Effect of ICD-9 to ICD-10 Transition on Accuracy of Codes for Stage of Diabetic Retinopathy and Related Complications: Results from the CODER Study

Cindy Cai, MD
Durham, NC
Suzanne M. Michalak, MD, Sandra S. Stinnett, DrPH, Kelly W. Muir, MD, MS, Sharon Fekrat, MD, Durga S. Borkar, MD

Purpose:
When International Classification of Disease (ICD) version 9 (ICD-9) transitioned to ICD-10, there was a marked increase in the complexity of ICD codes with potential for improved specificity in clinical database research. The objective of the study is to characterize the accuracy of coding for stage of diabetic retinopathy (DR) and DR-related complications (including vitreous hemorrhage, retinal detachment, and neovascular glaucoma) during this transition.

Methods:
This was a retrospective chart review of patients over 18 years of age diagnosed with diabetic retinopathy from 3 times periods corresponding to the use of: ICD-9 (2014-2015), “early” ICD-10 (2015-2016), and “late” ICD-10 (2018-2019). The main outcome was the proportion of agreement between the ICD code and documented chart standard for stage of DR and DR-related complications. Generalized estimating equations (GEE) models were used to assess the significance of the agreement. Positive predictive value (PPV), negative predictive value (NPV), sensitivity, specificity, and kappa (κ) statistics were generated for each diagnosis.

Results:
600 patients were included in the study (average age 61 years, range 25-93). Overall, there was substantial agreement between the ICD codes for stage of DR and documented standard (κ = 0.66). The proportion of ICD codes in agreement with the documented standard diagnosis increased with time: 66.5%, 78.5%, and 83.3% for ICD-9, “early” ICD-10, and “late” ICD-10, respectively. The odds of agreement were 2.67 (95% CI: 1.49 – 4.76, p<0.001) and 3.96 (95% CI: 2.34 – 6.69, p<0.0001) times greater for “early” and “late” ICD-10 codes compared to ICD-9. Looking at specific codes, the overall PPV/NPV/sensitivity/specificity for NPDR and PDR were excellent (>90%). The odds of agreement were 19.70 (95% CI: 11.54 – 33.64, p<0.0001) times greater for proliferative diabetic retinopathy than nonproliferative diabetic retinopathy. Compared to the stage of DR, DR-related diagnoses were overall less accurately coded (κ = 0.61, 0.48, 0.52 for vitreous hemorrhage, retinal detachment, and neovascular glaucoma).

Conclusions:
Coding in ICD-10 is more accurate than ICD-9, particularly for proliferative diabetic retinopathy compared to nonproliferative diabetic retinopathy. The increased accuracy emphasizes the potential for ICD-10 coding to be used effectively in database research.