The Need for an Informatics Solution in Translational Medicine

Authors:

Jens Hoefkens
Isabel Cuesta

PerkinElmer, Inc.
Waltham, MA

Enabling the Enablers

Informatics Designed for the Translational Scientist

Developing treatments that take individual variability into account ("personalized medicine") has given rise to a new discipline in science: translational research or translational medicine. Scientists in this field work to translate biological phenomena into targeted, evidence-based medicines that improve health and treat disease by more optimally matching drugs and individuals. Currently, at least 95 percent of pharmaceutical companies are performing translational research and the translational efforts are driving many of the new therapies entering the clinic today.

But those advances don't come for free. According to the National Center for Advancing Translational Science, translational medicine has "increased research costs and complexity," and is on par with more traditional clinical challenges of recruiting, study design, and regulatory burdens in driving clinical study costs.

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For the Better

These costs stem from the fact that translational medicine seeks to more deeply assess human biology itself – the intricacies of cellular behavior, compounded by environmental, and lifestyle factors. In the pursuit of that goal, translational scientists generate a growing list of sources, types, and volumes of data, including digital pathology, multiplexed flow cytometry, and next-generation sequencing. Large-scale biological databases capture proteomic, metabolomic, genomic, cellular, and other data from public and private basic research and clinical practice. Moreover, translational medicine projects are often multi- or inter-institutional endeavors, requiring the collaboration of scientists representing many organizations around the globe. This data landscape will only broaden, as scientific advances, such as mobile device patient monitoring, increase.

Current tools do not enable the translational researchers to engage directly and intuitively with the available data to affirm or refute a hypothesis. There is no easy means for scientists to search for and access integrated data so they can better identify and characterize biomarkers and develop the most efficient drug to treat a specific disease. Even the types of questions they can ask of the data are limited.

To gain the computational and bioinformatics power to analyze all the data, translational scientists most often call on IT counterparts or biostatisticians and data scientists to create custom applications. This creates its own problems. First, it can restrict the type of inquiry researchers can pose, inadequately focusing on the aftermath of an instrument run, for example. Secondly, it can take several iterations (not to mention days or weeks) before IT is able to serve up what the researcher needs – even if they deliver exactly what the researcher asked for.

New science needs new information solutions – self-service solutions that enable any scientist to engage directly with data more quickly and at a lower cost. These new solutions must address a different type of workflow, one that starts with a scientific question rather than the outcome of an experiment.

"Unless you can start harnessing data and making sense of it, in an automated way, with systems that are engineered to solve big data problems, you'll be overwhelmed by the data very quickly," says Nicolas Encina, vice president of the Innovation Lab at PerkinElmer. "You can no longer effectively manage this data manually and you certainly can't analyze or process it manually either."

PerkinElmer Signals™ for Translational

PerkinElmer Signals™ for Translational is a cloud-based data management and aggregation platform that offers out-of-the-box support for the complete precision medicine workflow – from data acquisition to biomarker discovery to validation. The purpose-built, Software-as-a-Service (SaaS) system easily integrates experimental and clinical data, enabling translational scientists to search for and retrieve relevant and aggregated data from across internal and external sources.

Reasons to Choose Signals for Translational

1 It enables translational researchers to easily search, access, and integrate complex, multivariate data, leading to proof or refutation of hypotheses and new questions and discoveries.

2 It's designed and built from the ground up to serve translational scientists; an out-of-the-box solution, not a generic solution topped off for translational purposes.

3 The universe of supported data types is flexible and ever-expanding as new data types are identified as useful for translational research.

4 It leverages the cloud to improve productivity and collaboration while lowering total costs.

"Too often, people think about data oriented from the informaticist's or technologist's point of view," says Daniel Weaver, senior product manager for translational medicine informatics. "PerkinElmer Signals™ for Translational presents the data in a way a regular scientist will be able to understand. It's organized around concepts a scientist gets, around the subjects of clinical trials, patient visits, samples collected, etc."

Before PerkinElmer Signals™ for Translational, most scientists would query data, for example, based on results from a certain day or sample run. To glean more knowledge required manual analysis of multiple data sets layered in Excel spreadsheets. With the growth of data from R&D and clinical research, this task became even more challenging. The new self-service PerkinElmer Signals™ for Translational platform, however, automatically gathers disparate data to answer more open-ended questions, such as, "Do elderly female patients with KRAS mutant breast cancer have increased localization of protein 'X' to the nucleus?"

A Novel Approach

To achieve this, PerkinElmer has taken a novel approach to data analytics – neither relational database-oriented in which a schema must be defined upfront, nor semantic web-based technologies that consume unstructured data but require semantic structuring on the backend. Finding a "point in space between the two," Dan Weaver says Signals responds to a scientist's queries by requiring only lightweight upfront structuring of the data, while also consuming additional unstructured data as part of the same data load.

The core functionality is presented through an intuitive web interface that enables translational scientists to find clinical subjects or samples of interest and decorate those subjects or samples with any number of related experimental data. The assembled data can be visualized using fit-for-purpose TIBCO Spotfire® templates or other third party visualization platforms to drive rapid hypothesis development and confirmation or refutation.

With PerkinElmer Signals™ for Translational, researchers are able to, without requiring IT assistance:

- Store the output from any bioinformatics or data scientist processing pipeline

- Extract, identify, and store information for entities, like subjects or samples, that are relevant to translational medicine analysis

- Normalize the representation of stored data

- Integrate with data from public domain sources like GEO and tranSMART

- Explore and analyze the assembled data in TIBCO Spotfire® templates for translational research

Jens Hoefkens, director of strategic marketing for research at PerkinElmer, says Signals is designed to emulate consumer experiences on websites like Amazon.com, which are easy to use because they are so intuitive. "The goal is not to intimidate, but to empower scientists," he says, noting partners report quick user adoption.

Leveraging the Cloud

Not only does PerkinElmer Signals™ for Translational enable translational researchers to more easily answer specific, exploratory-type questions, it enables their organizations to lower total costs by leveraging the cloud. This eliminates the need to maintain in-house IT systems and operations, while offering customers the flexibility, predictability, and scalability of on-premise systems without the associated costs.

At least as important, the cloud supports the externalization of research, as organizations are reaching out to outsourcing partners, biotechnology partners, clinics, and academia. Fostering this collaboration, in addition to increasing data access, increases the speed and efficiency of drug development and helps to better match patients with effective drugs.

As a cloud-based solution, PerkinElmer Signals™ for Translational can be accessed in multiple ways – from mobile devices, from the user's desktop, or from visualization platforms like TIBCO Spotfire®. It is a single-tenant solution with instances in local regions, end-to-end encryption, and VPCs, to ensure data security, privacy, and confidentiality.

As the field of translational medicine continues to grow, researchers need best-in-class solutions that lend speed and ease to their work. Self-serve access to a wide variety of data, using an informatics solution designed specifically for translational medicine workflows, will enable these researchers to more quickly and easily identify and manage the biomarkers that are essential to realizing the promise of personalized medicine.

Reasons to Choose Signals for Translational

PerkinElmer Signals™

Nicolas Encina, vice president of the Innovation Lab at PerkinElmer – where Signals was developed, says the name "Signals" is representative of company's mission to improve human and environmental health by helping researchers and scientists make sense of data: "With our breadth and depth of laboratory instrumentation, PerkinElmer is uniquely positioned to empower researchers with a unified experience that leverages advanced tools in big data storage, search, semantics, and analytics to accelerate decision-making."

"As a company, if you think about everything PerkinElmer offers, from our instruments and software to services, it's all about generating, capturing, and analyzing data – or signals – from the environment, from healthcare, from life sciences, and making sense out of it," Encina says. "Given that this platform is driven toward capturing signals from different instruments, data sources, and so on, it seemed like a really good analogy to what we do as a company – separating the signal from all the other noise that only confuses and convolutes information."

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