

Natural language processing: A catalyst driving revenue cycle transformation



Natural language processing is delivering on the promise of artificial intelligence in health care. It is playing a fundamental role in transforming health care operations by unlocking massive amounts of unstructured data contained in medical records and making it accessible for vital clinical and administrative functions within a medical facility. Nowhere is this more evident today than in the hospital revenue cycle.

Mining clinical documentation with AI

Artificial intelligence (AI) is increasingly being adopted across the health care industry. In a recent survey of 500 U.S. health care leaders, 94 percent responded that their organizations continue to invest in and make progress in implementing artificial intelligence.¹ Natural language processing (NLP) is leading the way by delivering significant value, particularly in the area of clinical documentation.

Only about 20 percent of the information in an electronic medical record (EMR) is structured clinical data.² The remainder is clinical documentation, which is unstructured information. Clinical documentation provides the fuel by which health care organizations drive their revenue-related operations and demonstrate quality of care. Without tools such as NLP and machine learning, health care organizations are potentially leaving the value of 80 percent of the record untapped. Drilling deeper into clinical documentation to get a fuller picture of a patient's health can have a far-reaching operational impact in areas such as care coordination, quality reporting, revenue cycle and more. This is especially important as health care shifts from fee-for-service to value-based models.

NLP comes to the forefront

Natural language processing is a form of artificial intelligence that uses computer algorithms to identify key elements in everyday language and extract meaning from unstructured data. It also leverages computational linguistics and other machine-learning disciplines.

Health care applications require an NLP engine with built-in clinical intelligence that can recognize the precise clinical details within the medical record — along with context, syntax and multiple semantic attributes. With these capabilities, NLP captures the entire encounter — providing rich, actionable data that can be leveraged in a variety of use cases such as clinical documentation improvement (CDI), computer-assisted coding (CAC), medical necessity determination and other applications dealing with unstructured patient data.

NLP can be an essential technology driving health care transformation. When combined with clinical models and rules engines, it can capture and understand the context and meaning implicit in medical records and, at scale, review millions of clinical documents daily. NLP helps everyone involved in the revenue cycle by processing enormous amounts of information with a high level of precision to help them work smarter and better utilize their talents.

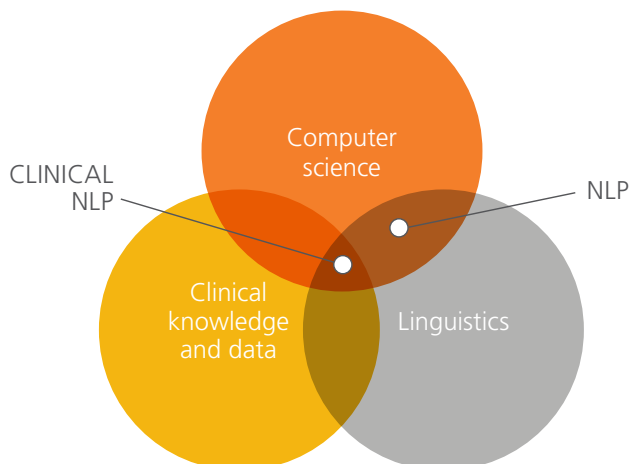
Five things to look for in an NLP engine

Applying NLP to clinical documentation requires a specific set of capabilities that differ from the needs of other industries. To take advantage of the full potential of NLP in health care, executives need to seek out solutions with the following attributes:

1. Clinical intelligence

The unique complexities of health care require a comprehensive approach that goes far beyond common parsing and medical term matching. The technology needs to intelligently integrate linguistic analysis with a vast knowledge of medical facts. Deriving context and meaning, as well as driving action, requires tremendous expertise to effectively interpret information, recognize relationships between conditions and treatments, and demonstrate understanding of clinical scenarios.

According to Jennifer Bresnick, HealthIT Analytics, **“NLP has nearly limitless potential to turn electronic health records from burden to boon. The key to success will be to develop algorithms that are accurate, intelligent and health care specific.”**⁴ An NLP engine that is not clinically aware performs only a shallow capture of medical terms and yields only minimal inferences and actions. NLP with clinical intelligence captures and understands the context and meaning implicit in the medical record and can analyze records longitudinally.



Improving the patient and provider experience with NLP

Today’s health care consumers expect the same level of service from their medical provider that they experience in other industries. This rise in consumerism extends to the back-end of the revenue cycle — especially with consumer-directed health care plans shifting much of the financial responsibility to the patient. By ensuring that encounters are documented and coded correctly the first time, NLP can improve the accuracy of patient financial data, which leads to timely, accurate billing. **The result: greater patient satisfaction.**

NLP can also play an important role in improving the provider experience. Studies have shown that physicians are frustrated by the additional work introduced by new technologies such as the electronic medical record. A recent survey by the New England Journal of Medicine found that **83 percent of clinicians, clinical leaders and health care executives view physician burnout as a problem at their organizations.**³

Improving clinician satisfaction by removing administrative burdens is a goal in most health care settings. A clinically aware NLP engine can improve the provider experience by delivering the supplemental intelligence needed to help satisfy complex documentation and coding requirements.

2. Agility

The NLP engine that you select should have an expansive architecture designed to support multiple applications and scale across the enterprise. Also, it should not be limited to a specific EMR system or any particular type of clinical documentation, and it should work across all care settings and medical specialties. **Your clinicians should not have to change the way they create their documentation to accommodate the system. Instead, the system should adjust to their needs.**

Another critical requirement is that the NLP engine should have the ability to work across the health system and integrate with key functions such as CDI, CAC, case management, utilization review, quality measures reporting and patient safety — providing consistency in performance across applications. Finally, the NLP engine must be agile enough to adapt to future use cases.

3. Cloud-based national engine

Maintaining and improving an NLP engine's performance is critical to long-term success. Some solutions in the marketplace deliver application- or site-specific systems that rely on medical dictionary matching, site-maintained pattern matching or localized machine learning. For revenue cycle applications like CDI and CAC, this can require significant organization-specific tuning and extensive programming every time rules change.

The better alternative is a cloud-based approach that benefits all users through cumulative technology improvement. In this scenario, every organization using the NLP-powered solution contributes to the engine's capability through continuous feedback that drives learning. This results in a significantly more robust repository of clinical knowledge and increasingly accurate performance. Changes in regulations, guidelines and compliance requirements are updated centrally through the cloud, eliminating the need to replace local dictionaries, pattern libraries or statistical models.

4. Proven return on investment (ROI)

While many vendors make bold claims about AI, innovation for the sake of innovation is not enough. What's needed is AI with an ROI. **The right NLP from the right partner applied to the right application can materially increase operational efficiencies, save administrative costs and improve revenue integrity.**

Whether it's documentation integrity, coding, quality reporting, care management or other essential applications, insight gleaned from data augmented by NLP provides new ways for organizations to respond quickly and with material impact on care quality and costs. Ask potential partners to demonstrate precisely how their NLP-enhanced applications have delivered measurable value and maximized ROI for their current customers.

5. Ongoing technological innovation

Your NLP technology should be able to adapt to new applications as well as take advantage of ongoing technological breakthroughs. The company that provides your NLP should be fully committed to continuously investing in the technology. To determine this, you should ask the following questions:

- Do they own the technology, or are they licensing it from a third party?
- Do they have a track record of innovation?
- Do they have NLP-related patents?
- Are they regularly introducing new NLP-driven applications and capabilities?

In short, you need a partner that has the proven expertise to deliver NLP solutions that are right for today, yet ready for tomorrow.



A cloud-based approach benefits all users through cumulative technology improvement.

Improving performance with NLP

The spectrum of available capabilities illustrates that not all NLP-driven applications are created equal. The most effective technology combines NLP with clinical intelligence, workflow automation and flexible reporting to deliver forward-facing capabilities that can demonstrate both financial and operational results.

Integrated solutions powered by a robust, clinically aware NLP engine will deliver benefits across the organization while improving accuracy, consistency and interdepartmental communication. Let's take a closer look at areas where NLP is delivering transformation today.

Clinical documentation improvement

Appropriate coding relies on proper clinical documentation. That's why it's critical to capture complete and accurate clinical documentation up front to prevent disruption in downstream workflow. While coding looks at what the physician said, clinical documentation improvement programs look at what the physician did not say. CDI identifies cases that appear to lack certain elements of documentation. This can be a daunting task. Traditional, manual CDI programs only have the resources to review a sampling of cases, and these limited reviews are often retrospective and don't always uncover improvement opportunities.

A clinically aware NLP extends the reach of CDI programs to all cases and helps pinpoint deficiencies at the point of care. This concurrent review means that issues can be addressed then and there, rather than days or weeks after discharge. More advanced systems prioritize cases by looking at clinical evidence and comparing it to the definitive diagnoses to identify gaps in documentation right away. As a result, the clinical documentation is more likely to accurately reflect the acuity of patient conditions and the course of care during the patient stay.



Benefits and results: The intelligent automation of CDI through NLP supports complete, timely and accurate documentation, quality reporting, precise coding and appropriate revenue capture. Among the results facilities have reported are a dramatic increase in the number of cases reviewed by CDI specialists, an improved physician query response rate and a more appropriate reflection of patient acuity.

Computer-assisted coding

NLP-powered CAC systems are in use at thousands of health care facilities across the country for hospital coding. NLP is the enabling technology that automatically reads and understands immense volumes of clinical documentation to identify diagnoses, procedures and supporting facts, and recommend appropriate codes. With its high degree of accuracy, a CAC program driven by clinically intelligent NLP presents coders with diagnosis and procedure codes that are more complete and more correct.

NLP is being applied to professional coding as well. The trend toward hospital-managed physician groups has shifted much of the responsibility for professional-fee coding and billing to the health care organization. Not surprisingly, NLP-driven CAC applications are being used in greater frequency for professional coding by medical centers, physician groups and billing companies.

NLP is also helping manage a growing physician coding challenge faced by many institutions with the advent of the EMR. Many physicians are bypassing coders and selecting their own codes in the EMR system, which often leads to incomplete or inaccurate results. NLP is now being applied to compare physician-determined codes with NLP-assigned codes. When potential errors or misaligned codes are identified, they are flagged for coder review. This proactive, targeted approach improves coding accuracy, reduces risk and preserves revenue.



Benefits and results: NLP-driven CAC systems help efficiently capture appropriate revenue, reduce denials, accelerate reimbursement, boost compliance and increase accuracy.

Medical necessity determination

Insurance reimbursement for inpatient admission requires the provider's clinical justification based on clinical risk factors associated with the patient's diagnosis and current condition. Failure to adequately fulfill these requirements may result in payment denials and the loss of proper reimbursement.

Artificial intelligence is now being applied to improve the accuracy and efficiency of the medical necessity determination process. As a first step, machine learning is being used to identify the right cases for physician advisor review. With this innovation, systems use deep learning to score cases on the likelihood that inpatient admission may be deemed medically necessary. Physician advisors can then efficiently focus their reviews on cases identified as more likely to qualify for admission.

Since cases can be complicated and voluminous, NLP is applied to automate the patient documentation review process. NLP scans the case and identifies clinical risk factors, delivering them to the physician advisors so they can more quickly and accurately make patient status recommendations. NLP also presents relevant evidence-based medical research needed to defend an inpatient recommendation if denied by a payer.



Benefits and results: Machine learning and NLP are replacing the slow and error-prone manual record review required in the past for determining medical necessity. The new AI-empowered process enhances efficiency and resource utilization, improves case review accuracy, provides greater outcome consistency, and results in more appropriate reimbursement.

Automating clinical validation with NLP and machine learning

According to the Centers for Medicare & Medicaid Services, **"Clinical validation is a clinical review of the case to see whether or not the patient truly possesses the conditions that were documented in the medical record."**⁵ With the expansion of public and private payer audits, and new risks of claim denials and fraud accusations, clinical validation is having a growing impact on CDI programs nationwide.

Clinical validation is the reverse of traditional CDI. **Instead of looking for gaps in the documentation, this process finds gaps in evidence.** This requires a different mindset. Accurately detecting the absence of key clinical evidence involves "an advanced skill requiring a strong understanding of clinical pathology"⁶ and can necessitate a painstaking review of the patient record.

NLP can assist CDI professionals with the challenging task of clinical review by applying artificial intelligence to access reasoning guided by clinical expertise and regulatory/payer policies. The results can either affirm or reject the coded condition by presenting appropriate corroborating or contradictory evidence.

Navigating the future

AI has a bright future in revenue cycle operations and across the health care industry. NLP-driven CDI and coding technology have demonstrated a proven ROI, and newer use cases — such as medical necessity determination and other utilization review applications — are now making their mark.

Bold approaches paired with AI technology are also sparking new thinking about today's information integrity and process complexity. McKinsey & Company has identified other high-potential NLP use cases that will reduce administrative costs and create medical value.

These include:



Prior authorization approval



Clinical decision support



Medical policy assessment⁷

In addition, industry sources list risk adjustment and hierarchical condition categories and clinical trial matching as other NLP use cases that will likely have an immediate impact.⁸

In the longer term, applying NLP to decision support and evidence-based medicine could help providers improve outcomes and save lives. According to Bresnick of Health IT Analytics, "Eventually, natural language processing tools may be able to bridge the gap between the unfathomable amount of data generated on a daily basis and the limited cognitive capacity of the human mind."⁴ Ultimately, AI technology will help health care continuously improve and adapt to change, while learning from clinicians and patients.

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Getting the most out of AI and NLP

How can your organization achieve its full potential when it comes to applying AI and NLP? Picking the right partner is an important first step. Look for a partner with:

- **Years of experience** applying AI to specific needs across the health system
- **A proven, clinically based** NLP engine
- **Expansive capabilities** that span multiple use cases and applications
- **Innovative ideas** for continued modernization of the entire revenue cycle

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