

AUTONOMOUS SURGICAL CODING

Whitepaper

Gregory Hobbs, MD

This study reveals how one hospital used AI to automate complex surgical coding, reduce denials, and recover millions in revenue.

www.milagroai.com

Objective

Accurate and timely coding for surgical procedures is essential for appropriate billing and reimbursement. Currently, there is a significant shortage of qualified coders in the US, with the American Medical Association reporting a 30% gap in this vital workforce. The shortage of specialty-specific surgical coders is even more severe. Current healthcare regulations and changing coding guidelines have amplified the complexity of medical coding. The surgical coder shortage has a direct impact on both provider and hospital revenue. Inaccurate or delayed coding processes can result in billing errors, delayed reimbursements, and potential revenue loss. Moreover, the absence of skilled coders leads to an increased administrative burden and inefficiencies, ultimately impeding the overall delivery of quality patient care.

As healthcare organizations increasingly recognize that automation of coding holds great promise, they also understand that challenges associated with fully autonomous coding are complex. The need for nuanced coding across diverse surgical specialties is a paramount consideration. Surgical coding is the most complex area, with its unique challenges that demand both precision and adaptability. Surgical coding covers multiple surgical specialties and subspecialties, each with its own set of codes and modifiers. Currently, there are over 11,000 surgical CPT codes as well as multiple modifiers. While the potential benefits of AI-powered autonomous coding are immense, the intricacies of coding, particularly in surgical procedures, require a sophisticated approach to ensure accuracy. Surgical coding can be difficult even for the seasoned coder, especially if they have more than one specialty to code. Surgical coding includes not only professional CPT codes and modifiers, but also ICD-10 codes, HCPCS, and facility coding. There may also be more than one surgeon involved in the case.

Previous studies have reported good results using AI algorithms to code a single surgeon or multiple surgeons within a single specialty, but to date we are unaware of any study evaluating the accuracy of AI empowered autonomous coding involving multiple surgeons across multiple surgical specialties, generating professional and facility codes including CPT, modifiers, ICD, and HCPCS codes for each ambulatory surgical procedure performed.

Milagro (Milagro.ai) is a novel real-time data abstraction platform that leverages artificial intelligence and advanced text understanding capabilities to produce a continuously updating abstracted dataset from which algorithms for specific purposes, including fully autonomous coding, can potentially address the complex challenges of surgical coding and fully automate the coding process. We designed a study whose primary goal was to determine the ability of Milagro to accurately identify CPT codes, modifiers, ICD codes, and HCPCS codes for ambulatory surgery cases for the following specialties: ophthalmology, gastroenterology, urology, and orthopedics.

A secondary goal of the study was to measure Milagro's ability to successfully identify mismatches between what was pre-authorized by the payer and what was actually performed by the surgeon in order to seek reauthorization of the case within a time frame acceptable to the payer, thus avoiding denials of these cases. Payers routinely deny claims with preauthorization mismatches, and only allow the provider an opportunity to seek proper reauthorization within 48 hours of the case. Since current coding processes seldom complete coding and identify the mismatch within this time frame, the cases are denied, and the reimbursement is lost. These preauthorization mismatches occur in 5-30% of surgical cases, depending on the specialty, and represent millions of dollars of lost revenue annually for a single hospital.



Methodology

The Milagro platform was integrated into the Epic EHR at Tampa General Hospital, a 1,084-bed academic medical center in Tampa, Florida. This enabled Milagro to capture in real-time all relevant patient data required for coding ambulatory surgery procedures. The study focused on four surgical specialties: ophthalmology, gastroenterology, urology, and orthopedics, and included surgical cases between January and June 2024.

Milagro was initially trained using 20-30 historical surgical cases for each CPT code that had been previously coded by the current team of surgical coders. Algorithms were then adjusted as required for accuracy. Milagro then coded surgical cases in the four specialty areas in real-time. Coding results were compared against the current manual coding process for accuracy, and any discrepancies between Milagro and the manual coding process were resolved by review from the Tampa General team to determine the final appropriate coding. Coding included CPT codes, modifiers, ICD codes, and HCPCS codes. To be considered correct, the coding was required to accurately identify all relevant codes for each case. If any codes were incorrect or missing, the coding was scored as incorrect.

In addition to accurately coding surgical cases, Milagro also measured the platform's ability to accurately identify mismatches between preauthorized CPT codes and the CPT codes for what was performed by the surgeon. This portion of the study included a measurement of Milagro's ability to correctly identify the payer and determine whether the case required reauthorization, and based on the payer's rules, whether the case could be successfully reauthorized. The dollar amount of cases successfully reauthorized was calculated using the average net revenue for those cases at Tampa General.



Results

The results of Milagro’s ability to correctly code all required coding elements of the surgical cases are found in Table 1. A total of 3,929 individual cases were coded, with an overall accuracy of 96.56%. Compare this to manual coding, which generally has an overall accuracy of 85%.

Table 1

Specialty	Ophthalmology	GI	Orthopedics	Urology
Total Cases	526	2022	240	1141
Accuracy	99%	97%	96%	94%

Table 2 shows the results of Milagro's ability to correctly identify mismatches between the preauthorization CPT code and the CPT of the procedure that was actually performed.

Milagro coded 8980 cases across the four surgical specialties and identified 2513 mismatched cases. Of these 2513 cases, 728 (8%) met the criteria for successful reauthorization. Using an average revenue per case as shown in the table, this represents \$3,756,764 of revenue that would have been denied by the payer.

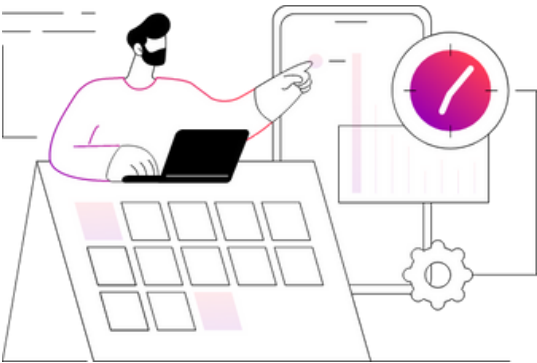


Table 2

Specialty	Ophthalmology	GI	Orthopedics	Urology	Total
Total Cases per Specialty	1018	4045	712	3206	8980
Avg Revenue per Case	\$4,854	\$2,956	\$12,520	\$5,209	-
Mismatch Cases	173	1302	225	812	2513
Percentage of Cases Mismatched	17%	32%	32%	25%	28%
Mismatched Cases Requiring Reauthorization	70	325	98	236	728
Percentage of Mismatched Cases Req Reauthorization	7%	8%	14%	7%	8%
Total Mismatched Case Value	\$339,780	\$960,700	\$1,226,960	\$1,229,324	\$3,756,764

Conclusion

This study demonstrates that Milagro can be successfully used for fully autonomous coding for ambulatory surgical procedures, including CPT codes, modifiers, ICD codes, and HCPCS codes across multiple surgical specialties and many individual surgeons.

Milagro had an accuracy rate of 96.56% and was more accurate than the current manual coding process. Additionally, Milagro was able to successfully identify preauthorization mismatches in a time frame that allowed successful reauthorization of eligible cases, thus preventing payer denials of those cases.

Milagro can be used by hospitals and ambulatory surgery centers to improve coding accuracy and timeliness of coding, reduce the cost of coding, and avoid denials for preauthorization mismatches, improving not only the financial bottom line but also the delivery of quality patient care.



To learn More, reach out to us >

info@milagroai.com