

October 21, 2009

Making Refrigerators Smart: *Freeing Nurses from Manual Logs*

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AGENDA

- Refrigerator Compliance Challenge
- RFID Smart Refrigerator Pilot
- Scalable Temperature Monitoring System
- Implementation Key Learning's
- Ideas for the Future

Refrigerator Compliance Challenge

Variety of Temperature Critical Items

- Medicines
- Vaccines
- Mother's Milk
- Patient's Food
- Warming Cabinets
- Blood and Transfusion Products
- Laboratory Reagents and Supplies

Refrigerator Compliance Challenge

Variety/Complexity of Temperature Compliance

- Hundreds of regulated refrigerators, freezers, and warmers in a typical hospital and associated clinics
- No standard size, configuration, or mfg of refrigerator
- Each department responsible for own compliance
- Multiple individuals use each refrigerator and potentially could respond to alerts and alarms
- Ease of installation, set-up, and training is key

Refrigerator Compliance Challenge



Manual Temperature Logging



Temperature Log for Vaccines (Fahrenheit) Month/Year: _____ Days 1-15

Completing this temperature log: Check the temperatures in both the freezer and the refrigerator compartments of your vaccine storage units at least twice each working day. Place an "X" in the box that corresponds with the temperature and record the ambient (room) temperature, the time of the temperature readings, and your initials. Once the month has ended, save each month's completed form for 3 years, unless state or local jurisdictions require a longer time period.

If the recorded temperature is in the shaded area: This represents an unacceptable temperature range. Follow these steps: 1. Store the vaccine under proper conditions as quickly as possible. 2. Call the vaccine manufacturer(s) to determine whether the potency of the vaccine(s) has been affected. 3. Call the immunization program at your local health department for further assistance: (.....). 4. Document the action taken on the reverse side of this log.

Day of Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Staff Initials															
Room Temp.															
Exact Time															
% Temp.	40°	40°	40°	40°	40°	40°	40°	40°	40°	40°	40°	40°	40°	40°	40°
Freezer	48°	Take immediate action if temperature is in shaded section*													
	47°														
	46°														
	45°														
	44°														
Refrigerator	43°														
	42°														
	41°														
	40°														
	39°														
Ambient	38°														
	37°														
	36°														
	35°														
	34°														
Room	33°	Take immediate action if temperature is in shaded section*													
	32°														
	31°														
	30°														
	29°														
Room Temp.	28°	Take immediate action if temperature is in shaded section*													
	27°														
	26°														
	25°														
	24°														

Approved for Immunization System (Distribution Center) of the Michigan Department of Community Health and the Colorado Department of Health Services.

*This form is not intended to be used for the collection of data for the Vaccine Confidence Index. For more information, visit www.immunize.org/vaccine-confidence.

Technical content reviewed by the Centers for Disease Control and Prevention, Inc. 2010. www.immunize.org/tag/dp1039.pdf • Item #F3391(107)

Distributed by the Immunization Action Coalition • (855) 647-9009 • www.immunize.org • www.vaccineinformation.org • admin@immunize.org

Additional Refrigeration Challenges

Multi-dose Vials & Other Multi-dose Packaging

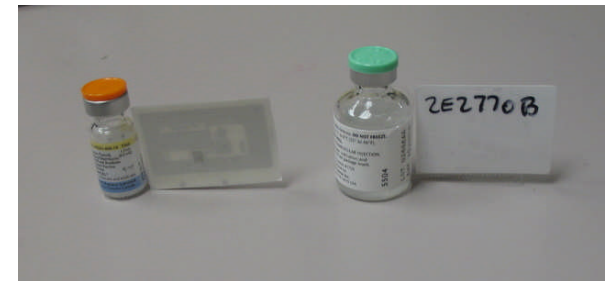
- Multi-dose products left out of the refrigerator
- Vial level tracking of doses used/remaining
- Product inventory management
- Recall management

RFID Smart Refrigerator Pilot

Utilization & Movement of Multi-dose Vials

- Integrated RFID/temperature monitoring system
- Individual drugs RFID labeled at unit level
- Implemented at large community clinic
- RFID proved technically feasible
- Cost prohibitive for Pharmacy to apply RFID labels at unit level
 - Multi-unit boxes of multi-dose vials of drugs administered by drawn syringes adds to the challenge
- Decision to pursue temperature monitoring only

RFID Smart Refrigerator Pilot



How and What do you tag?

Scalable Temperature Monitoring

Low Power WiFi Temperature Sensor

- Battery operated
- Minimal installation
 - Velcro sensor unit to side of refrigerator
 - Route sensor lead into refrigerator through door seal
 - No additional power or wiring requirements
- Each sensor logs temperatures and communicates to central server on set interval
 - Sensors utilize appropriate network security for WiFi network
 - Each sensor is autonomous and communicates to a central IP address – no need to establish a static IP for each sensor

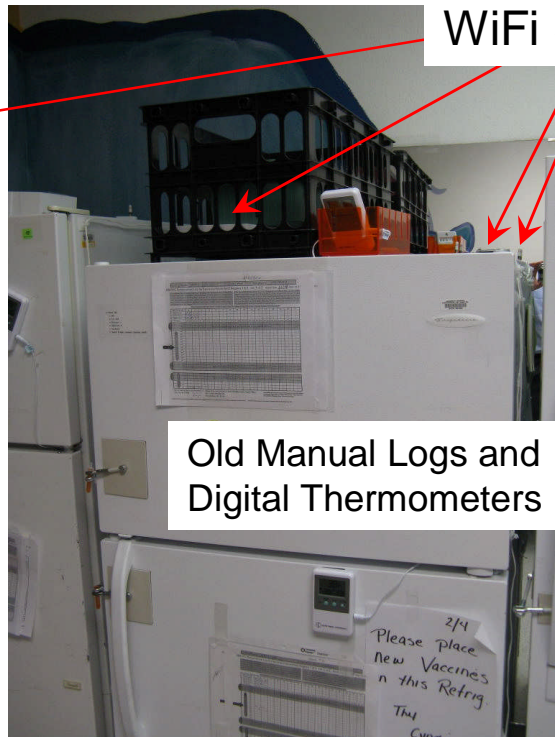
Scalable Temperature Monitoring

Web-based Monitoring Software

- Reporting dashboard
 - Graphical data representation
 - Location visualization
- Event alerts and escalation
 - Email and text alerts
 - Distribution lists & escalation paths
- Documentation for regulatory compliance
 - Event acknowledgement
 - Corrective actions
 - Report generation



Variety of Medication Refrigerators



WiFi Sensor Units

Old Manual Logs and Digital Thermometers





OR Medication Room

WiFi Sensor Units



Main Trauma Bay

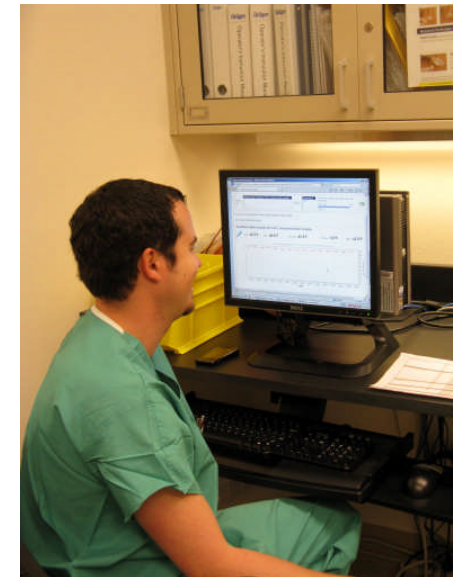


Main Trauma Bay

WiFi Sensor Units



Pediatric OR Medication Room



Implementation Key Learning's

Nurses in the Trenches

- Disruptive impact on their daily activities
 - **Right** or **Wrong**, “old way” was easy for them
 - New technology required action & responses
- Misperception of the technology
 - Some thought it was a “listening device”
- Data highlighted problems that needed fixing
- Reliability issues with early generation hardware added to the frustration with the “new way”

Implementation Key Learning's

Change Management Approach

- Broad training of all possible users in each area
- Provide background & insights as to technology
- Address concerns & misunderstandings up front
- ID the right people to respond to alerts
- Determine the right means to receive alerts
 - Inexpensive alert pager, etc.
- Simplify the process as much as possible

Ideas for the Future

- **Enterprise-wide Event Monitoring Software**
 - Hardware agnostic
 - Interface with breadth of sensors
 - Flexibility to centralize or decentralize monitoring to align with staffing plans
- **Cost Effective, Scalable RFID Solutions**
 - Leverage vendor use of RFID where possible
 - Target high cost, time and/or condition sensitive items