CASE STUDIES

Nursing Facility Monitors Vitals via BLE, IoT

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New York's Bishop Rehabilitation and Nursing Center has been tracking health conditions in real time using Murata Vios technology, while identifying trends so it can target healthcare and improve outcomes.

Sep 12, 2021   Skilled nursing facility Bishop Rehabilitation and Nursing Center has deployed a Bluetooth Low Energy (BLE)-enabled solution to achieve real-time vital-signs monitoring of acute patients, such as those recovering from cardiac arrest or a stroke. The Remote Monitoring Services solution, from Murata Vios , includes sensors attached to a person's skin to detect health conditions and then forward the collected data to a tablet via a proprietary BLE stack. The system leverages the healthcare facility's Wi-Fi network to forward data to a server, so that patients can move around freely while being monitored, without having to carry wired hardware.

The center leverages Murata Vios's remote team of cardiac-trained technicians to monitor the data in real time, and to call in an alert in the event of a detected health problem. Since 2020, the monitoring system it deployed for some patients has been providing data related to electrocardiogram (ECG), heart rate, blood oxygen, pulse rate, respiratory rate and posture. The center reports that the data has not only provided real-time alerting in the case of a health concern, but also enables the capture of historical information to track overall health trends. What's more, it can identify additional health issues that could affect a patient's recovery, such as sleep disorders.

The 440-bed rehabilitation and nursing center, located in Syracuse, N.Y., provides health services for both short- and long-term residents with acute needs. The center offers specialized health services including 24-hour skilled nursing care, subacute rehabilitation, inhouse dialysis, palliative care, and respiratory and wound care. Amenities include a hair salon, religious services, music, recreational activities and community partnership programs.

Rehabilitation and acute-care facilities often must monitor patients with acute health conditions, but they don't apply the same degree of condition monitoring that would be used with a hospital patient who is entirely bedridden. Like most such facilities, Bishop relied on its staff to conduct periodic vital-sign checks, such as taking blood pressure measurements every four hours, prior to the BLE system's deployment, according to James Waters, Bishop's respiratory therapist and programs director. Although that data provides intermittent views into a patient's health, he says, it has limits.

"That could leave a gap in there, [which] could be a change in vital signs, during which the patient is having a rapid change in condition," Waters says. Wired solutions could provide data in real time but would not enable the resident mobility that the facility emphasizes. "As a general rule, we focus on keeping them as active as they can be, [having them] participate in groups and do things within the limits of the infection-control constraints underway, especially during the pandemic. We've always been interested in using technology to extend the reach of providers and caregivers."

Waters adds, "One of our best resources is our staff, so we're always looking for ways to support them and also make the process better for the patient." The center had investigated monitoring systems that might have required tethers or having workers carry a cart as they moved around the premises. The Murata Vios system provided what Waters calls a more flexible solution: electrode sensors worn by patients on a small harness under their clothing, as well as a tablet that captures data via BLE and then forwards it to the server, where Murata Vios's offsite observers evaluate the data.

Because the system operates within the limits of Bluetooth transmission ranges, residents must remain within approximately 50 feet of the tablet. If they are moved around the center—to receive physical therapy, for example—the tablet accompanies them. Typically, the device is placed in the pocket of a patient's wheelchair. If, at any time, a person's vital signs fall outside healthy parameters, the live monitors identify that event and place a phone call to the staff.

The system was taken live before the COVID-19 pandemic began, and it has since been updated. "It's working so well," Waters says, "we've expanded the scope of service." Initially, the facility was focused on patients on the rehab floors, but the center now offers the technology for its long-term units in which high-risk patients may require additional monitoring. "Maybe someone is getting sicker or has a high-risk factor. Now we can deploy the system there and watch those patients. It's available for whoever may need it."

At present, six of the residents are using the system. "I think we're going to see accessibility of systems like this will continue to expand," Waters states. "There's a balancing point between who needs it and who will benefit most from it." The facility soon found that the system could provide more than real-time alerting—it could also monitor an individual's health trends. Bishop thus worked with Murata Vios to add analytic and trends-based tools to the software. "That is something we asked for, and Murata Vios built it into their portal."

In that way, even if there no acute event occurs, an overall trend—such as a change in heart rate—could signal a potential health issue, like a patient being dehydrated or having an infection. "That gets the right people and resources to focus on the problem to make sure our residents have what they need," Waters says. The solution has enabled the facility to detect medical conditions, such as undiagnosed health issues like obstructive sleep apnea or nocturnal heart-rate fluctuations. The facility's healthcare workers have found that other symptoms, such as heart health, would begin to improve once they addressed sleep apnea or other conditions.

In fact, Waters says, around half of the patients who come to the facility with heart failure have an untreated nocturnal sleep disorder. "That's interesting," he notes, "because we are in a position where we can get them referred to the resources they need to get that treated." The Murata Vios system, he explains, provides actionable data that the center can then send to a specialist who can put together an intervention plan.

Having a constant stream of data from this Internet of Things (IoT)-based system, Waters says, rather than episodic information from manual vital-sign capture, ensures health issues can be caught and properly addressed. "We keep finding more ways of using this information and ways of improving our care," he states. One recent example involved patients at high risk for getting bedsores. The technology enabled Bishop to monitor their movements in bed to ensure no one remained in one position for so long that they developed skin lesions.

Murata Vios was launched in Minnesota as Vios Medical in 2012, says Drew Hardin, the company's VP of sales, and it then created its IoT-based continuous monitoring solution. Murata acquired Vios Medical in 2017, and its name was changed to Murata Vios. Since then, the company has been re-engineering its product, which it commercialized in 2019. The acute rehabilitation facilities serve as the solution's key customers, Hardin says, and technology uses FDA-cleared software running on off-the-shelf technology.

"We are extremely light," Hardin states, "with a shared responsibility model which makes it less expensive and easier to monitor." In addition to sensors for managing ECG, heart rate, pulse rate, respiratory rate, pulse, peripheral capillary oxygen saturation and posture, other sensors and related technologies can be added for monitoring blood pressure and temperature. Murata Vios's remote monitoring service is U.S.-based and live 24-7, he says. "It comes down to the clinician burden, trying to remove the pressure off the front-line caregiver."

Murata Vios's Remote Monitoring Services software works on healthcare companies' existing IT networks, as well as in the cloud, and data can be integrated into a facility's electronic health records. The solution is secured by encrypted data transmission. There are multiple other security measures, Hardin notes, such as the security measures provided by Amazon Web Sservices EC2 Cloud, as well as private, encrypted site-to-site virtual private network tunnel technologies to isolate the data from public services.

Most hospitals have been leveraging wired patient-monitoring technologies for decades, Murata Vios reports, and its solution serves as an augmentation of existing systems for those that choose to adopt it. However, acute rehabilitation centers like Bishop, where post-stroke and -cardiac patients often end up—some with co-morbidities—are the facilities that need the most support in terms of patient monitoring. That is part of a trend by which rehabilitation centers are now taking on patient responsibilities that were historically the task of hospitals.

At present, there are 5,600 hospitals throughout the United States (not counting psychiatric facilities), according to Jim Zimmerman, Murata Vios's strategic and marketing director. Many have become more procedural-based, he says, with an emphasis on moving patients out of their facility to rehabilitation centers for recovery. There has been a growing number of post-acute care centers, he adds, which outnumber hospitals by about three to one. "So that's really our target market," Zimmerman states.

The number of post-acute care facilities is expected to continue growing as baby boomers age, Hardin reports. The Centers for Medicare & Medicaid Services has incentivized such facilities to take on patients, while penalizing providers if a person is re-admitted to a hospital. "Patient monitoring is the first step in preventing those readmissions," he says.