



Transforming Cold Chain Data into Proactive Diagnostics

Problem

While current health facility-based cold chain temperature monitoring systems rely on 30-day temperature loggers (FridgeTags) to ensure vaccine potency and safety, these loggers function as a reactive compliance tool rather than a proactive diagnostic system. This reliance on manual, high-level reporting creates three critical bottlenecks:

- **Granularity Gap:** Current protocols mandate reporting the total number of alarms. This approach strips away the granular temperature trends such as duration and frequency of excursion, cumulative heat exposure, and thermostat accuracy.
- **The Blind Repair Cycle:** Without remote visibility into equipment health, technicians are faced with redundant travel and inflated operational costs, as repair cycles are frequently stalled when technicians arrive at remote health facilities without the specific spare parts or tools needed for the repair.
- **Operational Isolation:** Cold chain maintenance currently exists in a silo. Without a streamlined way to funnel facility-level data to regional engineers, equipment oversight remains disconnected from integrated supervision, leading to delayed responses and preventable vaccine wastage.



Background

In Ethiopia, the Walk-In Cold Room (WICR) and Walk-In Freezer Room (WIFR) in central and regional Ethiopian Pharmaceuticals Supply Service (EPSS) hubs use remote temperature monitoring devices (RTMDs) that alert users of temperature excursion for immediate action and send data to a dashboard for further analysis, cold chain repair, and replacement. In health facilities, typically 30-day temperature loggers are used to monitor temperature of cold chain equipment (CCE). These devices store temperature data and number of alerts for at least 30 days. Health workers use these devices to report an aggregate number of high and low temperature alarms during the reporting period. While the temperature data is a reporting requirement, without the full details of the data (why these alerts are happening), this information falls short of being useful for equipment maintenance or repair needed.



The Solution

To address this shortcoming, JSI introduced the [Varo](#) and [Pogo-LT apps](#), transforming previously isolated temperature data from the FridgeTag into actionable insights, sending detailed diagnostic reports to centrally-located technicians. Varo is a simple smart phone app, which collects detailed data from the FridgeTag and sends it to a central location over email, where the Pogo-LT app aggregates and analyzes a summary of cold chain performance and high priority equipment. Our unique approach empowers immunization nurses at health centers, biomedics or equipment technicians at facilities, and supervision teams from both the service delivery side and supply chain side to use cold chain maintenance and performance information to proactively address equipment needs.



Key Implementation Steps

- **SOPs and Job Aids:** We first developed user-friendly job aids to streamline collection, reporting, and analysis of temperature performance data, enabling evidence-based decision-making at the facility level.
- **Orientation and Advocacy:** We conducted comprehensive orientation and advocacy sessions for over 400 key stakeholders including regional and zonal essential programme on immunization staff, Pharmaceuticals and Medical Devices Directorate staff, and logistics/ biomedical engineering staff, as well as regional health bureaus (RHB) immunization managers (comprising 67 women and 346 men). This collaboration successfully integrated supply chain, service delivery, and technical engineering teams to address CCE management through a systematic and unified lens.
- **Integration:** We embedded equipment oversight directly into our integrated supportive supervision using standardized checklists to monitor cold chain performance and record preventative maintenance alongside other immunization service delivery supports. This integration monitored consistent equipment reliability, rapid troubleshooting, and ongoing staff coaching through routine, streamlined supervisory visits.
- **Institutionalization:** To ensure long-term sustainability, the Ministry of Health has officially adopted the use of these apps technology for temperature reporting, providing formal direction and guidance through established national channels to scale and maintain the system.





Results

By shifting from a reactive to a data-driven model, cold chain maintenance operations have seen a significant transformation. Specifically:

- **Maintenance Prioritization:** The availability of diagnostics temperature data (aggregate and granular) allows the CCE management team to focus exclusively on specific units that require attention rather than performing blanket inspections.
- **Reduced Downtime:** Improved planning and faster response times minimize equipment downtime, ensuring vaccine refrigerators remain within the required temperature range.
- **Cost Savings:** Streamlined maintenance processes have led to a decrease in overall expenses related to emergency repairs, premature equipment replacements, and eliminating the need to send technicians to every health facility regardless of equipment status.
- **Remote Diagnosis & Preparation:** Teams now use temperature trends to diagnose problems remotely, allowing them to prepare the necessary spare parts before departing for the field.



Key Takeaways

- **Establishing a Performance Baseline:** This initiative marks the first time the RHB can monitor and analyze real-time equipment performance. By digitizing FridgeTag data through Varo and Pogo-LT, the RHB has moved from passive monitoring to active oversight.
- **Integrated Oversight:** The use of Varo and Pogo-LT by the RHB team aligns supply chain and service delivery perspectives into a unified supervisory model, ensuring both sides are working from the same data and that equipment oversight is consistently monitored alongside routine service delivery support.
- **Optimized Resource Allocation:** Data-driven insights allow the maintenance team to identify high-risk or poorly performing equipment and focus technical resources to resolve those issues, maximizing the impact of limited staff and budgets.
- **Digital Transformation:** Using Varo and Pogo-LT apps is the modern approach to unlock the data collected by FridgeTag devices, transforming raw data into user-friendly, actionable intelligence.



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