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Artificial intelligence technology holds the key to improving claims coding productivity, preparing for ICD-10

Increased demand for health care services, the growing complexity and cost of medical claims coding, and a shortage of experienced medical coding professionals already pose serious financial and compliance challenges to hospitals and physician practices. An October 2013 deadline to begin coding medical claims using the 155,000 item ICD-10 Index (a vast expansion from the 18,000-item ICD-9 Index) considerably heightens the potential to disrupt health care provider operations in the months and years to come.

Recent developments in artificial intelligence technology—particularly innovations to computer-assisted coding (CAC) applications—may provide a solution to these financial, compliance, and administrative productivity challenges. CAC applications automate many of the administrative tasks required to convert clinical documentation into medical bills by using Natural Language Processing (NLP) engines.

"NLP as a term does not identify a single technology, but rather is a set of different technologies and approaches that serve as the underpinning of CAC," said Mark Morsch, vice president of technology at OptumInsight™ (which until recently was known as Ingenix). "There are multiple technologies used for NLP in the CAC industry, ranging from simple tools that identify words and phrases to advanced artificial intelligence that enables the application to interpret meaning and context much like a person can. Here we are creating a nexus among medical coding, computer science, and linguistics," he said.

As hospitals and physician practices consider how CAC can support their medical claims coding efforts, it is important for them to better understand how differences in the underlying NLP methodologies may affect the speed, comprehensiveness, and accuracy of coding results.

Understanding various NLP methodologies

Generally speaking, there are four approaches to NLP: medical dictionary or terminology matching, pattern matching, symbolic rules, and use of statistical modeling.

Medical dictionary matching offers a simple approach to identifying medical terms within the clinical record, but cannot actually recommend potential code matches.

The **pattern matching methodology** identifies clusters of related words within clinical documentation and connects them to potential diagnoses or procedures. This approach is more advanced than medical dictionary matching, but does not interpret or apply coding rules to make recommendations. For example, pattern matching cannot recognize related symptoms or differentiate personal versus family histories.

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Symbolic rules offers a more sophisticated technique for analyzing medical language based upon parsing phrases and sentences. In this approach, linguistics experts construct symbolic rules based upon parts of speech and standard English syntax. A medical condition or procedure is recognized when one or more rules successfully match a portion of the clinical documentation. Symbolic rules support more advanced language recognition, but become very difficult to maintain for large code sets like ICD-9 and ICD-10.

The final approach, **statistical modeling**, takes the pattern matching methodology a step further by "training" the program to analyze documents that contain similar words or word-type distributions. The statistical algorithm then identifies patterns and connects them to their respective diagnoses or procedures. Although statistical modeling is more accurate, this approach suffers, though to a lesser extent from the same limitations of pattern matching.

In all four approaches, context, ambiguity, and special inferences affect how the NLP technology understands and applies language to analyze the medical record. For example, words leading up to and following the phrase "breast cancer" can drastically change how the words affect coding recommendations, Morsch explained. The chart may say "the patient has breast cancer," "the patient's mother had breast cancer," "the patient had breast cancer 20 years ago," or "no evidence of breast cancer," all phrases that have very different meanings. "Less-sophisticated NLP engines will be unable to make these critical distinctions," Morsch indicated.

Artificial intelligence improves results

Each of the most common methodologies underpinning NLP capabilities has its shortcomings, but the addition of artificial intelligence technologies can enable contextual interpretations that boost accuracy and speed. In doing so, Morsch says, "OptumInsight stands alone in this pioneering field."

Morsch points to LifeCode®, OptumInsight's NLP system that offers a hybrid approach between statistical modeling and symbolic rules. LifeCode automates the scanning and reading of clinical documentation, deciphers the meaning and context of words within medical records and recommends the appropriate codes. A reference to "breast cancer" is interpreted by LifeCode based upon the current clinical situation and medical history of the patient, which enables the technology to make an appropriate coding recommendation. "The recall and precision provided by this system offers hospitals and professionals a substantial advantage, because the more accurate the codes produced by CAC, the less work coders have to do to complete the coding," said Morsch.

Indeed, the LifeCode engine is so unique that a 2005 patent covers its underlying architecture, including methodology to assign meaning to information extracted from text and 'vector processing,' a mathematical model that allows the system to apply knowledge bases that build flexibility into the system.

A second patent, granted in 2011, covers 'mere-parsing,' which, Morsch says, "allows the LifeCode engine not only to identify and interpret words and phrases, but to actually understand more intricate English language expressions." This capability allows the system to find and recommend codes for detailed diagnoses that other systems often miss.

For example, the mere-parsing capability allows the LifeCode engine to associate other elements, such as an area of the body, with a condition, such as pain or inflammation. As the ICD-10 deadline approaches—which will involve coding to a vastly expanded and more precise index of diagnosis and procedures—this capability is becoming even more valuable.

"With ICD-10, coders need to get to a high level of granularity and the newly patented capability captures that for coders," according to Morsch. "The parsing also makes sure that negation—'no evidence of breast cancer'— is appropriately interpreted. Mere-parsing allows us to be very consistent."

OptumInsight's groundbreaking approach is yielding big results at Ohio Health, a network of eight not-for-profit hospitals and numerous health care organizations and physician practices. Diane Setty, corporate director of HIM at Ohio Health, says that she and her team were impressed by OptumInsight's expertise and technological capabilities when Ohio Health began its search for a CAC solution to support coding efforts. "OptumInsight was the only company we spoke with that could succinctly explain how their NLP engine operated and how it differed from the alternatives," Setty said.

Since implementing OptumInsight's CAC system, Ohio Health has seen diagnostic coder productivity increase 105.6 percent over the average productivity standard and emergency department coding productivity increase 60 percent since January—a 91.7 percent increase over the current average productivity standard—while maintaining high rates of accuracy and compliance. At the same time, Ohio Health realized more than $300,000 in annual cost savings in the coding department as the use of CAC allowed the re-allocation of six full-time coding positions.

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The health system also anticipates that using CAC technology will lead to an improvement of its case-mix index (CMI)—a key measurement for ensuring accurate Medicare and Medicaid reimbursement rates. Similar hospitals using OptumInsight's CAC solutions have improved their CMI by roughly 4 percent, which for Ohio Health would represent more than $10 million in additional revenue over six months.

Further, Ohio Health coders have provided positive feedback on the system. Support and engagement by these team members is important, because they will continue to play a critical role in the CAC process. They stand to benefit directly from the LifeCode system, which can trace and link codes back to the original clinical documentation and save them considerable time. Further, Morsch noted, LifeCode gauges the system's accuracy and provides reports on the percentage of recommended codes that coders are changing. "As this percentage decreases, coder confidence increases," he said.

As new operational challenges continue to emerge, hospitals and physician practices need to take full advantage of the range of benefits that CAC and artificial intelligence have to offer. "Health care providers can solve myriad problems by learning about and applying CAC/NLP approaches that will optimize their resources, minimize disruption, save time and money, and give their coding staff valuable tools that increase their productivity and accuracy," Morsch concluded. "OptumInsight understands what hospitals and physicians need, and we can provide the technology and expertise that will deliver results."

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