Chronic Condition Data Warehouse

Your source for national CMS Medicare and Medicaid research data

CCW White Paper

CCW Condition Categories

Impact of Conversion from ICD-9-CM to ICD-10-CM

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1: Introduction

On October 1, 2015, the Centers for Medicare & Medicaid Services (CMS), in accordance with the Health Insurance Portability and Accountability Act (HIPAA), converted from the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) to the 10th Revision, Clinical Modification (ICD-10-CM) and Procedure Coding System (ICD-10-PCS). Regardless of when a claim was submitted for payment, services that occurred prior to October 1, 2015 were billed using ICD-9 codes and all services provided on or after October 1, 2015 utilized ICD-10 codes[1].

ICD-10 diagnosis and procedure codes can have more alphanumeric digits than ICD-9, allowing for greater specificity in coding[2]. ICD-9-CM has approximately 14,000 diagnosis codes compared to the more than 70,000 unique diagnosis codes in ICD-10-CM. Similarly the most recent version of ICD-9-CM included 3,824 procedure codes, whereas ICD-10-PCS includes an initial set of 71,924 procedure codes[3,4].

Diagnosis and procedure codes are key components of a claim and are often used by researchers. The CMS Chronic Condition Warehouse (CCW), CMS' source for Medicare and Medicaid research data, includes variables for 60 conditions – 27 common chronic conditions and 33 other chronic or potentially disabling conditions – which were developed to facilitate researchers in the identification of cohorts of beneficiaries with specific conditions. The CCW condition variables were developed from algorithms that searched the CMS administrative claims data for specific ICD-9-CM diagnoses codes, Medicare Severity Diagnosis Related Group (MS-DRG) codes, or procedure codes. The algorithms used to identify these conditions from claims were updated to take into account the conversion from ICD-9 to ICD-10.

The objectives of this document are to: 1) verify that the CCW received Medicare claims after the ICD-10 conversion without disruption and demonstrate the impact on claims volume in the initial months of the conversion and 2) evaluate the impact of the conversion from ICD-9 to ICD-10 codes on prevalence estimates for the CCW condition algorithms.

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[1] CMS. ICD-10 webpage. https://www.cms.gov/medicare/coding/icd10/index.html

[2] CMS. Version 5010 webpage. https://www.cms.gov/Regulations-and-Guidance/HIPAA-Administrative-Simplification/Versions5010andD0/Version_5010.html

[3] Averill RF, et al. "Development of the ICD-10 Procedure Coding System (ICD-10-PCS)." https://www.cms.gov/Medicare/Coding/ICD10/Downloads/2016-Developmentofthe-ICD-10-Procedure-Coding-System.pdf

[4] https://www.cms.gov/Medicare/Coding/ICD10/2016-ICD-10-PCS-and-GEMs.html

All analyses presented were conducted by HealthAPT, LLC, the CCW contractor for CMS. The CCW database has complete (100 percent) Medicare claims and enrollment data, obtained directly from CMS sources. The CCW provides researchers who have obtained a data use agreement (DUA) with Medicare and Medicaid beneficiary, claims, and assessment data linked by beneficiary across the continuum of care.

Chapter 2: Methodology

To verify that Medicare fee-for-service claims were received in the CCW after the ICD-10 conversion without disruption and to determine the impact of the conversion from ICD-9 to ICD-10 on claims volume, we compared the number of claims processed by month for the last four months of 2014 and 2015 (September through December), using data files with an equivalent level of claim maturity[5]. We examined all claim types (inpatient, skilled nursing facility, hospice, home health, hospital or institutional outpatient, carrier, and durable medical equipment).

Next, we evaluated the impact of the ICD-10 conversion on prevalence estimates for each of the 60 CCW conditions. The CCW condition algorithms identify beneficiaries who have received a service or treatment for the condition by primarily examining diagnosis codes on claims, and for some conditions procedure and MS-DRG codes. Additional information regarding the algorithms and how they are specified is available on the CCW website. See the "Condition Categories" tab at www.ccwdata.org. The algorithms used to identify beneficiaries with these 60 conditions were updated to use the ICD-10 codes.

To convert data from ICD-9-CM to ICD-10-CM and ICD-10-PCS and vice versa, CMS and the Centers for Disease Control and Prevention (CDC) created the General Equivalence Mappings (GEMs), a comprehensive translation dictionary that provides important information linking codes of one system with codes in the other system and can be used to accurately and effectively translate any ICD-9-CM-based data. The GEMs were designed as a general purpose translation tool with translations based on the meaning of the code. They were developed independently without reference to Medicare data[6,7].

We identified the particular ICD-10-CM codes for each algorithm using a three stage process: 1) GEMs was used to conduct forward mapping from the ICD-9 diagnosis codes to ICD-10, 2), GEMs was used to conduct backward mapping of the ICD-10 codes mapped back to ICD-9 in order to verify that the resulting ICD-10 codes mapped to the condition, and 3) the ICD-10 codebook was used to verify that all relevant codes for each condition were included in the algorithm. When using the GEMs tool to convert the condition algorithms from ICD-9 to ICD-10, there was not always a 1:1 match between codes. The mappings between versions allow for the linking of an

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[5] 2014 claims data were processed through June 2015. 2015 claims data were processed through June 2016.

[6] CMS. 2016 ICD-10-Cm and GEMs webpage. https://www.cms.gov/Medicare/Coding/ICD10/2016-ICD-10-CM-and-GEMs.html

[7] CMS. General Equivalence Mappings Frequently Asked Questions – CMS.gov. https://www.cms.gov/Medicare/Coding/ICD10/Downloads/GEMs-CrosswalksBasicFAQ.pdf.

ICD-9 diagnosis to one or more ICD-10 diagnoses and instances where a single ICD-10 diagnosis code is associated with multiple ICD-9 diagnosis codes. In addition, two CCW conditions include procedure codes in the algorithm. For procedures under ICD-9, a single code could be used to apply to many different body parts using different approaches or devices. Under ICD-10-PCS, the codes are unique and specific – with a single code representing a distinct medical or surgical procedure, on a particular body system, using a particular approach and/or device.

Using 100% of fee-for-service Medicare claims data for 2015 and 2014, with an equivalent level of claim maturity[8], we calculated the prevalence of each of the 60 CCW conditions[9]. For 2014, all of the claims used ICD-9 codes; whereas for 2015, the first ¾ of the year used ICD-9 and the last quarter of the year used ICD-10 codes. We calculated the prevalence of the conditions among Medicare beneficiaries with full or nearly full fee-for-service coverage during the year. Full or nearly full fee-for-service coverage refers to those enrolled in Medicare on or after January 1, 2014 (or 2015) who had 11 or 12 months of Medicare Part A and B (or coverage until time of death) and one month or less of HMO coverage.

To compare the prevalence rates in 2015 to those in 2014 we calculated: 1) the percentage change in prevalence between 2014 and 2015 (the ratio of 2015 rates to 2014 rates), and 2) the average annual change in prevalence for the last five years (2010-2014). Next, to further demonstrate the potential impact of the transition to ICD-10 on prevalence estimates, we selected, for further analyses, three CCW conditions where the observed change in prevalence was higher than the observed annual change for the last 5 years. We examined the number of claims that were received by Medicare for each month of service in 2015 that met the diagnosis code criteria for the CCW algorithm. In addition to the number of claims with a diagnosis code for the condition for each month, we determined the unduplicated number of beneficiaries with claims for the condition for each month (note that beneficiaries could have been duplicated across months). Finally, for the same three conditions, we also examined the number of claims associated with each of the diagnosis codes in the algorithm, to determine whether particular code(s) were responsible for the observed changes. We summarize this information by identifying the particular codes that, when combined, account for approximately 80% of the claims in the ICD-9 or ICD-10 algorithm.

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[8] 2014 claims data were processed through June 2015. 2015 claims data were processed through June 2016.

[9] The 33 other chronic and disabling conditions were developed to identify conditions likely to be prevalent among dual Medicare-Medicaid enrollees. However, these 33 conditions are available for all Medicare beneficiaries using only Medicare claims, which is the data used for these analyses.

Chapter 3: Results

Medicare Claims Volume

The number of Medicare fee-for-service claims processed by month for the last four months (September – December) of 2014 and 2015 were compared to determine the impact of the conversion on claims volume. The CCW continued to receive claims weekly after the transition from ICD-9 to ICD-10, and, in general, did not have a meaningful disruption in the receipt of claims after the implementation of ICD-10 (Table 1).

Table 1. Number of Medicare fee-for-service claims received September through December by setting* in 2014 and 2015

September	2014 ICD-9	2015 ICD-9	Difference (2015-2014)	Percentage Change
IP/SNF/HOS	1,606,572	1,605,502	-1,070	-0.1%
HOP / HH	13,588,461	13,675,502	87,041	0.6%
Carrier	67,972,449	67,795,009	-177,440	-0.3%
DME	4,928,505	4,787,997	-140,508	-2.9%
October	2014 ICD-9	2015 ICD-10	Difference (2015-2014)	Percentage Change
IP/SNF/HOS	1,901,920	1,862,882	-39,038	-2.1%
HOP / HH	17,350,797	17,117,177	-233,620	-1.3%
Carrier	92,122,708	90,071,838	-2,050,870	-2.2%
DME	6,337,499	6,139,552	-197,947	-3.1%
November	2014 ICD-9	2015 ICD-10	Difference (2015-2014)	Percentage Change
IP/SNF/HOS	1,600,259	1,574,732	-25,527	-1.6%
HOP / HH	13,704,669	13,857,689	153,020	1.1%
Carrier	70,064,984	70,636,923	571,939	0.8%
DME	4,672,570	4,570,567	-102,003	-2.2%
December	2014 ICD-9	2015 ICD-10	Difference (2015-2014)	Percentage Change
IP/SNF/HOS	1,611,278	1,600,797	-10,481	-0.7%
HOP / HH	13,477,355	13,795,419	318,064	2.4%
Carrier	68,192,863	69,078,118	885,255	1.3%
DME	4,843,684	4,905,904	62,220	1.3%

* Setting acronyms = IP (inpatient), SNF (skilled nursing facility), HOS (hospice), HOP (hospital outpatient), HH (home health), DME (durable medical equipment).

Examination of the number of inpatient, skilled nursing facility and hospice claims in October 2015 (the first month of the implementation of ICD-10-CM) showed 2% fewer claims received

than compared to October 2014. By December 2015, the difference in the number of claims obtained was less than 1% fewer between 2014 and 2015.

For hospital outpatient and home health services, slightly fewer claims (1.3%) were received in October 2015 compared to October 2014. However, by November and December of 2015, more HOP and HH claims were received compared to 2014. A similar trend of increasing claims by November and December 2015 was found in carrier claims.

The number of durable medical equipment claims that were received in October and November 2015 were slightly lower than in 2014. However, in December 2015, more DME claims were received than in 2014.

Condition Algorithms

Overall for the 27 CCW chronic conditions, we found that the ratio of the 2015 prevalence rates to the 2014 rates were close to 1.00 and were consistent with the average annual change from 2010-2014. However, for asthma and chronic kidney disease (CKD), we observed deviations in prevalence rates from prior years (Table 2). For most of the 33 CCW other chronic and potentially disabling conditions, the percentage change in prevalence between 2014 and 2015 was consistent with the average annual change from 2010-2014. However, there were exceptions, notably cystic fibrosis and other metabolic developmental disorders, personality disorders, and spinal cord injury (Table 3). For asthma, chronic kidney disease, and spinal cord injury, we examined monthly counts of claims, and counts of beneficiaries with the claims of interest, which are presented in the next section.

Table 2. Prevalence of chronic conditions among Medicare fee-for-service beneficiaries: CCW Chronic Conditions 2014 and 2015

CCW 27 Chronic Conditions	2014 (%)	2015 (%)	Percentage Change (Ratio of 2015/ 2014)	Average annual change (2010-2014)
Acute Myocardial Infarction	0.85	0.87	1.03	1.00
Acquired Hypothyroidism	15.34	15.57	1.01	1.00
Alzheimer's Disease	4.41	4.30	0.98	1.00
Alzheimer's Disease, Related Disorders, or Senile Dementia	10.81	10.80	1.00	1.00
Anemia	23.35	22.88	0.98	1.00
Asthma	5.35	8.72	1.63	1.00
Atrial Fibrillation	8.55	8.64	1.01	1.00
Benign Prostatic Hyperplasia†	14.85	15.50	1.04	1.04
Cancer, Colorectal	1.27	1.26	0.99	1.00
Cancer, Endometrial*	0.57	0.59	1.04	1.08
Cancer, Breast	3.07	3.13	1.02	1.03
Cancer, Lung	1.08	1.08	1.01	1.00
Cancer, Prostate†	7.03	7.03	1.00	1.00
Cataract	18.29	18.15	0.99	1.00
Chronic Kidney Disease	17.63	19.32	1.10	1.00
Chronic Obstructive Pulmonary Disease	11.75	11.96	1.02	1.00
Depression	17.12	17.68	1.03	1.00
Diabetes	28.25	28.16	1.00	1.00
Glaucoma	9.91	9.58	0.97	1.00
Heart Failure	14.63	14.46	0.99	1.00
Hip/Pelvic Fracture	0.81	0.79	0.98	1.00
Hyperlipidemia	47.29	47.29	1.00	1.00
Hypertension	58.26	58.27	1.00	1.00
Ischemic Heart Disease	28.71	28.22	0.98	1.00
Osteoporosis	6.36	6.42	1.01	1.00
Rheumatoid Arthritis / Osteoarthritis	31.38	32.14	1.02	1.00
Stroke / Transient Ischemic Attack	3.98	3.94	0.99	1.00

* Prevalence rate was calculated for females only.
† Prevalence rate was calculated for males only.

Table 3. Prevalence of other chronic and disabling conditions among Medicare fee-for-service beneficiaries: CCW Conditions 2014 and 2015

CCW 33 Other Chronic and Potentially Disabling Conditions	2014 (%)	2015 (%)	Percentage Change (Ratio of 2015/ 2014)	Average annual change (2010-2014)
ADHD, Conduct Disorders, and Hyperkinetic Syndrome	0.92	0.99	1.08	1.09
Anxiety Disorders	13.84	14.96	1.08	1.12
Autism Spectrum Disorder	0.17	0.19	1.12	1.12
Bipolar Disorder	3.43	3.60	1.05	1.05
Cerebral Palsy	0.34	0.34	1.01	1.02
Cystic Fibrosis and Other Metabolic Developmental Disorders	0.54	0.65	1.20	1.05
Depressive Disorders	16.41	16.88	1.03	1.05
Epilepsy	2.60	2.64	1.01	1.04
Fibromyalgia, Chronic Pain and Chronic Fatigue	12.47	13.44	1.08	1.09
Hepatitis (any viral type)	1.20	1.24	1.03	1.03
HIV/AIDS	0.38	0.37	0.99	1.01
Intellectual Disabilities and Related Conditions	1.06	1.06	1.00	1.01
Learning Disabilities and Other Developmental Delays	0.09	0.11	1.15	1.17
Leukemia and Lymphoma	1.44	1.52	1.06	1.02
Liver Disease, Cirrhosis, and Other Liver Conditions (excluding Hepatitis)	3.64	3.88	1.06	1.05
Migraine and Other Chronic Headache	2.18	2.41	1.11	1.09
Mobility Impairments	2.69	2.71	1.01	1.00
Multiple Sclerosis and Transverse Myelitis	0.57	0.58	1.01	1.02
Muscular Dystrophy	0.06	0.06	1.00	0.99
Obesity	11.19	12.82	1.15	1.16
Other Developmental Delays	0.13	0.14	1.06	1.14
Peripheral Vascular Disease	12.07	12.14	1.01	1.00
Personality Disorders	0.59	0.80	1.35	1.03
Post-Traumatic Stress Disorder (PTSD)	0.92	1.03	1.12	1.14
Pressure Ulcers and Chronic Ulcers	4.93	4.86	0.99	1.00
Schizophrenia	1.92	1.88	0.98	1.00
Schizophrenia and Other Psychotic Disorders	4.07	3.98	0.98	1.01
Sensory Impairment (blindness and visual)	0.90	0.82	0.91	0.97
Sensory Impairment (deafness and hearing)	4.89	5.15	1.05	1.08
Spina Bifida and Other Congenital Anomalies of the Nervous System	0.16	0.16	1.00	1.01
Spinal Cord Injury	0.28	0.37	1.30	1.02
Tobacco Use Disorders	8.40	8.57	1.02	1.08
Traumatic Brain Injury and Nonpsychotic Mental Disorders Due to Brain Damage	0.42	0.44	1.06	1.03

Claim and Beneficiary Counts – Selected Conditions

Figure 1 shows that the number of claims and beneficiaries identified through the asthma algorithm remained fairly constant each month from January to September 2015. Beginning in October 2015, the first month with ICD-10 codes, there were increases in both claims and beneficiaries. The greatest impact was seen for Part B carrier claims[10], which increased from approximately 1.3 million claims from January to September to 5.1 million claims in October 2015. Correspondingly, the number of beneficiaries identified as having asthma using carrier claims more than tripled during the same time frame. Similarly, Part A claims (inpatient, skilled nursing, home health, or hospital outpatient) and beneficiary counts also more than tripled from September to October. Part B claims dropped slightly in November and December 2015, but still remained much higher than the levels from January to September 2015.

Figure 1. CCW condition asthma - claim and beneficiary counts by month, 2015
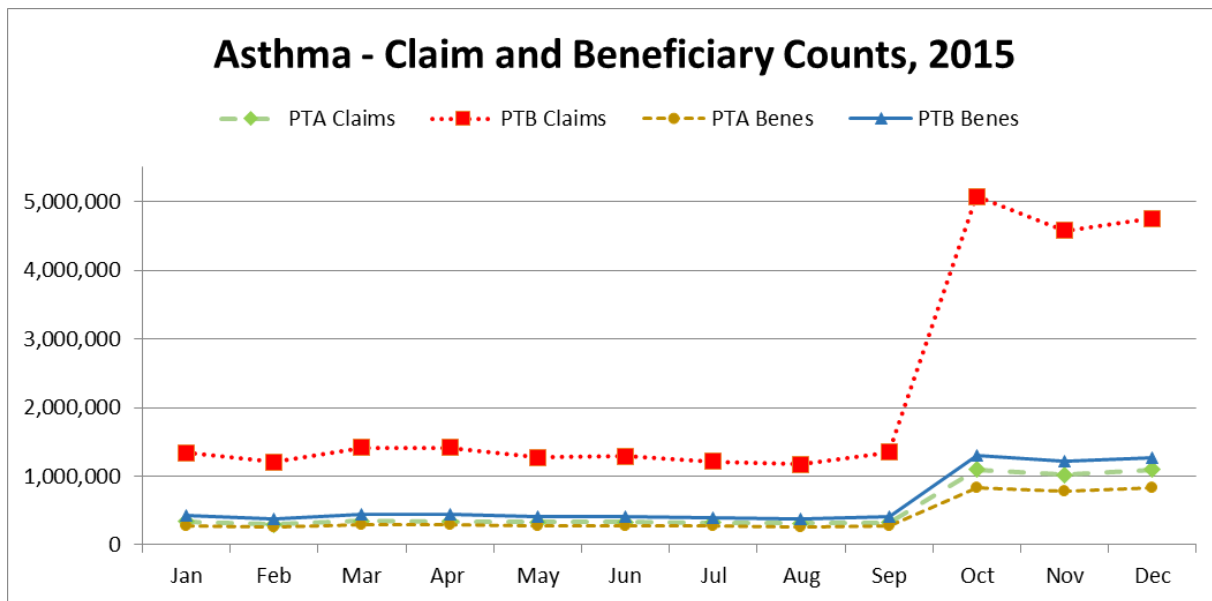

Figure 2 shows that for chronic kidney disease, there was a 31% increase in Part B carrier claims[11] from September to October and a similar increase in beneficiaries identified as having CKD using Part A (inpatient, skilled nursing, home health, or hospital outpatient) claims,

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[10] For the 27 CCW chronic conditions, carrier claims refer to claim types 71 and 72 (not DME claim types 81 or 82), and exclude any claims for which line item Berenson-Eggers Type of Service [BETOS] code variable equals D1A, D1B, D1C, D1D, D1E, D1F, D1G (which is DME), or O1A (which is ambulance services).

[11] For the 27 CCW chronic conditions, carrier claims refer to claim types 71 and 72 (not DME claim types 81 or 82), and exclude any claims for which line item Berenson-Eggers Type of Service [BETOS] code variable equals D1A, D1B, D1C, D1D, D1E, D1F, D1G (which is DME), or O1A (which is ambulance services).

there was a 15% increase in claims from September to October which was associated with a 16% increase in beneficiaries identified as having chronic kidney disease.

Figure 2. CCW condition chronic kidney disease (CKD) - claim and beneficiary counts by month, 2015
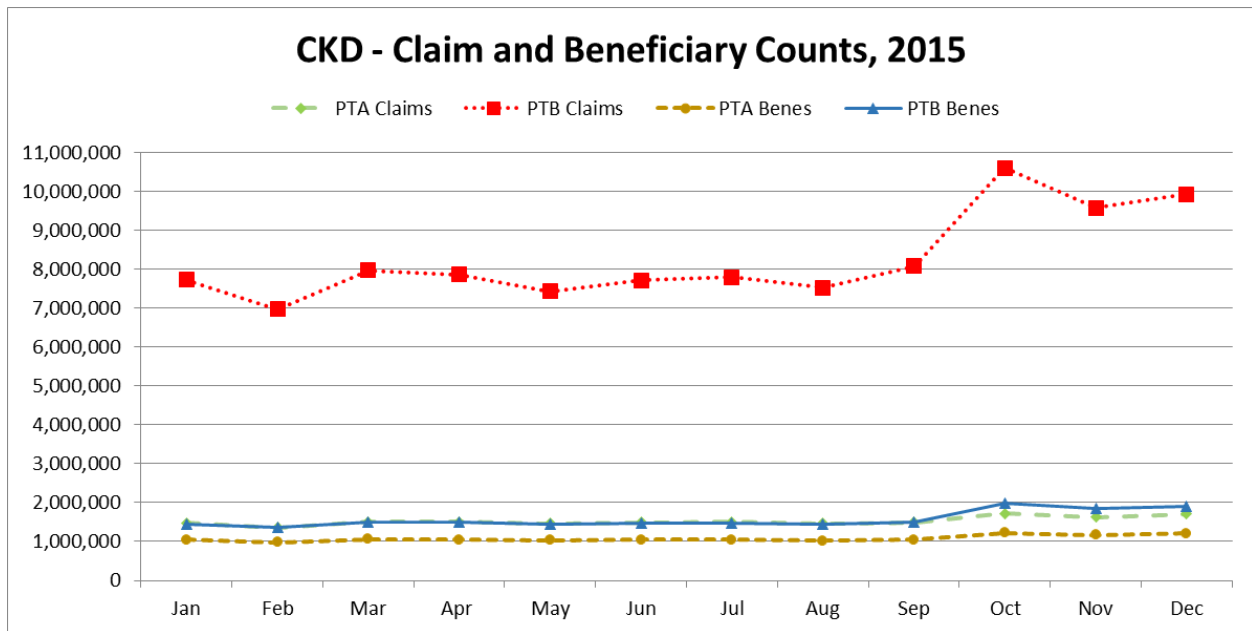

Figure 3 shows that the number of claims and beneficiaries identified through the spinal cord injury algorithm remained fairly constant each month from January to September 2015 and then increased beginning in October 2015. We observed a nearly a 3-fold increase in Part B carrier and durable medical equipment claims for spinal cord injury from September to October (26,658 versus 77,769 claims), with the number of beneficiaries identified as having spinal cord injury using Part B claims more than doubling during the same time frame. Part A claims (inpatient, skilled nursing, home health, or hospital outpatient) and beneficiary counts also more than doubled from September to October 2015.

Figure 3. CCW condition spinal cord injury - claim and beneficiary counts, 2015
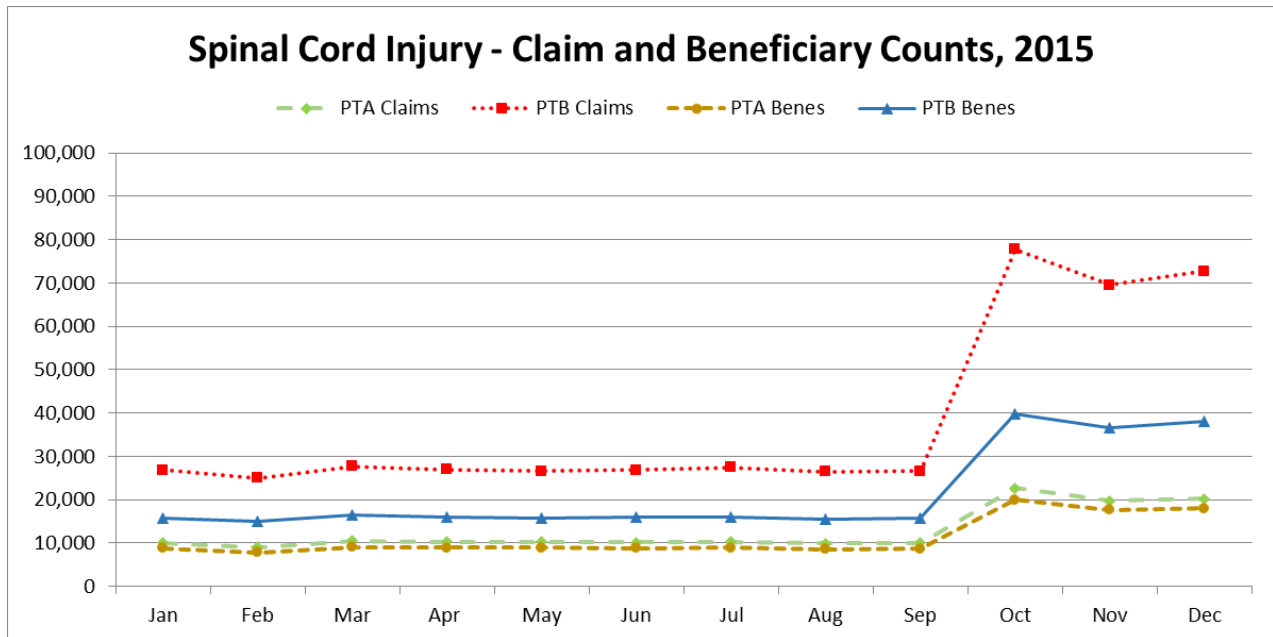
Claims by Diagnosis Code – Selected Conditions

For the CCW asthma algorithm, the ICD-9 diagnosis code 493.90 (asthma unspecified) accounted for 63.7% of Part A claims and 59.7% of Part B claims (Table 4), Using the GEMs mapping, ICD-9 code 493.90 primarily was associated with the ICD-10 code J45.909 (unspecified asthma, uncomplicated), which accounted for 16.9% and 10.0% of Part A and Part B claims, respectively[12]. The ICD-10 code accounting for the largest share of ICD-10 asthma claims is J44.9 (chronic obstructive pulmonary disease, unspecified), which accounted for 60.8% of Part A claims and 59% of Part B claims). Using the GEMs, this code mapped back to the ICD-9 code 493.20 (Chronic obstructive asthma), which accounted for only 19.7% of ICD-9 Part A asthma claims and 9.1% of Part B claims.

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[12] The ICD-9 diagnosis code 493.90 also was associated with the ICD-10 code J45.998 (other asthma). Since this code appears infrequently (< 1% of Part A claims), in Table 4 it is included in the "Other ICD-10" category.

Table 4. CCW condition asthma - distribution of claims by diagnosis code, 2015

ICD-9-CM diagnosis codes	Percentage of Claims (%)		ICD-10-CM diagnosis codes	Percentage of Claims (%)	
	Medicare Part A claims	Medicare Part B claims		Medicare Part A claims	Medicare Part B claims
493.90-Asthma unspecified	63.7	59.7	J44.9-Chronic obstructive pulmonary disease, unspecified	60.8	59.0
493.20-Chronic obstructive asthma, unspecified	19.7	9.1	J45.909-Unspecified asthma, uncomplicated	16.9	10.0
493.92-Asthma, unspecified type, with (acute) exacerbation	5.1	8.3	J44.1-Chronic obstructive pulmonary disease with (acute) exacerbation	14.4	17.6
493.00-Extrinsic asthma, unspecified	3.4	11.9	J44.0-Chronic obstructive pulmonary disease with acute lower respiratory infection	2.5	1.9
Other ICD-9	8.1	10.9	Other ICD-10	5.4	11.5

For the chronic kidney disease algorithm, the ICD-9 diagnosis codes 585.6 (end stage renal disease) was the most common code, followed by 585.3 (chronic kidney disease, Stage III [moderate]). These two codes accounted for 45.7% of ICD-9 Part A and 43.8% of Part B claims in the algorithm. These two diagnosis codes mapped to ICD-10 codes with equivalent meanings: N18.6 (end stage renal disease) and N18.3 (chronic kidney disease, stage 3 [moderate]). Similar to the comparable ICD-9 diagnoses codes, these two ICD-10 codes accounted for 40.7% of Part A and 36.6% of Part B claims (Table 5).

Table 5. CCW condition chronic kidney disease - distribution of claims by diagnosis code, 2015

ICD-9-CM diagnosis codes	Percentage of Claims (%)		ICD-10-CM diagnosis codes	Percentage of Claims (%)	
	Medicare part A claims	Medicare part B claims		Medicare part A claims	Medicare part B claims
585.6-End stage renal disease	29.6	26.7	N18.6-End stage renal disease	25.4	21.2
585.3-Chronic kidney disease, Stage III (moderate)	16.1	17.1	N18.3-Chronic kidney disease, stage 3 (moderate)	15.3	15.4
584.9-Acute kidney failure, unspecified	13.6	16.9	N17.9-Acute kidney failure, unspecified	11.7	14.1
585.9-Chronic kidney disease, unspecified	14.4	10.3	E11.65-Type 2 diabetes mellitus with hyperglycemia	11	14.2
585.4-Chronic kidney disease, Stage IV (severe)	5.3	5.5	N18.9-Chronic kidney disease, unspecified	11.2	7.6
403.91-Hypertensive chronic kidney disease, unspecified, with chronic kidney disease stage V or end stage renal disease	4.1	1.1	N18.4-Chronic kidney disease, stage 4 (severe)	4.9	4.8
250.40-Diabetes with renal manifestations, type II or unspecified type, not stated as uncontrolled	2.6	4.1	I12.0-Hypertensive chronic kidney disease with stage 5 chronic kidney disease or end stage renal disease	4	1.4
other ICD-9 codes	14.4	18.3	Other ICD-10 Codes	16.5	21.4

For the spinal cord injury algorithm (Table 6), the most common ICD-9 code identified on claims was 907.2 (late effect of spinal cord injury) which accounted for 57.1% of the ICD-9 Part A claims and 23.4% of Part B claims. ICD-10 codes are much more specific regarding the site of the injury[13] resulting in ICD-9 code 907.2 being mapped to the following four ICD-10 codes for Spinal Cord Injury: S14.109S, S24.109S, S34.109S, and S34.139S for unspecified injury to cervical, thoracic, lumbar, and sacral spinal cord respectively[14]. For the ICD-10 based spinal cord injury algorithm,

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[13] For ICD-10-CM diagnosis codes, the first three digits of the code indicate the location of the injury (S12.*=neck, S14.* = cervical spine, S22.* =thoracic vertebra, S32.* = lumbar spine, etc.).
[14] Only the ICD-10 code S14.109S is displayed in Table 6. The other codes S24.109S, S34.109S, and S34.139S are included in the "Other ICD-10" category. These four codes, collectively, accounted for 9.4% of Part A and 2.8% of Part B ICD-10 codes.

there wasn't a single diagnosis code that accounted for most of the claims identified as there was with the ICD-9 based algorithm. Many different codes appeared on the claims.

Table 6. CCW condition spinal cord injury - distribution of claims by diagnosis code, 2015

ICD-9-CM diagnosis codes	Percentage of Claims (%)		ICD-10-CM diagnosis codes	Percentage of Claims (%)	
	Medicare Part A claims	Medicare Part B claims		Medicare Part A claims	Medicare Part B claims
907.2-Late effect of spinal cord injury	57.1	23.4	S32.009A-Unspecified fracture of unspecified lumbar vertebra, initial encounter for closed fracture	9.7	14.7
952.9- Unspecified site of spinal cord injury without evidence of spinal bone injury	9.5	23.2	S32.10XA-Unspecified fracture of sacrum, initial encounter for closed fracture	7.8	7.3
806.4-Closed fracture of lumbar spine with spinal cord injury	4.2	4.2	S22.089A-Unspecified fracture of T11-T12 vertebra, initial encounter for closed fracture	6.6	4.5
806.25-Closed fracture of T7-T12 level with unspecified spinal cord injury	3.2	3.6	S12.9XXA-Fracture of neck, unspecified, initial encounter	4.0	9.8
952.00-C1-C4 level with unspecified spinal cord injury	2.6	6.2	S22.009A-Unspecified fracture of unspecified thoracic vertebra, initial encounter for closed	5.9	8.7
806.00-Closed fracture of C1-C4 level with unspecified spinal cord injury	3.1	5.0	S32.019A-Unspecified fracture of first lumbar vertebra, initial encounter for closed fracture	8.0	4.6
952.05-C5-C7 level with unspecified spinal cord injury	1.8	2.8	S14.109S-Unspecified injury at unspecified level of cervical spinal cord, sequela	5.1	1.5
Other ICD-9 Codes	18.5	31.6	Other ICD-10	52.8	48.9

Chapter 4: Summary

When the conversion to ICD-10 occurred in October 2015, the CCW experienced an initial decrease in the number of Medicare fee-for-service claims across all claim types compared to the prior year (October 2014). However, by November and December of 2015, claims were higher than the previous year for all claim types except inpatient, skilled nursing facility, and hospice. In general, the changes in claims volume that occurred during the initial conversion period were in the 1-2% range, indicating that there was minimal impact on receiving claims in the CCW.

In addition, the conversion from ICD-9-CM to ICD-10-CM required that the CCW condition algorithms, which search claims for specific diagnosis codes, be updated. Overall, the prevalence estimates for the 60 CCW conditions were consistent between 2014 and 2015. However, we did observe differences for some conditions, and tried to determine whether the change in prevalence was a result of the change in coding systems, particularly since the mapping between ICD-9-CM and ICD-10-CM diagnosis codes using the GEMs may not produce a 1:1 linkage.

For example, asthma prevalence was 5.3% in 2014 and 8.7% in 2015. The update to the asthma algorithm using the GEMs tool resulted in three ICD-10 codes being included that describe chronic obstructive pulmonary disease (COPD): J44.0 (chronic obstructive pulmonary disease with acute lower respiratory infection), J44.1 (chronic obstructive pulmonary disease with [acute] exacerbation), and J44.9 (chronic obstructive pulmonary disease, unspecified). These codes, which also are included in the COPD algorithm, appear to have contributed to the increased prevalence estimates for asthma. On the other hand, the ICD-10-CM codes for the chronic kidney disease algorithm appeared to yield a slightly higher population with the condition when compared to the ICD-9-CM version of the algorithm (19.3% vs 17.6%, respectively) even though the ICD-10-CM algorithm appears to closely resemble the chronic kidney disease algorithm based on ICD-9 codes. The number of codes associated with a condition did not necessarily increase estimates of the prevalence rates. For example, the CCW Hip/Pelvic Fracture algorithm had 39 ICD-9-CM codes compared to 423 unique codes with ICD-10-CM, yet the prevalence of the condition was stable after the ICD-10-CM conversion (0.8%).

Our analysis compared 2014 and 2015 data, but 2015 included only three months (October-December) of ICD-10 codes. Also, the CCW condition algorithms employ between one and three years of claims data to identify a beneficiary as having received services or treatment for the condition. More pronounced differences than what is presented in this paper may appear when a full year of claims based upon ICD-10 codes is examined or as the full surveillance period for the algorithms use claims with ICD-10-CM diagnosis codes.

The 60 CCW condition algorithms have been updated to ICD-10 using GEMs. Currently, CMS does not have plans to further refine the algorithms. However, the GEMs are not a substitute for learning about the specific ICD-10-CM and ICD-10-PCS included in the CCW algorithms. Users may want to review the ICD-10 codes included for a specific condition to ensure that they meet the needs of their research.

Appendix A: Acronym List

Acronym	Definition
CCW	Chronic Conditions Data Warehouse
CKD	Chronic Kidney Disease
CMS	Centers for Medicare & Medicaid Services
COPD	Chronic Obstructive Pulmonary Disease
DME	Durable Medical Equipment
GEMs	General Equivalence Mappings
HH	Home Health
HOP	Hospital Outpatient
HOS	Hospice
ICD	International Classification of Diseases
IP	Inpatient
MS-DRG	Medicare Severity Diagnosis Related Group
SNF	Skilled Nursing Facility