Firelight Surgical Lamps: Designing a Surgical Lamp for a Resource Poor Setting

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Executive Summary

Firelight surgical lamps was created with the aim to address the inability to perform safe surgeries in resource poor or emergency areas. Specifically these areas have limited or no access to electrical power and therefore need to use alternate sources to power surgical lamps. Well lit conditions are required where the surgeon has a clear view of the cavity of the patient and the absence of these conditions cause risk to increase dramatically.

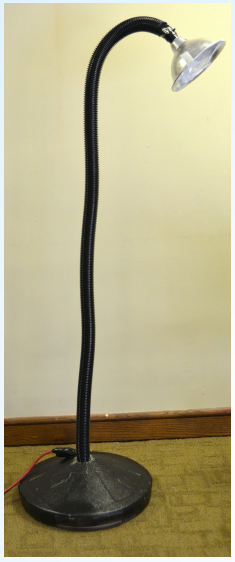
Features of the Lamp:

- Battery, Mechanically, or Electrically powered
- All lighting/lux criteria for a safe surgery met
- Low cost to be affordable

Clinical Need

- Electricity in developing countries is extremely limited
- Surgeons do not have a guaranteed or high quality light source
  - This lack of illumination can cause a wide range of issues for the patient, doctor, and administration
- Developing countries need not only a reliable lamp to circumvent electricity issues, but a surgical lamp that is relatively low cost and easy to transport to several locations.

Description of Design



- The light used is a 6 watt LED bulb with 128 LEDs
- A reflective lamp shade houses the light.
- It is powered by a 12V car battery attached to a power inverter or through a wall outlet
- the lamp can be powered by the "powerbox"

Specifications of the Lamp

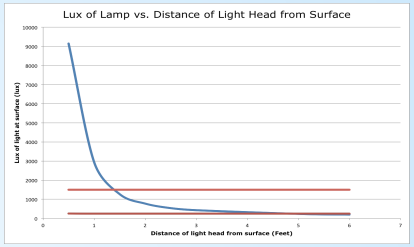


Fig 1: *Lux of lamp vs. distance of lamp head from surface* The red lines on this graph represent the lux range required for surgery and the blue line shows the actual lux of the light at varying distances from the surface

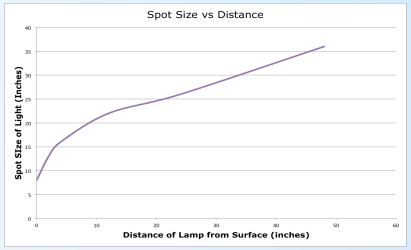


Fig 2: *Spot size of light vs. distance of lamp head from surface* This graph demonstrates the spot size of the light as it is moved from the table. The spot size meets requirements for surgery at all distances.

Description of Market

- 58 Countries are considered to have Mid-Low Human Development Index
  - HDI is based off of Life expectancy, Education, and Income
  - This affects 2.3 billion people and 800 hospitals
- Customers who would actually be purchasing Firelight would be Non-Governmental Organizations (NGOs)
  - Doctors Without Borders
  - World Bank
  - World Health Organization
- End users will be surgeons in resource-poor areas. The end beneficiaries will be the people of those areas who undergo safer surgeries

Novelty

Firelight is a novel solution due to its use of multiple possible energy sources.

- **Mechanical energy:** A bicycle crank generator can be attached to the lamp and used to power the light.
- **Battery Powered:** The light can be powered by a car battery with an invertor
  - This battery can provide 75 hours of energy to power the lamp.
- **Electrical Outlet:** the lamp can be plugged in directly to outlet.

Firelight is also portable so it can be used in clinic and home care

- **Easily disassembled**
- **Portable in original packaging**

Estimated Production Costs

Price	Component
$195	K-Tor Power Box Pedal Generator
$30	6 Watt 128-LED Array PAR30 Lamp
$10	Reflective Lamp Holder
$34	Power Inverter
$10	Copper Pipe
$4	Polypropylene Pipe
$15	Christmas Tree Stand
$4	Assembly (0.5 hours, minimum wage)
$2	Quality Assurance (.25 hours, minimum wage)
$120	Shipping Estimate to Nicaragua
$414	**Total Cost**

Acknowledgements

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