Chapter 6: CKD among Children and Adolescents

- 2.7 per 1,000 children with healthcare coverage within a single commercial payer had chronic kidney disease (CKD) (Table 6.2).
- Hospitalization rates was 12 times higher for children with CKD than for all children (Table 6.3).
- Between 2006 and 2016, healthcare expenditures increased by 50% for children with CKD, compared to 25% for children without CKD (Figure 6.3).
- Healthcare expenditures for children with CKD in 2016 were 7.6 times higher than expenditures for children without CKD (Figure 6.3).

Introduction

This chapter presents single private payer estimates of pediatric chronic kidney disease (CKD) prevalence in the United States. The chapters in the CKD volume have historically examined Medicare 5% sample data. Medicare beneficiaries are primarily aged 65 and older or disabled. The only category of children (aged 0-21) eligible for Medicare are those with end-stage renal disease (ESRD); this dataset therefore does not support investigation of CKD in. In the 2018 Annual Data Report (ADR), we introduce this new chapter as based on the Optum Clinformatics™ Data Mart cohort, utilizing a dataset of participants in the commercial insurance plans of a large U.S. managed-care health insurance company. Children with end-stage kidney disease were excluded from this chapter.

Methods

The Optum Clinformatics™ Data Mart data provides insight into a younger, employed population and their dependent children—approximately nine million lives per year, representing all areas of the country. Of these, this sample provides information for 1,970,375 individuals in pediatric age groups.

To be included in these analyses, eligible beneficiaries were required to have been enrolled in both a medical and a prescription plan throughout the one-year entry period (year one, the calendar year before the year reported in the figures and tables), and be alive, without ESRD, and still enrolled on January 1 of the reported year (year two). All beneficiaries in the Optum Clinformatics™ dataset had prescription drug coverage.

We present Optum Clinformatics™ data from 2005 through 2016 in the 2018 ADR, which is obtained from OptumInsight and includes claims from a large U.S. national health insurance company. To comply with the Health Insurance Portability and Accountability Act of 1996 (HIPAA) and prevent the re-identification of individuals in the database, certain combinations of sensitive data elements are not allowed. OptumInsight provides the data as different 'views', each containing a limited amount of sensitive data. Like Medicare data, Optum Clinformatics™ contains paid medical and prescription claims, enrollment information, and diagnosis and procedure codes as found on claims. Enrollment and member information such as year of birth, sex, race/ethnicity, state of residence, and plan participation are included, but detailed geographic and socio-economic data are not available. . Specifically, we are not able to report on laboratory within an individual case consequently we cannot report on prevalence of proteinuria, albuminuria or estimates of glomerular filtration rate.

Defining chronic kidney disease

The definition of CKD typically includes the presence of structural or functional kidney damage over a minimum period of three months. Functional damage is often characterized by sustained reduction in estimated glomerular filtration rate (eGFR), persistent elevations in urinary albumin excretion or a combination thereof (KDIGO, 2012). The presence of a structural abnormality of the kidney also fulfills the criteria for CKD.

Serum creatinine is a key laboratory measure for the estimation of GFR and GFR-based presence of CKD. Normal serum creatinine values increase with increasing child size and age from infancy to adulthood. Consequently, GFR estimation in children requires laboratory information as well as patient height at the time of laboratory testing. Blood laboratory testing is not a ubiquitous component of pediatric ambulatory care. Heights have not typically been available to laboratories, posing another barrier for the reporting of eGFR in children. The use of electronic health records and interoperable lab and electronic health records have the potential to solve the issue regarding height requirement for pediatric GFR reporting. Depending on available data sources, national surveillance initiatives may rely solely on diagnoses as represented in medical claims data.

Additionally, the American Academy of Pediatrics no longer recommends screening urinalyses in well child visits. While urinalyses are still recommended for cause, the absence of screening urine testing is reflected in the observed prevalence of urine testing of 0.2% in this cohort. Thus, the use of urinary albumin or protein excretion to define CKD will not contribute substantially to national surveillance initiatives overall nor to the surveillance in this Clinformatics™ cohort. Urine lab testing results were not included in our case definition.

Documentation of the presence of chronic structural or functional abnormalities of the kidney in medical claims may include traditional CKD codes or may only include a more precise structural or functional diagnosis. Consequently, a pediatric code set using ICD-9 and ICD-10 codes is used for this chapter. Laboratory results including urine protein, urine albumin, and serum creatinine were not available for analysis for this chapter and were not included in case definitions.

Details of this data are described in the *Data Sources* section of the *CKD Analytical Methods* chapter. For an explanation of the analytical methods used to generate the study cohorts, figures, and tables in this chapter, see the section on *Chapter 6* in the *CKD Analytical Methods* chapter. Microsoft Excel and PowerPoint files containing the data and graphics for these figures and tables are available to download from the *USRDS website*.

Population

Table 6.1 presents the comparison of all children and those with CKD within the 1,970,375 privately insured children in 2016. Overall CKD was present in 2.7 cases per 1,000 children. CKD was more common in children under 4 years of age and adolescents age 18 to 21. Proteinuria or albuminuria was tested in 11.7% of children with CKD compared to less than 0.2% of children without CKD. Although urine albumin and protein testing was infrequent in this Optum Clinformatics™ data set, others have reported frequencies of albuminuria in the National Health and Nutrition Examination Survey (NHANES), showing proteinuria in 3.5% of all adolescents surveyed (Saydah et el., 2018). Given the differences in data sources and methodology, we are not able to replicate NHANES data for accurate comparison. Co-existing conditions such as diabetes (4.1%), hypertension (8.8%), and cardiovascular diseases (10.3%) were more common in children with CKD than in the full pediatric population. However, these frequencies are much lower than reported in adults with CKD managed within the Medicare system (23.6%, 58.9%, and 38.8%, respectively) and similar to the young adult population included in the Optum Clinformatics™ sample (4.4%, 10.3%, and 4.5%, respectively) (see Volume 1, Chapter 2: *Identification and Care of Patients with CKD*).

vol 1 Table 6.1 Demographic characteristics of Optum Clinformatics™ pediatric patients, 2016

	All children		Children with CKD	
	Sample count	**Percent (%)**	**Count**	Percent (% of all children)
All	1,970,375	100	5,285	0.27
Age				
0-4	308,099	15.6	1,122	0.36
5-9	445,408	22.6	1,027	0.23
10-13	392,978	19.9	839	0.21
14-17	411,582	20.9	1,085	0.26
18-21	412,308	20.9	1,212	0.29
Sex				
Male	1,007,120	51.1	2,491	0.25
Female	963,175	48.9	2,794	0.29
Unknown	80	<0.01	0	0.00
Race/Ethnicity				
White	1,265,505	64.2	3,459	0.27
Black/African American	149,789	7.6	342	0.23
Asian	104,525	5.3	239	0.23
Hispanic	244,113	12.4	626	0.26
Unknown/Missing	206,443	10.5	619	0.30
Comorbidity				
Diabetes Mellitus	6,546	0.3	217	3.32
Hypertension	3,483	0.2	463	13.29
Cardiovascular Disease	17,549	0.9	543	3.09

Data Source: Special analyses, Optum Clinformatics™ (aged <22) alive & eligible for all of 2016. CVD is defined as presence of any of the following comorbidities: cerebrovascular accident, peripheral vascular disease, atherosclerotic heart disease, heart failure, dysrhythmia or other cardiac comorbidities. Abbreviation: CKD, chronic kidney disease.

Co-existing conditions

The prevalence of co-existing conditions within the pediatric sample highlights the presence of cardiovascular disease and diabetes mellitus as exemplar conditions and as conditions commonly associated with CKD progression in adults (Table 6.2). For this analysis, cardiovascular disease includes congenital and acquired heart disease but excludes hypertension. Overall, cardiovascular disease was present in 85 per 10,000 children and diabetes in 31 per 10,000 children in 2016. Concurrently diagnosed CKD and cardiovascular disease was present in 3 per 10,000 and CKD and diabetes was present in 1 per 10,000 children. Children with any of these three conditions account for 144 per 10,000 persons, or about 1.4 percent.

vol 1 Table 6.2 Prevalence of comorbid conditions by diagnosis codes (CKD, CVD, & DM), (a) total & (b) one or more, among Optum Clinformatics™ pediatric patients, 2016

(a) Total

	Optum Clinformatics™	
	Sample count	Cases per 10,000
All		
Total CKD	5,285	27
Total CVD	17,549	89
Total DM	6,546	33

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

	Optum Clinformatics™	
	Sample count	Cases per 10,000
All		
Only CKD	4,564	23
Only CVD	16,731	85
Only DM	6,054	31
CKD & DM, no CVD	178	1
CKD & CVD, no DM	504	3
DM & CVD, no CKD	275	1
CKD & CVD & DM	39	<1
At least one comorbidity	28,345	144
At least two comorbidities	996	5
No CKD, no CVD, no DM	1,942,030	9,856

Data Source: Special analyses, Optum Clinformatics™ (aged <22) alive & eligible for all of 2016. 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. Abbreviations: CKD, chronic kidney disease; CVD, cardiovascular disease; DM, diabetes mellitus.

Hospitalizations

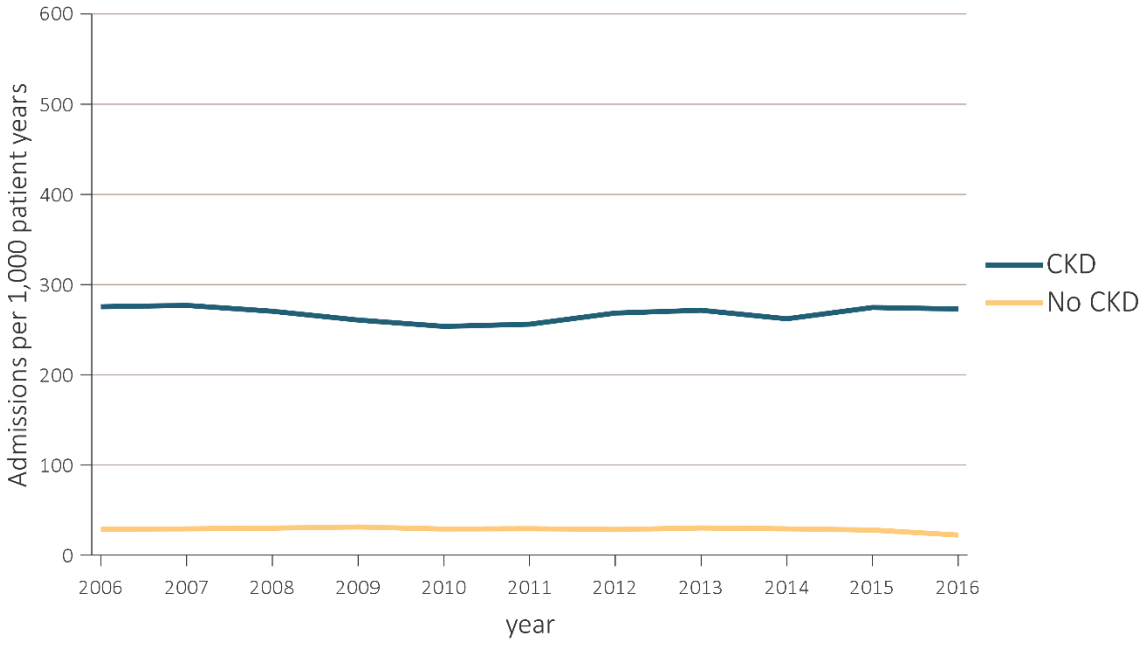
Table 6.3 displays the hospitalization rates of children with CKD and provides the all child hospitalization comparisons. Overall, children with CKD have 12 times higher hospitalizations per 1,000 patient-years compared to all children. The youngest children, age 4 years and below, have the highest frequency of hospitalizations in the full and CKD pediatric subsets. Longitudinal trends reveal a stable hospitalization rate between 2006 and 2016 for children overall and for the CKD subset (Figure 6.1).

vol 1 Table 6.3 Unadjusted and adjusted all-cause hospitalization rates (per 1,000 patient years at risk) for Optum Clinformatics™ patients aged <22, by CKD status, 2016

	Unadjusted		Adjusted	
	No CKD	All CKD	No CKD	All CKD
All	28.3	325.8	22.4	273.0
0-4	95.2	482.5	55.9	366.4
5-9	5.4	216.0	5.6	218.6
10-13	6.3	174.1	6.7	174.2
14-17	14.1	227.8	14.9	228.1
18-21	20.1	345.0	21.3	343.3
Male	26.9	346.9	20.8	275.5
Female	29.8	304.9	24.0	268.0
White	12.7	247.4	13.7	244.0
Blk/Af Am	14.0	267.1	15.1	262.8
Other	44.8	407.5	36.2	303.8

Data source: Special analyses, Optum Clinformatics™. January 1, 2016 point prevalent patients, aged <22. Optum Clinformatics™ commercial insurance patients aged <22 who were enrolled in the plan, did not have diagnoses of ESRD, and were alive on January 1, 2016. Adjusted for age/sex/race. Standard population: all patients, 2010-2011. Abbreviations: Blk/Af Am, Black/African American; CKD, chronic kidney disease.

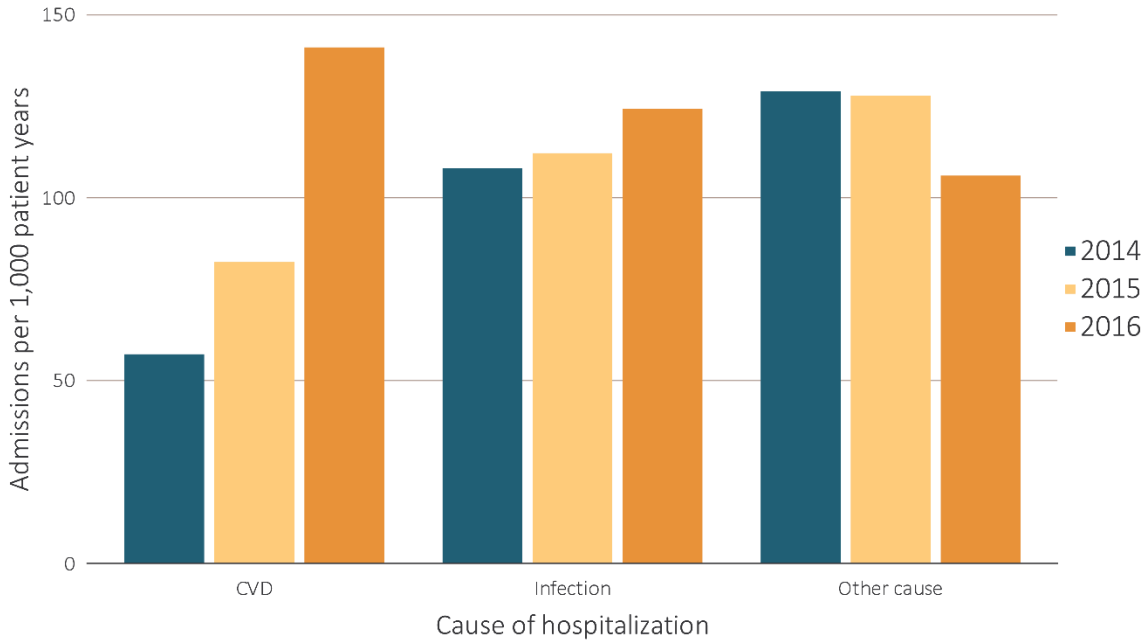
vol 1 Figure 6.1 Adjusted all-cause hospitalization rates (per 1,000 patient-years at risk) for Optum Clinformatics™ patients aged <22, by CKD status and year, 2006-2016



Data source: Special analyses, Optum Clinformatics™. January 1, point prevalent Optum Clinformatics™ patients aged <22 who were enrolled in the plan, did not have diagnoses of ESRD, and were alive on January 1. Adjusted for age/sex/race. Standard population: 2010-2011 patients. Abbreviations: CKD, chronic kidney disease.

CKD associated hospitalizations were categorized as cardiovascular, infectious and other. (Figure 6.2). Of the 273 adjusted hospitalizations per 1,000 patient years, adjusted cardiovascular was 140.5, infection was 123.6, and other diagnosis was 105.4. The leading causes of hospitalizations in other group includes kidney and urinary tract; metabolic, endocrine, nutritional; hematology/oncology, and gastrointestinal diagnoses. The cardiovascular disease associated hospitalizations has dramatically increased over this three-year period. As this period includes the transition from ICD-9 to ICD-10 codes, it may be that the shift in cardiovascular attribution is related more to this coding change rather than true changes in cardiovascular disease prevalence in hospitalized children.

vol 1 Figure 6.2 Adjusted rates of hospitalization (per 1,000 patient-years at risk) for Optum Clinformatics™ patients aged <22 with CKD, by cause, 2014-2016

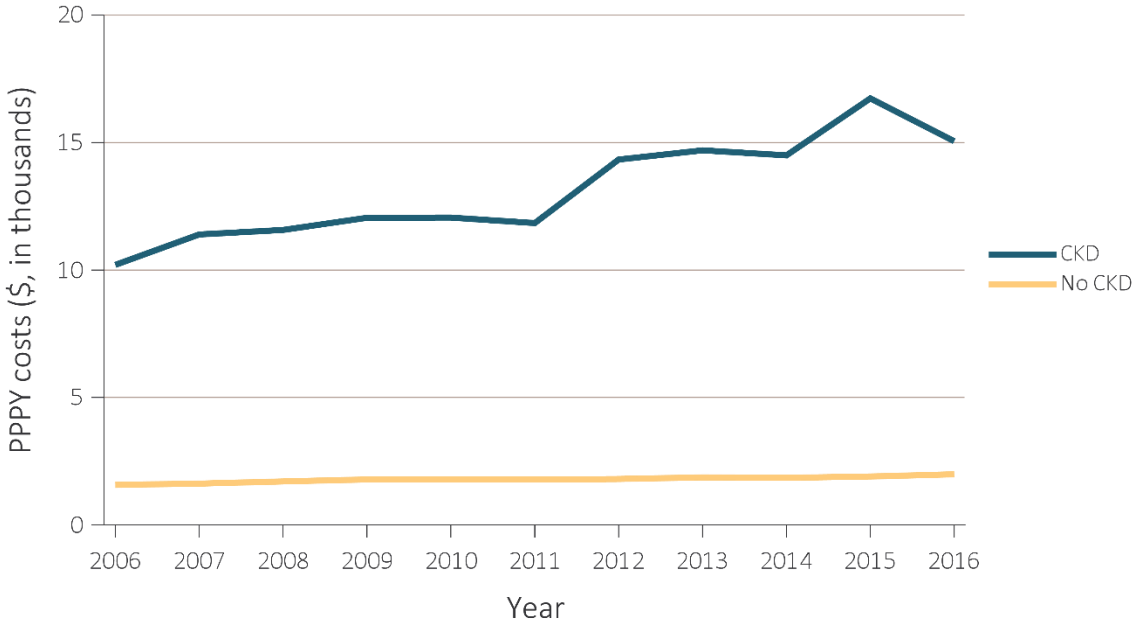


Data source: Special analyses, Optum Clinformatics™. January 1, 2016 point prevalent Optum Clinformatics™ patients, aged <22 who were enrolled in the plan, did not have diagnoses of ESRD, and were alive on January 1, 2014/2015/2016. Adjusted for age/sex/race; rates by one factor are adjusted for the others. Standard population: all patients, 2010-2011. Abbreviations: CKD, chronic kidney disease; CVD, cardiovascular disease.

Spending for CKD

Individuals with CKD often have extensive healthcare needs from CKD, CKD-related complications and from co-existing conditions. This chapter uses commercial spending to represent healthcare expenditures for children with CKD. This estimate does not include expenditures from other potential sources including co-insurance such as Medicaid, another commercial insurance, and self-pay costs. Between 2006 and 2016, single commercial healthcare expenditures for children with CKD increased 47.6%, from $10,200 per patient-year to $15,053 per patient-year (Figure 6.3). In comparison, expenditures for non-CKD children rose by 26.4% percent, from $1,571 to $1,985 per patient-year. Overall, expenditures were 7.6 times higher for children with CKD compared with non-CKD children in 2016.

vol 1 Figure 6.3 Per person per year commercial spending ($, in thousands) for Optum Clinformatics™ patients aged <22, by CKD status, and year, 2006-2016



Data Source: Special analyses, Optum Clinformatics™. Abbreviations: CKD, chronic kidney disease; PPPY, per person per year.

References

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