

ORIGINAL ARTICLE

Implications of Current Procedural Terminology code accuracy on surgical workflow and financial reimbursement

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ABSTRACT

Objective: Inaccuracies in Current Procedural Terminology (CPT) coding entries for surgical procedures have a profound impact on hospital systems and surgeon compensation for services. We sought to characterize the variations of surgical CPT entry at a multi-site academic medical center and estimate the financial burden implicated by improper code entry.

Methods: A mixed methods study was conducted to evaluate variations in CPT entry across an academic center. Semi-structured interviews with 8 surgical schedulers were conducted and analyzed to understand the current scheduling process. Coding data for surgical procedures performed within a 31-day period during September and October 2020 within the large healthcare system were assessed for appropriate CPT code entry. Reimbursement for the 2020 fiscal year was then analyzed to determine the impact of pre-operative CPT code accuracy on reimbursements and denials.

Results: Interviews revealed a lack of standardization in the surgical scheduling process across the hospital system. Lack of standardized onboarding and variations in workflow contributed to difficult cross coverage for schedulers and errors in CPT entry. On quantitative analysis, the accuracy of pre-operative CPT code entry was poor with only 59.3% of pre-operative CPT code entries being correct. In the 2020 fiscal year, \$5.4 million was lost due to problems related to CPT code entry.

Conclusions: Variations and lack of standardization in CPT code entry can greatly contribute to financial losses and disrupt surgical scheduling. Standardization of workflow and CPT entry schemes can help minimize scheduling complications and enhance the quality of care provided to patients.

Key Words: Current Procedural Terminology, Scheduling, Coding accuracy, Physician reimbursement, Denials

1. INTRODUCTION

The Current Procedural Terminology (CPT) system was developed in response to the rollout of Medicare and resulting need for standardized communication about healthcare services provided to payers, institutions, and patients.^[1-3] In

1983, the CPT system was adopted into the Common Procedure Coding System. Eventually, the CPT system became the national standard for communicating healthcare information after the passing of the Health Insurance Portability and Accountability Act (HIPAA) in 1996.^[4,5]

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CPT codes function as essential pieces of information in many processes within healthcare, including surgical scheduling. Knowing the correct CPT codes in advance of a surgery enables the schedulers to submit prior authorizations. CPT codes are utilized by surgical staff to capture anticipated operative complexity, duration, and essential equipment. These details are then used as a guide to ensure the optimal number and order of procedures are scheduled in order to maximize the use of operating room block times.^[6,7] Despite the adoption of the CPT system, ensuring accurate procedural coding during the surgical scheduling process remains challenging.^[8] Poor coding practices complicate the surgical workflow, create delays or cancellations, and reduce the quality of patient care delivered.^[9] To ensure proper reimbursement, the scheduled or preauthorized CPT code must match the performed procedure. A mismatch between codes can increase the likelihood of insurance denials that result in lower or no reimbursement. Thus, inaccurate CPT coding can also impede proper billing and approval, thereby negatively impacting physician reimbursement.^[10]

As denials in preauthorization codes have been steadily in-

creasing, ensuring proper CPT code entry has become increasingly important.^[8] Increased physician involvement in the coding of procedures has been shown to improve CPT code accuracy and reimbursement across various surgical specialties.^[11] However, the complexity of the CPT code system and variability that exists across workflows limits the ability of healthcare providers to learn how to accurately report their services.^[12] In this study, we first sought to characterize the current state of surgical scheduling within a large healthcare system by conducting interviews with schedulers to characterize the workflow. Secondly, we evaluated CPT coding accuracy by analyzing the percentage of pre-operative code entries that resulted in subsequent denials or full reimbursement for procedures.

2. MATERIALS AND METHODS

This study utilized a mixed-methods approach, incorporating qualitative interviews and quantitative analysis of CPT coding accuracy, to evaluate the scheduling workflow and entry accuracy across a healthcare system. This study was deemed exempt from Institutional Review Board review as a quality improvement initiative.

Surgical Scheduling Interview Questions	
1.	What services do you schedule surgery for?
2.	What are the most frustrating, time consuming, or inefficient parts of your job?
3.	What ideas do you have about how to make scheduling surgery and obtaining insurance authorization more efficient?
4.	Walk me through the process of how you learn a patient needs to be scheduled for surgery through scheduling and insurance authorization.
a.	If not mentioned, how do you know what equipment the surgeons will need for the case?
b.	If not mentioned, how do you know how much time a surgeon will need for a case?
5.	What onboarding or training did you receive when you started in this role?
a.	If not mentioned, did you receive formal training regarding CPT codes?
6.	Do you obtain insurance authorization in addition to scheduling surgery?
a.	If yes, what training did you receive in this area?
b.	If no, who does?
7.	Do you receive any regular education or have support from others in your role?
8.	Do your surgeons perform joint cases with other surgeons?
a.	If so, how do you go about scheduling joint cases?
9.	How often do you think surgical cases are delayed or cancelled due to issues with insurance authorization?

Figure 1. Surgical scheduling interview questions. A set of semi-structured questions that were used to guide the interviews with surgical schedulers.

2.1 Qualitative

A semi-structured interview guide was developed, containing questions designed to elicit information about the surgical scheduling workflow shown in Figure 1. Surgical schedulers were recruited by e-mail. A purposeful sampling strategy was used to recruit participants from multiple surgical sub-

specialties. Participation was voluntary and no compensation was provided to participants. Semi-structured interviews were conducted with eight surgical schedulers from surgical oncology, breast, vascular, plastic, reconstructive, and cardiothoracic surgery. All interviews were audio-recorded and transcribed verbatim. Verbal consent was obtained for

audio recording. All patient identifiers were removed from transcribed documents. Transcriptions were reviewed by two reviewers (M.S., L.L.) who identified recurrent themes. Specifically, interviews were continued until both reviewers concurred that thematic saturation was achieved, following the model described by Guest et al.^[13] Thematic saturation was assessed using a prospective data saturation approach, where new themes were analyzed from a set of 4 initial interviews, and further interviews were conducted until no new themes were identified.^[13]

2.2 Quantitative

Administrative data for surgical procedures performed between September 2020 and October 2020 at 16 unique sites within a large, not-for-profit healthcare system located in one state was extracted from the electronic health record (EHR). The 16 hospitals were divided into three sub-groups by geographic regions – 7 sites in a northern region (Region 1), 5 sites in a metropolitan area (Region 2), and 4 sites in a southern region (Region 3). The specific study sites and their associated regions are specified in Table 1. Hospitals are grouped in these three regions and surgeons tend to practice within a single region. Pre-operative CPT codes and post-operative billing CPT codes were extracted from EHRs.

CPT code entry was assessed for the accuracy, defined by the degree which the pre-operative CPT code aligned with the CPT code used to bill after the surgery. To evaluate the financial implications of the inaccuracy of CPT code entry, administrative data including hospital billing data for the entire 2020 fiscal year was compiled to evaluate the frequency of denials related to CPT code entry errors and the resulting denial amount.

Accuracy of pre-operative CPT was assessed by categorizing entries as incorrect, partially correct, or correct in comparison to the CPT code used to bill after the surgery was completed. Entries that contained missing or incorrectly entered information were considered “incorrect”. Entries with incomplete information, such as those with one CPT code entered correctly but missing additional codes or other necessary information for complete reimbursement, were designated “partially correct”. Accurately entered CPT codes, or ones where the pre-operative CPT code matched the code used for billing, were designated “correct”. Descriptive statistics were used to compare the accuracy of CPT code entry across geographic regions. A Chi-Squared test was then conducted to determine if the proportions of correct, partially correct, and incorrect codes were significantly different across the three regions.

Table 1. Study sites within the three regions of the healthcare system

Region 1	Region 2	Region 3
Greeley Hospital, Greeley, CO	Broomfield Hospital, Broomfield, CO	Grandview Hospital, Colorado Springs, CO
Inverness Surgery Center, Englewood, CO	Cherry Creek North Surgery Center, Denver, CO	Memorial Health Hospital, Central Hospital, Colorado Springs, CO
Longs Peak Surgery Clinic, Longmont, CO	Highlands Ranch Hospital, Highlands Ranch, CO	Memorial Health Hospital, North Hospital, Colorado Springs, CO
Longs Peak Hospital, Longmont, CO	University of Colorado Hospital - Inpatient, Denver, CO	Pikes Peak Regional Hospital, Woodland Park, CO
Medical Center of Rockies, Loveland, CO	University of Colorado Hospital - Outpatient Clinics, Denver, CO	
Poudre Valley Hospital, Fort Collins, CO		
Yampa Valley Medical Center, Steamboat Springs, CO		

3. RESULTS

3.1 Qualitative

Qualitative analysis of interviews revealed major themes such as lack of standardization of processes, poor communication between surgeons and schedulers, difficulty cross-covering scheduling roles, and lack of formal scheduling training. Interviews with surgical schedulers revealed that lack of standardization in scheduling workflow was the major barrier. Significant variations in what and how information is communicated by the surgeon to the surgical scheduler contributed

the most to the inconsistency of this process. Differences in how information is shared and the distinctive responsibilities of different team members across sites are shown in Table 2. The interviews also revealed that schedulers have created internal reference sheets of CPT codes for commonly scheduled surgeries because of the variations within each region. These sheets are not validated or updated regularly and may perpetuate the use of inaccurate CPT codes. Furthermore, schedulers often use their own judgement to choose which CPT codes they feel is most appropriate for a procedure:

Table 2. Comparison of variations in CPT entry, scheduling workflow, and responsibilities across the three geographical regions

Factor	Region 1	Region 2	Region 3
CPT code(s) required when surgical case request is submitted by clinician or scheduler	No	No	Yes
Pre-admission testing nurses involved in CPT verification pre-op	No	Yes	No
Schedulers responsible for verifying/adding CPT code(s) pre-op	No	Yes	No

“We have a little cheat sheet of the common things... I’m basically learning the CPT codes along the way for the ones we do all the time. And then we’ll just ask and kind of look, we use our book a lot, to kind of see what codes there are and what ones fit the best.”

Modes of communication included everything from an in-person, verbal request to a templated scheduling note in the EHR. Lack of knowledge of the minimum necessary information required to schedule a surgery and the importance of providing accurate information were referenced by multiple schedulers. Schedulers also noted that these gaps in communication were more prominent when working offsite:

“When I get the [patient’s] treatment plan and the surgery has to be done within [a certain] amount of time and I don’t have that time, I’ll reach out to the provider... That’s kind of tackling the doctor and sitting down with them and asking for their help. You know, that’s kind of the hardest part.”

Many schedulers also reported learning their current workflow by shadowing their predecessor rather than through standardized education. Participants felt that this form of training perpetuated discrepancies between how scheduling is performed. This inconsistency existed between surgical subspecialty clinics even within the same hospital and was cited as a frustration for schedulers who are expected to cross-cover for their colleagues who practice entirely different scheduling workflows. The qualitative interviews also highlighted that the lack of formal training or “onboarding” for new schedulers was a major driver of the variability across sites:

“There was no formal surgical scheduling training. It was, you know, the clinics operations person walked me through, like the mechanics of scheduling a surgery, how to go through and actually put the case information in. But then after that... was just kind of learn as you go along.”

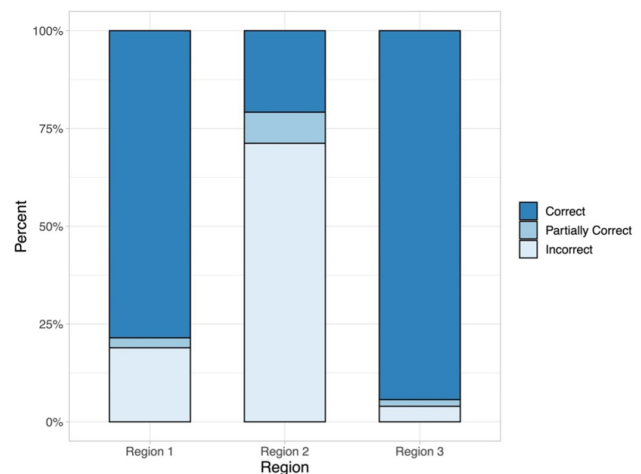
3.2 Quantitative: Variations in pre-operative CPT code accuracy

A total of 4,796 of CPT codes were entered between September and October 2020. When analyzing the accuracy of all CPT codes entered within the healthcare system, there were a total of 2,844 (59.3%) correctly entered CPT codes, 214

(4.5%) partially correct codes, and 1,738 (36.2%) incorrectly entered codes. The proportions of correct, partially correct, and incorrect codes contributed by each region are displayed in Table 3.

Table 3. Number and proportions of correct, partially correct, and incorrect CPT codes of the healthcare system contributed by each region

Region	Correct	Partially Correct	Incorrect
Region 1	1,694 (59.6%)	55 (25.7%)	409 (23.5%)
Region 2	379 (13.3%)	145 (67.8%)	1297 (74.6%)
Region 3	771 (27.1%)	14 (6.5%)	32 (1.8%)

**Figure 2.** Pre-operative CPT code accuracy by region. Percentage of correct, partially correct, and incorrect pre-operative CPT code entries within each of the three geographic regions of an academic-community hospital system from September 2020 to October 2020.

Among the regions individually, Region 3 had the highest proportion of correctly entered CPT codes (94.3%) (see Figure 2). In contrast, 78.5% of all CPT codes in Region 1 were correctly entered and only 20.8% of all CPT codes in Region 2 were correctly entered. A Chi-Squared test revealed that the proportions of correct codes, partially correct codes, and incorrect codes were significantly different across the three regions ($p < .001$).

3.3 Quantitative: Impact of CPT code entry on denials and reimbursement

When examining denials in the 2020 fiscal year, incorrect CPT code entry was identified as the root cause of the denial for 1,505 cases and resulted in a loss of \$5.4 million. An average of \$3,600 was lost per denied case due to inaccuracies in pre-operative CPT code entry. Of these 1,505 denials, 473 (31.4%) came from Region 1, 668 (44.4%) from Region 2, and 364 (24.2%) from Region 3. Region 1 had an average loss of \$2,700 per denied case, with most denials resulting from general surgery, orthopedic surgery, and obstetrics and gynecology services. Region 2 had an average of \$3,800 lost per denied case, with most denied cases from orthopedic surgery, obstetrics and gynecology, plastic surgery, and otolaryngology services. Lastly, Region 3 lost an average of \$4,000 per denied case, with the majority of denied cases deriving from general surgery, orthopedic surgery, and obstetrics and gynecology services.

4. DISCUSSION

4.1 Key findings of interviews and coding analysis

Our study characterized the variations in surgical scheduling workflow across different sites within a large healthcare system through our interviews with schedulers. Based on our analysis, there were significant differences in the proportions of correct, partially correct, and incorrect CPT codes across the three regions of the healthcare system ($p < .001$). We found that Region 3 had the highest proportion of accurately entered pre-operative CPT codes, while Region 2 had the lowest. Based on our interviews with schedulers, these findings illustrate that the difference in coding accuracy is associated with differences in workflow among the regions.

For instance, in Region 2, schedulers are responsible for pre-operative CPT codes entry and verification while surgeons are not required to provide CPT codes at time of surgical case requests (see Table 2). Region 2, interestingly, has the greatest proportion of incorrect CPT code entries among the three regions. In contrast, Region 3, which had the highest proportion of correctly entered CPT codes, is the only region where CPT codes are required when a surgical case request is submitted. Considering these results, when greater responsibility is burdened on schedulers with less communication from surgeons, there is a greater likelihood for CPT codes to be entered incorrectly.

4.2 Ramifications of coding inaccuracies

Prior studies have focused on interventions to optimize operating room (OR) scheduling with the goal of improving OR utilization including implementing templates, artificial intelligence, and OR control towers.^[14–16] Few studies have

concentrated on the downstream implications of the surgical scheduling process. Our interviews with surgical schedulers revealed that the variability in the surgical scheduling process existed both within and across the healthcare system. Schedulers also emphasized the importance of developing a standard workflow to support accurate and efficient communication about the requested surgery. This concept is supported by prior studies that have shown how valuable information can be lost when poor workflows impede communication or increase cognitive load, including interruptions.^[17]

In our study, \$5.4 million was lost in the study period due to inaccurate code entry, including denials of pre-operative entries that do not match post-operative codes. These implications are important to consider as surgeons are responsible for the operation and post-operative CPT code entry, but are often removed from the insurance pre-authorization process.^[18] If a surgery case is denied, this can negatively impact physician earnings and create administrative burdens related to managing denials.^[19] OR efficiency and resource allocation issues can arise from improper CPT code entry. Procedures with multiple components or surgeons involved require multiple CPT codes, and any missing or incorrectly entered code could result in missing equipment, for instance.^[20] Likewise, if an inpatient case is accidentally scheduled as an outpatient case, this could lead to issues in hospital capacity management. Based on prior studies, even presumed uniform procedures including thyroidectomies, were found to have variability in scheduling that increased costs for a hospital system.^[21] Taken together, these studies show how systematic assessment and consistency could help reduce unnecessary waste and instrument usage while simultaneously improving efficiency and patient-centered care.

4.3 Recommendations for surgical scheduling standardization

Based on our findings, we propose the adoption of a standardized scheduling process in the healthcare system. Our goal is to improve the efficiency of CPT entry to prevent downstream consequences including inefficient OR equipment allocation and cancellations. Our proposal is to standardize the scheduling workflow and allow for cross-coverage between schedulers of different sites and subspecialties, a repeated concern that was mentioned in our scheduling interviews. As wide variability in coding for similar procedures exists across surgeons and institutions, careful attention should be spent when designing a best practice for accurately scheduling surgeries.^[22, 23]

Modeled after Region 3 which had the highest proportion of accurately entered codes, our proposal workflow would implement changes such as requiring surgeons to provide pre-

operative CPT entries. Our proposed system is as follows: once a surgery is decided upon, the surgeon will first communicate information to the schedulers, including the CPT code. Then, the schedulers will submit a case request for a procedure to be scheduled. Authorization and verification can then take place, such as reviewing insurance coverage. As a result, a major component of our proposal is to standardize the way surgeons communicate the surgery that needs to be scheduled to schedulers. As schedulers referenced difficulty obtaining necessary information from surgeons, our proposal involves creating an order in the electronic medical record that surgeons would be required to fill out. These forms would require surgeons to enter CPT codes for the expected procedure, thus facilitating efficient communication of information to schedulers in a standardized manner.

Once the workflow is standardized across the healthcare system, training resources can be maintained in a single source and referenced by schedulers. Surgeons will also be educated on how to access and enter the order. With the implementation of standardized forms containing required CPT information, our recommendations would allow schedulers to more easily access information necessarily to plan a procedure. To assess the resulting changes in coding accuracy, we lastly propose to analyze CPT entry on a bi-monthly basis to ensure that the proportions of inaccurate codes and consequent denials decline. We will also continue to evaluate the effects on insurance denials and lost reimbursement. Ultimately, we believe that CPT code standardization will ameliorate the burden placed on surgeons and schedulers by requiring a standard set of information.

4.4 Limitations of our study

Our findings demonstrate that there is great variability in scheduling and code entry across different regions of a healthcare system that could benefit from workflow standardization. However, there are a few objective limitations to our approach. This study only characterized the surgical work-

flow and accuracy of CPT entry within a single multi-center health system. As a result, our exact results will not generalize to other systems. Nevertheless, this is an issue that other systems may want to examine to understand their own process and performance. Our analysis potentially underestimates the total revenue lost resulting from the current lack of surgical scheduling standardization. We did not include indirect costs such as time spent disputing denials, cancellation of surgeries, and OR inefficiency. Our study also does not quantify the impact on surgeon salaries that are dependent on collections. Nonetheless, this study provides insight on the ramifications of an inefficient and inaccurate surgical scheduling process.

5. CONCLUSIONS

CPT codes were designed to standardize the communication about services provided by healthcare workers to stakeholders and carries valuable information within the surgical scheduling process. Our study depicts how major barriers of accurate CPT code entry are related to differences in workflow and communication of information between surgeons and schedulers. Our recommendation and future directions are focused on the standardization of the overall scheduling process within the healthcare system. Our proposal focuses on standardizing how surgical schedulers schedule surgeries. We also propose a workflow of how surgeons would request surgeries utilizing a standardized form to ensure CPT code information is communicated. Ultimately, we believe that standardization of the scheduling process can improve CPT code entry accuracy, thus reducing denials and improving physician reimbursement.

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CONFLICTS OF INTEREST DISCLOSURE

The authors declare they have no conflicts of interest.

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