Applications of Generative AI and Large Language Models (LLMs) in Pharma Sales & Marketing

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About The Presenter

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Ayush Mundhra is a Regional Client Director at CustomerInsights.AI. He is a seasoned commercial strategy and analytics leader with **11+ years** of consulting experience in the life sciences sector. He specializes in advising pharmaceutical companies on various commercial matters, prioritizing client relationships, and team development. He holds an MBA from The Wharton School.

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Agenda

Introduction to Generative AI and Large Language Models

Generative AI Applications in the Pharma Industry

Application 1 – Competitive Intelligence

Application 2 – Field Assistance

Outcomes

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Introduction to Generative AI and Large Language Models

Generative Artificial Intelligence (AI) refers to a subset of AI that focuses on the creation of data, content, or even entire narratives. It can generate text, images, and other types of content autonomously.

Large Language Models are a class of Generative AI models. They are designed to understand and generate human-like text based on the input data. These models are trained on vast amounts of text data and can generate coherent and contextually relevant content.

Key Characteristics:

1 Creativity

Generative AI can produce content that appears creative and human-like.

2 Adaptability

It can adapt to different input data and generate contextually relevant responses.

3 Applications

These models find applications in content generation, chatbots, language translation, and more.

Benefits	Challenges
Efficiency: It can automate tasks that would otherwise be time-consuming.	**Bias:** Generative AI models can inadvertently reproduce biases present in the training data.
Scalability: Generative AI can produce large volumes of content quickly.	**Ethical Considerations:** AI use in content generation sparks authenticity-related ethical queries.
Consistency: It maintains a consistent tone and style when generating content.	**Security Risks:** Misuse of Generative AI can result in deceptive content, posing threats like misinformation, cyberattacks, and privacy breaches.

Applications of Generative AI in Pharma Marketing

Coordinated effort in pharmaceutical commercialization
Multiple teams collaborate for effective marketing, sales, and distribution while ensuring safety and efficacy.

Leveraging generative AI for innovation
GPT models help pharmaceutical companies innovate, enhance efficiency, and stand out from competitors across various functions, including marketing, sales, market access, medical affairs, regulatory compliance, and supply chain management.

Marketing Materials
- Generative AI can craft tailored promotional content - videos, graphics, and social media posts in line with campaign objectives and audience.
- It upholds content compliance with policies, ensuring accuracy and balance.

Brand Identity and Communication
- Generative AI models provide ideas for branding and messaging by leveraging customer insights and data.
- These AI models generate multiple taglines, slogans, and messaging alternatives.

Scientific conferences and symposiums
- Generative AI has the capability to generate scientific information and produce suggestions for event topics and content.
- Generative AI models can also create talking points and presentations for speakers.

Market research
- Generative AI can extract trends and insights from online sources, aiding in understanding patient and physician sentiments.
- Additionally, it facilitates competitor analysis to enhance pharmaceutical companies' market competitiveness.

Digital Marketing Effectiveness
- Generative AI models can analyze customer information and gain insights into preferences, behavior and demographics.
- It can also generate optimization algorithms to improve digital marketing campaigns and Search Engines.

Pharmaceutical Marketing Team - Application of Generative AI

1 2 3 4 5

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Applications of Generative AI in Pharma Sales

Generative AI tools have the potential to help pharmaceutical sales representatives enhance their comprehension of customer requirements and preferences, refine sales approaches, and create a favorable distinction from competitors.

Sales Copywriting Automation:
Utilizing generative AI, one can produce compelling and captivating sales materials, including sales presentations and emails. This technology enables the customization of messages to suit individual customers based on their unique profiles.

Next-best Action and Call Plans:
Generative AI can assist sales representatives by creating tailored strategies for each customer based on their specific journey and suggesting the most fitting and captivating approaches.

Customer Segmentation and Targeting:
Through the examination of customer data, generative AI can discern patterns, categorize customers according to their behaviors and habits, and generate a list of pertinent influencers who were previously outside the target scope.

Pharma Sales Education and Simulations:
Utilizing generative AI, sales teams can access tailored sales scenarios and virtual training environments, leading to an improvement in their sales techniques, ability to handle objections, and product knowledge through engaging interactive simulations

Sales Effectiveness:
Generative AI models can assist in the analysis of sales data, offering insights into performance metrics such as script rates, script drivers, and physician conversion rates, and then offer recommendations for enhancing overall performance

Introduction to Competitive Intelligence and Field Assistance

The pharmaceutical industry is increasingly adopting cutting-edge technologies to enhance various aspects such as data analysis, customer engagement, and the distribution of information. One growing technology with a multitude of applications in this field is Generative AI and Large Language Models (LLMs).

Competitive Intelligence

- Utilizes Generative AI to gather and analyse real-time social media posts about drugs.
- Provides pharmaceutical companies with valuable customer insights.
- Real-time data acquisition.
- Assess brand perceptions.
- Identifies areas of improvement.
- Advanced Sentiment Analysis.
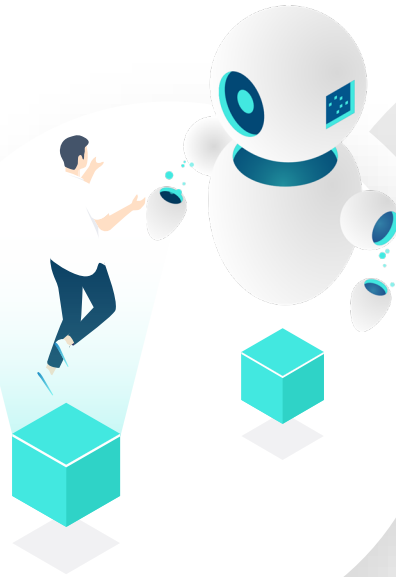
Field Assistance

- Solution for pharmaceutical Field teams, employing Natural Language Understanding and Open-Source LLMs to provide up-to-date information, guidance, and support.
- Provides real-time updates to the field teams.
- Insights into optimal frequency of visits and engagement strategies.
- Personalized customer engagement strategies.

Solution Overview for Competitive Intelligence Application

1 Source Identification
Identification of various sources for opinions, user reviews, side-effects for a given drug.

2 Data Landing Zone
Data extraction from WWW, identified sources using scraping tools and Python and ingesting to cloud.

3 Data Transformation
Textual data undergoes preprocessing through the elimination of stop words, punctuations and specialized characters.

4 Data Repositories
Data quality checks. Policies, practices and procedures to maintain data.

5 Analysis and Visualization
Use Gen AI and in-house models for Contextual Analysis and visualize results on ciPARTHENON.

Scheduled Triggers

Trigger 1
Keywords – Brand name

Trigger 2
Guided prompts to Gen AI

Data acquisition

Python
Web Data

II. Gen AI
Generated Data

Cloud Services

Security Layer

- Data/ Response Cleaning
- Data/ Response Standardization
- Quality Checks

- Text Attribution – Patient/ Physician/ Article
- Sentiment Analysis
- Zero-shot Classification – themes of conversations; patient/ physician conversations

ciPARTHENON

User Interface
KPIs

Data Refresh
Weekly Refresh

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Key Components of Competitive Intelligence

Competitive Intelligence, driven by Generative AI and various Open-Source algorithms, gathers near real-time social and non-social media posts, texts, and comments to analyze the following:

General Sentiment Analysis	Advanced sentiments analyses in patient reviews, physician posts, news, and articles to help pharmaceutical companies gauge public perception and improve healthcare-related information.
Top themes of Conversations	Extraction of keywords from social media posts by patients, physicians, caregivers and medical experts. This analysis informs us about patient experiences, treatment effectiveness, healthcare trends and concerns.
Physician treatment goals	Analyse physician conversations and identify goals for the treatment, which encompass personalized objectives such as disease control for effective symptom relief, cost reduction, and enhanced patient satisfaction.
Regional spread of social media influencers	Identifies influential figures on social media through hashtag analysis, Google searches for relevant blogs, and exploration of various platforms, enhancing the potential for successful product promotion and sales by connecting with genuinely engaging influencers.

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Use Case at One of Our Mid-Size Pharma Clients

I. Brand Analysis Across Web:
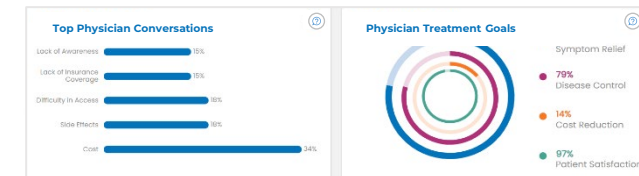Analysis of social and non-social media activity regarding drug and brand sentiments
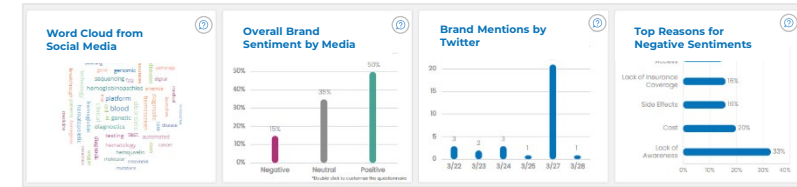
II. Identify Brand Influencers:
Identification of top brand influencers in each state, along with their primary specialty information.
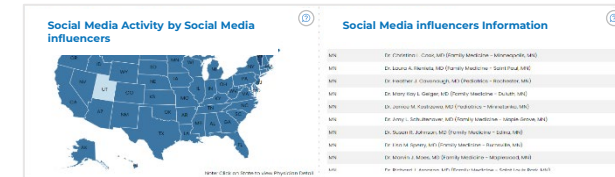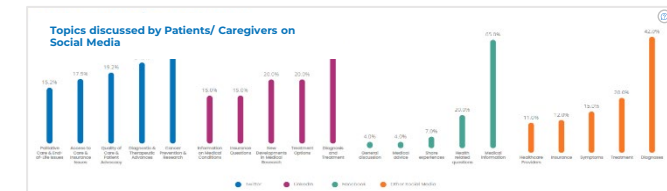

III. Physician Conversations:
Extracted and summarized the physician conversations into top themes, their corresponding treatment goals

IV. Patient Conversations:
Analyzed social and non-social media activity regarding drug and brand sentiment analysis.

V. Patient Emotions:
Extracted and displayed positive and negative statements made by patients in internet forums or social media platforms.

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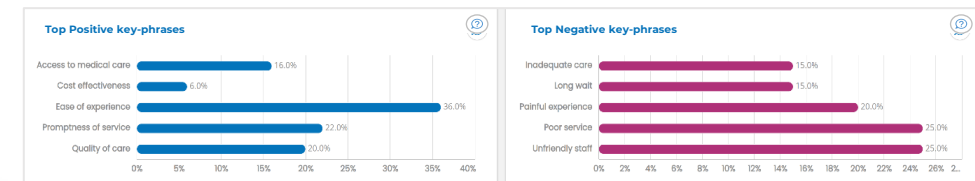
Solution Overview for Field Assistance Application

Using Generative AI tools like ChatGPT raises privacy and security concerns due to data collection and processing of confidential data. We've developed in-house Large Language Models (LLMs) to ensure safety of sensitive data.

We also improved user interaction with a natural language interface and summarized code outputs for informative responses using our LLMs.

Here is the step-by-step approach we followed to conceptualize Field Assistance

Your question is captured

We then extract SQL query from ChatGPT

Publish output to in-house secured trained LLMs

We publish natural language to ChatGPT SQL translate sub-model

..run it on internal data

And eventually extract answer to your question from in-house secured LLMs

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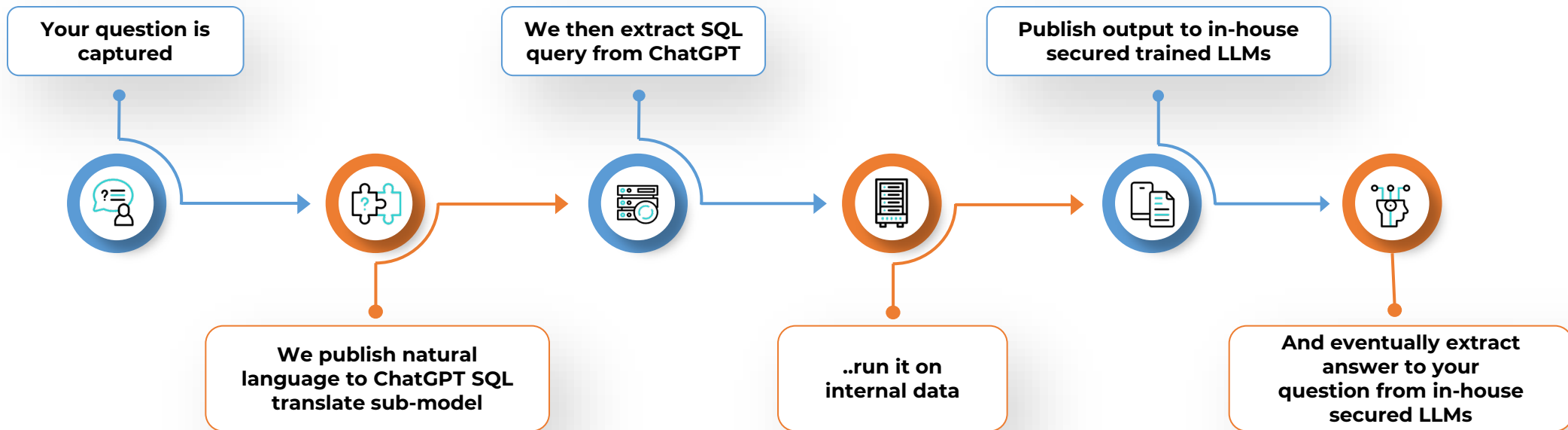
How Did We Train Our Models?

1 Fine-tuning ChatGPT models to generate SQL queries

Data Feeding
Input extensive pharma data, including tables, schema, and guidelines, into ChatGPT to fine-tune it.

Optimized Queries
Use this data to generate optimized SQL queries for improved performance.

Testing
Thoroughly test the model with a variety of natural language questions to ensure its effectiveness and accuracy.

2 Development of internal LLM's to generate natural language summaries

Generate Training Data
Create synthetic training data by prompting ChatGPT and fine-tuning it with HCP call guidance data, including HCP demographics, specialties, sales data, and follow-up actions.

Model Selection
Choose the "T5ForConditionalGeneration" model, a variant of Google's T5 model, designed for conditional text generation tasks.

Model Fine-Tuning
During fine-tuning, provide paired examples of input table rows in text format and their corresponding summaries. This process helped the model learn the mapping between input context and output text.

Model Validation
Ensure the fine-tuned model can generate summaries when given tables as input.

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Use case: We Deployed Field Assistance at One of Our Big-Pharma Clients in the Space of Oncology

Here is the conversation between medical representative who is assigned to Division – New York, Region – East and Territory – Brooklyn East and **Field Assistance** (prior to HCP visit) looked like below.

USER

Summarize the sales performance in my region this quarter.

What has been the reach of Tier 1 HCPs in my Territory this quarter, and how does that compare against the Divisional average?

Who are the bottom 5 Tier-1 HCPs, based on sales, in my Territory that I have not reached out to yet?

Among all the Tier-1 HCPs in my Territory that were reached the last quarter, give me the top 5 HCPs that had an E-mail follow-up.

Based on sales in this quarter, what is the rank of my Territory nationally?

FIELD ASSISTANCE

The total sales in your region this quarter has been 108,119, while your Division constituted **12%** of that.

Tier-1 HCP reach in your Territory this quarter has been **85%** in comparison to the Divisional average of **91%** for the same time period.

Alexis Tchaconas, Yanina Kravets, Alexa Cruz, Jason Caione and Guadalupe Jimenez are the bottom 5 HCPs in the East region with highest sales.

Gabriella Smith, Nicolas Hernandez, Meredith Long, Anusha Jillella and Chelsea Alvarez are the top 5 HCPs in Brooklyn that have an E-mail follow-up.

Brooklyn is ranked **13th** among the total 105 Territories nationally.
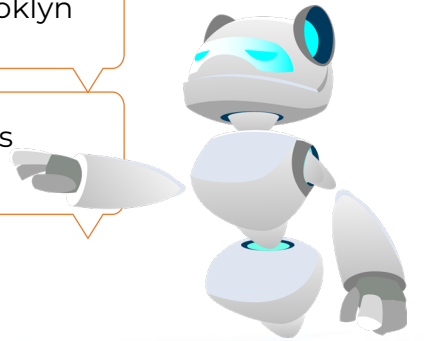
THANK YOU

For any questions, contact **Ayush Mundhra**.

E-mail: ayush.mundhra@customerinsights.ai
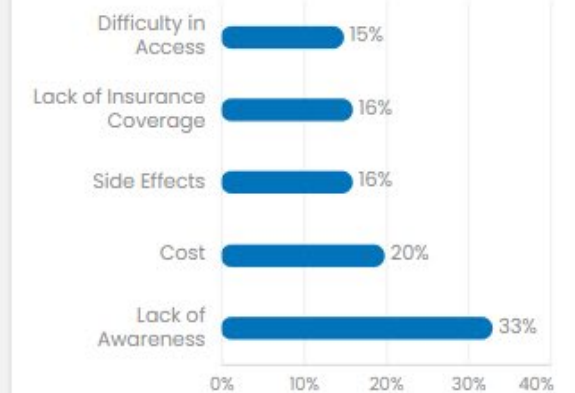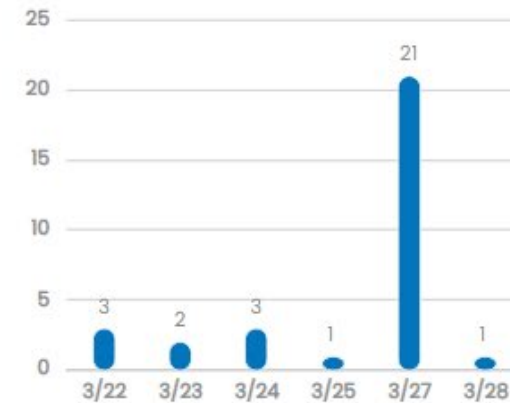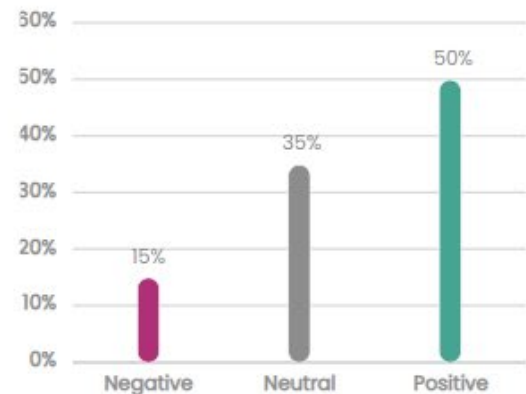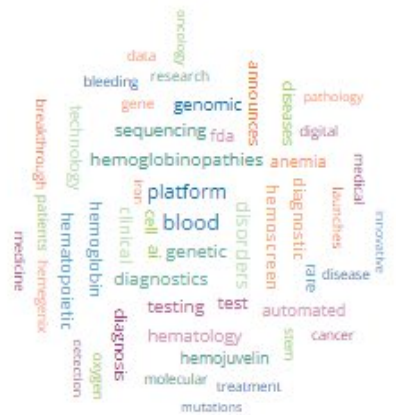**Phone:** +1-224-999-3558

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APPENDIX

Is there value in leveraging Generative AI over traditional methods (Python) for deriving competitive intelligence from the social space

Differences between Python and Generative AI implementation		
Factors	**Python**	**Generative AI**
Introduction	Python is a programming language that enables users to write their own code to solve problems and build applications.	Generative AI technologies like ChatGPT/ Bard AI/ Bing AI generate natural conversations between people and bots.
Automated Data Extraction	1. No – As websites content/structure constantly changes 2. API connectors – Needs API to extract data from specific sources like Twitter 3. Requires code for each source separately	1. Yes - Automated process that scrapes data from online sources such as websites and social media networks. 2. No API is needed to extract data from web 3. Less customizable than Python
Programming Knowledge	Requires programming knowledge	Does not require programming knowledge
Time taken to scrape data	Slow	Faster than Python
Data Volume	Can struggle with large data	Better at handling large volumes of data
Access to Websites	Can be blocked if it is not used responsibly	Less likely to be blocked by the websites

Use Case at One of Our Mid-Size Pharma Clients: Brand Sentiment Analysis across Web (1/5)

Brand analysis across web

➢ We analyzed social and non-social media activity regarding drug and brand sentiments. Given the expensive drug treating the rare disease, our analysis indicated that patient reviews mention "lack of awareness" and "cost/lack of insurance coverage" which expresses their negative emotions about the treatment being highly expensive.

Word Cloud from Social Media

Overall Brand Sentiment by Media

Brand Mentions by Twitter

**Top Reasons for Negative Sentiments**

Use Case at One of Our Mid-Size Pharma Clients: Identification of Brand Influencers along with the Demographic Details (2/5)

Identifying brand influencers

➢ The figure below shows the activity of brand influencers at the state level within the United States. The geographical heat map indicates that the brand has reached all the states. The Competitive Intelligence study also identified top brand influencers in each state, along with their primary specialty information.

Social Media Activity by Social Media influencers
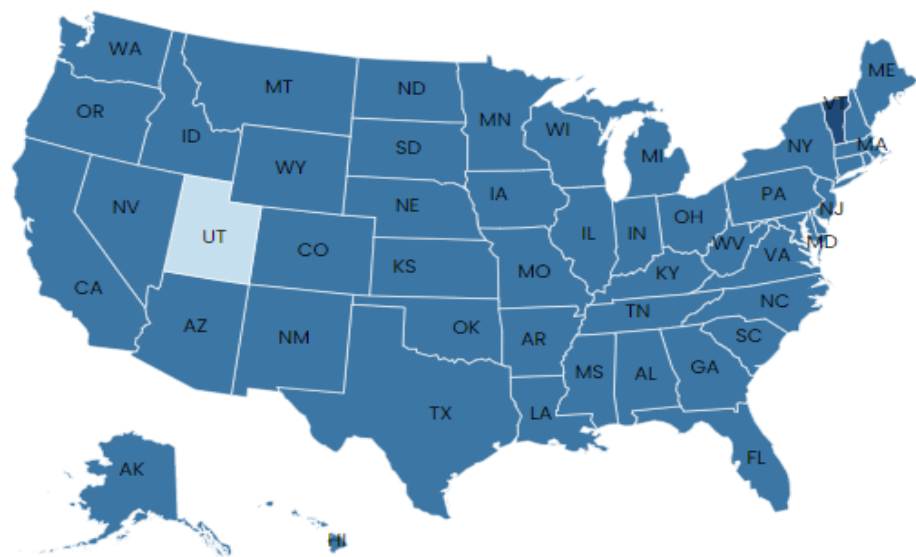
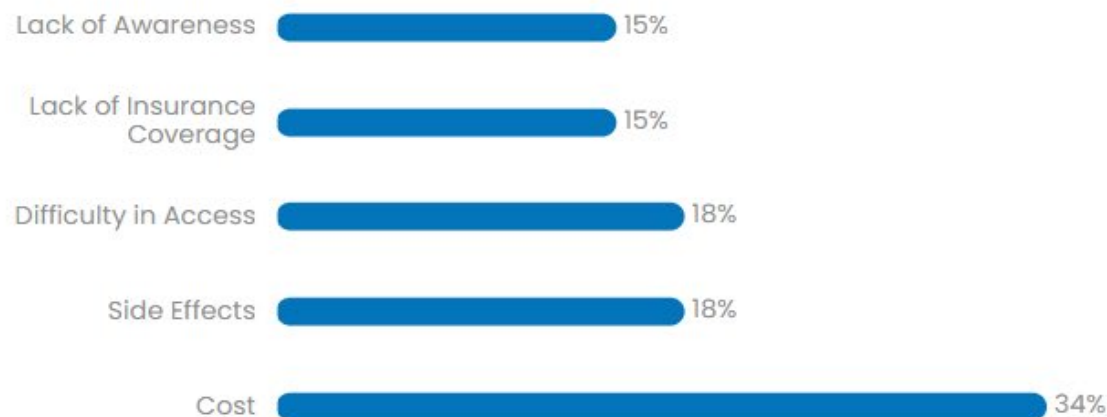Note: Click on State to view Physician Detail

Social Media influencers Information

State	Social Media Influencers
MN	Dr. Christina L. Cook, MD (Family Medicine – Minneapolis, MN)
MN	Dr. Laura A. Rieniets, MD (Family Medicine – Saint Paul, MN)
MN	Dr. Heather J. Cavanaugh, MD (Pediatrics – Rochester, MN)
MN	Dr. Mary Kay L. Geiger, MD (Family Medicine – Duluth, MN)
MN	Dr. Janice M. Kostrzewa, MD (Pediatrics – Minnetonka, MN)
MN	Dr. Amy L. Schultenover, MD (Family Medicine – Maple Grove, MN)
MN	Dr. Susan R. Johnson, MD (Family Medicine – Edina, MN)
MN	Dr. Lisa M. Sperry, MD (Family Medicine – Burnsville, MN)
MN	Dr. Marvin J. Moes, MD (Family Medicine – Maplewood, MN)
MN	Dr. Richard J. Aronson, MD (Family Medicine – Saint Louis Park, MN)

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Use Case at One of Our Mid-Size Pharma Clients: Scraping Physician Conversations and Understanding Their Treatment Goals (3/5)
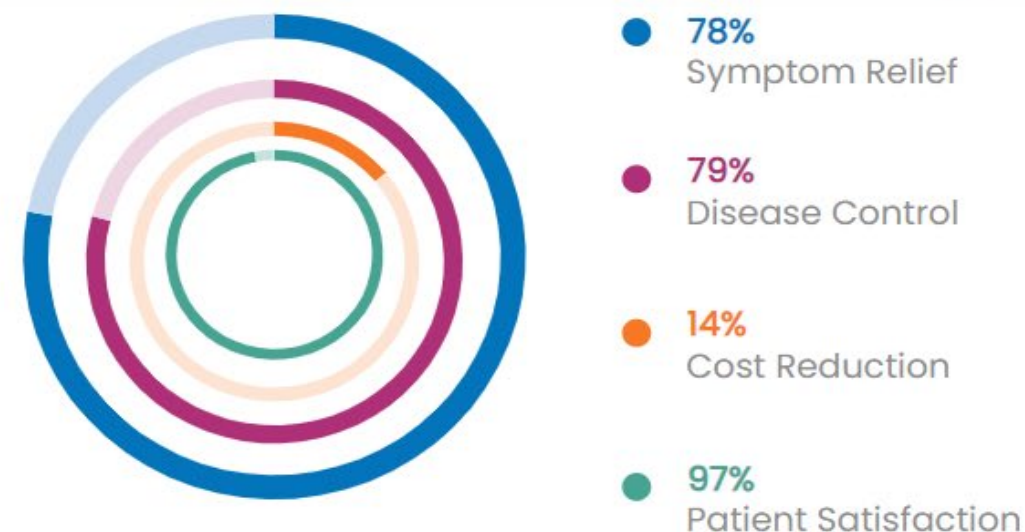
Physician Conversations

➢ The study included extraction of the physician conversations and summarizing them into top themes, their corresponding treatment goals, which indicated that most conversations revolve around the cost of treatment, followed by side effects and lack of insurance coverage (indicative of cost).

Top Physician Conversations

Lack of Awareness	15%
Lack of Insurance Coverage	15%
Difficulty in Access	18%
Side Effects	18%
Cost	34%

Physician Treatment Goals

- **78%** Symptom Relief
- **79%** Disease Control
- **14%** Cost Reduction
- **97%** Patient Satisfaction

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Use Case at One of Our Mid-Size Pharma Clients: Analysis of Conversations by Patients and Caregivers on Social Media (4/5)

Patient Conversations

➢ The figure below depicts an analysis of social and non-social media activity regarding drug and brand sentiment analysis. Given that it is a rare disease and the most expensive treatment, our analysis indicated that patient reviews mention "lack of awareness" and "cost/lack of insurance coverage" which expresses their negative emotions about the treatment being the most expensive.

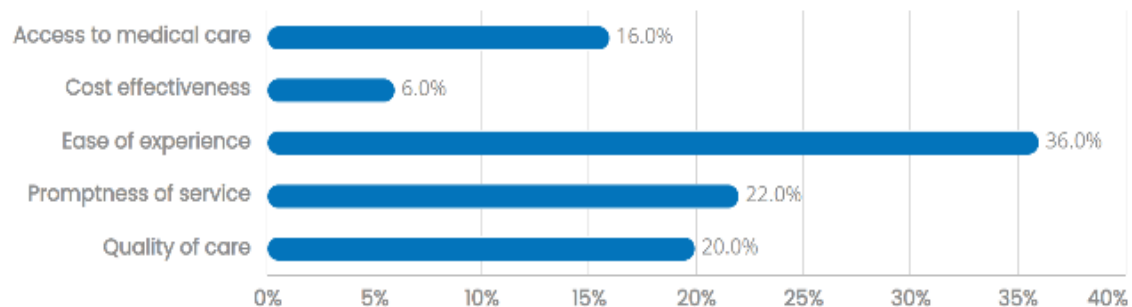Topics discussed by Patients/ Caregivers on Social Media

Use Case at One of Our Mid-Size Pharma Clients: Concluded by Dissection of Patient Topics between Positive and Negative Sentiment Buckets (5/5)

Patient Emotions

➢ The Competitive Intelligence extracted and displayed positive and negative statements made by patients in internet forums or social media platforms. All positive and negative reviews were analyzed and categorized into different topics, which helped decision makers comprehend patient feedback and concerns.

➢ The analysis below clearly indicates that positive feedback is primarily due to the drugs ease of use, while most negative feedback is related to treatment costs.

Top Positive key-phrases

Access to medical care	16.0%
Cost effectiveness	6.0%
Ease of experience	36.0%
Promptness of service	22.0%
Quality of care	20.0%

Top Negative key-phrases

Inadequate care	15.0%
Long wait	15.0%
Painful experience	20.0%
Poor service	25.0%
Unfriendly staff	25.0%

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