White Paper

LEVERAGING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING TO DRIVE COMMERCIAL SUCCESS

How pharma companies are harnessing artificial intelligence and machine learning, rich real world data, and deep pharma knowledge to increase sales while reducing overhead.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Sales and marketing teams in pharma sometimes have mere minutes to capture the attention of busy healthcare professionals who might prescribe their products. In today's highly competitive environment, general sales pitches and mass emails are ineffective. Today's life science marketing and brand strategists need highly specific information about their customers and their preferences in order to craft messages that cut through the noise and to engage them on a new level of precision. Artificial intelligence and machine learning are the way to accomplish this. These tools enable brand teams to uncover physician and patient level insights, allowing them to design precision marketing and sales strategies that deliver better business results.

WHAT IS MACHINE LEARNING, AND WHY SHOULD I CARE?

Machine learning is an aspect of artificial intelligence. An algorithm (or question) is defined based on the type of information the user wants to uncover, then it uses statistical analysis to identify patterns and predict outcomes. Over time the machine "learns" what patterns and information are most useful. The more data it has a chance to review, the better it gets.

Machine learning is already used in many common consumer applications. When Amazon predicts items you might want based on what you've purchased in the past, that is machine learning at work. This same model is used in commercial pharma applications to predict patterns, such as which communities have the highest need for a specific medication, which physicians are most likely to prescribe it, and what channels and messaging strategies will best resonate with healthcare professionals and patients. These tools have the potential to transform the commercial pharma landscape, and the companies that start today will have a competitive advantage in the future.

Optimizing brand performance requires aligning brand value and sales potential with specific market need. Artificial intelligence and machine learning technologies help make this optimization possible. When life sciences companies leverage machine learning tools for commercial applications, they can bring customer engagement to an entirely new level. For example, they can determine exactly which physicians are likely to prescribe their drugs, the marketing channels they are most likely to respond to, and the messaging that will have the biggest impact. These tools are equally impactful when engaging patients and payers in conversations about a product's value, to spur interest and support.

These detailed insights help them make evidence-based decisions that increase sales while making better use of limited resources to maximize returns.

However, it only works when organizations have access to all of the necessary elements of a successful machine learning strategy, which includes advanced machine learning and analytics technology, access to integrated global industry data, deep healthcare industry knowledge, and the technical expertise to build algorithms that generate meaningful insights. Together these tools can transform the commercial strategy, and give brand teams an edge in the marketplace.

AN EVIDENCE-BASED APPROACH

Artificial intelligence (AI) and machine learning (ML) are rapidly growing areas of the healthcare environment. Applications of AI in healthcare are expected to grow nearly $8 billion by 2022, up from $667.1 million in 2016[1]; and almost half of global life science professionals are either using or interested in using AI in their research.

While there is much talk about how these tools can drive insights in clinical research and trial management, they can be equally impactful in commercial applications.

Many aspects of pharmaceutical sales and marketing have traditionally relied on past experience, descriptive analytics, and predictions based on prior sales. That was an adequate sales strategy in the era of blockbuster drugs. But in today's healthcare economy, drug prices are closely monitored, customer engagement has transformed, sales and marketing budgets are limited, and even the most successful treatments can have much smaller patient populations. As a result commercial teams need a more targeted approach.

The solution? Use artificial intelligence and machine learning to uncover evidence-based insights into customer and product usage at deeper levels than was ever previously possible. The best platforms provide commercial teams with access to integrated internal and external data to understand physician and patient behavior, preferences, and needs. This intersection between professional and patient data allows commercial teams to delve into the intricacies of healthcare decision-making, and what data or commercial triggers have the biggest influence.

The insights generated by artificial intelligence and machine leaning, enable brand managers and market researchers to go beyond interpretation of historical events (i.e., what physicians prescribed in the past) and primary market research to a realm of prescriptive analytics and predictive analytics. Using these insights to model results of different courses of action, pharma companies can truly transform customer engagement and develop tailored marketing and sales strategies customized for every client that are more engaging and more efficient.

These aren't hypothetical outcomes. Forward-thinking pharma companies are already using machine learning and advanced analytics to transform their commercial strategies, and they are seeing enhanced sales results. These platforms are helping them drive commercial innovation and foster better business development and project delivery in a way that wasn't previously possible.

1. ENGAGING HEALTHCARE PROFESSIONALS

Engaging physicians and other healthcare professionals is one of the most challenging aspects of the pharma sales and marketing process. A brand's commercial performance centers on patient acquisition and patient retention, and that begins with the prescription.

1   www.prnewswire.com/news-releases/artificial-intelligence-in-healthcare-market-5268-cagr-growth-report-by-2022-677083533.html

Figure 1: Use ML to run what-if analyses that optimize trade-offs and maximize commercial performance

HCP
Total promotion investment
Promotion investment allocation across channels
Targeting and Messaging

ACCESS AND AFFORDABILITY
Tier status change by one
Copay change by $5
Patient assistance program

PATIENT
DTC promotion
Patient engagement programs

Simulation
Optimization
Integration

Brand Sales Increase by $$

Acquire new patients by X%

Increase patient retention by Y%

Reduce abandoned Rx by Z%

In the past, commercial teams sent out masses of commercial messages across multiple platforms to every physician who seemed likely to prescribe the product. It's a costly and unproductive approach to marketing that doesn't adequately leverage the limited human and financial resources brand teams dedicate to these tasks. It can also backfire when busy physicians grow irritated by the onslaught of mass communication.

In commercial application, machine learning and analytics tools enable a more targeted and sophisticated brand strategy and sales approach. By mining global healthcare data sets, machine learning algorithms can identify which physicians in a community are most likely to prescribe a treatment based on their patient practice makeup, HCP network characteristics, prior prescribing behavior, and comprehensive lifetime prescribing value. Using these

insights, sales teams can prioritize physicians based on their sales potential, and craft unique sales strategies based on physicians' needs and past history. They can also use these results to run "what-if analyses" to optimize trade-offs and to maximize investments in their commercial strategy, including where to deploy and adapt sales teams, and how to adjust sales strategies to maximize commercial potential. Further, a competitor's engagement strategy can also be analyzed for competitive advantage. Once a commercial program begins, sales teams can continue to use machine learning and analytics to assess performance of sales staff, and adjust their strategy based on internal sales data and evolving market trends.

In many cases, these insights make it possible for sales teams to drill down to highly specific patient and physician needs.
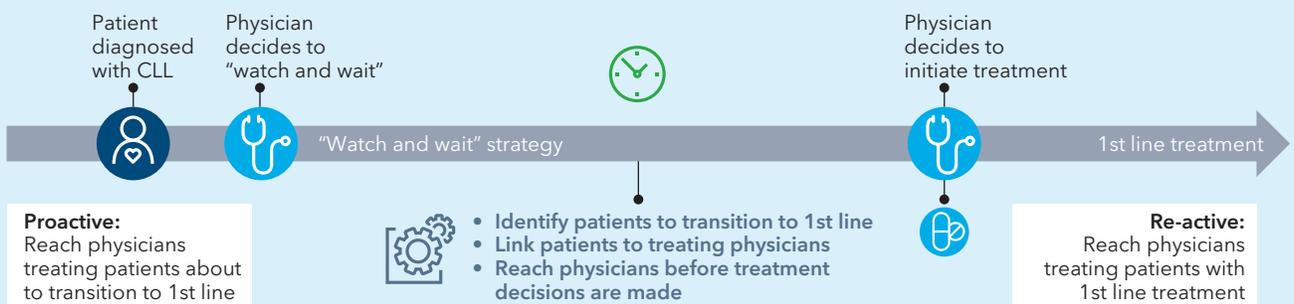
CASE STUDY: In oncology, finding the right physicians with the right patients is critical.

For certain chronic cancers (e.g., chronic lymphocytic leukemia, prostate cancer), patients don't always receive drug treatment right after initial diagnosis. Instead, doctors choose a "watch and wait" approach for a period of time before beginning the patient on a first or second line of treatment.

A global pharma company wanted to understand the strategy behind therapy initiation triggers so that the brand team could optimize the timing of sales and marketing efforts.

IQVIA created a machine learning algorithm for the company that analyzed electronic medical records (EMR) and medical claims data to identify patients with high potential to start first-line or second-line drug treatments and their prescribing healthcare professionals. These insights helped them engage with the right physicians at the point of decision-making to more effectively influence their treatment choice.

- **Identify combined features that are highly predictive of a patient's likelihood to initiate 1st line therapy**

Patient diagnosed with CLL

Physician decides to "watch and wait"

"Watch and wait" strategy

Physician decides to initiate treatment

1st line treatment

Proactive:
Reach physicians treating patients about to transition to 1st line

- **Identify patients to transition to 1st line**
- **Link patients to treating physicians**
- **Reach physicians before treatment decisions are made**

Re-active:
Reach physicians treating patients with 1st line treatment

2. MULTI-CHANNEL MARKETING OPTIMIZATION

Identifying which physicians have the greatest potential to prescribe a drug is only the first step in maximizing a commercial strategy. Busy physicians have little time to read marketing materials, which means brands may have only minutes to capture their attention and communicate the value proposition of their products.

Brand teams can use machine learning and analytics to make the most of these brief engagements, by predetermining each customer's preferred channel of communication (e.g. email, text, face-to-face, physical brochures, presentations), as well as the messaging, cadence, timeline, and tone they are most likely to respond to. Something as simple as sending a message at the right time of day, or timing a campaign to coincide with shifting seasonal trends, can have a powerful positive impact on response.

Brand teams can also use these tools to understand their competitive position in the context of the broader market landscape, so that they can adapt their channel coverage, spend level, timing and messaging to stand out from their peers. These tools provide brand teams with the confidence to deploy more targeted multi-channel marketing campaigns so they can increase digital engagement while optimizing resources for the most productive commercial brand execution.
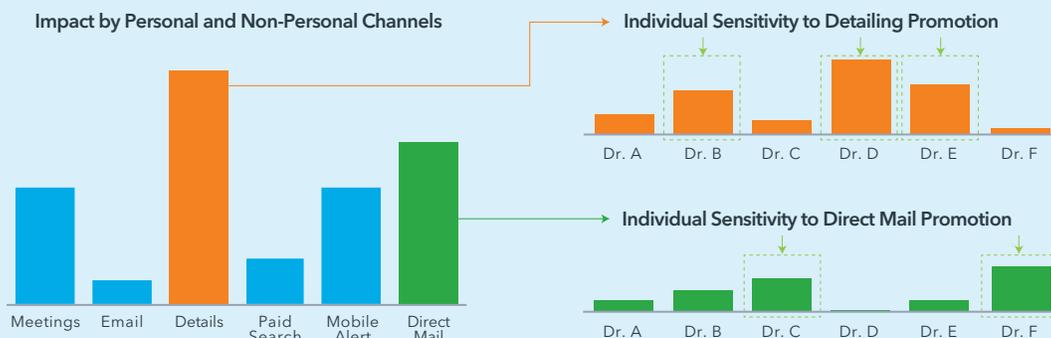
CASE STUDY: Right time, right channel

A global pharmaceutical brand team wanted to determine the appropriate mix of personal and non-personal promotional effort to optimally engage healthcare professionals in their network.

Using IQVIA's Advanced Analytics and Machine Learning platform and healthcare data assets, we integrated healthcare professional promotion activity data and prescription data to dynamically measure individual physicians' responsiveness to promotional channels in various segments. This allowed us to generate "HCP promotion sensitivity scores," which measure how responsive a healthcare professional will be to marketing and sales communications. The brand team used these sensitivity scores to identify the "Next Best Customer" and the "Next Best Action" to prioritize and engage each customer at the right time with the right message.

Because the machine learning process is dynamic, the company was able to adapt the campaign on-the-fly based on shifting sensitivity scores. This ensured they were constantly focused on meeting the needs of the most valuable healthcare professionals in their network with targeted messaging via the touchpoints that would have the biggest impact. The machine learning platform also tracked results on channel synergy and vendor effectiveness so the team could measure outcomes in real time and adapt their efforts accordingly.

This project resulted in $24.8M revenue increase at no additional cost within five months of implementation.

Impact by Personal and Non-Personal Channels

Individual Sensitivity to Detailing Promotion

Individual Sensitivity to Direct Mail Promotion

3. PATIENT-LEVEL INSIGHTS

In many instances, a single drug will be prescribed for multiple indications. Humira, for example, is used by dermatologists, rheumatologists, and gastroenterologists for a variety of illnesses. Prescription data alone won't clarify why a drug is being prescribed, so even when brand teams know who is prescribing their drug – or a competitor's drug – they don't have enough information to customize their marketing strategies for the needs of each physician and the patients they serve.

When companies have access to machine learning technologies and global healthcare data, they can eliminate this problem. The technology is able to interpret these data to provide highly accurate insights that determine when and why a physician is prescribing a particular drug, who their core patient population is, and whether physicians are prescribing it for multiple indications or for a single use.
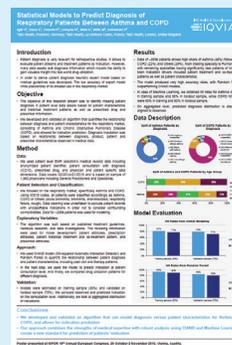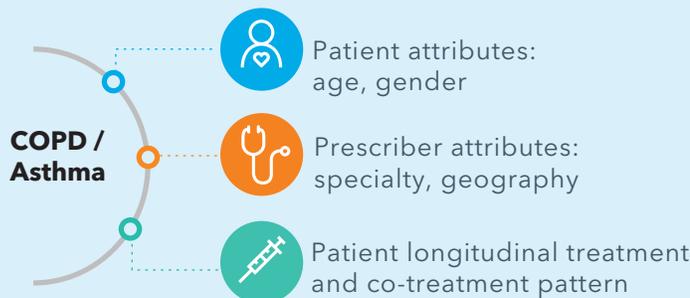
All of this information can be used to customize marketing messages and sales strategies to bolster the effectiveness of their physician engagements. Whether companies are trying to increase prescriptions from an existing customer, or to attract new physicians to a product, machine learning ensures they will be armed with the necessary data to be successful.

CASE STUDY: Asthma or COPD?

Recently, a pharma company wanted to identify the prescribing habits of physicians for a specific treatment used in patients with asthma and COPD. They leveraged IQVIA's Advanced Analytics and Machine Learning platform to evaluate anonymized EMR data, which made it possible to quantify relationships among diagnosis, patient characteristics, historical treatment and co-treatment patterns and prescriber characteristics.

The analysis provided the brand team with detailed data about prescribing habits, including the percentages of patients treated at individual healthcare facilities who were suffering from each condition, their main treating specialists, their preferred treatment patterns, and the patient characteristics. These detailed insights helped the brand team predict sales opportunities with new and existing clients by indication at sub-national level at a very high rate of accuracy.

- **Model diagnosis vs. patient characteristics for indications that allows for indication prediction with high accuracy**
- **Main indication drivers include patient characteristics, longitudinal treatment and co-treatment patterns**

COPD / Asthma

Patient attributes: age, gender

Prescriber attributes: specialty, geography

Patient longitudinal treatment and co-treatment pattern

- **Greater insight into source of business (new, switch, repeat) by indication at sub-national level**
- **Recommended actions by indication**

4. CONSUMER ENGAGEMENT

Today's patients are more educated about their own health and healthcare options than ever before. But like physicians, they are flooded with healthcare information from commercials, social media, patient advocacy groups, friends and family, and their own healthcare professionals. Helping them navigate this information and cut through the noise is key to ensuring they access the right treatments at the right times to address their healthcare needs.

Commercial teams can use a variety of tactics and channels to attract consumers, but unless these messages are engaging, meaningful, and delivered at the relevant point in their healthcare journey, these messages get lost in the din of advertising, resulting in little impact on prescribing results.

Machine learning technology can leverage patient level data to help commercial teams cut through this noise to identify the critical touchpoints in the disease pathway. These insights help commercial teams select the best channels for their patient engagements, and to craft messages that stick with them from diagnosis through treatment adherence.

Using longitudinal patient data and other healthcare data, they can also construct deep learning models that find commonalities across patients with certain diseases, to identify undiagnosed and at-risk patients. These insights make it possible to engage with patients sooner, and to become a trusted resource as they navigate this journey.

Once the messages are deployed, the machine learning tools can track their impact with surprising clarity. From counting ad clicks and measuring time spent with a message, to tracking prescribing trends in communities where campaigns were deployed, brand leaders can understand the financial outcomes of their investments and adapt them accordingly. Pharma companies may further leverage this data to demonstrate uptake of a treatment and health outcomes to payers as a way to demonstrate effectiveness and secure preferential coverage status from insurance providers.

CASE STUDY: A new approach to patient engagement

A global pharmaceutical company recently wanted to push digital content about its treatments to highly relevant patient populations. They knew the targeting decisions had to be automated and able to adapt in real-time -- while also adhering to strict data privacy laws.

To tackle this challenge, IQVIA's team designed a machine learning algorithm to analyze consumer healthcare data to understand the online activities of the targeted consumer population with a high degree of accuracy. The algorithm was able to predict the relevance of health conditions based on their attributes and behaviors, empowering their media partners to execute programmatic targeting to the qualified audiences in real-time and in a privacy compliant manner. The project resulted in improved targeting accuracy, reaching the right audience by two-to-10 times over the industry norm.

FINDING THE RIGHT PARTNER

The volume and variety of data now available in the healthcare market offers an unprecedented opportunity to answer complex questions and capture real-time evidence of product effectiveness, safety, and value, which is becoming a prerequisite for ongoing market access.

However, pharma companies have to be certain that their technology partners have the skills and knowledge to navigate the complex landscape of healthcare analytics, and that they have systems in place to protect patient privacy and to adhere to global patient data safety laws. This is one of the many challenges pharma companies face in deploying machine learning and analytics solutions. One recent report found that while life sciences professionals are eager to adopt artificial intelligence and machine learning, lack of technical expertise, limited data access, quality, and lack of standardization are viewed as considerable obstacles.

They are right to be concerned. Machine learning isn't an off-the-shelf piece solution that can be easily rolled out. It's a process in which computers have to be taught to identify relevant patterns so that they can make predictions about future outcomes. This takes time, expertise, and access to diverse, high quality relevant data sets.

Pharma companies that want to deploy the most effective solutions with the confidence that they will comply with data privacy laws need to find partners whose expertise straddles both worlds. And they need to do their due diligence. Many technology industry companies have tried to create solutions for the pharmaceutical industry, but too often these firms fall short because they lack the data and pharmaceutical domain expertise to understand the complexities of the healthcare data environment.

DIGITAL ADVANCED TARGETING

ADVANCED PATIENT TARGETING IMPROVED ACCURACY OF REACHING THE RIGHT AUDIENCE

- Automated, real-time and effective targeting with full privacy compliance
- Improved targeting accuracy, reaching the right audience by 2-10x over the industry norm

To avoid leveraging a system that isn't adequate for a pharma industry environment, business leaders should look for partners who can provide the following:

• Deep pharmaceutical knowledge and expertise. This expertise should include an understanding of global regulatory environments, payer expectations, physician and patient behavior, and therapeutic knowledge.

• A state-of-the-science artificial intelligence and machine learning platform. The solution should be capable of mining multiple integrated real world anonymized patient level data that is BIG, with speed and scale, to identify high-level global and regional trends, as well as detailed physician and patient-level insights.

• Data analytics and machine learning experts. Their customer team should include technical experts who are skilled in crafting machine learning algorithms for pharmaceutical applications and be able to work with state-of-the-science artificial intelligence and machine learning platforms that will generate insights that are highly relevant to the business challenges facing brand teams, to drive business impact.

• Access to vast structured and unstructured healthcare data sets. Machine learning algorithms are only as good as the data they can access. The most effective platforms will provide access to multiple global healthcare databases, including prescription data, EMRs, pharma sales data, and patient and disease trend data that are updated regularly.

• The ability to integrate these disparate data sets. Many healthcare data sets are unstructured, which means they use narrative formats, colloquial language or handwritten notes, that aren't easily analyzed. To leverage these assets, the platform has to be able to "clean" the data so the algorithms can interpret results and translate them into actionable insights to drive better commercial outcomes.

CONCLUSION

Deploying machine learning solutions is one of the biggest challenges in the healthcare industry today, but the companies that leverage the best talent, technology and data will be best positioned for commercial success.

For more information about IQVIA's Advanced Analytics and Machine Learning platform, or to learn more about how machine learning and artificial intelligence can transform your commercial strategies, please contact IQVIA at iqvia.com/contactus

ABOUT THE AUTHORS

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Yilian Yuan leads a global team of data scientists, statisticians and research experts to address the full range of business and industry issues in commercial, medical and scientific, and other client functional areas within the healthcare industry.

Dr. Yuan has over 20 years of experience applying a wide range of advanced analytics to provide actionable solutions to clients in the healthcare industry, including predictive modeling, machine learning, and statistical learning, discrete choice modeling and quantitative market research, as well as patient-based and event-based forecasting. Dr. Yuan has extensive expertise in real world patient level data and their applications to solve client business issues. Early in her career, she worked as an adjunct faculty member in the Department of Epidemiology and Biostatistics of The University of Tennessee, School of Medicine and taught PhD-level courses at The Fogelman School of Business at The University of Memphis.

Before joining IQVIA, Dr. Yuan was a Biostatistician and Team Leader for the Department of Health Care Research and Analysis at the Mid-South Foundation for Medical Care, Inc., in Memphis, Tennessee. There, she conducted many health care outcomes and resource utilization studies using patient level data from U.S. Government Medicare system.

Dr. Yuan earned a PhD in Applied Statistics from The University of Memphis and an MBA in Pharmaceutical Marketing from St. Joseph's University in Philadelphia. Yilian is a frequent speaker at industry conferences.

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Emily Zhao has extensive experience in data analytics leveraging statistical models, artificial intelligence and machine learning. Drawing on her deep knowledge and expertise in healthcare data analytics and its business applications, she leads a team of statistical modelers, data scientists and consultants to construct healthcare commercial effectiveness and real world insights solutions to drive brand strategy and optimize outcome. She provides leadership in both strategic directions and technical innovations.

Prior to joining IQVIA in 2011, Dr. Zhao was a marketing analytics director at Farmers Insurance. There she led predictive analytics for customer acquisition and retention, and pioneered media purchase models to optimize media buys for TV and digital channels. Previously, she had served as data analytics director at UnitedHealth Group, and had worked in advanced analytics functions for marketing and sales at Schering-Plough (now Merck). She had also been a computational biology and bioinformatics consultant for GSK, mining R&D high-throughput data from pre-clinical and clinical settings to understand drug treatment effects. Her rich and diverse set of experience and expertise have brought deep appreciation of the analytics methodology and technology advancements across industries, and afforded her wholistic understanding of the opportunities and challenges facing the healthcare industry.

Dr. Zhao holds a PhD in Immunology from the University of Pennsylvania School of Medicine and an MS in Engineering in Computer and Information Science from the University of Pennsylvania School of Engineering. She also holds a postgraduate Marketing Certificate from the Wharton School. She presents at industry conferences regularly and serves as a panelist on thought leadership discussions.