

MOUNTAIN MEDICINE SOCIETY OF NEPAL



NEWSLETTER

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Message from the Editors

Hello mountain medicine enthusiasts,

Hope you all are doing well amidst your busy schedule!

We are happy to share MMSN's Newsletter for the year 2023, which we have curated over the past few months. We are indebted to the Executive Committee for their constant support, and to our contributors whose literary articles have filled our pages.

A successful academic has two distinctive qualities: a) can think abstract concepts and b) share ideas through written and verbal medium. Our mission with this particular Newsletter is to help medical students and doctors share interesting cases and book reviews, and help them foster their writing skills.

Effective science communication lies at the heart of science practice. When interest groups like ours sit to have scientific discussions and share ideas, the whole becomes greater than the sum of its parts. When we write articles, present in journal clubs and conduct scientific discussions with a group that has diverse background, we cultivate the habit of negating each other's blind spots.

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MMSN Beginnings

Narrated by: Prof. Dr. Buddha Basnyat, Md, MSc, FACP and Dr. Pritam Neupane, MD

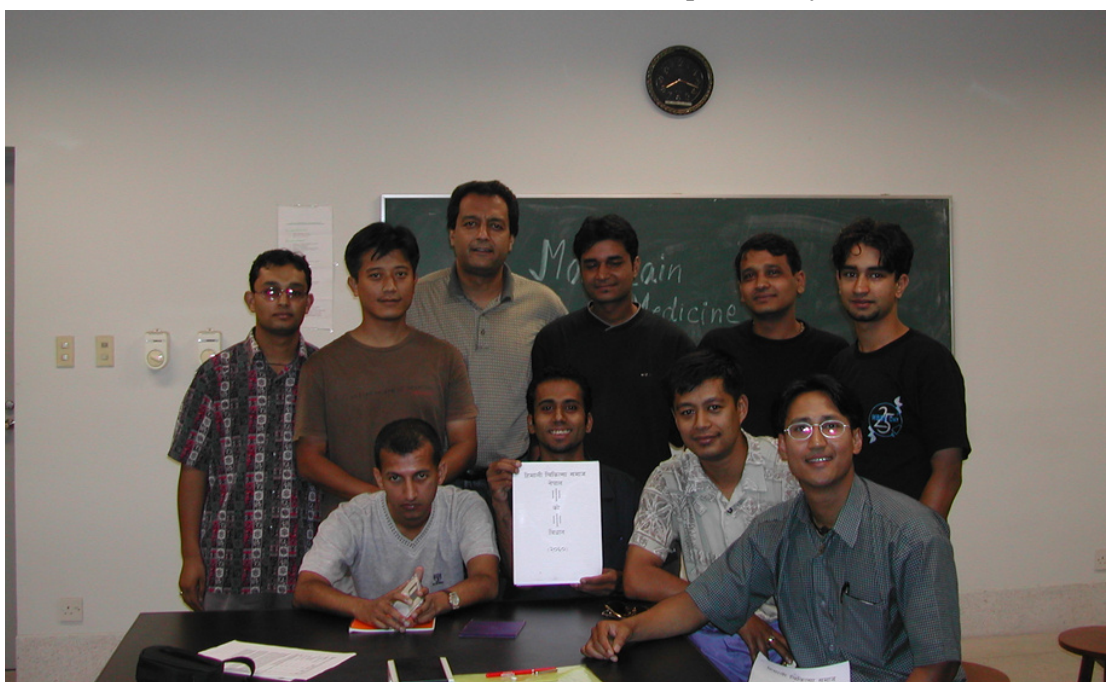
Written by: Dr. Suraj Shrestha, MBBS and Dr. Kshitiz Shrestha, MBBS

Teaching in the Western world is a little different than our methods of teaching in Nepal. We, being a resource-poor country, like many other countries in this region, rely on others' ideas and work to learn from them. While we do well in mathematics and science compared to our contemporary school students and college students in the West, our learning is based on repetition rather than on critical thinking. So, it comes as a surprise when we get exposed to the economically developed world's methods of teaching. One such example was Dr. Buddha Basnyat when he was doing his internship in Internal Medicine at Foothills Hospital in Calgary, Canada in 1981. The idea of a Journal Club was quite new to him which he enjoyed and took to his heart. He was itching to incorporate something similar in Nepal, where he returned to in 1984. He was a teaching faculty in the Physiology Department at Maharajgunj Medical Campus and also was a consultant at Patan Hospital.

Fast forward to the year 2001 and Dr Basnyat was appointed as the president of the International Climbing and Mountaineering Federation (UIAA) Medical Commission, a worldwide body that aims for safety in the mountains. Most countries had their academic mountain societies to conduct research and to provide authority and expertise in the area of high-altitude and wilderness medicine. Dr. Basnyat saw a clear opportunity to have our mountain medicine society in Nepal. Fate had it that he met Dr. Pritam Neupane during a night shift in Patan Hospital. They brainstormed a bit during a short downtime that night and that was the night that led us here today.

The Inception

Many researchers come to Nepal every year to conduct research in the high-altitude areas in Nepal. In the 1990s, Dr. Basnyat made several trips with Dr. Annalisa Cogo and other Italian doctors to the Pyramid Research Center in Lobuche for various high-altitude pulmonary research.



Picture details: First row (left to right): Sajeew Uprety (18th batch, USA), Pritam Neupane, (16th Batch, holding the Bidhan, USA), Sharad Tamrakar (13th batch, Australia), Santosh Pradhan (16th batch, UK).

Second row (left to right): Debish Pyakurel (20th batch, Nepal), Puncho Gurung (16th batch, USA), Dr. Buddha Basnyat, Nepal, Sanjay Yadav (16th batch, USA), Bhabishwor Tiwari (16th batch, USA), Prajwal Pant (20th Batch USA).

Similarly, in the year 2002, another research group arrived in Nepal for conducting high altitude research in the Everest region. The Project was called the 'Silver Pyramid Project'. They had wanted a Nepali doctor to be part of the research group. They approached Dr. Basnyat. Dr. Basnyat, buried under his other obligations, diverted the idea to Dr. Neupane to accompany the Silver Pyramid Project team. Dr. Neupane gladly accepted this opportunity. This experience was an eye-opener for Dr. Neupane in terms of exposure to research. Organizing to form a society of our own to share ideas and conduct research gained more steam from there onwards. Dr. Neupane along with his batchmates Dr. Sanjay Yadav, Dr. Puncho Gurung, Dr. Santosh Pradhan (IOM 16th batch), Dr. Prajan Subedi, Dr. Prajwol Pant (then medical students, IOM 20th batch) among others, assembled in their hostel room C-2 and started working on the idea of an academic society. They recall firmly believing that Nepalese doctors should all in fact be the experts on high-altitude medicine. There was a big debate on the nomenclature of the organization. Initially, an idea from Dr. Neupane was to call it MMASN (literally pronounced Masaan in Nepali, which meant a graveyard). So, the group settled on MMSN. Dr. Basnyat served as the President of the organization and Dr. Neupane served as the Vice President for the beginning days of MMSN.

The Journey

Early on, MMSN had two main objectives. The first was to disseminate information regarding MMSN to popularize high-altitude medicine and research among medical students and doctors. The second was to rapidly get these folks educated on basic high-altitude literature. The team started with a slurry of local conferences. A Journal club was held every month to discuss the important trials in high-altitude medicine. Then there was a large conference organized by MMSN, the venue being the basic science building, where all medical schools in Nepal at that time were invited to present their research and to learn about MMSN. It was a big success and they had only positive feedback and encouragement.

Most of these conferences were supported by the then-popular pharmaceutical companies, namely DJPL and SIMCA. The Journal Club became the signature offering of MMSN for young doctors and students who were encouraged to think critically when presenting the chosen article and to dissect it all the way, learning about methodologies and limitations. Dr. Basnyat felt that this was helping us get away from the rote learning which was our style in Nepal at all levels. A provisional plan to open branches in other medical schools was proposed, but that concept ran out of momentum due to various limitations. Regardless, students were getting excited about MMSN and joined in hoards with good turnouts in conferences and journal clubs.

Around this time, MMSN went international. There was a South Asian Conference called for by MMSN. Scholars from India, Sri Lanka, and other south Asian countries attended and exchanged ideas on high-altitude medicine. There was a large attendance from our students. Gazing at the feedback we received, we were doing well from an academic and organizational standpoint. There were some bright students from Nepal Medical College and other medical colleges who contributed significantly to the project's success.

MMSN then started taking on some routine responsibilities. One of them was the Gosaikunda medical clinic during the Janai Purnima festival. Himalayan Rescue Association (HRA) has always taken a medical team to Gosaikunda for the Janai Purnima festival. MMSN joined the team with doctors from around 2001. MMSN always involved a student in the group to help build up the pool for the future. Dr. Basnyat had taken medical students from Maharajgunj Campus (where he taught physiology) in 1991 to Gosaikunda to study high altitude sickness in the pilgrims. The names of the medical students were: Rajendra Koju, Dhan Bahadur Shrestha, Bijendra Rai, Jagat Chhetri, Prakash Karki, Shailesa Malla, Sunil Shrestha, and Akshya Gautam. An important article resulted from this trip (1). This is now an open-access article on PubMed (published in 1993) for the first time illustrated the fact that altitude illness is a life-threatening problem not only for Western trekkers but clearly also for the local population.

MMSN group later conducted a children's study in Gosaikunda which was published and is routinely cited (2). With this, Gosaikunda continues to be an excellent opportunity to experience high-altitude medicine with its natural cohort of lowland pilgrims acutely exposed to high altitudes.

Unequivocally, another huge milestone for MMSN was the initiation of Diploma courses in Mountain Medicine in 2011. While MMSN had always envisioned the idea of an educational course, it really started taking shape after several meetings with Dr. David Hillibrandt.

Dr. Hillibrandt is a British General Practitioner, who had suggested the idea of bringing a Diploma program to Nepal. Dr. Mani Raj Neupane spearheaded this project. He and Dr. Suzi Stokes traveled to choose a training site for the course and laid the groundwork for the program in 2010. This Diploma course continues to be a successful program in teaching high-altitude medicine and rescue skills to local and international candidates. 2003 onwards, MMSN members were routinely involved in various research projects. One was the Acetazolamide dosing trial in the Everest region (3).

Another one was a large Japanese study on gene polymorphisms in the Everest area. The principal investigator and her Japanese mentor professor of this study shared their findings in our Mo He Go building with MMSN. New batches of smart and enthusiastic doctors and students continued to join MMSN and continued to nurture MMSN with their ideas and efforts. In 2009, a conference entitled Snakes, Bugs, and Altitude was conducted with the help of Dr. Andrew Pollard from Oxford University in which Professor David Warrell and David Shlim also took part at the Hotel Yak and Yeti. Dr. Kamal Thapa (current vice-president of MMSN) spearheaded the organizing this program on behalf of MMSN. Another memorable event was the 2018 International Society of Mountain Medicine (ISMM) World Congress in Kathmandu. By then, Dr. Santosh Baniya and the current group of executive members were running the organization.

MMSN is truly a delightful story and is our success story. We need to keep this as the forum to generate and debate ideas and take high-altitude medicine to newer heights.

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Project Khumbu – Bringing Medical Imaging and Artificial Intelligence to the Himalayas

Prof. Dr. Saurabh Jha, MD

Q. Dr. Saurabh, tell us what motivated your team to take Radiology and AI to the Everest Base Camp?

A. In remote areas in LMICs, imaging does more than just diagnose disease. Sure, it's important to know if the patient has pneumonia or cancer. But the overarching question is whether the patient needs evacuating immediately for treatment. The consequences of false positives – unnecessary evacuations – can be catastrophic.

Evacuations are expensive and dangerous. Because there are no roads in the Khumbu, the Sherpa settlements in the shadows of the Himalayas, sick patients must be flown to city hospitals. Flights are too expensive and can be dangerous because weather at altitudes between 9,000 and 18,000 feet is unpredictable. Imaging is a medical evacuation triage and has value beyond getting the right diagnosis.

Q. Tell us more about the technologies themselves and why they were suited for this expedition.

A. My wilderness diagnostic first aid kit would include ultrasound, x-ray, and AI. Ultrasound is nifty, and light, but operator dependent. We have been spoiled by CT and MRI and have forgotten the value of the chest X-ray, which is particularly handy at high elevations where people can get life-threatening conditions such as high-altitude pulmonary edema, amongst other things, not to mention TB which is sadly still endemic and does not respect altitude or remoteness.

The challenge with X-ray machines is that they can literally be machines. Historically, we have always endeavored to take machines to patients. Marie Curie designed vans that took X-ray machines to the battlefield in World War One. And now portable machines go to the ICU. But these “x-rays-on-wheels” contraptions are unsuitable for rocky mountain terrain.

As technology evolved machines got smaller and now they're so small that they fit inside backpacks - Which

is kind of poetic. Getting to EBC is no longer the expedition it once was— any gap year backpacker on a shoestring budget can get there. It's only apt that now we can carry X-ray machines in backpacks!

In remote areas, forget radiologists there aren't even doctors, often just paramedics or enthusiasts with first aid knowledge. AI is helpful because it answers big questions: is there consolidation or pulmonary edema? Is the scan normal or abnormal? AI is a diagnostic band-aid and can be surprisingly useful in constrained situations. Diagnostic nuance can always come later. The marriage of equipment and AI, which is what MinXray and Qure.AI have done, is essential to improving access to imaging in remote areas.

Q. Did your effort succeed? What did you accomplish?

A. It's too soon to do a victory lap as there's much still to be done, but yes, we took an X-ray at the Everest ER, which is run by the Himalayan Rescue Association, a make-shift hospital in a tent at Everest Base Camp, the highest hospital in the world. So, we may have taken an X-ray at the highest elevation. You can't count the International Space Station because that'd be unfair! It's certainly the highest point a medical AI algorithm has been used.

Despite technological progress, imaging is still conspicuous by its absence in many parts of the world. We pushed imaging's geographical boundaries. By taking a radiograph and using AI at Everest Base Camp, perched at 18,000 feet, we pushed the boundaries of possibilities for imaging. This is symbolic. If X-rays can reach base camp, there's no reason they shouldn't be available in rural India, Pakistan, and Nepal.

Everest is etched in the popular imagination and is popular amongst hikers and climbers across the world. The Everest trekking route is important for the commerce and livelihoods of the Sherpas. Tourism and dare I say, “let me discover myself” narcissism that's so common amongst the privileged, benefit the indigenous Nepalese. We leveraged this route to raise awareness about the absence of imaging in remote areas.

Our goal was to create energy, a buzz, about medical imaging and AI. Whether the buzz will light a forest fire remains to be seen. I believe we generated excitement. Project Khumbu, a partnership between Penn Radiology, Nepalese physicians, and tech, is a unique partnership. Access to imaging can't be improved without private industry, who are problem solvers. Project Khumbu recognized their importance. We brought Nepalese policymakers and global problem solvers to the table.

It's good optics for private industry to be involved in LMICs. Far too many are fighting each other for the spoils of the lucrative American market, hardly distinguishing themselves scientifically or morally. Hopefully, collaborations like Project Khumbu will make private industry realize it may indeed be lucrative in the long run for them to pay attention to LMICs.

Q. Thinking about primary and rural health care, radiology is not available in most LMICs. What needs to happen for digital radiology and AI to be accessible in such settings globally?

A. Several things need to happen. First, we need to change mindsets. Imaging is still viewed as a first-world medical indulgence. I can see why – pretty pictures from CTs and MRIs make imaging seem like medicine's final frontier. It's important not to fall for the reverse Marie Antoinette fallacy – where we advise LMICs to stick to bread and not ask for cake. The thinking goes like this. Focus on things like mosquito nets, sanitation, and cholera. Worry about imaging later. But imaging isn't "cake". It's bread and butter. As you have said before, the chest radiograph should be part of the essential rural diagnostic kit, like basic blood tests are.

"Imaging saves lives" is a dull corporate platitude in the US and Canada. In places like Nepal, imaging does save lives. One example is ultrasound for high-risk pregnancies. Nepal's famous rural physician, Dr. Mingmar Sherpa, has taught ultrasound to nurses in Western Nepal. His teaching has measurably reduced maternal mortality from complications such as placenta previa, by early diagnosis and referral.

We need to democratize imaging to non-experts. By non-experts, I don't just mean non-radiologists, I mean non-doctors.



Project Khumbu in action.

Photo credits: Dr. Saurabh

I mean nurses, paramedics, midwives, the local Hakeem. There simply aren't enough doctors and they're mostly unwilling to live in remote areas, except for short bursts. This is understandable. You can't send your kids to the best schools if you live in Mustang, Western Nepal, which is still frozen in the fifteenth century. You can in Kathmandu. In order to democratize imaging, we need AI for extra interpretive help. Nevertheless, to attract early career physicians to remote areas, rural medicine needs to be an academic discipline with defined trajectories, opportunities to publish, and opportunities to pivot to different fields later. Concurrently, radiologists need to develop "rural radiology" with a view to augment imaging in rural areas with AI's help. Radiologists are too busy charting disc bulges on spine MRIs! They need to become more relevant.

Finally, and I know this is your pet peeve, price. Equipment needs to be cheaper. We can't rely on the industry's goodwill. Rather, we must leverage economies of scale. Vendors should be given exclusive contracts from LMIC governments, monopolies of sorts, in exchange for a graded reduction in price which would be inversely proportional to the number of units purchased. Counterintuitively, prices are more likely to be reduced with monopolies than the competition, providing monopolies come with pricing stipulations.

Journal Clubs

Prof. Dr. Buddha Basnyat, MD, MSc, FACP

Since the early 2000s, we have officially carried out monthly journal club meetings on the TUTH premises, usually in the basic science building. It has been transformative for the young doctors and medical students who present medical journal articles because the presentation is usually not a set of learned facts like talking about gastroenteritis or coronary artery disease. In the MMSN journal club, the presenter usually presents an article (often a randomized controlled trial) performed at high altitudes. The presenter has to try to be critical at every step and not necessarily heap praise on the article. This approach gets the critical appraisal part of the brain working which is the main focus of the journal club.

I try to be present in most journal clubs and listen intently to the presenter. Most of the people who present have spent at least about 8 hours (rough estimation) trying to critically look at the article and then make a critical summation in front of the audience which usually consists of their eager peers (except for me, haha)

For many, this kind of presentation is the first in their lifetime. I have a great time listening to these presentations because I can see that some presenters are natural at this while others have to work harder. Regardless, the presentation became interesting as I waited to listen to the limitations of the study in question: for me, the most important part of the presentation. We want the presenters to add their critical appraisal in addition to what is written in the article.

In our system of teaching in Nepal (at least so far as I know), there is an overemphasis on memorized text. Although a sharp memory is always very helpful regardless of how young or old you are, critical thinking is essential. I tell these young doctors and medical students that their enormous talent will go to waste if they just confine themselves to learning facts that someone else figured out first. By assessing the article being presented and not “buying” everything they are telling you, you are already on the path to being a research scientist. Or at least you have taken the first steps to achieving this.



Dr. Krishna Kandel presenting an article in one of our Journal Club session in front of Prof. Buddha Basnyat and Dr. Ken Zafren

When you have your questions about the article, I tell them, and then the presentation becomes interesting both for the presenter and the audience. If you just need bare facts, you can just check out Up to Date and the aim of our journal club is completely different from just amassing bare facts. I can see the relief in the presenter after they finish the presentation. Many put their heart and soul into this and want to do a good job, and most do.

When we first introduced the Journal Club to the first-year medical students studying physiology at IOM, Maharjgunj, this was in the early 1980s. This predates the MMSN journal club of the early 2000 but is directed at the same audience but much less frequently than now. I had been so enamored by the journal club that Bill Whitelaw (my MSc thesis supervisor at Foothills Hospital, University of Calgary, Canada) conducted in the pulmonary medicine research laboratory in Calgary that, on my return from Calgary around 1983-84, I felt we needed to have this kind of an approach for the physiology students in Nepal who I was responsible for.

So, since that time (on and off) the Journal Club has, in my estimation, blossomed and hundreds of Nepali medical students and young doctors have profited from this venture. And in the years to come we hope more will benefit by presenting cases at the MMSN monthly Journal Club.

Rethinking Medical Education

Dr. Subarna Adhikari, MD

The year was 2005 and we were in the first year of our medical school. Our teacher was delivering a lecture through a traditional projector (I can not recall the name of that antique device, but one had to prepare the slides on a transparent plastic sheet which you would then project. We do not get to see those projectors anymore) The lecture was clearly boring, like all other lectures are. The slides were too busy and full of information. As I was struggling to take notes with my pen in my paper notebook, a friend of mine took out his brand-new camera phone, zoomed into the slide being projected, and took a picture. It was an awkward moment. Everyone including the teacher stared at him for a moment. I gave him a reproaching look, but he simply shrugged and carried on. Very few people had personal mobile phones in those days, people who had camera phones were even fewer. Those camera phones were anything but smart, and so was our medical education technique.

Fast forward to 17 years later, I am in the third year of my second residency training. A lot of my educational content is delivered online. Many of my academic sessions are either workshops or simulations. I take notes on OneNote while practicing questions to prepare for my board exam. I can search the internet for free online lectures on pretty much everything. I can take free practice tests and quizzes, and develop my own methods of learning. If I am able and/or willing to pay, I have even more options to build my knowledge and consolidate my learning. Like many early millennials, I too get the feeling that I have lived in two very different eras: the era of letters and postcards, and the era of instant messaging. Even as we struggle to keep up with the new technology being thrown at us every single day, technological evolution is relentless and it is here to stay. Notwithstanding the plethora of new information coming one's way every minute, familiarizing ourselves with the basics will make our lives easier and help us learn ways to utilize technology to make our lives easier, most importantly to teach and to learn. Learning can be fun and has to be fun. Lectures over online video sessions are not fun.

But lectures are perhaps best delivered over interactive online video modules, which make you listen, research, and find answers. So, why do we need our teachers? We need teachers to help guide us to learn, and to pick up their brains. Our teachers should be able to answer our questions like: what is the best website that explains the anatomy of the human skull? Where do I find a simple explanation of respiratory physiology? Or our teachers should be able to send/play us a video of a difficult patient-physician interaction and give us five different topics to discuss in the video. Our teachers can create online quizzes and group assignments. These are just a collection of random ideas that came to me while I am sipping my tea and writing this article. There could be thousands of other creative ways to enjoy the learning process.

How is this article relevant to MMSN and why does it find room in the MMSN newsletter? MMSN is a lot of things, but at its core, it is an academic institution. Most of our activities center around learning, be it the journal club, the experience-sharing programs, or hiking for fun, not to leave behind our flagship program NepDIMM. What can we at MMSN do to keep up with technology and rethink our approach to learning. I think we are already doing a lot. In anticipation of the DIMM 2023, we had a training of trainers in 2022. We are looking for ways to restructure the DIMM course so it can be more interactive and learner-friendly. MMSN holds the potential to host many other courses, learning events, and experience exchange events. Every year, our members go out to different health camps, seasonal high-altitude clinics, Everest ER, countless expeditions, and abroad electives and come back with a lifetime's worth of experience. Perhaps we can create logs and inventories of these experiences, scientific and subjective, anecdotal and evidence-based. How can we make this knowledge more accessible to everyone including school students? Is it going to be by increasing our presence on social media, or mainstream digital media? How will we use technology to increase our reach and share our ideas with the world? It is time for us to think and execute on these topics!

Seven Years of Experience at a Rural Clinic: The Mountain Medical Institute

Dr. Abhyu Ghimire, MBBS

Inception

The need for a proper medical facility in a remote yet busy village as Namche Bazar (3500m) cannot be overstated. With the support from Um Hong Gill Human Foundation, The Mountain Medical Institute (MMI) was established and has been serving the local community as well as trekkers since 1st March 2017. At a location where erecting a building was unimaginable, a narrow strip of the slope was manually leveled and construction began for the clinic. The X-ray machine weighing in at over 550 kg was air-lifted to Syangboche and locals carried it on their backs to Namche Bazaar. At the request of locals and with the interest of expanding our services deeper into the mountains, a remote clinic branch was established at Dingboche and has been operational since March 2020.



The X-ray machine weighing in over 550 kgs, was air lifted to Syangboche and locals carried it on their backs to Namche Bazaar.

Our Services

Many porters, guides, and locals have limited financial resources. For these patients, we have provided free treatment. There are no consultation fees for Nepalese locals. Only a bare minimum is charged for medications. This nominal price for medications is a necessary evil. Making them completely free would lead to overconsumption of medicine.

SOME CLINICAL SCENARIOS

A Curious Case of Nystagmus

A 12-year-old boy presented with nystagmus and poor academic performance. He had dropped out of school. On examination, there was nothing wrong with his eyes but a pencil eraser was lodged deep in his middle ear. The pencil eraser had gotten stuck 5 years ago when the boy was only seven. He was taken to a doctor who was unable to remove the eraser using forceps, and was given ear drops to “dissolve the eraser.” The eraser-dissolving ear drops had failed. When other methods of extraction failed, we created a hook using a syringe needle, poked it into the eraser, and extracted the eraser.

In primitive hunter-gatherer times, hearing was necessary to alert humans of dangers in the wild. The auditory sense is crucial for alertness. If the ear is blocked for many years, especially during childhood developmental years, the part of the brain responsible for alertness doesn't develop properly. This boy had suffered from mental retardation as a consequence of an eraser stuck in his ear for 5 years!

Acetazolamide Toxicity Masquerading as AMS

Individuals who are unaware of the common side effects of acetazolamide can easily confuse them with symptoms of AMS. In an attempt to cure themselves of AMS, they take more and more acetazolamide, which further worsens the side effects. Increased consumption can cause toxic levels to accumulate causing metabolic acidosis, increased diuresis, and electrolyte imbalance. Patients present with symptoms like breathlessness, nausea, confusion, headache, paresthesia, anorexia, abdominal cramps, flank pain, tremors, and muscle cramps.

COVID-19 Outbreak

COVID-19 presents in a peculiar way in the mountains. It's all nice and calm when suddenly there is a sporadic case, and before you know it, the whole village gets infected. A medical response team has to be promptly organized and dispatched to the place where the outbreak has happened, which might be a few day's walk from the nearest clinic. On one such occasion, a patient was suffering from COVID ARDS (SpO2 30-40%) and needed immediate transfer. Sadly the weather was not favorable and we didn't know how long it would take for the requested helicopter to arrive. The patient needed Oxygen until evacuation was possible. There was no standby Oxygen in those remote villages. A simple experiment was devised based on the fact that oxygen aids combustion whereas nitrogen is an extinguisher. We held a burning matchstick in front of the hose of the respective cylinders and as expected, the flame burnt with much vigor for oxygen whereas it was instantly put out by nitrogen. We mounted this huge oxygen cylinder (approximately 70kgs) onto a stretcher. With the help of local youths and the police, we took turns to carry this up the mountain, to the patient. The patient barely pulled through the next 2 days. Finally, there was a weather window and the patient was evacuated to a tertiary care center in Kathmandu.

Vagal Manoeuvres successful in AVRNT

In another patient, arrhythmia lasted for 6-7 hours and there were multiple syncopal attacks. Since we had no Amiodarone or any other emergency cardiac medications, we had to resort to carotid massage, Valsalva maneuver, and cold water to face. Thankfully the heart reverted to sinus rhythm. The patient was helicopter evacuated and received at Shahid Gangalal Heart Centre in Kathmandu where an ECG was done which was normal, as it should be since the arrhythmia had already reverted to normal. The doctors there dismissed the case and said the doctor at Namche was wrong and there was no heart problem at all. I received an angry call from the family who had to go through a lot of trouble to Heli evac a misdiagnosed case. With much difficulty, we convinced the family to at least get a cardiac echo and X-ray done.



Dr. Abhyu Ghimire in front of the Mountain Medical Institute

Vitamin Deficiency in the Mountains

This patient presented with complaints of his hands assuming an unusual position. He denied pain. He had a history of “depressed mood” and generalized weakness. On being asked about his appetite, his response was “I am very hungry all the time but I just cannot eat.” He was referring to difficulty swallowing, as a result of muscle weakness. This aroused suspicion of Vitamin D deficiency. He was treated with supplements. This is a common presentation among the inhabitants of Khumbu. During vacations in Kathmandu, a battery of standard tests were done, but all of them came out normal and were unable to catch Vitamin D deficiency. We then asked patients to get specific serum Vit B12 and Vit D3 levels. This patient was kind enough to send us the reports. They clearly showed vitamin D3 deficiency. People here barely get any sun exposure as they are mostly indoors and fully covered in protective clothing when outdoors. Compounded by a not-so-nutritious diet, many have depleted vitamin reserves. If a study could be conducted, the prevalence would likely be astounding.

An Unusual Day in the Everest ER

Dr. Prakash Kharel, MBBS, EM resident

At the Everest Base Camp, good sunshine in the morning is a sign of a great day ahead, until you get an alert that someone has fallen into a crevasse of the Khumbu Icefall. A minor change in the consistency of the ice caused the patient to fall into a fissure and smash his leg against an ice block. His down suit was inked with blood as he broke his upper leg structure. The rescue operation was initiated and a helicopter was called for evacuation through a long line the medical team was all set with equipment at the helipad and was ready to perform the initial management.

At eight in the morning, a rescue effort was made after the arrival of the helicopter, but sadly, bad weather prevented the helicopter from attending the scene at the desired location. A second attempt was undertaken but as stated in Murphy's Law, "everything that can go wrong will go wrong", and so it did. The helicopter developed a malfunction and had to be grounded while waiting for an engineer to arrive from Lukla to fix it. During this interval, time did not stop to tick and our patient was shivering in the icefall. Fortunately, a Sherpa who had prior first-aid training was able to check vital signs periodically through radio transmissions.

Incidents similar to this are common occurrences in Everest. At ten o'clock, five hours after the patient's incident and fracture, the patient was finally rescued and hauled down to the helipad simply tied to a rope without a long-line rescuer. We were prepared with our armaments and took the necessary actions, and as soon as the down suit was ripped, it was obvious that his thigh was bleeding severely. We made an initial differential diagnosis of an open femur fracture. We opened an IV access, analgesics were started and splints to the neck and leg were placed in position. On our one-hour ride back to Kathmandu, since his pulse was feeble we immediately started stabilization; We used one liter of normal saline and added Ondansetron for his morphine-induced nausea. Finally, our helicopter landed in a hospital, and surgery was performed on the same day for his open femur fracture.

"Be prepared for the worst" is a common maxim that applies everywhere and even more in a ruthless place like Mount Everest. The helicopter breaking down and our inability to conduct a long line due to strong currents at the Khumbu icefall were incidents that had not even crossed our minds. The situation was tense and out of control despite us being eager to help and the poor patient was left for 5 hours with minimal assistance. Whatever the situation, maintaining a calm mind and taking the initiative to manage things that are under your control is the best way to work in the wilderness, and I suppose in every unideal situation that arises in life.

My decision to accompany him in the helicopter was the best decision I could have taken that day, and will stick as a grateful memory for the rest of my life. I am grateful to the company that arranged my return the very next day after the successful surgery of the patient. This case was undoubtedly a learning with the highest yield that I have gained from any experience in medicine. The delays, uncertainties, teamwork, patience, and dealing with immense stress were all ticked in this single case and I am proud to say that our teamwork was what allowed us to be successful in such an incident. I felt as if the entire emergency preparedness module was taught to me in a single day.



Dr. Prakash Kharel geared up in front of the mountains

Pema: Story of a COVID-19 Warrior in the Himalayas

Dr. Prasanna Karki, MBBS, IM resident

Pema, a Tibetan name, means lotus in English. As a lotus grows in one of the most difficult circumstances (dirty water) to produce the most beautiful flower, Pema Choden Gurung also sits as a lotus in the challenging Himalayas of Upper Dolpa to help her people sustain a healthy life. Dolpa, one of the most remote districts of Nepal, has not yet been fully connected with roadways. A duration of three days and a change of more than five vehicles will take you to the headquarters of the district, Dunai. So one could imagine the geographical challenges of this place. However, the biggest irony is that Dunai is the most developed and accessible place in the largest district of the country.

The journey to Upper Dolpa starts from Dunai and your only way of transport would be either by foot or on a horse. Shey Phoksundo Rural Municipality is one of the three local levels of the Upper Dolpa. Trekking over the famous Phoksundo Lake, crossing Kang La pass (5300 meters from sea level) over the Shey Gumba, two other passes of around 5000 meters, sleeping overnight in tents while covering a total distance of 90 kilometers in a duration of 5 days from Dunai finally lands you up in the village of Pema, Vijer (3850 meters).

Born in this beautiful traditional village of Vijer, Pema Gurung had a difficult childhood. Had it not been for the Revival of Vijer (ROV) project, Pema and so many other children would have been forced to live a miserable life of poverty and ignorance in this hidden village of Upper Dolpa.

ROV is a non-profit organization that educates Pema and other students till grade six and also provides them exposure to the outer world by taking them to Kathmandu for higher studies. Pema with the support of ROV goes on to become a staff nurse. Pema Choden Gurung stands as a symbol of courage in Vijer. As a female health worker working in the most remote part of the country, she is the major frontline in the fight against the COVID-19 pandemic.



Vijer Village of Shey Phoksundo Rural Municipality (Altitude 3850 meters)

Kunphen Sogtso Menkhang (a place to heal everyone) is her workplace in Vijer which was built by the project currently run by staff from both the government and the project. Gurung is not bound by her position as a staff nurse. She is ready to perform any activities related to health posts.

In early 2021, the government's decision to vaccinate all three local levels of Dolpa on the border to China with Vero cell vaccine was warmly welcomed by the people of Vijer. Shey Phoksundo municipality would bring the vaccine to Saldang, where the municipal office is located.

Saldang is a one-day walk from Vijer with Neng La Pass (5368 meters) ranging in between. The lack of adequate support staff in the health post to carry the vaccine would not stop people from Vijer from getting vaccinated as Gurung would go on by herself to carry the vaccine.

Medicine in Hills: My Experience

Anshu Deo, medical student



Pema riding on a horse to vaccinate people of Phot Gaun

Pema would ride on her horse (Dromar) to get the vaccines from Saldang. She would take nearly seven hours to get over the pass to Saldang, bring the vaccines the next day, and run a vaccination campaign in her village along with another health worker Bir Bahadur Budha. After completion of vaccination in Vijer, Pema and Bir would separate ways to vaccinate people of Phot Gaun and Ku Gaun respectively, which are again at a one-day distance from Vijer.

Besides COVID-19 vaccination, Gurung is also involved in routine vaccination programs for children and regular daily activities in the health post. She aims to decrease maternal and neonatal mortality in Upper Dolpa, which is a major health concern in these areas. With Pema being in the health post, none of the health workers face the problem of language barrier as Kham Bhasa is the native language in Vijer.

Working in a rural place with limited resources is difficult. That combined with the harsh conditions of high altitude makes it even more challenging. The contributions of Pema and other health workers during the fight against COVID-19 in Upper Dolpa are highly remarkable and inspiring. Therefore, the lady with a horse from Upper Dolpa is a true COVID-19 pandemic hero.

It was during our Community Health Diagnosis field visit when I was in my first year of medical school that I had my ankle sprained. As common as it may seem now it was not the case back then. On our way back after our daily data collection, my right foot lost its balance and I fell; my leg was swollen by the time I reached my room. There were no hospitals or pharmacies near the site of our residence. The only accessible health facility was a health post nearby and that too was closed by 4 pm.

I performed a hot water bag compression on my ankle as it was hurting badly. But later that day, my ankle turned red very quickly. So me and my friends turned out to Aama, our landlord, for help. She suggested a local remedy to apply cattle dung all over my ankle. After hearing her suggestion I laughed at her and I thought she was joking but later was shocked to find out that it was something she used to practice herself. She even offered to take me to visit a local Dhami-Jhakri (a witch doctor). Hearing her, something in my mind got me awestruck.

I realized that the problem I was facing was not dire when compared to what we Nepalese deal with regularly. I questioned that if someone had a serious illness needing immediate medical attention, how would they receive the needed medical aid? During our stay, I also observed that people didn't opt for institutional child delivery simply because it wasn't easily accessible. Ambulance and airlift was something people couldn't even think of. All they have is harmony and empathy for each other in times of need. The locals have a strong faith in their traditional remedies which in some cases might do more harm than doing better. A pharmacy can make a difference in such a place.

As a medical student, we put more emphasis on modern medicine but we frequently omit the significance of human beliefs. Although common ailments may not lead locals to visit hospitals as frequently as urban inhabitants do, it is not always due to lack of access but rather a strong belief in the healing power of nature. What they possess and we lack is "patience". During my short stay in the hills, I realized that treating patients not only requires medical knowledge but also the integration of cultural beliefs, then only we can provide holistic care to the patients.

Bridging the Gap: Medicine, Evolution and High Altitude

Dr. Saramshika Dhakal, MBBS

A recent article published in the Scientific American magazine (March 2023 issue) written by a cardiologist and evolutionary biologist Dr. Barbara Natterson-Horowitz brings forward the concept of "Sisterhood of Species". She claims that many of the greatest threats to women's health may have already been neutralized in other species. Through CRISPR and other novel technological modalities, her research team is trying to draw implications from the studies conducted on pregnant female species from the wilderness to help physicians and scientists develop new treatment modalities for pregnancy-related heart diseases in human females. Understanding the genetic modification- protein modification - structural modification as a result of evolution can help us decipher many codes we are yet to understand.

Evolution has ruthlessly selected the most adapted physiology. From the iron level in your blood (balance between risk of anemia and risk of infection) to the flow rate of blood in your vessels: everything seems finely tuned. But each adaptation/modification comes with a cost; we might sometimes trade survival in the present for a disease in the distant future. In the battlefield of nature vs. organisms, the dance seems mutual but the incentives are costly. So why should medical students study and understand such a ruthless process of evolution? Survival of the fittest is the ground rule, even when we are dealing with the most terrifying illnesses known to humankind like resistant bugs and relapsing cancer. These ruthless diseases genetically and metabolically evolve to escape our body's vigilant systems. Uncloaking and unmasking of such intelligent survival strategies lies at the heart of many novel therapeutics.

The attempt to link high-altitude medicine to evolutionary biology dates back to the times of Dr. John Dickinson, a high-altitude enthusiast working in Nepal during the 70s and 80s who used to store yak's heart in his fridge for research purposes. His intent was quite ambitious; understand yak's cardiac physiology to understand adaptation in Tibetan



A young highlander during his evening stroll in Khumjung Valley

highlanders. Another researcher was also on a similar ambitious tract. A young American anthropologist Dr. Cynthia Beall ventured into the steep trails of the Tibetan plateau, that too during a time when Tibet was socio-politically secluded from the rest of the world. She discovered that adaptation to high altitude was related to genetic variation at EGLN1 and EPAS1 which encode two crucial proteins contributing to oxygen homeostasis. Her research findings were used by the World Health Organization to adjust the thresholds for diagnosis of anemia according to the altitude of residence.

The intersection of evolutionary biology and altitude medicine is a unique research area. Nepal is home to many ethnic communities which have evolved unique genotypes and phenotypes that are well-suited for survival at higher altitudes. But such adaptation comes with a cost: they are prone to diseases that cannot be found in people residing in other altitudes and the presentation of common diseases can be pathophysiologically different. A more in-depth understanding of such evolutionary processes along with their physiology will help medical professionals solve the unique problems of these unique individuals.

Dermatological Problems in Pilgrims Visiting Gosaikunda Nepal

Dr. Pashupati Pokharel, MBBS

Aakash Sherpali, MBBS

Dermatological problems? Come on doc!! That's not an emergency, especially in the wilderness. Yes, yet the quality of the trek of pilgrimage matters to us as well. So, we focused on these issues as well.

The annual Janai Purnima, also known as the sacred thread festival, falls on Shrawan Shukla Purnima every year. Hindu Brahmins and Chhetris who have undergone Bratabandha (hair shaving ceremony) change the Janai (a sacred thread worn across the chest) on this day and tie a sacred thread around the wrist of the right hand, which they believe will purify the soul and protect the body from evil. Many people throng to Gosaikunda in Rasuwa district to observe this annual fair.

Every year Mountain Medicine Society of Nepal (MMSN) in collaboration with the Himalayan Rescue Association (HRA) Nepal conducts a free health camp targeting the pilgrimages visiting Gosaikunda (4380 meters altitude from sea level) during this auspicious Janai Purnima. A team of 5 doctors and a medical student from Maharajgunj Medical Campus volunteered in the 2022 camp. A young medical student from the 3rd year, Aakash Sherpali, had a concept of keeping track of the dermatological issues of the pilgrimages.

The most common dermatological conditions on a visit to the camp were pressure blisters in the foot and ankle region due to the tight fitting of the shoes. We advised for rest, use of socks, and adequate padding, along with analgesics and topical antiseptic cream for a few days. This was followed by insect bites, especially tick and bug bites. The poor maintenance of hygiene of hotels in the Gosaikunda area was the culprit behind this. We counseled for most cases to live in well-maintained hotels, and if not possible be careful about the room condition. For cases presenting with a febrile illness on the background of tick/bug bite, antipyretics along with 14 days of a course of doxycycline were advised along with descent as soon as possible.

Chelitis due to cold and strong wind currents was also a common condition among the pilgrimages. Moisturizer, preferably petroleum-based or local butter/ghee, was advised to apply to the lips. Additionally, people were counseled to use masks, sunscreen, and hats to protect from wind currents. A couple of cases of athletes' foot were also seen for which topical antifungals, drying of interdigital clefts, and wearing clean and dry socks were advised. Pilgrimages with superficial cut injuries were also consulted in our health camp. We checked the hemostasis and applied light dressing/bandaging depending on the case. Abrasions due to tight dress were advised for wearing comfortable clothes and/or adequate padding. We also witnessed a few cases of folliculitis for which antistaphylococcal antibiotics were prescribed.

Although the dermatological issues of pilgrimages traveling to high altitude look insignificant to physicians, they are essential issues from an individual perspective as they determine the quality of the journey. Besides, health camps conducted by MMSN in collaboration with HRA should be continued in the future to add an extra layer of happiness in the face of high-altitude travelers.



Some dermatologic conditions. A. Chelitis, B. Athletes foot C. Pressure ulcer

Into Thin Air; Experience from Gokyo Ri

Dr. Ashish Tiwari, MBBS

This is a tale of a doctor who went to Pheriche Aid Post for the Fall Season of 2021. It was a wonderful season at Pheriche. I received an opportunity to see and manage a variety of cases of AMS, HACE, and HAPE. Life at Pheriche was beautiful: waking up to the views of majestic Amadablam and the clear blue sky was a treat to our eyes. But I wanted to see of the Khumbu region and find out what was lying behind these majestic mountains. During our 2-month posting, I visited Cholaste Lake and went on an adventurous trek to Everest Base Camp. And one fine day, almost during the latter days of my posting, I planned for a trek to reach the highest point of Gokyo.

The path was along the side of the hill and luscious pine forest and mountains were present like a canopy. On our way, I found a guide dog who was with us from Pangboche to Phorste. It was cloudy that day and it was just the right weather for a trek. We reached in the evening and experienced true Sherpa hospitality at the small lodge run by a Sherpa family. The village was renowned all over Khumbu Valley for having at least one member of the family to have ascended Mt. Everest.

In the warmth of the burning Yak dung, enjoying some Sherpa stew we were keen to listen to the tales of our lodge owner who had climbed Everest more than 10 times. The next day we were determined to walk to Gokyo after having a heavy Sherpa breakfast “Shampa”. It was my first time having that meal but the taste still lingers as it had a very unique taste that I could not figure out.

The long journey awaited in front of us along a small path through the high hills and stairs that took us 700m higher in elevation. We trekked for 7 hours that day and I was exhausted on the way until I saw the first glimpse of Gokyo which made me forget my exhaustion. The sight of Ruddy Shelduck migratory waterfowl in Gokyo was also very elating. On our way up, we came across a group that was descending as one of their teammates had symptoms of HAPE. I realized the price of sudden ascent and unpreparedness in a place as ruthless as the mountains. The beauty of the lakes is determined to take you off the tiredness as it makes you hypnotized in a unique shade of blue.



Dr. Tiwari enjoying the view from the Gokyo Ri

We reached Gokyo at 5 pm and it was already getting cold. I was hungry and tired so the warm noodle soup at our hotel was too delicious and enjoying it with the view of Gokyo is an experience held dearly by me. We sat beside the heater and talked through the evening and shared our knowledge about altitude sickness and the experience we had as volunteer doctors at Pheriche Aid Post. The night was cold but the morning view of Gokyo from the room was breathtaking. I woke up and got ready for the ascent to Gokyo Ri which was a steep climb. The air was very thin so we had to stop to get air every 5 steps. The ascent was steep but the view got better with every step upwards. As I was basking in the sun, I enjoyed a panoramic view of the mountains above 8,000 m including Everest, Lhotse, Makalu to Cho Oyu.

I could feel my body working hard and to my surprise it made me feel alive at the height of 5,357 m (17,575 ft)- a high peak in the Khumbu region of the Nepali Himalayas. It is located on the west side of the Ngozumpa glacier, which is the largest glacier in Nepal and is reputed to be the largest in the whole Himalayas. After staying there for half an hour enjoying the view I came down and had lunch at the hotel. The time had come to return we stayed at Dole that day. On the way to Namche, we saw Himalayan musk deer, a rare find. The next day we went to Lukla and stayed the night. Took the last flight to Kathmandu and never have I felt such a dull city with smoke and dust around. I had been in a silent Shangri La in the Himalayas with few people and memories of the place still lingered in my mind. I will always remember my stay at Pheriche as a volunteer doctor for the Himalayan Rescue Association and I thank the Mountain Medicine Society of Nepal for this opportunity of a lifetime.

International Hypoxia Symposium Conference 2023

Dr. Matiram Pun, MBBS, MSc

Charles Houston, Geoff Coates, and John Sutton established the International Hypoxia Symposia to provide a forum for researchers, medical professionals, mountaineers, and other interested parties to exchange experiences related to hypoxic environments and the adaptations that let us survive. The International Hypoxia Symposia's goal is to provide the most advanced, sophisticated research to date on the many effects of hypoxia on people and animals in both health and sickness.

The famous Lake Louise Score of Acute Mountain Sickness was discussed and promulgated here. This conference typically happens during the month of February at Lake Louise, Alberta, Canada. This year, i.e., IHS 2023, was from February 7-12. The major topics of discussion in the conference were "From mountain tops to sea depths: Hypoxia-tolerant species", "Hypoxemia in the COVID ICU", and "Hypoxia and Brain".

This year, Dr. Buddha Basnyat, Dr. Geeta Basnyat, Dr. Jivan Lamichhane (then secretary of the America Nepal Medical Foundation), and I attended this conference. We enjoyed science, frozen Lake Louise, great food, and networking with other researchers and colleagues. We also discussed MMSN, high-altitude research in Nepal, ANMF, and DiMM/MMSN collaboration.



Pictures from the hypoxia symposium

Field Guide to Wilderness Medicine: A Book Review

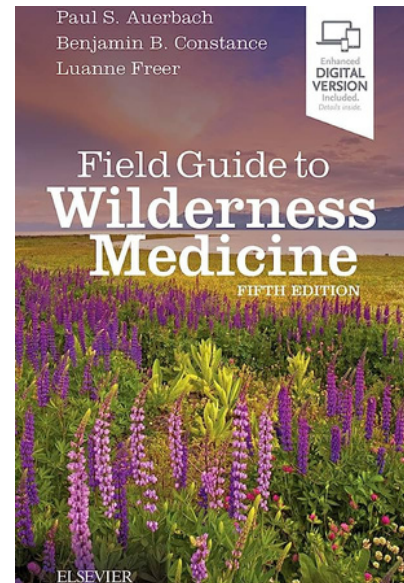
Dr. Dipendra N. Paudyal, MBBS

Why it's Interesting?

As the title of the book goes, it describes possible health challenges in the wilderness with their solutions in a field-based approach. The use of pictures, tables, diagrams, and graphics makes this book an exciting read. It begins with illustrations of colorful photographs of common wilderness organisms and pathologies before moving to its core content. With every turn of the book's pages, you will be amazed by its concise presentation. What's fascinating about this book is that it is not only limited to the field-based treatment of medical illnesses; it is spiced up with few concepts of preventive wilderness medicine. Preventive wilderness medicine has been advocated throughout the book, starting from the very first chapter.

Brief Review of the Chapters

The first chapter is on high-altitude medicine, where the book delves deeper into acclimatization and field-based approach to common altitude-related illnesses. This chapter will be intriguing to any aspiring high-altitude physician like myself trying to establish a foothold in mountain medicine. Preventive Wilderness Medicine is advocated through chapters on Immunization for Travel, Protection from Blood-Feeding Arthropods, and Field Water Disinfection. Next, the authors map their focus toward disaster and survival medicine in a chapter on Global Humanitarian Relief and Disaster Medicine, Survival, Search and Rescue, Improvised Litters and Carriers, Wilderness Medical Kits, and Avalanche Safety and Rescue. Additionally, there is a separate chapter on Knots where the book dissects the anatomy of knots and their types and elaborates on knot safety. Traumatology has been covered sweepingly in 9 different dedicated chapters. In addition to encompassing zoonotic diseases, the authors have included an interesting chapter on Animal attacks which covers animal bites, wound care, measures on avoiding and mitigating animal attacks, and bear attack prevention and risk reduction. The field of medical toxicology has not been left isolated, as the book includes chapters on toxic plants and animals. Disorders associated with environmental exposure, including hypothermia, peripheral cold injuries, and heat-related illnesses, are fairly discussed in this book.



Cover Picture of the Book "Field Guide to Wilderness Medicine"

As expected, common life-threatening emergencies have been incorporated into this book. However, a well-tailored chapter on Pain Management is the one that amazed me the most. While the chapters on SCUBA diving-related disorders, Envenomation by Marine Life, and Seafood Toxidromes may seem superfluous and redundant in Nepal, they still provide context to wilderness medicine. The photograph of a temporary rope halter on page 862 of the chapter Emergency Veterinary Medicine reminds me of Robyn Davidson's camels and her journey across 7 thousand miles of the Australian desert. The chapter, Emergency Veterinary Medicine, gives more life and wilderness to this book. Patient evacuation and pre-hospital care have been touched on in the chapter Aeromedical Transport. The final chapter, Leave No Trace advocates for sustainability in the wilderness by proper waste disposal, not hoarding any artifacts, respecting wildlife, and being considerate of other visitors. All these contents make this book more than just a medical textbook.

My Last Take

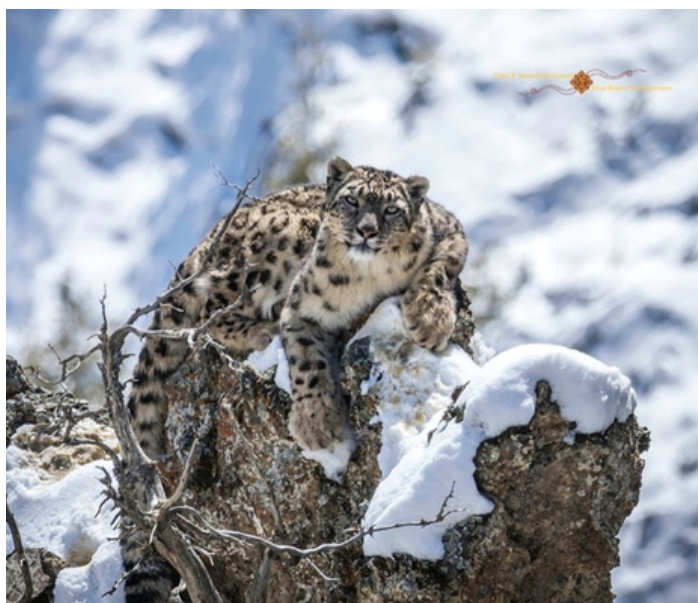
This book works well as a reference textbook for high-altitude physicians. However, there are multiple other resources like Auerbach's Wilderness Medicine, Wilderness Medical Society guidelines, and Harrison's Principles of Internal Medicine, which are more comprehensive and add layers to our baseline knowledge.

Tashi Ghale: The Catman from Manang

Dr. Sachin Subedi, MBBS

The idea of feline voyeurism might seem adventurous to strangers. However, it is a tough game of patience; it involves hiking miles and maintaining uncomfortable positions in the freezing winter evenings. Most days are empty when the unfortunate catch nothing but cold. All sacrifices are dedicated to catching a glimpse of the cats which have descended to attend calls of their carnal desires. Setting up trap cameras is a different game in itself; involves walking on scary cliffs while uttering cold curses intended towards the cats' choice of living in such extreme terrains. Even if we step outside the realms of romanticism for some time, we have to appreciate the contributions of such photographs beyond the abstract. It has helped the conservationists track the count of the apex predator which helps reduce pressure in limited grasslands of the Himalayan desert by keeping blue sheep and wild yaks in check.

In light of the recent controversy surrounding a surreal but supposedly edited photograph of a snow leopard taken by an American photographer in the Khumbu region, it is necessary to bring the spotlight back to a Nepalese photographer and conservationist from Upper Manang, Mr. Tashi Ghale.



Snow Leopard in its natural habitat as clicked by Tashi Ghale. Check out his Instagram page for more feline pictures (Photo Credits:Tashi Ghale)



Tashi Ghale sojourning through the Himalayas in search of mountain cats (Photo Credits: Tashi Ghale)

While running hospitality services in the most beautiful village of the Annapurna circuit, he has also made heaps and bounds of efforts to capture one of the most elusive creatures in nature. Whether we choose to label his efforts as madness or passion, they unquestionably deserve huge respect and appreciation. His photographs capture the beautiful landscapes of Manang while subtly showing its rising treeline and melting glaciers.

Mr. Ghale grew up enjoying the majestic views of Gangapurna. While working as a citizen scientist for the Third Pole Conservancy, he has managed to capture wonderful photographs, of not only the snow leopards but also the Himalayan Grey wolves and the rare Pallas cat. His contributions have been appreciated by the World Wildlife Fund-Nepal via the Abraham Conservation Individual Award in 2016. He was also selected as a Disney conservation hero in 2018. He has been putting efforts into passing his legacy to the younger generation in Manang by teaching them how to trace leopard marks and set up trap cameras.

Medical Challenges in the Mountains

Dr. Priti Bhusal, MBBS

I have been involved in the field of mountain climbing for 2 years now. People often ask me “How is the high mountain experience?” to which my usual reply is “Mountains are never easy, but they are always worth the effort.” Mountains have always been a symbol of challenge and adventure for human beings. They inspire us to explore, challenge ourselves, and push beyond our limits. Mountains teach us about the beauty and power of nature, and our resilience and strength. Whether we are climbing a peak or simply admiring its beauty, mountains remind us of the endless possibilities that await us if we are willing to take on the challenge.

Hiking, trekking, and climbing a high mountain should never be taken lightly. The steep inclines, rocky terrain, and unpredictable weather conditions can make even the most experienced climbers and hikers struggle. It takes a lot of physical endurance, mental toughness, and preparation to navigate the rough and unforgiving terrain of the mountains. Similarly, high-altitude mountain environments pose several medical challenges for individuals who venture into these areas.



Dr. Bhusal geared up en route to the Everest summit.



The primary challenge is hypoxia or a lack of oxygen due to the reduced atmospheric pressure at higher elevations. This can lead to several complications, including Acute mountain sickness (AMS), High-altitude pulmonary edema (HAPE), and High altitude cerebral edema (HACE). Other medical challenges associated with high-altitude mountain environments include dehydration, sunburn, frostbite, and hypothermia. In addition, individuals with a certain pre-existing medical condition may be at increased risk for complications at high altitudes.

Prevention and treatment of these medical challenges often involve gradual acclimatization to higher elevations, hydration, proper nutrition, and medication such as acetazolamide, which can help prevent AMS. In more severe cases, supplemental oxygen or descent to lower elevations may be necessary. It is important to consult with a healthcare professional involved in climbing at high altitudes before venturing into high-altitude mountain environments. Mountains can be dangerous. The high altitude, weather conditions, and rugged terrain can pose significant risks to climbers and hikers. From avalanches to rock falls, from hypothermia to altitude sickness, the mountains can test even the most skilled and experienced adventurers.

Beyond Everest: At the Intersection of Mountain and Space Medicine

Dr. Luke Apisa, MD

From Olympus to Olympus Mons

A burgeoning new field of medicine is rapidly taking shape. As space launches now occur nearly as often per month as they did each decade during the Apollo era, so too has the population of anticipated and would-be astronauts grown dramatically. The year 2022 saw 32 new individuals travel to space, a feat that would astound the engineers and space program leaders of the 60s and 70s.

Intriguingly, the chronology of travel to the world's tallest peak mirrors human space travel's own past in striking fashion. Hilary and Norgay's summit of Everest predates the human landing on the moon by a scant 16 years. This past climbing season on Everest saw nearly 600 summiteers (350 Sherpas and 250 clients).

While "wilderness medicine" assuredly took place wherever remote travel occurred in need of expert physician care, formalized medical training in the field post-dates that climb of Everest by five decades. Massachusetts General Hospital and Stanford University's Wilderness Medicine divisions opened in 2003. Here, two decades thereafter, a crop of new fellowships has arisen to treat space travelers: five decades and change after the initial Apollo moon landing.

Yet mountain and space medicine share more than chronology alone. While a full enumeration of the myriad domains of overlap exceeds the scope of this article, two will be taken here as illustrative examples: hypobaric hypoxia's implications for atmospheric design, and the so-called "backpack problem".

Hypobaric Hypoxia in the Mountains and Beyond

Human hypoxia has been long analyzed in anesthesia, critical care, and emergency medicine. Over the last century, we have come to understand that hypobaric hypoxia – hypoxia experienced at smaller total atmospheric pressures – carries with it a unique set of additional stressors on human physiology.



Dr. Luke Apisa, is Clinical Instructor of Emergency Medicine, Harvard Medical School; Assistant Fellowship Director, Division of Wilderness Medicine, Massachusetts General Hospital (MGH); and Fellow, Division of Space Medicine, MGH

These changes have been studied in high-altitude pilots and small sample sizes in hyperbaric chambers. The Himalayas and the Andes however represent the two best natural sites to assess changes in the body over long-term exposure to hypobaric hypoxia in vivo and at scale. As the atmospheres of orbital vehicles are custom created by engineers, and because mechanical stresses to the superstructure of a spacecraft are contingent on not the external forces acting upon it, but rather the internal pressure exerted outward by the contained atmosphere, hypobaric systems offer significant engineering advantages for space vehicle construction. Moreover, because extravehicular activities (EVAs) occur in spacesuits or smaller vehicles with even greater structural limitations, their atmospheres are still more greatly hypobaric than those of the orbiting or traveling space vehicle.

This need for low atmospheric pressure could be quite simply counterbalanced by increasing the fraction of inspired oxygen (FiO_2), but here again, we run into engineering constraints. Sufficiently, hyperoxic environments impose a substantially increased risk of vehicle fires, as was tragically seen in the 100% O_2 environment of Apollo 1.

Thus, space vehicle atmospheric environment selection walks a delicate tightrope between human and vehicle systems requirements. Practitioners of medicine with intimate familiarity with human performance under hypobaric hypoxic stress are integral not only to the design of space vehicles but the broader practice of space medicine as well.

Sending a Backpack to Space

The so-called “backpack problem” represents another overlap of mountain and space medicine. The problem as originally framed is this: of all the items in a hospital – medical equipment, medications, protective equipment, IV fluids – determine the selection of items that can fit into a single backpack that can most completely provide extended medical care over a range of months without access to other formal medical resources. These items must be stable across broad temperature ranges and varying physical loads.

Terrestrially, space and weight restrictions have been governed by what a human or pack-animal can carry to the given destination. In space, the problems become significantly more complex. Space is at a premium: extra individuals to carry more weight cannot be added as needed given launch vehicle stipulations. Moreover, each kilogram launched to orbit costs around \$10,000. A typical 60-liter backpack of supplies sent to space would itself cost as much as \$600,000.

Compounding this price constraint are thermal restrictions. IV pumps, defibrillators, or any medical device with a battery or electrical components must undergo rigorous testing to ensure it is not a fire risk in the spaceflight environment. The usual caveats that are second nature to the wilderness physician – e.g., which antibiotics will cover the most common and greatest variety of infections – take on new life in the far more constrained medical environment of spaceflight.

Higher Altitude Than Everest

In many ways, the course of space medicine – one being actively charted in this decade – can be viewed as an extension of the path of travel wilderness medicine has navigated these past twenty years. Austere and resource limited medicine are as wholly applicable in space as they are on the mountain or an Arctic ice shelf. Acute mountain sickness and decompression sickness are equally deadly risks to the spacefarer. No other terrestrial field of medicine subsumes these domains as completely as does wilderness medicine.

Space medicine offers the opportunity to take these areas of expertise and test them at a new extreme. Adding to hypoxic, hypobaric, and hyperbaric stresses the further risks of radiation, microgravity, and G-forces pose a new and fascinating world of problems for the house of medicine to solve. Though the world in which humans are living and working in space may be decades away, the medical expertise to treat them is being developed in this very moment.

Ad astra.

MMSN Activities

In the year 2022, the Mountain Medicine Society of Nepal (MMSN) conducted several outdoor activities with the help of the Farrar Foundation. Altogether, three wall climbing programs were organized with the participation of more than 80 medical students. In each wall climbing session, medical students were oriented on knotting techniques, wearing a harness, climbing, belaying, and other safety aspects of wall climbing. Additionally, the simulation of various clinical scenarios in regard to wall climbing was demonstrated by MMSN seniors.



Case discussion during wall climbing session

Two hiking programs were organized in 2022 with participation of more than 70 medical students. During the hiking, important emergency scenarios were discussed.



Group picture of the program hiking with case scenarios in the Champadevi trail

The Journal Clubs have been continuing with presentations from Dr Sushan Homagain, Dr. Roshan Aryal, Dr. Prinska Ghimire, and Dr. Pashupati Pokharel.



Attendants during a Journal Club Session at Maharajgunj Medical Campus

During the auspicious Janai Purnima season doctors namely Dr. Anupama Bhattarai (Team Leader), Dr. Prasanna Karki, Dr. Suraj Kandel, Dr. Dipendra Poudyal, Dr. Suraj Shrestha, and Aakash Sherpali (Medical Student) volunteered in the Himalayan Rescue Association's temporary health camp at Gosaikunda.



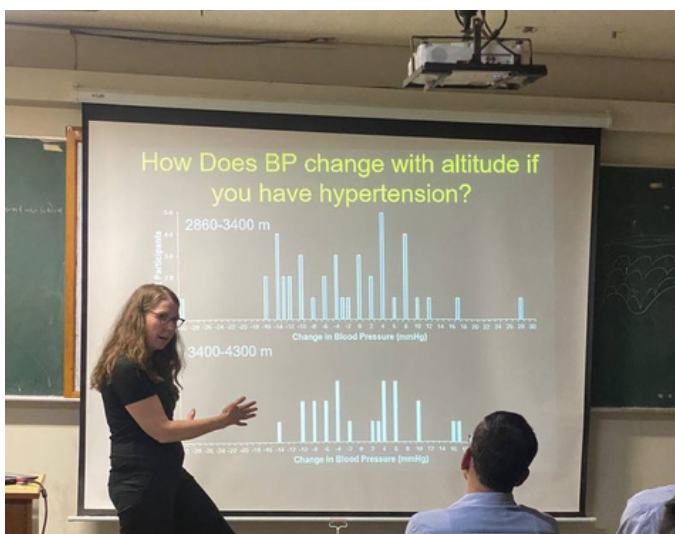
Pictrue showing HRA team for Gosaikunda temporary health camp 2022.

On November 2022 Pre-DiMM simulation training was organized with the facilitators Dr. Jez, Dr. Tom, and Dr. Beth from United Kingdom. The facilitators provided training related to navigation, wall climbing, and navigation on the field.



Pre-DiMM Candidates and Facilitators in Tudikhel ground, Kathmandu to learn navigation skills

Dr. Linda Keyes gave an important talk on the topic “Dealing with Hypertension at High Altitude”. Similarly, Dr. Sangeeta Poudel discussed her Everest ER experience and discussed some interesting cases. Dr. Ken Zafren shared his HRA experiences, Dr. Siddharth Yadav shared his journey from Maharajgunj to Mayo, and Dr. Monika Brodman discussed on mountain and emergency medicine.



Talk session by Dr. Linda Keyes on “Dealing Hypertension at High Altitude”

Dr. Rajesh Sharma Poudel and Dr. Suraj Shrestha participated in an eight weeks long elective period in John Radcliffe Hospital, Oxford University, United Kingdom as a part of MMSN.

Also, in November there was training of trainers (TOT) session for the Pre-DiMM candidates and volunteers at Kathmandu Nepal.



Participants and Facilitators of the ToT session for Pre-DiMM

In the coming days, while continuing our existing programs, we hope to expand our work, and knowledge into unexplored territories. We wish for a memorable experience to all the DiMM 2023 candidates.

For frequent updates, please log in to our website www.mmsn.org.np, our facebook group, or contact us via our email mmsn@gmail.com.

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