

At the Center of Design and Innovation:

A Unique Human Need

After visiting struggling hospitals in Bangladesh, biomedical engineering student Seule Kabir returned to VCU with the goal of developing low-cost surgical equipment for use in developing countries. From her vision, Operation Simple was born. The Operation Simple team, a group of interdisciplinary students taking part in a da Vinci Center project, set out to design, create, prototype and distribute a low-cost surgical table.

School of Engineering Dean Russell Jamison served as the engineering advisor on the project, directing students as they faced the challenge of creating a durable, portable surgical table for less than one percent of the cost of surgical tables on the market.

To test the table, Jamison packed up the table and flew to Honduras in March of 2010 to take part in a medical mission. Here is his story of engineering in action.



In route to Honduras:

I set out early in the morning to join a team of surgeons, anesthesiologists and nurses from the University of Illinois Urbana Champaign, Carle Hospital in Urbana, and hospitals in Chicago. We were traveling with a sense of purpose: to use our skills to help children without adequate access to health care. I brought with me the Operation Simple surgical table to supplement the lack of equipment and provide the first field test of the device. We prepared the shipment to fit within a compact, 2'x 2'x 2' corrugated box, weighing only eighty-nine pounds. For a fee, I was actually able to check the table as baggage on our flights from Richmond to Atlanta to San Pedro Sula.

Day 1, Quimistan: The first hospital we visited was Gracias A Dios Clinic in Quimistan, a very small town

three hours from the capital city of Tegucigalpa. Quimistan is a rural town with overwhelming levels of poverty and ill health. It was clear the team would be a great help here.

The clinic was modest in size and clean, but it had few medical supplies. The first day, Sunday, was busy and devoted to patient screening. Since our arrival had been announced in the local newspapers and on the radio, a large group of families had petitioned for their children to be scheduled for surgeries. The team saw boys and girls with cleft palates and cleft lips and children with burn scar contractures on their arms and legs, webbing of their fingers and incidents of ear or nose deformities.

In some cases, the surgeries were too complicated to perform with our limited resources, and that was truly difficult. Not being able to help every

child was frustrating for the team, but most cases were suitable for the surgeons to correct.

Day 2, Quimistan: Surgery was conducted in two rooms on Monday. The first room had a modestly equipped surgical table already in place. In the second room, we assembled and set up the surgical table. As surgery got underway, the table performed well. Because most of the patients were children, however, the full load-bearing capability of the table was not adequately tested. And, while the surgeons observed that the vertical elevation capability was adequate, they felt the number of detents for positioning the tilt of the table were coarser than they would prefer.

During cleft palate surgery, the surgeon sits with his head tilted down over the head of the child. The surgeon

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noted that this placed the lip of the Operation Simple table just above his lap, in an unobstructed and convenient configuration. The clear space allowed him to move his chair well underneath the table, which was an advantage.

There was one worrisome moment on the morning of the first day when I was called into the surgery because one of the welded fittings of the table had failed, causing the table to suddenly tilt. The nursing staff quickly secured the child, and thankfully, surgery was able to continue with no injury. In response to this flaw, we developed an intermediary mechanism to fix the adjustment of the table and used that for the rest of the trip.

Day 3, Quimistan: At the end of the day we packed up our equipment for transportation to San Pedro Sula. Before leaving Quimistan, we held a

ceremony during which I gave the surgical table to the Gracias A Dios Clinic. The director of the clinic, Dr. Turcios, responded with great emotion and gratitude at having a second surgical table for permanent use at the clinic. We, too, were pleased and hoped the table would aid in the incredible work they do there. Before our departure, we advised Dr. Turcios that we would return the table after using it in the Social Security Hospital in San Pedro Sula for two days.

Day 4, San Pedro Sula: Like large urban hospitals in the United States, the hospital in San Pedro Sula was a beehive of activity with dark and unclean corridors, hundreds of people waiting to be seen, and a general sense of overwhelming demand and insufficient resources.

The team setup in adjacent sur-

gery rooms. Again, the room in which the Operation Simple table was used was essentially empty. The Operation Simple table was clearly in desperate need during the second phase of the medical trip.

Day 5, San Pedro Sula: At the end of the second and final day in San Pedro Sula, the surgical team did one final assessment of the table. They suggested that it would be useful to have an attachment for an IV pole on the table to eliminate the need for a stand-alone IV pole.

Updates: As a field test this experience was invaluable. It allowed us to see, first-hand, the need for low-cost surgical tables like the Operation Simple table. It also allowed us to learn the limits of the table and make needed design changes before manufacturing the next prototype.