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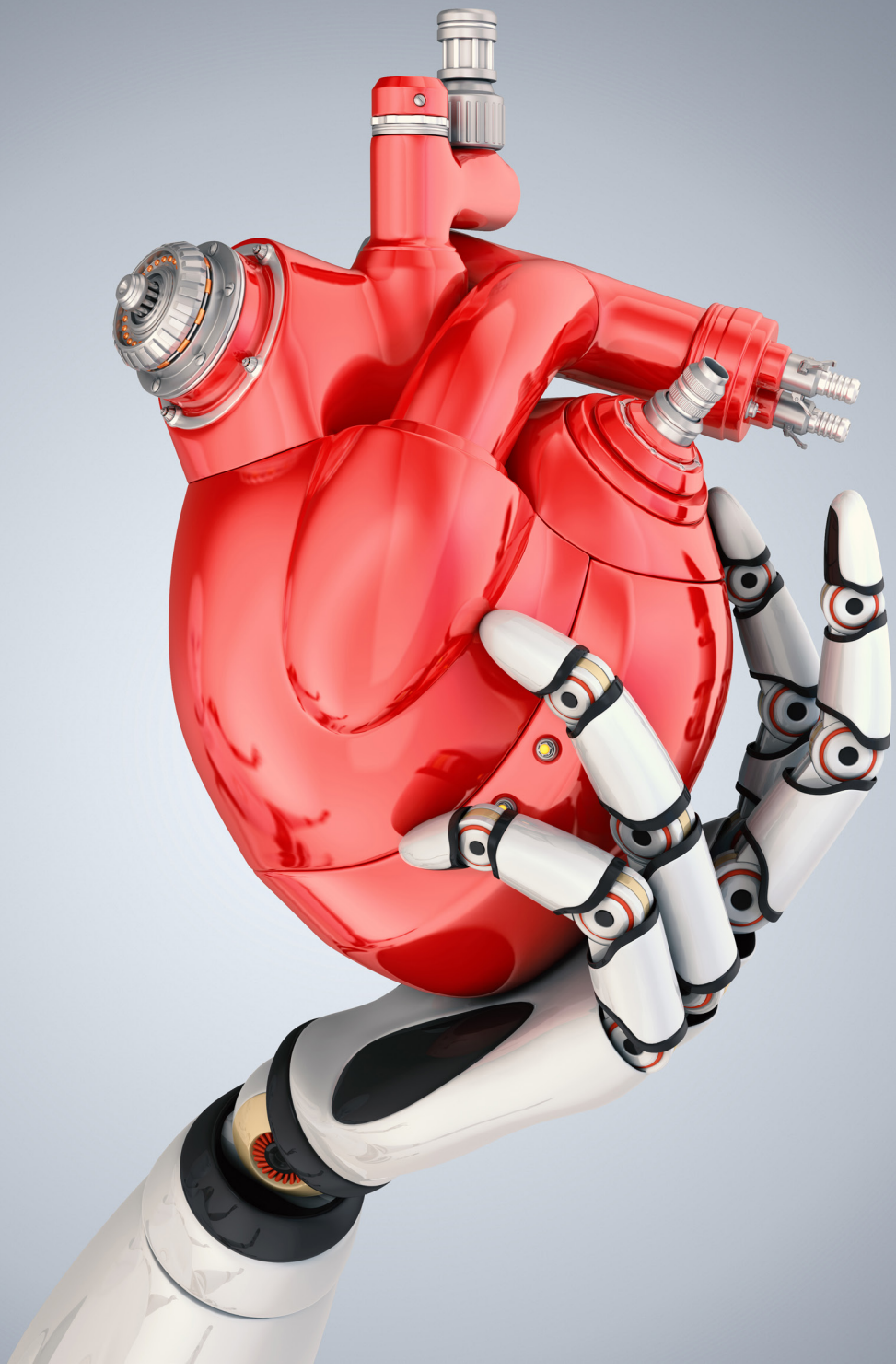
# ARTIFICIAL INTELLIGENCE IN TODAY'S BIOPHARMA



The confluence of data insights and analytics alongside high-end computation presents biopharma and medical practices worldwide with improved life-saving opportunities. How far have we come and what remains to be done?

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Marc Iskowitz
Editor-in-chief
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## THE SURPRISE OF THE MACHINE

**We editors used to** engage in asides about marketers' propensity to give in to the urge to chase shiny toys — cool technology not always supported by sound rationale. Yesterday's indulgence may just be today's necessity.

Emerging technology is being positioned as key to the healthcare system's move toward precision medicine and the trifecta of providing less expensive, higher-quality healthcare that is also more satisfactory to patients. The technology associated with artificial intelligence and machine learning holds, perhaps, the biggest potential to help medicine achieve those lofty goals.

AI is a subfield of computer science that has existed at least since the 1950s. Everything has its time, and what we're witnessing now is a convergence where data science, and in particular techniques like AI, is coming to healthcare.

Following in the footsteps of AI-based consumer products like Apple's Siri and Amazon's Alexa, AI is making its way into pharma — as companies like Merck have shown — and in the process prompting a rethink of the insights and analytics functions.

As these platforms crop up, what will it mean for marketers? AI is quickly crossing the line between shiny object and the opposite: a tool with a well-defined business and use case in our industry.

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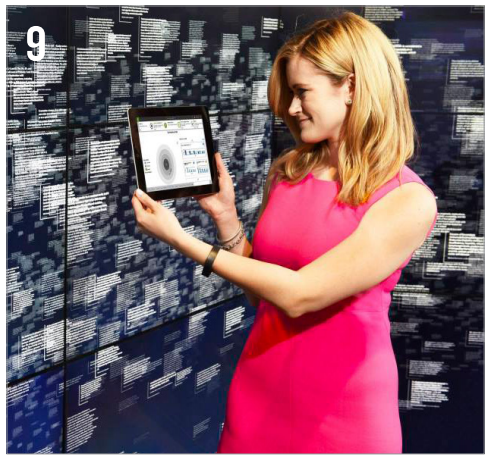





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**FutureTech Pharma**

# PHARMA ADOPTS DATA-SCIENCE CULTURE

With traditional forms of market research now being seen as outmoded, pharma is moving toward artificial intelligence and other methods

**BY MARC ISKOWITZ**

To whom does pharma turn when facing cutting-edge research challenges like designing algorithms to comb unstructured EHR data hunting for undiagnosed patients? Who helps glean patient insights from such digital data streams as social media? Who is designing the value-based frameworks behind pharma's latest wave of performance-based agreements with payers?

These are just a few of the tasks being fielded by data scientists, new insight and analytics professionals showing up in biopharma's ranks. These experts, skilled as they are in advanced data techniques, are being seriously courted by the industry.

"We're hiring engineers, quantitative pharmacologists, economists, mathematicians, and machine-learning experts," reported Sandy Allerheiligen, Merck VP of predictive and economic modeling, at last September's AI and the Near Term, a seminar organized by the consultancy Luminary Labs. "It's with diversity in mind — diversity not only in skill set, but also in experience."

Cut from a different cloth than traditional quants charged with tracking multichannel campaign management, these experts are as likely to have experience in classic metrics as they do in machine learning.

And they take their cues from consumer tech advances such as Amazon's Alexa and Apple's Siri, the virtual assistants for the home and phone, respectively, that use artificial intelligence. That term was coined in 1956 and roughly translates to "endowing computers with human-like intelligence." But the field has more recently rebranded as machine learning, an expression that refers to computers' data-gathering insights.

What's behind the latest recruiting wave in pharma? Some cite well-known factors like a renewed focus on outcomes-based payments, the greater diversity of data, and the size of data volume.

Others say it's a response to pressure driven by consumer tech, whether it's the way Apple and Uber have had to quickly figure out how to use huge amounts of data in an intelligent manner to deliver value to consumers, or such machine-learning projects as Microsoft's Hanover, which aims to predict which drugs and combinations are most effective in fighting cancer. And there's IBM, whose Watson Oncology Adviser uses AI to develop individualized treatments.

## DELIVERING VALUE

Data scientist Hilary Mason (*see sidebar, right*), Fast Forward Labs, suggests another reason, which she summed up as "technical possibility meets business opportunity."

To illustrate, Mason speaks of the ability to analyze images in rich media. When she was at Bitly, she observed that about 16% of the links were primarily media objects — an image, audio, or video.

"At the time, we weren't able to do anything with that object itself," recalled Mason, also at the Luminary Labs event. "We were restricted to analyzing text around it or what people said about it."

Now Instagram — thanks to a data technique called deep learning — can automatically ascertain what users like to take pictures of by analyzing images alone.

"Complex data that had been unavailable for machine-learning techniques earlier is now accessible," Mason explained. "It opens up many possibilities."

All of these factors have led to a kind of cognitive-computing inflection point

## Hilary Mason shares three tips on creating a data-driven culture

Hilary Mason has been described as a big data rock star. The former chief data scientist for URL-shortening outfit Bitly and data scientist in residence at the venture capital firm Accel Partners now heads up her own consultancy, Fast Forward Labs. Mason is much sought after for her advice in developing new business opportunities through emerging technologies, from supply chain and discovery to marketing.

Here she offers three tips on creating a data-driven culture.

**1. Seek leadership support.** You definitely need it to do this effectively, and if you don't have it, go somewhere else, where you have it.

**2. Galvanize the rank and file.** Even if you have leadership support, you will also need the support of the people who are actually doing the work, which is not a given. That's something that can be encouraged through training, hiring, and exposure.

**3. Make the people who resist look good.** While working with a large banking client on a language-generation project, a client encountered resistance from another internal business lead. A major objection had been, "This technology will never pass with the regulatory group." But when we got the regulatory group to be the first to use it, the client was then able to say, "Look, this is something that's freeing up a lot of people's time and money."

Forward thinking getting you

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in pharma where more emphasis is being devoted to preparing for big data and installing more data scientists.

More than 40% of insight and analytic leaders cited "preparing for or managing big data" and the need to "upskill our organization's analytic capabilities" among their chief priorities for the next two years, according to a 2016 survey conducted by TGaS Advisors.

Half of them said the advent of big data will have a profound impact on shaping the insights and analytics discipline. It will heighten the need for data science–based skill sets, according to the survey.

What's more, adds Sharon Getty, TGaS executive director of marketing science, anecdotal evidence suggests that data science is starting to supplant more traditional forms of market research as the latter are increasingly viewed as outmoded.

"We see continued downward pressure on primary market research budgets," she notes, "which signals a reprioritization of available funding [toward analytics] and a deprioritization or overall reduction in traditional project-based market research. Some organizations are taking a progressive stance and making concerted momentum in this direction."

Biotech firm Celgene formed an organizational capability known as IKU (information, knowledge, utilization) to manage healthcare data as a core asset and harness its derived insights to drive decision-making across the entire organization.

The company is hiring senior data scientists whose qualifications include machine-learning analyses using real-world evidence, among other healthcare-related data sources, according to an online job description.

Merck's own Center for Observational and Real-world Evidence (CORE) grew out of a need to provide stakeholders with robust evidence useful for decision-making. CORE's accomplishments include harnessing natural language processing — a technique that relies on pattern recognition — to find patients with peripheral arterial disease by extracting information from unstructured EHR data.

Merck and Regenstrief Institute researchers used machine-learning techniques to improve the method for identifying the number of PAD patients fourfold in an EHR compared with using structured data alone, according to a paper published in last April's *Journal of the American College of Cardiology*.

"External partnerships are one way in which we augment our expertise," explains Merck's Aman Bhandari, executive director of data science and partnerships. "You can't always hire a team that's multidisciplinary. We're very fortunate to have one."

The partnership also showcased what happens when different data sets and approaches are linked or compared. That pooling of data sets and capabilities will bring additional opportunities to light across the life-sciences continuum, according to a report from QuintilesIMS.

## FINANCIAL GUARANTEES

On the commercial side, as many payers ask for financial guarantees if drugs do not meet thresholds, insights generated from real-world data are being used to provide more accurate information on patients and expected outcomes, the QuintilesIMS report's authors observe.

They cite insurer Harvard Pilgrim Health Care's utilization of real-world evidence in three cases: observing the lowering of patients' lipids to those seen during clinical trials by tracking the effectiveness of Amgen's Repatha, monitoring hospitalizations for congestive heart failure by tracking the effectiveness of Novartis heart drug Entresto at reducing readmissions, and evaluating the ability of Eli Lilly's Trulicity to lower HbA1c in diabetic patients.

Having diverse teams sometimes presents its own challenges in terms of giving everyone the space to collaborate, which is, by Merck's Allerheiligen's estimation, a good problem to have.

Her firm created a data-innovation lab in 2016, which gave CORE members the opportunity to pull together teams and come up with their own ideas and solutions.

"We put tools at their disposal and allowed them to try some of these methods," she says. "As you can imagine, with such a wide array of quantitative backgrounds, how do you bring them together and just let them tackle problems? We got way more proposals than we [expected], which was great."

"Anecdotal evidence suggests data science is starting to supplant more traditional forms of market research as the latter are increasingly viewed as outmoded"

**— SHARON GETTY, TGAS**

Another challenge is instilling the mindset that diverse thinking is OK. Asked by Luminary Labs CEO Sara Holoubek how she makes an AI investment case, Allerheiligen responded, "How do we work with partners outside the company [who] make us think about it in different ways? How do we unleash staff? Some have been told 'this is your job, in this box,' and now we're asking them after 15 years to get out of the box."

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Indeed, data scientists sometimes need to come at research questions with unconventional solutions. A study published in 2015 saw Merck partner with Boston Children's Hospital to capture data on insomnia via Twitter. The research could help uncover previously undescribed populations of patients suffering from sleep problems, noted John Brownstein, chief innovation officer of Boston Children's, in a statement.

Speaking about data mining from social networks and online chatter, Brownstein says, "We think of this as the digital phenotype, our digital exhaust being critical in terms of understanding our health."

Among their prerequisites, this new breed of researchers also needs to be good communicators. They need to be able to speak with clinicians, lab scientists, and payers alike. Still, big pharma typically trains its staff. "It's rare that somebody comes in with a full package," Allerheiligen notes.

Like most other areas of biopharma, there's a talent scarcity here, too. Respondents to the TGaS survey said they expect fierce competition for data scientists, "particularly as they must now compete with other data-intensive industries and draw talent to biopharma as their preferred destination," Getty reports.

She adds that momentum is being aided by what she termed a notable cultural shift within many biopharma organizations away from gut or intuition-guided decisions toward data-driven decision-making.

"We don't get rewarded for how many models we built," Allerheiligen explains. "The value is, 'Did we answer a question?' So if we can answer it with a simple correlation, that's great. It's all about bringing a robust answer to the critical question."

### A CAUTIONARY TALE

Pharma, like every industry, faces ethical issues in building AI-based products. There has been no shortage of ethical conundrums arising from the use of machine learning.

For example, a 2016 ProPublica investigation revealed racial biasing in an algorithm used to assess who can be set free at every stage of the criminal justice system as part of a larger examination of "the hidden effect of algorithms in American life."

Mason cites the investigation as a cautionary tale in the march toward near-term use of AI. "That should not be allowed and should be kept in mind as we build these products," she explains.

A conversation is percolating around creation of an ethical code of conduct for data scientists. Although the medical community already has one, human subject laws and protections are used around the world for clinical research. This is a place where the scientific community within healthcare has something to offer the more general tech-oriented data-science community.

"We're concerned with making sure we're maintaining the highest ethics in the research we do," Bhandari points out. No matter the technique being used, "[we need to be sure] we're applying the scientific method in a rigorous and ethical manner."

### ETHICAL QUESTIONS

What does it mean when machines are more intelligent than humans? The Partnership for AI, a group composed of IBM, Google, Amazon, Facebook, and others, is studying some of the implications.

The Luminary Labs event revealed there are almost two stories about AI and its promise: automation of such simple tasks as factory robots and driverless cars, and about discovery and helping people do things better than they now can.

In the broader business environment, a lot of AI's potential seems centered around augmenting human capability and taking away what Mason called the "cognitive drudgery" of ordinary tasks. Meanwhile, healthcare is poised to derive more insights.

"We will know more about our individual genetics, long-term patient response, and adherence to regimens, as well as compliance," Allerheiligen says.

"For me, it's how do we learn how to translate a clinical-trial patient for a real-world patient? When we're projecting doses, what's the right dose of the drug and how do you find that? It's still a journey, but one whose answers are within reach."

## Why healthbots may eat search ads and mobile apps

The internet strongly agrees there's an AI revolution going on, and it has come to pharma marketing.

IBM Watson, the AI brain being infused all over healthcare, will form the back end of an interactive display ad for GSK Consumer Healthcare's Theraflu.

The cold and flu product was one of seven brands, across four beta partners, to sign on with Watson Ads, an initiative announced last summer by the Weather Co. — an IBM property — aiming to develop a new wave of ads with which people will be able to communicate. According to the firm, it marks the first consumer use of IBM's cognitive technology for advertising.


**This Campbell Soup ad, powered by Watson, uses IBM's cognitive technology**

"This is a whole new foray into marketing," says D. J. Reali, SVP, national ad sales for the Weather Co. "It allows marketers to get deeper engagement with consumers based on questions they might have about their product or things that can be developed and made via different products that marketers offer," Reali explains.

For example, a Campbell Soup ad, one of two campaigns up and running at press time, generates unique recipes based on a consumer's personal tastes.

Just don't call it a chatbot.

"A chatbot is based on a decision tree. Watson is based on cognition," Reali notes.

"We're looking at a paradigm shift for the digital experience for consumers in general and health and wellness in particular," explains Michael Spitz, VP of strategy, Klick Health.

The new user experiences are happening with increasing frequency on the health and wellness side. Patients may find themselves communicating more with AI-driven ads and chatbots as intuitive as Uber, Amazon, and Netflix.


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# IBM'S WATSON CRACKS CANCER CODE

AI has already impacted the treatment of cancer. Here's why numerous other therapeutic categories are soon to follow

**BY VIRGINIA LAU**

Owing in large part to an aggressive push by IBM's Watson Health, AI is already a big deal in healthcare. And to hear experts tell it, it's only going to get bigger in the months and years ahead.

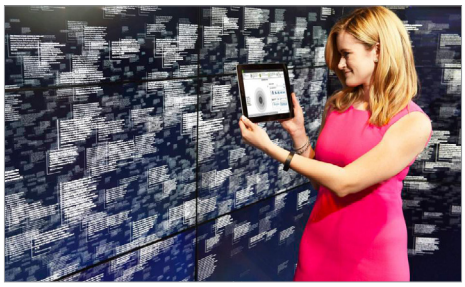
According to a report by consultancy Frost & Sullivan, the overall AI market is expected to reach $6.6 billion in 2021, with a compound annual growth rate of 41%. The report predicted that 90% of U.S. hospitals and 60% of global hospitals and insurance companies will implement AI systems by 2025.

Developed in partnership with Memorial Sloan Kettering Cancer Center, IBM's Watson for Oncology is now in use at hospitals in Thailand, India, China, and South Korea. It offers evidence-based personalized treatment recommendations for cancer patients by analyzing large volumes of data, including medical literature, patient health records, and clinical trials.

"There are more than 700,000 articles in research published per year," Rob Merkel, IBM Watson's healthcare and life sciences leader, says. "The average researcher reads 200 articles per year. When you factor in all the data sources, including clinical and exogenous factors, we believe in one life an individual generates more than 1,100 terabytes of information. It's far beyond human cognition."

Asia's high adoption rate for AI is attributable in part to widespread news sharing. Another reason is that chronic conditions like cancer are a recent phenomenon in the region, notes Kyu Rhee, chief health officer of IBM Watson Health.

"As these economies and their middle classes grow, and as people live longer and the infrastructure improves for things like work, infectious diseases, and traffic," Rhee explains, "areas like cancer become the number one cause of death. This is when doctors and patients start looking for ways in which they can scale and accelerate their knowledge, and this area of cognitive [computing] provides an opportunity for people to do that quickly."



JON SIMON/FEATURE PHOTO SERVICE FOR IBM

**IBM Watson project manager Leanne LeBlanc views analytics of healthcare data. Each person generates more than 1,100 terabytes of health-related data across his or her lifetime, the equivalent of more than 300 million books**

Some of Watson's recent partnerships include collaboration with Medtronic to predict hypoglycemia among diabetes patients — which it can do at an 86% accuracy rate up to four hours before an occurrence. Watson is also working with ClinicalTrials.gov and Froedtert Hospital and the Medical College of Wisconsin to match patients with clinical trials more effectively, as well as with CVS Health to predict the health of the pharmacy giant's customers through predictive analytics.

"We've already moved from the innovator stage to the early adopter phase," Rhee continues. "Now you're getting the other groups engaged and excited about this. So when you ask about the next five years, that's what we see."

## Artificial intelligence's past, present, and future

A glimpse at milestones in the rise of artificial intelligence

**1920**
The first use of the word "robot" occurs in Czech playwright Karel Capek's *R.U.R. (Rossum's Universal Robots)*

**1950**
British mathematician Alan Turing develops the Turing Test, setting the bar for an "intelligent" machine

**1950**
Isaac Asimov's collection of short stories *I, Robot* is published, promoting the idea of machine intelligence

ZAKEENA, CC

**1956**
A Dartmouth College conference is credited with giving birth to the field of AI and coining the term "artificial intelligence"

**1973**
James Lighthill reports that AI would not scale up well to solve real-world problems; British and U.S. governments curtail research funding

**1980s**
Interest, investment, and R&D in AI blossom, following proven business successes; by 1985, corporations spend more than a billion dollars on AI

**1987**
Funding dampens (again) with the 1987 collapse of the Lisp machine; Sun Microsystem, Apple, and IBM deliver workstations and computers with performance advantages

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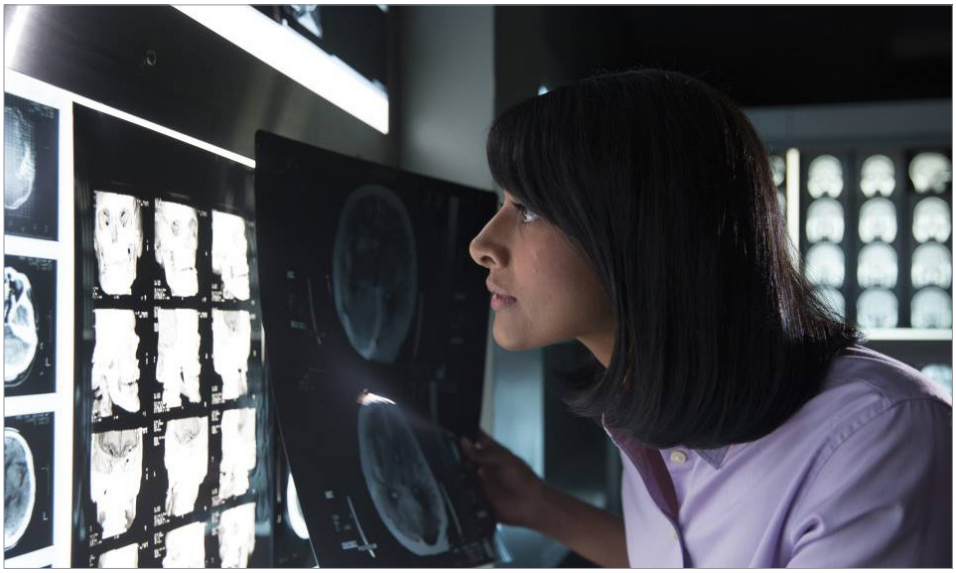
# HOW WATSON FOR ONCOLOGY IS ADVANCING CANCER CARE

Among the numerous benefits that this development offers is that it does not compromise the doctor–patient relationship

**BY VIRGINIA LAU**

What alarms Dr. Craig Thompson, president and CEO at Memorial Sloan Kettering Cancer Center, is that 20% of cancer patients in the U.S. are misdiagnosed.

Thompson said that during an IBM investor briefing in 2015 as he discussed his hospital's partnership with IBM Watson.



**With the acquisition of Merge Healthcare, IBM Watson can read radiological data and medical images**

Four years ago, Memorial Sloan Kettering and IBM Watson formed a partnership to develop Watson for Oncology. A team of physicians and researchers loaded thousands of patient cases, nearly 500 medical journals and textbooks, and 12 million pages of medical literature plus MSK-curated research as they trained the system to be a "learned colleague."

Healthcare professionals continue to feed new data to the system regularly, making it more intelligent and more intuitive every day.

### WHAT IT CAN DO

Currently, the system offers recommendations for lung, breast, and colorectal cancers and it is expanding to gastric-related cancers as well.

Imagine how this might change the patient–physician relationship and experience. Once Watson for Oncology has a patient's information, it can sort through medical literature from all over the world, find what is most relevant to that patient's specific cancer, and prioritize potential treatment options based on the evidence and the patient's health record.

With the use of its different APIs, the system can also read radiological data and

## 1997

IBM's super-computer Deep Blue beats world chess champion Garry Kasparov, leading to renewed interest in AI

S.M.S.I., INC.

## 2002

Roomba, an autonomous vacuum cleaner, is the first commercially successful robot for the home

## 2009

Google builds a self-driving car

## 2011

IBM's Watson competes against and defeats past winners Brad Rutter and Ken Jennings on *Jeopardy!*, a popular TV quiz show ▪ The birth of the intelligent personal assistant (IPA), with Apple's Siri, Google's Google Now, and Microsoft's Cortana ▪ Wellpoint begins working with IBM's Watson supercomputer to tackle claims adjudication

## 2012

Oncologists at Sloan Kettering and M.D. Anderson start training Watson as a cancer-treatment adviser following yearlong internship at Cleveland Clinic

## 2015

IBM launches a Watson Health business unit amid a slew of partnerships with drug and device companies ▪ Google's DeepMind AlphaGo defeats three-time European Go champion Fan Hui

## 2016

Microsoft's Hanover applies AI to understand and fight cancer ▪ Google's DeepMind Technologies studies whether computers can flag degenerative eye problems early on ▪ With Facebook and Microsoft on the bandwagon, chatbots create a lot of buzz

## 2017

On display at CES: hairbrushes that tell you how to deal with frizzy hair, fridges that show you what to cook, and toothbrushes that let you know how to brush up on your oral hygiene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handwritten notes and identify images in specific terms (for instance, identifying a particular patient's hand by recognizing distinguishing features). And it has voice-recognition ability.

It also understands context. "If Watson is ingesting a breast-cancer patient's data and it reads in the notes that the patient's sister had a mastectomy," Rob Merkel, IBM Watson's healthcare and life-sciences leader, says, "Watson knows it's an indication of family history even though the word 'family' may not appear."

And when there is conflicting data, Watson for Oncology alerts the user. If a nurse notes a patient's tumor as one size and the lab report lists a different size, Watson considers which is more recent and makes a recommendation while also making note that there is an inconsistency, Merkel explains. Incorrect diagnoses often lead to higher costs.

About 40% of Americans will be diagnosed with cancer during their lifetime. In about 15 minutes, Watson can present an analysis that would typically take months to come up with by contemporary means, Merkel points out. And Watson presents the evidence for each of its recommendations for the physician and patient to discuss.

"This is key," Memorial Sloan Kettering Cancer Center's Thompson said at the investor briefing. "It doesn't replace the doctor–patient relationship."

### WHO'S USING IT

Currently, Watson for Oncology is in use at a number of hospitals worldwide, including Bumrungrad International Hospital in Bangkok, Manipal Hospitals in seven cities in India, and Memorial Sloan Kettering in New York City.

Watson for Oncology–related solutions are also being used at the M.D. Anderson Cancer Center and the Mayo Clinic, Merkel added. And the American Cancer Society recently partnered with IBM to develop a virtual health adviser for cancer patients that will combine Watson's cognitive computing with ACS resources.

At the February IBM investor briefing, Dr. James Miser, chief medical information officer at Bumrungrad International Hospital, said the 580-bed hospital provides consultation to more than a million patients from 190 countries a year and has used Watson for Oncology since December 2015.

"One of the things that I have been very worried about from my own practice is keeping up with all the information that's going to be increasingly available," Miser said. "Watson for Oncology allows oncologists to keep up, to keep current, and give current best practice recommendations to their patients."

It takes the knowledge of doctors from the world's most prominent cancer institutions and the data they've collected over the years and incorporates them into a single system that then proposes personalized treatment recommendations, he pointed out.

"We don't have vast experience, but our doctors do like it," Miser added. "And our patients appreciate the opportunity of having an online, immediate second opinion from a pretty good source of data."

### THE FUTURE

So what does the future of Watson for Oncology look like?

Merkel said IBM Watson is working with partners to tackle the challenges of cancer from almost every angle. The company is training the system in additional types of cancer, in genomic analytics (Watson for Genomics), clinical trial matching (Watson for Clinical Trial Matching), research and hypothesis generation (Watson Discovery Adviser), and ways to engage patients to manage their own treatment.

"Our hope is that Watson will be an essential tool to oncologists everywhere," Merkel says.

"Our goal is to assist reducing the cognitive burden of physicians in keeping up with medical literature by providing clinically actionable insights to assist them in treating patients."

"If Watson is ingesting a breast-cancer patient's data and it reads in the notes that the patient's sister had a mastectomy, Watson knows it's an indication of family history even though the word 'family' may not appear"

— **ROB MERKEL,** IBM WATSON

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IMS Health

**Ira Haimowitz**
VP, product strategy
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## How would you rate biopharma's competency for using sophisticated data science? What hurdles remain?

A crucial component of biopharma's business success is the access to and reliance on intricate analysis of large data sets. We see differing rates across biopharma organizations and such internal hurdles as talent and cross-unit coordination and external hurdles like data fragmentation.

Companies use less advanced natural language processing techniques to boost social listening activities. Regulatory concerns serve as hurdles in adopting data science, the biggest short-term hurdle being the shortage of data-science talent.

Pharma competency is improving readily as machine learning and data science are introduced. The key driver is the idea of data as a valuable asset, finding the stories within it, and making smarter business decisions.

Biopharma's competency to leverage sophisticated data science is very much in its infancy. The sector is still learning about the "art of the possible." There are challenges with implementing appropriate technology, ensuring veracity, and deriving value from the volume and variety of data.

Sophisticated data-science competency has accelerated from experimental to innovative. Leading pharmaceutical companies are embracing data science by restructuring, hiring, and partnering to enable and expand integrated data sources in real time.

## What are the most compelling near-term use cases for data science in biopharma as a a value proposition?

Two compelling use cases of late have been around patient discovery and outcome prediction. Many clients have shown interest in and paid for exploration of data and analytics solutions that can help discover undiagnosed patients.

Social listening and textual analysis are here and ready to go with the potential to disrupt the traditional annual cycle in favor of rapid multivariate testing. Mining health claims data to understand patient journeys is possible.

The moves toward clustering and segmentation. The depth of clustering versus segmentation surfaces opportunities to understand the types of messages that will resonate with clusters, one step closer to a truly personalized marketing experience.

In the preclinical arena, for instance, applying machine vision to extract information from high-content assays to accelerate drug discovery. Postlaunch, a notable area of growth is sales force optimization.

One example we've accelerated is statistical propensity modeling to predict consumers' likelihood to treat within a category and then applying those models to targeted advertising in television and programmatic digital display campaigns.

## What are the ethical watch-outs for biopharma as it begins using these techniques?

A biopharma company could inadvertently skew results if a data set available for analysis was skewed toward a specific population, leading to unintended patient or population discrimination.

The ability to manage large volumes of text is going to pose challenges for adverse event reporting. Now that pharma can monitor for AEs, should pharma do it? Is there an ethical obligation to do so? These are among the questions pharma needs to examine.

Capabilities and promises. As more and more organizations promise support for advanced analytics, machine learning, and data science, pharma needs to understand the promises so as not to be taken advantage of.

Two broad issues: "Did I tell you that?" — personal information a patient chose not to share with the physician — and "Did I ask to know?" — where predictions could determine whether a person has a disease or condition, but the person has not asked to be informed.

When applying big data and probabilistic modeling, one needs to be aware that there are potentials for false positives. Not every model or inference applies to 100% of a population.

# PARTNER PERSPECTIVES

## greyhealth group

At ghg | greyhealth group we pride ourselves on staying ahead of the biggest healthcare industry trends, often helping to shape them. We constantly look to identify and leverage innovative technologies to build bigger and better solutions for our clients.

We've done just that with our relationship with IBM Watson. The first digital health partner to become With Watson Verified, we've built a strong relationship with their team and developed proficiency in utilizing the suite of Watson services to build solutions for clients.

Bringing Watson's cognitive abilities to bear for our clients allows us to generate insights about customers from previously untapped sources, make vast amounts of data accessible to key stakeholders, and analyze information to generate more powerful experiences and communications to enhance the customer experience and improve health outcomes.

To learn more about how ghg can help you leverage IBM Watson technology, please email us at chris.millsom@ghgroup.com.

## MNG DIRECT

The proliferation of big data in marketing to HCPs presents tremendous opportunity — as well as a formidable challenges — for life-sciences marketers. Consider that in 2015 alone there were more than 20 exabytes of healthcare data available to marketers, and the vastness of the opportunity and the challenge begin to come into focus.

What are the best data sources? What technologies can most efficiently help leverage data? What data sets are most relevant to my brand? These are just a few examples of what marketers are evaluating as they apply data strategies to their marketing plans.

Thankfully, there are best practices in data science and applied technology that enable marketers to effectively utilize both structured and unstructured data. Developing and elevating business intelligence capabilities is essential. At MNG Direct, we apply learnings from millions of data-driven interactions in the life-sciences market to intelligently maximize target audience reach, engagement, and campaign optimization.

## QuintilesIMS™

QuintilesIMS is a leading global healthcare provider of integrated information and technology-enabled services. QI is dedicated to helping its clients improve their clinical, scientific, and commercial results. Formed through the merger of Quintiles and IMS Health, QI's approximately 50,000 employees conduct operations in more than 100 countries. QI develops and implements solutions to help its clients maximize innovation and drive healthcare forward. To learn more, visit www.QuintilesIMS.com.

## ZEPHYR HEALTH

"Insights" from data are quickly becoming a key factor for competitive advantage for life-sciences companies. Healthcare data is scattered and siloed; providers, payers, and manufacturers often see a different version of the truth. Exciting advances have been made in big data collection and curation, including emerging technologies like augmented intelligence, machine learning, and data science–driven analytics. These innovations are creating a connected healthcare ecosystem that spans from research and development all the way through to commercialization for life-sciences companies. To get a true competitive edge, organizations need a comprehensive big data strategy and advanced analytics solutions to extract timely relevant insights. Life-sciences organizations that can tap into the expertise of data science–driven technologies, surfaced in user-friendly applications, will take the lead both in transforming their business and in being trend-setters who influence progress for the entire industry.