



AOA Critical Issues in Education

Current Procedural Terminology Code Selection, Attitudes, and Practices of the Orthopaedic Surgery Resident Case Log

A Survey of Residents and Program Directors

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Introduction: The Accreditation Council for Graduate Medical Education Resident Case Log is one of the primary tools used to track surgical experience. Owing to the self-reported nature of case logging, there is uncertainty in the consistency and accuracy of case logging. The aims of this study are two-fold: to assess current resident case log Current Procedural Terminology (CPT) code selection and practices across orthopaedic surgery residencies and to understand current attitudes of both program directors (PD) and residents surrounding case logging.

Methods: Residents and PDs from 18 residency programs received standardized, consensus-built surveys distributed through the Collaborative Orthopaedic Educational Research Group. Resident surveys additionally contained clinical orthopaedic subspecialties vignettes on sports, trauma, and spine. Each subspecialty section contained 4 clinical vignettes with stepwise increases in complexity/CPT coding procedures.

Results: One hundred sixteen residents (response rate: 28.4%) and 16 PDs (response rate: 88.9%) participated. Formal case log training was reported by 53.0% of residents and 56.3% of PDs. A total of 7.8% of residents rated themselves “excellent” at applying CPT codes for the case log, while 0.0% PDs rated their residents' ability as “excellent.” In total, 40.9% of residents and 81.3% of PDs responded that it was “extremely important” or “very important” to code accurately ($p = 0.006$). Agreement between resident CPT code selection and number of cases and procedures logged for each clinical vignette was conducted using Fleiss' kappa. As the clinical vignettes increased in complexity, there was a decreasing trend in kappa values from the first (least complex) to the last (most complex) clinical vignette.

continued

*A list of the Collaborative Orthopaedic Educational Research Group members is provided in a Note at the end of the article.

Disclosure: The **Disclosure of Potential Conflicts of Interest** forms are provided with the online version of the article (<http://links.lww.com/JBJSOA/A640>).

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Conclusions: The inconsistent case logging practices, dubious outlook on case log accuracy and resident case logging ability and attitude, and lack of formal training signals a need for formal, standardized case log training. Enhanced case logging instruction and formalized educational training for PDs and residents would be a meaningful step toward capturing true operative experience, which would have a substantial impact on orthopaedic surgery resident education and assessment.

Introduction

The Accreditation Council for Graduate Medical Education (ACGME) Resident Case Log is one of the primary tools used to track residency clinical skills exposure¹⁻⁴. Residents are expected to record cases in which they participated by entering corresponding Current Procedural Terminology (CPT) codes to count cases for which there is ACGME mandated minimum case numbers and capture the individual resident operative experience^{3,4}. There is uncertainty in the consistency and accuracy of case logging due to its self-reported nature^{1,3,5,6}. There is a potential for “logging related” apparent divergence among programs that may result in variation in case log numbers, even when such differences do not exist^{1,3,4,6}. Such discrepancies in case log numbers could result in notifications for improvement or citations to the program, and in rare instances, lead to program probation or affect accreditation.

Despite the importance of case log records, studies have shown a lack of standardization across orthopaedic surgery residencies^{3,4,6,7}. A survey of orthopaedic surgery residents in 2011 found there was significant variability in the number and types of CPT codes selected⁴. There was also a large difference in the number of logged cases when comparing the 90th and 10th percentile case log reporting programs⁶. Such discrepancies in case logging practices and CPT code selection are not isolated to orthopaedics and have been observed in a number of specialties⁸⁻¹². Even so, owing to differing case logging practices across orthopaedic residency programs, case log data may not be representative of true resident operative experience^{3,6}.

In July 2013, the ACGME modified and updated its case log guidelines under the Next Accreditation System (NAS)^{2,13}. Before these changes, residents included all procedures during each surgery for a single case log entry². Under the new NAS guidelines, only one primary CPT code is allowed for each case log entry that will count toward case numbers^{2,13}. Since the implementation of the NAS guidelines, there has been minimal investigation into case logging practices among orthopaedic surgery residencies. The aims of this study are twofold: to assess current resident case log CPT code selection and practices across orthopaedic surgery residencies, and to understand current attitudes of both program directors (PD) and residents surrounding case logging.

Methods

After Institutional Review Board exemption was obtained, 2 separate surveys were created and distributed to participating programs (Appendix). One survey was sent to residency PDs and the second survey was sent to orthopaedic

surgery residents. A total of 18 PDs and 403 orthopaedic surgery residents from 18 ACGME-accredited residency programs received surveys. Surveys were distributed through the Collaborative Orthopaedic Educational Research Group (COERG), a consortium of orthopaedic residency programs dedicated to improving the quality of resident education and faculty development research. The questionnaires were sent to the PD who was asked to electronically share the resident survey with all post-graduate year (PGY)-1 through PGY-5 categorical residents. Two follow-up emails were sent over 6 weeks.

Survey Demographic Questions

Survey demographic questions for residents included post-graduate year of study, age, self-identified sex, number of orthopaedic surgery residents in each year cohort, hospital setting, and geographic region (Table I). PD demographic questions were similar except for the inclusion of the number of years in practice (Table II). Surveys were anonymous; no personally identifiable information was collected.

Survey Objectives

Surveys were designed to assess 3 areas of interest: case log training, attitudes toward case logging, and case logging practices. Case log training was assessed by asking whether residents had formal case log training in their residency. Case logging attitudes were gauged by resident and PD perception of the residents' ability to accurately log cases and the importance of such accuracy. In the resident survey, case logging practices were further investigated through clinical vignettes that simulated case logging (Appendix). Residents were queried whether they logged their own cases and resources consulted or available for case logging. In addition, both groups were asked whether closed reductions, nail bed laceration repairs, and joint injections/aspirations were routinely logged.

Survey Development

The surveys were created through a consensus-driven, iterative process. The vignettes were developed to include clinical ambiguity with multiple codes and modifiers using “real” world cases that are frequently encountered by residents throughout their training. Trauma, sports, and spine were specifically selected because these subspecialties most often represented cases with numerous, “stacked” procedures, and thus facilitated the survey instrument to layer complexity as the vignettes progressed and allowed for the observed response of multiple CPT codes and procedures (Appendix). The surveys underwent multiple rounds of testing by orthopaedic surgery residents and were reviewed by

an Orthopaedic Surgery PD and Associate PD to closely mirror the case logging process. The surveys were built using REDCap, a secure web-based data capture tool, which was hosted at the senior author's institution^{14,15}. Survey responses were collected anonymously and managed within REDCap.

Statistical Analysis

Survey data were analyzed using the statistical software RStudio (Boston, MA). Attitudes toward the importance of CPT coding accuracy between residents and PDs were measured using χ^2 test. Chi-squared testing was also used to compare resident practices and PD instruction regarding logging joint injections/aspirations, closed reductions, and nail bed lacerations. Resident agreement of CPT code selection and number of cases and procedures logged were measured using Fleiss' Kappa, a measure of interrater agreement. The kappa value for each respective subspecialty's 4 clinical vignettes was compared using a one-sample analysis of variance (ANOVA) test.

Funding

This research received no funding.

Results

Eighteen COERG-associated residency programs indicated interest in participating and 16 of 18 PDs (response rate: 88.9%) and 116 of 403 residents (response rate: 28.8%) participated (Tables I and II).

Case Log Training

Formal case log training was reported by 53.0% of residents and 56.3% of PDs report providing formal training.

Case Logging Attitudes

Residents rated themselves "excellent" at applying CPT codes for the case log 7.8% of the time, while 0.0% PDs rated their residents' ability as "excellent" (Fig. 1). No PDs rated their residents' case logging ability as "below average" or "poor," unlike 16.5% of residents. In addition, 40.9% of residents vs. 81.3% of PDs responded that it was "extremely important" or "very important" to code case logs accurately (Fig. 2). There was a statistically significant difference in perceived importance of accurate case logging between residents and PDs ($p = 0.002$).

Case Logging Practices

All (100%) residents and PDs reported that residents log their own cases. Residents reported that they most frequently consulted the internet (87.8%), operative reports (42.6%), and other residents (27.8%) when selecting CPT codes. PDs reported that they most frequently encouraged residents to consult attendings (100%), operative reports (68.8%), and coding manual (62.5%) for CPT code selection. In comparison, 56.3% of PDs encouraged their residents to consult the internet, while among residents, only 6.1% used a coding manual and 14.8% consulted attendings (Table III).

Among residents, 44.3% report logging joint injections/aspirations, 78.3% report logging closed reductions, and 56.5%

TABLE I Orthopaedic Surgery Resident Demographics*

Orthopaedic Surgery Resident Respondents (N = 116)	
Postgrad year of study	
PGY-1	19.1% (22)
PGY-2	20.0% (23)
PGY-3	20.9% (24)
PGY-4	17.4% (20)
PGY-5	20.9% (24)
Research year	1.7% (2)
Age	
25-29 yrs old	40.9% (47)
30-34 yrs old	55.7% (64)
35-39 yrs old	2.6% (3)
40-44 yrs old	0.9% (1)
Gender	
Male	76.5% (88)
Female	20.0% (23)
Other	0.9% (1)
Prefer not to answer	2.6% (3)
Residency program setting	
University Hospital	49.6% (57)
Community Hospital	20.9% (24)
Multispecialty, Private Academic Institution	25.2% (29)
Military/Veteran Affairs	0.9% (1)
Other	3.5% (4)
Geographic region	
West	16.5% (19)
Southwest	0.0% (0)
Midwest	19.1% (22)
Southeast	25.2% (29)
Northeast	39.1% (45)

*PGY = post-graduate year.

report logging nail bed lacerations. Among PDs, 31.3% instruct residents to log joint aspirations/injections, 93.8% to log closed reductions, and 81.3% to log nail bed lacerations (Table IV). Although there was divergence in case logging practices between residents and PDs, there was no statistically significant difference ($p = 0.32, 0.15, 0.06$, respectively).

Clinical Vignettes

Fleiss' kappa was used to assess resident CPT code agreement and the number of cases and procedures each resident would log for each clinical vignette. Fleiss' kappa is a measure of interrater agreement that calculates a kappa value between -1 and 1 , with 1 signifying perfect agreement of CPT code selection, 0 signifying agreement no better than chance, and -1 signifying no agreement. Fleiss' Kappa values are shown in Figures 3 and 4. One-sample ANOVA found no statistically

TABLE II Orthopaedic Surgery Program Director Demographics

Orthopaedic Surgery Program Director Respondents (N = 16)	
No. of yrs in practice (post-training)	
0-5	12.5% (2)
6-10	37.5% (6)
11-15	6.3% (1)
16-20	31.3% (5)
>20	12.5% (2)
Age (yr)	
35-39	18.8% (3)
40-44	37.5% (6)
44-49	18.8% (3)
49-54	6.3% (1)
55-59	6.3% (1)
60-64	6.3% (1)
>65	6.3% (1)
Gender	
Male	68.8% (11)
Female	31.3% (5)
Residency setting	
University Hospital	81.3% (13)
Community Hospital	12.5% (2)
Multispecialty, Private Academic Institution	6.3% (1)
Other	0.0% (0)
Geographic region	
West	37.5% (6)
Southwest	0.0% (0)
Midwest	6.3% (1)
Southeast	18.8% (3)
Northeast	37.5% (6)

significant difference between orthopaedic subspecialties' kappa value for both CPT code selection and the number procedures and cases logged ($p = 0.24, 0.96$).

Discussion

The ACGME case log is viewed as an essential component of residency program accreditation and is intended to provide objective monitoring and assessment of resident surgical experience. However, this system is largely self-reported allowing for the possibility of variation between residents and residency programs. Since the implementation of the ACGME's NAS, there has been minimal study into updated case log practices, attitudes, and training. This is the only study post-NAS to examine the case log from both the resident and PD perspective and is the most comprehensive survey-based case logging simulation administered to orthopaedic surgery residents.

Inconsistencies in CPT code selection and case logging practices among residents aligns with studies in orthopaedics

and other specialties^{3,4,7-10,12,16,17}. Recent studies of general surgery residents found overall CPT code inaccuracy to be approximately 24% and 47%^{12,16}. Similarly, Okike et al. also observed that CPT codes were missed in resident case logs 46% of the time and extraneous codes were added 28% of the time³. Salazar et al. found significant differences in orthopaedic surgery CPT code selection when residents were presented with clinical vignettes⁴, and a foot and ankle case logging study found extremely low interrater agreement (0.04) between resident and surgeon CPT code selection⁸. Both studies were conducted before the implementation of NAS, which was designed to address some of the case logging issues. Even so, our findings suggest that despite the NAS guidelines, discrepancies remain in CPT code selection among orthopaedic surgery residents, especially as clinical vignettes became more complex.

Our results also demonstrated inconsistency in the number of procedures and cases logged by residents for each clinical vignette. Notably, agreement in the number of cases and procedures logged decreased as vignette complexity increased. There is currently no clear guidance from the ACGME Orthopaedic Residency Review Committee about how residents should approach case logging surgeries with multiple procedures and CPT codes. In cases such as this, the resident could log anywhere from one case with multiple CPT codes (one primary and multiple secondary CPT codes), to multiple, individual cases with a single primary CPT code and no secondary CPT codes. With many possibilities, there is significant variation and individual interpretation as to how a surgical experience could be logged. As such, the lack of standardization regarding how many cases and procedures are logged may artificially obfuscate actual resident surgical experience¹⁸.

In addition, there was an overall lack of consensus among residents in logging joint injections/aspirations, closed reductions, and nail bed lacerations. Given that closed reductions (specifically of the forearm/wrist) are an explicitly tracked minimum by the ACGME, there is concern that 21.7% of residents do not regularly log these procedures¹⁹. Moreover, although nailbed lacerations and joint injections are not explicit minimums, they do contribute to overall case numbers¹⁹. With approximately half of residents logging these procedures, it seems that these experiences are often not captured.

In the context of these findings, residents' low self-rating of their ability to select CPT codes and PDs' correspondingly low ratings of their residents' ability is concerning. The low agreement in CPT code selection, especially in complex vignettes, is not surprising given the lack of resident case logging confidence. A similar trend was seen by Murphy et al. with orthopaedic residents showing low accuracy and high discomfort in CPT code selection of foot and ankle cases⁸. There also seem to be incongruence in the coding resources PDs expect residents to consult and resources the residents actually use. Residents heavily favor the internet to reference CPT codes due to ease of use, despite possible inconsistencies in information on the internet, while 100% of PDs encourage residents to consult their attendings^{8,9}. A mere 12.2% of

Resident ability to apply CPT codes for ACGME case log

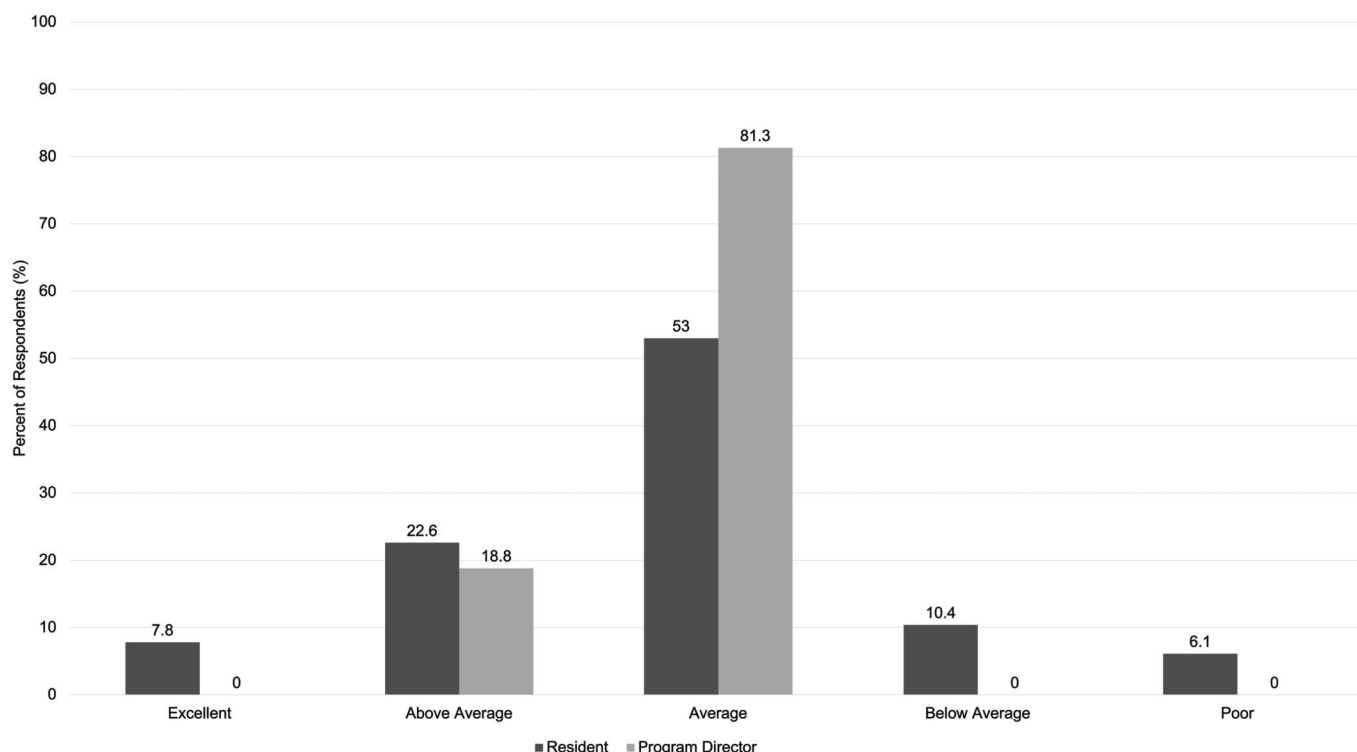


Fig. 1 Resident self-rating of ability to apply CPT codes for ACGME case log and program director rating of residents in their program's ability to apply CPT codes for the ACGME case log. Statistically significant difference between residents and program directors responding that it was "extremely important" or "very important" to code case logs accurately ($p = 0.002$). ACGME = Accreditation Council for Graduate Medical Education, and CPT = Current Procedural Terminology.

residents reporting it was "extremely important" to accurately code suggesting there may also be an attitudinal component contributing to case log inconsistencies. This difference in perceived importance of accurate coding between residents and PDs was found to be statistically significant ($p < 0.05$). The contrast between residents and PDs in overall case log attitudes and practices may signify a rift in program expectations vs. actual resident case logging behavior and perspective. Given this discrepancy, the attending surgeon could take the role to advise their resident with CPT code selection and case logging practices in a postoperative debrief to further enhance case logging education and reconcile program expectations and resident practices.

As aforementioned, inconsistencies in case log practices are not solely isolated to orthopaedic surgery residency programs and have been well-documented across numerous specialties^{3,4,7,9,10,12,17,20-22}. A general surgery resident case log study identified discrepancies in 24% of operative cases¹⁶, while another found CPT code selection to only be accurate approximately 53% of the time¹². Rosenberg et al. found large inconsistencies in case numbers among otolaryngology residency programs, which was posited to be due, in part, to a lack of standardization in CPT code unbundling prac-

tices¹⁷. Moreover, a multispecialty study consisting of neurosurgery, general surgery, and orthopaedics found an overall inaccuracy of 28% among residents' case logs⁷.

The attitudinal findings of our study are also congruous with literature in other specialties. A survey of general surgery residents found that only 4% felt the case log system was "very accurate" of operative experience¹¹. A survey of otolaryngology residency programs revealed similar findings with only 26.5% of residents and 35% of PDs indicating that they believe that case logs accurately reflect resident operative experience¹⁰. This was further reinforced by a multispecialty survey with only 11.3% of residents reporting that the case log was highly accurate⁹.

Given the importance of the case log for capturing resident surgical experience and impact on program accreditation, the low program engagement in formal case log training was surprising. A lack of case log education among orthopaedic residents has been posited to potentially contribute to inappropriate CPT code selection and coding practices^{3,4,8}. Moreover, the absence of case log training has also been noted across multiple specialties. A study of general surgery residents found that only 42% received formal training on how to log cases¹¹. Another survey of general surgery residents found that 37%

Importance of accurate coding in the ACGME case log

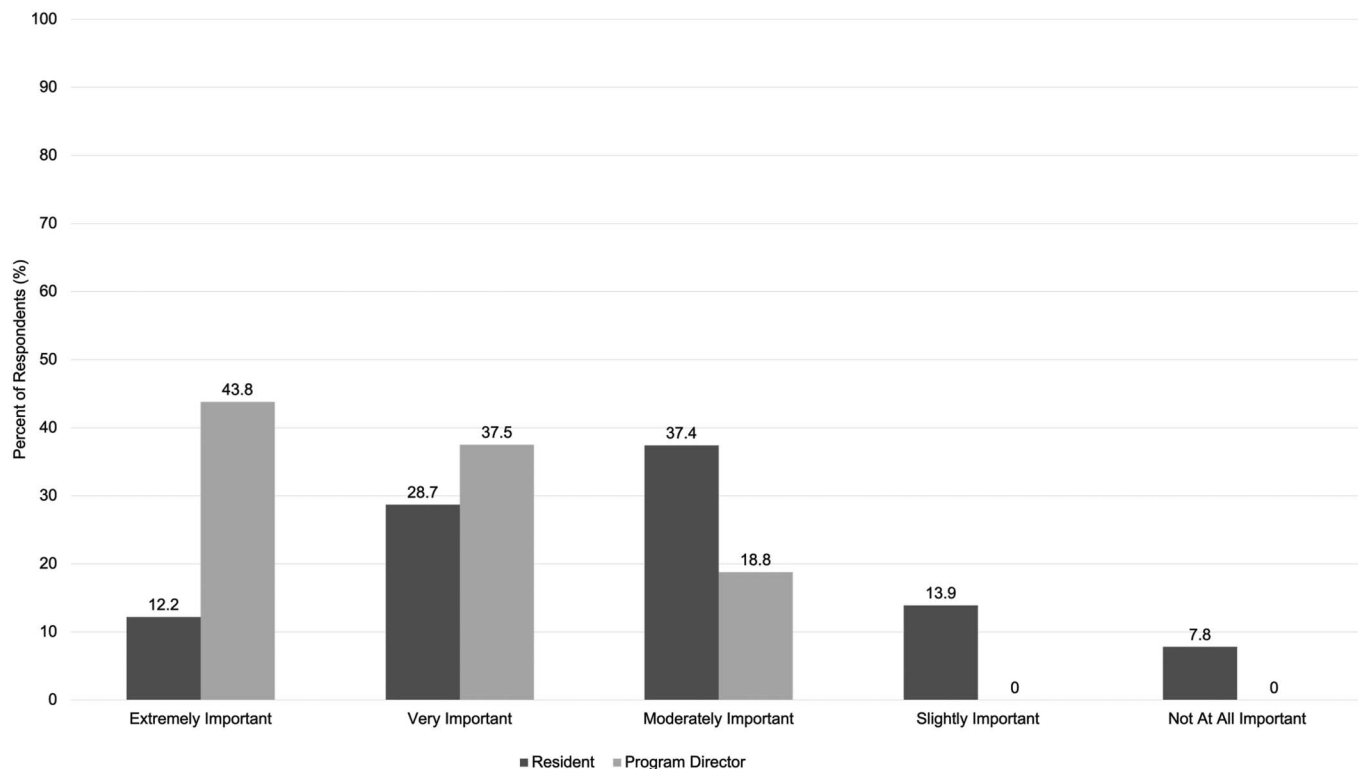


Fig. 2 Comparison between residents and program directors concerning the perceived importance of accurate coding in the ACGME case log. ACGME = Accreditation Council for Graduate Medical Education.

TABLE III Resources Residents Regularly Consult and Resources That Program Directors Encourage Residents to Consult When Selecting CPT Codes for the ACGME Case Log*		
	Resident (%)	Program Director (%)
Internet	87.8	56.3
Operative reports	42.6	68.8
Coding manual	6.1	62.5
Billing database	2.6	6.3
Residency tip sheet	7.0	31.3
ACGME resources	14.8	50.0
Attendings	14.8	100.0
Fellows	4.3	6.3
Other residents	27.8	43.8
Someone logs cases on my behalf	0.0	0.0
Other	5.2	0.0

*ACGME = Accreditation Council for Graduate Medical Education, and CPT = Current Procedural Terminology.

cited a “lack of formal education on procedural coding” as a challenge to accurate case log coding¹². The implementation of formal case log training has been recommended in studies across multiple specialties⁸⁻¹². A multispecialty study by Cadish et al. found that departmental instruction on methods for tracking cases improved resident logging habits and increased frequency of logged cases⁹. A recent otolaryngology study recommended an initiative to provide more clear, standardized instruction on case logging to residents¹⁰, and it has been recommended by general surgery studies for formal case log training as well^{11,12}. Although the underlying causes of case log inconsistencies is multifactorial, the absence of formal case log training curriculum should be addressed within orthopaedic surgery residencies to provide a standardized foundation. Further investigation into a formal case log education curriculum is a next step for the authors. Moreover, such an initiative would appropriately be within the role of the ACGME Orthopaedic Residency Review Committee to formalize case log training for CORD PDs and residents.

There were several limitations to our investigation. No standardized or evidence-based survey has been developed to empirically test the questions that we specifically sought to answer. As such, our survey design was expert and consensus-

TABLE IV Resident Case Logging Practices and Program Director Case Logging Instruction in the Specific Clinical Scenarios of Closed Reductions, Nail Bed Lacerations, and Joint Injections/Aspirations			
	Resident (%)	Program Director (%)	p-value
Log closed reductions performed in the emergency department/at the bedside?			
Yes	78.3	93.8	0.146
No	21.7	6.3	
Log nail bed laceration repairs performed in the emergency department/at the bedside?			
Yes	56.5	81.3	0.059
No	43.5	18.8	
Log joint injections/aspirations?			
Yes	44.3	31.3	0.321
No	55.7	68.8	

of approximately 30% are common among unsolicited electronic surveys administered to residents and surgeons, and surveys exceeding 1,000 words have lower response rates²³⁻²⁵. Although high response rates are the ideal, Hendra et al. found little relationship between response rate and nonresponse bias²⁶. In addition, Ebert et al. concluded that a lower response rate does not necessarily increase the level of selection bias²⁷. As such, response rates do not typically change the overall narrative of the survey. Our survey captured responses that were evenly distributed across postgraduate years, had a gender distribution representative of current orthopaedic surgery residency demographics (20.0% female respondents for the survey vs. 18.3% of current orthopaedic surgery residents), and included 18 orthopaedic surgery residency programs across multiple regions and practice settings which further contributed to the generalizability of our study despite the lower response rate^{28,29}. The clinical vignettes only tested the orthopaedic subspecialties of trauma, sports, and spine; it is unclear whether there are differing case logging practices in other subspecialties. However, the inclusion of all orthopaedic subspecialties would have made the resident survey too long. Nonetheless, our survey of 12 cases across 3 orthopaedic subspecialties provided the most extensive survey investigating case logging practices in the current literature.

based to achieve these aims. We posit that this provided a balanced and length appropriate tool, but additional study may be required to demonstrate consistency. The response rate of 28.8% for residents was not unexpected because response rates

Conclusion

Our study found a lack of orthopaedic surgery resident consistency in case log CPT code selection and number of procedures and cases logged under the current system. This

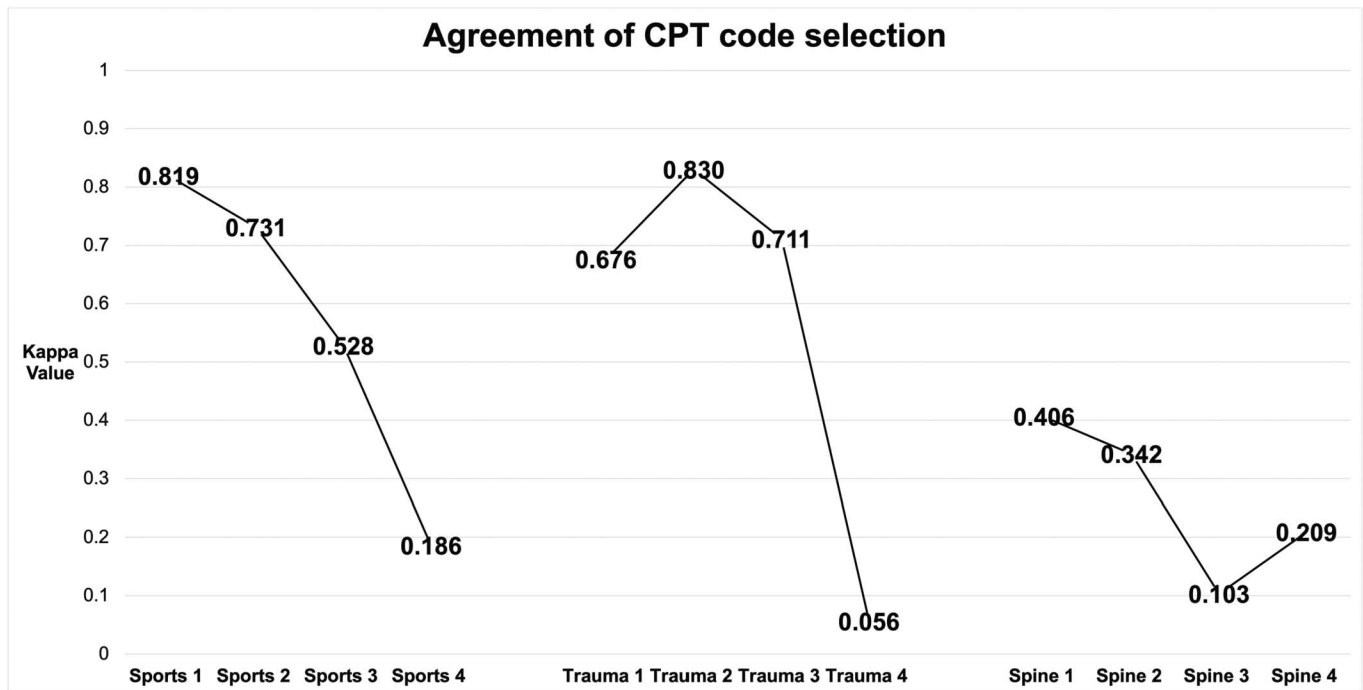


Fig. 3
Fleiss' Kappa analysis showing interrater agreement of resident CPT code selection for progressively more complex clinical vignettes in the orthopaedic subspecialties of trauma, sports, and spine. CPT = Current Procedural Terminology.

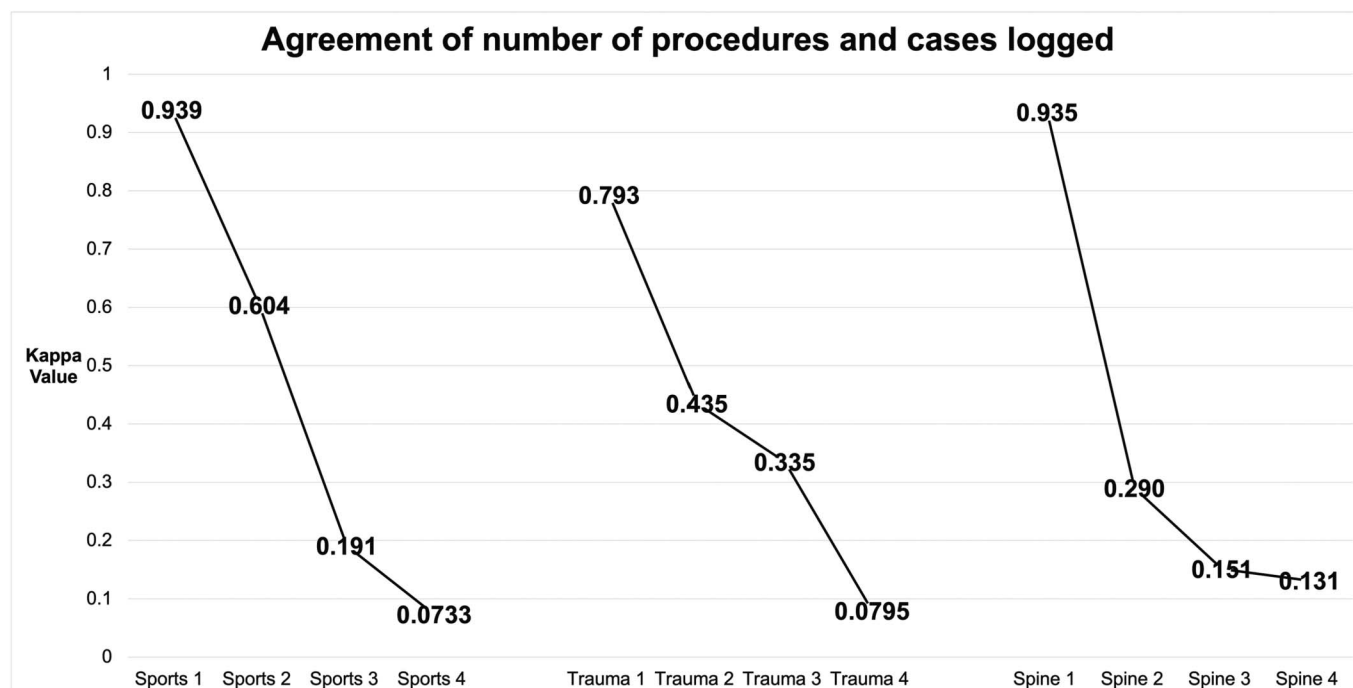



Fig. 4
Fleiss' Kappa analysis showing interrater agreement of the number of cases and the number of procedures logged per case for progressively more complex clinical vignettes in the orthopaedic subspecialties of trauma, sports, and spine.

trend was especially evident as the clinical vignettes became more complex. The inconsistent case logging practices among orthopaedic surgery residents, dubious outlook on accuracy and resident case logging ability and attitude, and lack of formal case log training were consistent with case log study findings across multiple other specialties. Although the cause of these findings is likely multifactorial, the widespread incidence of inconsistent case logging practices signals a need for formal, standardized case log training specific to specialty. Enhanced case logging instruction and formalized educational training from the ACGME Orthopaedic Residency Review Committee for CORD PDs and residents would be a meaningful step toward capturing true operative experience, which would have a substantial impact on orthopaedic surgery resident education and assessment.

Appendix

 Supporting material provided by the authors is posted with the online version of this article as a data supplement

at [jbjs.org \(http://links.lww.com/JBJSOA/A641\)](http://links.lww.com/JBJSOA/A641). This content was not copyedited or verified by JBJS. ■

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