



## ***Automated Monitoring Systems Provide Versatile, Improved Care in All Settings***

***Dartmouth-Hitchcock Health, Renown Health experience significant results with automation***

Consider the following scenario: A patient in his 30s was admitted to a general care unit after undergoing minor surgery. The patient's history of anxiety and pre-existing conditions were assessed and deemed to represent little perioperative risk. The patient was given medications for anxiety and opioids for pain. The patient's initial post-operative assessment was normal.

Yet, when a nurse entered the room at a regularly scheduled time to perform a vital signs assessment, the patient was found deceased.

"This was really the case that led us to say that this should never happen to a patient at Dartmouth-Hitchcock ever again," said Susan McGrath, PhD, Director of Surveillance Core Analytics at the academic medical center located in Lebanon, NH. "The

act of intermittent, manual vital sign collection is just not at a frequency or detail that provides clinicians with the ability to really detect patient deterioration in a timely manner."

She and colleagues participated in a recent webinar, "Hospital Automation: How Connectivity Is Redefining Healthcare Administration and Patient Care," to discuss how important automation has become to both inpatient and remote settings.



***The pandemic pushed the boundaries for parity when it comes to telemedicine. How long will it be before the entire healthcare system repositions itself to provide hospital-level care for patients at home through ongoing remote monitoring?"***

TONY SLONIM, MD, DrPH | President & CEO | Renown Health

With manual monitoring, clinicians are likely to miss significant changes in oxygen saturation, pulse rate, respiration rate, total hemoglobin and other clinical measurements. "There's indeed a lot of information that's just not seen when you're looking only at intermittent vital signs manually," McGrath said.

## Continuous monitoring makes a difference

To address this issue, Dartmouth-Hitchcock Health implemented an electronic surveillance monitoring system from Masimo in its general care settings about 15 years ago and has continued to expand the use of automated systems in other areas since then. These solutions aggregate data from bedside monitors and deliver the information directly to clinicians via their phones, pagers or computers so they can provide needed interventions.

"We believe that continuous monitoring of all patients in all settings is really something that is important in order to prevent deterioration from going too far and to bring resources to the bedside in an efficient way that brings treatment to patients," McGrath said.

Dartmouth-Hitchcock is improving its ability to both detect and respond to patients in decline in a variety of care settings, as it leverages continuous monitoring systems to address numerous challenges, such as delays in information delivery; loss of information; and limited understanding of risks, warning signs and possible outcomes. Perhaps most importantly, the hospital is using automated systems to help clinicians deal with the "noise" associated with all the unnecessary information they are typically bombarded with when caring for patients.

"With all of the blinking lights and alarms, it's often very difficult for clinicians to understand what is important and what is needed ... and how to best care for that patient," said Jennifer Jackson, Director, Connectivity, Masimo.

Automated alerting, however, has enabled clinicians to take the actions that effectively meet the needs of patients in decline. In fact, "We recently published a study that looked back over the 10 years after implementation and shows that in monitored patients we had not a single death ... from opioid-induced respiratory depression," McGrath noted.

Today, the following scenario is more representative of the norm at Dartmouth-Hitchcock: A patient in his 60s was admitted to the ICU with multiple injuries after a car accident. The automated surveillance system continuously monitored his health status via data from electrocardiogram (ECG) and pulse oximetry devices as well as periodic vitals charting from the EHR. After being in the intensive care unit (ICU) for three days, the patient was transferred to the general care unit. The electronic monitoring continued, and the rescue team was called when pulse oximetry alarms sounded. As a result, the patient was transferred back to the ICU to manage ventilation and his stay was extended an additional five days.

## Keeping tabs on home-based patients

While Dartmouth-Hitchcock's experience illustrates why it is important to electronically monitor patients in all inpatient areas, when the pandemic took hold, leaders at Renown Health, an integrated health system based in Reno, NV, recognized how crucial it is to automatically check on those receiving care outside of the hospital's four walls, as well.

"The pandemic pushed the boundaries for parity when it comes to telemedicine. How long will it be before the entire healthcare system repositions itself to provide hospital-level care for patients at home through ongoing remote monitoring?" asked Tony Slonim, MD, DrPH, President & CEO of Renown Health in Reno, NV. Slonim is a quadruple board-certified pediatric intensivist with a doctorate in Public Health, which gives him unique insight into the community health needs he oversees. Renown Health

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is the only tertiary care center serving the community, stretching 100,000 square miles between Sacramento and Salt Lake City with a large rural landscape in between.

During the COVID-19 pandemic, addressing the needs of this community’s patients and families brought many issues surrounding home care to the forefront of Renown’s approach to population health.

“How great would it be for people to not have to drive four hours because we can put wearable, continuous pulse oximetry literally at their fingertips, and measure oxygen saturation, pulse rate and respiration from 200 miles away?” asked Slonim.

Through a partnership with Masimo, a manufacturer of noninvasive patient monitoring technologies, a pulse oximeter monitor is configured to actively prompt patients to answer questions such as, “Are you having trouble breathing?” and “What is your temperature?” These responses, along with other data, are pushed to clinicians at Renown Health for evaluation.

Renown’s Hospital-at-Home model of care was fueled by Masimo technology that enabled patients to receive hospital-level care in the comfort of their own homes. “There is now compelling evidence that well-monitored, at-home treatment can be safer, cheaper and more effective than traditional hospital stays, especially for patients who are elderly, frail and vulnerable to complications,” said Mitchell Fong, MPH, Director, Telehealth, Renown.

“Our patients at Renown have the most sophisticated and reliable respiratory monitoring available anywhere,” said Fong. “We know that continuous physiologic monitoring with Masimo’s Patient SafetyNet™ improves outcomes and saves lives. The ability to extend that capability to patients in nontraditional settings and at home during this crisis is transformative. Our teams are excited to be able to delight patients and their families – and ensure they receive the clinical support they need by using this technology and monitoring.”

In addition, to effectively act on all alerts, Renown partnered with its local emergency medical services (EMS) agency. When hospital staff receive an alert and need additional resources to reach the patient or the emergency contact, the EMS unit will conduct a wellness check. This extra step ensures that patients’ needs are met. “It’s about making sure that you have clear escalation pathways, that there’s coordination and resources available to take timely and appropriate action,” Fong said.

Effectively serving patients became even more complicated, though, when COVID-19 cases spiked in the winter of 2020, forcing Renown to face capacity issues, in addition to exposure, safety and quality challenges. To accommodate this surge in patient volume, the hospital converted an adjacent parking garage into a fully equipped Alternative Care Site-field hospital.

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PAUL SIERZENSKI, MD | Chief Medical Officer | Acute Services



“This type of technology – Masimo, is a game-changer in improving patient care,” said Paul Sierzenski, MD, Chief Medical Officer, Acute Services. “Given the demand on our hospitals during this COVID-19 pandemic, we are pleased to provide appropriate patients with this telehealth solution, which uses wearable Masimo SET® pulse oximetry, allowing us to help manage the surge in COVID-19 patients, and allowing patients the convenience of their own homes.”

Patients also reported high satisfaction levels with the care they received while on the Masimo remote monitoring system; 91% of those surveyed indicated that they would recommend Renown.

## Addressing challenges with maturing systems

The experiences at Dartmouth-Hitchcock and Renown illustrate the importance of leveraging automated monitoring systems across the care continuum. Without such electronic surveillance, healthcare providers are likely to struggle to meet patient needs because:

- EHR data is not sufficient to recognize immediate declines in patients
- Trend data from monitors in different settings is not available
- Risk scores are not shared across care settings
- State scores are not common
- Rescue resource allocation is not optimized

Fortunately, as Masimo’s electronic monitoring systems have evolved over the past 30 years, healthcare providers have been able to address these issues. In fact, these electronic systems now not only monitor oxygen levels, but also capnography, ventilator status, patient positioning and more in a variety of environments, including the operating room, ICU, neonatal ICU and other settings. Most importantly, though, clinicians receive “contextualized information such as the location of the patient, the severity of the alarm and even the physiological values associated with that alarm,” which enables them to take immediate action, said Omar Ahmed, Senior Vice President, Software Engineering, Masimo.

To further bolster effectiveness, Masimo also strives to fine tune the alerts themselves. “We are constantly looking at how to improve this notion of bringing the patient’s condition to the clinician. So again, it’s not just an instantaneous alert about a heart rate. Instead, we want to provide the clinician with information about what does that mean” and what actions need to be taken to address the situation, Jackson concluded.

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**To learn more about how Masimo can help your healthcare organization improve care with automated monitoring systems, visit [Masimo.com](https://www.masimo.com), or email [Marketing@masimo.com](mailto:Marketing@masimo.com).**



### About Masimo

Masimo (NASDAQ: MASI) is a global medical technology company that develops and produces a wide array of industry-leading monitoring technologies, medical devices, connectivity and telehealth solutions, including innovative proprietary measurements, a wide-array of sensors, patient monitors, automation and connectivity software and devices, and innovative consumer products. Our mission is to improve patient outcomes and reduce the cost of care. Masimo SET® Measure-through Motion and Low Perfusion™ pulse oximetry, introduced in 1995, revolutionized pulse oximetry. Today, it is used to monitor more than 200 million around the world each year, and is the primary pulse oximetry at 9 of the top 10 hospitals listed in the 2020-21 *U.S. News and World Report* Best Hospitals Honor Roll. Additional information about Masimo and its products is located at <https://www.masimo.com>. Published clinical studies on Masimo products can be found at <https://www.masimo.com/evidence/featured-studies/feature>.

### About Renown Health

Renown Health is the region’s largest, locally governed, not-for-profit integrated healthcare network serving Nevada, Lake Tahoe and northeast California. With a diverse workforce of more than 7,000 employees, Renown has fostered a longstanding culture of excellence, determination and innovation. The organization comprises a trauma center, two acute care hospitals, a children’s hospital, a rehabilitation hospital, a medical group and urgent care network, and the region’s largest, locally owned not-for-profit insurance company, Hometown Health. Clinical institutes include: Cancer, Heart and Vascular Health, Neurosciences and Robotic Surgery. Renown is currently enrolling participants in the world’s largest community-based genetic population health study, the Healthy Nevada Project®. For more information, visit [www.renown.org](http://www.renown.org).