Diabetes Mellitus Coding Training for Family Practice Residents

Geraldine N. Urse, DO, MHPEd

Address correspondence to Geraldine N. Urse, DO, MHPEd, Director of Medical Education, Doctors Hospital Family Practice, 5100 W Broad St, Columbus, OH 43228-1607.

E-mail: geraldine.urse @ohiohealth.com

Context: Although physicians regularly use numeric coding systems such as the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) to describe patient encounters, coding errors are common. One of the most complicated diagnoses to code is diabetes mellitus. The ICD-9-CM currently has 39 separate codes for diabetes mellitus; this number will be expanded to more than 50 with the introduction of ICD-10-CM in October 2015.

Objective: To assess the effect of a 1-hour focused presentation on ICD-9-CM codes on diabetes mellitus coding.

Methods: A 1-hour focused lecture on the correct use of diabetes mellitus codes for patient visits was presented to family practice residents at Doctors Hospital Family Practice in Columbus, Ohio. To assess resident knowledge of the topic, a pretest and posttest were given to residents before and after the lecture, respectively. Medical records of all patients with diabetes mellitus who were cared for at the hospital 6 weeks before and 6 weeks after the lecture were reviewed and compared for the use of diabetes mellitus ICD-9 codes.

Results: Eighteen residents attended the lecture and completed the pretest and posttest. The mean (SD) percentage of correct answers was 72.8% (17.1%) for the pretest and 84.4% (14.6%) for the posttest, for an improvement of 11.6 percentage points ($P \leq .035$). The percentage of total available codes used did not substantially change from before to after the lecture, but the use of the generic ICD-9-CM code for diabetes mellitus type II controlled (250.00) declined (58 of 176 [33%] to 102 of 393 [26%]) and the use of other codes increased, indicating a greater variety in codes used after the focused lecture.

Conclusion: After a focused lecture on diabetes mellitus coding, resident coding knowledge improved. Review of medical record data did not reveal an overall change in the number of diabetic codes used after the lecture but did reveal a greater variety in the codes used.

J Am Osteopath Assoc. 2015;115(7):426-431
doi:10.7556/jaoa.2015.088

When physicians communicate about their work with third parties, such as insurance companies and the US Centers for Medicare & Medicaid Services, they use numeric coding systems such as the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM)[1] and Current Procedural Terminology (CPT) to describe key information about patients' visits. The ICD-9-CM codes identify why the physician is seeing the patient (eg, knee pain, ICD-9-CM 719.46), whereas the CPT codes identify what was done (eg, a steroid injection of the knee, CPT 20610).[1]

The ICD-9-CM is arranged alphabetically by diagnosis and linked to the numeric code. The codes are used to populate claim forms and to determine physicians' reimbursement for the work that they perform. They are also used for a multitude of other reasons, from preventing medical fraud to evaluating data for the patient-centered medical home model.

Despite physicians' frequent use of coding systems, errors are common.[2] Code accuracy, defined as the extent to which the ICD nosologic code reflects the underlying patient's disease, directly affects the quality of health care decisions made based on codes and is therefore of great importance.[2] Researchers studied errors in the code assignment process in the 1970s, 1980s, and 1990s, each time finding error rates ranging from 0% to 70%.[2] Different sources of error were identified, including human error (partially attributed to individuals who enter data), coding systems, and medical records.[3] The level of importance of information to be coded, as well as the coding ability of the physician, influences code accuracy.[4]

All ICD-9-CM codes should reflect the patient's true disease, including observed variables.[2] For example, in the diagnosis of diabetes mellitus, the fluctuation of the hemoglobin A_{1c} level is one such variable. It is not uncommon for a patient's hemoglobin A_{1c} level to change from 6.0% (within reference range, or controlled) to 8.0% (outside of reference range, or uncontrolled), only to return to a level within the reference range again during a 3-month period. The diabetes mellitus code for either a controlled or uncontrolled state should change as the patient's hemoglobin A_{1c} level changes. However, physicians often do not change the diagnosis code accordingly.

The 10th revision of the ICD, to be introduced in October 2015, will have more than 68,000 codes, compared with the 13,000 codes in ICD-9-CM.[5,6] The current ICD-9-CM system's design does not allow for an increase in the number of diagnoses or inclusion of information such as side of injury. The ICD-10 will allow more specific coding of diagnoses, including laterality, substantial room for the expansion of the number of diagnosis codes, use of well-understood terminology, and demonstration of consistency in coding.[7] Currently, 39 codes are associated with diabetes mellitus in the ICD-9-CM; this number will expand to more than 50 with the implementation of ICD-10.[8] With this increase of ICD codes, accurate coding may be even more challenging for physicians.

Doctors Hospital Family Practice residency participated in the Physician Quality Reporting System (PQRS),[9] formerly known as the Physician Quality Reporting Initiative, in 2011 and 2012. Established by the US Centers for Medicare & Medicaid Services, the PQRS is a voluntary process for physicians through which they receive additional reimbursement for reporting patient care parameters on chronic diseases. When the PQRS reports for these years were submitted, I noticed the residents used few of the available ICD-9-CM diabetes mellitus codes. The residents tended to stick with a single code for diabetes mellitus, even when a patient's blood glucose level varied or comorbidities developed. As the residents are faced with increasing patient loads and decreasing amounts of time to complete patient visits, they may reference a previous visit's documentation and select the last code used, which may or may not accurately reflect the changes in the patient's disease state.

Lack of training may be a contributing factor to coding inaccuracy. In my experience, residents rarely receive formal training in using ICD-9-CM codes. At Doctors Hospital Family Practice, residents learn to code by asking each other and attending physicians for help.

In an effort to improve the quality of coding performed by family practice residents, Doctors Hospital Family Practice implemented a 1-hour focused presentation on ICD-9-CM codes on the accuracy of diabetic coding into resident training. For the present study, I assessed residents' understanding of ICD-9-CM diabetes mellitus codes as well as the hospital's ICD-9-CM diabetes mellitus code use before and after the focused presentation. I hypothesized that residents' understanding of

diabetic coding would improve after the presentation. In addition, I hypothesized that residents would begin changing the diabetes mellitus code with the changes in the disease state, resulting in increased use of the available diabetes mellitus codes.

Methods

This 2-part study took place from September to November 2013 at Doctors Hospital Family Practice in Grove City, Ohio. Participants were first- through third-year family practice residents at the hospital who attended a 1-hour focused presentation on diabetes mellitus ICD-9-CM codes. This study was deemed exempt by the OhioHealth Corporation's institutional review board.

During the first portion of this study, residents completed a pretest consisting of 10 multiple-choice questions regarding diabetes mellitus coding using ICD-9-CM codes. Pretest questions covered general code knowledge (eg, What does the second position after the decimal indicate?), as well as case examples (eg, What code do you use for a diagnosis of prediabetes?). After completing the pretest, residents attended a 1-hour lecture on ICD-9-CM code accuracy. Key topics covered during the lecture included the history of ICD-9-CM and the meaning of the different numbers in a code, including what is indicated by a number's position in relation to the decimal. Case examples were presented, and residents participated in interactive practice coding using TurningPoint (Turning Technologies), an audience-response software system that allows for anonymous polling of the audience. The presentation concluded with an interactive question-and-answer session to clarify lecture points. Residents then completed a posttest of 10 multiple-choice questions on the same topics included in the pretest. The pretest and posttest results were reported in aggregate.

The pretest-posttest research design was used to monitor the effect of the program because it is the preferred method to compare participant groups and to measure the degree of learning occurring as a result of treatments or interventions.[10] Assignment bias and randomization of participants are not an issue in this type of design because all participants are provided the same information, thereby nullifying any confounding variables.

For the second part of the study, electronic billing information was gathered using an electronic medical record query for the number of times each of the 39 ICD-9-CM codes associated with diabetes mellitus had been used during a 6-week period before the lecture (phase 1) and during the 6 weeks after the lecture (phase 2). All patient visits for which diabetes mellitus codes were used were included in the analysis.

Statistical Analysis

Data were examined using an independent sample 2-tailed t test. A P value less than or equal to .035 was considered statistically significant. Analyses were performed using SPSS statistical software (version 22.0; IBM Corp).

Results

Eighteen Doctors Hospital Family Practice residents completed the pretest and posttest on diabetes mellitus coding. Among all residents, the mean (SD) percentage of correct answers was 72.8% (17.1%) for the pretest and 84.4% (14.6%) for the posttest, for an improvement of 11.6 percentage points ($P \le .035$).

Medical records for 176 patient visits included ICD-9-CM diagnostic codes for diabetes mellitus that were documented during phase 1 (*Table*). Ten of the possible 39 codes for diabetes mellitus (26%) were used. Of 176 medical records, 58 (33%) included the generic ICD-9-CM code of 250.00 for diabetes mellitus type II controlled and 64 (36%) included the ICD-9-CM code 250.02 for diabetes mellitus type II uncontrolled.

Table.
ICD-9-CM Diabetes Mellitus Coding Use Before and After a Lecture on Coding Accuracy

ICD-9-CM Code Description	Code	Patient Visits, No. (%)		
		Phase 1[a] (n=176)	Phase 2[b] (n=393)	Change
Diabetes mellitus type II controlled	250.00	58 (33)	102 (26)	+44 (6)
Diabetes mellitus type I controlled	250.01	…	9 (2.3)	+9 (2.3)
Diabetes mellitus type II uncontrolled	250.02	64 (36)	146 (37)	+82 (2)
Diabetes mellitus type I uncontrolled	250.03	…	7 (1.8)	+7 (1.8)
Diabetes mellitus type II with renal complications	250.40	10 (6)	19 (4.8)	+9 (0.2)
Diabetes mellitus type II with renal complications uncontrolled	250.42	6 (3)	10 (2.5)	+4 (0.5)
Diabetes mellitus type I with renal complications uncontrolled	250.43	1 (<1)	…	−1 (0.05)
Diabetes mellitus with ophthalmologic complications	250.50	…	1 (0.25)	+1 (0.25)
Diabetes mellitus type II with ophthalmologic complications uncontrolled	250.52	3 (2)	13 (3.3)	+10 (3.3)
Diabetes mellitus type II with neurologic complications	250.60	18 (10)	44 (11)	+26 (2)
Diabetes mellitus type II with neurologic complications uncontrolled	250.62	12 (7)	24 (6.1)	+12 (0.9)
Diabetes mellitus type II with peripheral circulatory disorder uncontrolled	250.72	…	8 (2.0)	+8 (2.0)
Diabetes mellitus type II with manifestations	250.80	…	5 (1.3)	+5 (1.3)
Diabetes mellitus type II with lower extremity ulcer, uncontrolled	250.82	1 (<1)	5 (1.3)	+4 (1.25)
Diabetes mellitus type II with complications uncontrolled	250.92	3 (2)	…	−3 (2)

[a] Six weeks before residents attended a focused lecture on diabetes mellitus coding accuracy.
[b] Six weeks after residents attended a focused lecture on diabetes mellitus coding accuracy.

During phase 2, medical records for 393 patient visits included ICD-9-CM diagnostic codes for diabetes mellitus, an increase of 217 records (*Table*). Thirteen of the available 39 codes (33%) were used, an increase of 7 percentage points from phase 1. Of 393 medical records, 102 (26%) included the generic ICD-9-CM code of 250.00 for diabetes mellitus type II controlled, a decline from 33% during phase 1. In addition, 146 (37%) included the ICD-9-CM code diabetes mellitus type II uncontrolled (250.02), and increase from 36% during phase 1. Use of other diabetes mellitus codes also increased from phase 1 to phase 2 (*Table*), indicating a greater variety in codes used after the focused lecture.

Discussion

The findings of the current study revealed that pretest-posttest scores improved after the focused 1-hour lecture on diabetes mellitus coding. This difference is not transferrable to improved ability to code diabetic patient visits, however, and is only reflective of improvement on the 10-question test. The improvement could be accounted for by familiarity with the material presented and the short time from the first to the second test.

Phase 1 medical record information revealed that 10 of the possible 39 codes (26%) for diabetes mellitus were used. An explanation for this pattern could be that residents continued to use the diabetes mellitus codes that were present in the medical records from prior visits. However, the focus of this study was not to determine physicians' ability to correctly code for diabetes mellitus but rather their ability to use all of the available diabetes mellitus codes within the ICD-9-CM. Thus, it is possible that the codes from previous visits were appropriate. Further investigation would be needed to determine if the coding was correct or incorrect. Future studies may also look into coding accuracy by year of resident training; more senior residents may have a better understanding of the complexities and subtleties of diabetes mellitus and thus be better at complex coding.

Phase 2 medical record information revealed that 13 of the 39 codes for diabetes mellitus (33%) were used, indicating a small change in the number of ICD-9-CM codes used between phase 1 and phase 2. Differences were found, however, in the distribution of the specific ICD-9-CM codes used. For example, the standard diabetes mellitus code of 250.00 was used more during phase 1 than during phase 2. In the 6 weeks after the focused lecture on diabetes mellitus coding, the number of codes used was distributed more throughout the available diabetes mellitus codes. This finding could be a result of residents' better understanding of the diabetic code assignment process after the focused lecture. However, additional research is needed to determine the effect of these observed changes.

Selection bias is always a concern. In the current study, all patients with diabetes mellitus cared for during the study period were included without exception. Therefore, the problem of selection bias should have been controlled.

This study had some limitations, including the use of aggregate numbers for the pretest and posttest results rather than assessing the performance of individual residents. However, the information obtained is not intended to guide performance of 1 specific resident but rather to observe the overall performance of family practice residents for all years of training. In addition, not all residents were present for both phases of medical record data collection, so that information would have been difficult to correlate. Aggregate data were used to assess overall use of ICD-9-CM codes.

In addition, the study's short duration made it difficult to infer ongoing change in coding behavior. However, the findings show that the overall pattern of coding can be changed after an educational presentation targeting a specific area of coding, which was the focus of the hypothesis. Further study into the best method of teaching coding to family practice residents should assess whether the changes in ICD-9-CM coding observed in this study are preserved after a longer period (ie, 3 or 6 months).

Conclusion

After family practice residents attended a focused lecture on diabetes mellitus coding, resident coding knowledge improved. The total number of diabetic codes used did not change after the lecture, but a greater variety in the codes used was noted. Additional research is needed to assess the long-term effects of such a program, but other institutions should consider incorporating similar focused coding training into their residency curriculum, particularly with the transition to ICD-10.

Acknowledgments

Author Contributions

Dr Urse provided substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; drafted the article or revised it critically for important intellectual content; gave final approval of the version of the article to be published; and agrees to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

1. Hart A, Stegman M, Ford B. *ICD-9-CM for Physicians 2013 Expert*. Salt Lake City, Utah: OptumInsight, Inc; 2012.

2. O'Malley KJ, Cook KF, Price MD, Wildes KR, Hurdle JF, Ashton CM. Measuring diagnoses: ICD code accuracy. *Health Serv Res*. 2005;40(5 pt 2):1620-1639. doi:10.111./j.1475-6773.2005.00444.x.

3. Green J. Wintfield N. How accurate are hospital discharge data for evaluating effectiveness of care? *Med Care*. 1993;31(8):719-731.

4. Nanovic L. Kaplan B. Reliability of Medicare claim forms for outcome studies in kidney transplant recipients: epidemiology in clinical outcome trials [published online June 18, 2009]. *Clin J Am Soc Nephrol*. 2009;4(7):1156-1158. doi:10.2215/CJN.03300509.

5. Conn J. Expensive, confusing, time consuming: looming shift to more complex ICD-10 coding system has hospitals and physicians scrambling. *Mod Healthc*. 2013;43(43):22-24.

6. Zenner P. *ICD-10 Impact on Provider Reimbursement* [White paper]. Seattle, Washington: Milliman; 2010. http://us.milliman.com/uploadedFiles/insight/health-published/icd-10-impact-provider.pdf. Accessed May 1, 2015.

7. Howard A. Coding for diabetes mellitus. *For the Record*. 2011;23(19):27. http://www.fortherecordmag.com/archives/102411p27.shtml. Accessed April 30, 2015.

8. Leppert M. ICD-9-CM vs. ICD-10-CM: examine the differences in diabetes coding. HCPro Just Coding website. http://www.justcoding.com/282660/icd9cm-vs-icd10cm-examine-the-differences-in-diabetic-coding. Updated July 24, 2012. Accessed May 1, 2015.

9. Physician Quality Reporting System. Centers for Medicare & Medicaid Services website. http://www.cms.gov/PQRS. Accessed May 26, 2015.

10. Pre- and post-testing. Boston University medical campus website. http://www.bumc.bu.edu/fd/files/PDF/Pre-andPost-Tests.pdf. Accessed May 26, 2015.

Electronic Table of Contents

The Journal of the American Osteopathic Association (*JAOA*) sends a monthly electronic table of contents (eTOC) as soon as new content is available online. To join the more than 100,000 individuals who currently receive the *JAOA*'s eTOCs, contact *JAOA* staff at circulation@osteopathic.org.