



Engineering World Health Summer Institute Nepal 2018 Final Report

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Program Partners:

Denmark Technical University

Nordic 5 Tech Alliance

VSN Nepal

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Access Health Care Nepal

Executive Summary

This year was Engineering World Health's third Summer Institute in Nepal. We had 21 participants (including 3 Nepali BMET students) in this year's program, working in 12 hospitals throughout Nepal.

The 18 participants from the Nordic 5 Technical Schools began the program at the Technical University of Denmark, where they took an intensive 3-week course in biomedical instrumentation. After completing the course, the group traveled to Dhulikhel, Nepal, for 1 week of cultural and language training before departing for their hospital placements. While in the hospitals, participants worked in groups of 2 or 3. During their 5-week placements, **the participants repaired 223 pieces of equipment worth an estimated US \$446,000^[1].**

Most participants reported very positive experiences in their hospital, although some said their hospitals lacked equipment needing repair. From the standpoint of healthcare in Nepal, this is a good development, as it means the hospitals we have been working in are becoming more self-sufficient. We will, therefore, begin to explore new partnerships with less well-equipped hospitals. Nearly all groups completed a secondary project for their hospitals, working with a budget of \$100 USD per person, to address a hospital need outside of equipment repair.

When asked if they would recommend this program, the participants gave a unanimous "yes." The participant feedback gathered was very helpful to us as we continually work to improve this program. Many impactful, high-need repairs were made, and participants appreciated the challenges that come with working in a different culture.

We are grateful to all at DTU and at Access Health Care who helped make this program possible and successful in the eyes of our participants and on-the-ground partners in Nepal.

Medical Equipment Repair

The 21 participants repaired or completed preventative maintenance on **223 pieces** of medical and hospital equipment, totaling approximately USD \$446,000^[1] of equipment repair service. Their work is summarized in the following charts:

Repairs/Maintenance by Type of Equipment

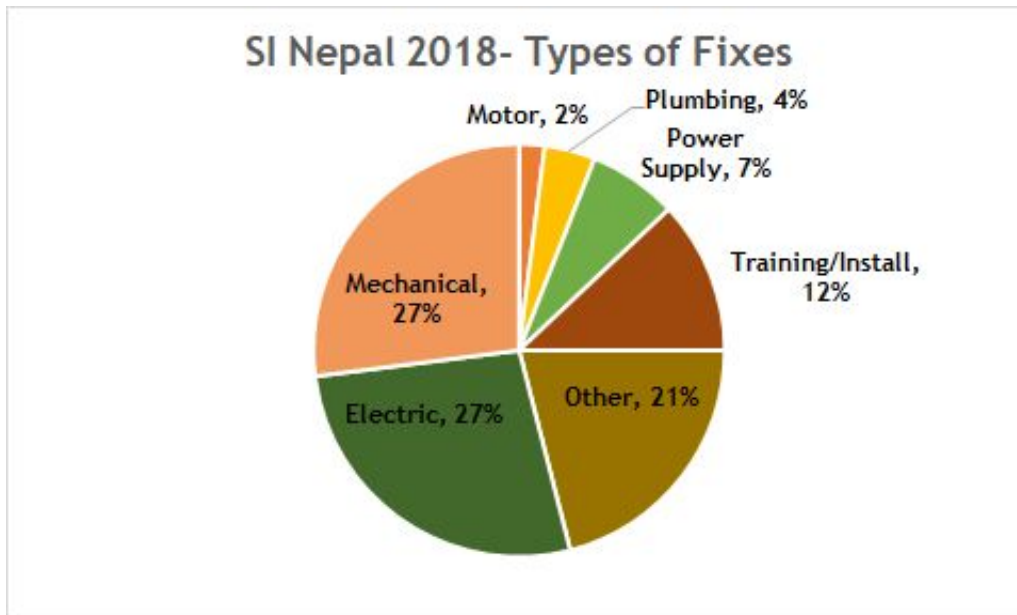
Type of Equipment	Total Pieces	Type of Equipment	Total Pieces
Anesthesia Machine	1	Microscope	4
Aspirator/Suction Machine	13	Nebulizer	25
Autoclave	14	Otoscopies	7
Automatic Voltage Regulator	1	Oxygen Concentrator	15
Blood Electrolyte Analyzer	2	Patient Monitor	2
Blood Gas Analyzer	1	Phototherapy Device	2
Blood Pressure Device, Automatic	1	Printer	3
Blood Pressure Device, Manual	17	Pulse Oximeter	8
Centrifuge (electric or hand operated)	5	Scale (laboratory and in wards)	7
Drying Machine	2	Spectrophotometer/Colorimeter	3
ECG	11	Thermometers	1
Fan	1	Ultrasound machine (imaging)	1
Fetal Stethoscope	1	Vacuum Extractor (for delivery)	2
Furniture	1	Ventilator	4
Incubator (infant)	1	Washing Machine	1
Infant Warmer (Radiant or other)	6	Water Bath (laboratory)	1
Infusion Pumps	6	X-Ray Film View Box	3
Lamp, examination	7	X-Ray Machine*	3
Lamp, surgical	7	Other	17

*User training and/or low voltage and peripherals repairs only

Repairs by Hospital

Hospital	Items Touched	Repaired	Abandoned	Repair Percentage
Hospital 1	33	26	7	79%
Hospital 2	6	5	2	83%
Hospital 3	37	26	11	70%
Hospital 4	12	3	9	25%
Hospital 5	21	14	7	67%
Hospital 6	33	28	5	85%
Hospital 7	43	28	15	65%
Hospital 8	45	32	13	71%
Hospital 9	29	25	4	86%
Hospital 10	5	1	4	20%
Hospital 11	19	12	7	63%
Hospital 12	29	23	6	79%
Total	312	223	89	71% avg

Repairs by Type of Fix



Secondary Projects

Each team is encouraged to complete a secondary project for their hospital during their placement. Through interviews with hospital staff, the participants identify a need in the hospital, then are given a budget of \$100 per person to use in a creative way to provide for that need.

Hospital 1

This group's secondary project was installing hand sanitizer stations at various locations around the hospital. The stations were mounted at the wall near the sink, and the locations were selected by the staff at each ward. Each station includes a basket and a laminated instruction card mounted on a piece plywood cut to size. On one side of the card are instructions in both English and Nepali, and on the other side of the card is the recipe for the making of alco gel.



Constructing the stations



A station installed

Hospital 2

Upon request from the hospital staff, this group gave a presentation describing how to conduct general maintenance of medical equipment. 32 members of the hospital staff attended the presentation, coming from all departments of the hospital- doctors, nurses, managers, technicians, etc. The presentation was translated to Nepali to ensure everyone could understand. The presentation was very well received and considered a great help to the staff.

Hospital 3

This group made hand sanitizers for the hospitals, including stands for the dispensers. Their hospital placement has concrete walls, making it difficult to effectively attach a dispenser to the walls, thus the need for the stands. The stands also give the added benefit of making the sanitizers movable so staff can choose the best location. In all, 6 stands were built and very well-received by the staff.



Painting the boards for the stands



The final product

Hospital 4

This group put together an inventory list to be used by the hospital, and possibly future EWH volunteers. The list identifies the problem with the equipment, status, if the equipment is under warranty, or needs spare parts. This provides the hospital with a efficient way to make prioritize repairs and maintain its equipment.

Hospital 5

This group completed three secondary projects. The first was providing a way for the hospital staff to make their own distilled water since it is too expensive for the hospital to buy. This group saw, and the staff described, how the use of tap water destroys their equipment. For example, tap water had created chalk in an autoclave, which led to a leak, rendering the autoclave non-functional.

The group made two variants of their water distillation procedure - one for distillation of water to be used in autoclaves, and one for water that would be in contact with a patient. They made quick-start guides for both procedures and purchased all of the necessary equipment.



Participant with a distiller bucket

Their second project was cleaning and organizing the workshop, making it easier to locate tools and equipment. They also organized all of the spare parts, placing them in boxes with labels, so that the staff could easily find them in the future.



The organized workshop

Their third project was hanging curtains between the beds. The participants measured and purchased fabric, then worked with a local seamstress to sew the curtains. The project was well-received and the nurses were happy with the results.



Before and After

Hospital 6

This group had multiple projects. The first was making side rails for hospital beds to prevent newborn babies from falling out. After giving birth, the new family will stay in the hospital for up to 4 days. There are child beds with railings, but the mothers generally want to stay with their newborn baby, including at night. However, doing this comes with a risk of the baby falling out of the bed. Thus, small side rails on the large hospital beds help the family give the baby a more worry-free beginning of its life. The group made 4 pieces in plywood that were painted white. The use of metal was discussed, but it can be difficult to find in small towns.



Bed with railing

The second project was supplying the hospital with oxygen cylinder trolleys. The hospital staff has a lot of difficulty transporting oxygen cylinders. Because of their heavy weight, they are often dragged across the floor. The large ones are almost impossible to move. Further, they all stand unsupported on the floor with the risk of falling over and exploding. The group bought oxygen trolleys that can keep a cylinder stable on the floor with less risk of it falling over. They bought one for the

medium-sized cylinders and one for the large-sized cylinders, as well as spare parts in case anything on the trolleys breaks.



The group with the two oxygen cylinder trolleys

Hospital 7

This hospital had many unorganized boxes filled with medical equipment in a hospital office and hallway. This group's project was to organize both areas. They found racks at the hospital, purchased baskets and plastic bags, and started unpacking and organizing every box. They reported finding everything from patient monitors to medicine, operation tools to insects in the boxes. Everything that could fit into a shelf was put there and labeled. Large equipment boxes were stored on top of the shelves and on the floor.



Before



After

This group also made a box with donated LEGO and crayons and paper for the children's ward. This gives something for the children to play with while in the hospital. They also made a string with clamps for the children to hang up their drawings.

Hospital 8

This group's secondary project was to renovate the admittance room in the children's ward. Before, the children's ward was worn down. By renovating the admittance room, the group hoped to provide the best first impression, and thus lift spirits from the start. They cleaned and painted the walls, then put up photos of cartoon characters that are currently popular in Nepal to make the ward more inviting for children while they're visiting the hospital.



After

Hospital 9

This group performed maintenance on last year's secondary project: hand sanitizers in the hospital. Some of the stations installed last year had been taken down, as the hospital ran out of hand sanitizer and could not afford to buy more. A container of sanitizer is 700 rupees; however it only costs 100 rupees to make it in the hospital. So this group repaired the boards from last year, made sanitizer, and created an instruction manual on how to make the sanitizer with local ingredients so the hospital can continue to make its own sanitizer in the future.

Hospital 10

This group's project was refreshing the emergency department at the hospital. They upgraded the department by painting walls and rusty bed lockers, and putting up new partitions. The partitions divide a large emergency hall into three different rooms: trauma room, staff room and general emergency. Previously, the partitions had been removed when new flooring was installed. The group hired carpenters to put the partitions back up. They painted the walls of the trauma room and staff room, as well as the partitions. Due to the humid environment in Nepal, many metal things are very rusty. They sandpapered and repainted patient medicine bed lockers. They were painted green to match the curtains and bed sheets.

Hospital 11

Here, the corner of the scrubbing room for the delivery room had become more of a junkyard for old equipment over which clothes were laid to dry. This group decided to clear out the area and give patients and their families a better place to hang their clothes. They cleared out the room and installed new wires for clothes hanging.

Participant Debriefs and Hospital Feedback

Engineering World Health seeks not only to assist the hospitals in which our participant volunteers work, but also to influence the volunteers' own development as engineers and as global citizens. Overall, the participants' feedback was very positive. Some of the biggest challenges- as always- were the heat in southern Nepal and the language barrier. A majority of participants enjoyed their experience in the hospital, found the staff welcoming and their work rewarding. One participant described fixing an infant warmer for a hospital that was previously using an external heater system: once the warmer was repaired, infants could be connected to an alarm system should their body temperature drop. As mentioned in the summary, a few participants reported that their hospital was lacking equipment in need of repair. Next year, we strive to create more partnerships with hospitals where participants can have a high impact.

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[1] EWH estimates the mean value of each repair at USD\$2000