Business challenge

Millions of pages of research, nearly 1,500 possible target proteins and wildly disparate clinical data made progress extremely slow for scientists seeking new drug therapies for ALS.

Transformation

Barrow Neurological Institute is using the IBM® Watson™ for Drug Discovery platform to analyze neuroscience and ALS-specific research. The platform’s natural language processing, dynamic visualization and evidence-backed predictions help Barrow narrow research scope and may ultimately help uncover new drug therapies.

“By using Watson for Drug Discovery, we can make scientific breakthroughs in a fraction of the time and cost, increasing our knowledge of diseases faster than ever before.”

Business benefits

5 new proteins
identified in months rather than years by analyzing large amounts of disparate data more quickly than traditional methods

Target identification
identified new pathways of interest for drug therapies that scientists may not have considered.

IBM Watson for Drug Discovery helps scientists discover potential new treatments for ALS

Based in Phoenix, Arizona, Barrow Neurological Institute is an internationally recognized leader in neurological research and patient care. The institute was founded in 1962, and today it is one of the world’s largest treatment and research facilities for a wide range of complex neurological conditions, including Alzheimer’s disease, Parkinson’s disease and amyotrophic lateral sclerosis (ALS). Barrow employs more than 300 researchers and clinicians.
A devastating diagnosis

French neurologist Jean-Martin Charcot first noted the characteristics of ALS in 1874, and the disease was brought to the general public’s attention when legendary New York Yankees first baseman Lou Gehrig was diagnosed with this devastating illness. More recently, ALS regained public awareness with the ALS Ice Bucket Challenge, a social media event that brought in an astonishing USD 115 million in donations over eight weeks beginning in August 2014.

ALS is a rapidly progressive disease that has no known cure. Dr. Robert Bowser, PhD, chairman of the neuro-biology department and professor of neurology and neurobiology at Barrow, describes the condition: “It’s a relentlessly progressive disease. Unfortunately, patients ultimately become entombed in their bodies, and they can no longer perform the daily activities that we take for granted—walking, speaking, even swallowing. From diagnosis to death is typically only three to five years.”

Fortunately, researchers are making progress in the fight against ALS. Recent discoveries point to a link between ALS and mutations in a class of proteins called RNA-binding proteins. There are approximately 1,500 of these proteins in the human genome, and mutations in 11 are known to cause ALS. However, determining which of the other proteins may play a role in this disease would take countless research dollars and hours. Says Bowser, “We’re talking many, many years of trial and error. It’s like throwing a dart at a dartboard and hoping you hit the right one.”

“All of the low-hanging fruit has already been picked, so we have to dig deeper than ever before.”

Dr. Robert Bowser

Bowser continues: “We have seen an explosion in the amount of research being done on ALS, and that’s great. But it also means there’s a lot more information out there, and different researchers are collecting and recording different types of clinical information. Mining all of that data is quite challenging and complex, and it’s becoming nearly impossible to keep up. Plus, all of the low-hanging fruit has already been picked, so we have to dig deeper than ever before.”

Accelerating new discoveries

Barrow is at the forefront of ALS research, but with more than 30,000 ALS patients in the US and an estimated 420,000 more worldwide at any given time, Bowser and his team are anxious to accelerate their research and discover new weapons in the fight against ALS. That’s why Barrow began working with IBM Watson technology, taking advantage of the Watson for Drug Discovery platform’s unprecedented cognitive capabilities to unlock additional discoveries in ALS research.
Watson for Drug Discovery is a cloud-based solution that analyzes scientific text and data to reveal known and hidden connections that can help increase the likelihood of scientific breakthroughs. With the platform’s natural language processing, dynamic visualizations and evidence-backed predictions trained in the life sciences domain, researchers can more readily generate new hypotheses and accelerate discovery.

“IBM Watson provides new and improved insights into the interconnections between proteins, genes and pathways.”
Dr. Robert Bowser

Says Bowser, “People might say ‘I can type those things into Google to get connections,’ but IBM Watson allows you to do more than just query particular genes or proteins. By applying its cognitive capacities to the literature, IBM Watson provides new and improved insights into the interconnections between proteins, genes and pathways.” The Barrow research team ultimately hopes to identify the proteins with the highest probability of being associated with ALS so that it can specifically target the most likely culprits with its research.

Furthermore, Watson for Drug Discovery platform helps speed the Barrow team’s research into potential medications for ALS patients. Says Bowser: “By analyzing its corpus of available information about drugs and genes, Watson for Drug Discovery can actually identify drugs that we wouldn’t have otherwise thought would target pathways of interest in ALS research. Watson can read more literature in a moment than I could read in a lifetime and show me novel connections out of all that data in real time. As a result, we’re gaining exciting new insights into new potential drugs that might help fight ALS.”

Focused research, faster progress

With Watson for Drug Discovery’s capacity for machine learning, Barrow is propelling its ALS research forward. Using predictive analytics applied to scientific abstracts, the solution uses features of the text to identify potential new ALS proteins and rank them according to how likely they are to be associated with ALS. Bowser points out that prioritizing research has a major impact on Barrow’s work. “Basic science research is both time-consuming and incredibly expensive. By using Watson for Drug Discovery, we can make scientific breakthroughs in a fraction of the time and cost, increasing our knowledge of diseases faster than ever before.”
In fact, the IBM Watson Health team recently used Watson for Drug Discovery platform to analyze hundreds of thousands of articles describing the role of nearly 1,500 RNA-binding genes, in search of patterns indicating a potential link to ALS. The Barrow team then examined the Watson platform's top evidence-based predictions and confirmed that nine of the top 10 ranked genes were linked to the disease. **More significantly, the study identified five new proteins that had never before been associated ALS.**

The Barrow team is working to validate these findings through preliminary experiments on human cells in an effort to push these discoveries forward. Ultimately, Barrow aims to bring the new discoveries to industry partners so that they can work together to develop new treatments for ALS.

The IBM Watson for Drug Discovery platform brings hope to patients living with ALS today and to the more than 500,000 patients who will likely be diagnosed with ALS during the next 10 years. Says Bowser: “They are an inspiration. We see them struggle against this disease, fighting relentlessly to beat it, and it motivates us to work just as hard to find new therapies.”