SickKids automates collection of data, links data to AI-enabled engine

By Norm Tollinsky

Toronto's Hospital for Sick Children (SickKids) is engaged in an ambitious artificial intelligence (AI) research project to mine physiological data from biomedical devices and to better understand what insights can be gathered from the physiologic data.

"I see it as a really unique methodology for integrating the vast amount of data that we're collecting and potentially transferring it into actionable information or insight to help guide a doctor's thought process," explained Robert Greer, computer scientist in the Department of Critical Care Medicine at SickKids.

Getting access to inaccessible data

SickKids collects and stores high-frequency data from multiple biomedical devices, but one data source, the hospital's anesthesia devices, was inaccessible. Determined to collect and store the high-frequency waveform data for research studies, SickKids turned to Enovacom Canada, an Orange Business Services subsidiary specializing in biomedical interoperability, for assistance in developing a solution for research purposes.

"We will be adding this additional information to our existing waveform program that has been running since 2016 in our intensive care unit (ICU)," said Greer. "The goal is to get us one step closer to establishing a continuous, highly accurate, physiological record across the hospital."

"As part of this initiative, we are starting to collect waveform data from operating rooms (ORs), imaging suites, catheterization suites and recovery rooms. This will add to our

existing ICU capture system and is part of a larger institutional plan to extend the initiative to our neonatal intensive care unit (NICU) and emergency department (ED)."

The ENOVACOM Patient Connect (EPC) product collects data from biomedical devices in proprietary format and converts it to formats required for hospital electronic medical records and data repositories.

"We have communication drivers for most of the biomedical device manufacturers," said Alain Larochelle, Enovacom Canada country manager. "If the device can communicate, we can capture it. For the ones we don't currently have, our R&D data analysts can supply them in four to eight weeks. The only constraint is that the device needs to be able to communicate."

Aside from anesthesia devices, EPC can collect data from ventilators, respirators, electrocardiogram (ECGs), infusion systems, and many more devices.

With EPC, data can be collected and transferred to a database every four hours, for example, but data can also be sent 200 Hz (samples per second) to a data lake or repository if it's to be used to develop and study machine learning algorithms, as SickKids is doing.

"We can configure EPC so all destinations get their data at the required frequency and in the format required," said Larochelle.

The solution isn't limited to deployments in ORs and ICUs. According to Larochelle, it can also be deployed in EDs, and any number of other departments with biomedical devices, including Maternity, Cardiology and Neurology.

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"A growing number of hospitals in Quebec have deployed our platform, while some of them have started to layer on EPC," noted Larochelle. SickKids, a prestigious teaching hospital, is Enovacom's first customer in Ontario.

EPC is unique, claims Larochelle, because it's a 100 percent software-based solution and therefore easier to deploy.

Going beyond clinical opportunities

Data collection from biomedical devices also presents a research opportunity. "Our intention is to conduct research projects to understand what insights we can gather from high resolution physiological data and support the future development of algorithms for decision support," said Dr. Asad Siddiqui, Paediatric Anaesthesiologist at SickKids.

Clinicians currently make decisions based on available metrics from medical devices, but cognitive limitations can limit the optimization of these decisions because patients can be connected to 15 or more devices generating thousands of data points per minute.

In the future, decisions could potentially be enhanced by basing the decisions on a larger number of data points and metrics which may result in a reduction of biases.

Dr. Siddiqui underlines the quality improvement benefit of having the data stored and retrievable, because "it allows us to go back, look at certain events that we need to review retrospectively and assess how we can improve or how we could have changed what happened in the OR."

"You can also go back in time and look at the waveform data from an ECG leading up to the time a patient had a cardiac arrest," added Greer.

"That's not something you can do today, so we want to assess the viability of providing this capability."

SickKids is in the process of collaborating with five other pediatric teaching hospitals to test the validity of its work beyond its local dataset and environment. This collaboration aims to enlarge the critical mass of data required to train its algorithms and ensure the data is unbiased.

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