

Innovative Light Bulb

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Background

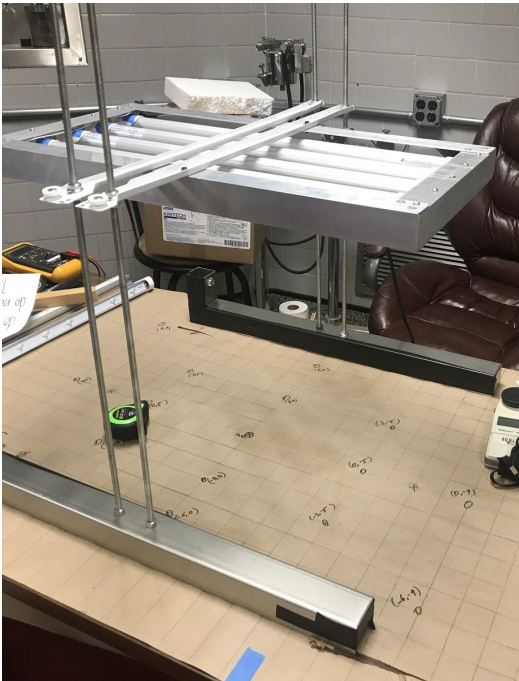
Neonatal Jaundice is a disease characterized by the yellowing of the skin caused by the buildup of unconjugated bilirubin. The buildup of bilirubin can cause disturbance of the blood-brain barrier which leads to brain damage called kernicterus. Phototherapy is used to treat jaundice by emitting blue light which changes the structure of bilirubin to allow for its excretion. There are two types of phototherapy, a lower dose called conventional phototherapy and a higher dose called intensive phototherapy. In Nigeria, homemade phototherapy devices are almost completely ineffective and the other options are too expensive for most hospitals and clinics. Dr. Henk Vreman at Stanford University found a solution to this issue by creating a phototherapy device that is used in Nigeria.

Need Statement

Healthcare workers in Nigeria, primarily in private, unregulated clinics, need to be able to administer adjustable doses of phototherapy from a low maintenance device to effectively treat hyperbilirubinemia because current units are difficult and expensive to maintain.

Ideation and Prototyping

Our solution focused on three problems. First, in Nigeria, health care providers commonly switch between conventional (3 bulb) and intensive (5 bulb) levels of phototherapy by removing the individual bulbs. This commonly causes damage to the bulbs by dropping them or breaking the lamp holders. In order to fix this issue, we added a switch to the device and changed the circuitry in order to be able to easily change between conventional and intensive phototherapy.



Another huge issue with phototherapy in Nigeria is the inconsistency of the phototherapy being administered. Commonly, the height of the device is changed without testing, bulbs are taken out or put in, or the device is not properly calibrated. To solve this issue, we created a user manual in order for healthcare providers to be able to properly administer phototherapy. The manual contains specifications for the



setup, use, maintenance, and safety instructions for the device. This manual is vital to ensure that the device is used properly and the newborns receive effective, accurate, and safe phototherapy.

Lastly, our team is working on being able to manufacture the device in its entirety in Nigeria. Currently, the molds on the end of the LED tubes cannot be made in Nigeria. In order to bypass the use of these we have considered using LED strips or other methods to manufacture the device. This decreases the overall cost of the device and allow for it to be manufactured without importation.

Competition and Market Analysis

There are a few commercially available phototherapy devices in Nigeria, one of which is NeoBLUE. This device has many unique features such as red-light centering of the baby but is very costly. Most of the phototherapy devices used in Nigeria are homemade. These homemade devices are cheaper than commercial products. However, these devices do not produce the proper irradiance for an effective phototherapy.

Because the goal of the device is to benefit infants with hyperbilirubinemia rather than achieving monetary accomplishments, the device would need to be funded through grants and other areas. The cost-saving strategies of the phototherapy units, as well as manufacturing parts of the device in Nigeria, would appeal to a humanitarian organization as a worthwhile investment. Hospitals with defective phototherapy units would see this prototype as an affordable, accessible, and effective alternative. Even hospitals with high-end phototherapy units that were donated could replace their unit with this device, since the maintenance costs and technical knowledge to upkeep their current, expensive units could be potentially undercut by our device.

Design Team

