Case Study:

Beyond Alarm Management

Bernoulli®

WESLEY Medical Center

Using the Bernoulli Clinical Insight Platform™, Wesley Medical Center has reduced the number of critical alarms in their Coronary Care Unit (CCU) by 78%, leveraging the system's Predictive Alarm Assessment and Smart Alarms capabilities. Going forward they foresee hospital-wide deployment, achieving even better patient care and safety using real-time analytics and advanced surveillance.

Wesley Medical Center in Wichita is part of the largest acute-care hospital network in a region comprising Kansas and northern Oklahoma, and treats more than 24,000 patients annually. Wesley selected the Bernoulli Clinical Insight Platform to:

- Quantify, understand and reduce their existing alarms;
- Capture and distribute data from 600+ devices for enhanced patient care, clinical surveillance, and predictive analytics;
- Support an evidence-based assessment and process for setting and adjusting alarm parameters; and
- Foster a holistic, real-time view of a patient's medical condition.

The Challenge

Wesley Medical Center installed the Bernoulli platform to capture a baseline of the total number of alarms triggered each day within the facility. According to Bernoulli's Baseline Alarm Evaluation, Wesley's alarms were sounding more than 10,000 times daily.

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"Based on Bernoulli's data, we realized that we had a huge problem with alarms," said Deborah Free, RN, Stroke Program Coordinator and Quality Manager at Wesley's Galichia campus. "The CCU/Rhythm Central Monitoring sounded like Grand Central Station all the time. It just wasn't a good workplace."

The Baseline Evaluation enabled Wesley clinical leadership to begin the process of mapping alarm trends, as well as classifying alarms by:

- Frequency, alarm type, and device
- Variations by time and day, rooms, locations, and units
- Alarm parameters and thresholds
- Physiological vs. technical alarms

The highly specific data generated by Bernoulli's Baseline Evaluation helped Wesley's clinical staff develop a more effective alarm management process to measure improvements over time to meet their patient-safety goals. By collecting high-resolution physiological data from their medical devices—not just the individual alarms—clinical leadership could determine the potential impact on the number of alarms and patient care before making actual adjustments to their settings. "Wesley utilized a multi-member interdisciplinary team and started to formulate a list of alarms that we felt were important," Ms. Free said. "At the same time, Bernoulli sent us a list of our most frequent alarms. We compared the two lists, and we came up with a prioritization of the alarms we wanted to address."

Table 1
Decrease in alarm volume due to Bernoulli Smart Alarm platform.

Alarm Type	Device Alarms	Smart Alarms	% Decrease
RR Low/High	428	212	50%
SpO_2 Low	508	61	88%
HR Low/High	349	8	98%
Asystole	15	15	0*
V-Tach	13	13	0*
V-Fib	2	2	0*

(*) Critical pass-through alarms from the device.

Coronary Care Unit

Alarm Reduction. Bernoulli's Clinical Insight Platform was launched in Wesley's 20-bed CCU. "We chose that unit because it had the highest [rate of] alarms in the facility, with the sickest, most critical patients," said Ms. Free.

Wesley elected to route patient device alarms through Cisco® IP phones, the standardized communication device for nurses at the facility. When initially activated, the system was configured to send all device alarms to the phones, essentially doubling the noise on the affected unit for the clinicians and the patients. This was immediately identified as unmanageable by the nursing staff.

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RESULTS

- Using smart alarms and a focus on improved sensor application and maintenance at the patient, Wesley was able to reduce specific critical alarms in its CCU by 78%.
- The Bernoulli platform is able to collect and distribute data from multiple disparate sources to provide Wesley clinical staff with a holistic picture of the patient's condition.
- With future hospital-wide expansion of the Bernoulli platform, Wesley anticipates even better patient outcomes, safety and satisfaction.

The Bernoulli platform was then deployed to filter and reduce the alarms being sent to the phones. The Smart Alarm capability of the system enables Wesley's clinical leadership to establish separate alarm thresholds as well as combination, trending and frequency alarms to eliminate non-actionable alarms from being sent to the clinicians. Bernoulli was able to reduce the number of these alarms in the CCU from 1,285 to 281 per day—a remarkable 78% decrease.

Lessons Learned & Next Steps

The clinical staff at Wesley continues to fine-tune its alarm management process and configuration. According to Ms. Free, "Alarm parameters are a continuum for nursing; it should be part of our assessment and monitoring process. Alarm management—and the parameters—have to be based on an individualized approach to your patient. Attention to this process has given us ownership." Ms. Free states that Wesley is looking to expand the utilization of the Bernoulli Clinical Insight Platform for alarm management hospital-wide.

Predictive Analytics. A critical element missing from many other approaches to alarm management is access to the patient's real-time continuous physiological data from the bedside devices, in addition to the alarms. Wesley is looking to move forward with the Bernoulli Clinical Insight Platform to collect physiological data from multiple devices to create a holistic picture of a patient's actual condition.

Ms. Free said that taken individually, a slight drop in heart rate, a gradual rise in end tidal CO_2 level or a slight decrease in respiratory rate may not indicate anything critical in a patient's condition. However, the Bernoulli Predictive

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Analytics capabilities can aggregate the data from those individual parameters to provide the caregiver with a more accurate, predictive picture of the patient's condition.

"So when I see all three of those trends together, that tells me that the patient is deteriorating and developing respiratory depression," Ms. Free said. She believes the Bernoulli Clinical Insight Platform can enable the clinical staff to reduce or even eliminate respiratory depression episodes for patients on a patient-controlled analgesia (PCA) pump.

Using smart alarms and leveraging better patient connection management, Wesley was able to reduce CCU alarms by 78%.

"That's where we are crossing over from alarm management to patient surveillance," Ms. Free said. "You have better patient outcomes in safety and satisfaction. If you have physiological patient parameters based on clinical knowledge from your experts, and if you can pull from a variety of data sources, the platform is predictive. That's what has really impressed me about the Bernoulli system."

Deborah Free, RN
Wesley Medical Center

Summary

The Bernoulli Clinical Insight Platform enabled Wesley to reduce the volume of alarms by leveraging a unified, comprehensive platform to manage multiple alarming devices in its CCU. Wesley now has the flexibility to determine which events will trigger alarms as well as where and how clinicians will be notified. Uniquely, the Bernoulli system provides Wesley with high-fidelity, real-time, actionable data pooled from a myriad of devices to improve patient monitoring and clinical intervention before a patient's condition turns critical—offering point-of-care clinical decision support and enhancing patient outcomes.

About Bernoulli

Founded in 1989 with headquarters in Milford, CT, Bernoulli is a leader in real-time connected healthcare, with more than 1,500 installed, operational systems. Its flagship Bernoulli Enterprise system provides an extensible platform for medical device connectivity, alarm management, clinical surveillance, virtual ICU and analytics to enable better outcomes, reduce the cost of care and improve patient and staff satisfaction. For more information visit www.cardiopulmonarycorp.com.