellowship at Dartmouth-Hitchcock Medical Center and Assistant Professor of Emergency Medicine at the Geisel School of Medicine at Dartmouth College, USA. He received his B.A. in Biology from the University of St. Thomas and obtained his D.O. from Des Moines University. Nick completed his emergency medicine residency at the University of Nebraska Medical Center and a wilderness medicine fellowship at UMass-Baystate Medical Center. He is a fellow of the Academy of Wilderness Medicine, has completed his Diploma in Mountain Medicine, and has additional training in hyperbaric medicine. He is active in wilderness medicine research and was PI for a three-week study on Mount Rainier in 2021, in addition to multiple publications. He enjoys traveling and has a passion for teaching and sharing knowledge, having taught wilderness medicine in 8 different countries.

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