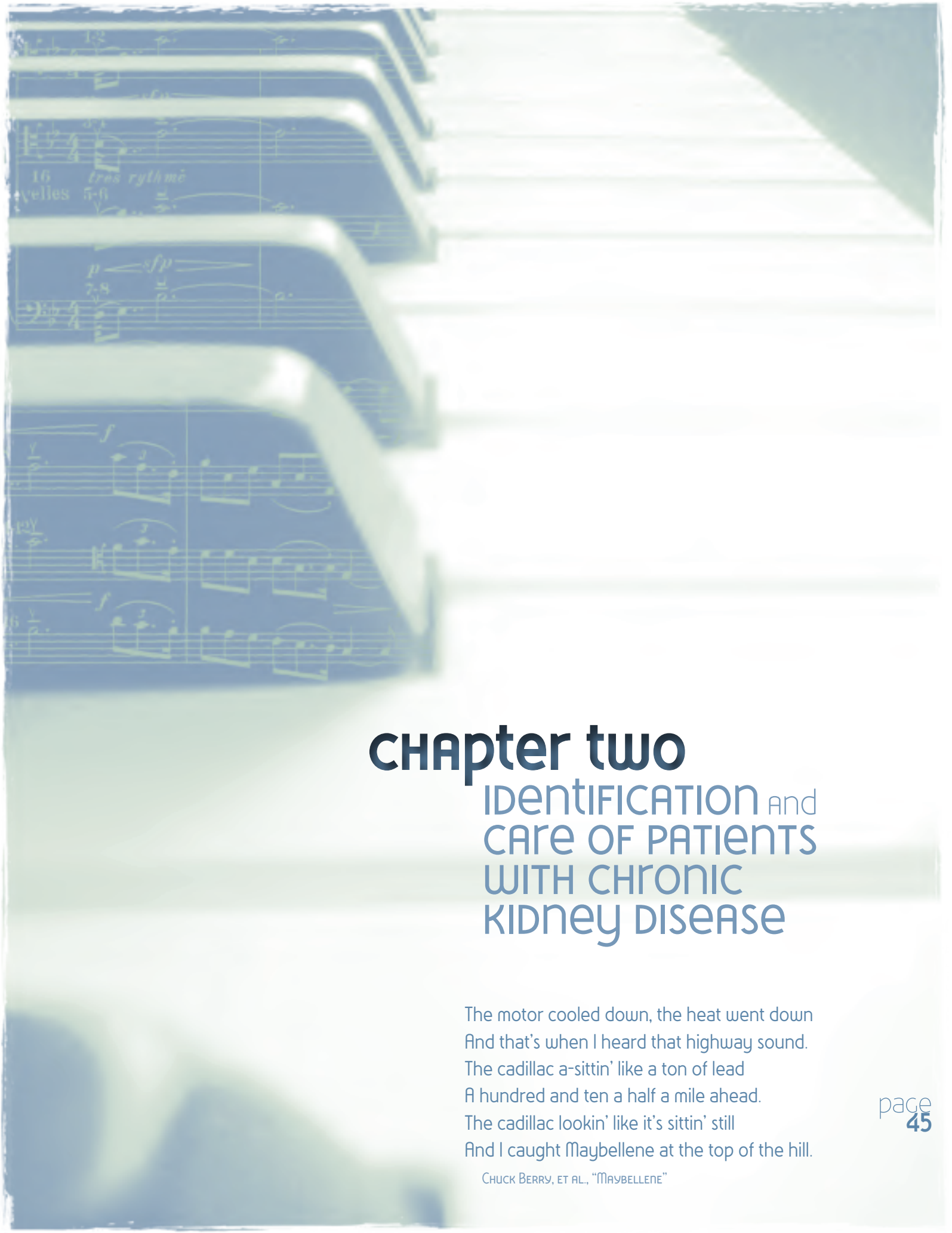


chapter two

Identification and Care of Patients with Chronic Kidney Disease

The motor cooled down, the heat went down
And that's when I heard that highway sound.
The cadillac a-sittin' like a ton of lead
A hundred and ten a half a mile ahead.
The cadillac lookin' like it's sittin' still
And I caught Maybellene at the top of the hill.

Chuck Berry, et al., "Maybellene"

The identification of CKD is a significant challenge, as most datasets lack the biochemical data that provide the greatest precision in identifying the disease. And while random samples such as the NHANES dataset contain biochemical information, they rarely include event rates or economic data, making it difficult to evaluate access to care for this high-risk population, or to examine the interactions of CKD with diabetes and cardiovascular disease.

The USRDS uses several datasets to assess the recognized CKD population, including the general Medicare 5 percent sample, with an average of 1.2 million individuals each year. Few datasets, however, are large enough to allow assessment of younger CKD populations, and few contain the laboratory data needed to determine the actual burden of the disease. To address these issues we use data from employer group health plans (EGHPs), including the Thomson Reuters MarketScan dataset, with information from 40 Fortune 100 companies, 80 percent of which are self-insured. This dataset contains information on approximately 17 million lives per year, with claims for services but no laboratory data. We also employ data from United Health Group's Ingenix i3 LabRx dataset, with information on 5.7 million lives per year from employers that are only 20 percent self-insured. This dataset contains provider charges but no paid claims; it does, however, contain biochemical data provided by contract laboratories in the United Healthcare system. Other ordered labs can be tracked, but results are not available.

The mean age of the Medicare population age 65 and older is 75.3 overall and 77.8 for those with CKD — a contrast to the EGHP population, at 44.3 and 52.4, respectively, for MarketScan patients, and 42.7 and 51.2 for those in the Ingenix i3 dataset. As expected, disease prevalence is lower for the younger EGHP patients. Interesting, however, is the similar disease burden in the MarketScan and Ingenix i3 populations, which are associated with two very different sets of employers with different health plan payment systems.

New, stage-specific ICD-9-CM codes (585.x) were introduced in the fall of 2005, providing an opportunity to track populations with reported diagnosis codes over time. CKD is also defined through codes for diabetes (250.4x) and hypertension (403.9x), and through codes specific to kidney disease, such as glomerular disease (583.x). Definition of the total recognized CKD population must therefore take into consideration a variety of codes beyond the 585.x series.

The recognized prevalent CKD population has been growing rapidly since 2003, a year after the new CKD stage classification system was published. Stage-specific codes are now being used more frequently, and use of the 585.9 code — for unknown/unspecified stage — has been falling.

The testing of patients at high risk for kidney disease has long been a focus of the USRDS, and has been added as well to the Healthy People 2020 goals developed by the Department of Health and Human Services (see the HP2020 chapter in Volume Two). But while urine testing for microalbuminuria has been recommended by the American Diabetes Association for some time, there has been slow progress in its use. In 2009, for example, just one in three patients with diagnosed diabetes received this test, in contrast to the 87 percent receiving creatinine testing.

INTRODUCTION

Because microalbumin testing must be ordered separately, it may represent a true intent to assess kidney disease. Recent papers addressing the risk stratification of kidney disease use both the urine microalbumin level and urine albumin/creatinine ratio, emphasizing that both tests are needed to fully assess kidney disease and its associated risks of death and progression to ESRD (Lancet 2010).

Data on physician care show that patients are far more likely to visit a cardiologist than a nephrologist after a CKD diagnosis. This may relate to concerns of primary care physicians that they'll lose contact with patients, as specialists assume aspects of care; it may also be difficult for patients to navigate what is for them a new system of care. Consultations within the hospital setting may present fewer barriers, an idea which should receive future assessment.

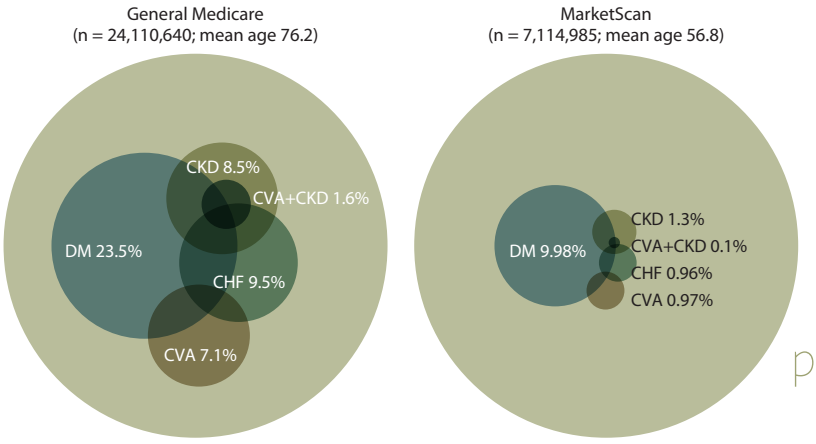
Approximately 70 percent of Medicare CKD patients with diagnosed diabetes, and 80 percent of those in the younger MarketScan population, receive ACEIs/ARBs. Beta blocker use reaches 70 percent for patients with congestive heart failure, but only 60 percent in those with hypertension; the very high rates of cardiovascular events and of sudden death among CKD patients may provide a background for studies assessing the value of beta blockers across the board for the CKD population. Use of lipid lowering agents reaches 60–70 percent in patients with CKD and diabetes or cardiovascular disease. Recent data from the SHARP trial (November, 2010), showing improvement in event rates with treatment, may increase use of these agents.

The many challenges of caring for CKD patients include fluid overload, congestive heart failure, and hypertension. Use of loop diuretics increases with CKD stage, while use of therapy with an erythropoiesis stimulating agent (ESA) is greatest in patients with Stage 4–5 CKD, consistent with advancing anemia. Use of oral vitamin D, most common among patients in the private health plans, is in part related to prescription drug coverage. The vitamin may be considered a nutritional supplement in most patients, but it is part of the required therapy to control secondary hyperparathyroidism in patients with CKD.

The identification and care of CKD patients is very complex. Disparities do exist and should be addressed, as these patients have very high event rates and high rates of progression to ESRD, making them a very costly and multifaceted population.

>> **Figure 2.I;** see page 123 for analytical methods. *Point prevalent general (fee-for-service) Medicare patients age 65 & older; point prevalent MarketScan patients age 50–64. Diabetes, CKD, CHF, & CVA determined from claims.*

2 i **Distribution of point prevalent general Medicare (age 65 & older) & MarketScan (age 50–64) patients with coded diabetes, CKD, CHF, & CVA, 2009**



This table presents descriptive data on patients in the three datasets used throughout Volume One of the ADR: the 1.2 million Medicare patients age 65 and older in the 5 percent sample, the 17.7 million patients age 20–64 in the MarketScan database, and the 5.8 million, also age 20–64, in the Ingenix i3 database. Information on race and ethnicity is not available in the MarketScan and Ingenix i3 data.

Data on comorbidity in part reflect the older age of the Medicare population. Nearly 92 percent of Medicare CKD patients, for example, have hypertension, compared to 60 and 67 percent, respectively, of those in the MarketScan and Ingenix i3 databases. Thirty-three percent of Medicare CKD patients have congestive heart failure, compared to 9.1 and 7.8 percent in the MarketScan and Ingenix i3 populations. And the rate of cancer in Medicare CKD patients is 18.4 percent, compared to 14.2 and 12.6 percent, respectively, in MarketScan and Ingenix i3 participants. » Table 2.a; see page 123 for analytical methods. *Prevalent patients surviving 2008, without ESRD, age 65 & older (Medicare) & 20–64 (MarketScan & Ingenix i3).*

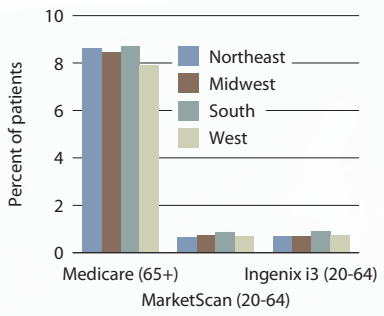
2ai Descriptive parameters of CKD datasets, by age, gender, race, ethnicity, & coded comorbidity

	Medicare 65+, 5 percent sample (2009)				MarketScan , 2008 (20–64)				Ingenix i3, 2008 (20–64)			
	All (mean age 75.3)		CKD (77.8)		All (mean age 44.3)		CKD (52.4)		All (mean age 42.7)		CKD (51.2)	
	N	%	N	%	N	%	N	%	N	%	N	%
All	1,190,985	100.0	100,987	100.0	17,709,971	100	139,649	100	5,769,002	100.0	46,890	100.0
20-44					8,366,071	47.2	28,673	20.5	3,073,210	53.3	11,217	23.9
45-54					4,893,847	27.6	36,410	26.1	1,545,401	26.8	13,237	28.2
55-64					4,450,053	25.1	74,566	53.4	1,150,391	19.9	22,436	47.9
65-74	614,820	51.6	37,223	36.9								
75-84	412,549	34.6	42,272	41.9								
85+	163,616	13.7	21,492	21.3								
Male	498,731	41.9	47,975	47.5	8,378,813	47.3	73,893	52.9	2,800,567	48.6	25,455	54.3
Female	692,254	58.1	53,012	52.5	9,331,158	52.7	65,756	47.1	2,968,142	51.5	21,433	45.7
White	1,043,313	87.6	84,589	83.8								
African American	86,379	7.3	11,026	10.9								
Other	16,369	1.4	1,158	1.2								
Hispanic	19,278	1.6	1,863	1.8								
Diabetes	278,639	23.4	47,883	47.4	1,013,077	5.7	52,719	37.8	311,369	5.4	17,331	37.0
Hypertension	720,520	60.5	92,679	91.8	2,258,530	12.8	84,358	60.4	807,633	14.0	31,263	66.7
CHF	113,803	9.6	32,769	32.5	92,277	0.5	12,661	9.1	27,588	0.5	3,661	7.8
Cancer	125,275	10.5	18,610	18.4	349,136	2.0	19,854	14.2	106,827	1.9	5,902	12.6

2bi Prevalence (%) of recognized CKD, by dataset, year, & age

	Medicare	MarketScan	Ingenix i3
2000	2.7	0.3	
2001	3.1	0.4	0.4
2002	3.4	0.5	0.4
2003	3.8	0.5	0.5
2004	4.2	0.5	0.5
2005	4.8	0.5	0.6
2006	6.0	0.6	0.6
2007	6.8	0.6	0.7
2008	7.7	0.7	0.7
2009	8.5	0.8	0.8
2009			
20-44		0.3	0.4
45-54		0.7	0.9
55-64		1.7	2.0
65-74	6.1		
75-84	10.3		
85+	13.1		

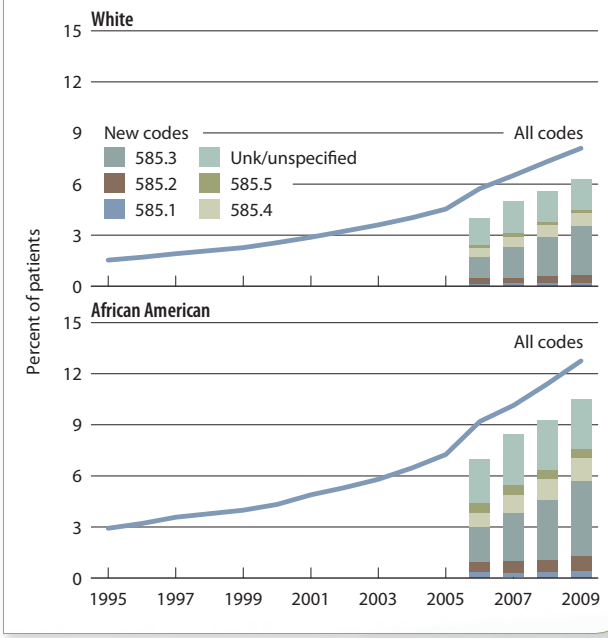
2ci Prevalence of recognized CKD, by census region & dataset



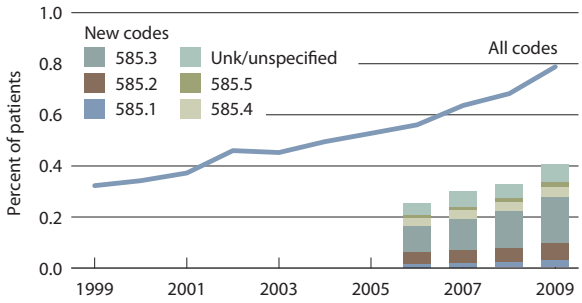
The prevalence of recognized CKD in the Medicare population increased threefold between 2000 and 2009, from 2.7 to 8.5 percent. While the proportions of patients with CKD in the MarketScan and Ingenix i3 populations are smaller, the net increases from 2000 and 2001 to 2009 parallel the growth noted in the Medicare population, at 0.3 to 0.8 and 0.4 (2001) to 0.8 percent, respectively.

By census region, prevalence of CKD in the Medicare population ranges from 7.9 percent in the west to 8.7 in the south; rates in the MarketScan and Ingenix i3 populations are highest in the south, at 0.88 and 0.92, respectively. » Table 2.b & Figure 2.2; see page 123 for analytical methods. *Prevalent patients surviving cohort year, age 65 & older (Medicare, 2009) & 20–64 (MarketScan & Ingenix i3, 2008).*

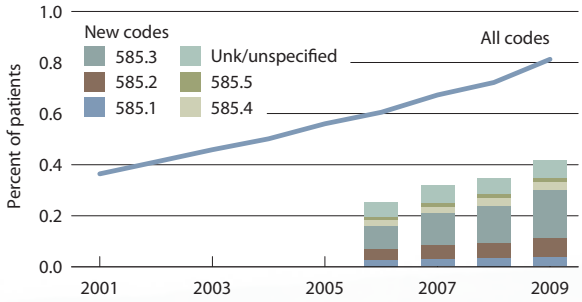
2 3i **Trends in CKD prevalence: Medicare patients age 65 & older, by race**



2 4i **Trends in CKD prevalence: MarketScan patients age 20–64**



2 5i **Trends in CKD prevalence: Ingenix i3 patients age 20–64**



ICD-9-CM CODES

585.1	Chronic kidney disease, Stage 1
585.2	Chronic kidney disease, Stage 2 (mild)
585.3	Chronic kidney disease, Stage 3 (moderate)
585.4	Chronic kidney disease, Stage 4 (severe)
585.5	Chronic kidney disease, Stage 5 (excludes 585.6: Stage 5, requiring chronic dialysis.*)
	Chronic kidney disease, unknown/unspecified

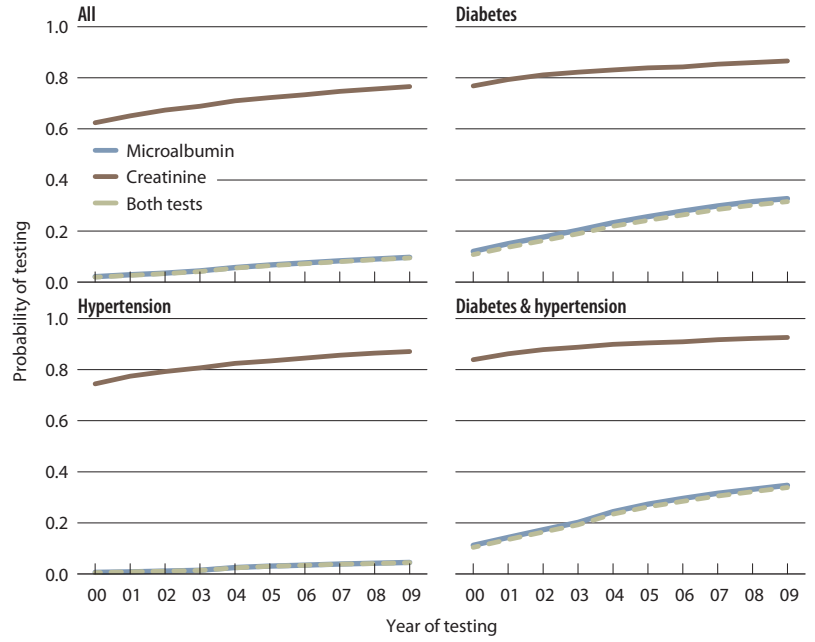
**In USRDS analyses, patients with ICD-9-CM code 585.6 are considered to have code 585.5; see Appendix A for details.*

CKD stage estimates are from a single measurement. For clinical case definition, abnormalities should be present ≥ 3 months.

Among Medicare patients, claims data identify 12.8 percent of African Americans, and 8.1 percent of whites, as having prevalent CKD in 2009, compared to 10.5 and 6.3 percent identified using only the combined 585 codes. The difference is even more pronounced in the EGHP population, with claims data identifying prevalent CKD rates nearly twice as high as those found using solely the stage-specific codes.

The most commonly reported stage-specific code in the prevalent CKD population is 585.3 (Stage 3), at 2.9 and 4.4 percent for white and African American Medicare patients, respectively, and 0.18 and 0.19 percent among MarketScan and Ingenix i3 patients. >> Figures 2.3–5 ; see page 123 for analytical methods. *Prevalent patients surviving cohort year, without ESRD, age 65 & older (Medicare) & 20–64 (MarketScan & Ingenix i3).*

2 6i **Probability of microalbumin & creatinine testing in Medicare patients at risk for CKD**



It is important that individuals at risk for CKD be screened periodically for kidney disease. Microalbumin and creatinine tests are valuable laboratory markers used to detect early signs of kidney damage. In 2009, the probability of creatinine testing in Medicare patients at risk for CKD was 0.77; the probability of receiving a urine microalbumin test (which must be ordered separately), in contrast, was 0.10.

In patients with diabetes or hypertension, the probablility of creatinine testing was 0.87; the probability of microalbumin testing in those with diabetes was 0.33, compared to 0.05 in patients with hypertension. Having both diabetes and hypertension greatly increases the odds of developing CKD. The probability of creatinine testing in patients with both conditions was 0.93, while the probability of a urine microalbumin test was 0.35; the probability of receiving both tests was 0.34. Because microalbumin testing must be ordered separately, it may represent a true intent to assess kidney disease. >> **Figure 2.6;** see page 123 for analytical methods. *Medicare patients from the 5 percent sample, age 20 & older, with both Part A & Part B coverage in the prior year; patients diagnosed with CKD or ESRD during prior year are excluded. Tests tracked during each year.*

2 Ci Probability of laboratory testing in patients at risk for CKD, by demographic characteristics, 2009

	Microalbumin		Creatinine		Both tests	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
All						
20-44	0.05	0.05	0.58	0.60	0.05	0.05
45-54	0.09	0.08	0.68	0.69	0.08	0.08
55-64	0.12	0.12	0.71	0.73	0.11	0.11
64-74	0.11	0.11	0.75	0.76	0.11	0.11
75-84	0.10	0.10	0.81	0.81	0.10	0.10
85+	0.06	0.06	0.82	0.81	0.05	0.06
Male	0.10	0.10	0.72	0.73	0.10	0.10
Female	0.10	0.10	0.80	0.80	0.09	0.09
White	0.09	0.09	0.77	0.77	0.09	0.09
African American	0.13	0.13	0.72	0.74	0.12	0.12
Other	0.12	0.12	0.70	0.71	0.12	0.12
Hispanic	0.14	0.15	0.71	0.72	0.14	0.14
Diabetes						
20-44	0.34	0.34	0.88	0.88	0.33	0.33
45-54	0.34	0.35	0.89	0.89	0.33	0.33
55-64	0.35	0.35	0.89	0.89	0.34	0.34
64-74	0.39	0.40	0.91	0.91	0.38	0.39
75-84	0.32	0.32	0.93	0.93	0.32	0.31
85+	0.21	0.21	0.92	0.92	0.20	0.20
Male	0.35	0.34	0.90	0.90	0.34	0.33
Female	0.34	0.35	0.93	0.93	0.33	0.34
White	0.34	0.35	0.92	0.92	0.33	0.34
African American	0.33	0.32	0.90	0.90	0.32	0.31
Other	0.35	0.35	0.87	0.87	0.34	0.34
Hispanic	0.36	0.37	0.90	0.90	0.35	0.36
Hypertension						
20-44	0.14	0.14	0.82	0.83	0.14	0.14
45-54	0.16	0.16	0.85	0.85	0.16	0.16
55-64	0.18	0.18	0.86	0.87	0.18	0.18
64-74	0.16	0.17	0.88	0.89	0.16	0.16
75-84	0.13	0.13	0.90	0.90	0.12	0.13
85+	0.07	0.07	0.89	0.89	0.07	0.07
Male	0.15	0.15	0.87	0.88	0.15	0.14
Female	0.13	0.13	0.90	0.90	0.13	0.13
White	0.13	0.13	0.89	0.89	0.13	0.13
African American	0.17	0.16	0.87	0.87	0.17	0.16
Other	0.17	0.17	0.84	0.84	0.17	0.17
Hispanic	0.20	0.20	0.88	0.88	0.20	0.20
Cardiovascular disease						
20-44	0.09	0.09	0.82	0.82	0.09	0.08
45-54	0.13	0.13	0.86	0.86	0.13	0.12
55-64	0.16	0.16	0.86	0.87	0.15	0.15
64-74	0.15	0.15	0.88	0.88	0.14	0.15
75-84	0.11	0.11	0.90	0.90	0.11	0.11
85+	0.06	0.06	0.88	0.88	0.06	0.06
Male	0.13	0.12	0.87	0.87	0.12	0.12
Female	0.11	0.11	0.90	0.90	0.11	0.11
White	0.11	0.11	0.89	0.89	0.11	0.11
African American	0.15	0.14	0.88	0.88	0.15	0.14
Other	0.15	0.15	0.85	0.86	0.15	0.14
Hispanic	0.18	0.19	0.90	0.90	0.17	0.18

Urine microalbumin and creatinine tests are used to determine possible kidney damage in patients at risk for CKD. Across all age, gender, and racial/ethnic categories, the probability of receiving a creatinine test is considerably higher — 5 to 13 times — than the probability of receiving a microalbumin test.

By disease category, the large disparity in the type of test performed is less evident in patients with diabetes, where differences favor creatinine testing over microalbumin testing by a margin of approximately three to one. And in patients with hypertension or cardiovascular disease, the probability of creatinine testing is 6–7 times greater than that of microalbumin testing.

>> **Table 2.c;** see page 123 for analytical methods. *Medicare patients from the 5 percent sample, age 20 & older, with both Part A & Part B coverage in 2008; patients diagnosed with CKD or ESRD during 2008 are excluded.*

Nearly 16 percent of NHANES participants have CKD. The likelihood of CKD increases with age, and is highest in participants age 85 and older, at 80 percent. CKD is recognized in women more often than in men, at 17.6 and 13.3 percent, respectively. By race, 16 percent of whites and African Americans have CKD. Sixty-three percent of NHANES participants age 85 and older have CKD of Stage 3 or higher.

Among Medicare patients age 65 and older, a CKD diagnosis code is more likely in older patients, women, and African Americans, and in patients with hypertension or cardiovascular disease (CVD). The odds of a code in patients age 75–84 and 85 and older are 42 and 84 percent higher, respectively, than in patients age 64–74. The odds are lower in women compared to men, and 40 percent higher in African Americans compared to whites. And in patients with diabetes, hypertension, or cardiovascular disease, the odds are 2–4 times higher than those in patients without these conditions.

In MarketScan patients age 55–59 and 60–64, the odds of a CKD diagnosis code are 17 and 40 percent higher compared to patients age 50–64, are lower in women compared to men, and are three times higher in patients with diabetes, hypertension, or cardiovascular disease than in patients without these conditions. >> Tables 2.d–f; see page 123 for analytical methods. *Medicare patients age 65 & older & MarketScan patients age 50–64, alive & eligible for all of 2009. CKD claims as well as other diseases identified in 2009. NHANES 2001–2008 participants, age 20 & older. eGFR estimated by MDRD method; CKD includes Stages 1–5.*

2di Percent of patients with CKD, by demographic characteristics, comorbidity, & dataset, 2009

	NHANES	Medicare (65+)			MarketScan (50–64)		
	Any CKD	DM (no HTN)	HTN (no DM)	CVD	DM (no HTN)	HTN (no DM)	CVD
All	15.5	9.7	14.8	21.7	5.8	5.1	9.7
20-49	7.2						
50-54	12.1				4.8	4.1	7.6
55-59	19.1				5.6	4.9	9.3
60-64	20.8				6.8	5.9	11.1
65-74	32.9	7.9	10.6	18.4			
75-84	53.8	11.3	16.4	22.9			
85+	80.1	14.3	21.7	25.7			
Male	13.3	10.7	17.4	23.1	6.3	5.8	10.1
Female	17.6	8.7	13.2	20.5	5.2	4.4	9.1
White	16.0	9.7	14.5	20.9			
African American	15.8	9.8	18.3	30.5			
Other	13.3	9.6	13.2	24.2			

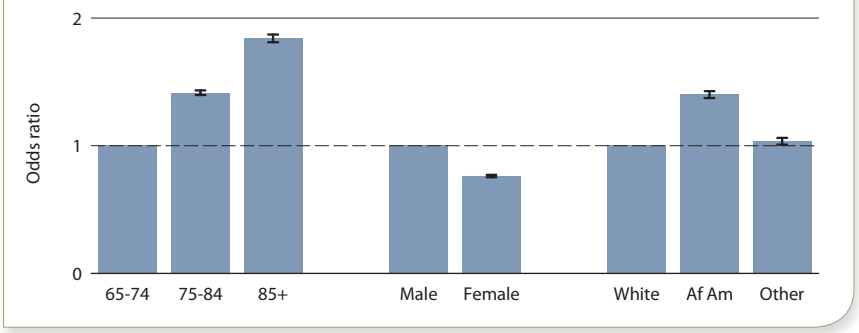
2ei Percent of patients with CKD of Stage 3 or higher, by demographic characteristics, comorbidity, & dataset, 2009

	NHANES	Medicare (65+)			MarketScan (50–64)		
	eGFR <60	DM (no HTN)	HTN (no DM)	CVD	DM (no HTN)	HTN (no DM)	CVD
All	7.8	2.4	5.3	8.1	1.4	1.5	3.1
20-49	1.2						
50-54	4.6				0.8	1.1	2.1
55-59	9.4				1.3	1.4	2.9
60-64	11.9				2.0	1.9	3.8
65-74	21.9	1.8	3.6	6.7			
75-84	37.8	3.1	6.2	8.9			
85+	63.1	4.1	8.0	9.4			
Male	6.2	2.6	6.5	8.9	1.6	1.7	3.3
Female	9.3	2.3	4.7	7.4	1.3	1.3	2.9
White	9.2	2.5	5.2	7.7			
African American	5.4	2.4	7.0	12.3			
Other	3.2	2.1	4.8	9.2			

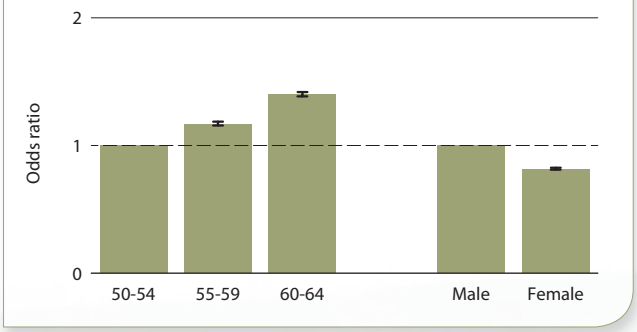
2fi Adjusted odds ratio of a CKD diagnosis code, by demographic characteristics, comorbidity, & dataset, 2009

	Medicare (65+)		MarketScan (50-64)	
	Odds ratio	p-value	Odds ratio	p-value
50-54			reference	
55-59			1.17	< .0001
60-64			1.40	< .0001
64-74	reference			
75-84	1.42	< .0001		
85+	1.84	< .0001		
Male	reference		reference	
Female	0.76	< .0001	0.82	< .0001
White	reference			
African American	1.40	< .0001		
Other	1.04	0.0068		
Diabetes	2.11	< .0001	3.28	< .0001
Hypertension	3.59	< .0001	3.31	< .0001
Cardiovascular disease	2.47	< .0001	2.84	< .0001

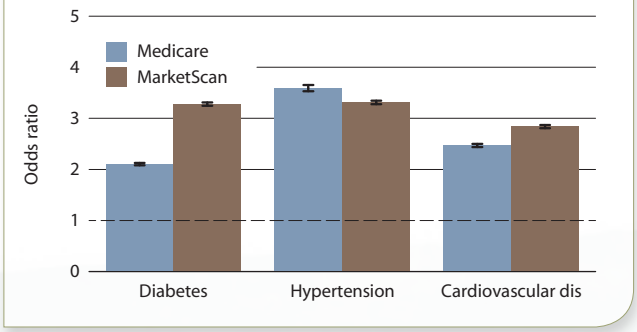
2.7i **Odds ratio of a CKD diagnosis code in Medicare patients age 65 & older, by age, gender, & race, 2009**



2.8i **Odds ratio of a CKD diagnosis code in MarketScan patients age 50–64, by age & gender, 2009**



2.9i **Odds ratio of a CKD diagnosis code in Medicare & MarketScan patients, by comorbidity, 2009**

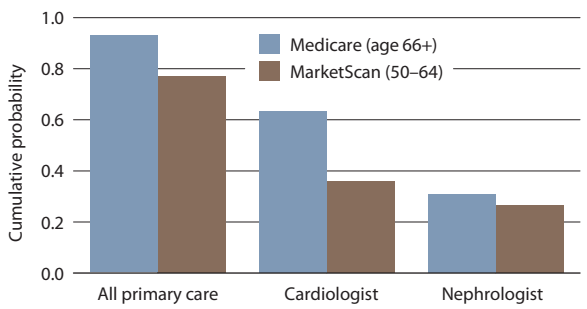


The odds of a CKD diagnosis code in Medicare patients age 65 and older, and in MarketScan patients age 50–64, are higher in older patients, males, and African Americans. And in both populations, patients with hypertension, cardiovascular disease, or diabetes are 2–3 times more likely to have a CKD diagnosis code compared to patients without these diseases.

» **Figures 2.7–9;** see page 123 for analytical methods. *Medicare patients age 65 & older & MarketScan patients age 50–64, alive & eligible for all of 2009. CKD claims as well as other diseases identified in 2009.*

In the year after being diagnosed with CKD, the cumulative probability of seeing a primary care physician is much higher than the probability of seeing a cardiologist or nephrologist, at 0.77 in the MarketScan population, and 0.93 in patients with Medicare coverage. And in both populations, the cumulative probability of a cardiology visit is much higher than that of a nephrologist visit, at 0.63 versus and 0.31, respectively, in Medicare patients and 0.36 versus 0.27 in the MarketScan population. » Figure 2.10; see page 123 for analytical methods. *Patients alive & eligible all of 2008. CKD diagnosis represents date of first CKD claim during 2008; physician claims searched during 12 months following that date.*

2.10i Cumulative probability of a physician visit at month 12 following CKD diagnosis in 2008, by physician specialty & dataset



The type of physician seen by month 12 following a CKD diagnosis changes dramatically with the severity of CKD. In Medicare patients with any CKD, for example, the probability of seeing a nephrologist is 0.25–0.35 across demographic groups; in those with a diagnosis code of 585.3 or higher, the probability is 0.48–0.64. In the MarketScan population, the probability of seeing a nephrologist is 0.27 overall, increasing to 0.51 in patients with a diagnosis code of 585.3 or higher. » Tables 2g–h; see page 123 for analytical methods. *Patients alive & eligible all of 2008. CKD diagnosis represents date of first CKD claim during 2008; physician claims searched during 12 months following that date.*

2.gi Cumulative probability of a physician visit at month 12 after CKD diagnosis in 2008, by demographic characteristics, physician specialty, & dataset

	Medicare (65+)			MarketScan (50–64)		
	Primary care	Cardiologist	Nephrologist	Primary care	Cardiologist	Nephrologist
50-54				0.72	0.30	0.24
55-59				0.75	0.35	0.26
60-64				0.77	0.40	0.27
65-74	0.91	0.60	0.32			
75-84	0.93	0.66	0.31			
85+	0.93	0.65	0.25			
Male	0.91	0.67	0.31	0.74	0.37	0.26
Female	0.93	0.61	0.29	0.77	0.35	0.26
White	0.92	0.64	0.29			
African American	0.91	0.61	0.35			
Other	0.90	0.59	0.30			
All	0.93	0.63	0.31	0.77	0.36	0.27

2.hi Cumulative probability of a physician visit at month 12 after a CKD diagnosis code of 585.3 or higher in 2008, by demographic characteristics, physician specialty, & dataset

	Medicare (65+)			MarketScan (50–64)		
	Primary care	Cardiologist	Nephrologist	Primary care	Cardiologist	Nephrologist
50-54				0.73	0.36	0.52
55-59				0.76	0.39	0.52
60-64				0.78	0.42	0.51
65-74	0.91	0.62	0.64			
75-84	0.93	0.67	0.59			
85+	0.93	0.66	0.48			
Male	0.91	0.69	0.62	0.76	0.42	0.52
Female	0.93	0.61	0.56	0.77	0.37	0.51
White	0.92	0.66	0.58			
African American	0.91	0.61	0.62			
Other	0.91	0.62	0.58			
All	0.93	0.65	0.62	0.77	0.40	0.51

ICD-9-CM CODES

585.1	Chronic kidney disease, Stage 1
585.2	Chronic kidney disease, Stage 2 (mild)
585.3	Chronic kidney disease, Stage 3 (moderate)
585.4	Chronic kidney disease, Stage 4 (severe)
585.5	Chronic kidney disease, Stage 5 (excludes 585.6: Stage 5, requiring chronic dialysis.*)
	Chronic kidney disease, unknown/unspecified

**In USRDS analyses, patients with ICD-9-CM code 585.6 are considered to have code 585.5; see Appendix A for details.*

CKD stage estimates are from a single measurement. For clinical case definition, abnormalities should be present ≥ 3 months.

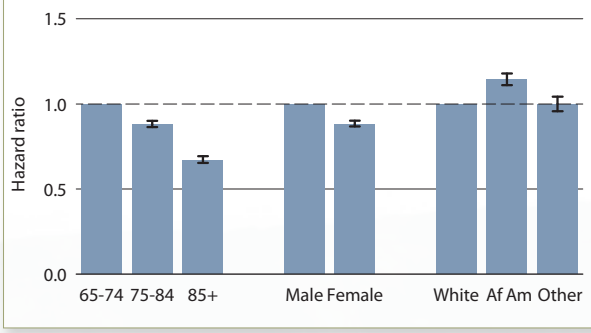
PROBABILITY & ODDS OF SEEING A PHYSICIAN AFTER CKD DIAGNOSIS

2.1i Hazard ratio of seeing a nephrologist 12 months after CKD diagnosis in 2008, by demographics, comorbidity, CKD stage, & dataset

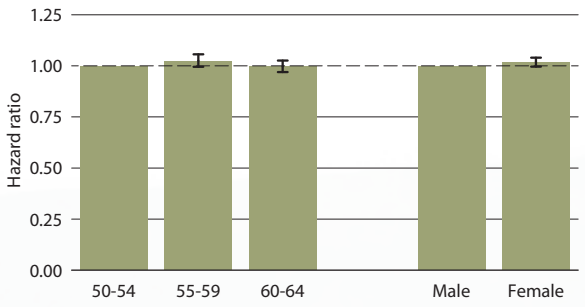
	Medicare (65+) Hazard ratio	p-value	MarketScan (50-64) Hazard ratio	p-value
50-54			reference	
55-59			1.03	0.0932
60-64			1.00	0.8760
65-74	reference			
75-84	0.88	< .0001		
85+	0.67	< .0001		
Male	reference		reference	
Female	0.88	< .0001	1.02	0.0938
White	reference			
African American	1.15	< .0001		
Other	1.00	0.96		
Diabetes	1.22	< .0001	1.21	< .0001
Hypertension	2.16	< .0001	1.43	< .0001
Cardiovascular disease	1.14	< .0001	1.14	< .0001
≥ Stage 3 vs < Stg 3 or unk	3.71	< .0001	3.62	< .0001

Among Medicare patients age 65 and older, African Americans are 15 percent more likely than their white counterparts to have seen a nephrologist 12 months after CKD diagnosis. For CKD patients with diabetes or cardiovascular disease, the likelihood of seeing a nephrologist is 22 and 14 percent higher, respectively, than in CKD patients without these conditions, and is more than twice as high in patients with hypertension. In patients with a CKD diagnosis code of Stage 3 or higher the likelihood of seeing a nephrologist is nearly four times that found in patients with CKD of an unknown stage or CKD of Stages 1–2. » **Table 2.i;** see page 123 for analytical methods. *Patients alive & eligible all of 2008. CKD diagnosis represents date of first CKD claim during 2008; physician claims searched during 12 months following that date.*

2.11i Hazard ratio of Medicare patients seeing a nephrologist 12 months after CKD diagnosis in 2008, by age, gender, & race

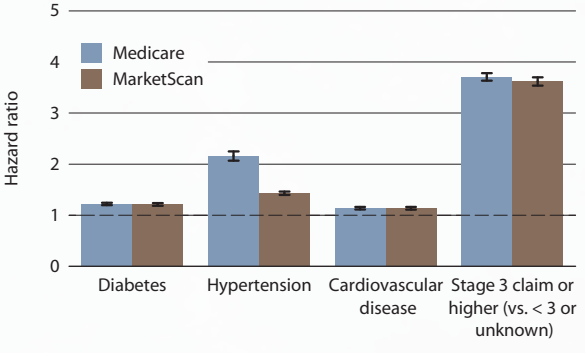


2.12i Hazard ratio of MarketScan patients seeing a nephrologist 12 months after CKD diagnosis in 2008, by age & gender



Factors associated with a higher likelihood of seeing a nephrologist 12 months after a CKD diagnosis include Medicare patients of African American race, and those with diabetes, hypertension, cardiovascular disease, or a CKD diagnosis code of 585.3 or higher. » **Figures 2.11–13;** see page 123 for analytical methods. *Patients alive & eligible all of 2008. CKD diagnosis represents date of first CKD claim during 2008; physician claims searched during 12 months following that date.*

2.13i Hazard ratio of patients seeing a nephrologist 12 months after CKD diagnosis in 2008, by comorbidity, CKD stage, & dataset



These figures present data on medication use among CKD patients in the Medicare 5 percent and MarketScan databases in 2009. Among Medicare Part D patients with a diagnosis of diabetes or hypertension, 69 and 64 percent, respectively, had evidence of ACEI/ARB/renin inhibitor use, compared to 77 and 73 percent in the MarketScan population; use was generally higher in patients with earlier stages of CKD.

In Medicare Part D patients with CHF or hypertension, beta blocker use was 70 and 60 percent, respectively, and 74 and 50 percent in the MarketScan population; use of this medication tends to be more common in patients with later stages of CKD.

In patients with hypertension or cardiovascular disease, use of a dihydropyridine calcium channel blocker was slightly higher in the Medicare population, and more common in those with later-stage CKD.

Use of lipid lowering agents is more apparent in patients with diabetes than in those with cardiovascular disease. In the Medicare population, for example, 69 percent with diabetes received some form of this medication, compared to 62 percent with cardiovascular disease; in MarketScan patients, use was 75 and 67 percent, respectively. » Figures 2.14–17; see page 123 for analytical methods. *Point prevalent Medicare CKD patients age 65 & older & MarketScan CKD patients age 50–64.*

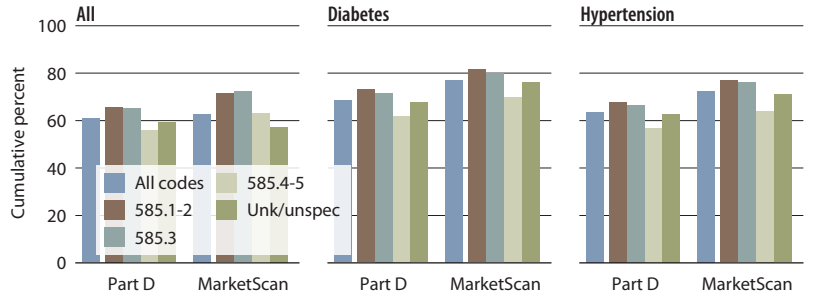
ICD-9-CM CODES

585.1	Chronic kidney disease, Stage 1
585.2	Chronic kidney disease, Stage 2 (mild)
585.3	Chronic kidney disease, Stage 3 (moderate)
585.4	Chronic kidney disease, Stage 4 (severe)
585.5	Chronic kidney disease, Stage 5 (excludes 585.6: Stage 5, requiring chronic dialysis.*)
	Chronic kidney disease, unknown/unspecified

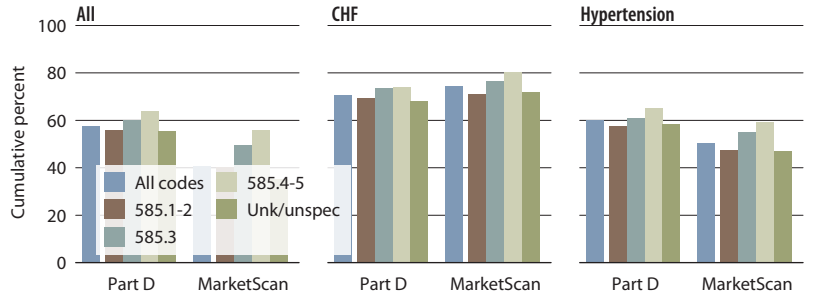
**In USRDS analyses, patients with ICD-9-CM code 585.6 are considered to have code 585.5; see Appendix A for details.*

CKD stage estimates are from a single measurement. For clinical case definition, abnormalities should be present ≥ 3 months.

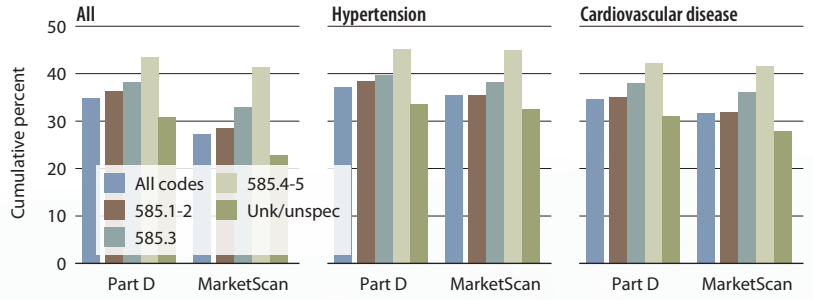
2.14i Medicare Part D & MarketScan CKD patients with at least one claim for an ACEI/ARB/renin inhibitor in the 12 months following the disease-defining entry period, by CKD diagnosis code, 2008



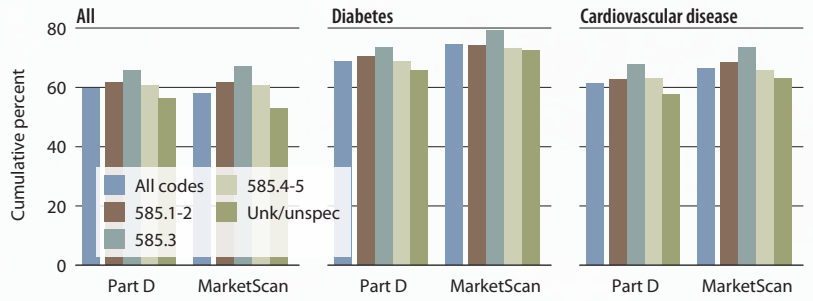
2.15i Medicare Part D & MarketScan CKD patients with at least one claim for a beta blocker in the 12 months following the disease-defining entry period, by CKD diagnosis code, 2008



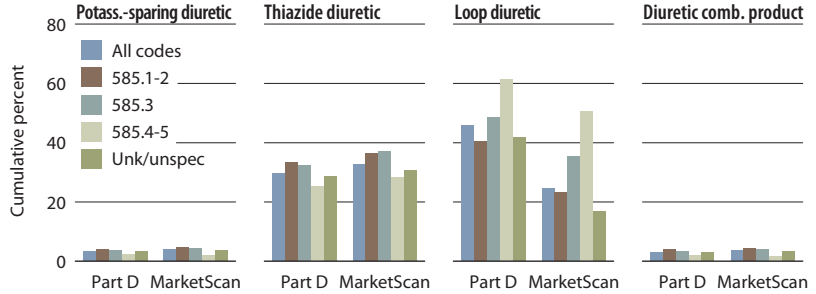
2.16i Medicare Part D & MarketScan CKD patients with at least one claim for a DHP calcium channel blocker in the 12 months following the disease-defining entry period, by CKD diagnosis code, 2008



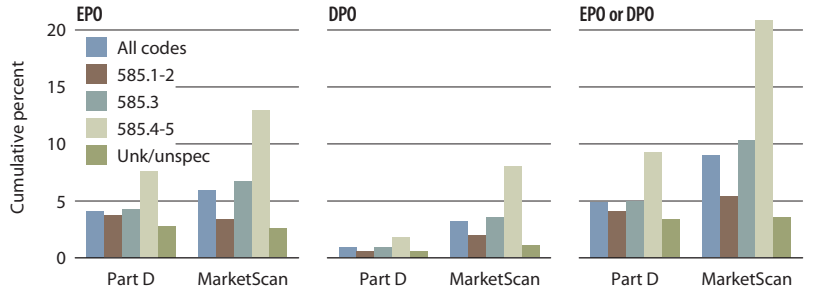
2.17i Medicare Part D & MarketScan CKD patients with at least one claim for a lipid lowering agent in the 12 months following the disease-defining entry period, by CKD diagnosis code, 2008



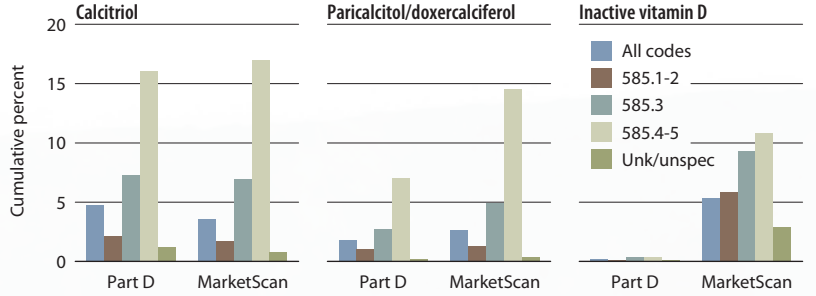
2.18i Medicare Part D & MarketScan CKD patients with at least one claim for a diuretic in the 12 months following the disease-defining entry period, by CKD diagnosis code, 2008



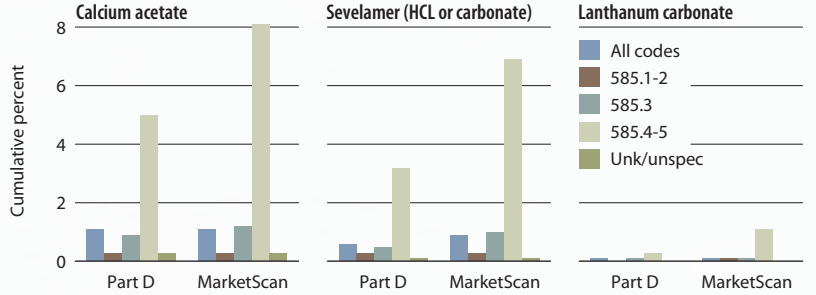
2.19i Medicare Part D & MarketScan CKD patients with at least one claim for an ESA in the 12 months following the disease-defining entry period, by CKD diagnosis code, 2008



2.20i Medicare Part D & MarketScan CKD patients with at least one claim for oral vitamin D in the 12 months following the disease-defining entry period, by CKD diagnosis code, 2008



2.21i Medicare Part D & MarketScan CKD patients with at least one claim for a phosphate binder in the 12 months following the disease-defining entry period, by CKD diagnosis code, 2008



Potassium-sparing diuretics or combination diuretic products (e.g. potassium-sparing plus thiazide diuretics) are rarely used in CKD patients. Thiazide and loop diuretics, in contrast, receive much wider use, with 30 and 33 percent, respectively, of Medicare and MarketScan patients receiving a thiazide diuretic, and 46 and 25 percent a loop diuretic. Across all stages of CKD, loop diuretic use is more common in Medicare patients than in the MarketScan population.

Overall, less than 7 percent of Medicare and MarketScan CKD patients used an erythropoiesis stimulating agent (ESA) — either EPO or DPO — in 2008. Nearly 21 percent of MarketScan patients with CKD of Stages 4–5, however, received an ESA.

Use of oral vitamin D is limited in CKD patients. In those with CKD of Stages 4–5, calcitriol was used by approximately 16–17 percent of Medicare Part D and MarketScan enrollees in 2008, while paricalcitol and inactive vitamin D received greater use in the MarketScan population.

In Medicare Part D and MarketScan patients with CKD of Stages 4–5, calcium acetate and sevelamer are the most widely used phospate binders. » Figures 2.18–21; see page 123 for analytical methods. *Point prevalent Medicare CKD patients age 65 & older & MarketScan CKD patients age 50–64.*

Medicare and MarketScan patients with coded diabetes, CKD, CHF, and CVA , 2009

Medicare patients, age 65 and older	» CKD 8.5% » Diabetes 23.5% » CHF 9.5% » CVA 7.1% » CVA + CKD 1.6% (Fig 2.1)
MarketScan patients, age 50–64	» CKD 1.3% » Diabetes 9.98% » CHF 0.96% » CVA 0.97% » CVA + CKD 0.1% (Fig 2.1)

Probability of urine microalbumin and creatinine testing in Medicare patients at risk for CKD, 2008–2009

Overall	» Microalbumin 0.10 » Creatinine 0.77 » Both 0.10 (Fig 2.6)
Diabetes, no hypertension	» Microalbumin 0.33 » Creatinine 0.87 » Both 0.32 (Fig 2.6)
Hypertension, no diabetes	» Microalbumin 0.05 » Creatinine 0.87 » Both 0.04 (Fig 2.6)
Diabetes and hypertension	» Microalbumin 0.35 » Creatinine 0.93 » Both 0.34 (Fig 2.6)

Adjusted odds ratio of a CKD diagnosis code, 2009

Medicare, age 65 and older	» White; reference » African Amercian 1.4 (Table 2.F)
	» Diabetes 2.1 » Hypertension 3.6 » Cardiovascular disease 2.5 (Table 2.F)
MarketScan, age 50–64	» Diabetes 3.3 » Hypertension 3.3 » Cardiovascular disease 2.8 (Table 2.F)

Cumulative probability of a physician visit at month 12 following a CKD diagnosis, 2008

Medicare patients, age 65 and older	» All primary care 0.93 » Cardiologist 0.63 » Nephrologist 0.31 (Fig 2.10)
MarketScan patients, age 50–64	» All primary care 0.77 » Cardiologist 0.36 Nephrologist 0.27 (Fig 2.10)

CKD patients with at least one claim for an ACEI/ARB/Renin inhibitor, 2008

Medicare Part D patients, age 65 and older	» All 61% » With diabetes 69% » With hypertension 64% (Fig 2.14)
MarketScan patients, age 50–64	» All 63% » With diabetes 77% » With hypertension 73% (Fig 2.14)

CKD patients with at least one claim for a beta blocker, 2008

Medicare Part D patients, age 65 and older	» All 58% » With CHF 70% » With hypertension 60% (Fig 2.15)
MarketScan patients, age 50–64	» All 41% » With CHF 74% » With hypertension 50% (Fig 2.15)

CKD patients with at least one claim for a calcium channel blocker, 2008

Medicare Part D patients, age 65 and older	» All 35% » With HTN 37% » With CVD 35% (Fig 2.16)
MarketScan patients, age 50–64	» All 27% » With HTN 36% » With CVD 32% (Fig 2.16)

Throughout the ADR, with the exception of NHANES data, CKD cohorts exclude ESRD patients.