Amazing therapies.

Dr. William Loging of Mt. Sinai Hospital is improving drug discovery success rates through better understanding of precision therapies.

"We all know someone affected by disease," says William Loging. "Either we are personally, or it's a family member or a friend. I'm here because of that. I want to make a difference."

A drug discovery researcher and associate professor of genetics and genomic science at the Icahn School of Medicine at Mount Sinai in New York, Dr. Loging wants to make that difference by improving drug success rates.

"Right now, every drug discovery effort has around a two percent rate of success," he says. "Only two percent of every idea scientists come up with will result in a drug that a person can take."

That success rate is so low because starting a new drug program can be exceedingly difficult. It requires the navigation of a variety of obstacles that range from the scientific — such as establishing a drug's efficacy — to the business — such as determining if a drug has a broad-enough application to justify the investment.

To Loging, the solution to improving drug success rates largely lies in information — asking the right questions of the data and doing it efficiently. "What I'm focused on doing is trying to make sense of all the information that we're putting together," he says. "All of the life science information that's out there — whether it be text analytics or gene expression data — and asking intelligent questions of it using sound experimental design."

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Asking the right questions relies, in part, on today's computational tools. For one, current technologies allow drug discovery scientists to understand how drugs affect individuals at the molecular level. Understanding the molecular impacts of a drug in a patient not only helps scientists understand more about the disease and how a drug differentiates from standard of care, but it boosts the efficiency of the discovery process as well.

"The computational tools allow you to look in depth," says Loging. "You can't wait around a week to get this information. You want to ask questions continually. It's highly inquisitive, experimental design — looking at it forwards and sideways. To us there is no failed experiment if it's powered correctly." Understanding the molecular effects of a drug helps expose potential roadblocks and move the discovery process along much more efficiently.

Additionally, when scientists are able to ask the "right" questions about a drug or disease, they end up with more useful answers. These answers are critical to responding to another significant challenge for drug discovery researchers like Loging — communication. Many drugs fail simply because those making the business decisions don't understand the data presented them. "It's not enough to just do the analysis," says Loging. "You have to help them connect the dots."

He cites one recent drug program that he was involved in (for autoimmune disease and now in clinical trials for several different uses) — was about to join the failed drug statistic. "Pharmaceutical management wanted to kill the project," he says. "They said, 'The drug doesn't make business sense for us. We don't know prior to the clinic if it will beat the first-in-class competitor.

We don't know all the possible other diseases it could go into.'" Loging conducted a wide array of analyses, presented them and management approved the continued development of the drug. "About six months ago, that drug was licensed out to another company for more than $500 million."

Computational power is a critical tool in the drug discovery process. But it doesn't stand alone. "[Cray] has an irreplaceable spot in my workflow," he says. "But it's really about asking the right questions and putting everything in the right context. That's what happens at the end of the day."

Of what determines success to him, Loging says: "Sound experimental design and asking the right questions. That's what drives the success of the science."

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