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System Overview

Securing infants immediately after the birth from theft or Abduction has become a major challenge across the globe, more prominent in developing countries like India, and the challenge multiplies, with the existing/conventional manual processes adopted by hospitals, which adds to lot of confusion and un-intentional child swaps, in hospitals where there is high delivery rates per day.

The BioEnable's BioBaby Infant Security system offers proven protection against infant abduction / theft and Swapping by centralizing the infant database. With combination of advanced Wireless technology and biometrics the system becomes highly reliable and easy to use.

Here is brief of how the complete system works, Mother is tagged at the time of Admission at the hospital with a wrist bracelet. All mother information is associated in her tag & after baby pediatric check; the baby's footprints are taken from footprint biometrics also baby tagged with tamper proof tag at his ankle. Asset Trail will automatically associate baby ankle tag to mother wrist tag. Once both, Mother and Infant, are registered in the System, the system processes this information and does De-duplication (for Biometric Footprint Data), to ensure the information is unique; this also helps identifying if the registered infant is not already registered in the system (which indicates the infant is abducted).

Existing / Conventional System Drawbacks:

Currently many hospitals use existing/ conventional manual processes which are not reliable and safe some of those manual systems elaborated below.

Here are few existing processes, which hospitals follow to secure the infants

- Use of color coded Plastic tags
- Use of Barcode tags

All such Manual processes are not centralized and need manual intervention for Validating the Tags, and Non Real time notifications of thefts makes it unusable. Verification confirmations for handing over the right baby to the right parents in real time are not available with current systems.
BioBaby System Features:

BioBaby system not only eliminates the conventional system flaws but also provides many advanced features which make hospital easy to manage the infant's security. BioBaby system features are listed below,

✓ Prevent un-authorized exit of Infants from the ward: System continuously monitors the baby within the ward, when registered baby who is not allowed by hospital staff to go out, tries to go out without seeking the hospital staff permission then system triggers an alarm which will notify the security staff to take immediate action.

✓ Track presence and movements of infants within the ward: Ward includes many powerful readers which are installed at various strategic locations; these readers track the presence of infant within the ward. If any infant tries to go out of the secured area then system will triggers an alarm for security guard to take an action.

✓ Track presence and availability of the mothers or staff with the Infants: System tracks the presence of mother/staff with its infant, if any mother or baby or staff tries to go out of ward without seeking the hospital authority permission then system triggers an alarm.

✓ Monitor tampering of the security system: If baby tag tampered or remove/cut by any person without prior authorization of hospital staff then system triggers an alarm with notification of tampered baby details on the system.

✓ Allow secure management of IN/Out movement of Infants & Mothers for different purposes: The gate entry system provides hospital staff to keep the record of baby which is coming IN/OUT; it keeps the information of baby with accompanied mother/staff. This also includes the reason for taking baby out of ward so that doctors would know the patient's locations and reason for the absence in the ward.
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Gate Entry Architecture

System offers following processes for controlling movement of infants from Wards

Process flow defines below:

For any Entry or Exit from the ward, following process has to be followed, at each entrance Gate Recorders are installed on inner and outer side of the gate, which are to be operated by Security Guard, Whenever a movement of infant happens, the Security guard has to record the movement on the Gate readers, Security guard has to ask Staff carrying the infant to show the Tags on the Gate Recorders, This will allow the movement. if baby wants to out from the ward then baby tag has to show to security guard for making entry on the Gate Recorder for OUT.

If any movement happens without such entries, the system will auto detect, such events and raise the alarms (Sirens).

For Automatic Detection, the process flow defines below:

After successful punching/registering baby tag on the Gate Recorder device, the baby tries to come into ward.at this moment, the Reader which is installed on the inner side of both gates, detect the baby tag and confirms his/her entrance in the ward, these are powerful readers which are enclosed in the door which cannot be seen by naked eyes.

After baby entered in the ward, there are readers which continuously keep an eye on the infant movement. These readers are centrally linked to BioBaby Protect System. If there is any suspicious activity detected by system then system triggers an alarm which is installed on various strategic locations.
Roof mounted RTLS readers detect and track movement of infants automatically.

Nurse carrying tagged Baby thru gate

2 Additional wall mounted Readers near gate allow authorized IN/OUT of Infants with Staff/Mother

2 additional Readers are mounted inside the Security gate with additional alarm to detect any un-authorized exit.

Security staff at gate can stop any un-authorized exit detected by the system.
RTLS Reader with Controller consist of an advanced integrated electronic panel with multiple wireless devices specially created for Infant monitoring and tracking.

The device is required to be installed throughout the wards and lobbies to track the presence and movements of Infants, Mothers and staff in real-time.

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operating Voltage Range</td>
<td>12VDC</td>
</tr>
<tr>
<td>2</td>
<td>Input Current</td>
<td>Standby: 1A max, Read: 2A max</td>
</tr>
<tr>
<td>3</td>
<td>Read Range</td>
<td>Adjustable upto 15 feet</td>
</tr>
<tr>
<td>4</td>
<td>Compatible</td>
<td>Communicate with the Infant monitoring tags</td>
</tr>
<tr>
<td>5</td>
<td>Operating Temp Range</td>
<td>-20°C to 60°C</td>
</tr>
<tr>
<td>6</td>
<td>Storage Temp. Range</td>
<td>0°C to 80°C</td>
</tr>
<tr>
<td>7</td>
<td>Operating Humidity</td>
<td>0 to 95% (non-condensing) Suitable for outdoor use</td>
</tr>
<tr>
<td>8</td>
<td>Communication</td>
<td>Ethernet / Serial</td>
</tr>
<tr>
<td>9</td>
<td>System Components</td>
<td>compatible with standard access controllers</td>
</tr>
<tr>
<td>10</td>
<td>Major Features</td>
<td>- Faster and accurate reading - Reads multiple Infant Tags - Multiple Communication Modes - Low power consumption</td>
</tr>
</tbody>
</table>
Tamperproof Infant Ankle Tags

Tamperproof infant ankle tags are highly integrated mobile electronic device capable of multiple function of monitoring and security of Infants.

The tags have special security mechanism specially made for newborn infants to ensure that tags cannot be easily removed by anyone OR alerts are generated on removal.

Tags can communicate with the Real Time Location System (RTLS) Readers installed throughout the facility to provide monitoring and tracking of the Infants. They have range of communication from 10 to 20 feet depending on the system design.

Features
• Specially made for use for Infants
• Compact and light weight
• Multiple security mechanism to prevent removal of tags
• Long range of communication with RTLS system

Benefits
• Allow monitoring and tracking of infants
• Provide security mechanism to prevent un-authorized enter and exit of Infants

Staff/Personal Tags

The same Tags as above are used for Mother & Staff and are worn on the wrist with a wrist strap. The Tags for the Mother/Staff do not have tamper proof mechanism specially used for Infants.
Multi-Biometric & RTLS Management System (with Display)

Multi-Biometric & RTLS Management System consist of multiple electronic hardware and software that together provide complete overview and management of the security system on single screen. It provide complete information on all the infants, mothers and staff in the ward and details of the Infants that have left the ward.

It show multiple security alerts that allow Nurses to keep and overview on the security and safety of the Infants.

✓ Easy User Interface
✓ Highly Customized Settings for the user convenience
✓ Alert Management : Interactive Audible Alerts

Benefits

✓ Developed for Hospital Environment: Highly Secure, Reliable Software which comes with attractive UI which records hospital data
✓ Low Maintenance cost
✓ Less manual work
✓ Alert Management : Interactive Audible Alerts

Multi-Biometric System

This system consist of a mobile workstation with Baby footprint scanner, Web camera and a complete computing system with Software to enroll Infants. It allow hospital to collect complete information about the birth, Scan biometric footprint of the Infant and Fingerprint of the mother along with Photos and create a secure biometric birth record. The details of the Tags issued to the Infants is also entered in this system.
General-Ward Architecture with Reader location for Indoor Monitoring device

Annotations:
- **Long Range Reader** (Installation on locations)
- **Short Range Readers** (Installation on Exit Gate)
- Reader coverage area
- Entrance Door

Corridor