Resuscitation Device

Team Members:
Nick Glattard
Brandon Jonen
Sam Jensen
Becky Eastham
Padraic Casserly
Betsy Hose

Client:
Tiffini Diage
Outline

- Problem Statement
- Background Information
- Design Matrix and Alternatives
- Block Diagram
- SolidWorks Design Video / Fabrication Progress
- PDS
- Testing
- Future Work
Problem Statement

- Bag Valve Masks are in high demand in developing countries
- Importation is expensive

Goals
- Low cost BVM
- Reusable
- Necessary components
- Manufactured locally
Basic Components

- 21: Self-inflating oblong bag
- 20: One-way inlet valve
- 16: Inlet Port
- 35: Exhalation Valve
- 24: Mask
- 18: Outlet Valve Assembly
- 14: Outlet Port
- 33: Optional entrainment reservoir for external source gas

US Patent 20060060199
March 23 2006.
Self Inflating Resuscitation System
(basic, standard design)

1. Bag is Squeeze
2. Air pushed past pressure release
3. Air moves through one way valve into mask
4. Upon exhalation air exits through non-rebreathing valve
5. Bag released oxygen enters through O2 port
### Design Matrix for Pressure Release

<table>
<thead>
<tr>
<th>Design Trait</th>
<th>Multiplier</th>
<th>Slit in Rubber (one piece)</th>
<th>Spring with rubber stopper (four pieces)</th>
<th>Adjustable spring and rubber stopper (five pieces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Ease of Assembly</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Accuracy</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Manufacturability</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Totals</td>
<td>51</td>
<td>56</td>
<td>41</td>
<td></td>
</tr>
</tbody>
</table>
Design Considerations

- Fewer Pieces vs. Functionality
  - 1 piece inlet valve vs. 2 separate inlet valves
Design Features

- **Neck**
  - Universal bag connection

- **Inlet Valve**
  - One piece
  - Universal bag connection
Design Features

Identical Inlet Valve Connections

Identical Neck Connections

Adult  Pediatric  Neonatal
PDS - Physical and Operational Characteristics

- **Weight**: comfortably lifted in one hand.

- **Materials**: Face mask must be biocompatible (latex free rubber) and safe to clean with Cidex

- **Aesthetics**: Clear plastic so it is easy to identify blockage

- **Ergonomics**: Easy to squeeze bag with one hand and maintain mask seal with other. Easy to disassemble

- **Size**: Compliance with ISO regulations of tidal volumes

- **Target Product Cost**: Initially 10 USD. Eventually 5 USD.
Testing

- Test tidal volumes using “Michigan Lung”
- Purchase spring of calculated spring constant
  - $P = \frac{F}{A}$
  - $F = -k \cdot x$
- Verify pressure release valve for 45cm H20
- Verify seal created by mask using neo-natal model
- Test one way valve threshold limits
- Assembly/disassembly time
## Future Work

<table>
<thead>
<tr>
<th>Task</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14</td>
<td>21</td>
<td>28</td>
<td>5</td>
</tr>
<tr>
<td><strong>Project R&amp;D</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redesign</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Prototyping</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Buying Materials</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Testing / Redesign</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Deliverables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midsemester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review Paper</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final Poster</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Meetings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Advisor</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Client</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Acknowledgements

- Dr. Amit Nimunkar
- Padraic Casserly
- Bat-Zion Hose
- Dr. Ryan Wubben
- Dr. Laura Houser
- Tiffini Diage
- Dr. Aklilu
- Dr. Amsalu
- Varun Eshwar
References


Thank You