The American Journal of Surgery 217 (2019) 834–838

Contents lists available at ScienceDirect

The American Journal of Surgery

journal homepage: www.americanjournalofsurgery.com

Implementation of a medical coding curriculum for surgery residents

Katherine A. Kelley [a, 1], Heather E. Hoops [a, 1], Laurene Palmer [a], Norman A. Cohen [b], Karen J. Brasel [a, *]

[a] Department of Surgery, Oregon Health and Sciences University, Portland, OR, USA
[b] Department of Anesthesia and Perioperative Medicine, Oregon Health and Sciences University, Portland, OR, USA

ARTICLE INFO

Article history:
Received 5 November 2018
Received in revised form
4 February 2019
Accepted 20 February 2019

ABSTRACT

Background: Medical coding knowledge is important for practice. We hypothesized that general surgery residents lack confidence in medical coding (MC) and that implementation of focused didactics would increase resident confidence and knowledge.

Methods: A MC curriculum was delivered to general surgery residents covering domains of the global procedural period (GPP), evaluation and management (E/M) coding, and hospital payment and quality metrics (HPQM). A 21-question survey was developed to assess resident comfort coding knowledge. Efficacy of the MC curriculum was measured by anonymous paper pre-test and post-test surveys.

Results: Pre-test ($n = 50$) findings revealed that residents were uncomfortable with MC. Following three MC lectures, the post-test ($n = 24$) demonstrated significant increases in resident comfort with MC ($p < 0.001$) and resident performance on domains of GPP ($p = 0.014$), E/M ($p < 0.001$), and HQPM ($p = 0.025$).

Conclusions: Residents feel uncomfortable with MC without formal education. This study supports a focused curriculum to prepare residents for practice.

Introduction

Medical coding knowledge is vital for future professional success as a surgeon regardless of the choice to enter an academic, hospital-employed, or private practice. However, previous studies in various specialties have identified a lack of medical coding and billing education in residency training across multiple specialties.[1–5] Lack of medical coding knowledge ill-prepares residents for future independent practice,[6] inaccurate coding.[3] Lack of medical coding knowledge is also prevalent among general surgery faculty, which limits the ability for residents to learn medical coding from faculty during standard clinical experiences.[4]

General surgery program directors recognize the need for focused training, with 87% strongly agreeing residents should be trained in business and practice management.[7] However, many program directors struggle with how to incorporate medical coding and other aspects of systems-based practice into their curriculum,[8] despite the fact that systems-based practice is an Accreditation Council of Graduate Medical Education (ACGME) core competency required for graduation.[9]

Based on these findings, we believe it is important to institute a formal medical coding and documentation curriculum. At the time of this study, our institution's General Surgery residents had no formal coding or medical documentation educational sessions. The objective of this study was to evaluate general surgery residents' comfort and understanding of medical coding and assess improvement in comfort level and knowledge after educational interventions. We hypothesized that general surgery residents lack comfort in medical coding and that the introduction of focused didactic lectures would increase resident confidence and improve knowledge of the medical coding across multiple domains.

Methods

This was an IRB approved study. A medical coding curriculum and corresponding 21-question anonymous survey was developed by the general surgery residents and faculty within the Department of Surgery in collaboration with the Department of Surgery Revenue Cycle Manager and Director of the Clinical Documentation Improvement project at our institution. The goal was to cover basic

* Corresponding author. Division of Trauma and Acute Care Surgery, Department of General Surgery, Oregon Health and Science University, USA.
E-mail address: brasel@ohsu.edu (K.J. Brasel).
[1] Kelley and Hoops are co-first authors.

https://doi.org/10.1016/j.amjsurg.2019.02.027
0002-9610/

concepts in office-based and hospital-based coding, as well as to highlight common mistakes residents make in daily documentation in both outpatient and inpatient settings.

The coding curriculum consisted of three 60-min interactive PowerPoint lectures with multiple-choice, short answer and open-ended questions were administered during 90-min blocks of protected educational time over a 7-month time period. A PowerPoint lecture format was chosen due to the large group size (77 categorical general surgery residents plus undesignated preliminary undesignated surgery residents) and the ratio of teachers to learners for the educational sessions. The first session focused on evaluation and management (E/M) coding and was led by the Revenue Cycle Manager of the Department of Surgery who is a Certified Professional Coder (LP). The second session focused on hospital-based documentation (HPQM) and was led by the Physician Director of the Clinical Documentation Improvement project (NC). The third session, which reviewed main points of the first two sessions and introduced the global procedure period (GPP), was led by two senior-level general surgery residents who received training at the American College of Surgery Coding and Billing workshop (HH and KK). Sessions were supplemented with laminated reference cards for E/M coding criteria and common surgical complications & co-morbidities (CCs/MCCs). Due to time and personnel constraints within the yearly resident curriculum, procedure-based coding was not addressed and served as a control for our survey.

The survey consisted of five Likert-scale questions measuring resident comfort with clinical documentation and sixteen multiple choice questions covering medical coding domains of global procedural period (GPP), evaluation and management (E/M), procedural documentation (PD), and hospital payment and quality metrics (HPQM). Examples of questions from each of the four coding domains are included in Table 3. A paper copy of the anonymous survey was distributed to a convenience sample of General Surgery residents during protected educational time October 2016. Demographic data only consisted of clinical PGY level. Following the three-session coding curriculum, the identical survey was administered as a post-test in paper form approximately 7 months later in May 2017, one week following the final educational session. Participation in conferences was unable to be tracked due to the anonymous nature of the surveys.

Data was entered and maintained in a password protected computer within an Excel document. Pooled data before and after the intervention were compared using a Mann-Whitney *U* test or chi-square test, where appropriate. The alpha significance level was set at ≤ 0.05. A sub-group analysis was performed, comparing junior resident performance (clinical PGY1-2) to senior resident performance (clinical PGY3-5).

Results

The pre-test survey was completed by 50 of 77 general surgery residents. Thirty junior residents (PGY1-2), 17 senior residents (PGY3-5), and 3 residents who did not specify PGY level completed the survey. On the 5-point Likert scale survey questions, residents responded that medical coding knowledge is important in residency and very important in independent practice (Fig. 1, Table 1). In regards to comfort level, residents felt very uncomfortable with the medical coding process, and uncomfortable with their ability to optimize documentation for quality metric purposes (Fig. 2, Table 1). Resident performance on 16 multiple choice questions across all four coding domains tested was poor. The average percentage of correct responses was 33% for GPP, 60% for E/M, 64% for PC, and 56% for HPQM domains (Table 2).

On subgroup analysis, there were no statistically significant differences between junior and senior residents for any of the 5-point Likert questions regarding resident values and comfort with MC. Junior and senior resident performance was also similar on the 16 multiple choice questions for MC domains of GPP, E/M, PC, and HPQM.

Following three 60-min focused educational sessions on

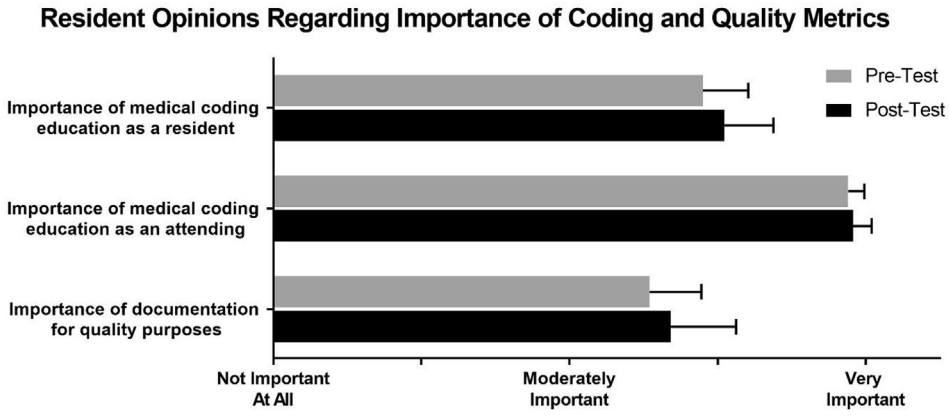

Fig. 1. Resident responses to questions regarding importance of coding and quality metrics.

Table 1
Descriptive Statistics and Statistical Analysis of Resident Survey Responses. P-values in bold indicate statistically significant differences between pre-test and post-test responses.

	Pre-Test Mean, (SD) (N = 50)	Post-Test Mean, (SD) (N = 23)	Mann-Whitney *U* Test Result
Q1: importance of coding education as a resident	3.90 (1.11)	4.04 (0.77)	p = 0.91
Q2: importance of coding education as an attending	4.88 (0.39)	4.91 (0.29)	p = 0.92
Q3: Comfort level with coding process	1.52 (0.86)	2.48 (1.04)	**p < 0.001**
Q4: importance of documentation for quality purposes	3.54 (1.23)	3.68 (0.99)	p = 0.74
Q5: comfort with optimizing documentation for coding	2.30 (1.22)	3.26 (1.01)	**p = 0.003**

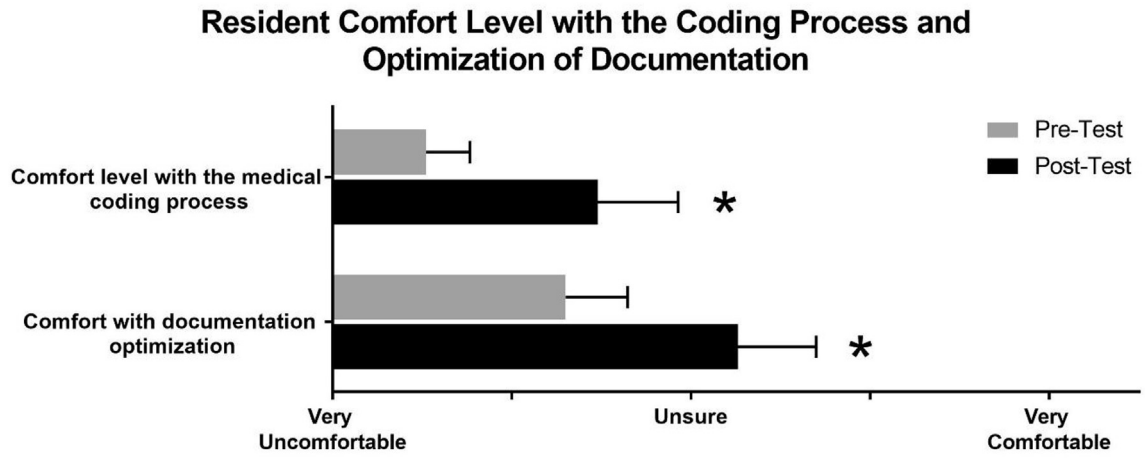

Fig. 2. Resident responses to comfort level with coding and documentation. A "*" Denotes a statistically significant difference ($p < 0.05$) between groups.

Table 2
Descriptive Statistics and Chi-Squared Test Results for Resident Performance on Multiple Choice Questions Across Four Coding Domains. P-values in bold indicate statistically significant differences between pre-test and post-test performance.

	Pre-Test % Correct (N = 49)	Post-Test % Correct (N = 20)	Chi-Squared Test Result
Global Procedural Period (3 Questions)	33%	52%	**p = 0.01**
Evaluation and Management (E/M) (5 Questions)	60%	82%	**p < 0.001**
Procedure Coding (4 Questions)	64%	55%	p = 0.61
Hospital-based Documentation (4 Questions)	56%	68%	**p = 0.02**

medical coding, the post-test was completed by 24 general surgery residents, including 11 junior residents and 13 senior residents. Responses demonstrated similar resident opinions regarding the importance of medical coding knowledge during residency and in practice (Table 1, Fig. 1). The post-test responses demonstrated a significant improvement in resident comfort level associated with the medical coding process ($p < 0.001$) and documentation to optimize quality metrics ($p = 0.003$) (Table 1, Fig. 2).

Compared to the pre-test, there was an improvement in resident performance on the 16 multiple choice questions in domains of GPP ($p = 0.014$), E/M ($p < 0.001$), and HPQM ($p = 0.026$). Resident performance in procedural coding domains on the post-test was similar to the pre-test ($P = 0.61$). (Table 2, Fig. 3). On sub-group analysis, there were no significant differences in survey responses to comfort questions or in percentage of correct multiple-choice questions between junior and senior residents on the post-test.

Discussion

Improved resident education in systems-based practice is needed in an era where healthcare costs and quality metrics are under increased scrutiny. Our current healthcare system relies heavily on physician and physician-trainee documentation of medical co-morbidities and amount of work done, which directly affects professional fees and hospital payments. Medical coding of provider documentation is also used for hospital and surgeon quality metrics. Understanding medical coding and billing is an essential step in optimizing documentation for both billing and quality purposes.

Our study demonstrates that general surgery residents understand the importance of medical coding both in residency and in future practice, but feel uncomfortable with the topic and in their documentation abilities. A focused curriculum in medical coding domains of the global procedural period, evaluation and management, and hospital-based payment and quality metrics led to improved comfort and knowledge among general surgery residents. Additionally, junior and senior residents shared similar comfort levels and performance on medical coding domains on the pre-test suggest that medical coding is not learned through standard clinical experiences during general surgery residency. Therefore, a focused curriculum is needed to better prepare general surgery residents for future practice.

Introducing formal medical coding and billing education for faculty may be helpful in providing residents with ongoing education and feedback in clinical settings to improve upon a foundation of basic knowledge gained through didactic educational sessions.[10] Alternatively, resident teaching can be facilitated by clinic staff and medical coders.[11] Methodology aside, formal education leads to improved documentation which in turn increases surgical coding compliance, and improves quality metrics such as expected mortality and case-mix index.[12,13] Formal medical coding education for both residents and faculty lead to significant increases in professional fees and hospital charges.[10,14] An increased clinical revenue generated by improving documentation, may be leveraged to improve educational curriculum and resources for both faculty and residents, as surgery residents are responsible for a significant percentage of medical documentation in both outpatient and inpatient contexts.

Ideally formal medical coding education would be incorporated into a practice management curriculum, that would also include contract negotiation, personal finance, marketing and job searching, as well as insurance coverage.[7,15] However, the majority of general surgery residency programs devote 3 h or less per year to medical coding and practice management topics.[7] Based on our study and those of prior studies, interventions do not need to be extensive. A study of otolaryngology residents demonstrated that a ninety-minute billing and coding education session is effective in preparing residents with limited experience to more competently bill and code.[16]

The results of this study have influenced the Department of Surgery at our institution by providing coding lectures to incoming interns and in implementing a quarterly practice management curriculum for general surgery residents that spans over a 2-year cycle, with three sessions devoted to coding and billing.

Table 3
Sample Questions from the Medical Coding Survey

Global procedural period (GPP)
You are seeing a patient in clinic for evaluation of a reducible inguinal hernia. The patient elects to have surgery and you schedule the case for the following week. Your new patient clinic note is not separately billable, as this is part of the 90 day global period for an inguinal hernia repair. a. True b. False
What is the global period for major procedure? a. Day of surgery to 30 days post-op b. Day of surgery to 90 days post-op c. Day prior to surgery to 30 days post-op d. Day prior to surgery to 90 days post-op
Evaluation and Management (E/M)
You are seeing a new patient in surgical oncology clinic who is medically complex. The information you provide in your note in the HPI, ROS, past medical/family/social history, and assessment/plan sections can be used to support level of billing with proper attending attestation. a. True b. False
Which components of a note matter for a new patient encounter in clinic? a. History, Review of systems, past medical history b. Physical exam c. Assessment and plan (medical decision making) d. Any 2 of the 3 categories e. All of the above
Hospital Payment and Quality Metrics (HPQM)
Complications/Comorbidities (CC's) and Major Complications/Comorbidities (MCCs) for patients undergoing surgery effect the DRG (Diagnosis related group), reimbursement and quality metrics for the hospital. a. True b. False
A patient becomes confused 1 day after a laparoscopic cholecystectomy for acute cholecystitis. The confusion seems to be associated with pain medication administration. The workup for the confusion was unremarkable. Which of the following terms would count towards a CC (comorbidity/complication) in determination of reimbursement and quality metrics for this patient? a. Confusion b. Altered mental status c. Drug-induced delirium d. None of the above
Procedural Documentation (PD)
Outpatient procedures are coded and billed using a. CPT codes b. E/M codes c. ICD-10 codes d. DRG (diagnosis-related group) e. None of the above
When debriding a wound and placing a wound vac the following is needed? a. Size of wound vac in square centimeters b. Dimensions of wound (Length, Width, Depth) c. Area of the wound which was debrided d. How it was debrided e. All of the above

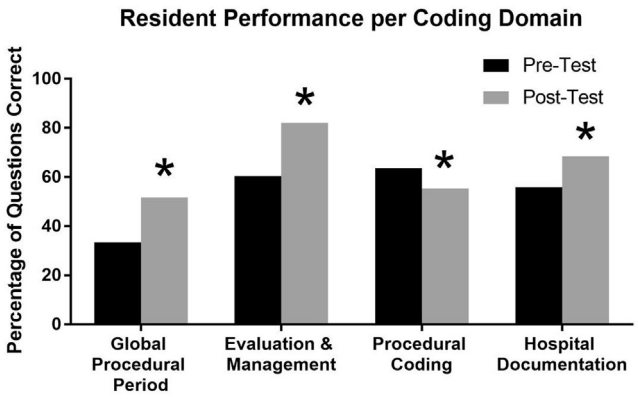

Fig. 3. Resident performance on Multiple Choice Question Survey before and after educational intervention. A "*" Denotes a statistically significant difference ($p < 0.05$) between groups.

Additionally, there has been both a department-wide and institution-wide effort to improve the inpatient documentation of all providers. Within the Department of Surgery, faculty undergo billing and coding onboarding training with their divisional manager and have additional opportunities for one-on-one coaching sessions. On an institutional level, a mandatory online educational module was administered to all faculty, residents, and advanced practice providers shortly after completion of this study in an effort to improve hospital payment and quality metrics across the institution.

Limitations of this study include its single-institution design. Resident comfort level and knowledge of medical coding may differ among institutions. However, our study demonstrates similar findings in regards to resident comfort level to other published studies.[4,14] Another limitation of this study is sampling bias. Due to the anonymity of the survey there was no way to determine whether the same residents completed the pre-test and post-test. Similarly, there was no way to determine whether the residents

who completed the post-test had attended the three medical coding educational sessions. However, these biases would make it less likely to see differences between pre-test and post-test surveys. It is possible that the effect of the educational intervention was greater than measured using the methods in this study.

In future studies, we hope to prove the effectiveness of a medical coding curriculum by measuring the level of service and CC/MCC capture rate before and after educational intervention. Demonstrating improvement in resident documentation may help justify the education time used for medical coding curriculum during residency and may lead to more institutional financial support and resources for implementation of such a curriculum.

Conclusions

This study demonstrates residents feel uncomfortable with medical coding without formal education. This study supports the efficacy of a focused curriculum to improve resident comfort level and knowledge of medical coding across multiple domains. At our institution, we have introduced additional medical coding training for both residents and faculty at both a departmental and institutional level. However, there is a need for standardization of a practice management curriculum to address deficiencies in resident knowledge in medical coding and billing as well as other subjects, such as contract negotiation, financial management and reimbursement. Formal practice management education that includes medical coding will better prepare residents for future independent practice.

Disclosures

The authors of this manuscript have no conflicts of interest to disclose.

Acknowledgements

We would like to thank Laszlo Kiraly MD for his critical review of the manuscript and for closing the presentation of this study at the 2018 North Pacific Surgical Association annual meeting. We would also like to thank Daniel Herzig MD for his assistance with study design.

References

1. Williford LE, Ling FW, Summitt Jr RL, Stovall TG. Practice management in obstetrics and gynecology residency curriculum. *Obstet Gynecol*. 1999;94(3):476–479.
2. Howell J, Chisholm C, Clark A, Spillane L. Emergency medicine resident documentation: results of the 1999 american board of emergency medicine in-training examination survey. *Acad Emerg Med*. 2000;7(10):1135–1138.
3. Ng M, Lawless ST. What if pediatric residents could bill for their outpatient services? *Pediatrics*. 2001;108(4):827–834.
4. Fakhry SM, Robinson L, Hendershot K, Reines HD. Surgical residents' knowledge of documentation and coding for professional services: an opportunity for a focused educational offering. *Am J Surg*. 2007;194(2):263–267.
5. Yount KW, Reames BN, Kensinger CD, et al. Resident awareness of documentation requirements and reimbursement: a multi-institutional survey. *Ann Thorac Surg*. 2014;97(3):858–864. discussion 64.
6. Hoops HE, Burt MR, Deveney K, Brasel KJ. What they may not tell you and you may not know to ask: what is expected of surgeons in their first year of independent practice. *J Surg Educ*. 2018.
7. Lusco VC, Martinez SA, Polk Jr HC. Program directors in surgery agree that residents should be formally trained in business and practice management. *Am J Surg*. 2005;189(1):11–13.
8. Heard JK, Allen RM, Clardy J. Assessing the needs of residency program directors to meet the ACGME general competencies. *Acad Med*. 2002;77(7):750.
9. ACGME General Surgery Milestones Project. The Accreditation Council of Graduate Medical Education and the American Board of Surgery. Available at: http://www.acgme.org/Portals/0/PDFs/Milestones/SurgeryMilestones.pdf. Last accessed Jan 4, 2019.
10. Reyes C, Greenbaum A, Porto C, Russell JC. Implementation of a clinical documentation improvement curriculum improves quality metrics and hospital charges in an academic surgery department. *J Am Coll Surg*. 2017;224(3):301–309.
11. Pulcrano M, Chahine AA, Saratsis A, Divine-Cadavid J, Narra V, Evans SR. Putting residents in the office: an effective method to teach the systems-based practice competency. *J Surg Educ*. 2015;72(2):286–290.
12. Jones K, Lebron RA, Mangram A, Dunn E. Practice management education during surgical residency. *Am J Surg*. 2008;196(6):878–881. discussion 81-2.
13. Spellberg B, Harrington D, Black S, Sue D, Stringer W, Witt M. Capturing the diagnosis: an internal medicine education program to improve documentation. *Am J Med*. 2013;126(8):739–743. e1.
14. Ghaderi KF, Schmidt ST, Drolet BC. Coding and billing in surgical education: a systems-based practice education program. *J Surg Educ*. 2017;74(2):199–202.
15. Mizell JS, Berry KS, Kimbrough MK, Bentley FR, Clardy JA, Turnage RH. Money matters: a resident curriculum for financial management. *J Surg Res*. 2014;192(2):348–355.
16. Benke JR, Lin SY, Ishman SL. Directed educational training improves coding and billing skills for residents. *Int J Pediatr Otorhinolaryngol*. 2013;77(3):399–401.