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Fall 2022



The Quarterly Publication of the Mountain Rescue Association

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**MEDCOM: Frostbite
Rescue Systems Discussion**



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Fall 2022

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ON THE COVER: Members of Eugene Mountain Rescue train in Lane County, Ore.

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President's Message

I'm writing this after a busy 4th of July weekend and reflecting on my new role as president of the MRA. It is quite an honor to be in the position and I appreciate the support I have had from all of you on my journey here. Yesterday I was sweating and working hard in 90-degree heat on a litter evac of an injured hiker. Poison ivy, loose rock and all the joys of Boulder County's Flatirons were challenging me and my teammates including several that had literally been up all night performing a high-country rescue at 12,000'. Two more mission call outs occurred before we had finished, and I drove to the next one with helmet and radio still on.


As the team wrapped up the third mission of the day our Sheriff's Emergency Services Incident Commander cracked open a cooler to share Gatorade and ice cream sandwiches and the heat and sweat and soreness were gone. The patients, none of them critically injured, were on their way to get checked out and the team was able to get back to family and friends for the day's celebrations. It is hard to describe to the rest of world why we volunteer so much of our time, talents, and attention to helping strangers in need. It's not for the glory because there really isn't any glory. I'm pretty sure it's not for the adrenaline rush because that is best left behind with good training. Maybe it's for the views.

At the Estes Park MRA conference one of the keynote speakers thought SAR folks liked being in control, denying death and acting the hero. While some of that may be true and most of the rest of what they had to say was excellent, I think it is something else that keeps us going. I think SAR brings out our best selves. All the training, personal experience, equipment, leadership, teamwork, and horsepower comes together on any given day to some random cliff, snow slope or mountain top and demands our full attention. Politics, climate change, violence and Covid-19 are forgotten for a bit. The worst day in our patients' lives is often one of our finest. It is a great privilege we have been given and we earn it every day and night and weekend and holiday.



As I look forward to how I can impact and enhance the MRA over the next two years I turn to you, the volunteer rescuers of the MRA. Amazing and hardworking folks who have the generosity and bandwidth to give so much are what makes this organization truly great. I am working for you. All of you are vital to the health of this organization and your voice is important and will be heard. I intend to let the world know what amazing work we do and that we are the experts in Mountain Rescue in the USA. I will work to keep the administrative wheels turning efficiently. And finally, I hope to empower all of you to be your best selves out there helping strangers. The ice cream sandwiches you will have to figure out on your own.

Alison Sheets
MRA President



*A fumarole on Mt. Hood
(Clackamas County Sheriff's Office)*

Down in a Hole: Team Rescues Man Stranded in Fumarole

Rick Lindfors-Ackerman - Meridian Editor in Chief

Mt. Hood, Ore. - Oregon's Mt. Hood is one of the most popular peaks in the U.S., drawing climbers from across the world. But the mountain is a challenge for even experienced alpinists with its variable conditions and steep slopes. The teams that service the mountain, Portland Mountain Rescue and the Hood River Crag Rats, run numerous missions each year for injured subjects. The mountain also carries another threat, one that isn't often thought of or seen by climbers: Fumaroles. Fumaroles

are vents in the mountain that emit hot, toxic gasses. On January 26, 2022, Portland Mountain Rescue had to rescue a man who had fallen on the mountain and ended up stopping inside a fumarole.

Ben Swerdlow and his wife, Mary Ryan received the callout for the rescue around 1815 that night. It was PMR's third callout for Mt. Hood in five days. A man was descending Mt. Hood on a snowboard when he fell, sustaining serious leg injuries and ending up inside a fumarole near Hogsback

and devil's kitchen at just over 10,000 feet elevation. The injured man's climbing party dug themselves into the slope to wait for rescue. Although uninjured, they were exposed to the cold.

After arriving at Timberline Lodge Swerdlow, Ryan and PMR member Jan Roethle formed a hasty team and took a sno cat to the top of Palmer chairlift. They arrived at the top around 2040 and would climb the rest of the way to the subject. A second hasty team element would follow them. Swerdlow's team made first contact with the subject around 2250.

The conditions at the fumarole were not ideal. The fumarole was heavily corniced and it was a 40 degree icy slope to get to the injured subject. The subject's friends were also showing signs of hypothermia as they had been sitting and waiting in the elements. Outside, the fumarole area was in the mid 30's with high winds. The subject himself was in a completely different environment. On the rocks inside the fumarole, the toxic fog warmed things to 100 plus degrees.

The hasty team started setting up rigging and figuring out a way to access the subject. Swerdlow and Ryan took care of the subject's friends. They also set up anchors and took readings on the gas levels in the Fumarole. "With these fumarole rescues, [teams] really need to take them slow. We need to be evaluating gas levels, visibility [and] stability around the fumarole itself," said Swerdlow. "You have these high gasses that are coming from the bottom. And the effect of that is heavily corniced lips." They found that the gas readings for hydrogen sulfide were within the team's safety tolerances. The level of gas coming from the vent can change depending on how much water is getting inside and being turned to steam. The team's avalanche beacons would serve two purposes in the mission: allowing location and tracking during a potential avalanche

and also allowing them to track the person going into the Fumarole where they would be shrouded by fog. Roethle volunteered to go in and treat the patient. No one can be ordered into a fumarole. "It's not gonna be safe. We do all we can to mitigate it, but there can be spontaneous



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releases [of gas], mostly focused on hydrogen sulfide on Mt. Hood,” said Swerdlow.

Portland Mountain Rescue team members carry small respirators in their packs to use on Fumarole missions. They’re similar to what painters and construction workers wear. Each respirator has vapor cartridges that filter out the toxic gases. Along with the respirator, Roethle strapped a gas meter to the leg loop of his harness, allowing him to get a warning if he was venturing into an area with higher concentrations of toxins before they reached his airway. The gases are heavier than air, so they can pool in certain areas. “As you’re descending, you want to do that very slowly, allow your gas monitor to catch up and make sure you’re entering a relatively safe airspace,” said Swerdlow.



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PETZL RESCUE SOLUTIONS

The challenge of the rescue professional is the need to adapt, especially when facing unexpected situations. In order to be ready for the unexpected, members of the Davis County Search and Rescue team train often in places like Farmington Canyon, Utah.



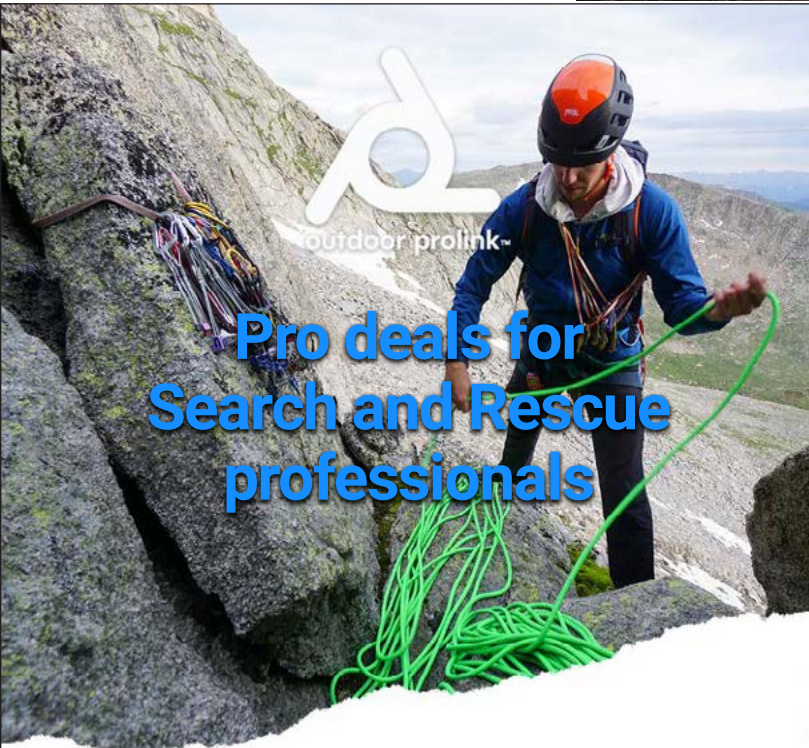
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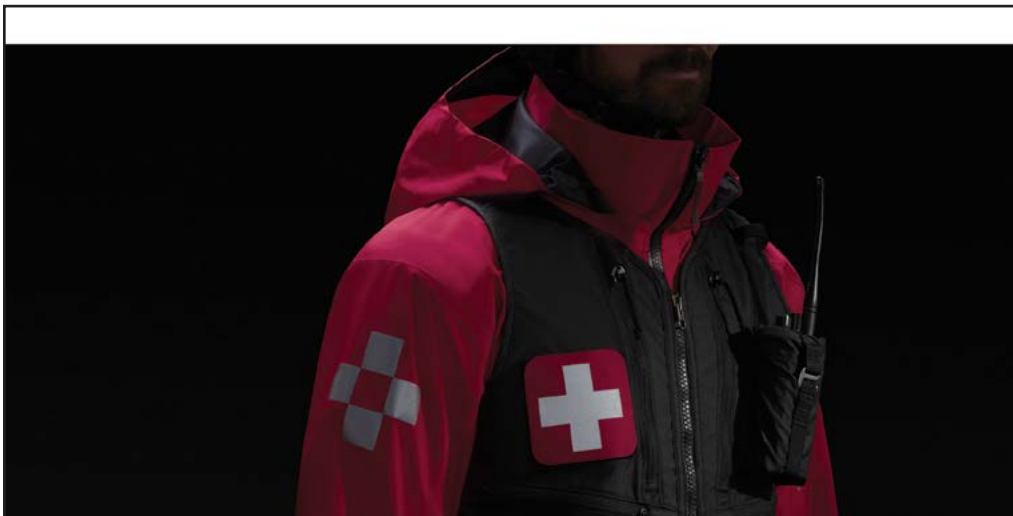
The team also used a rope system that is specially designed for accessing someone in a fumarole that allowed a rescuer to descend and also be hauled out with minimal operators.

The plan was to go in, get the subject to better air, and then fully package them for extraction. The main medical concern was possible internal bleeding coming from such serious leg injuries. “There was a lot broken,” said Swerdlow. “That made things really difficult.” Roethle descended into the fumarole, with Swerdlow tracking him on his avalanche beacon. Roethle was able to get a harness around the subject and pull him upwards ten feet to some better quality air. But since there was only one rescuer in the fumarole, it was a difficult haul and painful ordeal for the patient. “You just hear this guttural scream through the fog and knew that wasn’t going to be working,” said Swerdlow.

As this was happening, a team consisting of Crag Rats members set up a backup rope system. Swerdlow requested a second rescuer to assist with securing the patient. Crag Rats member Culley Weisman volunteered and went down with a pre-rigged SKED and vacuum mattress. Packaging proved difficult due to the large rocks inside the fumarole. “It’s like going into a boulder field and trying to package someone,” said Swerdlow. The two rescuers were able to package the subject and used the initial rescue system to

haul him up. "It was kind of a lucky transition," said Swerdlow, "There wasn't really a snow lip, it just blended right into the rock."

Once out of the fumarole and onto a flat surface, rescuers transferred the subject to a litter, where a doctor and paramedic started working on him, giving him an IV and pain medications. The team then lowered him to the top of Palmer lift to a waiting sno cat. "It was very icy. Five people including myself dropped their trekking poles or ski poles and [the poles] just sailed away into oblivion," said Swerdlow, saying the slope was far icier than he had seen before. Once the patient got to the sno cat, rescuers "survival skied" the remaining distance to Timberline, arriving around 0345.



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Summer Answer Key

E	S	E	L	N	C	Q	Y	U	O	H	D	O	L
C	R	T	Y	W	H	N	Y	D	M	A	D	F	J
L	V	M	A	I	I	D	W	E	T	R	V	I	E
I	G	X	E	E	N	C	V	S	R	N	L	N	L
F	Y	V	C	J	O	A	G	Y	U	E	W	C	Y
F	M	K	J	Y	O	R	H	Q	C	S	I	I	P
K	Y	H	G	R	K	A	Q	E	K	S	F	D	A
Q	F	W	A	B	A	B	R	R	H	D	J	E	T
R	C	P	X	E	V	I	C	R	L	O	A	N	I
V	E	J	S	K	W	N	A	G	D	S	T	T	E
T	Q	S	U	Y	P	E	K	Y	Y	H	W	K	N
G	Q	V	C	E	M	R	N	C	H	E	G	W	T
F	S	Q	G	U	I	B	R	I	G	G	I	N	G
F	K	B	B	N	E	M	O	U	N	T	A	I	N

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Fall Word Search

R	O	O	H	M	E	P	S	E	O	E	E	T	P
T	C	H	A	C	E	R	P	E	L	P	C	E	P
H	E	M	E	E	A	C	R	E	S	O	F	M	H
E	E	O	I	E	T	L	H	I	S	I	M	L	E
C	F	I	H	F	U	M	A	R	O	L	E	E	L
A	R	S	L	O	L	H	T	P	Y	R	T	H	I
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L	I	T	C	L	C	L	R	T	R	S	S	E	R
L	M	R	I	R	H	H	M	O	Y	T	C	F	I

Litter
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Pulley Efficiency and Mechanical Advantage

Justin Wheaton - Meridian Editor

The San Bernardino County Sheriff's Volunteer Forces Unit puts on a Rope Rescue Operator course every year. This course is the most basic introduction to rope rescue systems and application. The class builds a solid foundation based on our mission profile to allow teams to integrate on assignments. Primarily, the students will learn a few systems and a progression of mechanical advantages. The last two days of the course are repetitive application of the skills in a realist scenario. On the final day of our Rope Rescue Operator course, a great debrief discussion came up during the final test evolution. Both groups that tested that day became challenged to lift a 4 person load up a moderate slope using a 3:1 mechanical advantage (MA) with the DCTTRS system they had built. The decision was quickly made by both teams to reconfigure the pulleys to a simple 5:1 MA - Great Work! As the raise continued, the two groups were faced with another decision, this time, they diverged. One team decided to re-direct the haul downhill, while the other team did not. Given the slope of the hill and the length of the haul field, hauling downhill was a reasonable decision. When rigging the redirect to haul downhill the team realized they did not have more pulleys left in the cache. They decided they were going to build the redirect with carabiners, another reasonable decision given the tools at hand. At this time, a few extra pulleys were provided by some instructors, and it was said that we would debrief on why after the scenario. *So why the pulleys and not the carabiners?*

The introduction of that carabiner rather than a pulley, reduces the mechanical advantage to almost a 2:1. Yep – a 2:1.

Before we explain why, it's important to understand the difference between ideal MA, and theoretical MA. First, ideal MA is a broad estimate, designed to make decision making and evaluation easy in the field. This is how we almost always discuss MA - 3:1, 5:1, 9:1 and so on. These figures do not take into consideration many factors, but for simplicities sake, lets look at the big one,

The DCTTRS system set up with 5:1 MA's and waiting to begin raising.



efficiency. To calculate a theoretical MA, we must consider the efficiency of the pulleys in our system. The higher the efficiency, the higher the MA, the lower the efficiency, you guessed it – The lower the MA. By using the “T” system for determining ideal MA and subtracting the inefficiencies it is not difficult to calculate a theoretical MA. This calculation is still “theoretical” because we are only accounting for pulley inefficiencies. To figure out the *actual* MA can be difficult to do in an equation. You may need to consider the angles rope enter and exit pulleys, the ropes construction, force acceleration such as bouncing, and a host of other factors. However, we can measure the actual MA very simply by measuring input force and output force with scales called dynamometers.

Dynamometers being used to measure pulley efficiency.



The redirected haul system being hauled down hill.

So how does the carabiner being used as a redirect reduce my systems theoretical MA to a 2:1? Well, that's the fun part. As tension is introduced into your system by hauling, the efficiency of each pulley strips away your MA turn by turn. Like water moving through a water line into your home from the street, the larger pipes in the street full of water volume are reduced to the smaller pipes in your home, that change from large to small creates the



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water pressure in your home. To understand what this has to do with reducing MA, let's flip it around. If I had small waterlines in the street, and large pipes in my home, the small pipes would never fill the large ones in my home, and I would have no water pressure. No one likes a drizzly shower. A similar thing happens when we put our hauling tension into rope, that is then squeezed through an inefficient carabiner, before it goes through an efficient pulley. It deprives our system of much needed tension, like the big pipe deprived me of a good shower.

To demonstrate this, we will use the "T" method for determining MA, but we will show the theoretical MA by subtracting the efficiency from each pulley. Let's say our system pulleys are 90% efficient, that's about average for pulleys you see in rescue. And for the carabiner being used as a pulley, the efficiency is about 50%.

In a typical 3:1, If each pulley is 90% efficient, our tension is reduced by 10% at each turn.



A 2.71:1 theoretical MA, for our 3:1 ideal system.

Let's then say you only have 1 pulley with you. You decide to put it at the progress capture location to mind the prusik. Reasonable decision. However, that carabiner is going to reduce our tension by 50%



Our 3:1 ideal system, has been squeezed to less than a 2:1 MA



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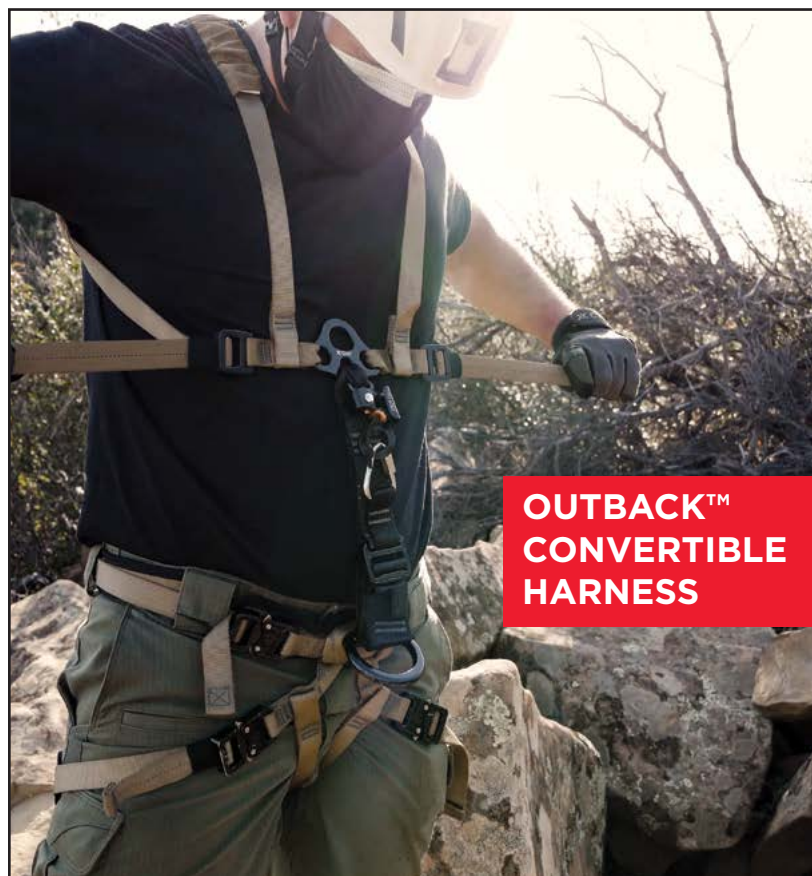


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Then we will reverse the two. It presents operational issues but let's see what it does to our mechanical advantage.



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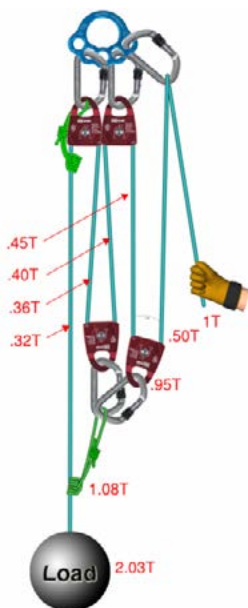
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Now Let's apply this concept to the 5:1 system in our story. Here is the theoretical MA to a simple 5:1.



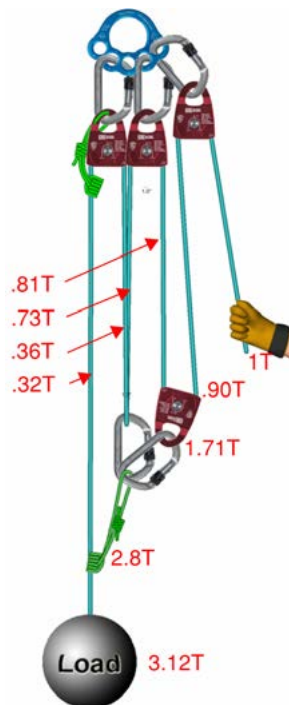
4:1 is the theoretical MA for our 5:1 system

Next, we will redirect our haul. We have no more pulleys, but we have tons of carabiners! Remember a redirect adds no mechanical advantage, but we rarely consider what it is taking away.



The carabiner redirect made our theoretical MA 2.03:1 MA !

Using the exact same gear, and what we have just learned, the easiest way to regain some of that mechanical advantage would be to use the carabiner as a pulley further down the system.



With the carabiner before the progress capture, we get a 3.12:1 MA

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Our systems are never truly what they seem. And we are often tasked with doing the best we can with what we have. It's not easy to calculate your actual mechanical advantage in the field, and it is typically not necessary to do so. But with this information, we can figure out what our theoretical mechanical advantage is. Some small changes to our rigging can make a considerable difference.

As with most things rigging there are many layers. You can always dig deeper and expand on your knowledge. If you would like to learn more about pulley efficiencies in rope systems, please check out these articles on pulley efficiencies in mechanical advantage progression, and an analysis on a systems overall efficiency as a function of the number of pulleys!

<http://rope-work-101.wikidot.com/pulley-systems>

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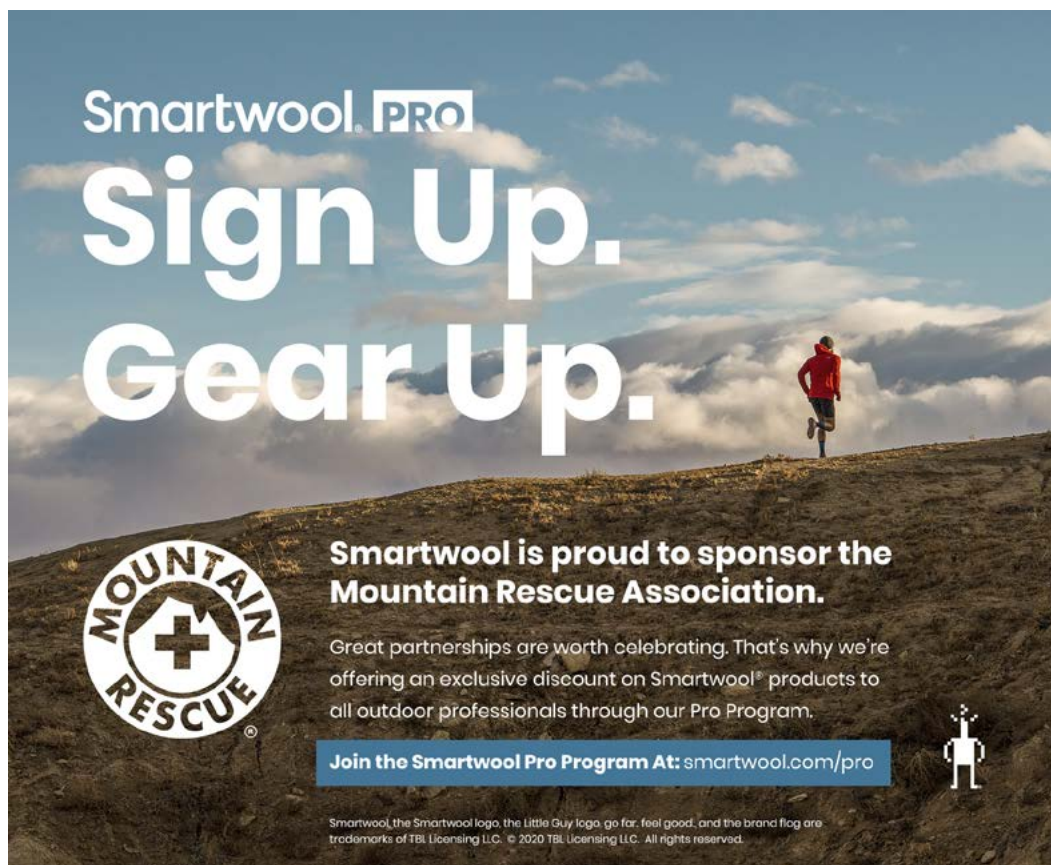
Prevention and Treatment of Frostbite in the Backcountry

Richard Yocum, MD, San Diego Mountain Rescue Team and Riverside Mountain Rescue Unit

Frostbite is a painful condition often resulting in loss of tissue that is usually preventable. The Wilderness Medical Society (WMS) published a 2019 update to their clinical practice guidelines for the prevention and treatment of frostbite¹, which serves as the primary basis for this discussion along with research by Cauchy *et al.* in Chamonix, France.^{2,3} Frostnip and frostbite occur when heat loss exceeds the ability of blood flow to deliver heat to tissues and prevent freezing.

Preventive Measures

- Avoid/minimize duration of exposure to extreme cold conditions, especially wet and high wind-chill
- Maintain adequate hydration and caloric intake
- Maintain adequate core temperature
- Cover all skin/scalp to protect from cold, wind, and moisture
- Use multiple clothing layers including wind protection
- Change from gloves to mittens
- Minimize blood flow restriction from constrictive clothing/footwear and inactivity
- Avoid perspiration and wet extremities
- Consider exercise to increase blood flow to the periphery (unless there is risk of exhaustion)
- Consider warmth from adjacent body heat, such as patient's own armpit or abdomen
- Consider chemical or electrical warmers for hands/feet
- Minimize effects of known diseases, medications, and substances (alcohol, drugs, tobacco)
- Regularly check all members in group for early signs of frostnip/frostbite
- Recognize early and treat immediately cold-induced numbness/frostnip



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Frostnip is a superficial cold injury distinct from frostbite but may precede frostbite. Although frostnip resolves with rewarming without permanent tissue damage, frostnip signals that appropriate action is immediately needed to prevent frostbite. Frostbite is traditionally categorized into 4 grades of severity of tissue damage based on clinical findings immediately after rewarming. Because these distinctions are difficult to assess before rewarming, a 2-tiered classification of superficial vs. deep is more appropriate for the field. A given patient may present with frostbite in more than one location with varying grades of severity.

Field Classification	Degree	Clinical Signs and Symptoms	Tissue Damage
Frostnip	None	Pale/pink/white, soft, sensation usually intact vs. numb, burning/tingling	None permanent
Superficial Frostbite (minimal to no anticipated tissue loss) ¹ 	1 st	Numbness, redness, slightly raised firm white-yellow plaque ¹ No blisters ² Absence of bluish discoloration ³ 	Possible skin sloughing ¹ No amputation of bone ³
	2 nd	Superficial clear-milky fluid blisters surrounded by redness and swelling ¹ Clear blisters ² Bluish discoloration on distal bone of finger/toe ³ 	Moderate risk of amputation ³
Deep Frostbite (anticipated tissue loss) ¹ 	3 rd	Deeper blisters that may be bloody, injury to deeper layers of skin ¹ Bloody blisters on finger/toe ² Bluish discoloration up to finger-hand or toe-foot joint ³ 	Tissue death through the deeper, dermis layer of skin and vessels ¹ High risk of amputation ³
	4 th	Injury completely through skin and into subcutaneous tissues, muscle and bone ¹ Bloody blisters over foot/hand ² Bluish discoloration proximal to finger-hand or toe-foot joint ³ 	Tissue death entire skin thickness, extending into muscle and bone ¹ Risk of amputation 100% ³

Some treatment recommendations may be generalized to most cases of frostbite.

Treatment General to All Frostbite

- Remove jewelry/other constrictive material from affected body part
- Assure adequate hydration and caloric intake
- Treat any underlying hypothermia (if mild, treat concurrently with frostbite; if moderate-severe, treat before treating frostbite)
- Start ibuprofen at a dose of 12 mg/kg divided twice daily to maximum 2400 mg/day in 4 divided doses (e.g., for 70 kg patient, 400 mg twice daily to 600 mg 4 times daily) (Nonsteroidal drugs such as ibuprofen can reduce vasoconstriction and tissue damage)
- If available, supplemental oxygen if hypoxic (O_2 sat < 88% or elevation > 4000 m/13,000')
- Do not debride/open blisters in the field
- Do not rub/apply ice or snow

How to Rewarm in the Field

- Use warm (not hot) water bath (37-39°C, 98.6-102.2°F, verified to be tolerated by noninjured hand ≥ 30 seconds) immersion for rapid rewarming until tissue is soft and pliable to touch, then air dry (don't rub). Avoid risk of thermal burns from fire, heated rocks, etc.
- Apply bulky, clean, loosely-wrapped, dry gauze/cotton dressings over thawed part/between fingers/toes
- Topical aloe vera may be applied to thawed tissue before dressing
- Nonsteroidal drug (e.g., ibuprofen) or opiate analgesic as needed for pain control
- Protect from refreezing and further trauma
- If possible, elevate the thawed extremity to reduce swelling
- Avoid use of thawed part if possible

If frostbite does not meet criteria for field rewarming, field treatment is directed at preventing further injury from trauma. Bulky dressings may be applied as described above for rewarmed frostbite.

A risk-benefit analysis may be required before using a frozen or thawed body part for ambulation. If avoidable, a frozen extremity should not be used for walking, climbing, etc.; however, it may be reasonable for evacuation purposes to walk on frozen toes or feet and on thawed toes, but inadvisable to walk on an entire foot that has been thawed.

Awareness of these preventive measures and guidelines may prevent permanent damage and the painful loss of body tissue.

1. McIntosh SE, Freer L, Grissom CK, Auerbach PS, Rodway GW, Cochran A, *et al.* Wilderness Medical Society Clinical Practice Guidelines for the Prevention and Treatment of Frostbite: 2019 Update, *Wilderness & Environmental Medicine* 2019;30(4S):S19-S32.
2. Cauchy E, Chetaille E, Marchand V, Marsigny G. Retrospective Study of 70 Cases of Severe Frostbite Lesions: A Proposed New Classification Scheme, *Wilderness & Environmental Medicine* 2001;12:248-255.
3. Cauchy E, Davis CB, Pasquier M, Meyer EF, Hackett PH. A New Proposal for Management of Severe Frostbite in the Austere Environment, *Wilderness & Environmental Medicine* 2016;27:92-99.



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Letter from the Editor

A couple things as we close out this edition of Meridian. First off, thank you for your continued reading and sharing of the publication. This marks two full years of Meridian under my editorial responsibilities, and the task has been quite fulfilling. I get to talk to MRA volunteers from across the U.S. and learn about their teams and heroic exploits as rescuers. It is a very fun deal to take on, and I hope to continue for the foreseeable future.

My signature at the end of these letters will also change as I am moving from Oregon back to my home state of Minnesota for a career change. I will continue SAR but with more focus on K9 work since there are, unfortunately, few mountains in Minnesota. The elevation changes of local ski hills are measured in the dozens or hundreds of feet, a major change from my main stomping ground of Oregon's Mt. Bachelor. Perhaps I will take up ice climbing. I would like to thank MRA President Allison Sheets for allowing me to continue editing Meridian despite being an "expat" for the time being as well as the MRA officers for their continued support.

That being said, Meridian is always looking for additional help. This publication, like our rescues, relies heavily on volunteer elbow grease. Meridian staff work on editorial and advertiser sponsorships that help garner revenue for the MRA and boost our support of teams across the country. If you'd like to contribute, don't hesitate to reach out by replying to an MRA lister email. We're looking for tales of great missions, team innovations and profiles of volunteers.

Looking ahead to the next issue of Meridian - we will have our normal plate of noteworthy missions, people and medical knowledge along with a writeup from a previous zoom conference on leadership. Part of the strategic plan for the Mountain Rescue Association involves improving leadership at all levels of our organization so we can continue to be the authority on alpine rescue and wilderness safety. The more we strive to improve our organization, the more effective we can be in our operations, training and educational campaigns. Look for all of this when December rolls around.

Cheers,

Rick Lindfors
Meridian Editor in Chief



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to find the MRA?**



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