Chapter 2: Identification and Care of Patients With CKD

- Over half of patients from the Medicare 5% sample (restricted to age 65 and older) have a diagnosis of chronic kidney disease (CKD), cardiovascular disease, or diabetes, while 18% have two or more of these conditions. Within a younger population (restricted to ages 22-64 years) derived from the Clinformatics™ Data Mart, 8.4% have at least one of the conditions, while 1.1% have two or more of the conditions (Table 2.2.b).
- In the Medicare 5% sample, 11.0% of patients were diagnosed with CKD in 2014, as opposed to less than 1% of patients in the Clinformatics™ population (aged 22-64) (Table 2.3).
- The total population with recognized CKD from the Medicare 5% sample has grown steadily, from 2.7% in 2000 to 11.0% in 2014. (Figure 2.1).
- Of patients in the Medicare 5% sample diagnosed with CKD Stage 3 in 2009, 2% had progressed to ESRD and 42% had died by 2014. In the Medicare population without identified CKD, progression to ESRD and death was 0.12% and 22%, respectively (Table 2.5).
- Urine albumin testing is recommended for monitoring patients with diabetes mellitus. Among patients with diabetes in the Medicare population, with or without a diagnosis of CKD, claims data indicate that testing for urine albumin has been steadily rising over time though it is still done in less than half of such patients (24.8% in 2005 and 39.1% in 2014). For example, urine albumin testing was performed in 48% of patients with a diagnosis of CKD and both diabetes and hypertension, in 2014. Patterns were similar, but with somewhat lower rates of testing in the Clinformatics™ population (Figures 2.2 and 2.3).
- Among Medicare patients with diagnosed CKD in 2013, patients who saw a nephrologist were more likely to be tested for urine albumin in 2014 (51%) than those who saw a primary care physician but not a nephrologist (24%) (Figure 2.4).

Introduction

Epidemiological evaluations of the identification and care of patients with chronic kidney disease (CKD) are a significant challenge, as most large administrative health care datasets lack the biochemical data (serum creatinine and urine albumin or urine total protein) required to definitively identify the disease. The National Health and Nutrition Examination Survey (NHANES), a nationally representative survey dataset contains the necessary biochemical information, as shown in Chapter 1, to estimate the prevalence of CKD in the general population. However, the cross-sectional nature of NHANES and the relatively small sample of patients (compared to large administrative datasets) limits the precision of estimated prevalence; evaluation of long-term outcomes, adverse events, and quality of care delivered to patients with CKD, as well as the ability to conduct analyses on subsets of patients. In addition, the NHANES survey only includes a single measure of serum creatinine and urine albumin. KDIGO guidelines state that two abnormal measures over at least 90 days are necessary to definitively determine CKD. While NHANES-based calculations likely overestimate the prevalence of CKD in the United States, this is the best source of such information at the present time.

Methods

For this year's chapter, we have utilized several health care datasets, including the general Medicare 5% sample, with an average of 1.2 million patients each year, Clinformatics™ Data Mart data (drawn from the commercial plans of a large U.S. national health insurance company), with information on about 9 million lives per year, and national health system-derived data from the U.S. Department of Veterans Affairs (VA). Analyses using the Medicare 5% dataset are restricted to patients aged 65 and older and are limited to those persons with both Part A and Part B fee-for-service coverage. Persons covered in Medicare managed care programs are not included due to the absence of billing claims. The Clinformatics™ Data Mart data provides insight into a younger, employed population and their dependent children. Like Medicare data, it contains information in the form of diagnosis and procedure codes on claims. The Clinformatics™ dataset also includes information on pediatric age groups, although for the analyses in this chapter only adult patients (ages 22-64 years) are included. Finally, the VA dataset includes diagnosis and procedure codes, as well as fairly complete biochemical results data. This allows comparison of the prevalence of CKD based on diagnosis codes versus biochemical data.

Throughout this chapter, the term "recognized CKD" is used when patients are identified based on the presence of a relevant diagnosis code in Medicare, Clinformatics™, or VA data, meaning that either a provider or billing coder in the health care system recognized the presence of CKD. As such, prevalence of recognized CKD may not necessarily reflect true disease prevalence, and any observed trend may not necessarily reflect true change in disease prevalence, but rather change in awareness or recognition of CKD, or indeed in billing practices, in general. To identify the recognized CKD population we included a variety of ICD-9-CM diagnosis codes, some of which are sub-codes under related comorbidities such as diabetes (250.4x) and hypertension (403.9x), and some of which are more kidney-disease specific, such as glomerular disease (583.x). In 2005, new CKD stage-specific codes (585.x) were introduced, providing an opportunity to track trends in the severity of CKD over time. Since their introduction, the CKD stage-specific codes have been increasingly utilized, accounting for 49% of all CKD in 2007 and 68% in 2014. Total CKD coding continues to grow, suggesting growing recognition of CKD over time. Studies have shown that diagnosis codes for CKD generally have excellent specificity (>90%), though their sensitivity is low (Grams et al., 2011). Table A lists the CKD-related ICD-9-CM codes used in this chapter. Details of these data sources are described in the Data Sources section of the *CKD Analytical Methods* chapter.

See Chapter 2 of the *CKD Analytical Methods* chapter for an explanation of analytical methods used to generate the study cohorts, figures, and tables in this chapter.

Table A. ICD-9-CM codes for Chronic Kidney Disease (CKD) stages

ICD-9-CM code[a]	Stage
585.1	CKD, Stage 1
585.2	CKD, Stage 2 (mild)
585.3	CKD, Stage 3 (moderate)
585.4	CKD, Stage 4 (severe)
585.5	CKD, Stage 5 (excludes 585.6: Stage 5, requiring chronic dialysis[b])
CKD Stage-unspecified	For these analyses, identified by multiple codes including 585.9, 250.4x, 403.9x & others

[a] For analyses in this chapter, CKD stage estimates require at least one occurrence of a stage-specific code, and the last available CKD stage in a given year is used. [b] In USRDS analyses, patients with ICD-9-CM code 585.6 & with no ESRD 2728 form or other indication of end-stage renal disease (ESRD) are considered to have code 585.5.

Prevalence of Recognized CKD

Table 2.1 presents demographic and comorbidity characteristics of individuals in the Medicare 5% sample (aged 65 and older) and the Clinformatics™ dataset. The mean age of the Medicare patients was 75.9 years, and the mean age of Clinformatics™ patients was 52.3 years. The high prevalence of comorbid conditions in the Medicare 5% sample reflects the older age of these patients. For example, 59% and 24% of the Medicare sample have diagnoses of hypertension and diabetes, respectively. In comparison, only 10.3% and 4.4% of the total Clinformatics™ population have diagnoses of hypertension and diabetes, respectively.

vol 1 Table 2.1 Demographic characteristics of all patients, among Medicare (aged 65+ years) and Clinformatics™ (all ages) patients, 2014

	Medicare 5%		Clinformatics™	
	Sample count	**(%)**	**Sample count**	**(%)**
All	1,276,732	100%	6,445,818	100%
Age				
<4	-	-	281,307	4.4
5-9	-	-	412,438	6.4
10-13	-	-	357,248	5.5
14-17	-	-	373,678	5.8
18-21	-	-	367,539	5.7
22-30	-	-	798,922	12.4
31-40	-	-	1,043,124	16.2
41-50	-	-	1,131,850	17.6
51-65	-	-	1,444,158	22.4
65-74	712,995	55.9	179,303	2.8
75-84	392,923	30.8	39,673	0.6
85+	170,814	13.4	16,578	0.3
Sex				
Male	554,559	43.4	3,279,378	50.9
Female	722,173	56.6	3,165,945	49.1
Race/Ethnicity				
White	1,095,736	85.8	4,469,440	69.7
Black/African American	96,565	7.6	556,682	8.7
Native American	5,407	0.4		
Asian	24,606	1.9	334,804	5.2
Hispanic	-	-	707,399	11.0
Other	42,846	3.4		
Unknown/Missing	11,572	0.9	341,121	5.3
Comorbidity				
DM	302,155	23.7	281,945	4.4
HTN	753,286	59.0	663,987	10.3
CVD	497,773	39.0	286,632	4.5

Data Source: Special analyses, Medicare 5% sample (aged 65 and older) and Clinformatics™ (all ages) alive & eligible for all of 2014. Abbreviations: CKD, chronic kidney disease; CVD, cardiovascular disease; DM, diabetes mellitus; HTN, hypertension. CVD is defined as presence of any of the following comorbidities: cerebrovascular accident, peripheral vascular disease, atherosclerotic heart disease, congestive heart failure, dysrhythmia or other cardiac comorbidities. - No available data.

Table 2.2 provides the prevalence of recognized CKD, diabetes, and cardiovascular comorbid conditions among patients in the Medicare population (aged 65 and older) and the adult Clinformatics™ population aged 22 through 64 years of age (younger patients were excluded as these comorbidities would be rare in them). Over half of the Medicare population has at least one of these comorbid conditions, and 18% have two or more. As expected, prevalence was much lower in the Clinformatics™ population: approximately 8.4% had at least one of these comorbid conditions, and 1.1% had two or more.

vol 1 Table 2.2 Prevalence of coded comorbid conditions (CKD, CVD & DM), (a) total & (b) one or more, among Medicare (aged 65+ years) and Clinformatics™ (aged 22-64 years) patients, 2014

(a) Any diagnosis of CKD, CVD, or DM

	Medicare 5%		Clinformatics™	
	Sample count	%	Sample count	%
	1,276,732	100%	4,418,054	100%
Total CKD	141,001	11.0	40,774	0.9
Total CVD	497,773	39.0	213,093	4.8
Total DM	302,155	23.7	234,456	5.3

(b) Combinations of CKD, CVD, or DM diagnoses

	Medicare 5%		Clinformatics™	
	Sample count	%	Sample count	%
	1,276,732	100%	4,418,054	100%
Only CKD	23,811	1.9	19,758	0.4
Only CVD	282,930	22.2	169,514	3.8
Only DM	117,872	9.2	186,038	4.2
CKD & DM, no CVD	18,506	1.4	10,455	0.2
CKD & CVD, no DM	49,066	3.8	5,616	0.1
DM & CVD, no CKD	116,159	9.1	33,018	0.7
CKD & CVD & DM	49,618	3.9	4,945	0.1
No CKD, no CVD, no DM	618,770	48.5	3,988,710	90.3

Data Source: Special analyses, Medicare 5% sample (aged 65 and older) and Clinformatics™ (aged 22-64) alive & eligible for all of 2014. Abbreviations: CKD, chronic kidney disease; CVD, cardiovascular disease; DM, diabetes mellitus. CVD is defined as presence of any of the following comorbidities: cerebrovascular accident, peripheral vascular disease, atherosclerotic heart disease, congestive heart failure, dysrhythmia or other cardiac comorbidities.

Table 2.3 presents the prevalence of recognized CKD in the Medicare population. Of Medicare patients aged 65 and older, 11.0% have a recognized (i.e., coded diagnosis of) CKD. The prevalence of recognized CKD increases with age, from 7.5% at ages 65–74 to 18.9% at age 85 and older. Males have slightly higher prevalence than females. The prevalence among Blacks/African Americans (hereafter, Blacks) (16.0%) is roughly 50% higher than Whites, while Asians and Native Americans have a prevalence slightly higher than Whites. Results from the adjusted analyses confirm greater odds of recognized CKD in older patients, Blacks, and those with diabetes, hypertension, or cardiovascular disease. The prevalence of recognized CKD in the Clinformatics™ population is substantially lower, driven by the lower prevalence among younger patients. Among patients of comparable age to the Medicare population, the prevalence is still lower possibly reflecting a healthier, employed population in the Clinformatics™ dataset.

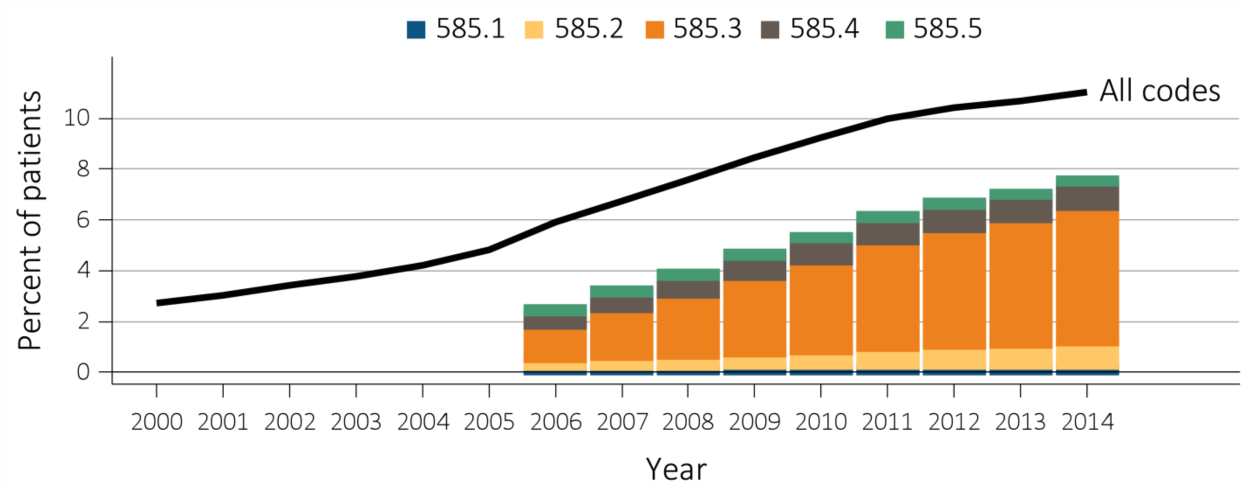
vol 1 Table 2.3 Prevalence of CKD, by demographic characteristics and comorbidities, among Medicare 5% sample (aged 65+ years) and Clinformatics™ (all ages) patients, 2014

	Prevalence of CKD	
	Medicare 5%	Clinformatics™
Overall	11.0	0.9
Age		
< 4	-	0.3
5-9	-	0.1
10-13	-	0.1
14-17	-	0.1
18-21	-	0.2
22-30	-	0.2
31-40	-	0.4
41-50	-	0.8
51-65	-	1.8
65-74	7.5	4.4
75-84	14.1	9.6
85+	18.9	13.2
Sex		
Male	12.1	1.0
Female	10.2	0.8
Race/Ethnicity		
White	10.7	0.9
Black/African American	16.0	1.2
Native American	11.7	-
Asian	11.7	0.5
Hispanic	-	0.8
Other/Unknown	9.8	0.8
Comorbidity		
DM – Yes	22.5	7.8
DM – No	7.5	0.6
HTN – Yes	17.2	5.8
HTN – No	2.1	0.3
CVD – Yes	19.8	6.5
CVD – No	5.4	0.6

Data Source: Special analyses, Medicare 5% sample (aged 65 and older) and Clinformatics™ (aged 22-64) alive & eligible for all of 2014. Abbreviations: CKD, chronic kidney disease; CVD, cardiovascular disease; DM, diabetes mellitus; HTN, hypertension. CVD is defined as presence of any of the following comorbidities: cerebrovascular accident, peripheral vascular disease, atherosclerotic heart disease, congestive heart failure, dysrhythmia or other cardiac comorbidities. - No available data.

Figure 2.1 shows the trend from 2000-2014 in prevalence of recognized CKD overall and by CKD stage-specific code in the Medicare 5% sample. It shows that the prevalence of recognized CKD has steadily risen each year.

vol 1 Figure 2.1 Trends in prevalence of recognized CKD, overall and by CKD stage, among Medicare patients (aged 65+ years), 2000-2014



Data Source: Special analyses, Medicare 5% sample. Known CKD stages presented as bars; curve showing "All codes" includes known CKD stages (codes 585.1-585.5) and the CKD-stage unspecified codes (585.9, and remaining non-585 CKD codes). Note: In previous years, this graph reported 585.9 codes as a component of the stacked bars. Abbreviation: CKD, chronic kidney disease.

Table 2.4 compares the prevalence of CKD in the NHANES, Medicare and VA populations among patients aged 65 and older, stratified by demographic characteristics and comorbid conditions, in order to highlight issues with identification of CKD across various types of data. For the VA population, information is presented on prevalence of CKD both based on diagnosis codes, as well as on available laboratory data documenting at least one serum creatinine result corresponding to an eGFR <60 ml/min/1.73m². Across all datasets, the prevalence of CKD increased with older age. However, the absolute prevalence of CKD was highest in the NHANES data, intermediate in the VA data (eGFR-based), and the lowest when based on diagnosis codes alone in Medicare claims or VA data. The NHANES, by design, includes measurement of kidney function in all participants, thus providing the closest estimate of the true prevalence of CKD, though overestimation is possible given its reliance on a single measurement. NHANES also does not represent people living in long-term care facilities, while many of those residents have Medicare insurance and are included in claims data. In contrast, the prevalence of recognized CKD based on diagnosis codes in either Medicare or VA data is lowest due to under-recognition and under-coding of the condition, with better capture of more advanced cases of CKD. Finally, eGFR-based CKD prevalence in the VA population while based on laboratory data, is dependent on the frequency of testing in the health care system, which is in turn based on clinical indication (i.e., not performed in all patients) and is likely an underestimate of the true prevalence in the population served by the VA health system.

vol 1 Table 2.4 Percent of patients with CKD by demographic characteristics, among individuals (aged 65+ years) overall and with DM, or HTN, in NHANES (2011-2014), Medicare 5% sample (2014) and VA (2014) datasets

	Overall				DM (with or without HTN)				HTN (No DM)			
	NHANES	Medicare	VA		NHANES	Medicare	VA		NHANES	Medicare	VA	
	CKD eGFR	CKD code	CKD code	CKD eGFR	CKD eGFR	CKD code	CKD code	CKD eGFR	CKD eGFR	CKD code	CKD code	CKD eGFR
Age												
65-74	28.1	7.5	3.1	14.3	46.0	18.4	7.2	23.8	32.1	8.7	4.6	17.2
75-79	46.0	14.1	4.2	26.0	57.4	25.9	10.3	40.3	44.1	14.8	7.5	32.8
80+	61.8	18.9	5.2	35.7	80.1	30.8	13.1	53.3	63.6	20.9	11.9	49.5
Race										.		
White	38.6	10.7	3.6	22.9	55.2	22.0	8.3	33.1	44.1	12.8	6.7	29.1
Black/African American	45.0	16.0	7.6	22.6	63.5	26.8	13.2	31.4	40.6	16.8	10.5	26.5
Native American	-	11.7	3.4	17.9	-	23.1	7.9	27.9	-	12.3	5.5	21.7
Asian	-	11.7	4.2	14.8	-	20.8	10.6	25.7	-	12.8	8.1	22.1
Other/Unknown	37.8	9.7	2.3	19.1	50.5	21.1	7.8	33.6	39.5	11.2	6.7	31.1
Sex												
Male	37.3	12.1	3.9	22.5	49.8	24.3	9.0	32.8	41.4	15.0	7.2	28.8
Female	40.3	10.2	2.1	18.9	61.1	21.1	6.8	34.8	44.7	11.8	5.0	31.0
All	38.6	11.0	3.8	22.4	55.3	22.5	8.9	32.8	43.3	13.1	7.2	28.9

Data Source: Special analyses, Medicare 5% sample aged 65 and older alive & eligible for all of 2014. NHANES 2011-2014 participants aged 65 and older, and VA aged 65 and older alive & eligible for all of 2014. The numerator for CKD by ICD-9 diagnosis codes included at least one inpatient ICD-9 diagnosis or two outpatient diagnosis codes in 2014; the numerator for CKD based on eGFR<60 ml/min/1.73m2 for the VA data included anyone with at least one outpatient serum creatinine available in 2014; eGFR was calculated using the CKD-EPI formula; if more than one value was available, the last one in the year was used. The denominator included everyone with at least one outpatient visit in 2014. Abbreviations: CKD, chronic kidney disease; DM, diabetes mellitus; HTN, hypertension; VA, Veterans Affairs. - No available data.

Longitudinal Change in CKD Status and Outcomes, Based on Diagnosis Codes

Table 2.5 shows CKD stage, ESRD, or death in 2013-2014 for a cohort of patients based on CKD diagnosis in 2009. The percentage of all Medicare patients from 2009 who died by the end of 2014 (i.e., after 5 years) was 23.7%, and the percentage alive with ESRD was 0.3%. In comparison, patients with a CKD diagnosis in 2009 were even more likely to have these outcomes. Among patients with no CKD in 2009, 22% had died by 2014, while 0.1% were still alive with ESRD. Among patients with any CKD in 2009, 43% had died and 2% were alive with ESRD in 2014.

vol 1 Table 2.5 Change in CKD status from 2009 to 2014, among Medicare patients (aged 65+ years) alive and without ESRD in 2009

			2013-2014 Status										
			No CKD diagnosis	CKD Stage 1	CKD Stage 2	CKD Stage 3	CKD Stage 4	CKD Stage 5	CKD Stage-unspecified	ESRD alive	ESRD death	Death without ESRD	Lost to follow-up	Total N
2009 Status	**No CKD Diagnosis**	row %	56.8	0.2	0.8	4.1	0.5	0.1	3.6	0.1	0.1	21.6	12.1	1,112,300
	CKD Stage 1	row %	18.5	5.1	4.0	15.0	2.6	0.6	6.4	1.1	1.4	36.2	9.2	2,620
	CKD Stage 2	row %	15.2	1.0	9.9	20.5	2.6	0.5	6.0	0.8	0.9	33.9	8.8	6,150
	CKD Stage 3	row %	8.3	0.4	1.8	27.1	5.8	0.6	4.1	1.9	2.1	40.1	7.9	36,419
	CKD Stage 4	row %	2.6	0.2	0.5	8.1	11.4	1.5	2.0	7.5	9.4	51.1	5.8	9,657
	CKD Stage 5	row %	7.1	0.4	0.7	6.8	3.0	1.5	3.8	8.0	10.7	52.5	5.6	2,581
	CKD Stage-unspecified	row %	19.6	0.5	1.5	10.5	2.4	0.4	10.9	0.7	0.9	45.0	7.8	45,246
	Any CKD	row %	13.4	0.6	2.0	16.8	4.5	0.6	7.0	2.0	2.4	43.1	7.7	102,673
	Total	row %	53.1	0.2	0.9	5.2	0.9	0.2	3.9	0.2	0.3	23.4	11.7	
		Total N	645,589	2,809	10,786	63,087	10,287	2,001	46,862	3,385	3,757	284,435	141,975	1,214,973

Data Source: Special analyses, Medicare 5% sample. Patients alive & eligible for all of 2009. Death and ESRD status were examined yearly between 2010-2014, and were carried forward if present. Among patients without death or ESRD by 2014, the last CKD diagnosis claim was used; if not available, then the last CKD diagnosis claim from 2013 was used. Lost to follow-up represents the patients who were not enrolled in Medicare Part A and Part B in 2013 or 2014. Abbreviations: CKD, chronic kidney disease; ESRD, end-stage renal disease.

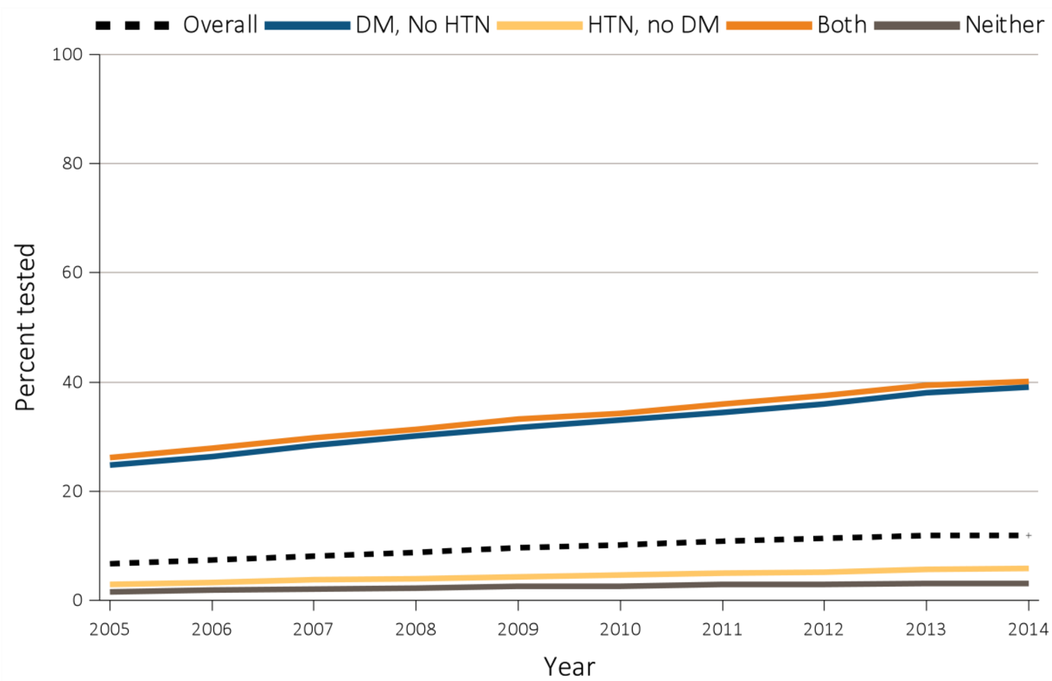
Laboratory Testing of Patients With and Without CKD

Assessing the care of patients at high risk for kidney disease has long been a focus of the USRDS, and is now part of the Healthy People 2020 goals developed by the Department of Health and Human Services (see the *Healthy People 2020* chapter in Volume 2). Although there are no recommendations to screen asymptomatic patients not at high risk for CKD, individuals at risk for CKD (most notably those with diabetes mellitus) should be screened periodically for kidney disease, and those with CKD should be monitored for progression of disease. Urine albumin is a valuable laboratory marker to detect signs of kidney damage, as well as to evaluate for progression of kidney damage. Urine testing for albumin in patients with diabetes has been recommended for some time by the American Diabetes Association (ADA). The 2012 Kidney Disease Improving Global Outcomes (KDIGO) guidelines on CKD evaluation and management recommend risk stratification of CKD patients using both the urine albumin/creatinine ratio and the estimated glomerular filtration rate (based on estimating equations incorporating serum creatinine values), emphasizing that this test is needed to understand patients' kidney disease status and risk of death and progression to end-stage renal disease (ESRD) (Matsushita et al., 2010; Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group, 2012).

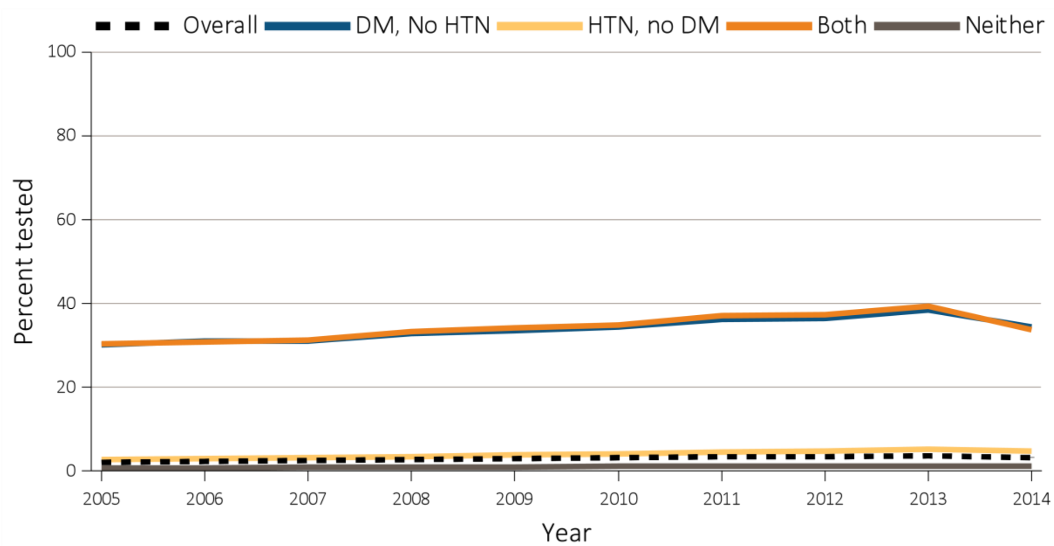
As shown in Figure 2.2, 12% of Medicare patients without diagnosed CKD received urine albumin testing in 2014, while 4.3% of the adult patients (aged 22 to 64 years) in the Clinformatics™ dataset without diagnosed CKD received a urine albumin test. Among Medicare patients, 39% with diabetes alone had urine albumin testing, compared to 6% of patients with hypertension alone. Having both diabetes and hypertension is known to increase the likelihood of developing CKD: among these patients (Medicare beneficiaries without a CKD diagnosis), 40% had urine albumin testing in 2014. Similar patterns were seen in the Clinformatics™ population in 2014: 35% of patients with diabetes alone had urine albumin testing, compared to 6% with hypertension alone, and 36% with both diabetes and hypertension. Because urine albumin testing must be ordered separately from standard blood tests (as opposed to serum creatinine, which is usually included as part of a standard panel of tests), urine albumin testing may better represent intent to assess kidney disease.

vol 1 Figure 2.2 Trends in percent of patients with testing of urine albumin (a) in Medicare 5% sample (aged 65+ years) & (b) Clinformatics™ (aged 22-64 years) patients without a diagnosis of CKD by year, 2005-2014

(a) Medicare 5%



(c) Clinformatics™

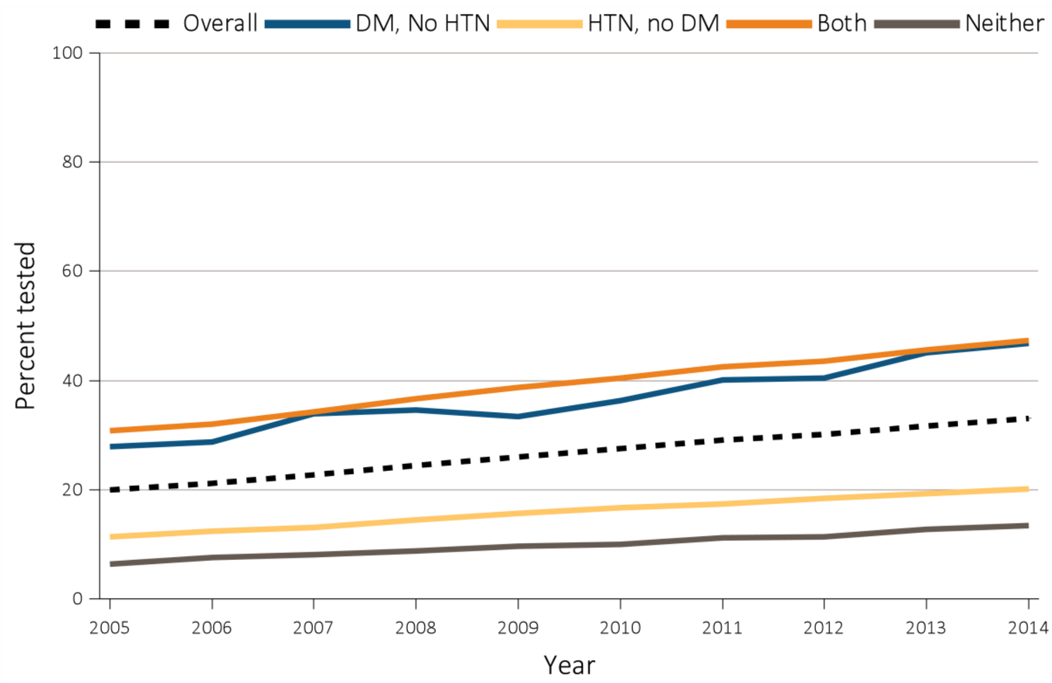


Data Source: Special analyses, Medicare 5% sample aged 65 and older with Part A & B coverage in the prior year and Clinformatics™ patients aged 22-64 years. Tests tracked during each year. Abbreviations: CKD, chronic kidney disease; DM, diabetes mellitus; HTN, hypertension.

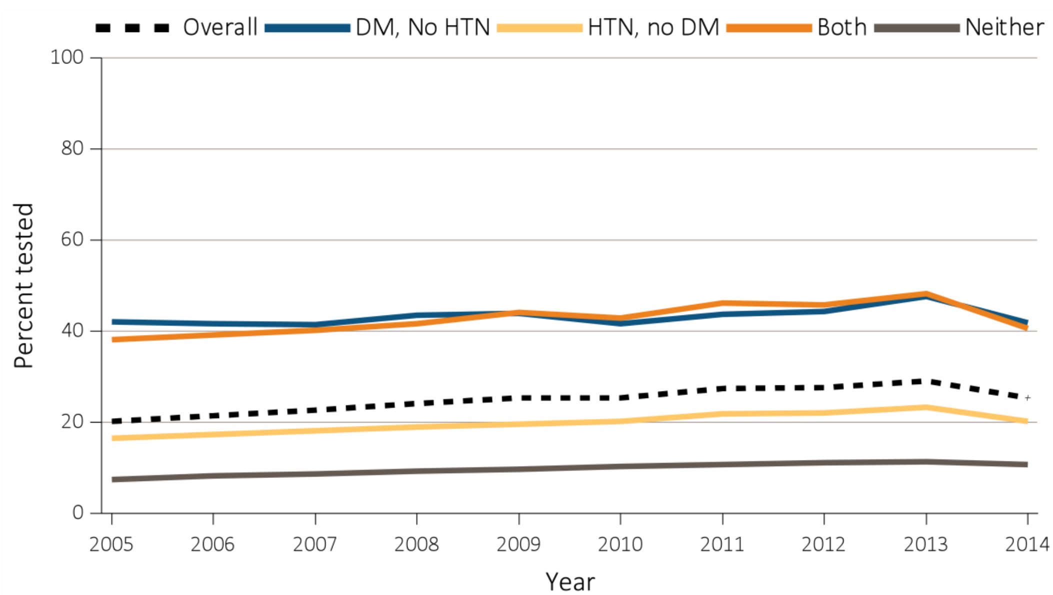
As shown in Figure 2.3, among patients with a diagnosis of CKD, patterns of testing were similar, though at somewhat higher rates, to patients without CKD. For example, in 2014, among patients with a diagnosis of CKD and both diabetes and hypertension, urine albumin testing was performed for 48% in the Medicare population and 43% in the Clinformatics™ population.

vol 1 Figure 2.3 Trends in percent of patients with testing of urine albumin in (a) Medicare 5% (aged 65+ years) & (b) Clinformatics™ (aged 22-64 years) patients *with* a diagnosis of CKD by year, 2005-2014

(a) Medicare 5%



(b) Clinformatics™



Data Source: Special analyses, Medicare 5% sample (aged 65 and older) with Part A & B coverage in the prior year and Clinformatics™ population (aged 22-64 years). Tests tracked during each year. Abbreviations: CKD, chronic kidney disease; DM, diabetes mellitus; HTN, hypertension.

Physician Visits After a CKD Diagnosis

Table 2.6 indicates the proportion of patients with at least one visit to a primary care physician, cardiologist, or nephrologist in 2014, among those with a CKD diagnosis in 2013. Patients with any CKD diagnosis were far more likely to visit a primary care physician or cardiologist than a nephrologist. This may relate in part to the fact that most guidelines (including the KDIGO CKD guidelines) indicate the need for referral to nephrology only for advanced CKD (CKD Stage 4; i.e., once the estimated glomerular filtration rate (eGFR) falls to under 30 ml/min/1.73 m^2), unless there are other concerns such as rapid progression of disease. Indeed, fewer than one-third of patients with any CKD claim in 2013 were seen by a nephrologist over the subsequent year. However, nearly half with CKD Stage 3 and roughly two-thirds with CKD Stage 4 or higher visited a nephrologist in 2014. Whether the involvement of a nephrologist improves outcomes, and at what stage of CKD, is a matter of ongoing interest. Overall, the patterns of physician visits varied little across demographic categories. A notable exception is that patients 85 and older with CKD Stage 3 or higher were as likely as younger patients to visit a cardiologist, but less likely than younger patients to visit a nephrologist.

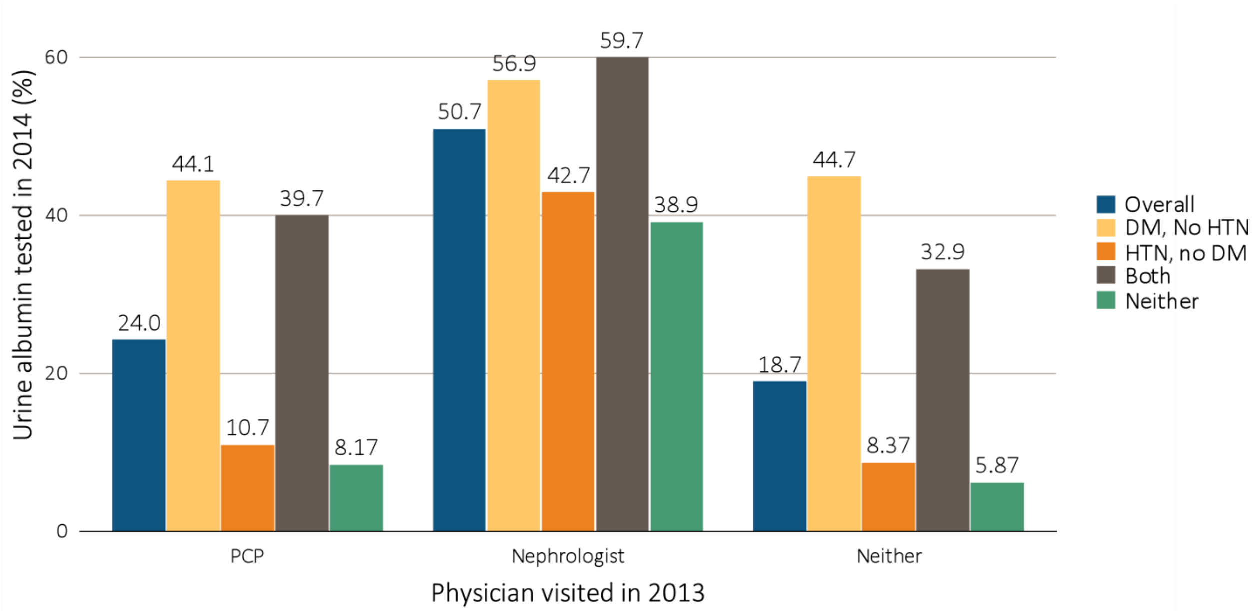
vol 1 Table 2.6 Percent of patients with a physician visit in 2014 after a CKD diagnosis in 2013, among Medicare 5% patients (aged 65+ years)

	Any CKD diagnosis			CKD diagnosis code of 585.3 (Stage 3)			CKD diagnosis code of 585.4 (Stage 4) or higher		
	Primary care	Cardiologist	Nephrologist	Primary care	Cardiologist	Nephrologist	Primary care	Cardiologist	Nephrologist
Age									
65-74	88.8	54.3	31.6	89.2	53.7	53.0	80.5	48.1	70.5
75-84	92.1	63.2	30.7	92.1	61.9	46.6	84.3	54.8	68.4
85+	93.6	64.3	24.0	93.3	62.9	34.1	86.7	53.7	55.0
Sex									
Male	91.1	59.8	28.9	91.5	59.1	45.7	83.7	52.5	66.1
Female	91.1	59.8	35.5	90.9	59.1	52.5	83.2	50.9	66.8
Race									
White	89.5	53.0	28.9	88.9	53.2	45.6	82.0	46.6	66.0
Black/African American	91.5	56.5	28.9	91.6	55.3	44.6	84.6	49.1	64.6
Asian	91.2	59.7	30.4	91.3	59.1	48.9	83.6	52.6	67.1
Other	90.5	62.4	30.5	91.0	62.6	48.7	82.2	54.9	68.0
Overall	91.0	59.4	29.9	91.3	58.7	46.7	90.0	63.0	66.1

Data Source: Special analyses, Medicare 5% sample aged 65 and older alive & eligible for all of 2013. CKD diagnosis is at date of first CKD claim in 2013; claims for physician visits were searched during the 12 months following that date. CKD diagnosis code of 585.4 or higher represents CKD Stages 4-5. Abbreviation: CKD, chronic kidney disease.

Figure 2.4 presents the proportion of patients with CKD (based on diagnostic code) who were tested for urine albumin in 2014, according to whether they saw a primary care physician or nephrologist in 2013. Patients who saw a nephrologist were more likely to be tested for urine albumin than those who saw only a primary care physician. This difference was greatest for patients without diabetes mellitus. The smaller difference in being tested for urine albumin across provider type among diabetic patients relates to the wide promulgation of guidelines directed at primary care physicians, such as those from the ADA, for routine renal function assessment in diabetics.

vol 1 Figure 2.4 Percent of Medicare 5% CKD patients (age 65+), with urine albumin testing in the following year (2014), by comorbidity and type of physician visit in 2013



Data Source: Special analyses, Medicare 5% sample aged 65 and older alive & eligible for all of 2014, with a CKD diagnosis claim and a physician visit in 2013. Patient visits with both PCP and nephrologists are classified as nephrologist. Abbreviations: CKD, chronic kidney disease; DM, diabetes mellitus; HTN, hypertension; PCP, primary care physician.

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Notes