



Case Study: Healthcare

Improving Patient Insights, Care through AI Data Analytics

Genetics are not the sole determinant of someone's overall health. In the healthcare industry, social determinants of health – economic stability, education, healthcare system, physical environment and more – have been found to be important factors in addressing the holistic healthcare needs and outcomes of patients.

Cognizant has developed an artificial intelligence (AI) and machine learning (ML) solution for a major healthcare provider that identifies and analyzes which social determinants of health (SDH) factors have a significant impact on a patient's health by mining the unstructured data found in physician notes.

In 2018, a large healthcare provider went looking for a resource with expertise in natural language processing (NLP) that could mine physician notes to identify SDH. The goal was to create a cohesive, complete patient health history – and better service their needs with the right regular and

At a glance

A major healthcare provider needed to establish interoperability across EMR systems to create a cohesive, holistic patient health history. They used AI and ML to ascertain whether SDH factors had a significant impact on patients' health outcomes.

Outcomes

- Identified 11% of encounters, via the NLP model, with homelessness and food insecurity-related social determinants.
- Identified 34% of additional encounters that lacked Z codes by text mining.
- Analyzed 900,000 patient records for patient insights.
- Improved quality of care and health outcomes.
- Reduced cost of care.

localized care – by establishing interoperability across thousands of healthcare provider electronic medical records (EMR) systems.

The healthcare organization selected us to implement this NLP-based solution based on our experience building similar solutions for other clients in the same industry as well as a successful pilot.

Text mining patient records creates insights

This project involved implementing NLP models for four key categories – economic stability, education, healthcare system and physical environment – to identify patients having SDH-related issues using physician notes.

We implemented an algorithm to mine the physician notes, analyzing 900,000 records from approximately 200,000 patients. These anonymized records comprised physician notes taken at the visits, or encounters, for each patient. They included multiple notes from the same visit, such as operative, clinical, post-operative and discharge notes.

Before implementing the solution, the healthcare provider extracted this information via diagnostic Z codes, which are subsets of the International Statistical Classification of Diseases (ICD-10) codes that physicians and other U.S. healthcare providers use to classify diseases, diagnoses, symptoms and procedures. Certain Z codes are indicators for SDH

factors (e.g., homelessness). But it's not mandatory for doctors to mention these particular Z codes as the diagnostic ICD-10 codes take priority over any claim. So oftentimes, those important Z codes would be missing. As a result, the hospital was only able to effectively track approximately 1-2% percent of patients.

The algorithm that we implemented read the notes to discover this information. After implementing the solution, there was an increase in the number of encounters that the healthcare provider was able to detect. For instance, we identified 34% additional encounters that lacked Z codes. We also found that around 17% mentioned issues like homelessness, which falls under the economic stability SDH category. While approximately 10% mentioned that they had some financial issues including lacking a job, being fired or having issues with their rent. This information would ultimately help the healthcare provider strengthen the SDH identification process to better understand patient needs to improve care.

A collaboration generates highly accurate predictions

This collaborative effort involved working with the client's clinical subject matter experts (SMEs) to build the text mining engine to predict the SDH based on the notes. We validated our predictions by giving the SMEs different samples, asking them to make predictions from the model, and then verified whether or not those predictions were correct.

The team created seven models related to the following:

1. Homelessness and finances
2. Education and literacy
3. Physical environment
4. Behavioral health
5. Social support
6. Healthcare
7. Caregivers

All of the models were approximately 85–88% accurate, except for the Caregiver model, which was around 77% accurate. The team quickly determined the reason for the lower ratings: the model was not picking up if it was the patient or caregiver speaking to the physician about issues related to caregiver stress. The team then added rules to the engine to track phrases related to caregiver stress as well as the caregiver's relationship to the patient (parent, child, sibling, etc.) to increase the accuracy of the Caregiver model.

Targeting patients for outreach with a 360° view

We built a text mining engine that would efficiently analyze physician notes to extract not just specific

words and relevant information, but also to find meaningful insights and context. For example, the model could provide contextual information – using specific tagging for pronouns, verbs or other parts of speech – about who is speaking to the physician. It could also identify people potentially abusing multiple ER visits to then redirect them to appropriate organizations and local resources instead. And it could target people in need of care for a particular disease and point them to specific outreach programs.

The NLP models, validated by the healthcare provider SMEs, continue to churn out results on a regular basis. The organization now has 360° views of patients in the EMR systems that include more and better SDH details. Using these continuously refined models, the healthcare provider will strengthen the SDH identification process to better understand patient needs, improve patient care decision-making capabilities, enhance patient services and resources locally and increase quality of care.

The key result is that by supporting patients with proper care in their local communities, their overall health and illnesses are more closely monitored and controlled. This has resulted in fewer acute medical issues requiring emergency room visits and actually lowered healthcare costs overall.

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About Cognizant Healthcare

Cognizant's Healthcare Business Unit works with healthcare organizations to provide collaborative, innovative solutions that address the industry's most pressing IT and business challenges – from rethinking new business models, to optimizing operations and enabling technology innovation. A global leader in healthcare, our industry-specific services and solutions support leading payers, providers and pharmacy benefit managers worldwide. For more information, visit www.cognizant.com/healthcare.

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As part of Cognizant Digital Business, Cognizant's Artificial Intelligence Practice provides advanced data collection and management expertise, as well as artificial intelligence and analytics capabilities that help clients create highly-personalized digital experiences, products and services at every touchpoint of the customer journey. Our AI solutions glean insights from data to inform decision-making, improve operations efficiencies and reduce costs. We apply Evolutionary AI, Conversational AI and decision support solutions built on machine learning, deep learning and advanced analytics techniques to help our clients optimize their business/IT strategy, identify new growth areas and outperform the competition. To learn more, visit us at cognizant.com/ai.

About Cognizant

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