This Summer in the Mountains

Welcome to the first edition of International Mountain Medicine Center’s newsletter! Join us for exciting program updates and thought provoking articles on mountain emergency medicine & rescue.

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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.

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Summer 2016

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Whether you are a prospective student or a contributing faculty member, check out our upcoming courses and events!
The Diploma in Mountain Medicine continues to make up the core of what we do here at the UNM International Mountain Medicine Center. When we’re not out in the Sandia Mountains helping students rig for a litter haul, we’re likely in the office escaping the Albuquerque summer heat and covering a whiteboard with ideas for new lectures, collaborative opportunities, or convoluted technical rescue problems. Truthfully we spend the entire year planning and prepping for this singular behemoth of a program and do so for a really important reason; we strongly believe the diploma holds the potential to change the face of rescue in the U.S.

So, what shape-shifting face-lift are we looking for? We believe that rescue teams across the U.S. need to evolve by excelling both as thoughtful rope rescue technicians and as advanced wilderness medical providers. In order for this evolution to take place across the nation, we need a strong base of leaders. These leaders model the integration of quality medical care with elite, non-medical mountain skills, and demonstrate the capacity to medically manage remote emergencies while also addressing technical rescue problems and mountain hazards. We envision that the graduates of our DiMM programs become these leaders and return to their respective corners of the U.S. to stimulate a ground-up progression of our discipline.

We have been graduating these leaders from our program since 2012. Just last year, 22 students successfully earned their Diplomas in Mountain Medicine. 2015/2016 also marked a major milestone in the evolution of our curricular options, with the completion of our first ever Online + Seminar format of the curriculum. Historically, our courses were embedded within the traditional
SILVERTON Colorado

The Flight For Life helicopter crew poses with our Winter DiMM class in front of their Asstar helicopter. Flight For Life has collaborated with Silverton EMS and the local SAR teams to provide rapid response for avalanche rescues.

our Winter DiMM crew joined Silverton EMS, Silverton Avalanche School, and Flight For Life Colorado in the San Juan Mountains for an interagency avalanche rescue simulation.

We also had two fantastic mountain medicine leaders visit our Summer DiMM course in May. First, Dr. George Rodway, president-elect of the UIAA Medical Commission and co-director of the WMS DiMM program, flew in to participate in the first few days of coursework and gave an inspiring presentation on real-world opportunities for DiMM graduates. Later, Dr. Alan Oram, IFMGA Mountain Guide and Medical Advisor to the American Mountain Guides Association (AMGA), drove down from the Tetons to participate in the back half of the course at the Enchanted Tower near Datil, NM. After cruising some world-class sport climbs on the tower, he then demonstrated the AMGA rescue drill, which utilizes standard climbing equipment only to rescue injured clients from multi-pitch rock climbs.

From my perspective, discovering and fostering these collaborations is the most exciting part of being on the faculty side of the table at the IMMC. Our DiMM program has a solid track record of converting students to colleagues and outside professionals to collaborators, which propels us farther forward each year. What am I looking forward to in 2017? The ideas and challenges that none of us have thought up yet.
In October of 2015 the University of New Mexico collaborated with the University of Insubria, located in Verase, Italy to hold a joint conference in Albuquerque, NM on Mountain Emergency Medicine with practical sessions held at the Grand Canyon, Arizona.

**Collaboration with the University of Insubria, Italy**

Jason Williams

It was a chance encounter 6,000 miles away from Albuquerque, NM, that led to a remarkable collaboration and cultural exchange. In the summer of 2014 I walked into a room at the World Congress on Mountain Emergency Medicine held at the European Research Academy in Bolzano, Italy. I sat next to a lively Italian thoracic surgeon by the name of Dr. Luigi Festi. It turned out that Dr. Festi ran a Masters degree Diploma in Mountain Medicine program in Italy. We shared stories of our classes, the mountains, and fathomed the potential of collaboration between respective programs. Light-heartedly, I told Luigi that he should bring his students to New Mexico for a week. To my surprise, without hesitation, he said, “Yes, we will come to New Mexico. I think we will come in October, and I will bring all 19 students.” You can imagine my shock!

**October 5th to October 11th, 2015**

Nineteen physicians from Italy, Slovakia, Chile, Brazil, and the Netherlands came together in New Mexico for a week of conference and practical training in Mountain Emergency Medicine. After a hand full of trips to the Albuquerque International Sunport, the group assembled on Monday at the UNM Department of Emergency Medicine for an afternoon of lectures. The timing of the trip was fortuitous as many participants saw the sky filled with hot air balloons that were flying as a part of the Albuquerque International Balloon Fiesta. On Wednesday morning we packed the vans and headed out to the Grand Canyon National Park. Our existing collaborations with Grand Canyon National Park Emergency Services made this a prime destination to conduct practical exercises, ranging from utilizing an iStat for heat related illnesses to high angle rescue scenarios to a
In the end we left feeling grateful to host such an exceptional group. Memories of early morning trips to the balloon fiesta, engaging lectures, hot hikes in the Canyon, exhausting rope rescue scenarios, sunsets on the South Rim, and ear-to-ear smiles will forever be in our minds.

Photos & video do these days justice: https://vimeo.com/143669849

**March 2016**

The Alps - the birthplace of modern mountain emergency rescue. At some point every climber and rescuer should take a pilgrimage to this beautiful land. Riding on the coat tails of Dr. Festi, in March of 2016 Dr. Darryl Macias and I traveled to Italy and France where we instructed and participated in a continuation of the University of Insubria Masters in Mountain Medicine program. It was great to be back in Europe, but seeing the same 19 students that traveled to New Mexico almost a year earlier was incredible. We began our travels at the University of Insubria in Verase, Italy just a half hour outside Milan. Luigi gave us a tour of the campus and hospital including their state of the art surgical suites.
Standing outside the University we saw the Alps calling in the distance. We gathered in a bus and headed to Chamonix, France, which sits on the Italian and French borders. The two countries literally separated by the highest peak in the Alps, Monte Bianco, (Italian) aka Mont Blanc (French).

In Chamonix, we conducted lectures at the Training Institute on Mountain Medicine Research and went for an afternoon ski. Dr. Buddha Basnyat, President of the International Society for Mountain Medicine, joined us for the travels and gave several thought provoking lectures along the way. On the Italian side of Monte Bianco, the next day in Courmayer we participated in lectures and practical sessions at the Mountain Foundation, a non-profit group dedicated to safety in the mountains. On the last day, back in Milan, we gave a lecture at the Mountcity festival, an annual festival in Milan dedicated to mountain culture. The theme there was on safety in the mountains. The Europeans certainly have learned how to balance adventure and exploration with safety and prevention.

The continuation of this cooperation has marked a milestone in international collaborations for the IMMC. We anticipate this is just the first of many opportunities to engage other leaders of mountain medicine from around the world, sharing ideas and pushing the standards for medicine and rescue in the mountains.
Some will recognize Koh Phi Phi as one of the locations devastated by the Indian Ocean tsunami that took place in December of 2004. Considered to be the world’s deadliest tsunami, the natural disaster left over 230,000 dead across Southeast Asia\(^1\). Just over 10 years later, the island located in the Andaman Sea off of the Southern coast of Thailand barely shows evidence of the catastrophe.

It was here that my climbing partner and I set out for some sunrise sport climbing. The limestone cliffs of the Tonsai Tower stood before us, mildly illuminated by the morning glow as the sun crept above the horizon. Hoping to get off the ground before the crab-eating macaques awoke to harass us, we roped up.
NUTS & BOLTS: Inside Bolt Corrosion

We opted for a moderate two-pitch climb that ended with a comfortable belay in a shallow cave. Upon starting up the second pitch, we found the climb to have two bolt lines side-by-side. The right-most line was composed of what appeared to be properly recessed ring bolts, very slightly corroded, with the sworn by RE-500 red Hilti glue. The left hand line sported what appeared to be a stainless steel U-bolt, no visible corrosion, held in by an unrecognized adhesive. Unsure of what to clip and what not to clip, we opted to bail from the climb in favor of mimosas on the beach.

The Problem

In the 1990’s, climbers in Thailand observed failure of stainless steel expansion bolts under body weight alone. These failures were especially concerning given that some bolts were failing after less than one year of being placed. Metallurgist Mike Shelton traveled to Thailand to lend his expertise to the issue and suggested that the primary issue was the material of the bolt [2]. Further investigation revealed that a process known as Stress Corrosion Cracking (SCC) was at the root of the problem. The expansion bolts that are so near and dear to our climbing hearts in the continental US are the prime candidates for SCC. Stainless steel, regardless of the grade, retains inherent stresses within the metal that take place during the manufacturing process. When the bolt is put under constant tension, as is the case with expansion bolts, the bolt is made especially vulnerable to corrosive conditions [3]. The fluctuating humidity, high ambient temperatures, and presence of chloride from the seawater make the magnesium-rich limestone cliffs of Southern Thailand the prime environment for SCC. To make matters worse, this type of corrosion typically occurs at the rock/metal interface, hiding it from view of the unsuspecting climber. For all intents and purposes, clipping expansion bolts in this environment could be considered on par with the risks of free solo rock climbing with an added false sense of security.

The Solution

To avoid the issues of SCC, fixed protection would need to avoid a number of the aforementioned factors. Climbers began to use glue-in (resin) bolts. This afforded a couple of advantages. First, glue-in bolts are held in by an adhesive, thus avoiding the tensile stresses that are inherent with expansion bolts. Second, the adhesives used for glue-in bolts could create a water-tight seal around the bolt, allowing for less of the corrosive chemicals to contact the metal. This latter aspect is particularly true when using an epoxy resin, such as the waterproof red glue produced by Hilti. All of that being said,
A display at Tonsai Basecamp shows the various types of bolts that are found throughout the area. The three bolts on the left are made of titanium whereas the rest are various types of steel. Note that many of the bolts do not have any identifying information on them.

Photo: Trevor Mayschak

**Nuts & Bolts: Inside Bolt Corrosion**

Stainless steel glue-ins are still at risk for corrosion. As such, the climbing community has adopted the use of titanium glue-in bolts. Accelerated corrosion testing at the University of Colorado showed that a 316 stainless steel hanger would crack in under 5 hours, whereas a titanium bolt under similar conditions would remain unaffected for 28 days. A large rebolting effort called the Thaitanium Project has undertaken the task of replacing all of the old stainless steel bolts, expansion and glue-ins alike, with titanium glue-in bolts.

**Limitations**

Although this is a good solution, there are a few limitations that should be recognized. Glue-in bolts are inherently more challenging to place than expansion bolts and have a greater potential for error. Take, for example, an area in Railay known as Duncan’s Boot. This area of the Phra Nang Peninsula sports a number of Petzl glue-ins that, to the naked eye, may look solid. Unfortunately, the individual that bolted these climbs used a 10mm drill bit for the 10mm bolts. A glue-in bolt of 10mm diameter requires a hole of at least 12mm in diameter to accommodate the glue; otherwise, the glue will be pushed out upon insertion of the bolt, leaving very little adhesive in place.[4]

Another error in the glue-in process is cleaning out the bolt hole. According to Lightner Jr., the individuals that rebolted a climb called Kratoy in the Muai Thai area failed to follow the manufacturer’s recommendations for cleaning the bolt holes. Slow pull-testing of glue-in bolts has shown that bolt holes cleaned out by a blower have a pull-out force of 10.4 kN compared to 34.7 kN for those that are blown out, brushed, and blown out again.[5] In addition to the number of errors that can occur when the bolts are placed, recognizing what makes a good glue-in bolt can be extremely challenging. The majority of bolts do not identify the manufacturer or the material.

**Slow Pull-Testing of glue-in bolts.**

Top: Hole blown out with blower. Failure at 10.4 kN. Middle: Hole blown out with compressed air at 8 bar. Failure at 15.3 kN. Bottom: Hole blown, brushed, and blown with blower. Failure at 34.7 kN. [5]
used. Considering that corrosion oftentimes takes place out of sight, identifying weak bolts can be anything but intuitive.

**The Bottom Line**

It might be tempting to think that these issues are far from home, especially if you live in a region of the states as dry as the Southwest. It’s important to recognize that the type of bolt corrosion that occurs in Thailand happens all over the world. Areas such as Thailand, Italy, and Greece certainly have a higher risk of bolt corrosion, but this type of corrosion occurs even in the driest of climates, albeit at a slower rate. The UIAA recently released a document outlining a number of variables that play into bolt corrosion, from environmental factors to the grade of the metal used[^6]. It should also be known that a similar type of corrosion can occur when the alloys used between the hanger and the bolt are different. Known as galvanic corrosion, the electric potential between two dissimilar metals can cause rapid corrosion to occur. This is most common when a stainless steel hanger is placed on a zinc-plated bolt[^7]. This type of corrosion occurs out of sight at the bolt/hanger interface, making it challenging to identify. At the end of the day, climbers need to recognize that the potential for bolt failure is always present. Never put yourself in a situation where you’re relying on a single bolt. When traveling to climb, chat with the local guides and look into up-to-date guidebooks to get the beta on safe climbs. And if you’re ever in doubt, just don’t climb it. ■

[^6]: UIAA Document on Bolt Corrosion
[^7]: Galvanic Corrosion in Climbing
Recognizing someone with a life-threatening hemorrhagic injury in the austere environment is critical to ensuring that individual's survival, and quick decision-making and treatment is essential.

Injuries that are visible externally are easiest to spot, and are usually more effectively treated in the field setting. Common external injuries that are sources of major bleeding include large lacerations to the face and scalp, open fractures of long bones, traumatic extremity amputations, and soft tissue wounds deep enough to damage veins and arteries. If the location of the injury allows, applying direct pressure to the wound is recommended. If this is successful in controlling bleeding, a pressure dressing can be an effective means of maintaining direct pressure on the wound continuously in order to facilitate extrication and evacuation. This may not be possible in the case of large extremity injuries or fractures. In these instances, a tourniquet should be applied proximal to the injury. While a tourniquet can be improvised, a manufactured tourniquet designed for this purpose is recommended and should be carried by anyone spending time in a remote setting. If application of a tourniquet does not stop the bleeding, then a second tourniquet should be applied. Once applied, tourniquets should not be removed. Prompt extrication and evacuation is essential.

Internal injuries can also cause hemorrhaging, but are more difficult to recognize in the austere environment. These injuries require rescuers to make a presumptive diagnosis based on the subject's mechanism of injury, chief complaint, and vital sign instability. A patient with suspected internal bleeding must be promptly extricated and evacuated. In the meantime, the patient must be kept warm and protected from the elements. In multi-system control, control external sources of bleeding. Ensuring that the patient is oxygenating and ventilating appropriately is key. This may mean performing other interventions such as needle decompression of a suspected pneumothorax, or performing airway...
management. If it's possible that the patient has suffered a pelvic fracture, a pelvic binder should be prophylactically applied. Limiting IV fluid resuscitation will help prevent the patient’s clotting factors from becoming diluted.

Auxiliary treatments for the patient with significant bleeding include topical hemostatic agents and tranexamic acid. Topical hemostatic agents are helpful in the management of soft tissue injury with significant bleeding. Tranexamic acid can be administered in the setting of many different sources of life-threatening hemorrhage, but must be administered within the first 3 hours after injury, and requires IV access.

No matter the type of injury or source of hemorrhage, the injured subject requires swift action on the part of the rescue team to prevent morbidity and potentially mortality.
Upcoming Courses & Events

**WILDERNESS FIRST AID**  
**July 20, 2016**  
**Location:** Silver City, NM

Using our hybrid format, this class combines 8 hours of online, self-paced content with 8 hours of in-class practical training. Graduates will receive a Wilderness First Aid certification, valid for 2 years. Course fee: $775

**7TH WORLD CONGRESS OF MOUNTAIN & WILDERNESS MEDICINE**  
**July 30 - Aug. 4, 2016**  
**Location:** Telluride, CO

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. This collaboration between the International Society for Mountain Medicine and the Wilderness Medical Society is sure to be a great opportunity to learn about what’s on the cutting-edge. Our faculty will be providing workshops on backcountry ultrasound as well as technical rescue/medical simulation. Visit www.wms.org for more information!

**DIPLOMA IN MOUNTAIN MEDICINE - FALL SEMESTER**  
**Aug. 22 - Dec. 16, 2016**  
**Location:** Albuquerque, NM

This fall semester, learn how to adapt your medical training to the mountain setting and complete the first half the Diploma in Mountain Medicine. Open to paramedics, nurses, midlevels, and physicians, students may enroll for either 9 college credit hours or may pay for certificate only. Classes will be held regularly every Thursday from 1-4pm with the occasional weekend trip to different locations throughout the southwest. Contact us for more information!

**WILDERNESS FIRST RESPONDER**  
**Sept. 6 - Oct. 29, 2016**  
**Location:** Albuquerque, NM

Using our hybrid format, this class combines 40 hours of online, self-paced content with 40 hours of in-class practical training. Practical sessions will take place on Tuesday & Thursday evenings from 6:15 to 8:45 on UNM North Campus and in Open Space areas of Albuquerque. Graduates will receive a 2-year Wilderness First Responder certification and will be eligible to license as a First Responder within the state of New Mexico and nationally as well. No previous medical training needed! Course fee: $575

**WILDERNESS FIRST RESPONDER - REFRESHER**  
**Nov. 12, 2016**  
**Location:** Albuquerque, NM

Join us to renew your Wilderness First Responder certification! This course combines 16 hours of online content with an 8-hour in-class practical session to train WFRs in current best practices at the basic life support level. Additionally, this course awards licensed EMS providers with 24 hrs of continuing education to renew their licenses. Course fee: $200

**WILDERNESS FIRST AID, WILDERNESS FIRST RESPONDER, & WILDERNESS EMT UPGRADE COURSES**  
**Spring 2017, Dates TBA**  
**Location:** Albuquerque, NM

Wilderness Medicine courses of all level will be held throughout the spring. Let us know if you’re interested so that we can keep you up to date as we finalize the schedule!

**DIPLOMA IN MOUNTAIN MEDICINE - SUMMER SEMINAR**  
**May 6 - 14, 2017**  
**Location:** Albuquerque, NM

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

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**NEED A CLASS??**

Are you a member of a group looking for wilderness medical or rescue training? Be it a recreational group or SAR team, our faculty can provide tailored courses to meet your specific needs. Contact us to discuss options!

**FOR MORE DETAILS ON OUR COURSES, VISIT OUR WEBSITE HERE!**
REFERENCES

Nuts & Bolts


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