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Artificial Hype

GE HEALTHCARE
SPECIAL SUPPLEMENT

The immunotherapy hurdle – and why doctors could soon predict how each patient will respond

A partnership between Vanderbilt University Medical Center and GE Healthcare will create AI-powered apps to enable safer and more precise immunotherapies

When two doctors oceans apart were jointly awarded the Nobel Prize in Physiology or Medicine for their work in immunotherapy – the breakthrough treatment that turns the body's own immune system against the cancer – the world cheered. Their efforts had ushered an entirely new way of treating devastating cancer and new pharmaceutical drugs that helped patients with no other hope achieve remission.

Little doubt exists about the tremendous contributions these scientists made to medicine and patients' lives. They had succeeded where others had frequently failed, grinded through years of trials when others had given up and proved to the world the power of a previously untested therapy.

> "One of the biggest challenges for treating patients with immunotheraby is when I sit in a clinic room, the patients across from me, and I can't necessarily tell them who is going to benefit and who is going to get side effects form that immunotheraby.
>
> *Dr. Travis Osterman,*
> DO Assistant Professor in Biomedical Information and Hematology & Oncology, VUMC

Today both say they want to continue their work to ultimately treat more patients.

But despite the rapid advancements and excitement surrounding immunotherapies, there is a looming challenge that doctors and researchers are dealing with in trying to treat their patients clinically.

Many of those patients who stand to receive the immunotherapies researchers work so hard to find may not respond to the treatment and could also experience severe side effects, such as inflammation in internal organs, infections, hormone or gland problems and more[1]. No matter how effective a treatment is in the lab or in trials, to date it has been exceedingly difficult to know which patient will respond well or reject a given treatment.

Additionally, it takes an average of 12 years[2] and costs almost two billion dollars[3] to bring a drug to market, where it can be fully administered to patients. In many cases, patients who aren't the right match for specific treatments are recruited to participate in clinical trials, creating unnecessary expenses, severe side effects and slowing down approvals of new therapies.

"We don't want to give a therapy that has a high likelihood of doing more harm than good. This is a big problem in immunotherapies. We're relying on very primitive tools right now," said Dr. Park, M.D., Ph.D., Director of Precision Oncology, Vanderbilt University Medical Center.

Dr. Park's organization, Vanderbilt University Medical Center (VUMC), announced it is forming a partnership with GE Healthcare to address this hurdle to making immunotherapy mainstream. Together, the two institutions will create Artificial Intelligence (AI)-powered apps and positron-emission tomography (PET) imaging tracers to predict how individual patients will respond to immunotherapies – in advance, before treatment.

"The partnership will hopefully allow us to have more precision in who we can treat. It will allow us to predict whether they're going to have a response and equally important, whether they are going to have any side effects," said Dr. Park.

By creating multiple diagnostic tools, VUMC and GE Healthcare seek to enable safer and more precise cancer immunotherapies. This would help physicians to better target immunotherapies to the right patients and avoid potentially damaging, ineffective and costly courses of treatments.

This will be achieved by retrospectively analyzing and correlating the immunotherapy treatment response of thousands of VUMC cancer patients, with their anonymized demographic, genomic, tumor, cellular, proteomic and imaging data. The two organizations will co-develop AI-powered apps drawing on this data to help physicians identify the most suitable treatment for each individual patient.

"We think that there are probably answers in all of the data that we collect, and we're going to work with GE Healthcare to sift through that data and use cutting edge technology to try and find the answers to those questions," said Dr. Osterman.

As part of the partnership, the two institutions will also develop new PET imaging tracers. These apps and tracers will help physicians to stratify cancer patients for clinical trials, with the hope that the PET tracers will also be used to monitor the efficacy of immunotherapies in everyday practice.

The first AI app prototype will be available by the end of 2019 and the PET tracer proof of concept by the end of 2020.

The partnership adds to the increasing list of ventures between academic institutions and health tech creators to accelerate the development of potentially life-saving treatments. In August, a center jointly funded by GE Healthcare and the Swedish government announced it would help cell therapy company BioLamina develop and fine-tune its manufacturing processes so it can scale and more quickly deliver treatments to market. Similarly, inside the Center for Commercialization of Regenerative Medicine's labs in Toronto, funded by $40 million from GE Healthcare and the Ontario government, scientists are paving the way for manufacturing cells that can turn into any kinds of cell needed in therapy – in bioreactors.

"As we become more adept at treating and preventing cancers, the disease will no longer be a life-ending tragedy for so many patients. Rather, cancer will become a chronic condition that can be effectively managed without limiting a person's vitality or lifespan," said Jeff Balser, MD, PhD, President and Chief Executive Officer of Vanderbilt University Medical Center, and Dean of Vanderbilt University School of Medicine. ■

[1] https://www.cancer.net/blog/2018-02/what-you-need-know-about-immunotherapy-side-effects

[2] https://www.sciencedirect.com/science/article/pii/S2452302X1600036X

[3] https://www2.deloitte.com/us/en/pages/life-sciences-and-health-care/articles/measuring-return-from-pharmaceutical-innovation.html