



## Nepal Ambulance Service Expands Nepal's Capacity to Respond to Emergencies

By Rebecca Walker, MD, Stanford University

Following the catastrophic April 2015 earthquake, Nepal has made significant strides to strengthen its infrastructure and increase local capacity to respond to disasters. Central to both local and international efforts is the Nepal Ambulance Service (NAS), the only agency in Nepal that employs fully trained medical providers to deliver life-saving care at the scene of an emergency. The NAS is a local nonprofit organization, originally launched in 2010 with Nepal's first cadre of skilled emergency medical technicians (EMTs) (1). In preceding years since its formation and during the 2015 earthquake, NAS functioned as the only prehospital (ambulance-based) system in the Kathmandu Valley, responding to emergencies with its five ambulances and 30 EMTs. Since its inception, NAS EMTs have cared for and transported 19,731 patients. These EMTs were trained in a formal education program by physicians from Stanford University to deliver essential treatment and safe transportation of patients with all types of medical emergencies and conditions. The patients are often in critical condition. In the days soon after the April 2015 earthquake, NAS responded to 712 earthquake-related calls for assistance. They were also dispatched to the Kathmandu airport after it became clear that a large number of critical patients would arrive there by helicopter from outlying areas. At the airport, military medical teams from Nepal and India triaged the patients, directing the most severely injured patients to the NAS personnel. The NAS EMTs who were not involved in their ambulance work when the earthquake occurred were directed to aid in search and rescue efforts, or to use their skills assisting with the care of earthquake victims who arrived in the emergency departments of major hospitals, such as Patan Hospital and Tribhuvan University Hospital.

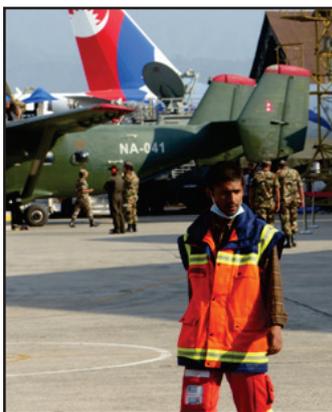
As many experts had long predicted, an earthquake in Nepal was inevitable. Indeed, another earthquake continues to be a threat. One of the NAS founders and current board

members, Mahesh Nakarmi, is an earthquake emergency management specialist who has provided insight to NAS and other organizations throughout Southeast Asia. International teams participating in the Nepal earthquake disaster response quickly noticed the impressive capacity of NAS, particularly its expertise to perform essential life-saving procedures and then effectively transport patients. Because of what was observed after the earthquake, nongovernmental agencies, such as International Medical Corps (IMC) and Medical Teams International (MTI), began discussions with NAS to explore ways to expand the efforts of NAS in providing emergency prehospital care not only in Kathmandu, but throughout Nepal.

These conversations eventually led to formal partnerships. IMC granted monetary funding to NAS to replace damaged equipment, greatly enlarge and improve its dispatch center, purchase five additional ambulances, and train a new class of EMTs for expanded service to five locations outside of Kathmandu. This increased coverage has already commenced in Chitwan, and includes plans for Malekhu, Pokhara, Kavre, and Butwal. Expansion of NAS into rural areas is also planned with an initial service to be initiated in partnership with MTI in Dhading. Stanford University has increased its support to the effort by providing education and medical direction, currently with a team in Kathmandu providing instruction to the next 50 EMT students undertaking a 12-week education and training course.

In addition to NAS, the Nepali government and private organizations played a key role in assisting the prehospital response in the aftermath of the earthquake. An excellent example is the Kathmandu police force, which has a long-standing collaborative relationship with NAS. After the 2015 earthquake, the damage to the NAS dispatch center meant that the phone line was interrupted for a short time. In response to a noted increase in the number of calls for emergency response, the

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At the Kathmandu airport in May of 2015, a NAS EMT prepares to receive patients from rural Nepal. (Image credit: R.Walker)

This journal is published twice a year by the Global Nepali Professional Network (GNPN). The GNPN is an American organization dedicated to the professional development of its members and technological progress of Nepal. It is a tax-exempt 501(c)(3) non-profit organization with members throughout the United States. The organization utilizes the creativity and talent of its members and the broader American community to develop technology-rich solutions that address some of Nepal's challenges.

The GNPN was originally established in July 29th, 2007 at the University of California Berkeley (UC-Berkeley) under the name CAN-USA.

Please visit our website at [gnpn.org](http://gnpn.org).

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## **Welcome**

By Suresh Ojha, President of CAN-USA

On behalf of the Computer Association of Nepal-USA (CAN-USA), welcome to all readers of this journal. We are especially pleased to offer this publication to all respected guests, delegates, and participants of the 23rd CAN Info-Tech show and conference.

CAN-USA began in July of 2007 on the campus of the University of California, Berkeley with the goal of utilizing the collective information and communication technology (ICT) skills and resources of Nepal's diaspora (specifically of those in the U.S.) to serve Nepal as well as provide a platform for the professional development and growth of its members. During its ten years of existence, CAN-USA's efforts have gained much traction, and at the request of leaders within the disciplines of finance, business, healthcare, and governance, we have expanded our scope. We, therefore, changed our name to the Global Nepali Professional Network (GNPN), and while we are still an organization with a keen and permanent focus on ICT efforts, we now have resources in other key arenas that can be brought to bear in the service of Nepal.

Among our ten years of achievements, we recently opened an information sharing center in Kathmandu in partnership with the CAN Federation, which is a permanent facility to help Nepalis receive training in a variety of skills as well as to provide office space for visiting members of CAN-USA\GNPN. We have also engaged in numerous knowledge-sharing seminars between Nepal and the U.S., have forged strong relationships with leading institutions, including the CAN Federation, Tribhuvan University Institute of Engineering (IOE), and key Nepali-diaspora organizations throughout the U.S. We also sponsored a "hackathon" event, which was aimed at gleaning innovation from computer programmers and IT technologists and applying it to disaster relief situations in the future, and for six years, we have hosted a monthly networking event for professionals. These well-attended Kurakani Series events bring together entrepreneurs, technical experts, academics, and members of the Nepali and broader American community to focus on problem-solving.

Years before the devastating April-2015 earthquake struck Nepal and in anticipation of the occurrence of a major tremor striking the region, CAN-USA launched its Radio Mala program under the visionary leadership of Dr. Sanjeeb Panday of Tribhuvan University (TU). In 2012, we raised funds and constructed the first amateur radio (a.k.a. ham radio) repeater in the history of Nepal. Ham radio is frequently used as a backup-communication system when  
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# The CAN Federation: a strong Advocate for ICT industry in Nepal

By the CAN Federation Secretariat

The Computer Association of Nepal was established in 1992 and later registered as the Federation of Computer Association of Nepal (CAN Federation) in 2015 with the involvement of professionals, specialists, manufacturers, institutions, and related organizations from the information and communication technology (ICT) sector of Nepal. It is the umbrella organization with a membership base ranging from ICT institutions and associations to individuals working within the ICT sector. Representing the private sector, the association also works closely with the government of Nepal in a vital advisory role for policy relating to ICT. It works along the lines of an autonomous, non-political, non-partisan, non-profitable, and service-oriented organization.



Er. Binode Dhakal, CAN Federation President.

Over the recent years—despite challenges—Nepal has witnessed an increase in uptake of ICT programs and institutions. For example, Nepal has embarked upon a sizable eGovernment initiative that seeks to drive efficiency across the public sector in addition to stimulating local demand for ICT products and services. Financial institutions in Nepal are sustaining the uptake activity as a strategic resource to enhance competitiveness and to offer value to customers.

It is along these lines that the CAN Federation positions itself with its private sector agency and efforts. With its tagline “Let’s Build eNepal: Together we CAN,” the CAN Federation’s mission is to help Nepal enter the era of a knowledge-based society and economy and is committed to sustaining its effort towards this mission, advocating for more pronounced policy thrusts and strategic framework aimed at creating an ecosystem for the growth of the ICT sector, both as development enabler and a growth cluster in its own right.

Here then is an itemized summary of the CAN Federation’s objectives, achievements, relationships, and awards.

The CAN Federation’s objectives are

- to assist in the utilization, enhancement, and promotion of ICT within the country;
- to help develop strategies to meet requirements for the development of ICT literacy and skills;

- to provide and protect rights and privileges and benefits to individuals and institutions and organizations affiliated with CAN;
- to provide support and facilities to general, corporate, and honorary members of CAN;
- to ensure ICT advocacy, advisory, and implementation with government coordination;
- to act as the major body in facilitating private ICT organizations;
- to assist in the institutional development of ICT;
- to assist and develop the synchronization and standardization of ICT training and education;
- to develop coordination among computer professionals;
- to organize and conduct seminars, workshops, talks, and training programs and to provide consultancy and R & D services;
- to exchange ICT knowledge, skill, and technology with similar types of organizations within and outside the country; and
- to assist in the field of technology transfer, export, import, and formulation of national policies.

Some of our key achievements and activities include

- annual programs such as CAN Info-Tech, CAN SofTech Summit, CAN Commtech, and ICT Conferences;
- establishment of 54 district branches across the country;
- creation of CAN-USA and CAN-Japan;
- representation of the CAN Federation in national and international forums;
- sponsoring of best practices workshops; and
- hosting of regular regional networking meetings and capacity-development training programs.

To foster national and international relations in the ICT sector, the CAN Federation is a member of

- the Federation of Nepalese Chamber of Commerce and Industries (FNCCI);
- Chamber of Nepalese Industries (CNI);
- Nepali Chamber of Commerce (NCC);
- AsianOcenian Computing Industry Organization (ASOCIO); and
- World Information Technology and Services Alliance (WISTA)

The CAN Federation was given the ICT Best Practice Award in 2010 by the ASOCIO for the CAN Info-Tech show and conference and was awarded Best Association in the Commodity Sector of Nepal by the FNCCI in 2011. ■

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other commercial systems are destroyed or overwhelmed in disaster events. After risking their lives during a major aftershock, Dr. Panday and his TU team, constructed a very-high-frequency (VHF) repeater, which was immediately offered as a backup communication system to Nepal's hospitals and the Nepal Ambulance Service. A certificate of special congressional recognition for our leadership in disaster communications was presented to us by the office of the Honorable Michael M. Honda of the U.S. House of Representatives. This was the first time a Nepali diaspora organization received an award from the U.S. Congress.

I hope you enjoy this journal, and as Nepal's Sajha Fulbai (inclusive garden) begins to blossom into second and third generations within the U.S. and elsewhere, you will realize the idea that Nepal's diaspora contributing to its ancestral homeland in concrete and meaningful ways has indeed changed from a mere possibility to reality. Along with our partners in

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police created radio announcements to assure the public that they would be coordinating with NAS. Since the NAS ambulance posts are located at police stations by design, this coordinated "back-up" communication was a natural strategic modification. Nepal Telecoms, which initially worked with NAS and the Ministry of Health to permit the use of "102" as a dedicated 3-digit emergency number in 2010, provided space near their offices for a temporary dispatch center in the immediate aftermath of the earthquake. The number "102" continues to be designated officially for use by the lay public as well as healthcare institutions when needed to call for emergency care and transport.



Dr. Joe Becker from Stanford Emergency International, teaching EMT students in Kathmandu in December 2016. (Image credit: P.Acker)

This recent international disaster response highlighted Nepal's need for increased capacity to respond to daily emergencies, as well as being able to rapidly scale up the "routine" system when disaster strikes. It was observed that rural

Nepal, we will continue to create and expand the platform for Nepal's diaspora and well-wishers of Nepal to engage in professional discussion and focused problem solving that will last for many years to come. Together we CAN! ■



Suresh Ojha, CAN-USA President

Suresh Ojha is a second-generation Nepali-American. In 2003 he established Nepal's only Radio Frequency and Microwave research and teaching laboratory at Tribhuvan University. He also established TU's coursework on RF and Microwave circuits and systems. Both are in operation today. He works as a principal design engineer for a major electronics manufacturer in Santa Clara County's Silicon Valley.

areas in Nepal were among the most gravely affected. In most of these locations, no system exists for emergency care. Health providers lack adequate referral systems to triage and treat sick patients. In most of Nepal, educational programs and health-system-strengthening initiatives could improve the care delivered. There are many lessons to be learned from other countries. Outside of Nepal, focus on disaster response and the burden of trauma has increased dramatically over the last decade. The International Trauma Research Network concludes the number of deaths per year from injuries is greater than that of all deaths from HIV/AIDS, malaria and tuberculosis combined (Fig. 1). The Disease Control Priorities Project estimates that close to

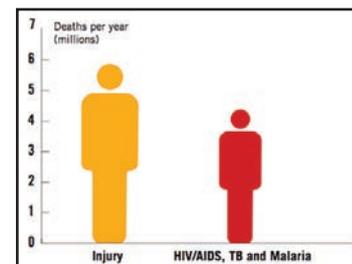


Fig. 1. Comparison of worldwide deaths per year. 2016. (Source: [http://www.who.int/violence\\_injury\\_prevention/key\\_facts/VIP\\_key\\_facts.pdf](http://www.who.int/violence_injury_prevention/key_facts/VIP_key_facts.pdf))

half of deaths and a third of disabilities in low and middle income countries could be addressed by implementation of effective emergency care (2,3). According to the World Health Organization (WHO), the global burden of trauma is increasing, with injuries listed as the top three causes of

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## Kurakani Connecting Global Nepali Professionals

By Er. Hira Dangol, GNPN

The Kurakani team at the Global Nepali Professional Network (GNPN) organizes a monthly networking meeting for Nepali professionals. These events are referred to as Kurakani events. At each Kurakani event, a guest speaker talks about a topic relevant to Nepali professionals.

The purpose of the Kurakani events is to educate, inspire, and foster working relationships within the Nepali community.

Kurakani events provide a platform for industry leaders, professionals, entrepreneurs, investors, educators, researchers, and technologists from the Nepali community across the globe to accelerate innovative ideas and growth of hi-tech ventures. This platform plays pivotal role for exchanging knowledge and ideas among industry experts living across the globe in support



Past Kurakani events.

of growth of the Nepali economy. We build expertise and learning ecosystem to foster strong leadership skills among members as well as promote their individual growth. We also support and facilitate initiatives that give back to Nepal.

The Kurakani team is now in its sixth year of existence and has delivered tens of events. The speaker at our first Kurakani, which took place in December of 2007, was Mahabir Pun, the pioneer who helped bring

wireless technology to the Himalayan region. Other guest speakers throughout the years have included Kanwal Rekhi, Kanak Mani Dixit, and Dr. Shanta Dixit. Kurakanis have included panel discussions as well. The first panel discussion took place at the Runway Twitter building in San Francisco, and

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## A History of Amateur Radio in Nepal and Lessons Learned from the Gorkha Earthquake

By Dr. Sanjeeb Prasad Panday

### A Brief History

Amateur radio (aka ham radio) is a mature technology that is used for emergency communication as well as other uses such as “non-commercial exchange of messages, wireless experimentation, self-training, private recreation, etc.”(1). Ham radio is especially effective in emergency communications because other communications technologies (i.e., cell phone and landline) can become overloaded or damaged during emergencies. Nepal’s first ham operator was an American missionary, Father Marshall Moran (9N1MM), who was the founder of St. Xavier’s School in Godavari in 1951. Father Moran was the only radio operator authorized by royal ordinance, which was issued by king Mahendra to operate a telecommunication station in Godavari. At a time before the Internet, before international phone calls, even before teletype, Father Moran could reach any part of the world at the push of a microphone button.

In 1993, radio communication license rules were enacted and tested. Three people Satish Kharel (9N1AA), Suresh Raj (9N1HA), and Ram Bahadur Gurung (9N1RB) received licenses at that time. After a few years, another test was conducted and new license were issued to Krishna Khatri (9N1AB) and Gourish Krishna (9N2AA). No amateur radio license exams were held after that for many years. Then in 2011, the Ministry of

Information and Communication (MOIC) renewed interest in amateur radio licensing, and Tribhuvan University encouraged its students to get involved. As a result, 10 students obtained their amateur radio licenses. About 21 new operator licenses were issued overall during the year of 2011. Since then, the MOIC has been conducting amateur radio exams every year, and there are now about 147 amateur radio operators in Nepal. Out of these 147, about 70 belong to the Institute of Engineering (IOE) amateur radio club.

### Anticipation of a Massive Earthquake: The Impetus to Prepare

Since “Nepal is located at the boundary between Indian and Tibetan tectonic plates . . . in a seismically active region” and “historical data evidence the occurrence of destructive great earthquakes in the past (2),” members of the IOE along with the Computer Association of Nepal-USA (CAN-USA), also known as the Global Nepali Professional Network (GNPN), sought to install a ring of ham-radio repeaters in anticipation of a imminent massive earthquake. Under the program called Radio Mala, the CAN-USA team installed the first repeater atop the National Society of Earthquake Technology (NSET) building, which is located on the southern outskirts of Kathmandu. Installation took place in April of 2012, and the repeater, which was donated to CAN-USA by Mr. Russ Foster of the San Francisco Bay Area, is still in operation and

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transmits at 145.000 MHz and receives at 434.500 MHz. In addition to the repeater, eight handheld radios for Nepali operators were donated and disaster drills were later performed under the guidance of the CAN-USA in which the operational status of key hospitals was assessed, reported via the repeater, and published on the Internet. Numerous volunteers from the U.S. also visited



CAN-USA volunteers from the San Francisco Bay Area's Silicon Valley



CAN-USA volunteer Mr. Rob Rowlands in Nepal demonstrating operation of donated radio handsets.

Nepal and helped train operators to use the handheld radios and other donated equipment, and later in 2014 more equipment was donated, specifically an Elecraft K3 transceiver and multi-band dipole antenna by San Francisco Bay Area resident Mark Espinosa.

In March of 2015, another repeater was donated. This one being a very high frequency (VHF) repeater, which unfortunately was stuck in Nepal's customs office when the dreaded massive earthquake finally hit in April of 2015 (known as the Gorkha earthquake).

#### **Ham Radio During the Gorkha Earthquake**

On April 25, 2015 the 7.8-MMS earthquake hit Nepal. Immediately after the first jolt, many ham operators were using handie talkies (HTs) communicating with each other on the only ham-radio repeater available in Nepal, which was the one installed back in 2012. Some radio operators setup an emergency communications net at 14.210 MHz and started passing emergency traffic, much of which was information about foreign visitors who were missing.

After the initial tremor, everyone was terrified and worried as there were continual aftershocks. Most Families spent nights outdoors in an open space, and students and staff were not

allowed back into buildings at Tribhuvan University. A couple of days after, however, authorization to re-enter the building was granted and the IOE amateur-radio operators (9N1SP along with 9N1AJ, 9N1SH, 9N1DI) as well as other hams passed traffic to Tim McFadden (T6TM), an operator from the U.S. Military Auxiliary Radio System (MARS). McFadden's location was in Afghanistan, and transmissions were sent daily at 0515Z on 21.360 MHz center of activity frequency. Transmission content included authenticated situation reports, which were received from different local newspapers, and from Nepal's home ministry websites. McFadden then posted the information on the All Partners Access Network (APAN) portal. Slow-scan television (SSTV) images were also transmitted during daily communication with McFadden. Occasionally, ham-operator Koji Shimabukuro (JS6QFM) from Okinawa, Japan joined the 21.360 MHz emergency net and monitored communications as well.

Finally, in May of 2015, the VHF repeater that was held up in the customs office at the Tribhuvan International Airport was released, and as life in Kathmandu slowly returned to normal, the IOE radio club members proceeded to install the repeater on top of the club's five-story building, some 80-feet above ground level. In the forefront of everyone's mind was the possibility of more aftershocks, and after a couple of days working on top of the building, an aftershock did occur. It's needless to say the team scurried out of the building. No one wanted to go back to continue the installation, but with the realization that Nepal's hospitals had no backup communication, Mr. Ajay Bhattarai (9N1AJ) gained enough courage to return, and he was able to reach McFadden (T6TM) in Afghanistan.



IOE radio club members installing a VHF repeater on top of the club's five-story building.

#### **Lessons Learned**

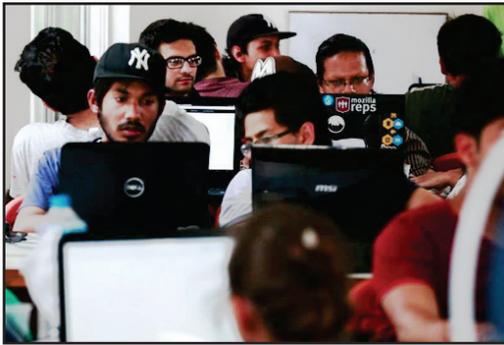
Numerous lessons were learned from the Gorkha earthquake. With the long-established and successful role of amateur-radio in disaster communications, rigorous training of volunteer operators and preparedness greatly ensures successful emergency-communications assistance. Effective training comes from repeated routine drills.

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## ReNepal's 2015 Hackathon Event Review

By Dr. Bishnu Prasad Gautam of Wakkanai Hokusei Gakuen University, Japan;  
Mr. Pritesh Patel from Atlanta, Georgia, USA;  
Dr. Topraj Gurung from the San Francisco Bay Area's Silicon Valley in USA;  
and Dr. Omprakash Gnawali of the University of Houston, USA

The 2015 ReNepal Hackathon was held on May 27, 2015 (just one month after Nepal's devastating Gorkha earthquake) at the Kathmandu Engineering College for the purpose of bringing innovative ideas from computer programmers, IT technologists, and researchers to apply software-based disaster-relief solutions to future disaster events. The hackathon was attended by 69 participants from 12 different colleges and six separate companies and organizations.



Hackathon participants

In response to the needs during natural disasters, we generally bring food, medicine, clothes and other material to the disaster stricken areas that can help sustain the lives of people. The hackathon was a software-response by the IT community spanning academia, software engineers, and researchers over a short period of time on software projects that can address the needs of rescue teams or the needs of citizens during reconstruction. Organizing an event soon after the disaster seems like a strange decision on one hand; however, it convinced IT engineers to think seriously and feel valuable as citizens helping the nation with their unique perspective. The IT community requires guidance and collaboration with other relevant sectors of society (i.e., healthcare, NGOs, and government) to ensure that software developed for disaster events addresses the real needs on the ground. We invited Commander Dr. Krishna Tamang from the AIG, Armed Police Force and Paul Chhetri from the United Mission to Nepal organization to share their experiences from on-the-ground, post-disaster activities to inspire and inform participants.

For readers who are unfamiliar with the concept of a hackathon, we've provided here a brief explanation. A hackathon is an event in which students, IT engineers and professionals gather over a short period of time (e.g. 24 hours) to work

on software projects. Generally, hackathons are organized in normal situations in which participants are encouraged to have experimentation and creativity. Hackathons have become a popular way to encourage innovation for digital technologies, e.g. a common output of a hackathon can be an Android app, a website, or a software program that accomplishes certain needs in the market. Less common, however, is organizing hackathons to promote social causes, e.g., to innovate technologies for disaster-risk reduction or simply help with rescue and relief efforts. Teams typically consist of three to five members. Some hackathons may have just a few teams, while larger ones have several hundred participants. The CodeRED hackathon, for example, was attended by about 250 participants and was held at the University of Houston in the U.S. It is common for the organizers to provide food and water, Internet access, mentoring resources, and a place to take naps. At the end of a hackathon, often a jury will select a few winning teams or ideas and present the winners with prizes. The ReNepal hackathon followed this format and also included prize money for the best software or app developed during the event.

During the ReNepal Hackathon, there were many interesting and useful ideas explored, pursued, and developed into functioning prototypes or demos. The Trauma Relief web portal by Bobby Basnet, Sajesh Khadgi, and Saurav Bajracharya won the Rs. 35,000 top prize of the event. Trauma Relief aims to address mental health issues that arise after stressful situations such as disasters. The Sahayogi-Haat app by Ashwin Shrestha, Anmol Paudel, and Bhupal Rai won the Rs. 25,000 second prize. This app has technology to help locate family or friends missing after a disaster. The Disaster Broadcaster



Winners of the 2015 ReNepal Hackathon event.

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therein we talked about entrepreneurial opportunities for Nepali professionals in the Middle East. Another Kurakani event included guests from Google, StoryCycle, and the Apa Sherpa Foundation where stories and indoor imageries from the Everest region was presented, which was exceptionally memorable as it was facilitated by the by Google Earth Outreach team.

Following the 2015 Nepal earthquake, we brought together GNPN's Radio Mala and disaster-preparedness-initiative team along with other San Francisco Bay Area organizations to talk about disaster-relief efforts. The discussion included many stories from the ground.

In 2016, during the week of the Global Entrepreneurship Summit (GES) at Stanford University, we tapped in several Nepali GES delegates including Nepali startup founders from around the U.S. for a panel discussion, which included the topic of the rise of Nepali



Our Kurakani event at the 2016 GES.

business startups and the next opportunity for global disruptions. The effort of GESs, by the way, was initiated by President Obama with the purpose to identify and "deepen ties between business leaders, foundations, and entrepreneurs in the United States and . . . around the world."(1).

Primarily, the Kurakani team has focused on areas that promote professional networking and help showcase inspiring speakers. Other areas of interest, however, include new ventures, knowledge sharing, social innovation, leadership,

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Building strong relationships between key players before a disaster occurs eliminates delays and helps the establishment and understanding of protocols. Key organizations that amateur-radio operators should build relationships with include government-response agencies, hospitals, military, and police. In the case where our VHF repeater was frozen in Nepal's customs office, the government of Nepal was remarkably helpful once they were aware of the function of the repeater and how it could be used to help save lives.

Finally, utilizing a developing nation's diaspora members can play a crucial role in disaster relief. CAN-USA (GNPN) and the



Fig. 1. Key areas of interest.

investment and strategy, and policy and public administration (see Fig. 1). While currently most of our events take place within the San Francisco Bay Area, we are working on growing our reach in locations such as Dallas and Boston. In addition, we intend to run Kurakani events in Nepal.

For more information, visit the GNPN website (<http://www.gnnpn.org/whatwedo/gnnpn-kurakani/>). ■

Reference:

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Hira Dangol, GNPN VP and Chair of the GNPN Kurakani team

**Hira Dangol** is a business-startup advisor who is passionate about connecting ideas, technology, and people. Dangol currently works at Bank of America as VP of Systems Engineering and advises OnTargetCloud, an early-stage startup. He has extensive technology experience from companies like AT&T and Cisco Systems and currently serves as an executive for VLAB, a chapter of the MIT Enterprise Forum. He also serves on the board as VP for GNPN and founded Northernbelt Innovation Lab to inspire high-school students to pursue studies in STEM (science, technology, engineering, and math) fields.

Association of Nepalese in America (ANA) have tremendous networking and resources. ■

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## GNPN's Earthquake-Relief Efforts in Nepal

By Pradeep Khanal

To our utter disbelief, almost 9,000 people lost their lives and 20,000 were injured after the massive earthquake and subsequent aftershocks struck Nepal on April 25, 2015. Understandably, every Nepali and those who love Nepal from around the globe wanted to help. In this immediate aftermath of this tragedy, our organization, Global Nepali Professional Network (GNPN), stayed in the forefront of involvement and initiated a central communication platform especially amongst the Nepali diaspora. We held regular "sync-ups" for a couple of days to bring forth recent updates through direct communication with international and local responders and government agencies. Our organization collaborated with many other like-minded organizations, namely the America Nepal Medical Foundation (ANMF), the American Society of Nepalese Engineers (ASNEngs), the Non-Resident Nepali Association National Coordination Council of USA (NRN NCC of USA), and The Association of Nepalis in the Americas (ANA) in establishing a centralized communication platform, especially for diaspora members. We worked with Google to enable their Google Person Finder, which helped us create crowd-sourcing-based map that included medical centers, shelters, and food supply centers, plus we created a web portal and a Facebook page as our central information repository.

### Fundraising for Earthquake Relief Efforts

In addition to the centralized communication platform, GNPN raised over \$100,000 for earthquake relief. To maximize fundraising, we encouraged institutional donations and also helped our members in procuring matching funds from their respective employers whenever possible. During the



Immediate-relief efforts to which GNPN contributed.

first phase, this fund was used for immediate rescue, relief, and resource needs. In the later phases, we targeted funds towards relief efforts that ensured longterm rehabilitation of earthquake victims. GNPN collaborated and worked with the CAN Federation in Nepal, on all funding and relief works. The CAN Federation, a 23-year-old non-profit organization located in Nepal has chapters in 72 districts and has thousands of members spread around the country. Our partnership with the CAN Federation, facilitated all aspects of GNPN's fundraising, fund-dispersal, and overseeing activities.

Mobilizing grass-root level organizations was part of our initial action. Our funds were directed towards the highly affected areas of Sindhupalchowk, Nuwakot, Gorkha, Lamjung, Kavre, and Kathmandu districts for the purchase of relief materials such as tarp, small tents, corrugated sheets, and food items (e.g., lentils, salt, sugar, instant noodles, and flattened rice). The grass-root level organizations that distributed relief supplies included the Society of Ex-Budhanilkantha Students (SEBS), Sahayeta, the Institute for Social and Environmental Research-Nepal (ISER-NEPAL), and Nuwakot Sewa Samaj. Our relief efforts also included the building of 50 temporary shelters in the Kathmandu and Sindhupalchowk districts.



Temporary shelters were built at a cost of \$190 each.

Furthermore, GNPN contributed \$5000 to the Prime Minister's Disaster Relief Fund. The donation was handed directly to the then Prime Minister of Nepal, Mr. Sushil Koirala, at his official residence in Baluwatar, Nepal.

The GNPN also partnered with Gham Power Nepal Pvt. Ltd. for the Rebuild With Sun campaign and successfully raised more than \$20,000. This fund was used for the installing of solar-power stations in almost 30 community schools within the most earthquake affected areas in Nepal.

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After the earthquake, we co-sponsored a 24-hour disaster-centric hackathon, which took place at the Kathmandu Engineering College in Kathmandu, Nepal and was attended by 69 participants. The hackathon aimed to create software-based disaster-relief solutions for future disaster events.

For later funding phases, our objective was to support high-impact earthquake-relief projects focused on education and technology, which is in line with GNPN's vision and fundraising commitment to donors. Staying true to this objective, GNPN went through a thorough and vigorous process in soliciting and identifying organizations and projects for funding. Here is a list of the projects GNPN has funded or is funding.

- Knowledge-sharing center in Kathmandu. The knowledge-sharing center is an GNPN/CAN-Federation common platform in Nepal for sharing information, knowledge, and expertise among industry professionals, researchers, policy makers, and service providers in various areas including, but not limited to, disaster preparedness, Kurakani, technology sharing, etc.
- Expansion of telemedicine services provided by the ASK Foundation. Currently, the ASK Foundation operates clinics at the remote locations of Kalikot and Dhading and plans to expand into earthquake affected area Dhading and Rasuwa.
- Medication for Nepal. Medication for Nepal is a peer-to-peer platform that connects patients directly with donors and supports the government's free essential-drugs program by setting up a supplementary medical-supply chain in pilot districts.
- Digital empowerment by the Women Development Advocacy Center. The Women Development Advocacy center aims to provide computer learning hardware and software courses to marginalized youth. They collaborate with primary and secondary schools in local areas for their employment as computer teachers so that computer literacy can reach to all homes in neighborhoods, especially in Terai.
- A week-long information and communication technology training event for youth and women. This event was a multi-sponsored effort among NI-LAB, GNPN, and the Microsoft Innovation Center in Nepal. The event was led by NI-LAB and provided digital-literacy training to underserved youth and women. Laptops and certificates were also made available.
- Sustaining GNPN Kurakani. Sustaining the very successful and well-attended GNPN Kurakani events includes funding for attracting inspiring speakers and bringing communities

together for mutual benefits. Funding is also allocated to grow Kurakani in its quest to become global.

### **Disaster (Earthquake) Preparedness Activities**

Prior to the massive 2015 earthquake in Nepal, GNPN had launched a first-of-its-kind project called Radio Mala. Radio Mala, when completed, will be a ring of amateur-radio (a.k.a. ham radio) repeaters setup within Nepal. Ham radio is commonly used as a means of backup communication during disaster events. To help Nepal in its earthquake preparedness and disaster-relief effort, GNPN was instrumental in establishing Nepal's first ham radio repeater, which was actively used during the earthquake. We've successfully raised \$35,000 to date for Radio Mala.

GNPN has collaborated with many U.S. and Nepali government and non-government organizations, and in 2015, GNPN worked on a joint initiative to prepare a position paper on earthquake preparedness and disaster relief in Nepal along with the ANMF and the ASNEngs.

An integrated disaster-communication consortium was established by GNPN by partnering with hospitals, universities, NGOs in Nepal as well as the Armed Police Force of Nepal, the Ministry of Home Affairs, and the Nepal military. In addition, we partnered with American universities, corporations, and civic preparedness groups. ■



Pradeep Khanal,  
immediate past president of GNPN

**Pradeep Khanal** is the immediate past president of the GNPN and a member of the ASNEngs, the Daayitwa Initiative, and the ASK Foundation. He led the effort to establish the Mahim Ojha Memorial Community Library in Nepal, and while at Louisiana State University, he became the founding president of the Nepalese Student Association. Pradeep received his master's of science in electrical engineering from the University of Texas at Austin and considers himself Nepali at heart and global in spirit. He believes in bringing professionals together to make great things happen. He is particularly interested in fostering social entrepreneurship and is currently pursuing an MBA at the Haas School of Business at the University of California at Berkeley.

## BANWO's Cooking Stoves

By Dr. Amod Pokhrel

On April 15, 2015, Nepal was struck by a massive earthquake. The earthquake not only killed people and livestock, it also severely damaged and destroyed many homes and the essential appliances inside. Although some details about the damage caused by the quake are slowly emerging, there is a dearth of information available on the environmental damage that this earthquake has brought and the effects such changes may have on the health of quake-affected families in the future. For example, in the Kavre district one of the heavily earthquake-affected areas of Nepal, the quake badly damaged and destroyed many biogas plants. As a result, households that were using biogas-based stoves to cook had to revert back to using open wood-fired stoves ("Chulo" is the word for stove). The biogas chulo emits substantially less pollution indoors whereas the wood-fired chulo generates many harmful pollutants such as fine and ultrafine particles and carcinogens such as benzene, formaldehyde, and benzopyrene.

Immediately after the earthquake, there was an outpouring of local and international support towards relief and recovery efforts, and one organization called the Bay Area Nepali Women Organization (BANWO) recognized the need to ensure clean cooking, heating, and lighting solutions since about 91% of rural populations in Nepal use wood or dry-dung-cake-based fuel for cooking and heating, and overall only about 76% of people have access to electricity. Studies conducted by many researchers (including this author) have

shown that the use of wood-fired stoves for cooking and kerosene for lighting over an extensive period of time can increase the chance of several diseases for women, including tuberculosis. To minimize the exposure to indoor air pollution and health risks associated with such exposure, BANWO (which is based in the San Francisco Bay Area) partnered with Energant to introduce a new cooking solution. They refer to their stove as the E-chulo.



The E-chulo stove, a forced air convection device.

The E-chulo uses forced air convection to improve combustion performance as well as thermal efficiency. Forced air convection is enabled through the use of a thermoelectric-generator (TEG) powered fan that injects air into the wood-gas stack and creates turbulent mixing for a complete combustion of particles, carbon monoxide, and volatile (continued on page 16)

## HandHero: Helping Nepali Burn Survivors Rebuild Hand Function and Rejoin the Community

By Jana Lim and Kimberly Souza

Burns are a huge problem worldwide. Currently, 50% of people in the developing world still use open fires for cooking, lighting, and heating their homes(1). This results in an estimated 11 million burns each year in the developing world (2). In Nepal, burns are the 2nd most common injury and are responsible for 150,000 disabilities (3). The majority of patients affected are young children who tend to fall into open fires, severely burning their hands (4). The long-term consequence of an inadequately treated third-degree-burn injury is formation of aggressive scar tissue that can contract the hand into a fist or other unnatural position, destroying function and mobility. Furthermore, these patients are often ostracized for their visible disability. This type of injury is common in low- and middle-income countries where there is lack of access to adequate acute care.

To address this huge problem, a team of interdisciplinary graduate students developed HandHero, an innovative, low-cost medical device for post-surgery burn patients. HandHero was conceived in the 2014 Design for Extreme Affordability course at the Hasso Plattner Institute of Design at Stanford University in California. The team partnered with ReSurge International, a California-based nongovernmental organization (NGO) that sponsors reconstructive surgeries, including post-burn contracture releases, in the developing world. The challenge was to find a way to help ReSurge expand its impact. During a need-finding trip to Nepal, we met several patients who had received reconstructive surgery on their hands, yet had not achieved recovery, or, in fact, had scar tissues re-contract and relapse to their pre-surgical state. We realized the missing link between surgery and recovery (maintenance or improvement

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death for persons aged 5 to 44 years (4). Overall, both pre-hospital and facility-based emergency care are high impact and cost-effective interventions (3). As regards injuries, public access to skilled providers and trauma centers leads not only to decreased mortality, but improved rehabilitation and decreased morbidity for those who would normally be counted among the workforce for the country. Around the globe, public health and policy officials charged with caring for disabled citizens realize that investment in ventures that improve outcomes in younger adult populations have important economic consequences.

Worldwide, experts agree that time-sensitive interventions save lives in situations of trauma, cardiovascular diseases, infections, and acute exacerbations of certain chronic illnesses, such as asthma. However, similar to other complex interventions, it is difficult to measure the benefit of an emergency care system service for one individual. This difficulty in apportioning health improvements for a particular individual is also true for vaccines, seatbelts, sanitation, or even the decision to stop smoking tobacco. However, when measured on the scale of an entire population, without a doubt, these interventions are all valuable and cost effective. Likewise, availability of rapid and efficient emergency care is cost-effective and can lead to health improvements (3). When an unexpected event creates the need for urgent medical attention, the system must already be in place to ensure the best outcome. Even the most luxurious private ambulance service may be unable to intervene in time if they are not summoned immediately to the scene of an accident. In the critical moment of medical need, a uniform system that is the same for everyone must be in place. EMTs are a "seatbelt" that should be a high-priority investment for Nepal. The Nepali people and government should be commended for targeting this need in demonstrable human resource development and organizational focus, particularly in the aftermath of a natural disaster.

Strengthening local institutions and continuing to improve emergency care, both in the prehospital and hospital setting, is a critical next step for effective post-disaster response. Funding agencies have a unique opportunity to work with each other in a supportive role by directing efforts to specific goals in emergency care, including human resource development, building infrastructure, providing long-term salary support, logistics assistance, and other capacity-building initiatives. As described in the flagship WHO report, "A Universal Truth: No Health Without a Workforce," health development goals should include strengthening human resources and training healthcare personnel (5).

Despite the progress made in Nepal in prehospital care, there is still a lot of work to do. Gaps in expertise particularly strain the nonprofit system already hindered by equipment needs and limited capital investment. Protocols and referral systems could be developed and deployed to cover locations in rural Nepal where most of the population lives. The assistance of international alliances to direct support impacting this type of long-term investment would be highlighted as a model for global disaster assistance. The development of new processes as well as the organization of existing resources enables a "regionalization" of emergency care that can optimize outcomes. Global health objectives and relief efforts will hopefully continue to spur work in partnerships that support capacity-building and human resource targets, well before disaster strikes once again. ■

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**Dr. Rebecca Walker** is an assistant professor of Emergency Medicine at Stanford University School of Medicine and has been working with the Nepal Ambulance Service since 2009. She provided oversight for curriculum development and the current training in Kathmandu and partnered with NAS and IMC to design post-disaster EMS capacity building.

<https://med.stanford.edu/profiles/8582?tab=publications>

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app by Abhishek Maharjan, Ruraj Joshi, Sraddhanjali Acharya and Subigya Jyoti Panta allows fast broadcast of disaster-related alerts through all media channels (i.e., TV, radio, SMS, etc.). The app won the third-place prize of Rs. 15,000. Bal Krishna Bal of Kathmandu University, Richan Shrestha from LeapFrog Technology Nepal Pvt. Ltd., Prashant Shrestha from YoungInnovations, and Paul Chhetri served as judges. Dr. Minendra Rijal, the former Minister of Information and Communications distributed the prizes to the winners and congratulated all the participants that brought passion and energy for social good through technology.

Organizing the ReNepal hackathon required the help and support of many individuals. We are indebted to them for stepping up in a time of need by providing their expertise and resources.

There were three broad tasks for this hackathon: fundraising, logistics, and theme. Fundraising was needed to pay for the prize money, venue, food, and logistics. We thank the Kathmandu Engineering College, University of Houston, Wakhok Nepal, Leapfrog Technology, WorldLink, Expresiv, Young Innovations, and the Global Nepali Professional Network (GNPN) for their cash and in-kind support.

For logistics (i.e., making sure the facilities, people, and technology were in place and in top shape to support the event), we thank the entire logistics team, which includes Prof. Hirendra Man Shrestha, Shiva Prasad Koirala, Sudeep Shakya, Anmol Bajracharya, and the rest of the Kathmandu Engineering College, Kalimati team. In addition, we thank Himal Karmacharya, Bal Krishna Joshi, Richan Shrestha from Leapfrog Technology, Bibhusan Bista, Prawesh Shrestha, Prashant Shrestha from Young Innovations; Ankur Sharma, Swapnil Acharya, and rest of the Expresiv team; Prof. Bal Krishna Bal from Kathmandu University, Dr. Rajesh Rajbhandari from Bluecross, Pradeep Khanal, Hira Dangol from Global Nepali Professional Network, Dileep Agrawal from Worldlink Communications, Nootan Ghimire and Raju Dawadi and many others for their heroic effort to help plan and run the event.

Finally, the programming of the event including the theme of the event was mostly decided by the core team consisting of Bishnu Prasad Gautam, Pritesh Patel, Topraj Gurung, Omprakash Gnawali, and with valuable input from the logistics team and the broader IT community.

The organization of this event was a perfect example of how quickly people can come together and coordinate effectively when fueled with a desire to help other people. Working

under stressful circumstances and under very-short timelines with the organizing team located across the world in different time-zones added to the challenge. Digital collaboration and communication tools, including social media, helped the team work together, almost as if we were working from the same office!

Unlike many hackathons, ReNepal was organized with very little advance planning. Typical hackathons take months to prepare. However, the strong teamwork among the organizers and genuine collaboration across government, academia, and the private and non-profit sectors made this event successful. A large number of participants came to the event and gave everything they had for 24 hours. They forged new friendships and worked on many new and useful ideas and products for social good. The long-term impact and success of the ideas that came from the hackathon is yet to be known, but the participants were unanimous in their appreciation for the opportunity to use their skills to address the needs of disaster-struck Nepal.

Organizing the event was a life-changing experience for all of us. We learned that when people are fueled with a genuine and pure service mindset and a desire to help people in time of need, it's pretty easy to work together and create substantial artifacts even in a very short time. That's a beautiful phenomenon to witness and be a part of. It goes to show you how wonderful humanity is in its true colors. Please visit our website (<http://renepal.org/>) and watch our video (<http://bit.ly/renepalvideo2015>). ■

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of post-surgical range of motion) was proper long-term physical therapy.

We decided to focus on designing a solution to allow post-surgical burn patients the critical access they need to long-term rehabilitation. After extensive research into ReSurge International's patient database, we determined that the majority (>50%) of surgeries performed involve the hands, and furthermore, the majority of hand surgeries (approximately 85%) are flexion contracture releases (i.e., releasing scar tissue from the palmar side of the hand). Additional factors that guided our decision included the high prevalence of hand-burn injuries due to the way babies fall into open fires, and the importance of having functional hands to lead an independent life.

The proper treatment for a severe burn injury starts with skin graft and/or post-burn contracture release surgery, followed by long-term and frequent physical therapy with splinting. The current standard of care includes static progressive splinting for 6 to 12 months after surgery (5). In the absence of post-surgical physical therapy and splinting, the injured area is at extremely high risk for re-contracture (estimated to occur in between 60-100% of cases). With severe re-contracture, patients' hands revert to their contracted state and appear as if surgery had never been performed. Patients thus continue to struggle with limited range of motion and function, and sometimes return to the clinics unsatisfied with their clinical outcome and need to undergo repeated expensive and painful surgeries.

Physical rehabilitation is critical to recovery, yet extremely inaccessible for these patients, since the few physical therapists present in Kathmandu are ill-equipped with supplies and are located far from rural patients. Patients who do not receive adequate physical therapy develop scar re-contractures within a matter of months.

Our solution to this problem is an affordable and user-friendly orthotic device that promotes healing at home, with minimal professional intervention. The HandHero splint works by applying progressive pressure to the fingers of a contracted hand to gently stretch the tendons and muscles back to a functional state. It features a user-friendly steel lacing ratchet mechanism that the patient can use to progressively straighten their hand. We are currently conducting field tests with burn contracture patients in Nepal and have obtained proof-of-concept that our splint works effectively as designed. Preliminary follow-up data suggest that patients using HandHero are able to maintain and even improve range of motion in affected joints while maintaining high satisfaction and compliance.

Surgeons and NGOs are spending critical resources on repeated surgeries for re-contractures that could easily be avoided with proper physical therapy. Many hospitals in Nepal have limited or no physical therapy services. Therefore, nearly all patients who receive contracture release surgeries at those hospitals will eventually develop re-contractures. The HandHero provides the preventative therapy at less than 10% of the cost of surgery, enabling hospitals and NGOs to extend their resources to reach even more patients, and empowering patients to take their treatment into their own hands. The HandHero Splint fulfills a pressing existing need not only Nepal, but also holds the potential to make physical therapy accessible to millions of burn patients worldwide.

Hand disabilities caused by open fires are extremely common globally, and can have devastating consequences if they are not properly treated. Since hand function is critical to the ability of individuals to function independently, support themselves, and raise a family as an accepted member of their community, the value proposition that HandHero offers these patients in regaining full recovery is enormous. In Nepal, HandHero gives patients \$9707 USD in restored productivity over a lifetime in addition to the dignity and self-esteem to rejoin their community as a contributing member. Our innovation will expand the impact of medical facilities and non-profit organizations working in the surgery space by improving patient outcomes and decreasing resources consumed because of repeat surgeries on the same patient due to recontracture (\$250 USD per patient per surgery).

In the existing Nepali medical system, the HandHero splint bridges a key gap for hand burn patients by creating a situation of accessible long-term physical therapy. However, the need for post-burn contracture physical rehabilitation spans far beyond hand injuries to other body parts, such as axilla, elbow, neck, and leg.

These injuries are beyond the scope of this project, but we envision several key ways the health system in Nepal could be improved to better serve all burn patients. Firstly, there is a need for surgeons and physical therapists, who not only understand the importance of post-surgical rehabilitation but are equipped with the tools and expertise to support patients until they are fully recovered. A major shortage of trained physical therapists complicates the challenge of long-term follow-up care for these patients. With a total population of 28 million people, Nepal only has 600 physiotherapists, most of whom are not fully equipped for hand therapy. Additionally, these physical therapists may charge expensive fees, lack specialized hand therapy training, and

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The HandHero splint has an easy-to-use ratchet mechanism to progressively splint a patient's hand open over a period of 6-12 months.

be found only in Kathmandu, which may require several hours or even days of travel for many rural burn patients. Recent studies from the World Health Organization and the Lancet Commission on Global Surgery have shown that access to surgeries in low- and middle-income countries, even for extremely rural and remote patients, has been steadily increasing over the last decade. Unfortunately, the pace of ancillary services, such as specialized physical therapy, has not kept up. Specialized physical therapy workshops could help correct this imbalance between access to surgical care and to follow-up services. At Kirtipur Burn and Cleft Hospital, we have seen the benefits of having a dedicated physical therapy department and a trained hand therapist engaged in follow-up care. We have also learned that physical therapists at other hospitals in Kathmandu recognize the knowledge gap in hand therapy and express a desire to gain these skills.

Secondly, patients and their families need to be fully informed about the treatability of burn contractures, as well as the need for splinting and rehabilitation. A common and harmful misconception is that surgery is a quick one-time fix, when in reality it is the first step in a long-term investment in therapy leading to improved health and independence.

Thirdly, services must be made more accessible to patients who do not have the time or monetary resources to make repeated trips to the city for follow-up care. Making more rehabilitation services available at remote health camps or district health posts would help meet this need.

Finally, education about burn prevention, fire safety, and scaling back use of open fires in the home would ultimately prevent many of these injuries from occurring in the first place. Until this happens at a national scale, however, it is important to realize there is an existing patient population living with treatable disabilities, whose quality of life could be greatly improved by adequate medical awareness and care. ■

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*Jana Lim is a PhD candidate and Kimberly Souza is an MD candidate at Stanford University School of Medicine. They were both members of the original team that conceived the HandHero project in the 2014 Design for Extreme Affordability course at the Stanford Institute of Design (d.school). Beyond the course, they led a multidisciplinary team of graduate students to further develop, manufacture, and test the HandHero device. They have both spent time in Nepal for research and testing.*

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organic compounds. The TEG also generates surplus power during operation, and during optimum operating conditions, it produces 15 watts of power at 5 volts DC for external devices. Extra energy is then sent to storage in an internal rechargeable lithium-iron-phosphate (LiFePO<sub>4</sub>) battery for the charging of small electronic devices, such as cell phones and LED lights for an extensive period of time. Compared with other batteries, LiFePO<sub>4</sub> batteries have substantially lower fire risk and have superior cycling stability, typically losing only 20% capacity after 7000 deep cycles.

In May 2016, along with Energant and local NGOs, BANWO provided an E-chulo makers training program in Kathmandu. About 25 people participated in this training program. After the training, participants, mainly women, actively took part in assembling the stoves. This process alone provided

employment to six people. Up to this point, BANWO has distributed about 150 stoves to earthquake-affected families of the Dhading and Kavre districts. In addition to distribution, it is also providing training to local technicians to fix the stoves if they should malfunction. This training has helped villagers to use the stove continuously. Now there is a big demand for the stoves in rural areas as it provides households with light and power to charge their mobile phones. However, the cost is still prohibitive for many people because of heavy import duty on electronic parts used in the stove to generate electricity. If the Nepal government provides a subsidy and tax break on the import of electronic components and some steel parts, the price of stove could be brought down substantially. If this goal could be achieved, there is a tremendous potential for expanding this technology to other rural areas of the country beyond earthquake affected districts. ■



Volunteers assemble E-chulo stoves for earthquake-affected families.



Earthquake-affected families receiving their E-chulo stoves.



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