NJBIZ

CANCER CARE

2015

Jersey on forefront of finding cures, providing comfort

PRECISION MEDICINE

Using gene sequencing to spark discoveries

BIG DATA

Tracking patient histories can streamline treatment

URBAN OUTREACH

New facility geared to females in city

Dr. Robert S. DiPaola is the director of the Rutgers Cancer Institute of New Jersey.

The best hope for finding a cure

Precision Medicine Initiative already showing its potential

President Barack Obama made many pledges and promises during his 2015 State of the Union address, and one in particular brought joy to the heart of New Jersey, at the Rutgers Cancer Institute of New Jersey, a part of Rutgers Biomedical Health Sciences.

"Tonight, I'm launching a new precision medicine initiative to bring us closer to curing diseases like cancer and diabetes," the president announced.

The surprise proclamation thrilled Dr. Robert S. DiPaola, the director of the institute — which started its precision medicine initiative over two years ago.

"This is not a fad; this is big," he said. "This is rapidly changing the way oncology is going to be practiced."

The concept is complex, but easy to understand: Since cancer is a genetic disease — caused by mutations of genes — the precision medicine initiative is about doing gene testing, called sequencing, to find the specific gene defect that is the cause of an individual's cancer. The sequencing can include hundreds of genes.

Doctors can then search for specific drugs, each chosen to treat the patient's genetic abnormalities.

It's truly personalized medicine.

Few people in the country have a better understanding of this than DiPaola, so NJBIZ reached out to him for a question-and-answer session:

NJBIZ: Let's start at the beginning. Why did the Rutgers Cancer Institute of New Jersey push for this type of initiative from the start?

Robert DiPaola: As the state's only National Cancer Institute-designated Comprehensive Cancer Center, based within Rutgers Biomedical and Health Sciences, we took it upon ourselves to launch a precision medicine initiative. The purpose of this program is to apply this type of technology, gene sequencing, to patients in real time to do the best we can to enhance their care, given the state of knowledge and drugs available. We know oncology is changing rapidly in this direction and we know it will evolve over time, but we wanted to be state of the art from the beginning. Only a robust translational research institution can step up to the plate and take responsibility for bringing all of those very complex pieces together (expert basic science genetic and computational analysis, novel targeted therapy development, meaningful outcomes assessment and dedicated precision medicine clinical trials).

NJBIZ: So how does it work? Describe the process.

RD: We start with patients coming in and enrolling in a clinical trial, wherein we sequence their tumor to find what genetic abnormalities are there. Their case is then presented in what we call a molecular tumor board. It's a large academic team: basic science researchers that are experts in genetic abnormalities; informatics specialists that analyze emerging data for new knowledge and trends; and pathologists and clinicians who are experts in clinical trials, because most times we are finding genetic abnormalities where there isn't a known drug widely available or proven outcome evidence. So we bring all those components together under clinical trials that are designed to find the best possible drugs available to match these abnormalities, bringing the new opportunity to patients in need. To use genetic information alone, which may be done

at a number of emerging laboratories, and guide therapy without such robust clinical research and expertise may lead to unclear use and outcomes.

NJBIZ: So is this the first stop for someone diagnosed with cancer?

RD: Most of the people who are coming here for these clinical trials are patients who have had standard treatment already, and their cancer has become resistant to those treatments. Ideally, we would see patients before their initial treatment plan is solidified.

NJBIZ: Let's talk more about mutated genes or genes with abnormalities. How is identifying them tied to treatment?

RD: If you look at any patient with cancer, what you'll find typically are multiple genes that are abnormal or mutated and are driving that cancer in that individual. What we've learned as we've been able to do more and more gene sequencing is that sequencing certain genes in a patient's tumor allows us to really determine which genes are abnormal and target those genes to be treated. We're at the beginning of an era where we can start to target therapy based on the abnormalities in that person's tumor, although most efforts are in the form of clinical trials.

NJBIZ: How many of these abnormalities are found, typically?

RD: What we found in our initial pilot trial is, on the average, three to four abnormalities in any one individual's tumor, which meant we would try one or more drugs to fight those particular abnormalities. We often need to use a combination of drugs to target all the different abnormalities. If they have three abnormalities, we want to battle all of them. Of course, we also follow patient outcomes to be sure that we are improving care.

NJBIZ: OK, we're getting it now. With so many genes, there are seemingly an endless amount of combinations. Is this what you mean by personalized medicine?

RD: Exactly. If you want a demonstration of the relevance of this approach, look at lung cancer. In the past, there were only a few different types of lung cancer. When you do the genomic sequencing, what you find is well over 100 different types, because you have different genetic abnormalities in different combinations in different individuals. So you want to give a very specific therapy to one individual that may be different from what is indicated for the next person, with what was previously believed to be the exact same disease, to improve effectiveness and reduce side effects.

NJBIZ: And what have been the early results?

RD: Through clinical trials, evidence is emerging demonstrating that this is real for specific genes. Genes that are being sequenced are now leading to guided therapy. Drugs for melanoma and lung cancer that are based on specific genetic changes are now approved by the FDA. For example, in melanoma there is a gene called BRAF kinase that gets mutated in some tumors. When it does, targeting that gene with a specific drug is effective.

NJBIZ: We're guessing the state's numerous pharmaceutical companies love this?

RD: Absolutely. We're already working with some of them. As we begin to grow this initiative, I think we'll have more and more opportunities. Several pharmaceutical companies are developing many of these targeted agents. I think if we want to have a bigger impact, we need to drive toward multitargeted combinations, so when we find a tumor that has three genes that are abnormal we do everything possible to find three drugs — and it might be from different companies. We may need to partner with different companies to get access to these drugs as this initiative grows. And it will grow. It's the right thing to do to improve outcomes, and patients deserve that.

NJBIZ: If this makes sense — and already is showing results — why aren't more places doing this?

NJBIZ: How important is presidential support for the program?

RD: We were really pleased the president announced that he was going to launch a national precision medicine initiative and has even put funding toward that. This is big because it calls to light something we know is incredibly important in changing the way we care for cancer patients very rapidly.

RD: Other NCI-designated centers across the country are doing this, leveraging the expertise in research and technology needed to optimize such an effort. And, of course, there are people out there who can get their tumors sequenced, but the whole initiative, given the complexity of it, requires a tremendous amount of expertise in a large, multidisciplinary team in an academic environment to really do it right. Many complex components are needed, which are usually parts of NCI-designated cancer centers like the Rutgers Cancer Institute of New Jersey, including the evolving technology, computational experts who do the analyses, scientists who understand the genes, and those that engage in therapies with expertise in clinical trials of targeted agents. Without a full academic team putting it together, you worry about where it can be optimal for patients. And yes, to put it all together is fairly expensive.

NJBIZ: Sure, finances are always an issue. Where is the funding for this coming from?

RD: We rely a lot on philanthropy. To get some of this launched, we received an anonymous donation of $10 million, which certainly helped enormously. Insurers are covering some of it, sometimes, not always — especially in patients where there is not a known therapy for their genetic abnormality, but I think that will evolve over time. If we can create a streamlined approach for sharing what works and what does not with insurers, both the payors and the patients will win.

NJBIZ: But if you're the only center in New Jersey doing this, how are you going to reach patients?

RD: We've taken it as our responsibility to the state to launch this initiative out of our academic program. We have partners and affiliates across the state, and we're planning on piloting this clinical research in collaboration with other oncology care teams so we can make sure to reach as many of the patients as possible. We need to reach more people, discover more genes and really design more therapies. Where we can't find the therapy, where you don't have even one FDA-approved drug, as an NCI center we often have drugs that we are using in clinical trials that may be beneficial. This is the way we are going to make great inroads.

You want to take it to the point where you are achieving cures someday, and the way you do that is being able to target the multiple abnormalities in an individual's cancer.

NJBIZ: But if they live in the corners of the state, even your Central Jersey location isn't that convenient. How do you overcome that?

RD: Part of our mission is to get this out there to patients and do whatever possible for patients to continue to be treated at their physician's office. This is doable. If a patient is going into an office or hospital anywhere in New Jersey, they still would want access to all the expertise. We can serve as a hub for the state. Using diagnostic information that can be done at Rutgers or through outside laboratories, our molecular tumor board meets with the all the appropriate expertise and gives guidance under the context of clinical trials. We are doing whatever's possible for them to get it done closest to their home. That's our mission. If we continue to do it right and stick to our mission, we'll better enable the patient to be treated locally.