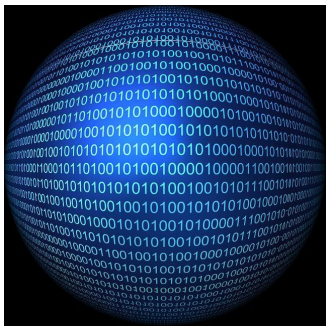
ICU
MANAGEMENT & PRACTICE

Boston Startup Wants to Harness ICU Data to Help Doctors Make Better Decisions



A Boston startup wants to bring smart analytics to critical care in order to help doctors spot and treat at-risk patients.

The intensive care unit (ICU) is one of the most data-intense rooms in a hospital, but the information streaming out of heart monitors, ventilators, and pressure sensors is generally not integrated and analyzed to enable a deeper understanding of the patient's condition. To change this, Boston-area startup Etiometry is building a clinical-decision support system that can interpret large volumes of real-time patient data and provide doctors with a snapshot view of actionable information.

Etiometry's founders, some of them former aerospace navigation guidance engineers, were inspired by what they saw as a lack of systems control or analytics for patient data and an even greater lack of tools to help physicians make decisions. "You have all this data generated in the ICU, but you don't have a technology that does anything with it," says Dimitar Baronov, vice president and chief technology officer at Etiometry. "The only thing you have is human expertise and training." Analytics could help physicians interpret their data, ultimately allowing them to make better decisions, intervene in a more timely manner, and catch adverse events before they happen, says president and CEO Evan Butler.

Clinical-decision support tools guide diagnoses and treatments by plugging patient data into predictive models that have been built on prior patient outcomes. The ideas behind decision support are not new—for decades, researchers have tried to bring computational tools into the hospital that can assist physicians with decisions related to patient diagnoses and treatment. Large companies such as Siemens and Philips offer products that alert clinicians to early signs of a patient's failing health, and research organizations such as Draper Laboratory are developing similar real-time decision support programs.

But the complexity of human biology and the slow adoption of electronic records by hospitals have delayed the technology. Great variability exists between patients, says Dean Sittig, a clinical information systems researcher at the University of Texas Health Science Center at Houston, such that a normal heart rate for one person could be near-death for another. Furthermore, a computer's perspective is limited. "A computer usually looks at one small aspect of the patient's problem but doesn't get the context," says Sittig. "An expert doctor can understand the huge picture of what's going on with a patient."

Another challenge has been the predominance of paper-based data storage, which has limited the amount of data available to researchers trying to use machine learning to build better models of patient care. "Typically, most hospitals store data on ICU machines for about 72 hours and then throw it away," says Butler. "In the last few years, what's really enabled our technology is that other companies are coming into hospitals and saving all the data."

Using these large data collections to improve predictive modeling is a powerful notion, says Peter Szolovits, head of the Clinical Decision-Making Group in MIT's Computer Science and Artificial Intelligence Laboratory. "If the models are accurate enough, then you could use them when trying to decide between different treatments for a patient." Such models, trained on real-patient data, could tell doctors what the different predicted outcomes would be for each treatment option and the degree of uncertainty associated with each prediction.

Etiometry's technology presents this information in a user-friendly interface that lets doctors quickly see which ICU patients are at risk for adverse events and then take a closer look at any at-risk patients, reviewing a detailed list of potential events and the likelihood that they will happen. The team says their framework can interpret all patient data generated in an ICU—from instantaneous data, such as heart rate, to data collected over multiple hours, such as blood work.

The company has focused on pediatric ICUs, using machine learning to build algorithms from retrospective data they've received from Boston Children's Hospital, the Toronto Hospital for Sick Children, and other centers. It plans to begin testing with real-time data in the next year.

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