The AI Advantage: Reclaiming Revenue and Resilience in Radiology RCM

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Introduction

Twenty years ago, I worked at a radiology billing company that was an early adopter of computer assisted coding (CAC) technology. At that time, the CAC vendor claimed that up to 75% of reports could be sent directly to billing. However, even after three years, we were still reviewing 100% of the output and never submitted any claims directly to billing due to a lack of confidence in the coding engine's accuracy. Unfortunately this was a common experience across the coding industry with early-generation CAC technology.

Fast-forward two decades later, despite many advancements in CAC technology, it still hasn't delivered the high direct-to-bill (DTB) rates initially promised. In my work with providers across the country in a variety of settings, I've observed that CAC on very rare occasions may reach a 50% DTB rate, but often tops out around 30–35% and is even as low as 20% in many cases. Unfortunately CAC has continued to fall short of expectations for many organizations.

This ongoing struggle to achieve meaningful efficiency gains with CAC has left many organizations searching for a better solution—one that can truly deliver on its promises. That's where AI-powered autonomous coding enters the picture. Autonomous coding offers a smarter alternative that is scalable, accurate, and designed to thrive in radiology's high-volume environment. In this column, we explore how this technology is helping forward-thinking leaders improve compliance, cut costs, and build a more resilient revenue cycle. But before diving deeper into the solution, it's important to understand why the current environment demands a fundamental shift in how radiology revenue cycle operations are managed.

Why the Industry Needs a Shift

Hospital radiology departments and imaging centers face tremendous pressure from rapid expansion driven by mergers and acquisitions, rising outpatient demand, and ongoing staffing shortages. These challenges have fueled a cycle of escalating burnout and growing backlogs, negatively impacting the stability of cashflow. Addressing these challenges requires a fundamental change in how the revenue cycle is supported and optimized. Thankfully, automation has the potential to solve many of the bottlenecks slowing down the revenue cycle.

Built on advanced artificial intelligence (AI), including machine learning (ML) and deep learning (DL) algorithms, autonomous coding is fast, accurate, and scalable. Specifically, autonomous coding can accelerate the process, not only by assigning the correct CPT, HCPCS, and ICD-10-CM codes without human intervention, but also by identifying missing information in radiology reports, flagging procedures that lack documentation supporting medical necessity, and applying coding edits to address potential issues prior to the claim scrubbing process. Each of these capabilities streamlines the coding process, reduces claim denials, and ultimately accelerates reimbursement and improves cash flow.

While automation holds great promise, not all coding technologies are created equal. Many organizations still rely on embedded EHR tools or chargemaster-based coding logic, but these solutions have critical limitations that hinder accuracy and compliance.

Why Auto-Coding in the EHR Isn't Enough

While some EHR systems automatically assign ICD-10-CM codes based on the ordering provider's selected diagnosis, this approach is often disconnected from the actual clinical documentation.

Diagnoses selected by the physician may be vague, inaccurate, or unsupported by the final radiology report, leading to coding errors, compliance risks, and potential revenue loss. Furthermore, many radiology departments depend heavily on the chargemaster to drive CPT® coding and billing, but the chargemaster often houses out-of-date codes, leading to denials and missed revenue.

Autonomous coding offers a more sophisticated alternative, breaking this dependency by enabling granular, documentation-driven coding that reflects the true scope of services provided, transforming both the process and the outcomes of radiology revenue cycle management. Instead of relying on static mappings and pre-assigned codes, it analyzes the full radiology report to assign accurate, encounter-specific CPT®, HCPCS, and ICD-10-CM codes based on what is actually documented. This level of contextual understanding enhances accuracy, supports compliance, and ensures appropriate reimbursement.

Understanding how autonomous coding delivers superior outcomes requires a closer look at the next-generation technology that powers it, how it differs from traditional CAC systems, and why the distinctions are crucial.

CAC vs. Autonomous Coding: What's the Difference?

It's important to note that autonomous coding is not simply an upgraded version of CAC; rather, it represents an entirely different class of technology with significant architectural and functional differences, delivering a much higher level of automation. While CAC suggests codes that require manual review and final code selection by human coders, autonomous coding performs the entire coding process independently with no human intervention. This shift transforms the role of

TABLE 1. CAC vs. autonomous coding.

Category	Computer-Assisted Coding (CAC)	Autonomous Coding
Technology	Relies on natural language processing (NLP) and rule-based logic	Uses machine learning (ML) and deep learning (DL) to analyze unstructured data
Coding Process	Suggests codes that must be reviewed and selected by a human coder	Assigns CPT®, HCPCS, and ICD-10-CM codes without human intervention
Human Involvement	High: Coders review, correct, and create rules	Minimal: Coders only review exceptions; the model improves with feedback
Adaptability	Struggles with unstructured data and language variability	Learns from provider-specific patterns and adapts to varied report styles
Rule Maintenance	Requires continual creation and maintenance of coding rules	No rules required; learns from historical coding data
Workflow Impact	Slows workflow due to manual review and editing	Speeds up workflow by sending many reports directly to billing
Direct-to-Bill (DTB) Rate	Typically tops out around 30–35%, occasionally reaching 50%	Capable of consistently achieving DTB rates as high as 85–90%, improving revenue cycle speed
Coder's Role	Manual code selection, rule management	Quality assurance, exception handling, complex case review, and documentation improvement
Scalability	Limited: Requires more staff to scale	High: Can manage growing volumes without proportional increases in staffing
Compliance and Accuracy	Prone to errors from vague diagnoses or unsupported CPT® codes	Enhances accuracy and compliance through full-document analysis and contextual understanding

the coder from routine code assignment to handling exceptions, conducting quality assurance, and allowing them to focus on higher-value tasks such as reviewing complex cases and supporting documentation improvement. As a result, autonomous coding not only streamlines the billing workflow, but also elevates the function of coding professionals within the revenue cycle.

Technology and Intelligence

CAC is primarily driven by natural language processing (NLP), focusing on the identification of specific words and phrases to suggest codes, while relying heavily on rule-based coding. Creating rules can be a time-consuming process and may result in hundreds and even thousands of rules being established over a course of time, continually requiring manual updates. Additionally, CAC requires reports with a predefined structure and cannot easily adapt to changes in language patterns. The new generation of AI technology is capable of processing reports containing large amounts of unstructured data, detecting language patterns, and understanding context. Powered by the advances in self-supervised learning, these models continuously improve by learning from the data they analyze.

Autonomous coding solutions utilize ML, DL, and large language model (LLM) algorithms to assign codes without pre-defined coding rules and without being explicitly programmed. The algorithms in DL models are trained using a large historical data set to ensure the coding engine produces the most relevant predictions, capturing the subtle variations and coding style of the provider. Leveraging large volumes of historical data is what enables the model to achieve a high DTB rate—meaning codes can be assigned and sent to billing without human intervention—an area where traditional CAC has consistently fallen short.

Workflow

CAC is a tool that relies heavily on human intervention to arrive at correct codes, while autonomous coding solutions can code many encounters with no human intervention. In a typical CAC workflow, reports are sent to the coding engine, the engine reads the text, and it provides code suggestions. A coder then reviews the coding engine output and makes any necessary changes.

With an autonomous coding solution, reports are sent to the coding engine, coded within seconds, and sent directly to billing. Any encounters that cannot be coded by the engine are routed to a human coder for review. Common exceptions may include low-confidence predictions, missing or insufficient documentation, ambiguous language, conflicting clinical information, procedures that may not meet medical necessity requirements, and complex cases such as interventional radiology. These exceptions ensure that only high-confidence, fully supported cases are sent directly to billing, maintaining accuracy, compliance, and revenue integrity. As coders review these exceptions and modify, add, or delete codes, the model continuously learns from those actions, improving accuracy over time, without the need for extensive rule creation.

These technological and workflow advantages translate directly into measurable business outcomes. From cost savings to faster billing cycles, autonomous coding delivers a strong return on investment while supporting operational resilience.

Benefits of Autonomous Coding: Maximizing ROI

Although CPT® coding is chargemaster-driven in the facility setting, human coders are often responsible for assigning

TABLE 2. **RCM challenges solved by autonomous coding.**

Challenge	Solution via Autonomous Coding
Shrinking reimbursement	Improves capture of reportable services; minimizes undercoding and denials
Staffing shortages	Reduces dependency on human coders; scalable without increasing FTEs
Coding backlogs	Speeds throughput with no human bottleneck
Inconsistent coding	Increases consistency and accuracy using trained models
Denials due to documentation gaps	Flags missing information; supports medical necessity and documentation review
Outsourcing/offshoring dependency	Eliminates need by boosting internal efficiency
Slow billing cycles	Achieves high DTB rates; accelerates revenue capture

diagnosis codes to radiology encounters, which can lead to significant coding backlogs for high-volume providers. An autonomous medical coding solution delivers exceptional scalability and efficiency, enabling organizations to manage increasing procedural volumes without the need for proportional staffing increases or reliance on outsourced coding support, all while effectively eliminating backlogs. This is a win for an organization's operational budget and cashflow.

Once trained, the model applies coding uniformly across all accounts, enhancing both consistency and accuracy. This minimizes human variability and reduces the risk of coding errors that commonly result in claim denials. The improved reliability supports stronger compliance and further reduces costs by limiting manual intervention and appeals. By fully automating the coding process, autonomous solutions boost productivity and accelerate billing cycles through high DTB rates, leading to improved cash flow, while eliminating the need for external coding resources, either offshore or onshore.

Overall, autonomous coding can dramatically increase return on investment and transform the revenue cycle into a faster, smarter, and more cost-effective operation.

Conclusion

Two decades ago, the promise of coding automation failed to meet expectations, fostering skepticism across the industry. Today, however, autonomous coding has emerged as a transformative force delivering what early CAC technologies could not. With the ability to independently assign CPT®, HCPCS, and ICD-10-CM codes based on full report context, autonomous coding bridges the long-standing gaps between documentation, accuracy, and efficiency.

For radiology leaders navigating shrinking margins, rising volumes, and workforce limitations, this shift couldn't come at a more critical time. By reducing manual intervention, minimizing denials, eliminating outsourcing, and enhancing compliance, autonomous coding doesn't just improve the revenue cycle—it redefines it.

As we look ahead, organizations that embrace this next-generation technology will be best positioned to reclaim lost productivity, boost financial performance, and build a more resilient, future-ready revenue cycle management operation.

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