



engineeringworldhealth

Summer Institute  
**Guatemala 2023**  
Final Report

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## EXECUTIVE SUMMARY

**Engineering World Health's 2023 Guatemala Summer Institute - our seventh program in Guatemala since 2018 - was highly productive and enjoyed by students.**

This Institute hosted participants from seven different countries, including the United States, Canada, Mexico, Singapore, Denmark, and the Netherlands. The international students were joined by seven Guatemalan students from the Universidad del Valle de Guatemala, whose participation was graciously supported by the Lynn Toby Fisher Scholarship Fund, for a total of 16 participants. After one month of intensive language and technical training, they served as volunteer biomedical equipment technicians in hospitals around Guatemala for five weeks.

Participants stayed together at a hotel during the first month, and in homestays for the second month. During the first four weeks of the program, the group underwent intensive technical and Spanish language training in Quetzaltenango, also known as Xela, Guatemala's second-largest city. Their technical training included both lab and lecture, with weekly visits to a local hospital to provide the participants with hands-on experience before beginning their hospital placements. After training, participants were assigned to one of four EWH partner hospitals, located throughout Guatemala, to work in small groups.

**During their five weeks of hospital work, participants completed an estimated \$364,000 worth of service and repairs. A total of 182 pieces of equipment were returned to service** across five different partner hospitals, including Hospital Rodolfo Robles in Xela, Hospital Nacional Pedro de Bethancourt in Antigua, Hospital Nacional de Retalhuleu, Hospital Regional de Occidente in Xela, and the Hospital Nacional de Sololá.

In addition to medical equipment repairs, participants completed a total of four secondary projects and participated in group excursions, including a trip to Lake Atitlán.



*Virginia, Sofia, and Daniel working on an ECG Simulator Kit during a lab in month one training*

## MEDICAL EQUIPMENT REPAIR

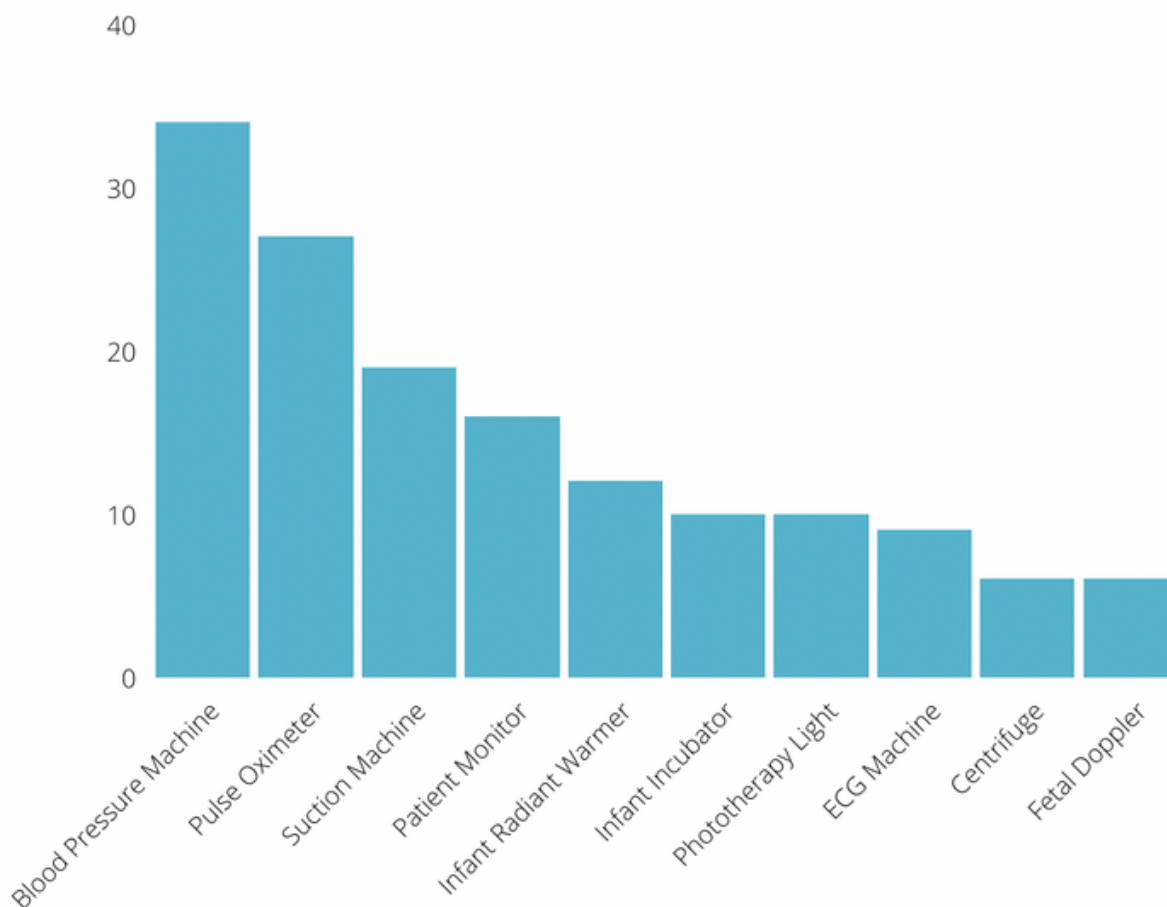
Participants were able to repair 182 of the 255 pieces of equipment that they encountered, for a success rate of 71%.

Each team completes a Work Summary Form during their time in the hospital to document the pieces of equipment they encounter, the reason the piece of equipment is broken (e.g. power supply issue, blown fuse, etc), and if the repair is successful. The most common barriers to repair are typically lack of necessary parts and those which require more advanced knowledge. Their work, as taken from the Work Summary Forms, is summarized below.



*Maricarmen, Arushi, Melissa, and Shirley outside their placement hospital*

### Repairs/Maintenance by Type of Equipment - Top 10



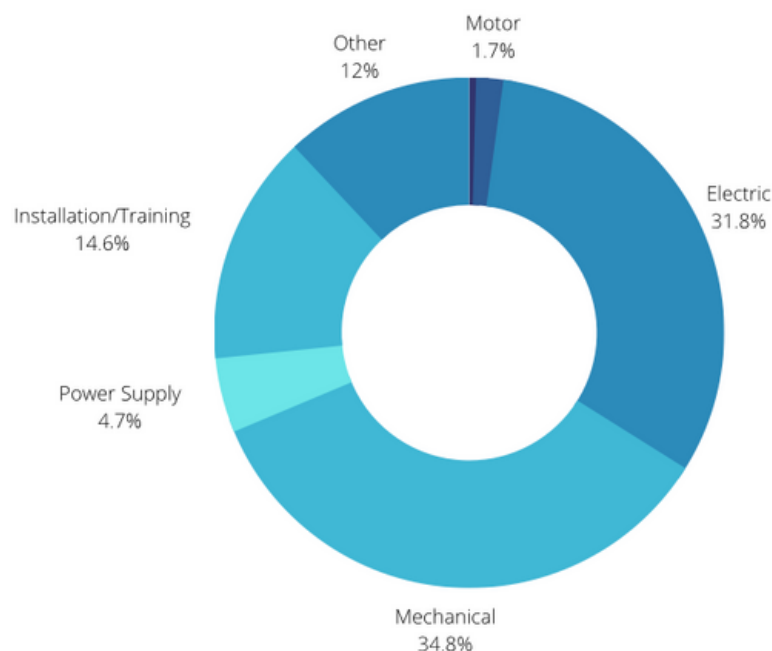
## MEDICAL EQUIPMENT REPAIR

Blood pressure machines, pulse oximeters, suction machines, patient monitors, and infant radiant warmers were among the most common types of equipment repaired during the 2023 Guatemala Summer Institute.

Electric and mechanical problems were the primary issues identified among broken equipment.

Notable high-impact repairs included an infant warmer that was critical to the NICU at one hospital, and ten infant warmers at another.

### Repairs/Maintenance by Type of Repair



2023 Guatemala SI Participants at their final conference

*I think the most valuable part of the EWH Institute was all of the different people I learned from - the other students, the coordinators and the hospital staff. The experience definitely opened my eyes to other ways of thinking and doing things!*

## 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 and are given a budget of \$100 per person to use in a creative way to provide for that need. The 2023 Guatemala participants completed a total of 5 secondary projects, detailed below.

### Group 1

During an interview with an orthopedic surgeon, Group 1 learned that the hospital treats 1-2 cases of clubfoot per day. He mentioned that many of the mothers were very young, and lack proper vitamin intake. He believed that if the pregnant women took folic acid during their first trimester, the incidence of birth defects such as clubfoot would decrease. To help address this issue, they built a dispenser using a jar, wood, and a section of PVC pipe. They also created informational posters to hang around the maternity department to spread awareness of the benefits of folic acid during pregnancy, and made a patient tracking log to monitor folic acid intake over time, which they hope will help doctors track the correlation between folic acid intake and instances of clubfoot over time.



*The finished folic acid dispenser*

### Group 2



*The new custom cart holding the infant scale*

Group 2 built a custom cart with shelves for their secondary project. The NICU at their hospital had a specific, very precise scale for weighing babies, and they needed a reliable method to transport the scale across the hospital wing while ensuring that the readings from the scale remained consistent. To address this need, Group 2 built a sturdy wooden cart with a top plate salvaged from disused bed in the hospital graveyard. The doctors and nurses were excited to put their new cart to use!

## SECONDARY PROJECTS

### Group 3



*Replacing blue-colored white bulbs in a bili light with blue LEDs to make it more effective*

Group 3 completed several different secondary projects at their placement hospital, including:

- Creating a system for the hospital to report and store damaged equipment
- Creating informational posters and training 50 medical students and doctors on how to troubleshoot and repair blood pressure cuffs, which break easily and suffer damage from the heat
- Using LED lights to rewire the hospital's bili lights, making them much more effective
- Making containers and filters for aspirators
- Sanding and painting rusty cabinets and carts



### Group 4

With help from a team in Denmark and the hospital's IT department, Group 4 created a website for hospital staff to report broken equipment to maintenance. This website, which can be accessed with a QR code, is designed to replace an ineffective paper system. When hospital staff put in a maintenance request, maintenance staff can accept the request and search the database for the equipment to see if it has been broken before, who fixed it, and how they fixed it.



*A screenshot of the website*

## PARTICIPANT DEBRIEFS AND FEEDBACK

**Participants thoroughly enjoyed the 2023 Guatemala Summer Institute, with 100% indicating that they would recommend the program to a friend.**

Participants particularly loved working with and learning from their Instructor, Dr. Fryda, and On-the-Ground-Coordinators, Laura, Ahmed and Susan.

Primary challenges cited among feedback were the language barrier and, thus, communication with hospital staff.

When asked about the most valuable part of the program, students overwhelmingly responded with two things: being able to make a difference for people in need, and having the opportunity to meet and learn from so many other people, including other students, EWH staff, and medical professionals. One student remarked, "We fixed a lot of stuff for the OR and we could see they started using our repairs immediately. But the most valuable thing is the friendships I made!"

**Another said, "For me, the most valuable part of the program was meeting other engineering students from all over the world. I really enjoyed learning about different cultures. Every single participant brought something unique to our group."**

When asked to describe the program, students said it was *life-changing*, *unforgettable*, and *transformational*. Several students said that the program helped them not only gain skills, but also the confidence to try new things.

"During these two months I really integrated myself into a new community and new people, and I think that itself has given me more confidence to do it again in the future - to take risks and do things that might make me nervous, I went to Guatemala not knowing anything about the country or the courses, but I believe I came out being almost an expert. It was definitely an experience of a lifetime for me and I'll never forget it!"

**EWH would like to thank all of the students, coordinators, instructors, partners, and donors who helped make this program possible!**



*Testing a patient monitor using an ECG simulator*