



Bioinformatics for Critical Care

Clinical data warehouse project aims to improve neurotrauma care and research

Case Study

Healthcare
Intel® Xeon® Processor
Clinical Data Warehouse

“The power of Intel in digital health is that it sees the problems, it has the skills to solve them, and it’s outside the framework of proprietary applications. It has the size and scale and credibility to help us change the practice of medicine.”

*Geoffrey Manley, MD, PhD
Chief of Neurotrauma
San Francisco General
Hospital and Medical
Center*

Challenge	<ul style="list-style-type: none"> ▪ Roadblocks to data integration. Efforts to integrate healthcare data sources are hampered by a lack of standards, stringent privacy requirements, long-standing cultural issues, and continued reliance on paper solutions and proprietary applications.
Solution	<ul style="list-style-type: none"> ▪ Open technologies, standards-based platforms. Using open source software and standards-based Intel® technologies, the UCSF Critical Care Data Warehouse Project provides authorized researchers with a single-source view of information from three independent clinical sources: a Phillips CareVUE* ICU electronic medical record, a mainframe-based lifetime care record that utilizes Siemens Invision*, and real-time information from bedside clinical monitors and equipment (Aristein Bioinformatics). ▪ Scalable performance. The warehouse runs on Intel® quad-core server technologies, for energy-efficient performance as data volumes grow and additional users come online.
Impact	<ul style="list-style-type: none"> ▪ Better tools, research, and care. Research is being performed across multiple, disparate data sources with both technical and regulatory requirements addressed, demonstrating that complex challenges to data integration in healthcare can be overcome. Ultimately, the warehouse will help doctors improve treatment planning and clinical care for brain-injured patients and provide unprecedented opportunities for neuroscience research.

Patients whose brain injuries land them in a neurotrauma ICU are connected to a dozen or more clinical monitoring devices. But when it comes to using the data produced by those machines to improve treatment and advance biomedical research, neurosurgeons lack the rigorous analytical tools that are commonplace in virtually every other industry.

Leaders of the University of California, San Francisco’s (UCSF) Brain and Spinal Injury Center (BASIC) say that situation is tragic—and they’ve undertaken a two-year project with the University of California, Berkeley (UCB), and the Intel Digital Health Group to start changing it.



The UCSF Critical Care Data Warehouse is built upon open source LAMP software (Linux*, Apache*, MySQL*, and PHP*) with Intel quad-core server technologies from HP to power the warehouse. An application developed by Aristein Bioinformatics and implemented at UCSF extracts data from bedside devices. Innovative statistical methods are being developed to promote high-quality, consistent data. The project team also plans to develop visualization techniques and explore advanced models of understanding and interpreting data patterns and using them to advance clinical care.

"We're building the Rosetta Stone," says Dr. Geoffrey Manley, co-director of BASIC and chief of neurotrauma at San Francisco General Hospital and Medical Center. "We're proving that you can integrate these three very disparate formats and languages and build a knowledge base to improve care in the future."

The data warehouse is designed with full consideration for healthcare's rigorous security and privacy requirements. Patient-identified data is available only to authorized clinicians, and researchers accessing the database must be authorized by an internal review board. Data is stored in its native formats, and the Systemized Nomenclature of Medicine (SNOMED) terminology is used for indexing, storing, and retrieving clinical data, with cross mapping to other medical classifications.

Manley is a principal investigator for the project, along with Stuart Russell, PhD, who chairs Berkeley's top-ranked computer science division and serves on the faculty of the university's Institute of Cognitive and Brain Sciences. Intel has provided funding and resources and loaned technical experts to help design the warehouse architecture.

Along with providing tangible assistance, Manley says, Intel has helped address cultural issues that typically slow healthcare's transition to a digital environment. "The Intel people bring the weight of their company to the project," he comments. "They have helped us move through the political issues that you have to solve if you're going to share information in a meaningful way, and brought the various

vendors and IT groups out of their silos. On both the administrative and technical levels, we are resolving problems more quickly because of Intel's involvement."

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Moving Beyond Primitive

Manley and Russell expect advanced data analysis and visualization techniques to enable a new wave of clinical advances. "It's tragic how primitive our information analysis tools are compared to every other industry," says Manley. "We have to develop better standards of communication for healthcare. We have to build large, integrated data warehouses and a more collaborative environment if we really want to improve patient care."

Projects like the UCSF-UCB-Intel collaboration are pointing the way. And while Manley saves lives in the operating room on a routine basis, the data warehouse is what excites his passion. "On the clinical side, you're making a difference one person at a time," he notes. "With this project, we're setting a standard for what needs to be done throughout healthcare. This is work that can transform the practice of medicine."

Spotlight on UCSF and UCB

The University of California, San Francisco, is a leader in biomedical research, patient care, and education. In addition to its own medical centers, UCSF provides physicians and staff to San Francisco General Hospital, which operates the only Level I Trauma Center for the 1.5 million residents of San Francisco and northern San Mateo County.

The University of California, Berkeley, is the nation's top computer science school (tied with MIT and Stanford), according to U.S. News' America's Best Graduate Schools 2009. With 35,000 students, UCB is the flagship of the California public university system.

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0908/TC/CMD/XX/PDF 320433-001US

