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FEATURED STORY

Smarter Data Warehousing Preserves a 'Goldmine' of Information

Research IT has developed a way to maintain a rich trove of vitals that can be used in future AI efforts without compromising patient privacy.

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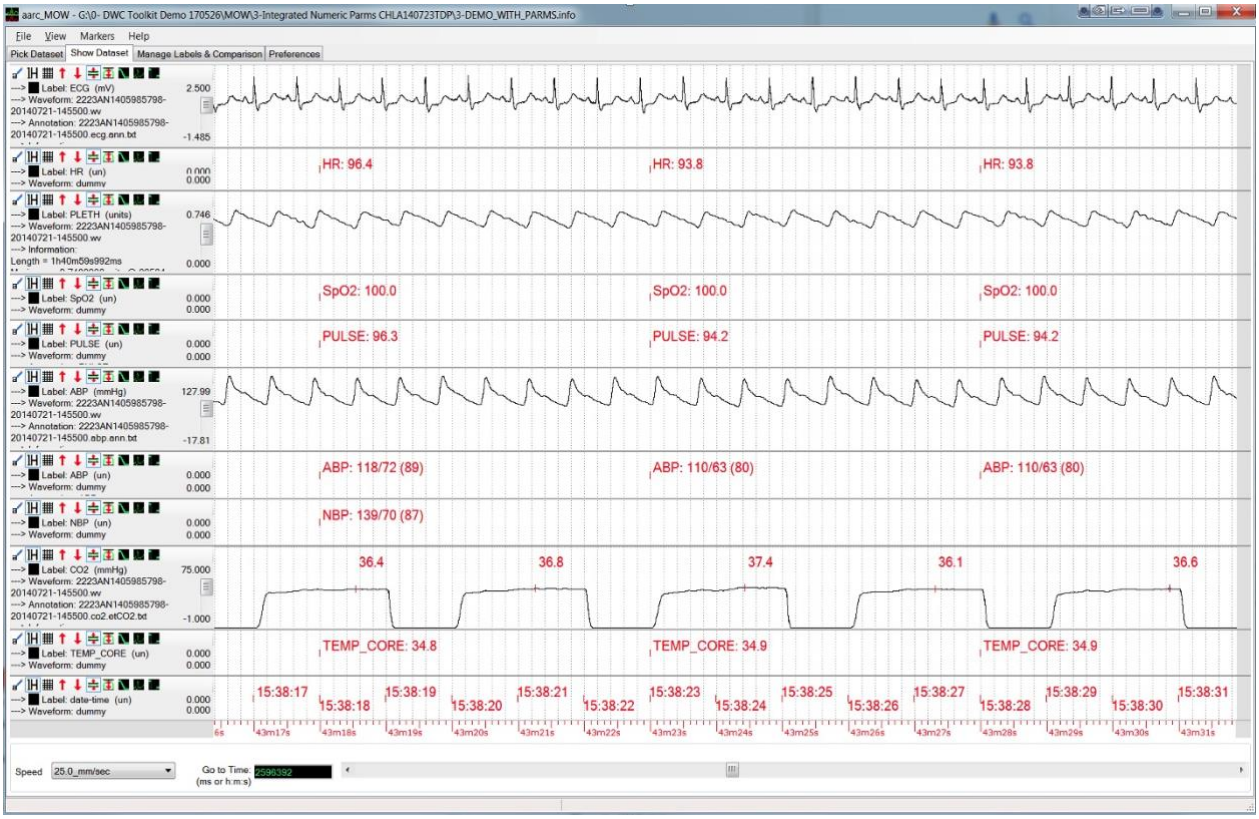
Many of us have seen bedside monitors, either in person or on TV. Bedside monitors are prevalent in the NICU (Neonatal Intensive Care Unit), Emergency Department, Surgery and other clinical units, collecting patients' vital signs at an incredibly granular level.

Vital signs such as blood pressure, heart rate, blood oxygen level, and temperature are important indicators of patient disease and the severity of the condition, and physicians make critical clinical decisions based on these readings.

Maxim Tolchinskiy/Unsplash photo

At Stanford Hospital and Stanford Medicine Children's Health, these signals from individual devices are aggregated to the Philips Data Warehouse Connect enterprise-level database. However, only a tiny portion of this data gets recorded in the patient's electronic medical record (EMR). Moreover, due to the sheer volume, this goldmine of information is periodically purged from the Philips Data Warehouse. Once the data gets permanently deleted from the database, it is no longer available for future research.

Research IT has developed a highly scalable and cost-effective solution called STARR-Wave, part of STAnford Medicine Research Data Repository (or STARR), a data lake containing linked research-ready data from disparate clinical ancillary systems alongside EMR data from both hospitals. This rich trove of data can be used in future AI efforts without compromising patient privacy.



Stanford researchers using the Philips Data Warehouse Connect tool kit for waveform display, measurements, and annotations.

STARR-Wave integration is fully operational for pediatric data, ensuring future research access to vitals by:

- Periodically copying patient vitals data from on-premises biomedical systems to a Research IT-managed, HIPAA-secure cloud storage location as a permanent archive.
- Reconstructing the database, generating waveforms as depicted in the figure below, alarms (for e.g., heart rate dropping below 60) and numeric readings such as blood pressure or pulse.
- Uploading the processed data to cloud storage ready for research.

Researchers at Stanford have successfully used this data in studies ranging from method development and quantitative analysis to machine learning. Our STARR-Wave solution also supports a growing number of new studies at Stanford School of Medicine. A handful of notable uses include:

- Dr. Suzanne Tamang led several Stanford University teams in aiding the validation of a hemorrhage risk detection model operating on a smartphone or tablet in the Department of Defense Nett Warrior (body-mounted information system) program. An AI model indicates the current risk of internal hemorrhage, and the probability of the need for a massive transfusion. This study used vitals such as heart rate, respiration rate, peripheral oxygen saturation (SpO2), and systolic, diastolic, and mean blood pressure from trauma patients to validate the model.

- Drs. Melissa Scala, Michael Scahill, Valerie Chock, and Katherine Travis are running a large-scale analysis to characterize patterns of heart rate variability (HRV) in preterm neonates. They seek to define normal patterns and so to be able to detect clinical anomalies. Their hope is that conditions that are currently challenging to diagnose early but carry major potential for harm — such as intracranial hemorrhages, sepsis, or necrotizing enterocolitis — can be detected more reliably with this readily available, noninvasive approach.

- Dr. Anoop Rao conducted a study to measure the efficacy of an innovative sensor (funded by the NIH Small Business Innovation Research program) to measure blood pressure continually and accurately in the NICU. Findings from the study are expected to result in an FDA submission. To learn more about this research visit Advances in Non-Invasive Blood Pressure Monitoring.

Aditya Romansa/Unsplash photo

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Visit the STARR bedside monitoring page to learn more about STARR-Wave, or request a consultation.