Redesign of an Incubator and Warmer

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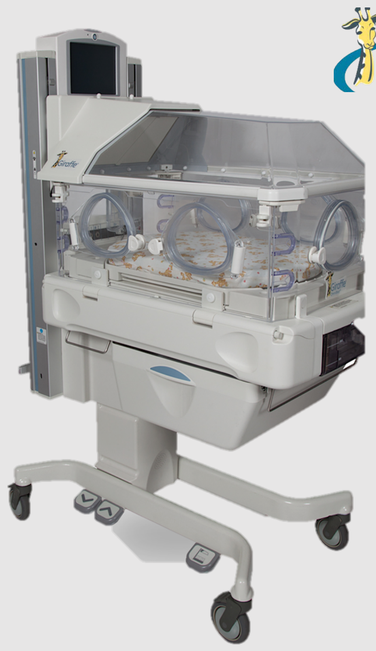
Existing Device

GE Giraffe Incubator and Warmer



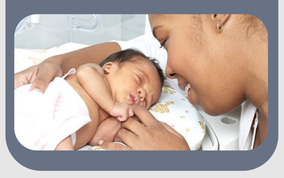
Giraffe

Bi-Directional Airflow

Thermoregulation

Patient Access

Family-Centered Care



Durability

- \+ Lifespan of 10 years assumed
- — Leads to a GE healthcare dependency which is not compatible with the public health care sector or the situation in a refugee camp
- — No use of region-specific resources

Cost

- — 35’000$ for the basic unit, 43’600$ including all gadgets
- — Cost of ownerships furthermore includes: repairing cost, training cost, energy usage, warranty extension, transport/shipping cost
- — not affordable for local public health care centers

Performance

- \+ Modern state-of-the-art device (already established in the market)
- Additional features such as a rotatable, x-ray compatible mattress or a touch screen panel control
- \+ Very safe, fast transport possible and good noise conditions
- \+ Regulatory approved

Usage

- Private vs. public health care / not appropriate for public health care
- Not accessible for everyone
- — Need of medical professionals (nurse-patient ration 1:1 or 1:2 needed)
- — Need of high user knowledge and training

Personas

Fatima — Jordan

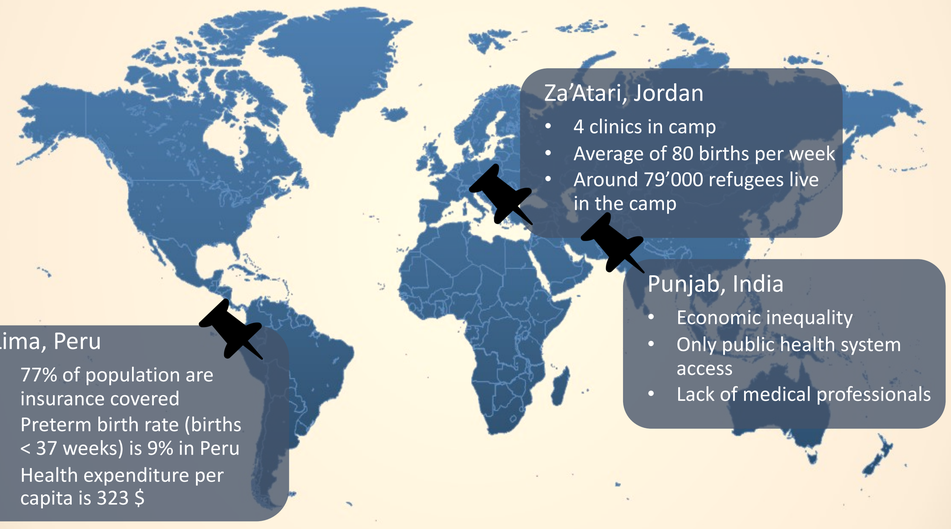
- Living in Za’Atari refugee camp in Jordan
- 38 years old
- 5-year old son and 6-year old daughter
- Housewife
- Daily income: 0 USD

Garima — India

- Living in Punjab, northern part of India
- 35 years old
- 4-year old daughter and 8-year old son
- Farmer, sells products
- Daily income: 0,87 USD

Maria — Peru

- Living in Lima
- 30 years old
- 3 & 9-year old daughter, 7-year old son
- Supermarket worker
- Daily income: 4 USD



Similarities

- Economic difficulties
- Certain level of restricted access to health care
- Public health care system available (UNHCR in Jordan)

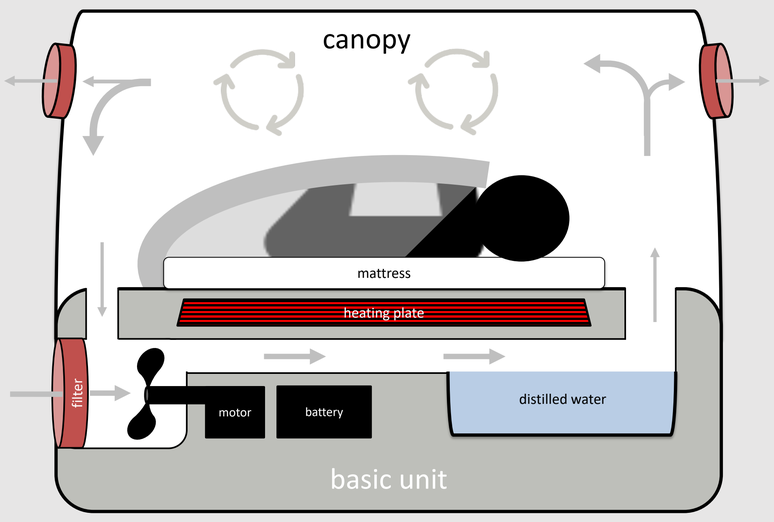
Differences

- Big difference in access to medical health care and amount of services provided
- Cultural differences (caste society, family)
- Different environment in each country (political and climate)

Redesign and Re-evaluation

Air Flow and Filtering System

Adjustable Heating Plate



Modular Construction

Air Humidification

Durability

- Lifespan of 5 years assumed
- \+ Cheaper materials and way of production leads to less durability of single parts (but easy to repair due to exchange parts)
- — Important to train staff to avoid misuse
- \+ Possibility to produce it locally could be explored for the different personas

Cost

- \+ Material cost 320 $
- \+ Reduced production cost achieved
- \+ Cost of ownership strongly reduced due to less power consumption, less dependence on external provider (parts and training) and less parts to be repaired
- \+ Very low maintenance costs due to modular construction
- — Initial investment needed for development and production start

Specification and detailed cost

Basic PVC unit (including components):	155$ (250$)
Components:	heating plate (20$), fan and motor (30$), HEPA filter (30$), water container (5$), mattress (10$), battery (20$)
External thermometer and hygrometer:	10$
PVC glass Canopy:	40$ (closed version) or 30$ (open version)

Limitations

- Established market and initial investment are main hurdles to implementation
- Enough quantity of qualified staff still essential to guarantee safety of the baby
- Targeting correct market sector important, performance oriented users will seek other device
- Health provider for each persona has different priorities
- Good appropriateness for Punjab (India) and Za’Atari refugee camp (Jordan) achieved. Alternative application in Lima (Peru) due to better developed health care infrastructure
- Sale price still not determined

Performance

- Focus on main functions
  - Steady body temperature
  - Supply with warm and humid air
  - Filtered air to ensure sterile microenvironment
- — No high-tech production, could lead to performance variations
- — Less automated processes and control, staff has to take bigger part monitoring the baby’s signals
- Possible testing in real world environment, adaptations regarding feedback from local end-user

Usage

- \+ Less complicated training needed for proper and correct use
- \+ Clear construction, transparent functioning and easy comprehension
- \+ Leads to less dependency on external provider and able to repair locally
- \+ Affordable for health institutions
- \+ Enables access for almost all