Projected Impact of the ICD-10-CM/PCS Conversion on Longitudinal Data and the Joint Commission Core Measures

by Susan H. Fenton, PhD, RHIA, FAHIMA; and Mary Sue Benigni, RHIT

Abstract

The transition from ICD-9-CM to ICD-10-CM/PCS is expected to result in longitudinal data discontinuities, as occurred with cause-of-death in 1999. The General Equivalence Maps (GEMs), while useful for suggesting potential maps do not provide guidance regarding the frequency of any matches. Longitudinal data comparisons can only be reliable if they use comparability ratios or factors which have been calculated using records coded in both classification systems. This study utilized 3,969 de-identified dually coded records to examine raw comparability ratios, as well as the comparability ratios between the Joint Commission Core Measures. The raw comparability factor results range from 16.216 for Nicotine dependence, unspecified, uncomplicated to 118.009 for Chronic obstructive pulmonary disease, unspecified. The Joint Commission Core Measure comparability factor results range from 27.15 for Acute Respiratory Failure to 130.16 for Acute Myocardial Infarction. These results indicate significant differences in comparability between ICD-9-CM and ICD-10-CM code assignment, including when the codes are used for external reporting such as the Joint Commission Core Measures. To prevent errors in decision-making and reporting, all stakeholders relying on longitudinal data for measure reporting and other purposes should investigate the impact of the conversion on their data.

Key words: ICD-10-CM/PCS implementation; longitudinal data reporting, comparability ratios; Joint Commission Core Measures

Introduction

The US healthcare system currently uses ICD-9-CM codes for a wide variety of purposes, including disease monitoring and quality measure reporting. Preparations for the implementation of the International Classification of Diseases, Tenth Revision, Clinical Modification, and International Classification of Diseases, Tenth Revision, Procedure Coding System (ICD-10-CM/PCS), now expected to be delayed until October 1, 2015, have been underway for years. Much of the focus has been on preparing coders and physicians to use the new classification system.[1–4] Many providers are also conducting in-depth analyses of the expected financial impact of the conversion.[5–7] Other impacts, such as the comparability of coded data over time, that have not received as much attention may have significant effects on the healthcare industry.

Background

The transition to ICD-10-CM/PCS is expected to result in longitudinal data discontinuities for disease and procedural reporting. These data discontinuities occurred with cause-of-death statistics when ICD-10 was adopted for mortality reporting in 1999.[8] While the ICD-10-CM/PCS General Equivalence Mappings (GEMs) are useful for suggesting potential equivalent ICD-10-CM or ICD-10-PCS codes for ICD-9-CM codes, the GEMs do not provide comparability ratios, sometimes also called comparability factors. Comparability ratios are needed to be able to track and trend data longitudinally. For example, a healthcare organization tracking heart disease or other conditions would need a comparability ratio to fully understand its patient population and the impact of any clinical interventions following the implementation of ICD-10-CM/PCS. A comparability factor of 100 would indicate that the same number of cases were coded to a given disease or condition in ICD-10-CM as in ICD-9-CM, meaning minimal discontinuity. A comparability factor less than 100 would indicate that fewer cases were coded for a given disease or condition in ICD-10-CM than in ICD-9-CM, whereas a factor greater than 100 would

suggest that more cases were identified in ICD-10-CM than in ICD-9-CM. Understanding the impact of the classification system change on longitudinal data will be important for researchers and managers for many reasons, including disease management, population health management, value-based purchasing contract negotiations, and reporting of quality measures, such as the Joint Commission Core Measures, among other purposes.

Methods

Institutional Review Board (IRB) approval was sought and obtained from both the University of Wisconsin Hospital and Clinics and the School of Biomedical Informatics at the University of Texas Health Science Center at Houston. After consultation with internal experts in business planning, decision support, and managed care contracting, the hospital selected two months of records, 2,191 discharges from July 2011 and 1,778 discharges from July 2012, for recoding in ICD-10-CM/PCS. July 2011 and July 2012 were determined to be representative of the facility's typical payer and patient mix.

Four experienced ICD-9-CM coders who were internally trained in ICD-10-CM/PCS were selected to perform the recoding. The facility chose to utilize a "translational" method rather than natively recoding in ICD-10-CM/PCS. This method means that assistive encoding software that suggested the appropriate codes was used to suggest crosswalk values where possible. When this approach was not possible, the coders natively recoded the record. Outsourced or contract coders were used to backfill the ICD-9-CM coding gap, thus providing the in-house coders with the valuable ICD-10-CM/PCS coding experience.

Once the dually coded data set was created, it was de-identified. The de-identified data were provided to the School of Biomedical Informatics at the University of Texas Health Science Center at Houston via secure FTP download. Frequencies were run for all ICD-9-CM and ICD-10-CM codes without respect to position. Codes that appeared more than 80 times in ICD-10-CM were selected for comparison with ICD-9-CM. The 2013 GEMs were used to determine matches between ICD-10-CM/PCS codes and ICD-9-CM codes. The comparability factor calculation used was taken from the 1999 National Center for Health Statistics cause-of-death report.[9] The formula is $C_i = D_i(\text{ICD10})/D_i(\text{ICD9}) \times 100$. For example, if an ICD-10-CM code occurred 100 times in the data set and the GEM-indicated matching ICD-9-CM code occurred 120 times in the data set, the comparability factor would be 83.3 = (100/120) × 100.

The Joint Commission Core Measure comparison was created utilizing the July 2, 2013, National Hospital Inpatient Quality Measures, Appendix A for ICD-9-CM codes and Appendix P for the ICD-10-CM/PCS codes. Table 1 is an example of the tables used in the process of calculating the Joint Commission Core Measure comparability factor.

Table 1: Joint Commission Core Measure Comparability Factor Table

ICD-9-CM Codes	Count	ICD-10-CM Codes	Count
518.81		J96.00	
518.84		J96.20	
		J96.90	

Findings

The comparability factor results of the raw frequencies of ICD-10-CM codes divided by the raw frequencies of ICD-9-CM codes are listed in ascending order in Table 2. The results range from 16.216 for Nicotine dependence, unspecified, uncomplicated to 118.009 for Chronic obstructive pulmonary disease, unspecified. The comparability factor for conditions of interest include those for Peripheral vascular disease, unspecified (79.245); End-stage renal disease (82.803); Type 2 diabetes mellitus without complications (88.679); Unspecified asthma, uncomplicated (91.611); and Anemia, unspecified (93.678).

Table 2: Comparability Factor

ICD-10-CM Code	ICD-9-CM Code	Description	Comparability Factor [(No.ICD10/No.ICD9) x 100]

F17.200	305.1	Nicotine dependence, unspecified, uncomplicated	16.216
I50.9	428.1	Heart failure, unspecified	40.762
I48.91	427.31	Unspecified atrial fibrillation	61.347
F17.210	305.1	Nicotine dependence, cigarettes, uncomplicated	65.718
Z95.5	V45.82	Presence of coronary angioplasty implant and graft	76.046
M10.9	274.9	Gout, unspecified	76.056
J91.8	511.9	Pleural effusion in other conditions classified elsewhere	76.230
M19.90	715.90	Unspecified osteoarthritis, unspecified site	76.852
Z79.899	V58.69	Other long term (current) drug therapy	78.175
Z91.81	V15.88	History of falling	78.448
R11.2	787.01	Nausea with vomiting, unspecified	79.130
I73.9	443.9	Peripheral vascular disease, unspecified	79.245
E78.0	272.0	Pure hypercholesterolemia	80.905
Z99.2	V45.11	Dependence on renal dialysis	82.301
N18.6	585.6	End-stage renal disease	82.803
Z98.1	V45.4	Arthrodesis status	82.963
R19.7	787.91	Diarrhea, unspecified	83.230
J18.9	486	Pneumonia, unspecified organism	83.333
M81.0	733.0	Age-related osteoporosis without current pathological fracture	83.505
Z51.89	V66.7	Encounter for other specified aftercare	84.034
K59.00	564.00	Constipation, unspecified	84.053
E87.5	276.7	Hyperkalemia	84.211
Z79.82	V58.66	Long term (current) use of aspirin	84.380
F34.1	300.4	Dysthymic disorder	84.821
I12.0	403.91	Hypertensive chronic kidney disease with stage 5 chronic kidney disease or end stage renal disease	84.892
Z92.21	V87.41	Personal history of antineoplastic chemotherapy	84.956
N40.0	600.00	Enlarged prostate without lower urinary tract symptoms	85.000
I25.10	414.01	Atherosclerotic heart disease of native coronary artery with unstable angina pectoris	85.197
N17.9	584.9	Acute kidney failure, unspecified	85.324
D63.1	285.21	Anemia in chronic kidney disease	85.345
E86.0	276.51	Dehydration	85.408
R13.10	787.20	Dysphagia, unspecified	85.577
Z88.1	V14.1	Allergy status to other antibiotic agents status	85.714
Z88.2	V14.2	Allergy status to sulfonamides status	85.774
Z93.1	V44.1	Gastrostomy status	85.841
Z79.52	V58.65	Long term (current) use of systemic steroids	85.845

Z88.8	V14.8	Allergy status to other drugs, medicaments and biological substances status	86.179
Z88.5	V14.5	Allergy status to narcotic agent status	86.179
E83.51	275.41	Hypocalcemia	86.325
Z88.0	V14.0	Allergy status to penicillin	86.552
N18.9	585.9	Chronic kidney disease, unspecified	86.577
F41.9	300.00	Anxiety disorder, unspecified	86.667
G40.909	345.90	Epilepsy, unspecified, not intractable, without status epilepticus	87.368
K21.9	530.81	Gastro-esophageal reflux disease without esophagitis	87.441
Z98.89	V45.89	Other specific postprocedural states	87.665
G47.33	327.23	Obstructive sleep apnea (adult) (pediatric)	87.725
I12.9	403.90	Hypertensive chronic kidney disease with stage 1 through stage 4 chronic kidney disease, or unspecified chronic kidney disease	87.755
Z79.01	V58.61	Long term (current) use of anticoagulants	87.786
Z86.718	V12.51	Personal history of other venous thrombosis and embolism	87.970
Z87.891	V15.82	Personal history of nicotine dependence	88.051
R09.02	799.02	Hypoxemia	88.235
Z85.828	V10.83	Personal history of other malignant neoplasm of skin	88.542
Z66	V49.86	Do not resuscitate	88.571
E11.9	250.00	Type 2 diabetes mellitus without complications	88.679
I25.5	414.8	Ischemic cardiomyopathy	88.776
N39.0	599.0	Urinary tract infection, site not specified	89.085
D62	285.1	Acute posthemorrhagic anemia	89.151
G43.909	346.90	Migraine, unspecified, not intractable, without status migrainosus	89.209
J69.0	78.448	Pneumonitis due to inhalation of food and vomit	89.286
Z79.4	V58.67	Long term (current) use of insulin	89.385
Z92.3	V15.3	Personal history of irradiation	89.453
D69.6	287.5	Thrombocytopenia, unspecified	89.655
J98.11	518.0	Atelectasis	89.773
E66.9	278.0	Obesity, unspecified	89.802
D72.829	288.60	Elevated white blood cell count, unspecified	89.899
E66.01	278.01	Morbid obesity due to excess calories	90.000
E87.1	276.1	Hypo-osmolality and hyponatremia	90.400
I25.2	412	Old myocardial infarction	91.228
T81.4XXA	998.59	Infection following a procedure, initial encounter	91.228
E03.9	244.9	Hypothyroidism, unspecified	91.388
J45.909	493.90	Unspecified asthma, uncomplicated	91.611

E78.5	272.4	Hyperlipidemia, unspecified	91.627
E87.6	276.8	Hypokalemia	91.837
N18.3	585.3	Chronic kidney disease, stage III (moderate)	91.837
E87.2	276.2	Acidosis	91.954
Z86.73	V12.54	Personal history of transient ischemic attack (TIA), and cerebral infarction without residual deficits	92.135
I95.9	458.9	Hypotension, unspecified	92.386
Z95.1	V45.81	Presence of aortocoronary bypass grafts	92.778
I10	401.9	Essential (primary) hypertension	93.542
D64.9	285.9	Anemia, unspecified	93.678
Z68.41	V85.41	Body mass index (BMI) 40.0-44.9, adult	93.694
Z51.5	V66.7	Encounter for palliative care	94.118
R33.9	788.20	Retention of urine, unspecified	94.512
Z90.49	V45.72	Acquired absence of other specified parts of digestive tract	94.771
Z83.3	V18.0	Family history of diabetes mellitus	95.082
F32.9	311	Major depressive disorder, single episode, unspecified	95.851
Z87.442	V13.01	Personal history of urinary calculi	102.062
Z87.440	V13.02	Personal history of urinary (tract) infections	104.110
Z82.49	V17.3	Family history of ischemic heart disease and other disease of the circulatory system	115.674
J44.9	496	Chronic obstructive pulmonary disease, unspecified	118.009

Table 3 details the comparability factor for selected Joint Commission Core Measures. The results range from 27.15 for Acute Respiratory Failure to 130.16 for Acute Myocardial Infarction in descending order.

Table 3: Joint Commission Core Measure Comparability Factor

Core Measure	Comparability Factor [(No. ICD10/No. ICD9) × 100]
Acute Myocardial Infarction	130.16
Drug Dependence	102.10
Mental Disorders	97.49
Asthma	89.32
Pneumonia	85.47
Cystic Fibrosis	84.09
Ischemic Stroke	74.78
Hemorrhagic Stroke	70.00
Heart Failure	60.10
PSI Pressure Ulcer	58.11
Diabetes	48.98
Septicemia	45.96
Acute Respiratory Failure	27.15

Discussion

These findings indicate that the GEMs and encoder assistive tools designed to help with the ICD-10-CM conversion will not ensure longitudinal data continuity between ICD-9-CM and ICD-10-CM. Organizations will use these tools to code the patient encounters; however, additional processing will be required to ensure data continuity after the conversion. Furthermore, while longitudinal data comparability is important, organizations will also have to begin reporting Joint Commission Core Measures and other metrics using ICD-10-CM/PCS. A failure to fully comprehend the impact of the classification system change could put organizations at a disadvantage.

To explore some of the longitudinal comparability factor, the ICD-10-CM codes F17.200 and F17.210, for nicotine dependence, have comparability factor of 16.216 and 65.718, respectively. This represents only 92 percent of the codes assigned to ICD-9-CM code 305.1, Tobacco use disorder. The unspecified nicotine dependence noted in ICD-10-CM should concern organizations attempting to track efforts relating to smoking cessation. Although the researchers did not have access to the source records, it can be supposed that the unspecified nicotine dependence code resulted from a lack of specific documentation.

Some of the longitudinal differences may simply be due to the vast differences in the classification systems. The comparability factor of 40.762 for Heart failure, unspecified (I50.9) likely reflects the lack of a code for congestive heart failure, unspecified, as is found in ICD-9-CM. The comparability factor of 61.347 for atrial fibrillation is most likely due to the presence of four types of atrial fibrillation in ICD-10-CM. Moving to the findings of comparability factor greater than 100, Chronic obstructive airway disease had a comparability factor of 118.009 because of the inclusion of Asthma with chronic obstructive pulmonary disease, Chronic asthmatic obstructive bronchitis, and Chronic bronchitis with airway obstruction, among other variants—most of which are not included in the ICD-9-CM code for Chronic airway obstruction, not elsewhere classified (496). These findings indicate that changes in the classification system may result in data differences that could affect healthcare organizations in a variety of ways. For example, an organization that had negotiated a payment contract based on its ability to maintain a certain number of chronic obstructive airway disease cases may find that it cannot meet the goals that were set on the basis of ICD-9-CM codes.

Table 4: Acute Myocardial Infarction Core Measure

ICD-9-CM Codes	Count	ICD-10-CM Codes	Count	Comparability Factor
410.01	5	I21.02	3	
410.11	8	I21.09	10	
410.21	4	I21.11	3	
410.31	3	I21.19	13	
410.41	8	I21.3	4	
410.71	93	I21.4	94	
410.91	5	I24.8	22	
		I24.9	15	
Total	126	Total	164	130.16

The comparability factor for quality measure reporting are expected to be of special interest to organizations. The comparability factor for the Joint Commission Core Measure of Acute Myocardial Infarction is 130.16. As can be seen in Table 4, this Core Measure includes more codes and cases with ICD-10-CM than with ICD-9-CM. A review of the codes reveals that the ICD-10-CM codes include those for acute ischemic heart disease as well as various forms of acute myocardial infarction. Table 5 details the findings for the Respiratory Failure Core Measure, which had a comparability factor of 27.15. This factor is likely due to increased detail found in ICD-10-CM, which separates respiratory failure with hypoxia and hypercapnia from respiratory failure without those conditions. This limited analysis did not include access to the source records or the Core Measure reports from the same time period. These results do indicate that healthcare organizations may

want to understand the impact of the classification system change on the various quality measures and other reporting requirements that currently use ICD-9-CM codes.

Table 5: Respiratory Failure Core Measure

ICD-9-CM Codes	Count	ICD-10-CM Codes	Count	Comparability Factor
518.81	132	J96.00	28	
518.84	19	J96.20	4	
		J96.90	9	
Total	151	Total	41	27.15

These findings related to comparability factor between ICD-9-CM and ICD-10-CM codes and the Joint Commission Core Measures indicate that the coming conversion will have an impact on the continuity of longitudinal data, possibly including quality measures, population health management, disease management, and financial negotiations. The main limitation of this study is that it includes only one organization's data over two months, so the findings cannot be generalized to other organizations. For the next steps, the researchers are creating confusion matrices to establish the overlap between the two classification systems for the different Joint Commission Core Measures. It is hoped that these matrices will assist in more fully understanding the differences between the classification systems.

Conclusion

This limited study has revealed significant differences in comparability between ICD-9-CM and ICD-10-CM code assignment, including when the codes are used for external reporting such as the Joint Commission Core Measures. All stakeholders relying on longitudinal data for measure reporting and other purposes should investigate the impact of the conversion on their data. Without understanding the magnitude of the difference that is attributable to the change in classification systems, those using the data may reach erroneous conclusions or make questionable decisions.

Acknowledgments

The authors wish to acknowledge the contributions of Karen Freymiller, Inpatient Coding Manager, and the University of Wisconsin Hospital inpatient coding staff. Significant assistance with this project was also provided by Lisa Woodward, ITS Director of Revenue Cycle Systems.

Susan H. Fenton, PhD, RHIA, FAHIMA, is an assistant professor and the assistant dean for academic affairs in the School of Biomedical Informatics at the University of Texas Health Science Center at Houston in Houston, TX.

Mary Sue Benigni, RHIT, is the director of coding and clinical documentation improvement at the University of Wisconsin Hospital and Clinics in Madison, WI.

Notes

[1] AAPC. "ICD-10-CM Anatomy and Pathophysiology." 2014. Available at http://www.aapc.com/icd-10/anatomy-pathophysiology.aspx?gclid=CKemlcKwwLwCFTJp7AodvhwAQg.

[2] American Health Information Management Association (AHIMA). "ICD-10 Delay Updates." May 1, 2014. Available at http://www.ahima.org/icd10.

[3] Centers for Medicare and Medicaid Services. "ICD-10." 2014. Available at http://www.cms.gov/Medicare/Coding/ICD10/Index.html.

[4] The Claro Group. *What You Need to Know about ICD-10*. 2014. Available at http://www.icd10answers.com/.

[5] Nachimson Advisors, LLC. *The Impact of Implementing ICD-10 on Physician Practices and Clinical Laboratories*. 2008. Available at http://www.nachimsonadvisors.com/Documents/ICD-10%20Impacts%20on%20Providers.pdf.

[6] Thompson, Penny, and Cindy Greenberg. *Why Payers Must Embrace ICD-10 and How They Should Prepare for It*. Plano, TX: EDS, 2009.

[7] Wildsmith, Thomas F. *Examining the Cost of Implementing ICD-10*. HayGroup Inc., on behalf of America's Health Insurance Plans. 2006. Available at http://www.ehcca.com/presentations/hithipaa414/3_04_1.pdf.

[8] Anderson, Robert N., Arialdi M. Minino, Donna L. Hoyert, and Harry M. Rosenberg. *Comparability of Cause of Death between ICD-9 and ICD-10: Preliminary Estimates*. National Vital Statistics Reports 49, no. 2. Hyattsville, MD: National Center for Health Statistics, 2001.

[9] Ibid.
