

A photograph of a female nurse in blue scrubs standing by a hospital bed, looking down at an elderly patient lying in the bed. The background shows a hospital room with blue curtains.

Bernoulli One™ Real-Time Data Analytics

There are a few key things that separate Bernoulli One™ from any other system.

Patient health monitoring and advanced clinical surveillance are among these things. Our far-reaching data collection ability and what we do with the data is another.

**We believe that data is knowledge
and knowledge is powerful.**

Like other medical device integrators, we can get the data. But we go farther. We get old and new data. Past and present. Retrospective and real-time. And connect it to paint a picture for clinicians. A picture of what could happen if things don't change.

Bernoulli One

Clinical Surveillance

Real-Time Analytics

Comprehensive
Integration

What Does “Real-Time” Really Mean?

There is some ambiguity in defining “real-time”. Here we define what “real-time” means to Bernoulli and illustrate how our real-time data can improve your workflows and patient outcomes.

Bernoulli real-time data collection

A key advantage to real-time data collection is greater granularity into a patient’s situation. Bernoulli aggregates high-frequency, streaming data. For comparison, data manually entered in the EHR is only valid if the patient’s condition is unchanged from the time of collection to the time of data entry. Retrospective EHR data is not an accurate representation of a patient’s current condition and could cause serious safety risks.



Consider this example of a nurse caring for an elderly patient admitted with congestive heart failure. The nurse hasn’t had time to chart the last two sets of patient vital signs or the patient’s input and output. The last two sets of blood pressure have decreased to a dangerously low level. And since the beginning of the nurse’s shift nearly eight hours ago, the patient’s urinary output has exceeded input. Signs that point to severe dehydration. A life-threatening situation. Going by the data charted in the EHR several hours prior, the physician unknowingly orders an improper dosage of medications. The patient is given the new medication causing her blood pressure to plummet. The rapid response team is notified.

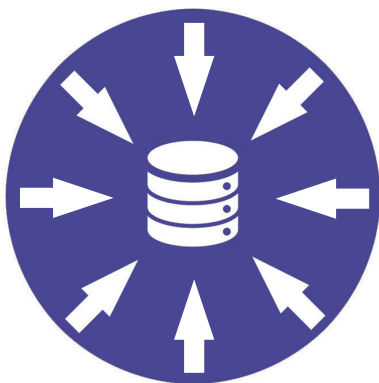
In a different scenario where Bernoulli was in use, the nurse would have received an early warning notification indicating a trend in decreasing blood pressure and this would have been avoided.

Bernoulli real-time data analysis

Bernoulli analyzes data as frequently as six seconds or as quickly as a device will allow. By immediately analyzing real-time patient vitals and pairing the results with retrospective data from the EHR, Bernoulli *One* can detect events before they occur.

Bernoulli real-time notifications

The system sends an alert to the appropriate caregiver when a worsening condition is detected. Early intervention can make all the difference.



Real-time data collection



Real-time data analysis



Real-time notification

Keep reading to learn about Bernoulli *One's* ability to further define, group, and categorize parameters that are independent of the attached medical device, allowing for more advanced clinical surveillance.

Bernoulli Analytics and Smart Alarms

Bernoulli is a powerhouse when it comes to clinical decision support. Our proficiencies in real-time data acquisition, manipulation, and application are patent protected making Bernoulli unlike any other system. To help explain how the system works, let's look at an example where Bernoulli detects consecutive patient events and sends an early warning alert to a caregiver. Jill is a 32-year old female patient that has been involved in a car crash and is currently on a ventilator in the Intensive Care Unit. She has respiratory trouble. Each time she coughs it forces the high peak pressure on the ventilator to alarm and send a notification to the nurse. These episodes typically self-correct and a nurse does not need to intervene. However, if Jill has three or more coughing spells within a one-minute increment the nurse would like a notification. A parameter is set within the Bernoulli system to detect these consecutive events. When they occur, the system then generates a new type of alarm - a smart alarm - which leads to early identification of patient deterioration and better patient protection.

The most common Bernoulli smart alarms include:

- **Limit Alarms** - Occur when a given value (patient measurement) violates either an upper or lower limit (e.g. HR > 140, or HR exceeding 140 bpm)
- **Trend Alarms** - Occur when a given value (patient measurement) violates an upper or lower percentage compared with the average value (normal) for a patient
- **Combination Alarms** - Occur when two values (patient measurement) violate their limits, either high or low simultaneously

- **Consecutive Alarms** - Occur when a value (patient measurement) goes in and out of a limit violation a given number of times, over a specific time period
- **Sustained Alarms** - Occur when a value (patient measurement) violates a specified threshold for a minimum time period
- **Setting change** - Identified as changes to a saved setting on a limit threshold, such as a change in bradycardia or tachycardia threshold.
- **Smart ranked alarms** - Alarms are ranked based upon whether they meet criteria for urgency or warning. These alarms can be displayed on the dashboard according to the level by which they exceed specific thresholds (urgent, warning)
- **Advanced Algorithms** - A set of rules that are more complex than simply comparing a parameter with a given threshold and reporting on a deviation. Further, using advanced rules, the system creates complex mathematical relationships and studies parameter behaviors to create a set of instantiated rules that can then be built into the operational portion of the platform for live use.

Bernoulli clinical experts can work with your staff to customize clinical protocols for your facility. Together, we can reduce adverse events and improve patient safety.

Bernoulli Research and Benchmarking

Bernoulli Research

Every hospital regardless of its size has initiatives to improve quality of care for their patients. Unfortunately, many institutions are challenged by modest data collection processes that make it difficult to move forward. With the Bernoulli One platform, accessing the data is simple. Bernoulli collects and stores data from nearly any source inclusive of networked and non-networked devices. Researchers can access the data at any time from the Bernoulli database. Because our system does the hard part in collecting the data, your leaders can spend more time establishing new ways to improve outcomes.

Bernoulli Benchmarking

Benchmarking can be an effective means for driving new quality improvement processes. Using the Bernoulli benchmarking module that acquires data from nearly every accessible data source, hospitals can perform comparative analysis' that lead to positive changes. A cloud-based solution, the system enables patient-specific, departmental, or hospital-level assessments. It also de-identifies patient health information to ensure patient privacy.

Bernoulli®



To learn more about how the Bernoulli One clinical surveillance, medical device integration, and real-time data analytics solution can help your hospital, please contact us.

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