Wireless Refrigerator Temperature Monitoring Systems: Because You Have Other Things to Worry About

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I ADMIT IT: WIRELESS REFRIGERATOR TEMPERATURE MONITORING IS NOT THE most exciting topic, and we all have a dozen other things to think about. But then again, it probably will not take you long to recall how mad you were when your paper temperature log went missing right before your last JCAHO survey. More than one facility has lost significant quantities of medication because they "just didn't notice" that the refrigerator was unplugged or that the door was cracked open. A simple fact remains: Most of us need to improve our processes, and wireless monitoring systems can be the low-hanging fruit.

In patient care areas, procedure rooms, and ambulatory clinics, most hospitals use small consumer-grade refrigerators and a trusty paper temperature log that is filled out once or twice a day by pharmacy technicians on restocking runs. For larger "industrial strength" refrigerators in the central pharmacy, more and more facilities are using audible temperature alarms, chart monitors, or a hard-wired monitoring system. However, these solutions are often too expensive to use on the smaller consumer units.

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Documentation issues aside, manually checking the temperatures once or twice a day will not give you an accurate assessment of your medication storage conditions. Think about those mini-fridges on the floors: They usually do not have fans to circulate cold air inside the box; the compressors do not run all time; and their doors are open for a fair amount of time during heavy medication administration times. This means your true refrigerator temperatures would graph more like a healthy EKG than the steady 36 to 38 degrees Fahrenheit indicated by your paper logs.

Wireless Temperature Monitoring Systems

Refrigerator temperature monitoring is a task that screams, "Automate me!", and wireless monitoring is an effective way to accomplish this. There are several commercially available wireless temperature monitoring systems that have been used in the U.S. to monitor drug storage. Many of these systems were originally developed for the food service industry, but are now being used in the health care market.

A typical system is comprised of hardware, monitoring software, and a personal computer or server. Temperatures are measured by a probe attached to the refrigerator that uses a transmitter to output radio frequency (RF) signals to a receiver. The receiver is connected to the hospital's internal computer network, which then routes the temperature data to the computer. Signal boosters or repeaters may be needed to increase the operational range of the transmitters. Once the temperature information reaches the computer, the software stores the data and determines if an alert should be triggered. Users can view temperatures, respond to alarms, document follow-up actions, and generate summary reports from the computer.

Choosing a System

When evaluating systems, check with your biomedical engineering, facilities, and IT departments to make sure the temperature system is compatible in your environment. Will the RF signal interfere or be interfered with by other systems, such as telemetry or portable phones? Are the software and network requirements compatible? Asking these questions up front will help narrow the selection options and facilitate a smooth installation. Once the compatibility concerns have been addressed, there are several key product features you should look for in a wireless refrigerator temperature monitoring system.

Temperature Alerts

Alert features are a must. One of the most significant benefits of automated monitoring is the system tells you when something is wrong; you do not have to go look for it. The temperature alerts in your system should be fully customizable to accommodate your facility's needs and offer several notification options, such as e-mail, alpha-pages, or computer pop-ups. A system with those features could, for example, notify technician supervisors by e-mail during the day and on-call personnel after business hours regarding out-of-limit temperatures in standard medication refrigerators. That same system could page study coordinators 24 hours a day if units storing investigational drugs are out of their acceptable range, which might be different from the limits set for standard medication refrigerators. Regardless of the delivery mechanism, there should be an easy way to document and report on the action-steps taken to address the alert via the system's software.

System Maintenance Features

The system should inform you if the probe transmitter, repeater, or receiver is not functioning properly or if it needs repair. At a minimum, any battery-operated device, such as the temperature transmitter or back-up batteries in the repeater or receiver, should report a low battery charge. Also, if temperature

Photo courtesy of Isensix

Alert features are a must for a temperature monitoring system.

data is not being received and recorded, you should be able to quickly identify the truant transmitter(s). If you plan on deploying your system in locations without emergency power or in off-site clinics, you need to ask about buffering. This allows the battery-operated devices to "queue" data in the event of power outage or network downtime, and subsequently fill in the gaps when power or network connections are restored.

Other Considerations

Be sure to find out what accessories are available for your system, specifically temperature probes. Most of the time, the standard probe that will ship with your transmitter will be an air probe. Air probes work fine in most situations, but for high-use units or QA purposes, a submersible probe that is less susceptible to temperature fluctuations caused by opening the refrigerator door may be more appropriate. Also, if you have investigational drugs or products that require extremely cold temperatures, special probes may be needed.

Installation

Installations will vary depending on the vendor, but they all should follow a similar process. Typically, the vendor will start with a site survey to determine the number of repeaters and receivers you will need. At this point, your IT folks may need to provide some network connections for the receivers. Also, if the signal repeaters are going to be hidden above the ceiling tiles, new power outlets may be required. Once your facility is ready, the actual installation is pretty straightforward, and even a large pharmacy department can have the equipment installed and connected in just a few days. Next, the software will be loaded and the transmitters will be registered with the system. Transmitter registration usually involves naming the refrigerator or freezer, setting the alarm values, and organizing them into groups, if needed. Finally, the installers should verify signal connectivity and address any outstanding issues.

The Michigan Experience

So does a wireless temperature monitoring system help? Yes. Using such a system, the University of Michigan Health System has greatly improved our documentation of temperatures and follow-up actions, communications between the technician coordinators and the maintenance department, and the pharmacy staff's satisfaction with the monitoring process.

Prior to the installation of our wireless temperature monitoring system, we were only able to locate about 85 to 89% of the temperature readings we should have had on file for any given month. The automated system has improved our compliance with temperature documentation to nearly 100%. Additionally, the availability of continuous temperature data helps the maintenance department troubleshoot malfunctions. In fact, we discovered that some mini-fridges simply weren't capable of meeting our storage requirements and had to be replaced. The temperature patterns that lead to that conclusion would never have been identified under our manual processes, with only one to two temperature points per day.

We are pleased with benefits we have experienced from the use of wireless refrigerator temperature monitoring. The technicians are happy that they do not have to manually check thermometers. The coordinators who took over the tasks of monitoring and responding to temperatures with the automated system are happy

TempTrak from Cooper Atkins

that the proper documentation is easier to maintain and that problems are easier to identify. Finally, the department is happy that the improved monitoring process helps ensure proper storage conditions for our pharmaceutical products, which are an important part of our mission to provide safe and effective care. P&P

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Where to find it:

VENDOR	READER SERVICE #	WEBSITE
Aegis Scientific	29	www.aegisfridge.com
Cooper Atkins	78	www.cooper-atkins.com
DeltaTRAK, Inc.	76	www.deltatrak.com
Hampshire Controls	81	www.hampshirecontrols.com
Isensix	80	www.isensix.com
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