Chapter 4: Hospitalizations, Readmissions, Emergency Department Visits, and Observation Stays

- ESRD patients continue to experience a relatively high frequency of hospitalization, although over the last decade the frequency of admissions has declined. Between 2007 and 2016, adjusted hospital admission rate for dialysis patients declined from 2.0 to 1.7 per patient-year (PPY), a reduction of 15%. During that same period, admission rate for transplant patients declined from 1.0 to 0.8 PPY, a 20% reduction (Figure 4.1).
- Hospitalization rates for HD patients were highest in their first year but fell considerably through the first three years of HD, whereas PD patients generally experienced increasing hospitalization rates over years after dialysis initiation (Figure 4.3).
- All-cause hospitalization rates among adult HD patients decreased by 14.2% from 2007 to 2014 and have remained stable in 2015-2016 (see Table 4.1). Hospitalizations due to cardiovascular events and those for vascular access infection fell by 18.9% and 54.6% from 2007 to 2016, respectively.
- Select patient groups continue to exhibit more frequent hospitalization. For 2015-2016, adjusted hemodialysis (HD) patient hospitalization rates were higher for those aged 22–44 years or 75 years and older, females, and those of Non-Hispanic White or Black/African American race and for those who had diabetes as their primary cause of kidney failure (Table 4.1).
- Among ESRD patients in 2016, more than one in three live hospital discharges were followed by a readmission within 30 days (35.4%), compared to 21.6% for patients with chronic kidney disease (CKD) and only 15.3% for older Medicare beneficiaries without a diagnosis of kidney disease (Figure 4.7).
- The frequency of 30-day readmissions among dialysis patients was stable from 2007-2011 at approximately 39%, fell somewhat in 2012-2013, and has remained at approximately 37% during 2014-2016. Readmissions for transplant patients were approximately 8 percentage points lower but followed a similar time trend (Figure 4.8).
- Dialysis patients frequently visit the emergency department (ED) at rates that have increased over time. Between 2007 and 2016, unadjusted ED visit rates for HD patients increased from 2.6 to 3.0 PPY, while rates for peritoneal dialysis (PD) patients increased from 2.2 to 2.4 PPY, and rates for transplant patients increased from 1.3 to 1.4 PPY (Figure 4.14).
- Observation stays were relatively rare for ESRD patients, but approximately doubled in frequency from 2007-2016. Unadjusted rates of observation stays for HD patients increased from 0.16 to 0.38 PPY, while rates for PD patients increased from 0.12 to 0.25 PPY, and rates for transplant patients increased from 0.08 to 0.15 PPY (Figure 4.17).

Introduction

Hospital admissions, subsequent readmissions, and emergency department visits are a major burden for patients with ESRD. On average, patients with ESRD are admitted to the hospital more than once a year, and more than one in three hospital discharges are followed by a readmission within 30 days. Furthermore, inpatient treatment represents a significant societal and financial burden, accounting for approximately 33% of total Medicare expenditures for patients with ESRD (see Volume 2, Chapter 9: *Healthcare Expenditures for Persons with ESRD*).

Clinical studies conducted in a broad range of settings have demonstrated that both improved health care and care coordination may reduce rates of unplanned or non-elective health care use including

hospitalization, readmission, and emergency department visits. Several studies have suggested that a sizable portion of readmissions may be preventable (Coleman et al., 2006; MedPAC, 2007; Rich et al., 1995; Stewart et al., 1999) and emergency department visits could be avoided (Oster and Bindman, 2003; Ballard et al., 2010, University of Michigan Kidney Epidemiology and Cost Center, 2016). Trends in hospitalization, readmission, and emergency department visits broadly reflect health care utilization, may reveal important aspects of quality of care, and help with identification of potential gaps therein, and evaluation of cost-effectiveness of health care.

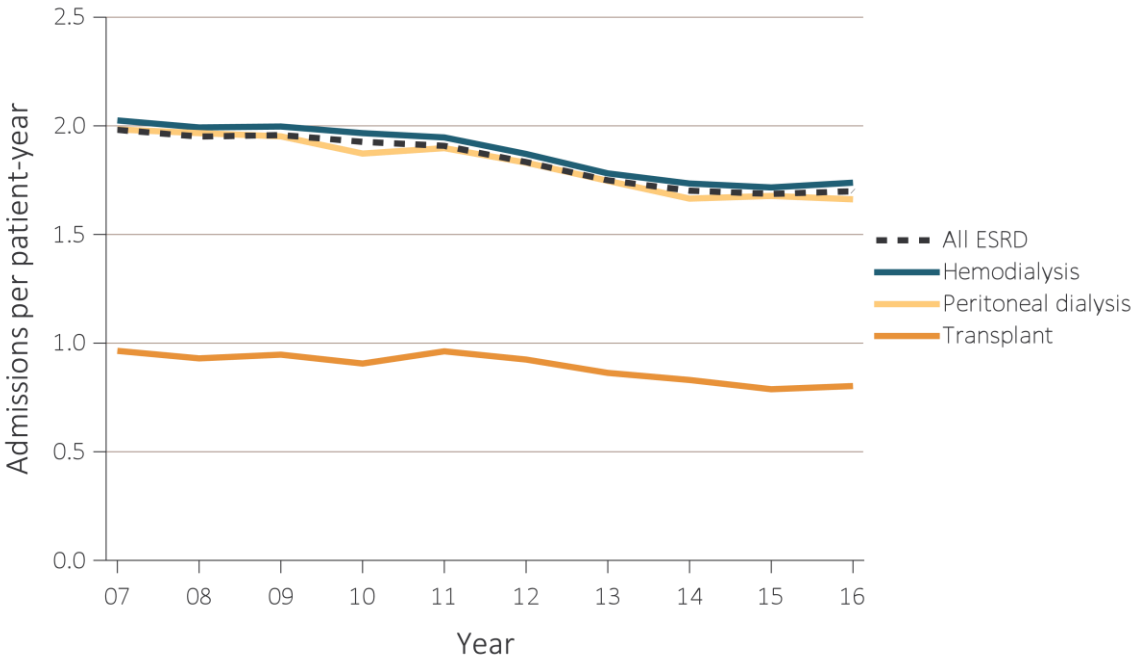
Methods

The findings presented in this chapter were drawn from data sources from the Centers for Medicare & Medicaid Services (CMS). The analyses in this chapter rely on claims data from traditional Medicare (Parts A and B); patients who primarily rely on other sources of health insurance are excluded (e.g. employer/group coverage and Medicare Advantage). Methodological details are described fully in the *Data Sources* section of the *ESRD 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 4* in the *ESRD Analytical Methods* chapter.. Downloadable Microsoft Excel and PowerPoint files containing the data and graphics for these figures and tables are available on the *USRDS website*.

Trends in Hospitalization Rates

Over the past decade, the frequency of hospital admissions and resulting number of hospital days for ESRD patients have gradually declined; in recent years (2014-2016), however, they appear to have stabilized. As shown in Figure 4.1, in 2016 the adjusted rates of admission for HD and PD patients decreased to 1.7 PPY as compared to 2.0 in 2007, a reduction of 15.0%. Over that same period, admission rates for transplant patients fell by 20.0%, from 1.0 in 2007, to 0.8 PPY in 2016.

vol 2 Figure 4.1 Adjusted hospitalization rates for ESRD patients, by treatment modality, 2007-2016



Data Source: Special analyses, USRDS ESRD Database. Period prevalent ESRD patients; adjusted for age, sex, race, ethnicity, primary cause of kidney failure, and vintage; standard population: ESRD patients, 2011. Abbreviation: ESRD, end-stage renal disease.

The USRDS Annual Data Report (ADR) regularly highlights cause-specific hospitalization as an important morbidity surveillance topic, with a focus on hospitalizations resulting from infections and cardiovascular conditions. Hospitalizations for these causes have also declined over the 2007-2016 period, albeit the declines in these categories are less than the decline in all-cause hospitalization (see Figure 4.2). The decline in hospitalizations due to infection was most pronounced among patients receiving PD from 2007 to 2014. These improvements likely reflect, at least in part, greater attention to infection control practices among dialysis patient, particularly in those on peritoneal dialysis.

vol 2 Figure 4.2 Adjusted all-cause & cause-specific hospitalization rates for ESRD patients, by treatment modality, 2007-2016

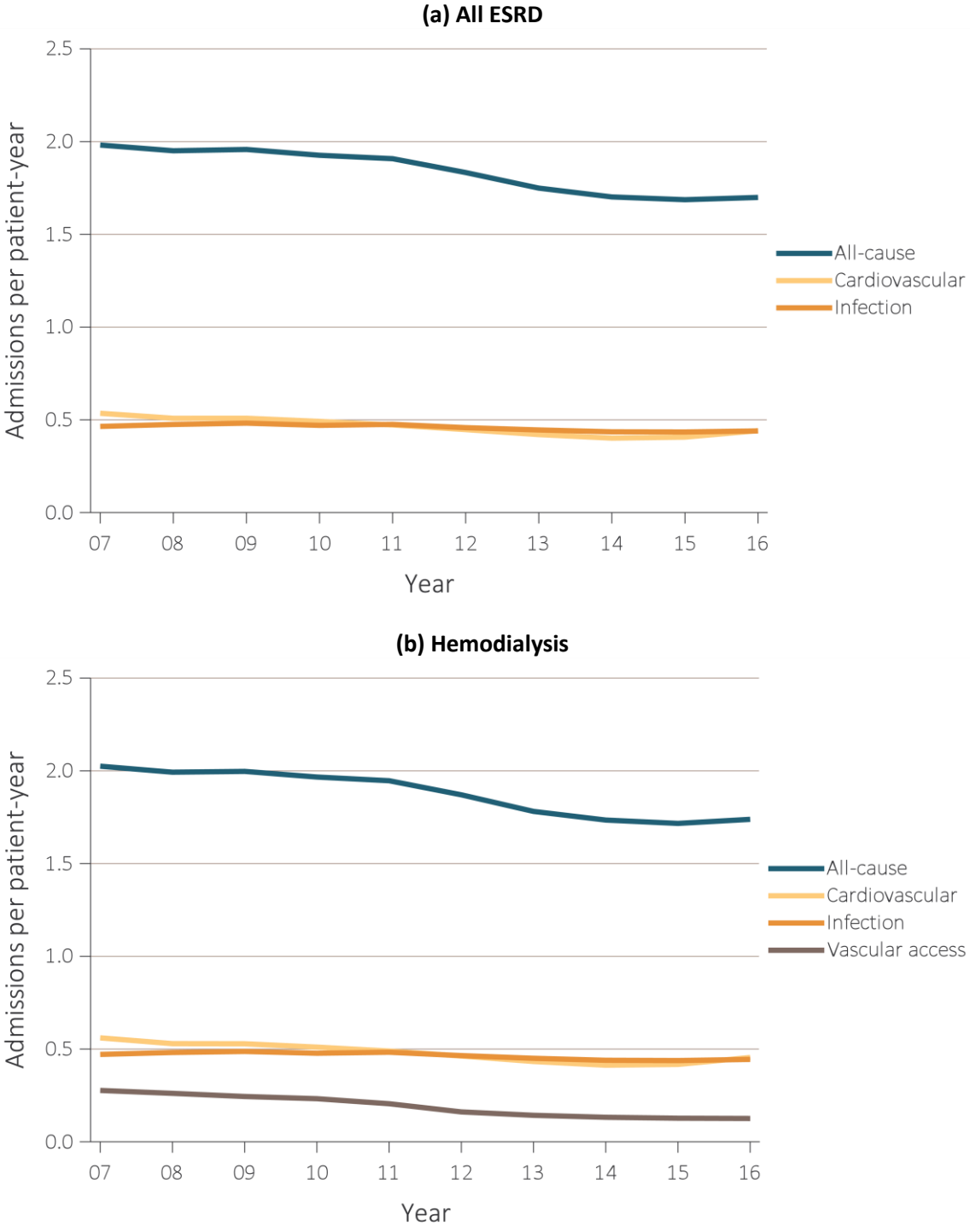
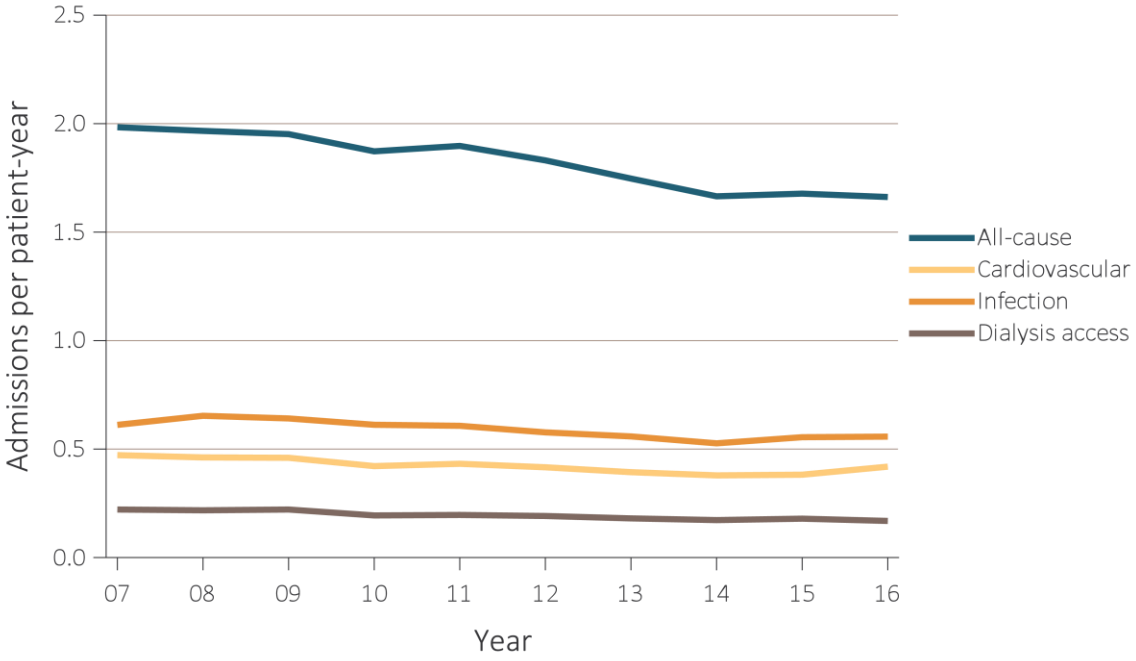


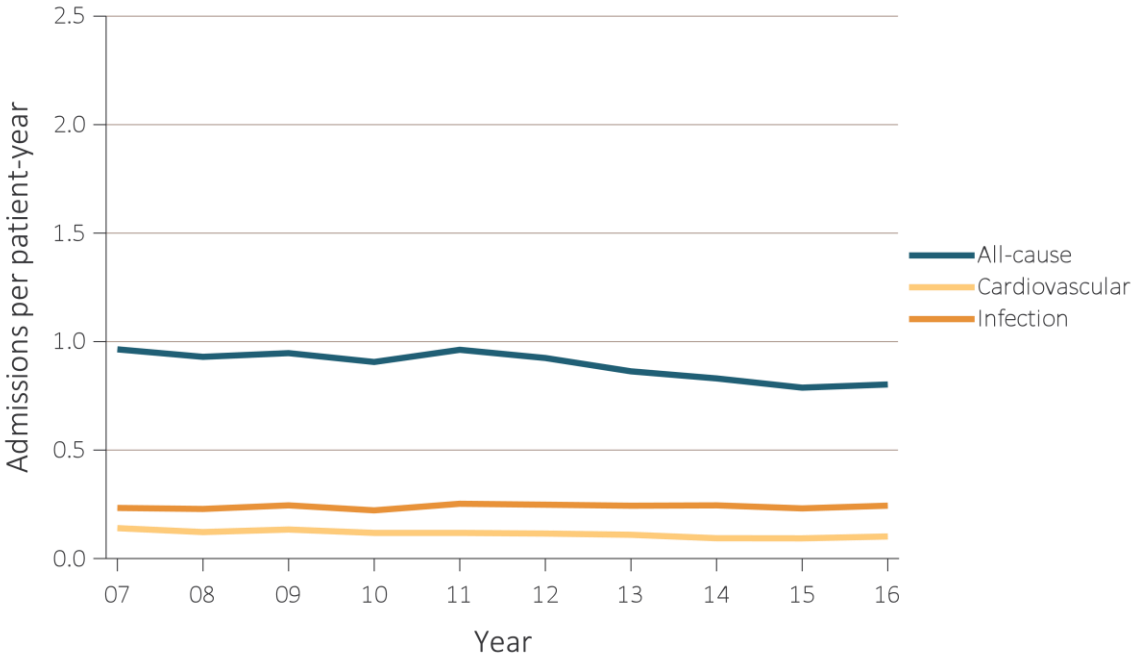
Figure 4.2 continued on next page.

vol 2 Figure 4.2 Adjusted all-cause & cause-specific hospitalization rates for ESRD patients, by treatment modality, 2007-2016 (continued)

(c) Peritoneal dialysis



(d) Transplant



Data Source: Special analyses, USRDS ESRD Database. Period prevalent ESRD patients; adjusted for age, sex, race, ethnicity, primary cause of kidney failure, and vintage; standard population: ESRD patients, 2011. Abbreviation: ESRD, end-stage renal disease.

All-cause hospitalization rates among adult HD patients decreased by 14.2% from 2007 to 2014 and have remained stable in 2015-2016 (see Table 4.1). Hospitalizations due to cardiovascular events and those for vascular access infection fell by 18.9% and 54.6% from 2007 to 2016. Patient groups with a higher risk of overall hospitalization included those aged 22–44 years or 75 years and older, females, and those of Non-Hispanic White or Black/African American race. Patients who had diabetes as their primary cause of kidney failure had a higher risk of hospitalization both overall, and for most cause-specific diagnoses.

While the overall trends of decreasing hospitalization rates are encouraging, it is plausible that these all-cause and cause-specific declines were influenced at least in part by changes in clinical care practices and policies that emphasize greater utilization of ambulatory care services. In the most recent data, it appears hospitalization rates have stabilized and are no longer declining.

For patients starting HD, hospitalization rates were highest in their first year but fell considerably through the first three years of HD, before stabilizing (Figure 4.3.a). Incident HD patients in more recent cohorts consistently experienced lower hospitalization rates throughout their time on HD than did previous cohorts. Incident HD patients in 2014 had a relatively low hospitalization rate of 1.9 PPY during their first year of treatment, compared to the previous cohorts, who experienced hospitalization rates of 2.2-2.4 PPY in the first year of HD (Figure 4.3.a).

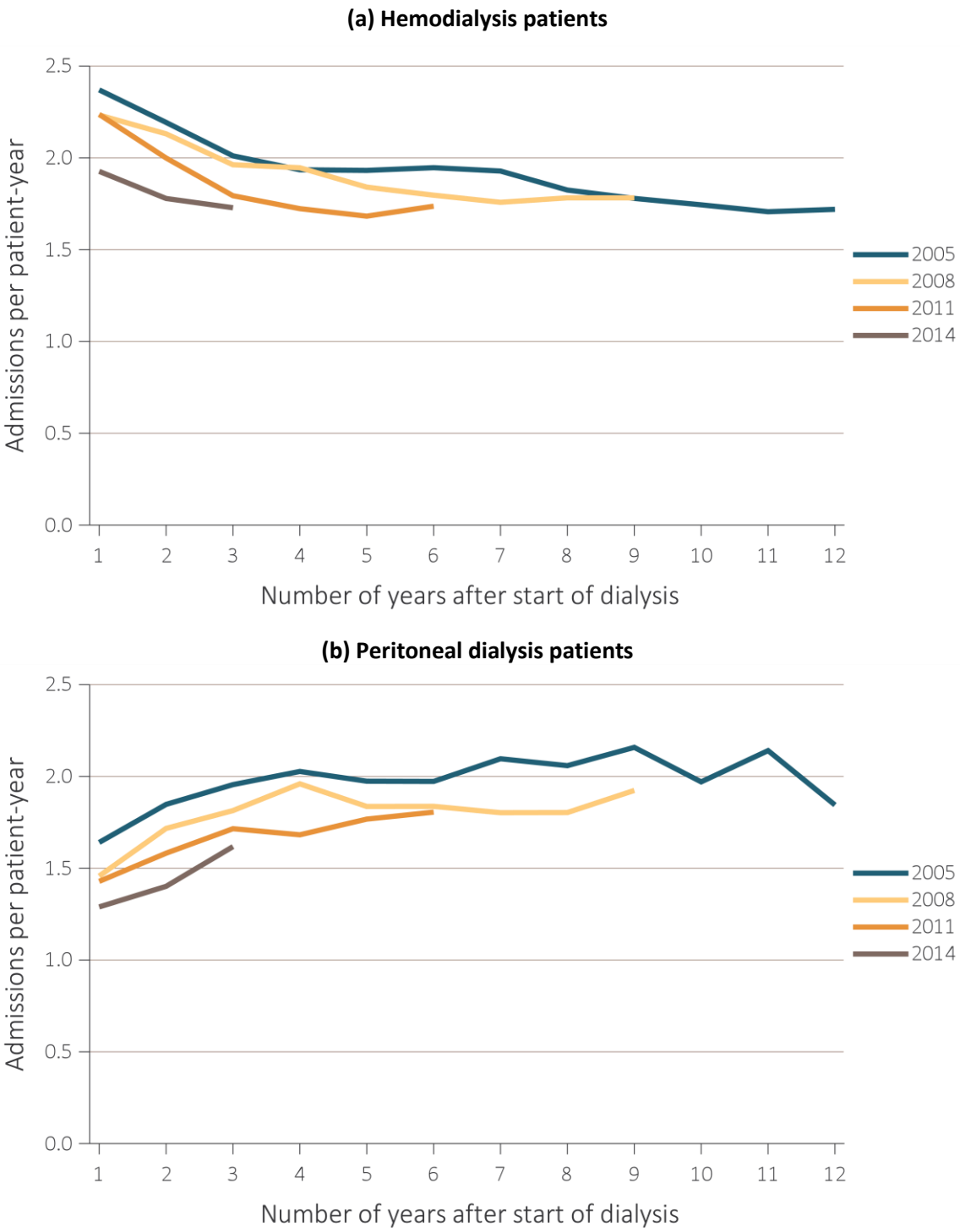
While patients on HD experienced falling hospitalization rates as they accumulated time on dialysis, PD patients saw rising hospitalization rates. However, recent cohorts of incident PD patients still had fewer hospitalizations overall than did the older cohorts. Incident PD patients in 2014 had 1.3 hospitalizations PPY, rising to 1.6 PPY by the third year of PD (Figure 4.3.b).

vol 2 Table 4.1 Adjusted rates of all-cause & cause-specific hospitalization per patient-year for adult hemodialysis patients, 2007-2016

	All	Cardiovascular	Any infection	Vascular access infection
2007-2008	1.99	0.53	0.48	0.26
2009-2010	1.97	0.51	0.48	0.23
2011-2012	1.87	0.46	0.46	0.16
2013-2014	1.74	0.41	0.44	0.13
2015-2016	1.74	0.46	0.44	0.13
2015-2016, by patient characteristics				
Age				
22-44	1.98	0.43	0.46	0.16
45-64	1.71	0.44	0.43	0.12
65-74	1.71	0.47	0.44	0.11
75+	1.75	0.48	0.47	0.12
Sex				
Male	1.60	0.43	0.42	0.11
Female	1.92	0.48	0.48	0.15
Race				
White	1.76	0.45	0.47	0.12
Black/African American	1.75	0.47	0.42	0.14
American Indian or Alaska Native	1.50	0.32	0.46	0.07
Asian	1.21	0.33	0.32	0.09
Native Hawaiian or Pacific Islander	1.29	0.33	0.38	0.10
Other or Multiracial	1.52	0.40	0.44	0.13
Ethnicity				
Hispanic	1.56	0.41	0.42	0.12
Non-Hispanic	1.78	0.47	0.45	0.13
Non-Hispanic White	1.88	0.48	0.50	0.12
Non-Hispanic Black/African American	1.76	0.47	0.42	0.14
Cause of renal failure				
Diabetes	1.95	0.51	0.50	0.13
Hypertension	1.61	0.46	0.38	0.12
Glomerulonephritis	1.51	0.38	0.38	0.12
Other cause	1.70	0.38	0.47	0.13
Vintage				
<1 year	1.81	0.46	0.50	0.14
1-<2 years	1.73	0.45	0.43	0.11
2-<5 years	1.72	0.46	0.42	0.10
5+ years	1.73	0.45	0.45	0.14

Data Source: Special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients aged 22 & older; adjusted for age, sex, race, ethnicity, primary cause of kidney failure, and vintage; standard population: ESRD patients, 2011. See Vol. 2, ESRD Analytical Methods for principal ICD-9-CM and ICD-10-CM diagnosis codes included in each cause of hospitalization category. Abbreviation: ESRD, end-stage renal disease.

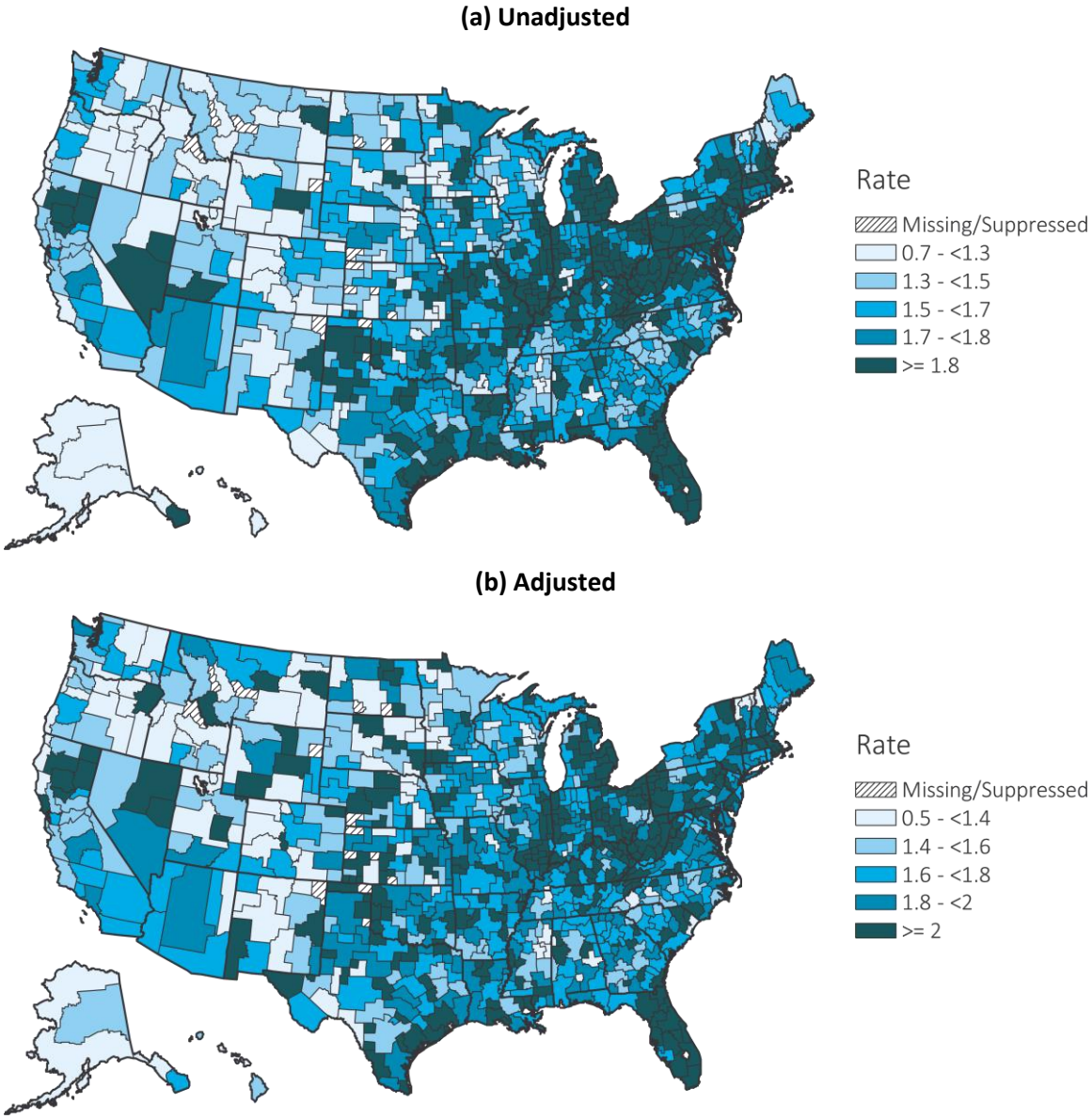
vol 2 Figure 4.3 Adjusted all-cause hospitalization rates by treatment modality and number of years after start of dialysis, for cohorts of incident patients in 2005, 2008, 2011, and 2014



Data Source: Special analyses, USRDS ESRD Database. Period prevalent ESRD patients, adjusted for age, sex, race, ethnicity, primary cause of kidney failure; standard population: ESRD patients, 2011. Abbreviation: ESRD, end-stage renal disease.

The 2013-2016 unadjusted hospitalization rates among patients with ESRD varied considerably across 805 U.S. Health Service Areas (HSAs), from a low of 0.7 PPY in Mitchell County in Iowa to a high of 2.7 PPY in Letcher County in Kentucky (interquartile range: 0.4 PPY; Figure 4.4.a). The rates were generally highest in a wide band stretching from the Midwest through the Northeast. After adjusting for demographic differences among the HSAs, we find adjusted hospitalization rates were somewhat attenuated in several HSAs in the Midwest and Northeast; states in the western United States continued to have generally lower hospitalization rates, but several HSAs in this region appear to compare less favorably after demographic adjustment (Figure 4.4.b).

vol 2 Figure 4.4 Map of the hospitalization rates of ESRD, by Health Service Area, in the U.S. population, 2013-2016

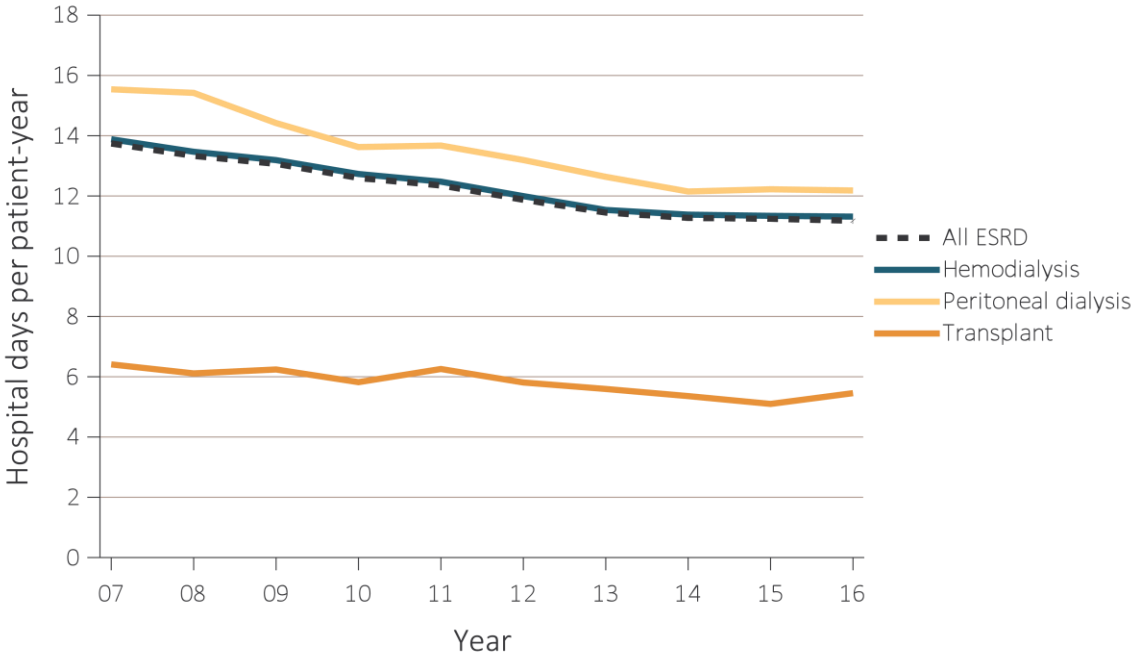


Data Source: Special analyses, USRDS ESRD Database. Period prevalent ESRD patients; adjusted for age, sex, race, ethnicity, primary cause of kidney failure, and vintage; standard population: ESRD patients, 2011. Abbreviation: ESRD, end-stage renal disease.

Hospital Days

Continuing a downward trend observed since 2007, the number of total hospital days among all patients with ESRD has decreased from 13.7 PPY to 11.2 PPY (Figure 4.5). From 2007 to 2016, hospital days PPY decreased from 13.9 to 11.3 for HD patients, from 15.5 to 12.2 for PD patients, and from 6.4 to 5.5 days for those with a functioning kidney transplant. Most of the decline in hospital days during 2007-2016 occurred during 2007-2014, similar to the trends observed above for hospital admissions.

vol 2 Figure 4.5 Adjusted hospital days for ESRD patients, by treatment modality, 2007-2016



Data Source: Special analyses, USRDS ESRD Database. Period prevalent ESRD patients; adjusted for age, sex, race, ethnicity, primary cause of kidney failure, and vintage; standard population: ESRD patients, 2011. Abbreviation: ESRD, end-stage renal disease.

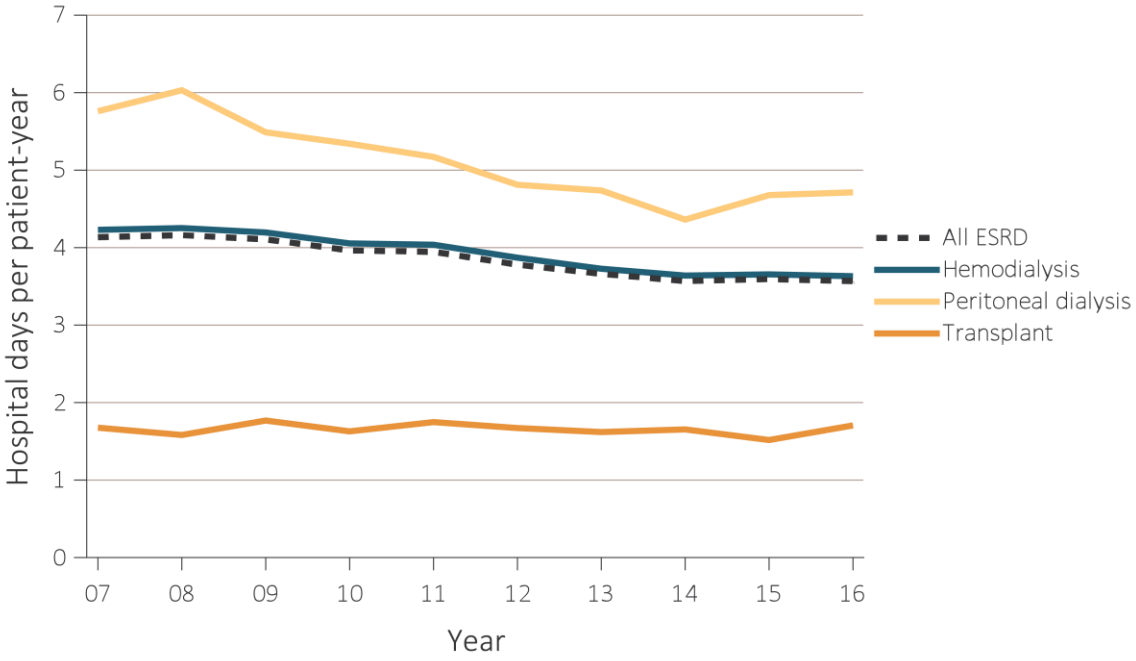
With adjustment for differences in patient characteristics, from 2007-2016 the number of infection-related hospital days decreased by 14.1% for HD patients, 18.2% for those on PD, and increased by 1.8% for patients with a kidney transplant (Figure 4.6.a). From 2007-2016, the number of inpatient days for cardiovascular hospitalization for all patients with ESRD fell from 3.1 days to 2.2 days, a decline of 28.1%; however, since 2014 the number of inpatient days due to cardiovascular hospitalization has increased from 2.2 days in 2014 to 2.6 days in 2016 (Figure 4.6.b). However, this increase in cardiovascular inpatient days is not accompanied by a corresponding increase in all-cause inpatient days, which have been relatively stables since 2013. The increase in cardiovascular inpatient days may be reflective of changes in hospital diagnosis coding practices with the national transition from ICD-9-CM to ICD-10-CM in October 2015; however, this requires further investigation and monitoring.

The number of inpatient days for cardiovascular hospitalization fell by 29.8% for those with a transplant during 2007-2016 (Figure 4.6.b).

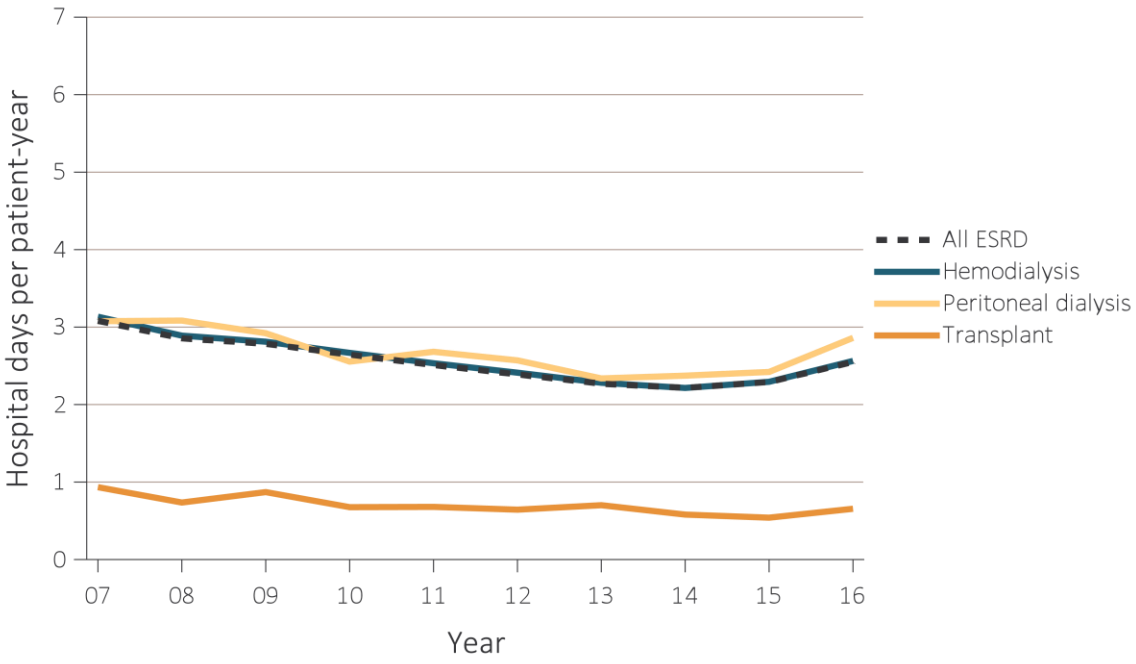
Even after adjustment, the number of hospital days due to infections and cardiovascular events for patients on dialysis were more than twice that of those with a transplant. For HD and PD patients in 2016, infection-related hospital days were 3.6 and 4.7 PPY, compared to 1.7 PPY for transplant recipients. Hospital days for cardiovascular admissions were approximately four times more frequent for patients on dialysis than for those with a transplant—2.6 and 2.9 PPY for HD and PD patients, as compared to 0.7 PPY for transplant recipients.

vol 2 Figure 4.6 Adjusted hospital days for infection & cardiovascular causes, for ESRD patients by their treatment modality, 2007-2016

(a) Infection



(b) Cardiovascular



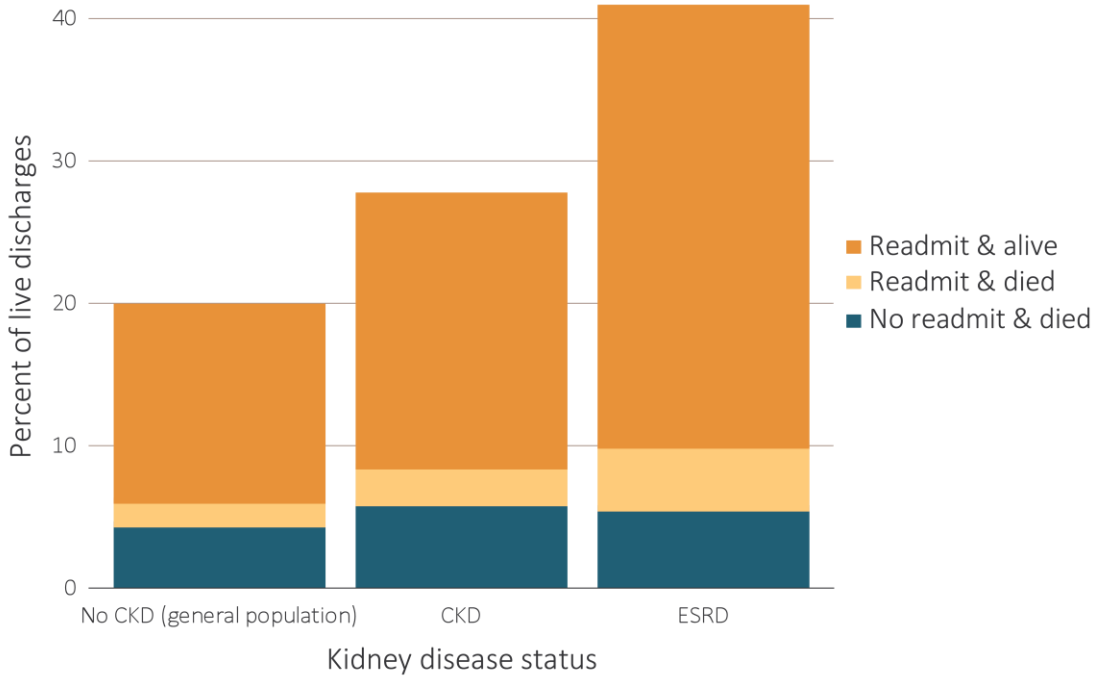
Data Source: Special analyses, USRDS ESRD Database. Period prevalent ESRD patients, adjusted for age, sex, race, ethnicity, primary cause of kidney failure, and vintage; standard population: ESRD patients, 2011. Abbreviation: ESRD, end-stage renal disease.

Readmission

Readmissions following a hospital discharge are an important predictor of subsequent adverse clinical events, both in the general and ESRD populations, and may also be related to quality and coordination of care at the time of discharge. Among dialysis patients, readmissions are associated with increased morbidity and mortality and reduced quality of life. Recurrent hospitalizations also pose a significant societal and financial burden, particularly for ESRD patients.

In this chapter, readmission is defined as a hospital admission occurring within 30 days of a hospital discharge, excluding emergency room visits and those intended for rehabilitation purposes. Hospital readmissions with associated death were more common among patients with CKD or ESRD than in the general population. Patients with CKD and ESRD experienced 30-day readmissions following 21.6% and 35.4% of hospital discharges, respectively, as compared to only 15.3% of older Medicare beneficiaries without a diagnosis of kidney disease (Figure 4.7). This held true for the combined outcome of post-discharge death and/or readmission—experienced by 27.6% of CKD patients and 41.0% of those with ESRD, versus only 19.8% of patients without diagnosed kidney disease.

vol 2 Figure 4.7 Proportion of patients aged 66 & older discharged alive from the hospital who were either readmitted or died within 30 days of discharge, by kidney disease status, 2016



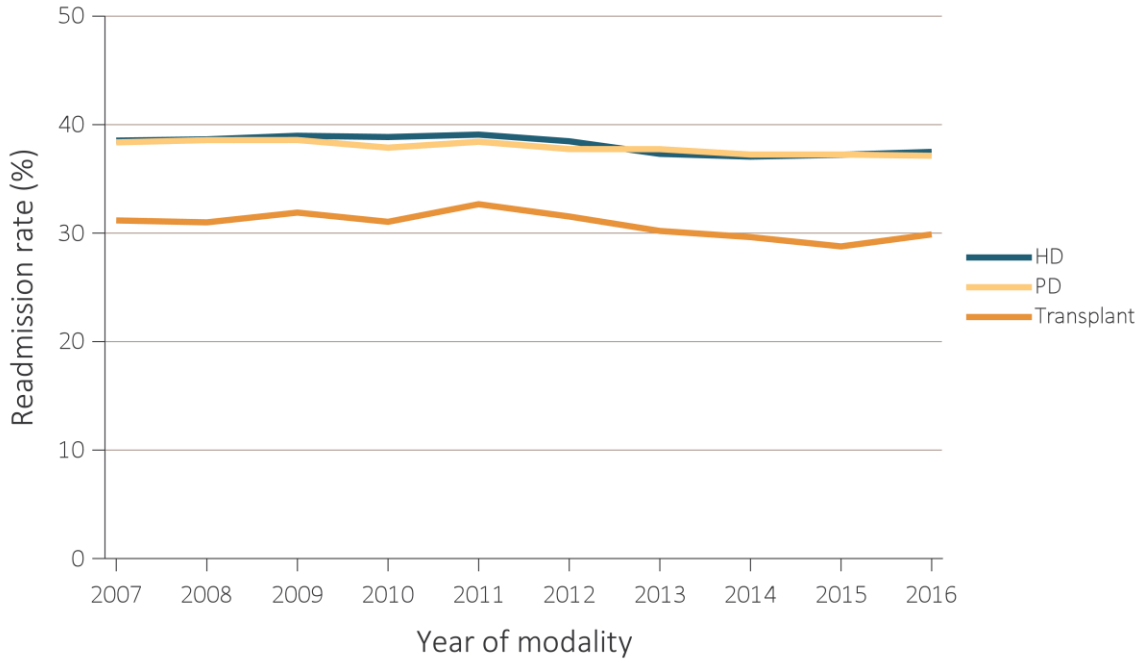
Data Source: Special analyses, USRDS ESRD Database and Medicare 5% sample. January 1, 2016 point prevalent Medicare patients aged 66 & older on December 31, 2016. For general Medicare: January 1, 2016 point prevalent, Medicare patients aged 66 & older, discharged alive from an all-cause index hospitalization between January 1, 2016, and December 1, 2016, unadjusted. CKD determined using claims for 2016. Abbreviations: CKD, chronic kidney disease; ESRD, end-stage renal disease; readmit, readmission.

The frequency of 30-day readmissions for dialysis patients that was stable from 2007-2011 at approximately 39%, fell somewhat in 2012-2013, and has remained at approximately 37% during 2014-2016 (Figure 4.8). Readmissions for transplant patients were approximately 8 percentage points lower but followed a similar time trend. The timing of the decline in readmissions corresponds to declines observed in the broader Medicare fee-for-service population in response to the Medicare Hospital Readmissions Reduction Program (Zuckerman et al., 2016).

Beginning in 2015, the Centers for Medicare & Medicaid Services began using risk-adjusted measures of readmissions for public reporting on the Dialysis Facility Compare website and for value-based purchasing as part of the ESRD Quality Incentive

Program (QIP). So far, we observe no clear immediate changes in national readmissions occurring with the initial implementation of these programs in 2015-2016 relative to 2013-2014. The response to these programs may change over time as patients and health care providers gain experience with the programs and the use of readmission as a quality measure.

vol 2 Figure 4.8 Proportion of ESRD patients readmitted within 30 days, by treatment modality, 2007-2016



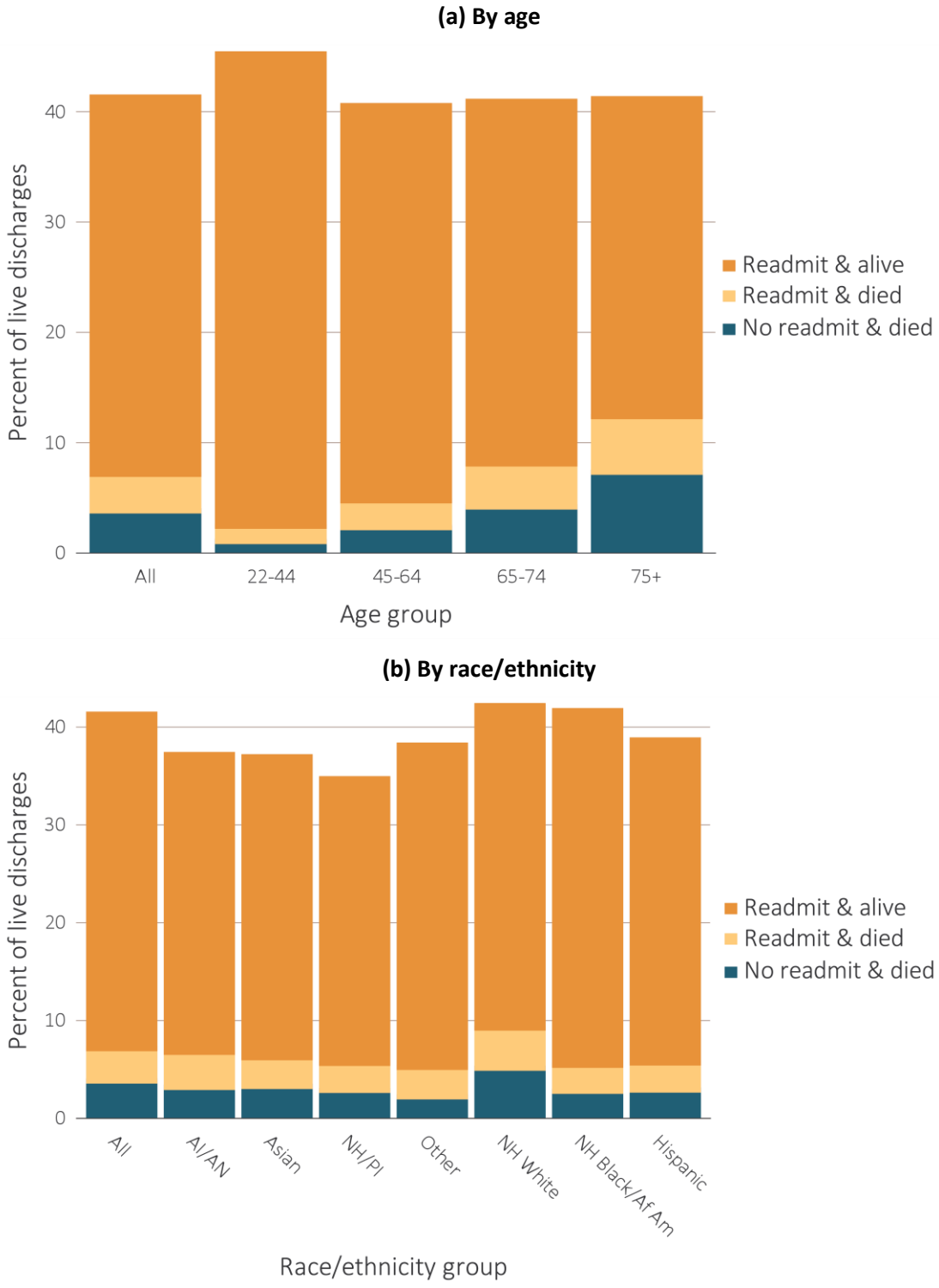
Data Source: Special analyses, USRDS ESRD Database. Abbreviations: ESRD, end-stage renal disease; HD, hemodialysis; PD, peritoneal dialysis.

Among HD patients prevalent in 2016, 37.5% of discharges from a hospitalization for any cause were followed by a readmission within 30 days (see Figure 4.9.a). For older patients, readmissions were observed to be less frequent; however, mortality was observed to be more frequent, illustrating these competing risks, as death precludes readmission. Not surprisingly, rate of post-discharge death without readmission, for example, was the highest in patients aged 75 years and older, at 7.3%, while these patients had the lowest occurrence of readmission, at 33.8%.

The highest proportion of readmission with survival occurred for adults aged 22 to 44 years—43.0% of their discharges were followed by a readmission within 30 days. For the two combined outcomes of readmission followed by either survival or death, the highest proportion was again seen among patients aged 22–44 years, at 44.4%. The proportion surviving following readmission exceeded the two combined death outcomes for all age groups (34.1% vs. 7.1%), even in patients aged 75 and older, at 28.8% and 12.4%. These data illustrate that the observed, elevated proportion being readmitted among younger versus older cohorts was not entirely due to the competing risk of mortality in the aged.

We examined the proportion of HD patients discharged alive who were either readmitted or died within 30 days of discharge, by race and ethnicity (Figure 4.9.b). The highest proportions being readmitted were observed among Non-Hispanic Blacks—36.2% were readmitted and lived while 38.9% were readmitted with the combined outcome of either survival or death. They were followed by the Other or Multiracial group (32.9% vs. 35.9%). The lowest such rates occurred among Native Hawaiians and Pacific Islanders, of whom 29.1% were readmitted and lived, and 31.9% were readmitted with the combined outcome of either survival or death. The highest proportion of post-discharge deaths occurred among Non-Hispanic White HD patients at 9.2%, possibly influenced by the older average age among this group.

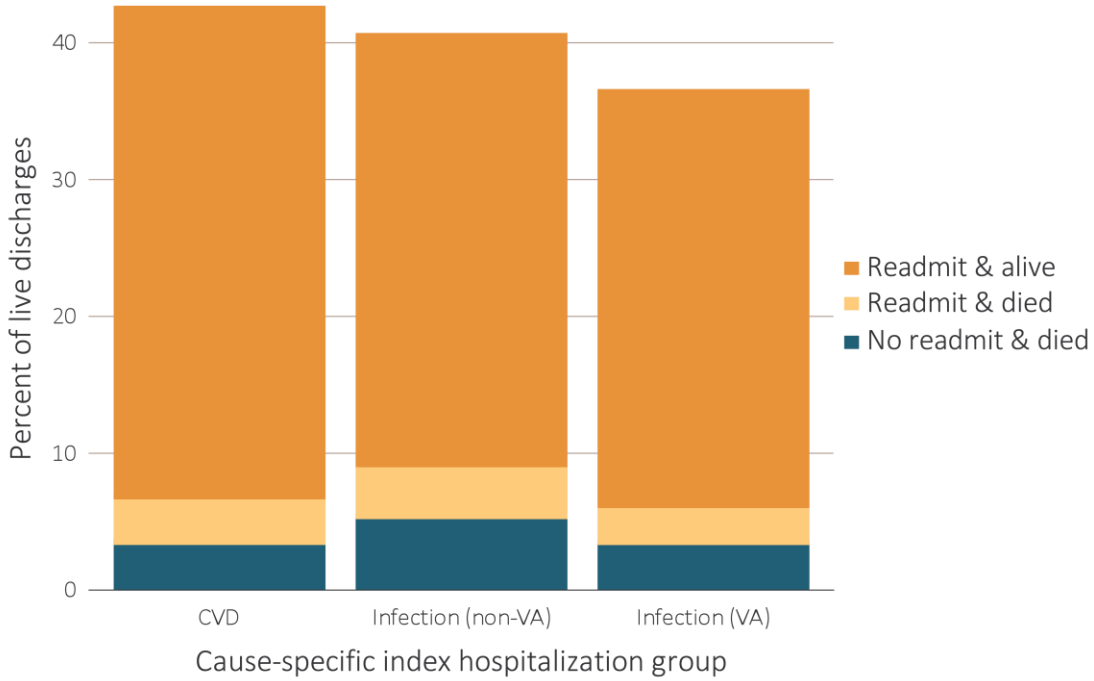
vol 2 Figure 4.9 Proportion of hemodialysis patients discharged alive from the hospital who either were readmitted or died within 30 days of discharge, by demographic characteristics, 2016



Data Source: Special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients, all ages, 2016, unadjusted. Patients less than age 22 are not represented as a group due to insufficient sample size. Includes live hospital discharges from January 1 to December 1, 2016. Cause-specific hospitalizations are defined by principal ICD-10-CM codes. See Vol. 2, ESRD Analytical Methods for principal ICD-10-CM diagnosis codes included in each cause of hospitalization category. Abbreviations: Af Am, African American; AI, American Indian; AN, Alaska Native; ESRD, end-stage renal disease; NH, Native Hawaiian; NH Black/Af Am, Non-Hispanic Black/African American; NH White, Non-Hispanic White; Other, other, multiracial, or unidentified race; PI, Pacific Islander; readmit, readmission.

For HD patients in 2016, the proportion of all-cause readmission was 37.5% (Figure 4.9.a). For index hospitalizations due to cardiovascular conditions, infections, and vascular access infections, 39.2%, 35.1%, and 32.9% of these patients were readmitted within 30 days (Figure 4.10), respectively.

vol 2 Figure 4.10 Proportion of hemodialysis patients discharged alive that either were readmitted or died within 30 days of discharge, by cause of index hospitalization, 2016



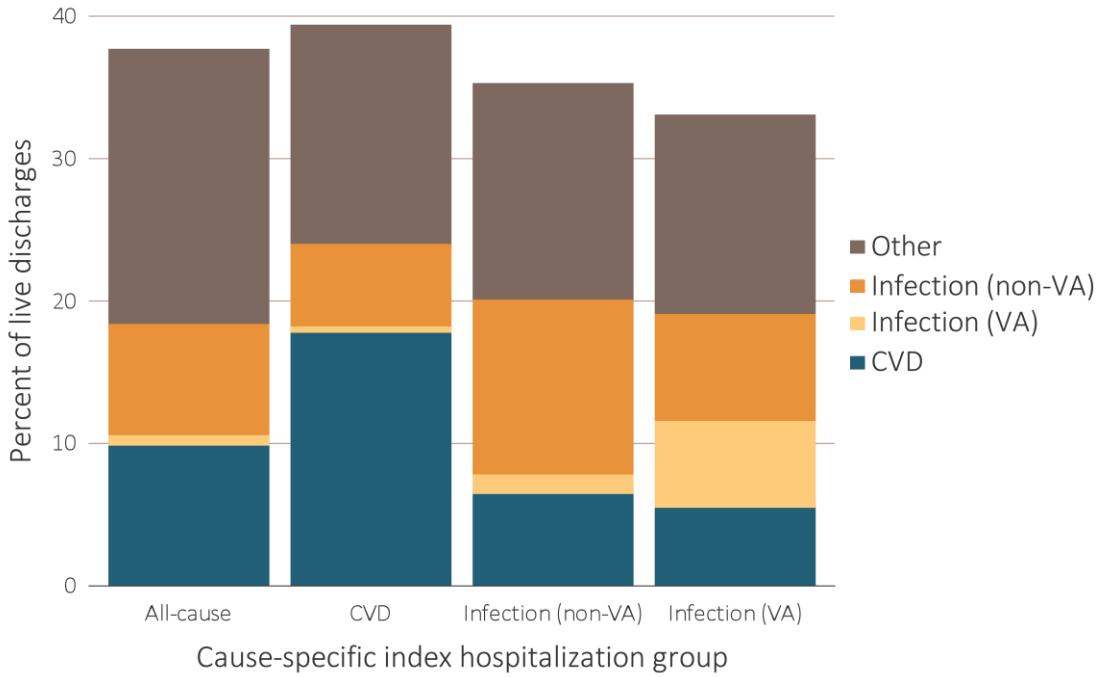
Data Source: Special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients, all ages, 2016, unadjusted. Includes live hospital discharges from January 1 to December 1, 2016. Cause-specific hospitalizations are defined by principal ICD-10-CM codes. See Vol. 2, ESRD Analytical Methods for principal ICD-10-CM diagnosis codes included in each cause of hospitalization category. Abbreviations: CVD, cardiovascular disease; ESRD, end-stage renal disease; readmit, readmission; VA, vascular access.

Figure 4.11 illustrates that readmission in the 30 days following a hospital discharge does not always result from a similar diagnostic cause as the index hospitalization.

During 2016, of those admitted for treatment of cardiovascular issues and then soon readmitted, nearly half (45.8%) were admitted to treat the same or another cardiovascular condition. However, this pattern differed for those initially hospitalized to address vascular access infection (18.5%), and other types of infections (34.9%). The proportion of cause-specific readmission among those with all-cause index hospitalization were also fairly low—only 26.8% returned for additional cardiovascular treatment, 2.0% for vascular access infection, and 20.8% to address other types of infection.

The patterns of readmission following an unrelated index hospitalization suggest the development of new conditions or complications of the original condition. These differences might in part be attributed to the nature of chronic conditions that typically do not resolve (i.e. cardiovascular disease) versus acute conditions that are expected to resolve (i.e. infection).

vol 2 Figure 4.11 Proportion of hemodialysis patients with cause-specific readmissions within 30 days of discharge, by cause of index hospitalization, 2016

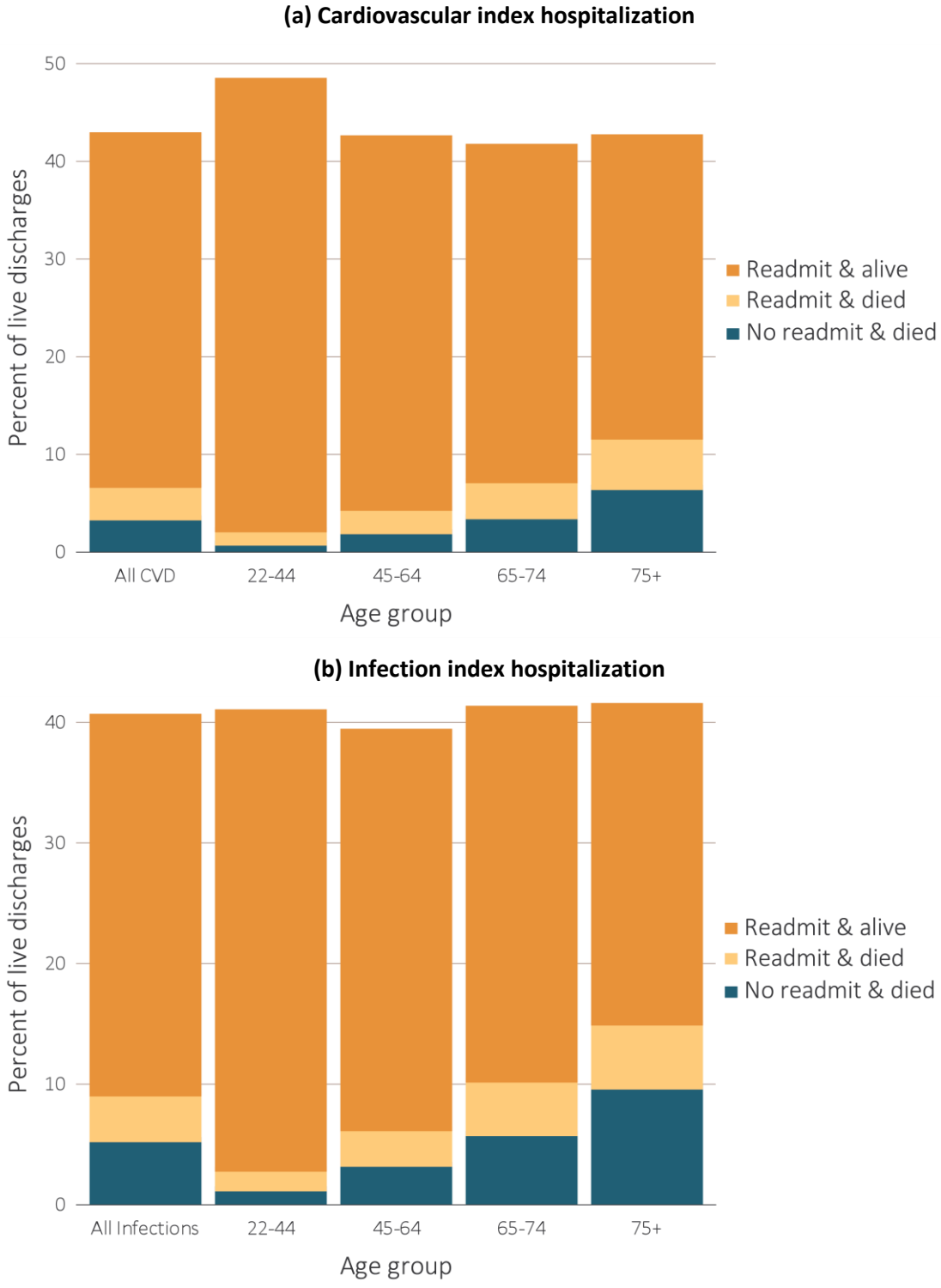


Data Source: Special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients, all ages, 2016, unadjusted. Includes live hospital discharges from January 1 to December 1, 2016. Cause-specific hospitalizations are defined by principal ICD-10-CM codes. See Vol. 2, ESRD Analytical Methods for principal ICD-10-CM diagnosis codes included in each cause of hospitalization category. Abbreviations: CVD, cardiovascular disease; ESRD, end-stage renal disease; VA, vascular access.

Readmissions following discharge from a cardiovascular index hospitalization were slightly higher among younger adults compared with all other age groups, for whom the readmission appeared similar. For those aged 22–44, for example, 47.3% of such discharges were followed by a readmission within 30 days (Figure 4.12.a). In general, these rates mirrored those for all-cause index hospitalizations as seen in Figure 4.9.a, although the rates in Figure 4.12.a for those aged 22-44 were slightly higher.

Similarly, readmission following discharge from an infection index hospitalization followed the same trend among the age groups. In those aged 22-44, 39.5% of these discharges were followed by a readmission within 30 days (Figure 4.12.b). Generally, as age increased, the frequency of readmission slightly decreased while the frequency of patients dying within the 30 days after discharge without a readmission increased.

vol 2 Figure 4.12 Proportion of hemodialysis patients discharged alive who were either readmitted or died within 30 days of discharge for (a) cardiovascular index hospitalization and (b) infection index hospitalization, by age, 2016

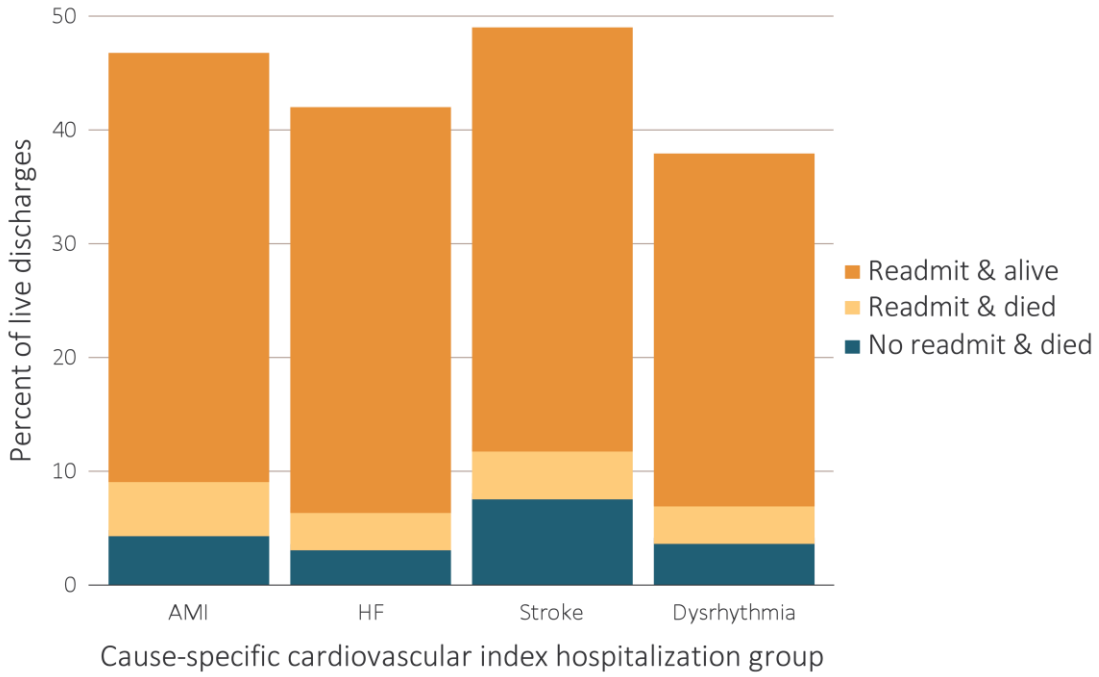


Data Source: Special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients, all ages, 2016, unadjusted. Patients less than age 22 are not represented as a group due to insufficient sample size. Includes live hospital discharges from January 1 to December 1, 2016. Cause-specific hospitalizations are defined by principal ICD-10-CM codes. See Vol. 2, ESRD Analytical Methods for principal ICD-10-CM diagnosis codes included in each cause of hospitalization category. Abbreviation: ESRD, end-stage renal disease; readmit, readmission.

In subgroups of cardiovascular index hospitalizations (Figure 4.13), readmission occurred most frequently following discharge from treatment of acute myocardial infarction (AMI), at 41.9%, and stroke, at 40.9%. The lowest frequency of readmission occurred following discharge after dysrhythmia, at 33.8%. When not readmitted, stroke patients had the highest post-discharge mortality, with 7.8% dying within 30 days of discharge.

As comorbid cardiovascular disease and its complications have a critical interaction with kidney disease of all types, this 2018 ADR features two chapters specifically addressing these issues—Volume 1, Chapter 4 Cardiovascular Disease in Patients with CKD, and Volume 2, Chapter 8, Cardiovascular Disease in Patients with ESRD.

vol 2 Figure 4.13 Proportion of hemodialysis patients discharged alive who were either readmitted or died within 30 days of discharge for cardiovascular index hospitalization, by cause-specific cardiovascular index hospitalization, 2016



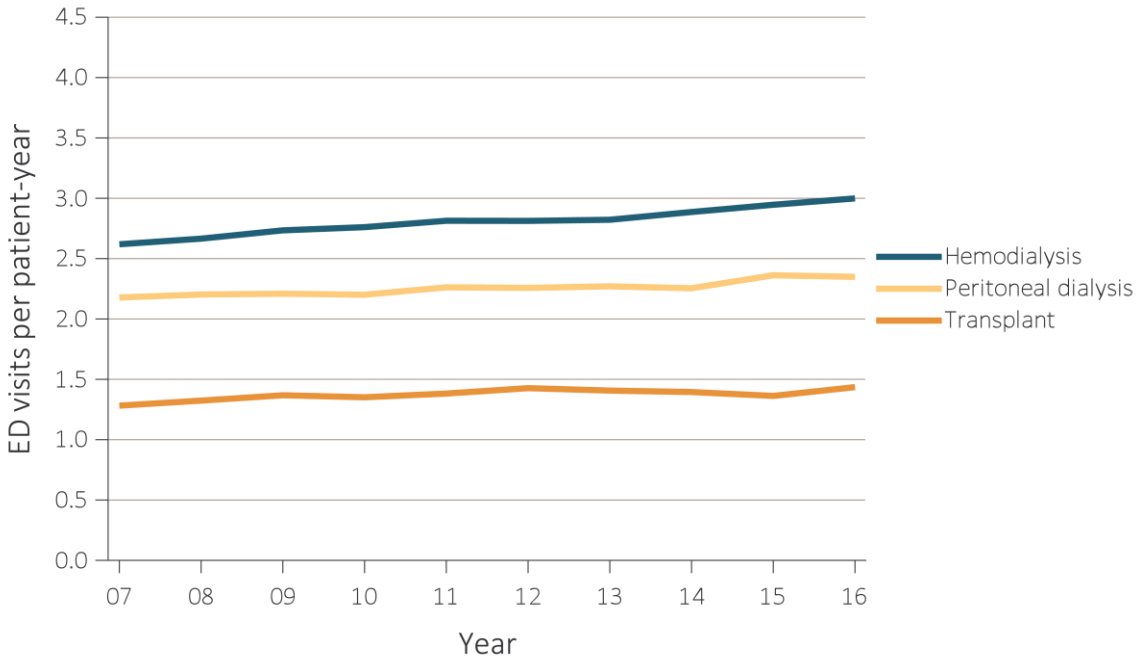
Data Source: Special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients, all ages, 2016, unadjusted. Includes live hospital discharges from January 1 to December 1, 2016. Cause-specific hospitalizations are defined by principal ICD-10-CM codes. See Vol. 2, ESRD Analytical Methods for principal ICD-10-CM diagnosis codes included in each cause of hospitalization category. Abbreviations: AMI, acute myocardial infarction; ESRD, end-stage renal disease; HF, heart failure; readmit, readmission.

Emergency Department Visits and Observation Stays

New for the 2018 Annual Data Report, we present data on emergency department (ED) visits and observation stays. Our comprehensive assessment of ED visits includes those resulting in discharge from the emergency department as well as those resulting in hospital admission. In contrast to declining trends over time in hospital admission rates (see Figure 4.1 above), it is notable that rates of ED visit have increased over time. Between 2007 and 2016, unadjusted ED visit rates for HD patients increased from 2.6 to 3.0 PPY, while rates for peritoneal dialysis (PD) patients increased from 2.2 to 2.4 PPY, and rates for transplant patients increased from 1.3 to 1.4 PPY (Figure 4.14).

The frequency of ED visits is relatively high in ESRD populations; the Agency for Healthcare Research and Quality (AHRQ) reports rates of ED use among the general population of 0.38 per person aged <18 years, 0.40 per person aged 18-44 years, 0.47 per person aged 15-64 years, and 0.58 per person aged 65 years and older (AHRQ, 2018a). They also report the frequency of ED use increasing over time in the general population.

vol 2 Figure 4.14 Unadjusted ED visit rates for ESRD patients, by treatment modality, 2007-2016



Data Source: Special analyses, USRDS ESRD Database. Abbreviations: ED, emergency department; ESRD, end-stage renal disease.

The increase in ED visits over time has been primarily among those ED visits that end in discharge from the ED rather than a hospital admission. The percentage of ED visits that end with discharge has grown from 51% of ED visits in 2007 to 56% of ED visits in 2016.

ESRD patients 22 to 44 years of age consistently had the highest rate of ED visits during 2007-2016, with the rate of ED visits also increasing faster over time (Figure 4.15). Previously in this chapter, we have reported this age group has a higher hospital admission rate (Table 4.1) and a high frequency of readmission (Figure 4.9.a). This difference in disease burden may be due to different causes and etiology of ESRD among young adults as well as indicative of a potential subpopulation that may benefit from quality improvement activities or care coordination.

vol 2 Figure 4.15 Unadjusted ED visit rates for ESRD patients, by age group and treatment modality, 2007-2016

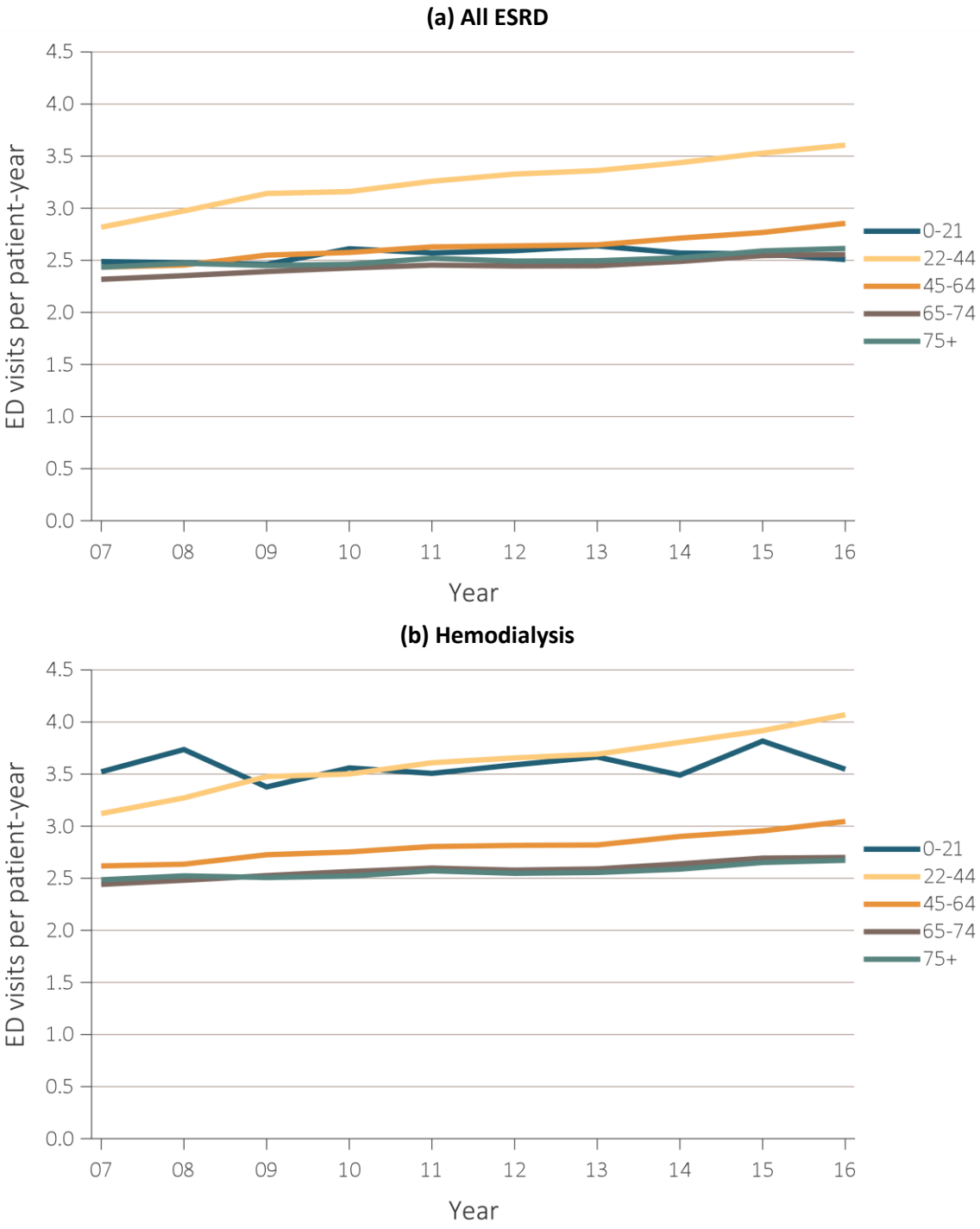
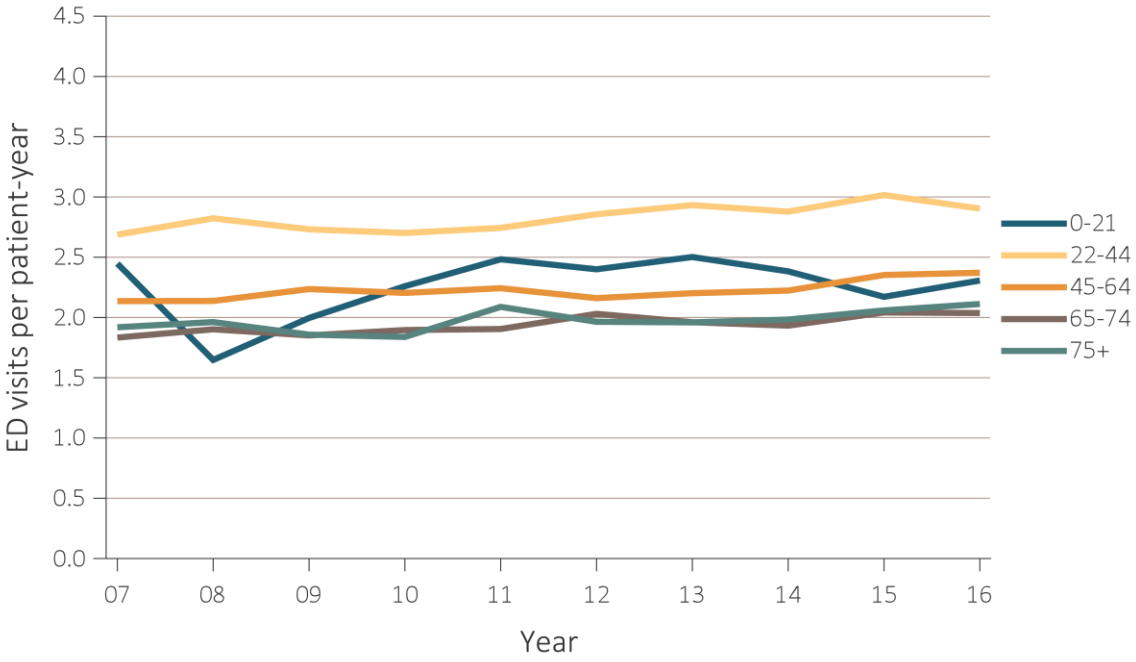


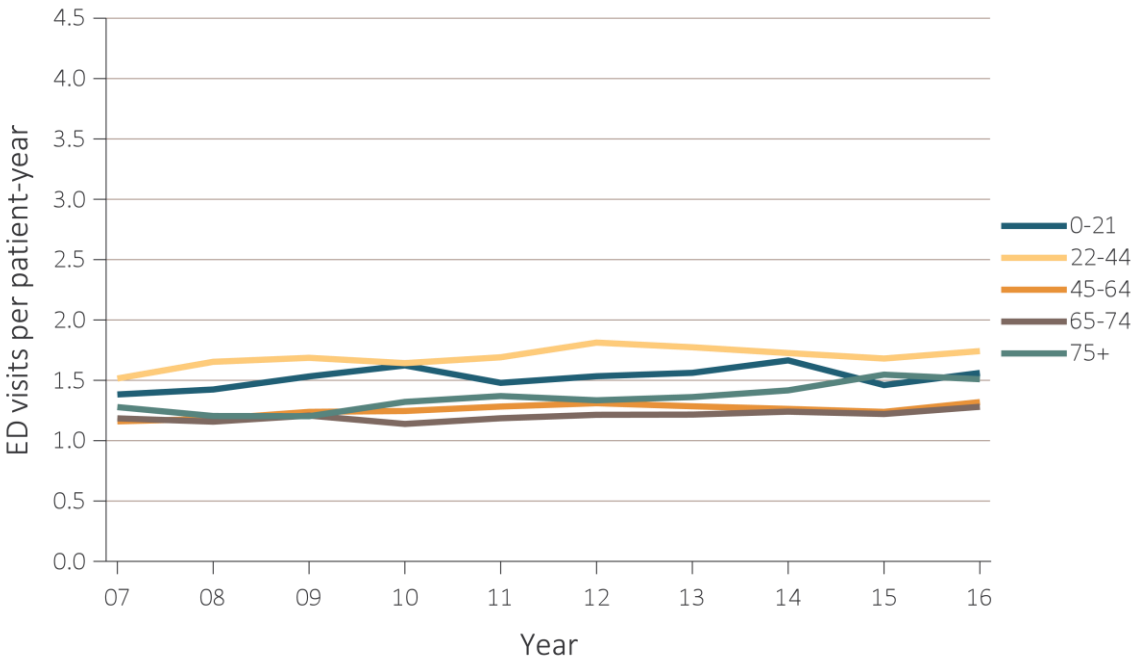
Figure 4.15 continued on next page.

vol 2 Figure 4.15 Unadjusted ED visit rates for ESRD patients, by age group and treatment modality, 2007-2016 (continued)

(c) Peritoneal dialysis



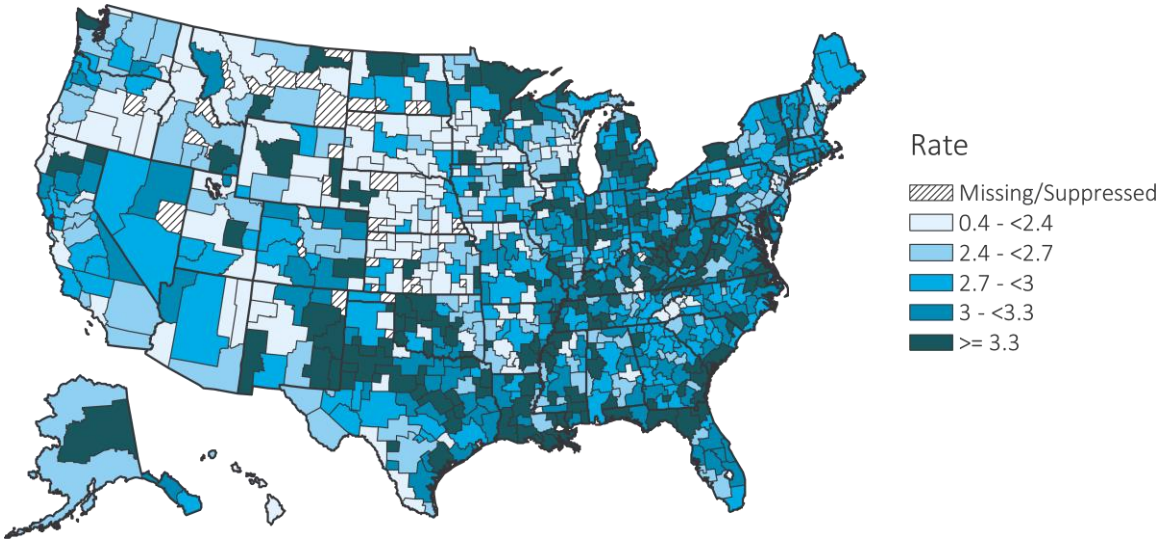
(d) Transplant



Data Source: Special analyses, USRDS ESRD Database. Abbreviations: ED, emergency department; ESRD, end-stage renal disease; HD, hemodialysis; PD, peritoneal dialysis.

There is substantial geographic variation in ED visit rates across HSAs, with relatively high rates of ED visits found in parts of the Midwest and South, moderate rates in the Northeast, and relatively low rates in the Plains States and the Western United States (Figure 4.16). In general, geographic trends tend to be similar to those observed for hospitalization rates (Figure 4.4).

vol 2 Figure 4.16 Map of the unadjusted ED visit rates of ESRD, by Health Service Area, in the U.S. population, 2016

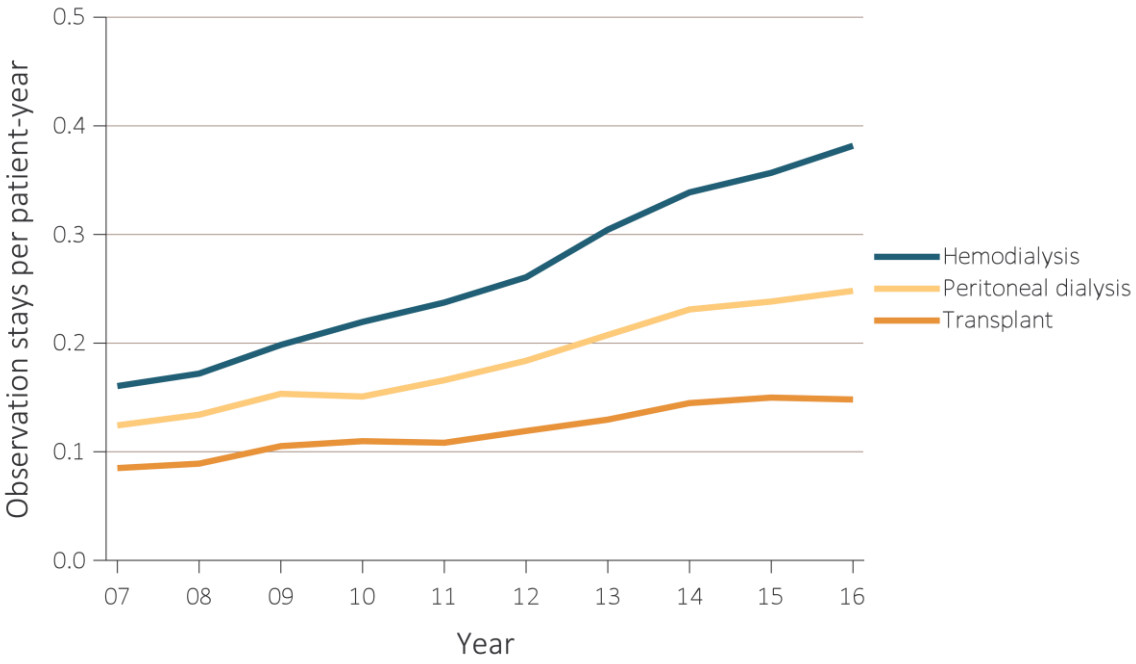


Data Source: Special analyses, USRDS ESRD Database. Abbreviations: ED, emergency department; ESRD, end-stage renal disease.

Observation stays are used by some hospitals as an alternative when an inpatient admission may not strictly be warranted, but a patient could benefit from a period of medical supervision, for example, to rule out serious illness or while waiting for important/critical laboratory results and in some instances for ensuring relief from significant symptoms e.g., bronchospasm or pain. Observation stays are relatively rare compared to other health care services examined in this chapter; however, observation stay rates for ESRD patients approximately doubled in frequency from 2007-2016. Unadjusted rates of observation stays for HD patients increased from 0.16 to 0.38 PPY, while rates for PD patients increased from 0.12 to 0.25 PPY, and rates for transplant patients increased from 0.08 to 0.15 PPY (Figure 4.17).

Increases in the use of observation stays have been noted in other populations. The Medicare Payment Advisory Commission found the number of outpatient observation stays increased by 88 percent in the general Medicare population between 2006 and 2012, from 0.028 to 0.053 visits per beneficiary (MedPAC, 2015). Notably, this shows observation stays are used considerably more often for ESRD patients when compared to the general Medicare population.

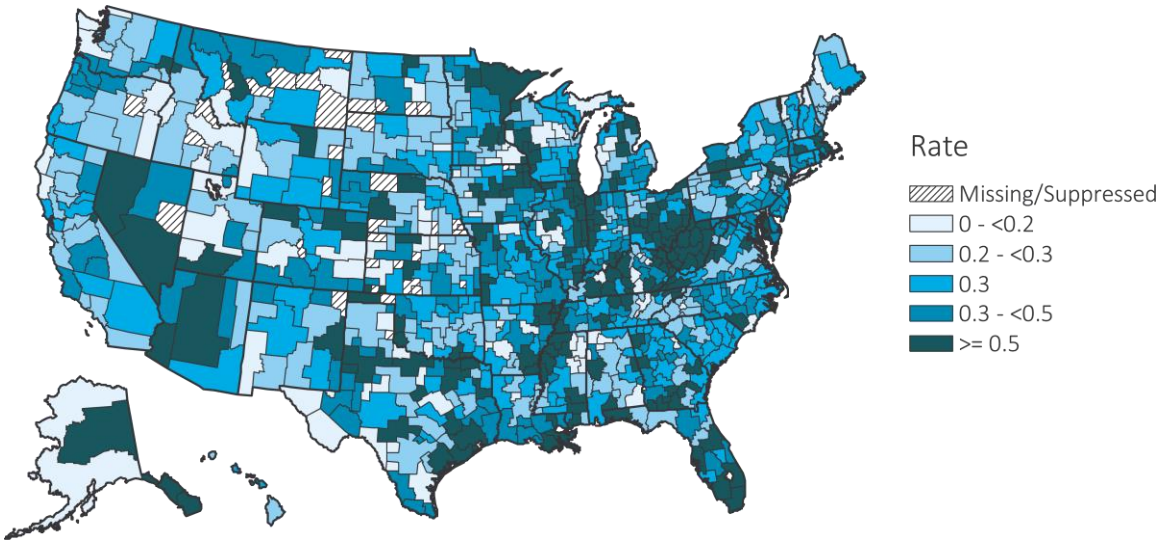
vol 2 Figure 4.17 Unadjusted observation stay rates for ESRD patients, by treatment modality, 2007-2016



Data Source: Special analyses, USRDS ESRD Database. Abbreviation: ESRD, end-stage renal disease.

The rate of observation stays varies geographically, with relatively high rates in several HSAs in the Midwest and South (Figure 4.18). Regional variation in the frequency of observation stays may reflect a variety of factors, including patient appropriateness for observation, local practice patterns, and availability and capacity of observation units.

vol 2 Figure 4.18 Map of unadjusted observation stay rates of ESRD, by Health Service Area, in the U.S. population, 2016



Data Source: Special analyses, USRDS ESRD Database. Abbreviation: ESRD, end-stage renal disease.

This chapter examines several forms of health care utilization; there are differences in the conditions treated across health care settings. We applied the Agency for Healthcare Research and Quality Clinical Classification Software (AHRQ, 2018b) to group the principal diagnosis codes observed on Medicare claims into 283 clinically meaningful categories. Table 4.2 shows the ten most common clinical classifications in each form of health care utilization discussed in this chapter. The most common clinical conditions were relatively similar for hospitalizations, readmissions, and emergency department visits that resulted in a hospital admission. In these settings, septicemia was the most common followed by complication of device. Nonspecific chest pain was the leading clinical condition in emergency department visits without a hospital admission and observation stay.

vol 2 Table 4.2 Top ten most common principal diagnosis clinical classifications for patients with ESRD, by service type, 2016

Hospitalization (N = 870,783)		Readmission (N = 168,002)		ED with admission (N = 487,492)		ED w/o admission (N = 562,078)		Observation stay (N = 124,223)	
Septicemia (except in labor)	9.3%	Septicemia (except in labor)	8.6%	Septicemia (except in labor)	9.2%	Nonspecific chest pain	6.0%	Nonspecific chest pain	13.0%
Complication of device; implant or graft	9.2%	Complication of device; implant or graft	8.5%	Complication of device; implant or graft	7.6%	Chronic kidney disease	5.5%	Hypertension with complications and secondary hypertension	9.4%
Hypertension with complications and secondary hypertension	8.2%	Hypertension with complications and secondary hypertension	7.4%	Hypertension with complications and secondary hypertension	6.8%	Complication of device; implant or graft	5.4%	Complication of device; implant or graft	9.0%
Diabetes mellitus with complications	5.1%	Fluid and electrolyte disorders	5.6%	Fluid and electrolyte disorders	5.8%	Hypertension with complications and secondary hypertension	5.2%	Fluid and electrolyte disorders	6.5%
Fluid and electrolyte disorders	4.5%	Diabetes mellitus with complications	5.0%	Congestive heart failure; nonhypertensive	4.5%	Abdominal pain	4.5%	Chronic kidney disease	4.6%
Congestive heart failure; nonhypertensive	4.4%	Congestive heart failure; nonhypertensive	4.5%	Diabetes mellitus with complications	4.4%	Other lower respiratory disease	3.5%	Other lower respiratory disease	3.4%
Pneumonia (except that caused by tuberculosis or sexually transmitted disease)	3.5%	Complications of surgical procedures or medical care	4.0%	Pneumonia (except that caused by tuberculosis or sexually transmitted disease)	4.1%	Diabetes mellitus with complications	3.0%	Diabetes mellitus with complications	3.3%
Complications of surgical procedures or medical care	3.1%	Other nervous system disorders	3.0%	Acute myocardial infarction	2.5%	Superficial injury; contusion	2.9%	Syncope	2.4%
Respiratory failure; insufficiency; arrest (adult)	2.6%	Pneumonia (except that caused by tuberculosis or sexually transmitted disease)	2.9%	Complications of surgical procedures or medical care	2.5%	Fluid and electrolyte disorders	2.8%	Deficiency and other anemia	2.2%
Acute myocardial infarction	2.6%	Respiratory failure; insufficiency; arrest (adult)	2.8%	Respiratory failure; insufficiency; arrest (adult)	2.4%	Other connective tissue disease	2.7%	Abdominal pain	2.2%

Data Source: Special analyses, USRDS ESRD Database. Abbreviations: ED, emergency department; ESRD, end-stage renal disease.

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