

# How Artificial Intelligence can reshape medical coding and optimize healthcare revenue cycle management

Medical coding is long overdue for a tech overhaul. Deep Learning with Large Language Models are the answer.

By Michael Brozino

While claims that the healthcare sector is constantly on the verge of collapse can be somewhat exaggerated, it does often feel like an industry under siege from multiple fronts.



From staff shortages, administrative burdens, ransomware attacks, rising costs, and workflow inefficiencies, healthcare organizations of all shapes and sizes are operating under heightened pressure and having to do more with less.

The recent rapid developments in deep learning with large language models have led to a massive uptick in the technology's use within workplaces across virtually every industry. Despite legitimate concerns and fears surrounding the nascent technology, a McKinsey survey revealed that 40% of respondents reported their organizations will increase their investment in AI due to recent advances in deep learning.

As deep learning is leveraged across industries by automating certain tasks everywhere from marketing and supply chain management to customer service and HR, its use in healthcare has been a bit more controversial.

Yes, AI is already being used in healthcare settings for both clinical and administrative functions, and we can only expect its usage to grow with time. However, some are voicing their concerns about how poorly trained AI models can lead to biases and ethical concerns, exploitation of valuable patient data, and more. Chief among the concerns from physicians and other medical professionals is an innate lack of trust for AI to carry out critical clinical functions such as diagnosing patients as they have no insights into the source knowledge or truth behind the diagnosis.

## Different views on ai's role in healthcare

For reasons like these, the healthcare industry has historically been a reluctant or late adopter of deep tech, so it's understandable that the industry would be cautious about introducing powerful AI tools within a clinical setting without extensive research.

Whether in a clinical setting or a more administrative capacity, all healthcare organizations want to be cautious in adopting powerful new AI tools, to take into account patient trust and comfort. This is typically why the industry is notorious for being a late adopter of more cutting-edge technology.

The rapid advancements in AI, however, have forced the issue on healthcare decision makers due to the abundance of deep-learning-powered products flooding the market and aiming to ease the numerous burdens placed on care providers.

But regarding the use of deep learning in clinical settings, some healthcare organizations are pushing for more while others prefer the "wait-and-see" approach. For an industry that is facing several serious challenges, however, there is a desperate need to boost efficiency wherever possible, and deep learning can help in certain key areas.

## Medical coders and healthcare billing

Let's look at revenue cycle management (RCM), which is a crucial part of any healthcare system's operation, as a prime example. A healthcare billing department is responsible for filing payment claims with a patient's insurance company for proper reimbursement, but these claims often get denied due to billing errors.

These errors amount to an astronomical \$28.9 billion a year in losses for healthcare organizations. Some 23% of claims are either denied, lost, or ignored, and the average cost for a healthcare provider to appeal a denied claim is \$118. These lost funds hinder a healthcare organization's entire operation by reducing department budgets dedicated to purchasing technology and equipment, combatting staff burnout, infrastructure investments, and just about every other expenditure.

At the heart of this inefficient RCM system is the highly labor-intensive job of medical coders. Medical coders are tasked with translating details from a patient's medical documents, which may include logging progress notes, consultations, operative reports, diagnostic procedures, and more in a highly standardized fashion. This enables healthcare organizations to bill insurance companies for reimbursements in a legally compliant way.

The work of medical coders is repetitive and detail-oriented, which also means it is prone to the inevitable phenomenon of fatigue and human error. On top of that, with the abundance of challenges already plaguing most healthcare organizations, a shortage of medical coders and the commonality of unreliable legacy computer-assisted coding (CAC) software further compound existing flaws with RCM.

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## Limits of Computer Assisted Coding

CAC software first emerged in the late 1990s to successfully automate part of the coding process. This also coincided with the establishment of the Healthcare Common Procedure Coding System (HCPCS) and the implementation of the Current Procedural Terminology (CPT) codes by the American Medical Association, which contributed to the standardization of medical coding. This would lead to CAC systems then becoming an absolute necessity in the early 2000s with the influx of medical codes and the prevalence of new electronic health record (EHR) systems.

But more than two decades after becoming a fixture within healthcare billing, healthcare billing needs a major upgrade. With the shortage of medical coders and the difficult training required to execute the job, not to mention the plethora of other challenges squeezing healthcare budgets, a new method, or standard, is needed to capture lost revenue and retain talent.

## Automating the medical coding process with AI

Here is where AI's use in healthcare should be welcomed and even encouraged. Solving the inefficiencies of the current RCM system could be drastically bolstered with AI's help to automate the medical coding process. Recognizing the serious disconnect between the way healthcare organizations manage their billing with CAC systems and the capabilities of advanced automation technologies, particularly in the form of deep learning and machine learning (ML), means there is plenty of room for improvement.

Automating the medical coding process with the assistance of AI has great potential to create a higher standard for medical billing and enable healthcare organizations to take advantage of missed revenue opportunities.

### **The objective:**

to leverage AI, ML, and deep learning to create a platform that removes the need to have a human involved in the actual coding process. To make this a reality, the platform should use the largest databases across several medical domains, including radiology, which is a complex form of medical coding perspective due to the amount of codes required.

Before automating the medical coding process, it's important to understand how AI works together with ML and deep learning, which are subsets of AI.

In short, AI teaches a system to do things, such as carrying out specific tasks, intelligently. In contrast, ML teaches the system to do intelligent things while learning from experience, and deep learning teaches systems to be intelligent, learn from experience, and understand human language. All these processes are key in automating the medical coding process but deep learning especially due to the need to analyze clinical narratives, physician notes, and other unstructured data.

A key aspect stimulating this entire process is the functionality of a transformer model. By leveraging deep learning and synthetic data generation capabilities, a transformer model is akin to an engine that enables an autonomous medical coding system to then adapt and learn the ever-changing coding and regulatory guidelines needed to serve a specific domain.

## What is a transformer model and how can it help medical coding?

A transformer model is a type of neural network that is trained to understand context and meaning by tracking relationships in sequential data. By applying an evolving set of mathematical techniques, a transformer model can detect subtle ways even distant data elements in a series influence and depend on each other.

In the context of medical coding, a transformer model takes unstructured clinical data such as reports, test results, physician notes, or another form of medical documentation and through natural language processing (NLP) training can generate accurate AI task outputs. Through this model, an autonomous coding platform can output text classification, clinical language understanding, code generation, and much more.

By autonomously analyzing clinical notes or reports, autonomous coding platforms can accurately generate reimbursement codes for ICD-11 (International Classification of Diseases Version 11) and CPT (crucial for radiology RCM) systems in real time, making charges available to billing systems within only a few seconds. This type of use case offers healthcare organizations a real solution to optimizing RCM to achieve quicker and more accurate codes without any human oversight. This can result in higher direct-to-bill rates, saving organizations time and money which can contribute to breakthroughs in care delivery.

An effective model can conduct active learning, a type of ML where the model is only trained on the most relevant data. This enables the collection of immediate feedback from auditors as well as medical coders, allowing the platform to adapt to different systems without any human interference or oversight.

The transformer model must be a key component of any medical coding platform as it essentially serves as the engine for automating the process. Without the ability to take clinical data and learn an organization's unique characteristics, a medical coding platform wouldn't be able to relieve the massive burdens medical coders and administrators experience. And, of course, without optimizing the billing process, there's no recouping of lost revenue.

## Advantages of autonomous platforms

The current industry standard achieves a 50% direct-to-bill rate, at best, highlighting the clear need for automation. Going from archaic CAC systems to autonomous AI-powered platforms will not only unlock missed revenue opportunities through an optimized RCM, but it will also decrease operational costs within a healthcare organization's billing department.

For medical coding, the ideal autonomous platform is easily scalable and enhances coding compliance and consistency, optimizes certified coder resources on the most complex cases, reduces human coder reliance amid the talent drought, and boosts RCM turnaround. Focusing on these key issues addresses all the pain points associated with the current system's flaws.

## Best implementation practices

To facilitate the best implementation of an AI-powered autonomous coding solution, it's advised to review templates to ensure all required elements for coding and billing are documented in each radiology report. The leading platforms will support pre, post, and during implementation as well as AI training to help clinics, hospitals, and facilities smoothly onboard the new system into their operations.

By focusing on comprehensive documentation improvement, refining CPT, HCPCS, and ICD-10-CM coding practices, optimizing workflow, and placing a magnifying glass on the quality of code, providers can lay the groundwork for an autonomous coding solution that's both effective and efficient. Regular audits, ongoing education, and a commitment to consistent quality assurance will guarantee the highest possible direct-to-bill rates because it's trained on a healthcare provider's very best historical data.

## Evolution of medical coders

As we anticipate AI disrupting every industry and replacing many jobs in the process, it makes sense to wonder how autonomous medical coding platforms will impact the role of medical coders going forward. But just like with many other jobs, AI won't make medical coders redundant but rather transform their positions by redefining their key responsibilities.

Since technology relies on human input and feedback, medical coders will still play an equally important role in the revenue cycle management and the wider healthcare industry. Instead of having to direct their focus on highly repetitive and tiring coding processes, they will be tasked with validating and auditing the system, coding exceptions and complex cases, and other big-picture revenue cycle responsibilities.

Medical coding and revenue cycle management are often overlooked aspects of the healthcare industry. However, addressing their shortcomings isn't something that any healthcare organization can view as a luxury—optimizing billing efficiency is a necessity for a robust and dynamic healthcare industry.



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He spearheads the company's growth and expansion in the U.S. market. Michael has a deep passion for leveraging cutting-edge technologies to solve complex financial and operational challenges in the healthcare field. He brings to the table over 30 years of executive experience, having worked with Fortune 500 companies, venture-backed firms, and early-stage startups. Notably, he was the President and CEO of SimplifyMD. Additionally, Michael held a significant role at McKesson as a Senior Vice President, during which he championed the expansion of their corporate marketing division. He currently sits on the advisory boards of several prominent healthcare companies. Michael completed his B.S. in Economics and Bioscience from Penn State University.