This Winter in the Mountains

Welcome to the 3rd edition of the UNM International Mountain Medicine Center’s newsletter! Want to view previous editions? Click here to view our newsletter archive!

NEWSLETTER CONTRIBUTORS

Dr. Risa Garcia is a 2nd year Emergency Medicine resident at UNM and Diploma in Mountain Medicine student

Dr. Hans Hurt is an attending physician for the UNM Emergency Department and an IMMC faculty member

Dr. Jake Jensen is an Emergency Medicine physician and the current UNM Wilderness, Austere, and International Medicine Fellow

Dr. Darryl Macias is an attending physician for the UNM Emergency Department and an IMMC faculty member

Dr. Aaron Reilly is an attending physician for the UNM Emergency Department and an IMMC faculty member

Jason Williams is the Director of the IMMC

NEWSLETTER DEADLINE

The Mountain Dispatch is a semiannual newsletter released every summer and winter. If you would like to contribute to the newsletter, your submission must be received by October 1st for the winter edition or by March 1st for the summer edition.

DISCLAIMER

The International Mountain Medicine Center and its faculty, contributing authors, and the affiliate entities shall not be liable or responsible for the advice or safety of any techniques described in this newsletter. It is the responsibility of the medical provider or rescuer to investigate technical and medical techniques and evaluate them for safety, effectiveness, and applicability. Reliance on any information provided by this newsletter is solely at your own risk.

Paramedic DiMM student Chris Carr demonstrates proper rope management when belaying from above
FEATURED THIS ISSUE

Winter 2018

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Front Cover: Emergency Medicine physician and DiMM student Casey Ambrose shakles out while climbing at the Ouray Ice Park

During our Winter DiMM Seminar, students take part in a complex avalanche rescue scenario.
INTERNATIONAL DIPLOMA IN MOUNTAIN MEDICINE

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INSIDER’S PERSPECTIVE: WILDERNESS MEDICINE IN THE KHUMBU

Jake Jensen, MD
Hans Hurt, MD
Darryl Macias, MD

High in the Himalayas of Nepal, just off the beaten track to Everest and perched amongst the clouds lies a humble pastoral village called Phortse. You may not see it if you trek up the more traveled path to Tengboche Monastery, but if you look left across the gaping gorge of the Dudh Kosi river, you will see a terraced knoll dotted with stone structures. There lying in the shadows of the sacred Himalayan peaks above a quiet birch forest you will find the village of Phortse. Home to generations of Sherpa climbers, it is here that the Khumbu Climbing Center has found a home.
INSIDER’S PERSPECTIVE:  Wilderness Medicine in the Khumbu

The Khumbu Climbing Center, or KCC, was founded in 2003 with a mission statement “to increase the safety margin of Nepali climbers and high-altitude workers by encouraging responsible climbing practices in a supportive and community based program.” For 2 weeks each winter, technical climbing skills, English language, mountain safety, rescue skills, mountain geology, and wilderness first aid are taught to students, whose experience ranges from novice to Everest veterans. Over 800 students have benefited from this annual vocational training aimed to improve both their quality of life through better employment opportunities and their safety as they work high in the Himalayas. In January of 2018, three of our IMMC physicians, Drs. Hans Hurt, Jake Jensen, and Darryl Macias had the unique opportunity to travel to Phortse to teach mountain medicine, as well as assist with teaching other technical mountaineering and rescue skills. Here is their story.

Prior to departing, we discussed what topics would be pertinent for the course knowing that we would only have 8 hours with each group, and therefore wanted to ensure that all the information taught would be beneficial. While we knew we could cover topics such as acute mountain sickness, high altitude cerebral edema, high altitude pulmonary edema, and hypothermia, we also wanted to ensure that we covered more commonly encountered conditions. We reviewed the current literature to make an updated list.
of the most common complaints encountered during expeditions and treks. Ultimately, a small booklet full of illustrations, diagrams, written in simple English for each student was made.

After traveling halfway across the world from Albuquerque to Kathmandu, we met with a small group of other KCC western instructors and flew to Lukla together. Lukla is home to the world’s “most extreme and dangerous airport”, perched on the side of the steep valley amongst 6,000 meter peaks. Lukla is often referred to as the gateway to Mount Everest as most expeditions into the Khumbu region start there. From there we began our 3-day trek to Phortse stopping in Phakding and Namche Bazaar along the way to acclimatize. We also enjoyed great views of Everest, Nuptse, Lhotse, Ama Dablam, and countless other peaks, often sipping “chiya” at quaint tea houses. Our arrival to Phortse was a humbling one as many locals were waiting at a stupa, which marks the entrance into the village. We were warmly welcomed with cheers, hugs, and khatas (long flowing silk fabrics to adorn the neck) to mark our newfound friendship.

Shortly after arrival, the preparation began for the biggest group of students that KCC has ever had in a course. Over the next few days, instructors met to review the skills that they would teach. We joined the Rigging for Rescue technical climbing team to assist in teaching advanced climbing skill updates to the Nepali instructors. We then taught mountain medicine for one day to all of the Nepali instructors, something they found extremely valuable. For many it had been years since their last medical training.

Educating the instructors also gave us a chance to test out our teaching strategies using various scenarios, demonstrations, and discussions. Based on their feedback, we made minor adjustments and gained a few additional topic ideas to benefit the students.

After the instructor seminar, we had a day off as students arrived and registered for the course. We took this time and traveled over to Tangboche, visiting the Monastery and enjoying the magnificent view as we stood.
beneath the breath-taking pyramid of Ama Dablam. Opening ceremonies occurred the next day, and for the first days of the course we both observed and assisted as students learned skills such as knot tying, rappelling, belaying, anchor building, and ice climbing. From there our real work began.

For the remainder of the course we taught students mountain first aid. We began with personal safety, scene size-up, and going over the MARCH algorithm for primary patient assessment. Other topics included wound care, blisters, orthopedic injuries, altitude illness, hypothermia, frostbite, and GI issues. We opted for topic discussions, demonstrations, scenarios, and hands-on activities, eliminating standard Power Point presentations. We found that most students understood English with variable fluency. With each class we learned more Nepali, useful for teaching; this made our teaching even more effective. At times our Nepali words were not perfect, making for many laughs (the Nepali word for knee is very close to a very different part of the male body). However, they understood us, appreciating our efforts to use as much Nepali as possible.

Since we would have a group of approximately 10 different students rotating with us daily, students introduced themselves each morning. Through this we found that around 10% of the students had had some form of medical training in the past. This number was lower than the number of students that had climbed or been on expeditions to Everest and other 7,000 meter (~23,000 foot) and 8,000 meter (~26,000 foot) peaks. This solidified the importance of our medical course, as for many it was the first formal medical education they had ever received and may be the only training some students ever have. Our main focus in teaching was in line with the mission statement of the KCC. We continually emphasized safety and self-care during every topic we taught. Overall, our instruction was very well received and
students did exceptional during the test day, demonstrating that safety was of utmost importance in caring for self and others.

We enjoyed our time in Nepal, and were glad we could contribute to the cause. We were all humbled by the experience, and developed a deeper appreciation, respect, and love for the people, culture, and landscape of Nepal. We look forward to future collaborations with the KCC and hope to expand future teaching opportunities.
SAVE THE DATE

2nd International Mountain Medicine Symposium
Silverton, CO

June 1 - 3, 2018
Click For More Information

Promoting excellence through high-quality education for medical rescuers tasked with patient care in the austere mountain environment

14 AMA PRA Category 1 Credits for MDs and RNs, 14 EMS CME Credits

http://mtnmedsymposium.org/
Click here to view the 1st part of this series in which Dr. Macias discusses the basic concepts of pain management and the role of NSAIDs in backcountry medicine.

Case 2: You are involved in a high-angle technical rescue effort to extract a healthy 30-year-old male who sustained an apparent closed right tibial fracture after a 20-foot leader fall on a climb. Although initially dazed and confused, his mentation is normal. Aside from pain in the extremity, he has no other complaints. He has no medical problems, nor allergies to medications, and his vital signs are within normal limits except for a pulse rate of 110 beats per minute. A focused physical exam reveals tenderness and crepitus to the right distal tibial area with intact neurovascular function. How will you treat his pain once your initial resuscitation priorities are established?
Opioid analgesia

If the previous pain management modalities have been ineffective, prescription opioids, which mitigate pain by affecting the spinal cord mu receptor, are often effective. While the addictive nature of opioids has led to recent initiatives for “the opiate-free emergency department,” the risk of addiction should not outweigh the duty to treat severe pain in the prehospital remote setting.

Nevertheless, this class of pain medication is not without side effects; opioids can be sedating, and many can cause a histamine induced skin rash, vomiting, euphoria or dysphoria, loss of airway reflexes, or hypotension. Oral formulations of opioids, such as oxycodone (5-10 mg/dose) are easy to carry and fairly effective; other preparations, such as hydrocodone with acetaminophen (Vicodin), or codeine, may not be as effective. Many practitioners prefer oral opiates without acetaminophen, due to concerns of hepatotoxicity with excessive dosing.

Intravenous or intramuscular morphine may produce similar symptoms as oral opiates, with compromising airway reflexes and precipitating hypotension being the most significant. Intravenous access may prove challenging in an austere environment. Intramuscular medications in a cold environment may initially be ineffective due to a cold, hypoperfused skeletal muscle; rewarming may then suddenly increase drug delivery, potentially causing the above described side effects. Monitoring blood pressure and oxygen saturation would be wise in these instances. Oral morphine must be given at higher doses, since much of it is rendered ineffective when taken by mouth. Fentanyl, at a dose of 1 microgram (not milligram) per kilogram, may be more suitable for trauma as it does not have as much of an effect on blood pressure, though it can still sedate and cause hypoventilation. If administered rapidly, intravenous fentanyl can arrest respiratory muscle function altogether. The military uses oral transmucosal fentanyl citrate (“fentanyl lollipops”) in the prehospital combat setting. The medication can be self-administered to an injured patient. When taped to the patient’s finger, the lozenge is easily pulled from the mouth if the individual drifts into unconsciousness. Intranasal fentanyl is both efficacious and non-invasive; however, it appears that giving volumes over 1 mL is ineffective. Doses greater than 0.5 mL can be equally divided between the nares using an
Welcome to the world of ketamine, which is very effective for pain management. Ketamine has been used for years in the developing world for analgesia during painful procedures in health care facilities that do not have monitoring devices. It appears to be a useful single agent for pain and is ideal for trauma, as it does not cause hypotension, nor does it attenuate airway reflexes. Rather, hypertension and tachycardia are the side effects, which are not considered clinically significant. Additionally, the observed increase in intracranial pressure, which could occur in head injury, does not appear to be clinically significant either. Caution is recommended with glaucoma and other disorders where an increase in intraocular pressure is undesirable, and too rapid of an infusion can cause laryngospasm and vomiting. Vomiting may be minimized with antiemetic pretreatment. Vivid dreams or hallucinations are possible. I recommend “coaching” patients to think of pleasant ideas before slow drug administration, preferably in an environment of low stimulus. Unpleasant emergence reactions can be mitigated with benzodiazepines.

atomizer. An initial dose of 50-100 micrograms (1.5 micrograms/kg) appears to be effective and can be repeated in several minutes. A similar medication, sufentanil, comes in lower volumes at higher concentrations, but overdosing may be a problem. For any of these medications, naloxone can be administered to reverse overdose. Higher doses of naloxone may be necessary when reversing synthetic opioids, such as fentanyl.

**NMDA antagonists**

Glutamine. We love this little amino acid in our protein power drinks. It is also an excitatory neurotransmitter that helps the receptor protein, NMDA (N-methyl-D-aspartate), which lives in nerve cells, to transmit electrical impulses. If you antagonize, or block this glutamine receptor, you get an anesthetic effect that seems to cause a “separation” of the perceiving, intelligent brain (the cortex) from the mid brain that senses pain. In other words, not only do you not sense pain, but you do not know of it, and your consciousness is somewhere beyond this world, causing “dissociative anesthesia.”
Subdissociative doses (0.3-0.5 mg/kg IV) may be used for pain alone or with an opioid. Intranasal ketamine at a dose of 1 mg/kg, or ketamine by mouth (5-6 mg/kg) can also be used. Ketamine can also be used when managing the acutely agitated patient.

Topical lidocaine patches and EMLA cream can be used for minor pain, and theoretically, topical lidocaine, or even cocaine, can be used for lacerations, but the potential for neurotoxicity and seizures limits the amount of these medications that can be used. Subcutaneous injections of lidocaine or bupivacaine is useful for wound repair anesthesia, and an injection of 1 mL of these preparations into a discrete area of muscle tenderness (a “trigger point”) is very efficacious in the backcountry, although a maximum of three injections are recommended. Proximal nerve blocks with lidocaine are ideal in backcountry situations where a large area of anesthesia is needed, in a patient who cannot tolerate the side effects mentioned with some of the other pain medications. Experience and ultrasonographic localization of nerve bundles increases success as well as diminishes the possibility of inadvertent vascular injection. Acupuncture has been touted as very effective in minor injuries in a military emergency department and in case reports of appendicitis, although it does not appear to be as effective as the treatments previously outlined. Hypnotism and music may also be helpful adjuncts.

Other modes of pain relief

Topical capsaicin. An active component of chili peppers, capsaicin appears to work on the TRPV-1 vanilloid receptors to decrease pain. Capsaicin causes initial burning, since it releases substance P, responsible for pain. Repeated applications of topical capsaicin cause diminution of substance P production, decreasing pain. Capsaicin has been used for musculoskeletal injuries and osteoarthritis but may not be the treatment of choice for acute, severe trauma. Arthritic conditions, select musculoskeletal disorders and exacerbations of back pain have been treated with injectable steroids or steroids by mouth. Many of us who carry dexamethasone for altitude illness could utilize a corticosteroid for pain as well.

Intranasal Fentanyl on the ski hill.
Antidepressants and antiepileptics appear to be useful in chronic pain syndromes but not in an acute pain situation. Clonidine, a blood pressure medication with partial mu receptor activity, is impractical, given its propensity for hypotension, and because there are better medications available. And although we would like to think that cannabinoids work for pain...well...sorry folks, cannabinoids simply do not reduce acute pain itself, though they may alter mindset to mitigate the perception pain. Other sedatives, such as benzodiazepines, are similarly ineffective at reducing pain.

Case 2 deserves parenteral pain medications as a first line. For trauma, intramuscular or intranasal fentanyl or ketamine would be easier than an intravenous medication. A nerve block (regional anesthesia) would be difficult, since sterile technique and patient exposure would be needed. Oral opiates or ketamine may not be as effective, although could theoretically be used if you deem the risk of aspiration minimal. NSAIDs and topical medications would not be appropriate.
Here at the UNM IMMC, we are very fortunate to be able to be involved in a multitude of educational, medical, and technical endeavors. One of our many support roles involves providing medical support for ultramarathons. This past fall, we sent faculty and support personnel to staff the medical teams for two separate ultramarathon events: The Racing the Planet 4Deserts Atacama Crossing and the Trans-Pecos Ultra. Described below is a unique look at each race discussing the locale, terrain, and medical logistical issues unique to ultra endurance events in remote environments.
Trans-Pecos Ultramarathon

Risa Garcia, MD, PGY-2

Ultramarathons aren’t meant to be easy. Set in beautiful, harsh landscapes meant to push runners to their limits, these events are also a challenge to medical personnel providing support. In late October, participants gather in Big Bend Ranch State Park in southwestern Texas to run a 163-mile race through the Chihuahuan Desert. The TransPecos Ultramarathon crosses rocky terrain rife with cactus, rattlesnakes, javelinas, wild burros, and lacking in much water or shade. This seven-day, six-stage race showcases the American Southwest while providing significant challenges for medical providers due to its remote location and potential for serious injuries and illnesses. As a second year emergency medicine resident interested in race and austere medicine, this was an exciting opportunity to be part of the medical team.

Big Bend Ranch State Park is adjacent to the better known Big Bend National Park located in southwestern Texas along the Rio Grande at the border of Mexico. At 311,000 acres, it consists of high peaks (Oso Mountain reaches 5,134 ft) and deep canyons with elevations as low as 2,300 ft. Even in October, the mornings are cold while the days can become very hot. Access to the park is limited to two entries on the east and west sides of the park. Once in the park, there is a central ranger station from which access to the interior of the park is mainly via four-wheel drive roads. There is a small airstrip near the ranger station. The closest towns at the periphery of the park are Presidio to the west and Lajitas at the southeastern border. Due to this remote location, outside medical support and transportation in the event of an emergency is logistically difficult. Although there is an airstrip in the park, night landing is not permitted. Outside EMS support is provided by the Presidio and Terlingua EMS and the nearest large hospitals are in El Paso and Lubbock. Besides the logistical difficulties a medical team would face should they need to

FOOT CARE | Trans-Pecos Ultra

It is no surprise that ultraendurance events are hard on the feet. Medical providers at these events must understand how to best manage these issues so that participants may continue the race.
which he hadn’t thought was a big deal. In the debrief of the situation at the end of the day, we discussed the difficulties we would have faced had the patient been having an acute myocardial infarction or respiratory failure. Besides the lack of most acute coronary syndrome medications (other than aspirin), the transportation of a sick patient was the biggest difficulty we saw regarding the case. Although she could ambulate on her own, she was slowed significantly by her injury and would not have made the time cut off for the day.

Perhaps the most interesting medical issue seen at the race this year was with a volunteer. A former ultramarathon runner himself, the individual had denied any major medical issues on his medical screening form. The morning of a middle stage, he was sweeping the course with another volunteer when he began experiencing shortness of breath. His symptoms began after setting out from camp and before the next checkpoint. There was not a medical provider sweeping with him as everyone was heading to their respective checkpoints for the day. A scramble ensued to get back to the volunteer with communications being complicated by our spotty satellite phones. When reached, he had been resting and was clearly chagrined at the fuss made over him. His symptoms were improving, but the medical provider tending to him administered aspirin. The volunteer revealed that he did have a history of atrial fibrillation which he hadn’t thought was a big deal. In the debrief of the situation at the end of the day, we discussed the difficulties we would have faced had the patient been having an acute myocardial infarction or respiratory failure. Besides the lack of most acute coronary syndrome medications (other than aspirin), the transportation of a sick patient was the biggest difficulty we saw regarding the case. Being involved in the Trans-Pecos Ultramarathon was eye opening for me as to the challenges and joys of providing medical support for such a race. While no major medical event occurred, we had enough “what ifs” to let me see the complexities of race medicine. It is an exciting aspect of emergency medicine and only whetted my appetite for more. ■

Click here for more information on the Trans-Pecos Ultramarathon!
Atacama Crossing

Jake Jensen, MD, Wilderness Fellow

In September/October of 2017, I had the opportunity to provide medical support for the Racing the Planet Atacama Crossing located in northern Chile. The Atacama Desert is the driest non-polar region on earth with an average precipitation of 15mm (0.6 in) per year. It lies at the base of the Andes with an average elevation of over 2,130m (7,000ft), and sits in the shadows of many volcanic peaks reaching around 6,000m. There are multiple salt flats, salt lagoons, and geysers that dot the landscape. This area is also known for its wonderful night skies and is home to some of the largest telescope arrays in the world. During the event, participants get the opportunity to pass through slot canyons, climb and descend multiple sand dunes, travel through salt flats, and run through the Valle de la Luna (Valley of the Moon), so named for it lunar like appearance. Needless to say, the scenery and location was quite epic.

This particular ultramarathon covered approximately 250 km (155 miles) over a 7-day period. As a medical team, our goal was to get as many participants as possible to the finish while ensuring their safety and well-being. In addition to common maladies such as blisters, subungual hematomas, and various musculoskeletal complaints, participants were at risk for more potentially serious illnesses including altitude illness, heat related illness, hydration imbalance, and electrolyte disturbances. We also were able to collect data for an ongoing study.

This participant completed the race after having a suspected scaphoid fracture splinted. Managing patients such that they can finish the race is ideal. Doing so requires a thoughtful risk vs. benefit discussion with the patient.
that hopes to gain further insight into these disorders during multi-stage events, particularly looking at plasma sodium concentration changes over the course of the event. (For more information regarding dysnatremia and hydration status in multistage ultramarathons, check out the December 2018 WEM Live! Podcast where our faculty discuss the latest research regarding these disorders).

Fortunately for us and the competitors, nobody presented with significant concerns for serious medical pathology. We did treat plenty of blisters, sprains, contusions, abrasions, clinical fractures, and even some cellulitis. This was my first time participating in an event like this, and won’t be my last. I had a great time and met many new friends, heard some great stories, and left inspired watching these athletes perform an amazing feat. I can’t say that I will ever participate in an event like this, but have definitely been running a lot more after being inspired by all those involved.

Click here to learn more about the Atacama Crossing!
Upcoming Courses & Events

DIPLOMA IN MOUNTAIN MEDICINE - SUMMER SEMINAR  
May 16 - 24, 2018  
Albuquerque, New Mexico  

Our seminar format of the Diploma in Mountain Medicine is designed medical providers that would like to acquire a DiMM from out afar. The summer seminar completes half of the program with 25 hours of online content followed by a 9-day practicum throughout New Mexico. This course offering is full.

2ND ANNUAL MOUNTAIN MEDICINE SYMPOSIUM  
June 1-3, 2018  
Silverton, Colorado  

From advanced medical care to mountain rescue best practices, this conference will hold lectures and workshops taught by leading experts in fields of wilderness medicine and mountain rescue. Check out the symposium website by clicking here to see the conference schedule as well as registration options!

WILDERNESS FIRST AID & WILDERNESS FIRST RESPONDER REFRESHER  
Aug. 10, 2018  
Albuquerque, New Mexico  

Want to learn the fundamentals of wilderness emergency medicine? Using our hybrid format, this class combines 8 hours of online, self-paced content with 8-hours of in-class practical training to train individuals on how to recognize and manage emergencies in the backcountry. Upon completion, students will receive a Wilderness First Aid certification, valid for 2 years. Course fee: $200

DIPLOMA IN MOUNTAIN MEDICINE - SUMMER SEMINAR  
Sept. 12-20, 2018  
Albuquerque, New Mexico  

Our seminar format of the Diploma in Mountain Medicine is designed medical providers that would like to acquire a DiMM from out afar. The summer seminar completes half of the program with 25 hours of online content followed by a 9-day practicum throughout New Mexico. This course is filling up fast, so submit an application today! Course fee: varies with level of licensure.

INTERNATIONAL COMMISSION FOR ALPINE RESCUE - 2018 CONVENTION  
Oct. 17-20, 2018  
Chamonix, France  

The ICAR Annual Convention is where leading experts gather to present cutting-edge technology and techniques in mountain rescue. This year the convention will be held in Chamonix, France. The general topic for the meeting is “The Influence of Climate Change on Mountain Rescue Operations.” Click here for more information.

INTERNATIONAL TECHNICAL RESCUE SYMPOSIUM  
Nov. 2-4, 2018  
Portland, Oregon  

Want to learn what’s new in technical rescue? The International Technical Rescue Symposium is where technical rescue experts from around the world present original rescue on a variety of topics related to technical rescue. Click here to learn more about this exciting conference!

INTERNATIONAL SOCIETY FOR MOUNTAIN MEDICINE - WORLD CONGRESS ON MOUNTAIN MEDICINE  
Nov. 21-24, 2018  
Kathmandu, Nepal  

The year, the biennial World Congress on Mountain Medicine will take place in the heart of Nepal, one of the most iconic alpine locals in the world. During the three-day conference, researchers will present on topics in mountain emergency medicine, high-altitude research, and travel medicine in the Himalayas. More information on the conference can be found here!

DIPLOMA IN MOUNTAIN MEDICINE - WINTER SEMINAR  
Jan. 30 – Feb. 7, 2019  
Albuquerque, New Mexico  

Our seminar format of the Diploma in Mountain Medicine is designed medical providers that would like to acquire a DiMM from out afar. The winter seminar completes half of the program with 25 hours of online content followed by a 9-day practicum throughout New Mexico. This course is filling up fast, so submit an application today! Course fee: varies with level of licensure

WILDERNESS & AUSTERE MEDICINE 4TH YEAR ELECTIVE  
April 1-26, 2019  
Albuquerque, New Mexico  

The WAM Elective is a course offered for 4th year medical students that want to learn the fundamentals of wilderness and austere medicine. From marine medicine to high-altitude physiology, this course is a great way to learn about the various niches in the field of wilderness medicine. Email us to learn more!
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Acute Pain Management in Remote Settings


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