Wild Ducks Episode 7: Personalized Medicine Podcast

IBM Watson to Join the War on Cancer

Jeff: It's been almost 45 years since President Nixon first declared the War on Cancer. As a society, we've spent billions and billions of dollars on research since then, and we've made some impressive progress against certain forms of the disease.

But we've still lost millions of lives and things only seem to be getting worse. According to the World Health Organization, there are roughly 14 million new cancer cases reported every year. That's about the size of Bangkok or Metropolitan Los Angeles. And that number is only expected to grow as populations age.

Many leading researchers now agree that our best hope to stem that tide is to deliver more personalized care to each and every cancer patient. But how do we get there? Today's Wild Duck thinks he has the answer.

He's harnessing the power of big data and IBM Watson to develop a new method that he believes could one day make personalized treatments the de facto standard of care for everyone. And he wants to test the method in a novel clinical trial for all of the medical community to see. We first heard about this idea at the World of Watson conference in New York City this spring. Here's a short clip from the event.

“I think it’s very likely that within the next 2-3 years that we’ll see a clinical trial in cancer of drug-picking using a human or a computer-aided human, a Watson-aided human. I think that’s a relatively straightforward trial to do. I think it’s likely to happen and I think it’s likely the computer will win—or the human helped by computer will win. The reason I say that is because it’s very hard to do. The data are complicated and complex and we need help.”

Jeff: As journalists, we've written a lot about healthcare innovation over the years. But a Wild Duck calling for a clinical trial pitting doctor against doctor? Where one team has only experience to go on and the other has experience, plus Watson? This is something entirely new. We had to hear more. So we packed our bags for Chapel Hill, North Carolina.

Hi, I'm Ned Sharpless. I'm the cancer center director at the Lineberger Comprehensive Cancer Center at The University of North Carolina. Welcome to the cancer center, guys.

Jeff: That's who we're talking to today. I'm Jeffrey O'Brien
Bernhard: And I’m Bernhard Warner. You’re listening to Wild Ducks, a podcast series brought to you by IBM about innovators using science, technology and ambition to change the world.

Dr. Sharpless is a physician, a mathematician, a molecular biologist, and an inveterate problem solver. He’s published more than 100 scientific papers and has 10 patents to his name. Like many industry leaders, he’s achieved great success through sheer intelligence and a dogged reliance on instinct.

Jeff: And for the longest time, Sharpless was skeptical of anything that looked like a distraction or a shortcut. Which is how he perceived big data. But lately he’s become a full-on convert.

A few years ago, I think I was still thinking like most classically trained oncologists. We would look at a couple genes and it would become obvious how to treat people and the drug companies would make the drugs to match these genetic mutations. And I didn’t really see at the time that it was the big data problem that I now realize it to be. So the need for computational power wasn’t as obvious to me back then.

Jeff: Sharpless’ shift in attitude came while discussing Watson with a researcher at another world-renowned cancer center and one of IBM’s leading healthcare partners: MD Anderson in Houston, Texas, where Sharpless also sits on the advisory board.

So a colleague of mine at MD Anderson, Lynda Chin, who is a big data wrangler there, was working with Watson and she told me at a meeting over drinks that she was really excited about the Watson project. And I thought this was hilarious. I was like, the Jeopardy! playing computer is going to cure cancer. I don’t think so. It’s a hard problem. I don’t believe that.

Bernhard: It’s not like Sharpless was ever a Luddite. In fact, he was an early proponent of genomic sequencing for cancer patients and sequencing remains integral to UNC’s approach. The cancer center has sequenced around 1,700 patients to date and has more than a petabyte of genomic data on file. But his visit to Houston was a turning point. When he saw Chin’s progress on the so-called Oncology Expert Advisor, powered by Watson, it really opened his eyes.
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Nine months later, Lynda actually showed us specifically what they were doing with Watson and I got it. I could see right away. It was the kind of thing that you could really see physicians needing and using and once you had it you couldn’t be a modern physician without it. And that was just one application that they’d been developing, and the technology is powerful and you could see how you could use it for other types of problems.

Jeff: To help listeners understand Sharpless’ vision for Watson and the future of cancer treatment, I should first explain how the current treatment process works at a world-class facility like the University of North Carolina.

A group of expert doctors called the tumor board convenes once a week to study the case files of as many as 20 patients who have exhausted all obvious treatments and don’t have a clear path to recovery. Despite all their collective expertise, the board typically generates recommendations for only about half of the cases.

Bernhard: Half the cases? Why so low?

Jeff: Well, it’s partly a bandwidth problem. It’s just not humanly possible to stay on top of all the clinical trials happening around the world. The board tries to keep up with the latest advances in cancer medicine, but reading journals could easily be a full-time job.

Another reason his team can’t come up with more recommendations, according to Sharpless, is too often they just can’t see a clear pattern that tells them what to do. And even when they do recommend a therapy, they don’t know if they’re recommending the best therapy.

Bernhard: Incorrect cancer treatments are absolutely devastating. They’re highly toxic, hugely expensive, grueling for patients and their families, and perhaps worst of all, they’re time-consuming at a point when time is especially precious.

So Sharpless hopes to reduce the number of ineffective treatments by making use of Watson’s ability to learn from really large datasets. Those treatment patterns that were missing earlier? They’d crystalize into view.

He and his team are training Watson to recommend treatment options for patients who have not responded well to standard treatment.
During this process, Watson is learning which drug regimens have worked best for various types and stages of cancer, with detailed insights down to the DNA level.

And Watson never has a bandwidth problem. It’s constantly ingesting reams of medical literature to stay abreast of new discoveries. Once the team has made sufficient progress training Watson, the idea is to enroll actual patients in the clinical trial we mentioned at the outset.

So the trial that one could envision in this area is take patients and assign them to the therapy the old way. Doctors doing their best, the molecular tumor board making recommendations, versus the new way, which is the same group of doctors doing their best, but now they have help with Watson.

**Jeff:** The trial would likely be in a specific disease, say lung cancer, and focus on a couple hundred patients without a clear standard of care therapy. The cancer center would match two groups of randomized patients. One would receive treatments prescribed by the tumor board in the traditional way.

**Bernhard:** The other group would go through the same process but the doctors on the tumor board would consider Watson’s treatment options. The trial would focus on efficacy but also consider time and cost — and Sharpless thinks he knows what the outcome will be.

And I suspect if we did such a trial and we had the algorithm working the way we want, it would win. For the reasons I mentioned. There’s just too much data. This problem is too big and complicated for people to do well.

**Jeff:** Coordinating such a trial isn’t trivial, especially because Sharpless wants to involve other world-class cancer centers. But in a world of digital networks and real-time data, he thinks it can happen. And if the Watson-aided team were more accurate and efficient, he thinks it could change the culture of medicine. He imagines a world of fewer fishing expeditions because researchers and clinicians could have all the world’s cancer data at their disposal.

**Bernhard:** One of the most exciting things about this idea for me comes from the fact that Watson never stops learning. The more patient data that Watson analyzes,
the more it will learn about the nuances of each disease and how each patient responded to treatment.

Taking all that information into account, it will help doctors prescribe treatment options for subsequent cases. Simply put, the more data that Watson digests, the more personalized the treatment options can become.

Jeff: We shouldn’t create the impression that Watson will ever be some kind of brilliant autonomous cancer doctor. Human expertise and empathy are far too important in cancer treatment. That became clear as our interview with Dr. Sharpless was winding down.

I asked him what keeps him going in the face of all the anguish and failure that comes with being a cancer researcher. And what drives him to keep seeing patients? He answered with an anecdote from his time at the Dana-Farber Cancer Institute in Boston. It made the hair stand up on my arms.

Seeing patients really crystalizes and focuses the mind. When I was at the Dana-Farber, I always made myself walk to the cafeteria by a different route on Halloween. So usually I would just go down to the elevator and walk to the cafeteria. But on Halloween I would go to the third floor and cut through the pediatric cancer clinic. And you’d see all the little kids with their IV poles, bald, getting chemotherapy dressed up as pirates and ghosts and cowboys. It was. It’s ... that makes one then want to go to work the next day. It makes you feel what you are doing is important.

Bernhard: The Wild Ducks we talk to are often so brilliant and accomplished that they may come across as almost super-human. To the contrary, Dr. Sharpless and the rest of the Wild Ducks are deeply human. They do what they do because they care. Because they have families and because they're not satisfied with scourges, pain, disease and ineffective treatments and failure.

That is the great part about being a physician. And I still feel like taking care of people is a real privilege and a lot of fun. You really get to know them. You see them through some bad times and good times. Many of these patients are cured and still send me ... I have a kid who sends me a Christmas card every year and he’s now done with MBA school and he’s a famous businessman somewhere. So that’s the great part about it.
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**Jeff:** Cancer isn’t going away anytime soon. But thanks to people like Dr. Sharpless, we may be on the cusp of developing a whole new way to treat it.

> So what we’d like to have at the end is an algorithm that recommends, that uses genomic information, DNA and RNA, to make recommendations about therapy that are better than a group of humans. That’s the goal. But I think very doable.

**Jeff:** To all of us whose lives and families have been touched by cancer, that would be welcome progress.

Thanks for listening to this episode of Wild Ducks. Please visit our website, ibm.com/wildducks, where you’ll find a Q&A and some video outtakes from our interview with Dr. Sharpless. I’m Jeffrey O’Brien.

**Bernhard:** And I’m Bernhard Warner. Follow us on Twitter @IBMWildDucks. We always welcome your feedback and ideas. Thanks for listening.