iNurse: Low-Cost, Continuous Vital Signs Monitoring for Neonates in Low-Resource Settings

Nathan Lo¹, Abhijit Navlekar², Eric Palmgren², Rahul Rekhi¹, and Fabio Ussher²

Department of ¹Bioengineering, ²Electrical Engineering | Rice University | Team BioLink | monsensor@gmail.com

The Challenge
- Four million lives lost in first 28 days of life, overwhelmingly in low-resource settings¹
- Lack of access to affordable and appropriate technology to monitor neonatal vital signs
- Understaffed wards prevent detection of distress and tracking of health trends

The Solution
iNurse is a medical device that provides round-the-clock, low-cost, wearable, and power-efficient vital signs monitoring for neonates.

Key Design Criteria

<table>
<thead>
<tr>
<th>Objective</th>
<th>Target Criterion</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accurate</td>
<td>Calculated respiratory rate within 10% tolerance</td>
<td>✓ (&lt;5% error)</td>
</tr>
<tr>
<td>Reliable</td>
<td>Alert has sensitivity and specificity &gt;95%</td>
<td>In progress.</td>
</tr>
<tr>
<td>Low-cost</td>
<td>&lt;$100</td>
<td>✓ ($35.50)</td>
</tr>
<tr>
<td>Compatible</td>
<td>Communicates with central wireless brick</td>
<td>✓</td>
</tr>
<tr>
<td>Durable</td>
<td>Sustains 5 foot drop test, and can be sterilized</td>
<td>✓</td>
</tr>
<tr>
<td>Safe</td>
<td>No exposed leads or electrical hazards</td>
<td>✓</td>
</tr>
</tbody>
</table>

How It Works

Step I: Strap belts onto chest and abdomen
Step II: Use one-button calibration to ensure snug fit
Step III: Allow iNurse to begin vitals monitoring
Step IV: Alarm + feedback motor activated if acute distress

Conclusion & Next Steps
- iNurse provides low-cost vitals monitoring for babies in developing settings, and allows for tracking of multiple neonates simultaneously.
- In cases of acute distress, iNurse will intervene by alerting nurses and vibrating motor to awaken baby.
- Will incorporate Team VitaSigns’ heart rate monitoring and Team SWAG’s wireless communication capabilities.

Acknowledgements
This project is funded through Beyond Traditional Borders, which is made possible by a grant from the HHMI, and the OEDK. We would like to thank Drs. Gary Woods, Maria Oden, and Ashu Sabharwal for their mentorship.

References