Introduction to Volume 2: ESRD in the United States

Introduction

Volume 2 of the USRDS Annual Data Report (ADR) offers a source of detailed descriptive epidemiology of end-stage renal disease (ESRD) in the United States. Registration in the U.S. national ESRD database legally requires the completion of the ESRD Medical Evidence form (CMS 2728). This documentation of new ESRD patients must be submitted to the Centers for Medicare & Medicaid Services (CMS) within 45 days of onset of renal replacement therapy.

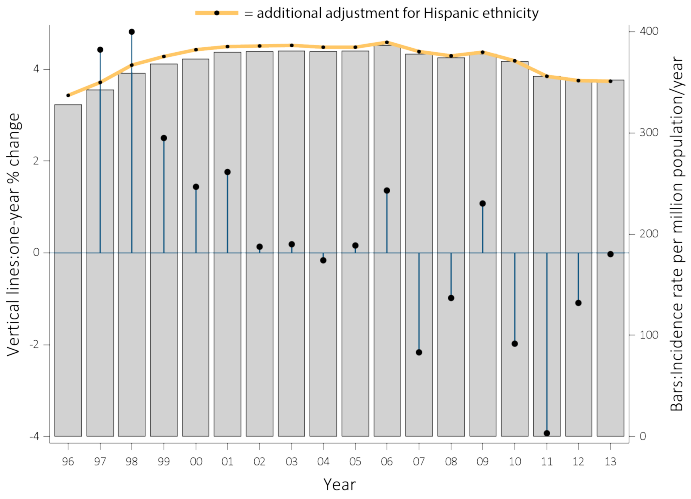
Data collection for many national projects administered by the CMS has been transitioning from paper-based data entry to a fully web-based system. These projects include data to create core metrics and measures, such as the assessment and reporting of provider performance through Dialysis Facility Reports (DFR) and Dialysis Facility Compare (DFC), as well as the Quality Incentive Program (QIP), which ties provider achievement of selected quality targets to Medicare reimbursement. This web-based system is known as the Consolidated Renal Operations in a Web-Enabled Network (CROWNWeb). For Volume 2 of the USRDS Annual Data Report (ADR), the coordinating center has previously relied on data from Medicare claims for its analyses, however, in 2015, data from CROWNWeb is included for the first time in several chapters.

Volume 2 of the 2015 USRDS ADR provides key statistics on ESRD in the United States and includes the following chapters: Incidence, Prevalence, Patient Characteristics, and Treatment Modalities (Chapter 1); Healthy People 2020 (Chapter 2); Clinical Indicators and Preventive Care (Chapter 3); Vascular Access (Chapter 4); Hospitalization (Chapter 5); Mortality (Chapter 6); Transplantation (Chapter 7); Pediatric ESRD (Chapter 8); Cardiovascular Disease in Patients With ESRD (Chapter 9); Dialysis Providers (Chapter 10); Medicare Expenditures for Persons With ESRD (Chapter 11); Medicare Part D Prescription Drug Coverage in Patients With ESRD (Chapter 12); International Comparisons (Chapter 13); USRDS Special Study Center on End-of-life Care for Patients With ESRD (Chapter 14).

Chapter 1: Incidence, Prevalence, Patient Characteristics, and Treatment Modalities

There were 117,162 new cases of ESRD reported by the end of 2013; the unadjusted incidence rate was 363 per million/year, representing no change compared to 2012. The adjusted incidence rate rose sharply in the 1980s and 1990s, but leveled off in the early 2000s, and has declined slightly since its peak in 2006 (Figure i.1). The rate of incident ESRD is roughly 3-fold higher for Black/African Americans than for other races, and 1.4-fold higher for Hispanics versus non-Hispanics.

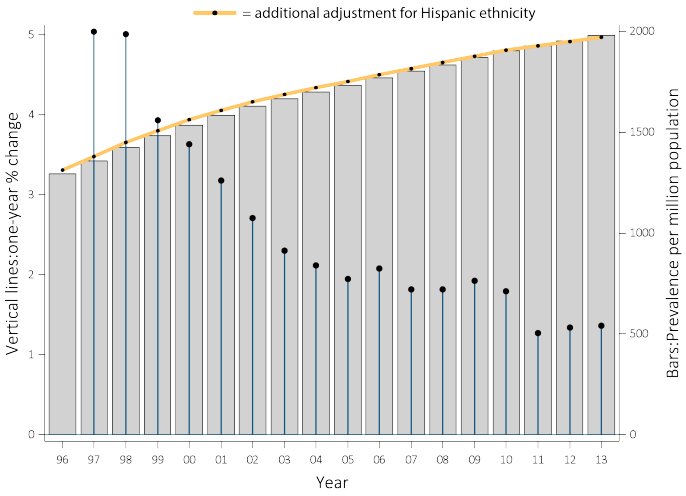
vol 2 Figure i.1 Trends in the adjusted* incidence rate (per million/year) of ESRD (bars; scale on right), and annual change (%) in the adjusted* incidence rate of ESRD (lines; scale on left) in the U.S. population, 1996-2013



*Data Source: Reference Table A.2(2), and special analyses, USRDS ESRD Database. *Adjusted for age, sex, and race. The standard population was the U.S. population in 2011. Abbreviation: ESRD, end-stage renal disease. This graphic is also presented as Figure 1.2.*

Despite this stability in ESRD incidence, at the end of 2013, there were 661,648 prevalent dialysis and transplant patients receiving treatment for ESRD—a 3.5% increase from 2012. The number of ESRD prevalent cases continues to rise (by about 21,000 cases per year), as does the adjusted prevalence (Figure i.2). Because the incidence of ESRD has plateaued, the ongoing rise in prevalence can be attributed to the decline in mortality rate among ESRD patients.

vol 2 Figure i.2 Trends in the adjusted* ESRD prevalence (per million) (bars; scale on left), and annual change (%) in adjusted* prevalence of ESRD (lines; scale on right), in the U.S. population, 1996-2013

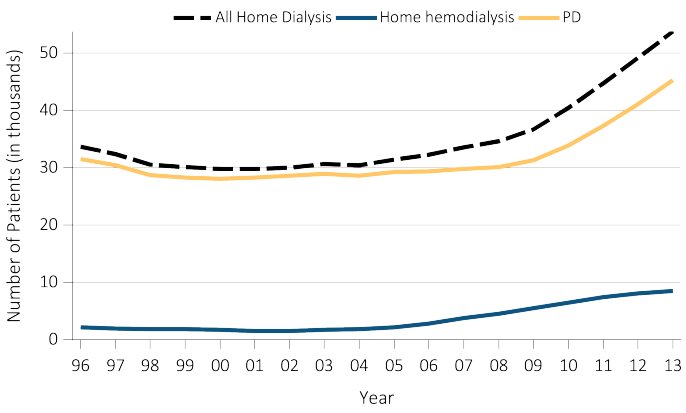


*Data Source: Reference Table B.2(2), and special analyses, USRDS ESRD Database. *Adjusted for age, sex, and race. The standard population was the U.S. population in 2011. Abbreviation: ESRD, end-stage renal disease. This graphic is also presented as Figure 1.11.*

The mean eGFR at initiation of dialysis has been stable or decreased slightly from 2010 to 2013 after increasing steadily from 1996 until 2009. However, the percentage of incident ESRD cases receiving little or no pre-ESRD nephrology care remains high, at 38% in 2013.

Among prevalent ESRD cases, the use of home dialysis (peritoneal dialysis or home hemodialysis, Figure i.3) has increased appreciably in recent years. Home dialysis accounted for 11.5% of all prevalent dialysis patients in 2013, up from a low of 8.9% in 2008. Among prevalent ESRD cases receiving home dialysis, the proportion using home hemodialysis was over 3-fold higher in 2013 (15.8%) than in 2001 (5.2%).

vol 2 Figure i.3 Trends in number of prevalent ESRD cases (in thousands) using home dialysis, by type of therapy, in the U.S. population, 1996-2013



Data Source: Reference Table D.1. December 31 prevalent ESRD patients; PD consists of CAPD and CCPD only. Abbreviations: CAPD, continuous ambulatory peritoneal dialysis; CCPD, continuous cycler peritoneal dialysis; ESRD, end-stage renal disease; PD, peritoneal dialysis. This graphic is also presented as Figure 1.23.

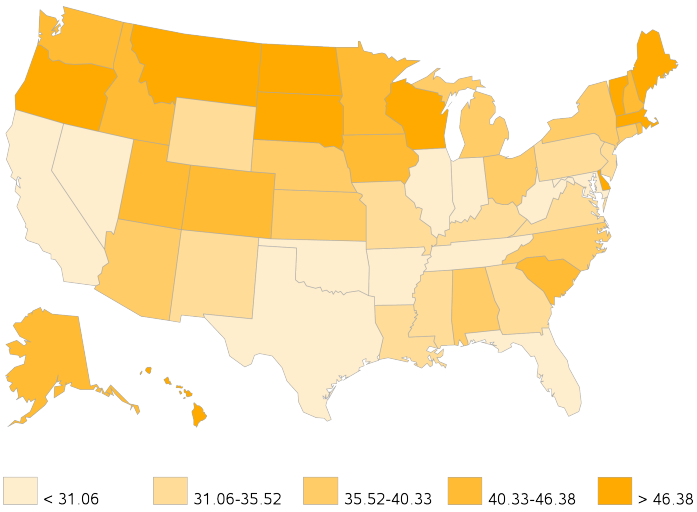
Chapter 2: Healthy People 2020

In 2015, we present data for 10 Healthy People (HP) 2020 Objectives, spanning 19 total indicators. As in previous years, we present data overall and stratified by race, gender, and age groups. In 2013, 11 of 19 indicators met HP2020 goals, and most of the remaining objectives continue to show improvement. We include maps for some of the indicators to illustrate geographic variation. Specifically, we present state-level comparison maps for HP2020 objectives CKD-10 (proportion of CKD patients receiving care from a nephrologist at least 12 months before the start of renal replacement therapy) and CKD-13.1 (proportion of patients receiving a kidney transplant within 3 years of end-stage renal disease) (Figure i.4). To update HP2020 objectives relating to vascular access, we present data from CROWNWeb for the first time. Previous USRDS annual reports have relied on data from the clinical performance measures project, which only collected information through 2007. Using CROWNWeb, this year we were able to present data from 2012 and 2013 for HP2020 objectives CKD 11-1 (proportion of adult hemodialysis patients who use an arteriovenous (AV) fistula as the primary mode of vascular access) and CKD 11-2 (proportion of adult hemodialysis patients who use a catheter as the only mode of vascular access).

We observed substantial geographic variation in the proportion of chronic kidney disease patients

receiving care from a nephrologist at least 12 months before the start of renal replacement therapy, with percentages varying by more than 50% from the lowest quintile (30%) to the highest quintile (46%).

vol 2 Figure i.4 HP2020 CKD-10 Geographic distribution of the adjusted proportion of chronic kidney disease patients receiving care from a nephrologist at least 12 months before the start of renal replacement therapy, by state, in the U.S. population, 2013: Target 29.8%



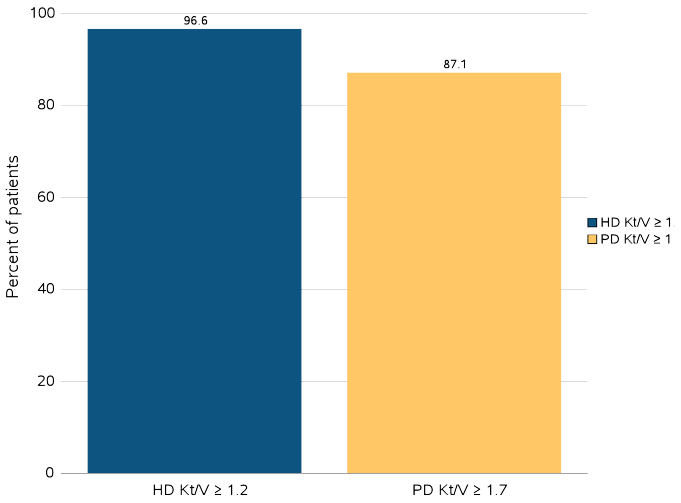
Data Source: Special analyses, Medicare 5 percent sample. Incident hemodialysis patients with a valid ESRD Medical Evidence CMS 2728 form; nephrologist care determined from Medical Evidence form. Adjusted for age, sex, and race. Abbreviations: CDC, Centers for Disease Control and Prevention; CKD, chronic kidney disease. Abbreviations: CDC, Centers for Disease Control and Prevention; CKD, chronic kidney disease; ESRD, end-stage renal disease. This graphic is also presented as Figure 2.1.

Chapter 3: Clinical Indicators and Preventive Care

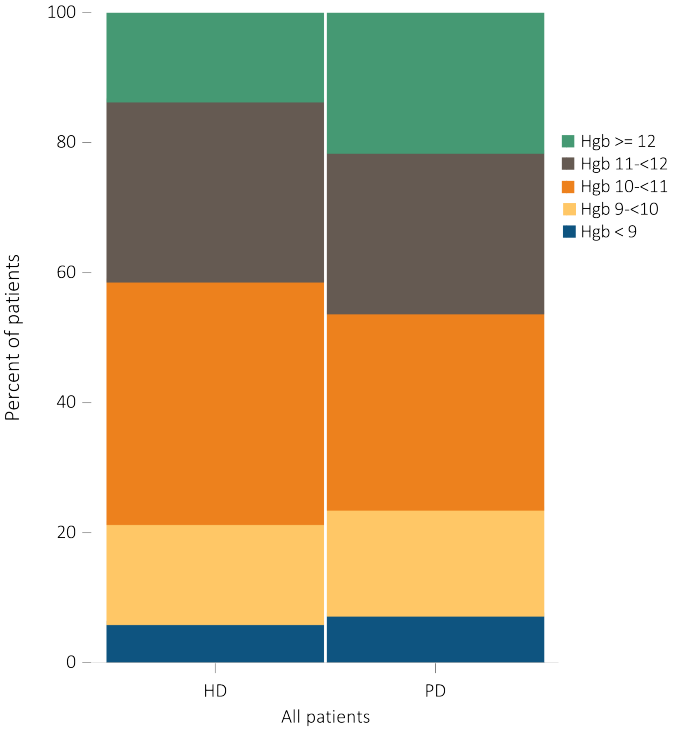
Given the high morbidity and mortality of the ESRD population receiving dialysis, quality improvement has long been a priority. For the first time, due to the recent availability of data from CROWNWeb, national trends in serum calcium, phosphorus, ferritin and transferrin saturation levels are reported in the ADR. For example, as of December 2014, 2.4% of hemodialysis patients and 2.3% of peritoneal dialysis patients had a serum calcium of >10.2 mg/dl (Figure i.5.c). Avoidance of this threshold is currently being utilized as a quality indicator in Centers for Medicare & Medicaid Services (CMS) programs such as Dialysis Facility Compare and the Quality Incentive Program given concerns about associations between hypercalcemia and vascular calcifications or cardiovascular events.

vol 2 Figure i.5 ESRD clinical indicators: (a) Percentage of prevalent hemodialysis and peritoneal dialysis patients meeting clinical care guidelines for dialysis adequacy by modality, (b) percentage distribution of achieved mean Hgb among prevalent hemodialysis and peritoneal dialysis patients; and (c) percentage of patients with serum calcium >10.2 mg/dL by modality, CROWNWeb data, December 2014

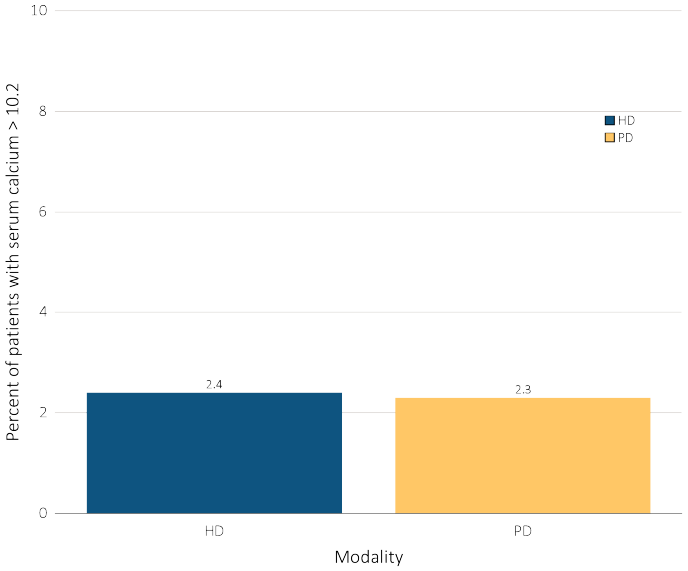
(a) Percentage of prevalent hemodialysis and peritoneal dialysis patients meeting clinical care guidelines for dialysis adequacy by modality



(b) Percentage distribution of achieved mean Hgb among prevalent hemodialysis and peritoneal dialysis patients



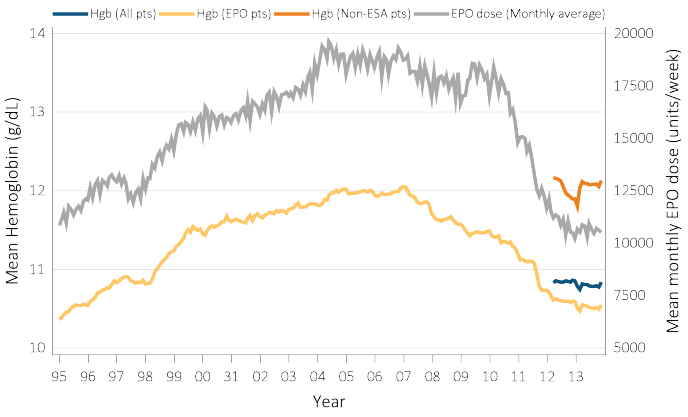
(c) Percentage of patients with serum calcium >10.2 mg/dL by modality



Data Source: Special analyses, USRDS ESRD Database. Results shown are for laboratory values reported to CROWNWeb for December 2014, restricted to patients as follows: Panel a: Dialysis patients initiating treatment for ESRD at least 1 year prior to December 1, 2014, and who were alive through December 31, 2014. Panel b: Dialysis patients initiating treatment for ESRD at least 90 days prior to December 1, 2014, who were ≥18 years old as of December 1, 2014, and who were alive through December 31, 2014. Panel c: Hemodialysis and peritoneal dialysis patients initiating treatment for ESRD at least 90 days prior to December 1, 2014, who were ≥18 years old as of December 1, 2014, and who were alive through December 31, 2014. Abbreviations: ESRD, end-stage renal disease; HD, hemodialysis; Hgb, hemoglobin; Kt/V, see Glossary; PD, peritoneal dialysis. This graphic is also presented as Figure 3.1.

The decreasing trend in mean hemoglobin (Hgb) levels over the last several years following a peak near 12.0 g/dL in 2007 in erythropoiesis stimulating agent-treated hemodialysis patients appears to have finally plateaued. Mean Hgb levels were relatively stable in 2013, with only small changes in mean values across most months, with a mean monthly Hgb of 10.5 g/dL among ESA-treated hemodialysis patients (Figure i.6).

vol 2 Figure i.6 Mean monthly Hgb level and mean monthly EPO dose (expressed as units/week) in adult hemodialysis patients on dialysis ≥90 days, Medicare claims, 1995-2013

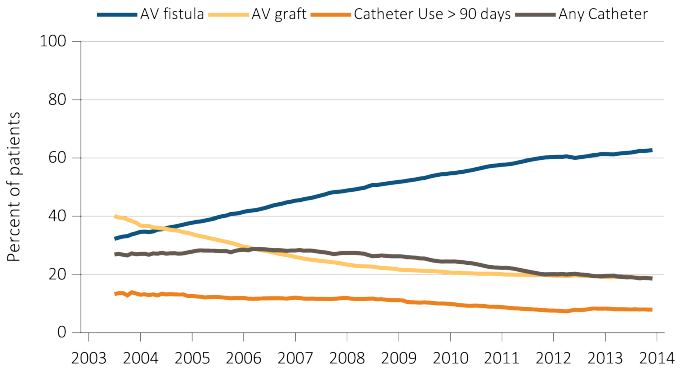


Data Source: Special analyses, USRDS ESRD Database. Mean monthly Hgb level among ESA-treated hemodialysis patients within a given month (1995 through 2013) or all hemodialysis patients (April 2012 to December 2013 only) who, within the given month, had a Hgb claim, were on dialysis ≥90 days, and were ≥18 years old at the start of the month. Mean monthly EPO (epoetin alfa) dose is shown for hemodialysis patients within a given month who had an EPO claim, were on dialysis ≥90 days, and were ≥18 years old at the start of the month. EPO dose is expressed as mean EPO units per week averaged over all EPO claims within a given month. Abbreviations: EPO, erythropoietin; ESA, erythropoiesis-stimulating agents; Hgb, hemoglobin. This graphic is also presented as Figure 3.2.

Chapter 4: Vascular Access

New for 2015, this Chapter outlines the patterns of vascular access for incident and prevalent hemodialysis patients in the United States. Figure i.7 displays trends in vascular access use among prevalent hemodialysis patients from 2003-2013. There has been a large rise in AV fistula use and AV fistula placement since 2003, with use increasing from 32% to nearly 63% and placement increasing from 38% to 66% of patients, respectively. In contrast, AV graft use has decreased from 40% to 19% over the same time period. Catheter use has also declined, albeit not as dramatically, decreasing from 27% to 19%. In 2013, only 8% of prevalent hemodialysis patients had been using a catheter for >90 days.

vol 2 Figure i.7 Trend in vascular access type use among ESRD prevalent patients, 2003-2014

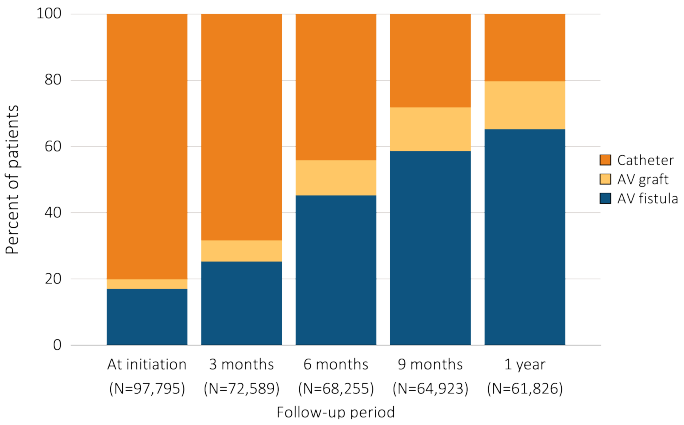


Data Source: Special analyses, USRDS ESRD Database, and Fistula First data. Fistula First data reported from July 2003 through April 2012, CROWNWeb data are reported from June 2012 through December 2013. Abbreviations: AV, arteriovenous; ESRD, end-stage renal disease. This graphic is also presented as Figure 4.6.

Figure i.8 shows cross-sectional data from both the CMS Medical Evidence form (CMS 2728) (for vascular access information at initiation) and CROWNWeb (for follow-up data with respect to vascular access in use at 3, 6, 9 months and 1 year). At 90 days, most hemodialysis patients were still using a catheter, highlighting the importance of ongoing efforts to improve pre-dialysis

access planning. The percentage of patients using an AV fistula exclusively at the end of 1 year on dialysis was 65%, up from 17% at initiation of hemodialysis. The proportion of patients with an AV graft for vascular access was 3% at initiation, and 15% at 1 year. Thus, at 1 year, 80% of patients were using either an AV fistula or AV graft without the presence of a catheter.

vol 2 Figure i.8 Vascular access use during the first year of hemodialysis by time since initiation of ESRD treatment, among patients new to hemodialysis in 2013, from the ESRD Medical Evidence form (CMS 2728) and CROWNWeb data, 2013-2014

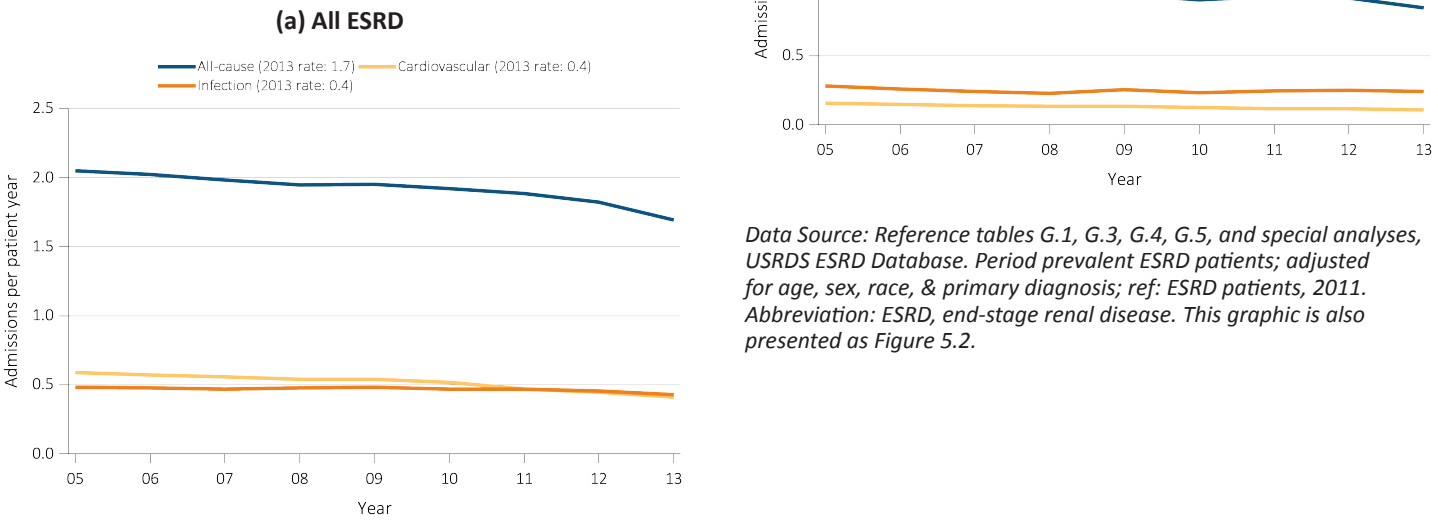


Data Source: Special analyses, USRDS ESRD Database. Medical Evidence form (CMS 2728) at initiation and CROWNWeb for subsequent time periods. Abbreviations: CMS, Centers for Medicare & Medicaid; ESRD, end-stage renal disease. This graphic is also presented as Figure 4.7.

Chapter 5: Hospitalization

Among hemodialysis patients, the overall hospitalization rate in 2013 was 1.7 admissions per patient year—down from 2.1 in 2005 (Figure i.9).

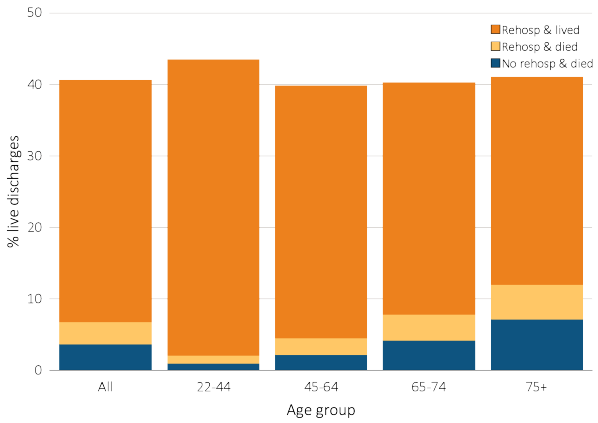
vol 2 Figure i.9 Adjusted all-cause & cause-specific hospitalization rates for ESRD patients, by treatment modality, 2005-2013



Data Source: Reference tables G.1, G.3, G.4, G.5, and special analyses, USRDS ESRD Database. Period prevalent ESRD patients; adjusted for age, sex, race, & primary diagnosis; ref: ESRD patients, 2011. Abbreviation: ESRD, end-stage renal disease. This graphic is also presented as Figure 5.2.

Rehospitalization has also been recognized as an important indicator of both morbidity and quality of life. It is also often costly, particularly among the ESRD patients being treated in dialysis facilities. Among hemodialysis patients prevalent in 2013, 37.0% of discharges from a hospitalization (for any cause) were followed by a rehospitalization within 30 days (Figure i.10).

vol 2 Figure i.10 Proportion of hemodialysis patients discharged alive from the hospital who either were rehospitalized or died within 30 days of discharge, by age, 2013



Data Source: Special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients, all ages, 2013; unadjusted. Patients less than age 22 years are not represented as a group due to insufficient sample size. Includes live hospital discharges from January 1 to December 1, 2013. Cause-specific hospitalizations are defined by principal ICD-9-CM codes. See Vol. 2, ESRD Analytical Methods for principal ICD-9-CM diagnosis codes included in each cause of hospitalization category. Abbreviations: ESRD, end-stage renal disease; rehosp, rehospitalization. This graphic is adapted from Figure 5.6.a.

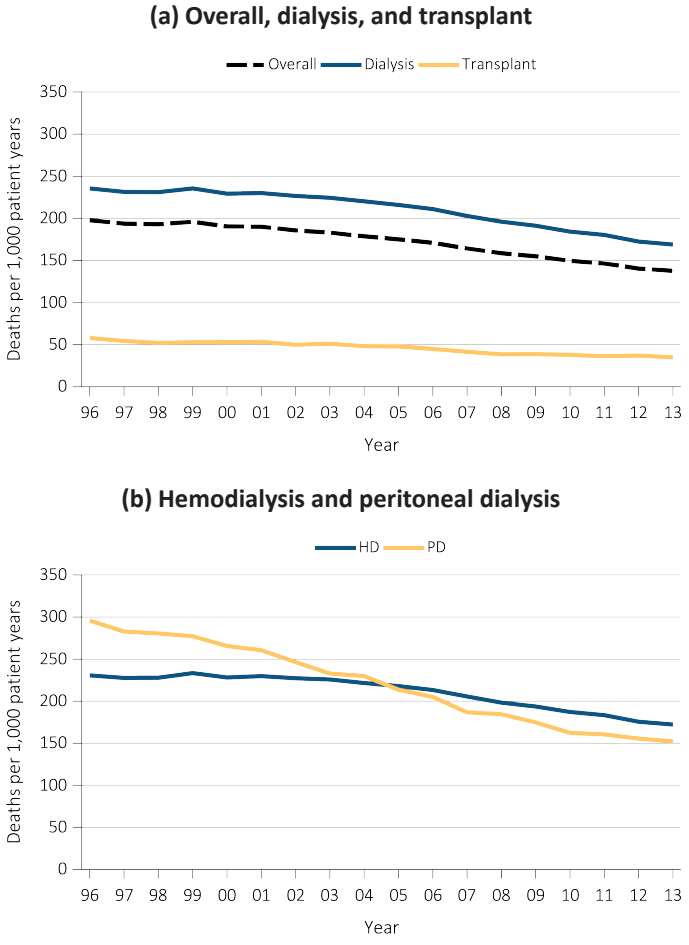
Chapter 6: Mortality

Overall mortality rates among ESRD (dialysis and transplant) patients continue to decline, with steeper declines in more recent years. Since 1996, the net reduction in mortality was 30% for all ESRD patients, including 28% for dialysis patients and 40% for transplant patients. The adjusted death rate fell by 7% from 1996 to 2003, and by 23% from 2004 to 2013 (Figure i.11.a). The trend was similar for dialysis (hemodialysis and peritoneal dialysis) patients, with the mortality rate falling by 5% from 1996 to 2003 and by 23% from 2004 to 2013. Among transplant patients, mortality fell by 12% from 1996 to 2003 and by 28% from 2004 to 2013.

Among hemodialysis patients the adjusted mortality rate fell by 2% from 1996 to 2003 and by 22% from 2004 to 2013. Among peritoneal dialysis patients, the mortality rate fell by 21% from 1996 to 2003 and by 34% from 2004 to 2013 (Figure i.11.b). The net reductions in mortality from 1996 to 2013 were 25% for hemodialysis patients and 49% for peritoneal patients.

Adjusted mortality rates in 2013 were 138, 169, and 35 per 1,000 patient-years for ESRD, dialysis, and transplant patients, respectively. By dialysis modality, mortality rates were 172 for hemodialysis patients and 152 for peritoneal dialysis patients, per 1,000 patient-years.

vol 2 Figure i.11 Adjusted all-cause mortality (deaths per 1,000 patient-years) by treatment modality (a) overall, dialysis, and transplant, and (b) hemodialysis and peritoneal dialysis, for period-prevalent patients, 1996-2013



Data Source: Reference Tables H.2_adj, H4_adj, H.8_adj, H.9_adj, and H.10_adj; and special analyses, USRDS ESRD Database. Adjusted for age, sex, race, ethnicity, primary diagnosis and vintage. Ref: period prevalent ESRD patients, 2011. Abbreviations: HD, hemodialysis; PD, peritoneal dialysis. This graphic is also presented as Figure 6.1.

Among hemodialysis patients, from 1996-2011 the average yearly death rate was highest during the first year, then dropped to its lowest point during the

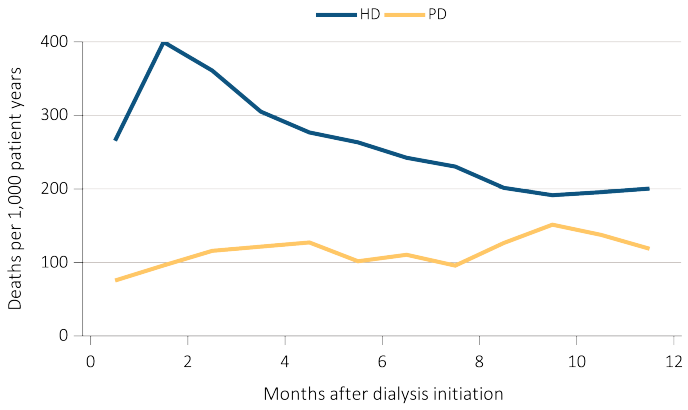
second year, and then tended to rise for more than 5 years afterward (Figure i.12). Among peritoneal dialysis patients, mortality rates tended to increase over the first five years after starting dialysis. For both hemodialysis and peritoneal dialysis patients, mortality rates tended to be higher after 5 years than between 2-5 years on dialysis. The patterns of death rates according to time since dialysis initiation have been fairly similar over calendar time (comparing cohorts based on calendar year of initiation of treatment), within modality.

Among patients starting hemodialysis in 2012, reported all-cause mortality peaked at 400 deaths per 1,000 patient-years in month 2, and decreased thereafter to 200 per 1,000 patient-years in month 12. Note that the steep rise in hemodialysis mortality rates between months 1 and 2 may reflect data reporting issues; e.g., some patients who die soon after starting dialysis related to ESRD might not be registered as being ESRD and included in the CMS database (Foley et al., 2014). The extent to which this occurs is currently unknown.

Among patients with peritoneal dialysis as initial renal replacement modality, mortality does not peak early but instead tends to increase gradually during the first year on dialysis. Mortality at month 12 among these patients was 119 per 1,000 patient-years. Peritoneal dialysis patients may not experience an early peak in mortality, in part, because patients beginning ESRD via peritoneal dialysis are a highly selected group, in many cases being younger, healthier, and having undergone substantial pre-ESRD planning.

Post-transplant mortality among the <2% of patients who initiate ESRD treatment with a kidney transplant peaks in month 1, followed by a generally decreasing trend for the remainder of the first year (not shown).

vol 2 Figure i.12 Adjusted mortality (deaths per 1000 patient-years) by treatment modality and number of months after treatment initiation among ESRD patients, 2012



Data Source: Special analyses, USRDS ESRD Database. Adjusted (age, race, sex, ethnicity, and primary diagnosis) mortality among 2012 incident ESRD patients during the first year of therapy. Ref: incident ESRD patients, 2011. Abbreviations: ESRD, end-stage renal disease; HD, hemodialysis; PD, peritoneal dialysis. This graphic is also presented as Figure 6.3.

Mortality rates among ESRD patients increase with rising age, as expected. Mortality rates differ by race, but this difference is not constant within age groups or by modality. For example, White patients on dialysis had comparable mortality rates to Black/African American patients among those aged 0-44 years old, but higher mortality than Blacks at older ages (Table i.1).

vol 2 Table i.1 Adjusted all-cause mortality (deaths per 1,000 patient-years) by patient age and race among ESRD patients, 2012

Age	Race	ESRD	Dialysis	Transplant
0-21	White	12	31	4
	Black/African American	20	35	4
	Other	14	29	7
22-44	White	37	62	9
	Black/African American	48	60	10
	Other	24	38	6
45-64	White	99	143	30
	Black/African American	98	114	29
	Other	71	99	21
65-74	White	197	245	70
	Black/African American	167	183	71
	Other	137	171	61
75+	White	359	382	136
	Black/African American	275	283	132
	Other	239	254	112

Data Source: Special analyses, USRDS ESRD Database. Adjusted (sex and primary diagnosis) all-cause mortality among 2012 period prevalent patients. Ref: period prevalent ESRD patients, 2011. Abbreviation: ESRD, end-stage renal disease. This table is also presented as Table 6.1.

The differences in expected remaining lifetime between the ESRD and general populations are striking (Table i.2). Dialysis patients younger than 80 years old are expected to live less than one-third as long as their counterparts without ESRD, and dialysis patients aged 80 years and older are expected to live less than one-half as long as their counterparts without ESRD. Transplant patients fare considerably better, with expected remaining lifetimes for people under the age of 75 estimated at 67% to 84% of expected lifetimes in the general population.

vol 2 Table i.2 Expected remaining lifetime (years) by age, sex, and treatment modality of prevalent dialysis patients, prevalent transplant patients, and the general U.S. population (2012), based on USRDS data and the National Vital Statistics Report (2013)

	ESRD patients, 2013				General U.S. population, 2012	
	Dialysis		Transplant			
Age	Male	Female	Male	Female	Male	Female
0-14	24.1	22.4	59.2	61.2	70.7	75.4
15-19	20.9	19.3	46.8	48.6	59.7	64.4
20-24	18.1	16.5	42.5	44.2	55.0	59.5
25-29	15.8	14.3	38.6	40.2	50.3	54.6
30-34	14.1	13.0	34.7	36.4	45.7	49.7
35-39	12.5	11.7	30.8	32.4	41.0	45.0
40-44	10.8	10.3	26.9	28.6	36.4	40.3
45-49	9.1	8.8	23.2	24.8	31.9	35.6
50-54	7.7	7.7	19.8	21.3	27.7	31.1
55-59	6.5	6.6	16.6	18.1	23.7	26.8
60-64	5.5	5.7	13.8	15.2	19.8	22.6
65-69	4.5	4.8	11.4	12.7	16.2	18.5
70-74	3.8	4.0	9.4	10.4	*12.8*	*14.7*
75-79	3.2	3.5	7.7a	8.6a	9.8	11.3
80-84	2.6	2.9			7.1	8.4
85+	2.1	2.4			4.9	5.8

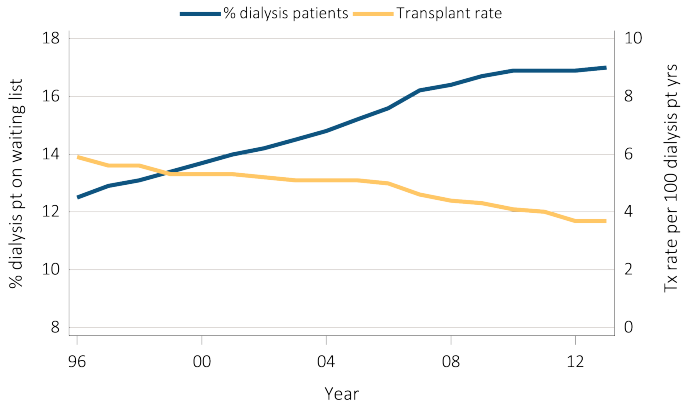
Data Source: Reference Table H.13; special analyses, USRDS ESRDS Database; and National Vital Statistics Report. "Table 7. Life expectancy at selected ages, by race, Hispanic origin, race for non-Hispanic population, and sex: United States, 2012 (2015)." Expected remaining lifetimes (years) of the general U.S. population and of period prevalent dialysis and transplant patients. [a]cell values combine ages 75+. Abbreviation: ESRD, end-stage renal disease. This table is also presented as Table 6.4.

Chapter 7: Transplantation

Kidney transplantation is the renal replacement therapy of choice for a majority of patients with ESRD. Successful kidney transplantation is associated with improved survival, improved quality of life and healthcare cost savings when compared to dialysis.

The unadjusted transplant rate per 100 dialysis patient years has been falling, while the percentage of prevalent dialysis patients wait-listed for a kidney has been rising (Figure i.13). Probable contributing causes include a growing prevalent dialysis population and a growing imbalance between donor supply and demand, which in turn leads to longer kidney transplant waiting times.

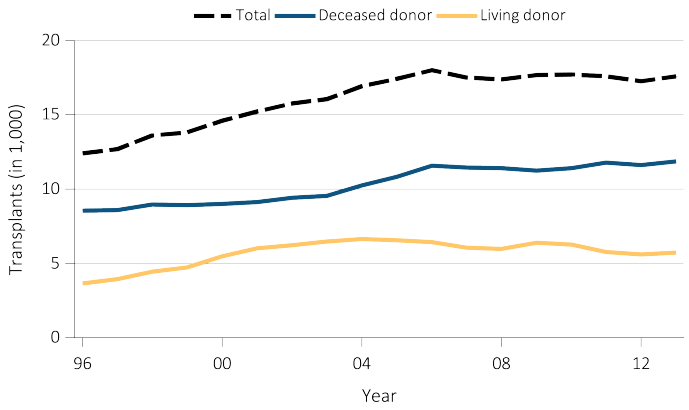
vol 2 Figure i.13 Percentage of dialysis patients wait-listed and unadjusted kidney transplant rates, 1996-2013



Data Source: Reference Tables E4 and E9. Percentage of dialysis patients on the kidney waiting list is for all dialysis patients. Unadjusted transplant rates are for all dialysis patients. This graphic is also presented as Figure 7.1.

The total number of kidney transplants has leveled off over the past decade (Figure i.14). During this period, a small overall increase in deceased donations has balanced a small decrease in living donations.

vol 2 Figure i.14 Number of kidney transplants, 1996-2013

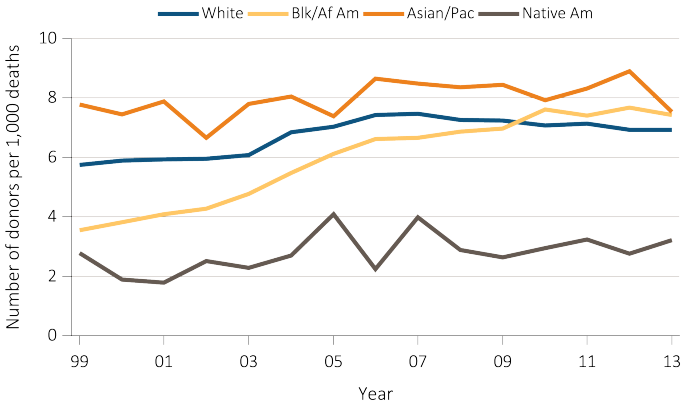


Data Source: Reference Tables E8, E8(2), and E8(3). Counts of transplants are for all dialysis patients. This graphic is also presented as Figure 7.3.

The number of deceased donors with at least one kidney retrieved has been increasing since 2003, reaching 8,021 in 2013 (Figure i.15).

In recent years (since 2010), Blacks have surpassed Whites in deceased donation rates. The rate of deceased donors per 1,000 deaths among Blacks more than doubled from 1999 to 2013. Notably, Asian or Pacific Islanders have had the highest donation rate, and Native Americans have had the lowest donation rates since 1999.

vol 2 Figure i.15 Unadjusted deceased donor kidney donation rates, by donor race, 1999-2013



Data Source: The U.S. death population data are obtained from Centers for Disease Control and Prevention; the deceased donor data are obtained from UNOS. Deceased donor kidney donation rates by donor race. Abbreviations: Asian/Pac, Asian/Pacific Islander; Blk/Af Am, Black/African American; Native Am, Native American. This graphic is also presented as Figure 7.17.b.

Among the recipients of deceased donor kidney transplants, the probability of all-cause graft failure in the first year following transplant decreased from 14% in 1996 to 8% in 2012, while the probability of death decreased from 6% in 1996 to 4% in 2012. Similarly, among those who received living donor kidney transplants, the probability of all-cause graft failure in the first year following transplant decreased from 7% in 1996 to 3% in 2012, while probability of death decreased from 2.3% to 1.5% over the same time period.

Improvements in patient survival probabilities have persisted for most of the five- and ten-year outcomes (Tables i.3 and i.4).

Chapter 8: Pediatric ESRD

A greatly expanded chapter on Pediatric ESRD is a notable feature of this year's ADR. Pediatric ESRD affects children of all ages. The majority of these children will depend on renal replacement therapies over many decades. Consequently, children with incident ESRD often traverse the entire ESRD modality continuum of hemodialysis, peritoneal dialysis, and transplantation. These children are subjected to frequent hospitalizations and have a risk of mortality far exceeding the general pediatric population in the United States. Children with ESRD are quite different in disease etiology, transplant opportunities, morbidity and mortality when compared to adults with ESRD. The chapter has been expanded to include information about vascular access in children as this can have far reaching implications into adulthood. Also, this year for the first time, the USRDS Annual Data Report pediatric chapter includes a section on young adults. This provides an opportunity to improve our understanding of the issues surrounding transitional ages and outcomes in these patients.

The leading causes of ESRD in children during 2009-2013 are as follows: cystic/ hereditary/congenital disorders (33.0%), glomerular disease (24.6%), and secondary causes of glomerulonephritis (GN) (12.9%). The most common individual diagnoses associated with ESRD include renal hypoplasia/dysplasia (N=703), congenital obstructive uropathies (N=659), focal glomerular sclerosis (N=911), and systemic lupus erythematosus (N=537). In children with ESRD, sickle cell nephropathy, human immunodeficiency virus (HIV) nephropathy, and systemic lupus erythematosus are more common among Blacks compared with other racial groups.

A total of 1,462 children in the United States began ESRD care in 2013, and 9,921 children were being treated for ESRD on December 31, 2013. The most common initial ESRD treatment modality among children overall is hemodialysis (56%). Peritoneal Dialysis is the most common initial treatment modality in children younger than 9 years and those who weigh less than 20 kg. 37% of children received a kidney transplant within the first year of ESRD care during 2009-2013. The number of children listed for incident and repeat kidney transplant was 1,277 in 2013. As of 2006, deceased donor transplants were more common than living donor transplants. All-cause hospitalization rates are 2 per patient year among children with ESRD. The five-year patient survival probability was 0.89 for children initiating ESRD care between 2004 and 2008. Since 2006, 81% of incident pediatric ESRD patients have started hemodialysis with a central venous catheter. In aggregate, children have initiated ESRD therapy with hemodialysis more frequently than peritoneal dialysis or transplantation. Data from 2013 demonstrate the same pattern with 816 (55.8%) initiating with hemodialysis, 367 (25.1%) peritoneal dialysis, and 267 (18.3%) transplant. When examined by age, peritoneal dialysis is the most common initial ESRD treatment modality for children age 9 years and younger (Figure i.16.a). Hemodialysis becomes the most common initial modality at patient age 10 and older. Kidney transplantation accounts for less than 40% of initial modality across all pediatric ages. Similarly, initial ESRD treatment modality is associated with

vol 2 Table i.3 Trend in 1-, 5-, & 10-year deceased donor kidney transplant outcomes, 1996-2012

	One year post-transplant			Five years post-transplant			Ten years post-transplant		
Year	Prob. of all-cause graft failure	Prob. of return to dialysis or repeat transplant	Prob. of death	Prob. of all-cause graft failure	Prob. of return to dialysis or repeat transplant	Prob. of death	Prob. of all-cause graft failure	Prob. of return to dialysis or repeat transplant	Prob. of death
1996	14.3%	10.2%	5.8%	36.2%	25.7%	19.4%	59.1%	42.9%	39.3%
1997	12.9%	8.5%	6.2%	34.7%	23.7%	19.2%	58.1%	40.8%	39.6%
1998	12.8%	9.2%	5.5%	33.8%	24.0%	18.1%	56.8%	40.4%	38.1%
1999	13.7%	9.2%	5.9%	34.0%	23.1%	18.9%	56.8%	39.4%	38.4%
2000	13.2%	8.6%	6.4%	34.6%	23.1%	19.7%	57.3%	39.1%	39.3%
2001	12.2%	8.0%	5.7%	33.3%	21.4%	19.9%	55.8%	37.0%	38.7%
2002	12.3%	8.3%	5.8%	33.0%	22.2%	18.9%	54.1%	36.2%	37.4%
2003	12.1%	7.6%	5.7%	32.1%	20.6%	18.6%	54.9%	36.1%	37.9%
2004	11.5%	7.3%	5.5%	31.7%	20.8%	18.4%			
2005	11.4%	7.1%	6.0%	30.2%	19.3%	18.0%			
2006	10.8%	7.0%	5.2%	29.6%	18.9%	17.3%			
2007	9.7%	6.2%	4.7%	28.5%	17.9%	16.9%			
2008	9.5%	6.2%	4.4%	26.9%	16.2%	16.3%			
2009	9.5%	5.7%	5.0%						
2010	9.0%	5.6%	4.5%						
2011	7.6%	4.6%	3.9%						
2012	7.6%	4.6%	3.8%						

Data Source: Reference Tables F2, F14, I26; F5, F17, I29; F6, F18, I30. Outcomes among recipients of a first-time deceased donor kidney transplant; unadjusted. Abbreviations: Prob., probability. This table is also presented as Table 7.2.

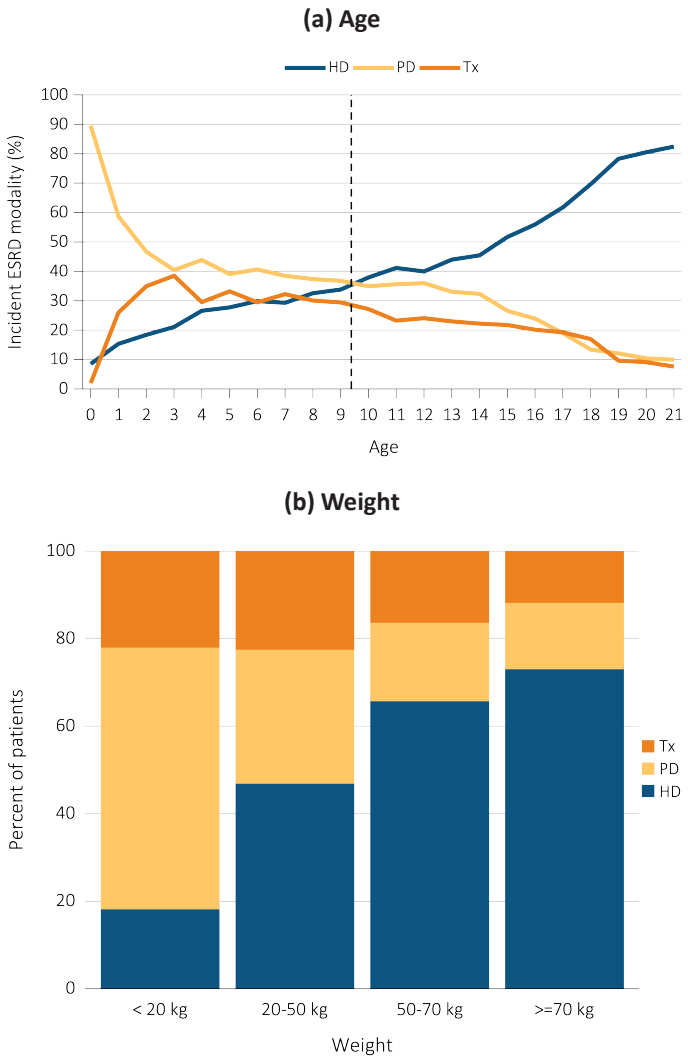
vol 2 Table i.4 Trend in 1-, 5-, & 10-year living donor kidney transplant outcomes, 1996-2012

	One year post-transplant			Five years post-transplant			Ten years post-transplant		
Year	Prob. of all-cause graft failure	Prob. of return to dialysis or repeat transplant	Prob. of death	Prob. of all-cause graft failure	Prob. of return to dialysis or repeat transplant	Prob. of death	Prob. of all-cause graft failure	Prob. of return to dialysis or repeat transplant	Prob. of death
1996	6.9%	5.2%	2.3%	22.9%	16.8%	9.6%	43.3%	32.4%	22.7%
1997	6.7%	4.8%	2.7%	22.2%	15.8%	10.5%	43.2%	31.1%	24.4%
1998	6.0%	4.4%	2.3%	20.9%	14.6%	10.0%	42.4%	30.6%	23.4%
1999	6.1%	4.3%	2.2%	20.8%	14.7%	9.6%	41.2%	29.0%	22.7%
2000	6.6%	4.6%	2.6%	21.9%	14.9%	10.6%	42.2%	29.1%	24.0%
2001	6.2%	4.1%	2.5%	21.3%	14.3%	10.2%	41.2%	27.8%	24.0%
2002	5.8%	3.9%	2.5%	20.5%	13.6%	10.3%	40.0%	26.2%	24.6%
2003	5.4%	3.9%	1.9%	20.1%	13.8%	9.5%	39.6%	26.1%	23.3%
2004	5.2%	3.5%	2.1%	18.8%	12.7%	8.8%			
2005	5.3%	3.7%	2.0%	18.7%	12.6%	8.8%			
2006	4.4%	3.0%	1.7%	16.8%	11.1%	8.1%			
2007	3.8%	2.4%	1.4%	16.6%	10.5%	8.0%			
2008	4.1%	2.7%	1.6%	15.3%	9.9%	7.5%			
2009	3.9%	2.6%	1.4%						
2010	3.5%	2.2%	1.4%						
2011	3.4%	2.2%	1.9%						
2012	3.2%	1.9%	1.5%						

Data Source: Reference Tables F8, F20, I32; F11, F23, I35; F12, F24, I36. Outcomes among recipients of a first-time living donor kidney transplant; unadjusted. Abbreviations: Prob., probability. This table is also presented as Table 7.3.

patient weight. Peritoneal Dialysis is most commonly the initial modality in small children. Hemodialysis is the least common initiating modality in small children and increases in frequency with increasing patient weight (Figure i.16.b). Over time, transplant has become the most common prevalent ESRD treatment modality in children. Of the 9,921 children and adolescents between the ages of 0 and 21 years with prevalent ESRD as of December 31, 2013, kidney transplant was the most common modality (6,739[67.9%]), followed by hemodialysis (1,954 [19.7%]) and peritoneal dialysis (1,197 [12.1%]) (Figure i.16.b).

vol 2 Figure i.16 Trends in ESRD modality at initiation, by (a) patient age, and (b) weight, 1996-2013



Data Source: Special analyses, USRDS ESRD Database. Includes incident ESRD patients in the years 1996-2013. Abbreviations: ESRD, end-stage renal disease; HD, hemodialysis; PD, peritoneal dialysis; Tx, transplant. This graphic is also presented as Figure 8.2.

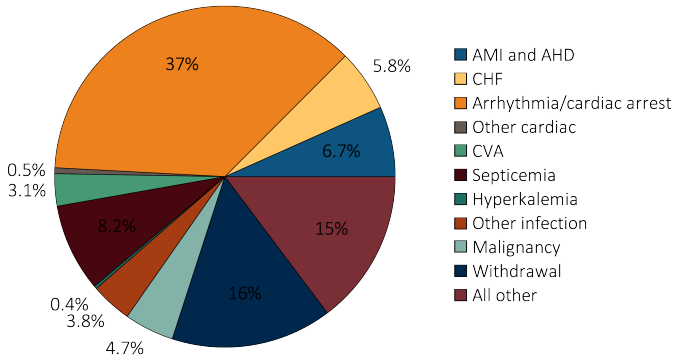
As a result of improvements in the care of pediatric patients with ESRD and kidney transplants, a larger percentage of these children are surviving into adulthood. The transition of these patients into adulthood represents a truly unique process and has resulted in the development of specific transition programs to improve health care for these individuals. For the first time in the USRDS Annual Data Report, we include a section in the pediatric chapter highlighting the young adult age group (defined in the USRDS as 22-29 years of age) that classically encompasses the transitional age groups. Despite their young age, cardiovascular disease remains the leading cause of mortality in this cohort, similar to older patients with ESRD. This section highlights the young adult population focusing on modality and the cardiovascular disease trends in this population.

Chapter 9: Cardiovascular Disease in ESRD Patients

This chapter has been reintroduced for the 2015 ADR, as the USRDS special study dealing with cardiovascular disease in CKD/ESRD ended at the beginning of 2014. Cardiovascular disease is a significant comorbidity for patients along the entire spectrum of chronic kidney disease and ESRD. ESRD patients are among the highest risk populations for a number of cardiovascular diseases. Presence of ESRD often complicates disease management and treatment, as it can influence both medical and procedural options, thereby adversely affecting a patient's prognosis. In this chapter, we focus on reporting the prevalence and outcomes of ESRD patients with diagnosed major cardiovascular conditions, stratifying by type of renal replacement therapy being received (hemodialysis, peritoneal dialysis, and kidney transplantation). For individual cardiovascular conditions, we compare the survival of patients with and without the condition. Given its role as the primary health care payer for ESRD patients, our analyses are based mostly on data from the national Medicare population.

As shown in Figure i.17, cardiovascular diseases are a major cause of death in ESRD patients, contributing to more than half of all deaths, among which the category of arrhythmias and cardiac arrest alone is responsible for 37% of the deaths.

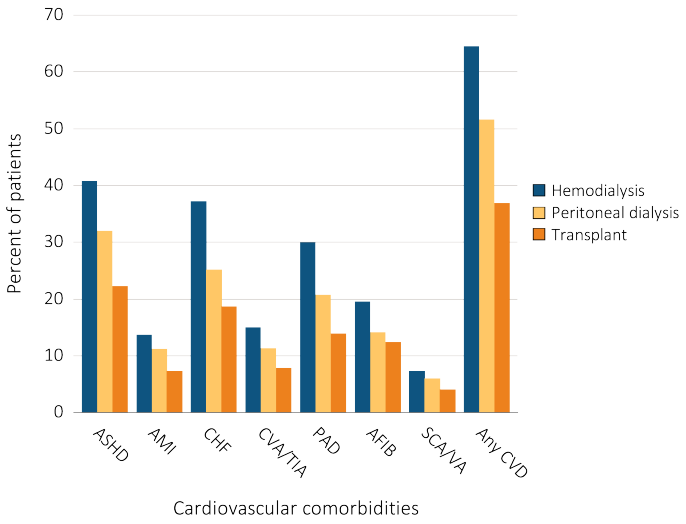
vol 2 **Figure i.17 Causes of death in ESRD patients, 2013**



Data Source: Reference Table H12. Abbreviations: AHD, atherosclerotic heart disease; AMI, acute myocardial infarction; CHF, congestive heart failure; CVA, cerebrovascular accident. This graphic is also presented as Figure 9.1.

ESRD patients have a high burden of cardiovascular disease across a wide range of conditions (Figure i.18).

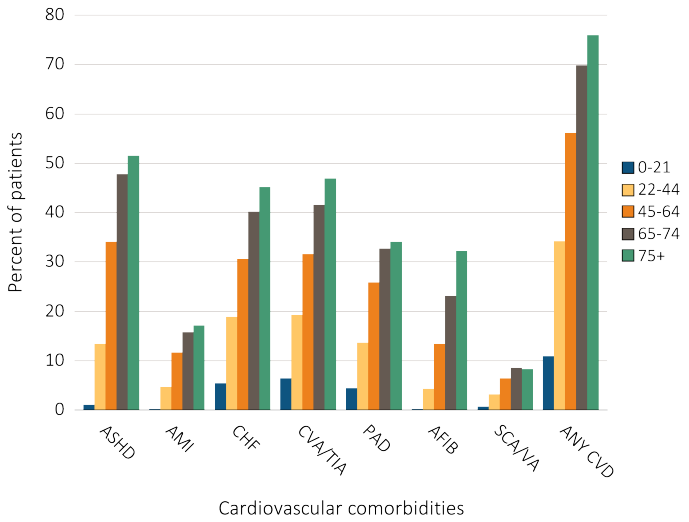
vol 2 **Figure i.18 Prevalence of cardiovascular diseases in ESRD patients, by treatment modality, 2013**



Data Source: Special analyses, USRDS ESRD database. Point prevalent hemodialysis, peritoneal dialysis, and transplant patients at all ages, with Medicare as primary payer on January 1, 2011, who are continuously enrolled in Medicare Parts A and B from July, 1, 2010 to December 31, 2010, ESRD service date is at least 90 days prior to January 1, 2011, and survived past 2012. Abbreviations: AFIB, atrial fibrillation; AMI, acute myocardial infarction; ASHD, atherosclerotic heart disease; CHF, congestive heart failure; CKD, chronic kidney disease; CVA/TIA, cerebrovascular accident/transient ischemic attack; CVD, cardiovascular disease; PAD, peripheral arterial disease; SCA/VA, sudden cardiac arrest and ventricular arrhythmias. This graphic is also presented as Figure 9.2.

Not surprisingly, older ESRD patients tend to have a higher prevalence of cardiovascular conditions (Figure i.19). It is notable, however, that the prevalence of these conditions is high even among those 20-44 years of age, although a much higher prevalence is observed among those 45 years or older. ASHD is the most common condition, with its prevalence exceeding 50% in ESRD patients aged 75 years or older, followed by CHF, PAD, AFIB and CVA/TIA.

vol 2 **Figure i.19 Prevalence of cardiovascular diseases in ESRD patients, by age, 2013**

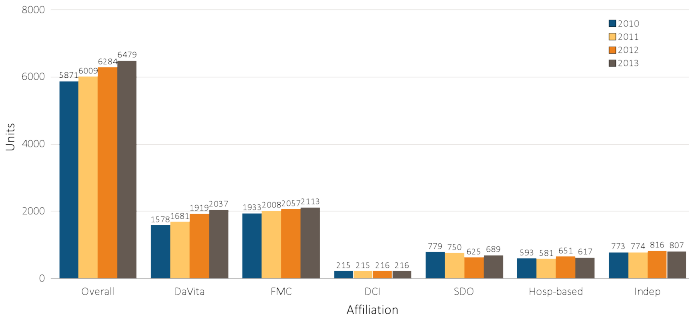


Data Source: Special analyses, USRDS ESRD database. Point prevalent hemodialysis, peritoneal dialysis, and transplant patients at all ages, with Medicare as primary payer on January 1, 2011, who are continuously enrolled in Medicare Parts A and B from July, 1, 2010 to December 31, 2010, ESRD service date is at least 90 days prior to January 1, 2011, and survived past 2012.Abbreviations: AFIB, atrial fibrillation; AMI, acute myocardial infarction; ASHD, atherosclerotic heart disease; CHF, congestive heart failure; CKD, chronic kidney disease; CVA/TIA, cerebrovascular accident/transient ischemic attack; CVD, cardiovascular disease; PAD, peripheral arterial disease; SCA/VA, sudden cardiac arrest and ventricular arrhythmias. This graphic is also presented as Figure 9.3.

Chapter 10: Dialysis Providers

The three large dialysis organizations (LDOs; DaVita, Fresenius [FMC] and Dialysis Clinic, Inc. [DCI]) treated 71% of all dialysis patients in the country at the end of 2013 (Figure i.20). Although DCI is considered a large dialysis organization for the purposes of this chapter, it is important to note that both DaVita and Fresenius are ten times as large. Nationwide, 608 dialysis units were added during the four-year period from 2010 to 2013, with most belonging to the LDOs; DaVita experienced the largest growth of all provider types in both facilities and patients. Small dialysis organizations experienced declines in the numbers of patients and units over the same period. Nearly 90% of all dialysis patients in 2013 received hemodialysis; hospital-based providers had the highest proportion of peritoneal dialysis patients at 21%, more than double the national average.

vol 2 Figure i.20 Dialysis unit counts, by unit affiliation, 2010-2013



Data source: Special analyses, USRDS ESRD Database. Abbreviations: DCI, Dialysis Clinic, Inc.; FMC, Fresenius; Hosp-based, hospital-based dialysis centers; Indep, independent dialysis providers; SDO, small dialysis organizations. This graphic is also presented as Figure 10.1.

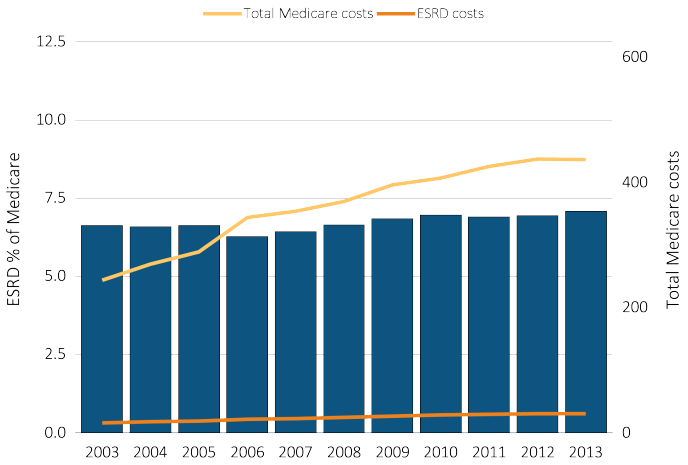
For the 2015 report, we introduce new tables illustrating one-year Standardized Mortality Ratios (Table i.5) and Standardized Hospitalization Ratios in 2013, to allow a simpler and more direct comparison of each facility-type's measure with the 2013 national norms.

Notably, hospital-based units continue to perform better than the national average on both measures. Dialysis providers of all types experienced an overall 5% decline in Standardized Mortality Ratios between 2010 and 2013. All provider types also experienced an overall decline in Standardized Hospitalization Ratios between 2010 and 2013, by 6%.

Chapter 11: Medicare Expenditures for Persons With ESRD

As illustrated in Figure i.21, total Medicare fee for service spending in the general Medicare population declined by 0.2 % in 2013 to $437.0 billion; spending for ESRD patients increased 1.6 %, to $30.9 billion, and accounted for 7.1% of the overall Medicare paid claims costs in the fee-for-service system.

vol 2 Figure i.21 Trends in costs of the Medicare & ESRD programs, 2003-1013



Data Source: Special analyses, USRDS ESRD Database; Reference Table K.1. Total Medicare expenditures obtained from Trustees Report, table II.B1 https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/ReportsTrustFunds/TrusteesReports.html. Abbreviations: ESRD, end-stage renal disease. This graphic is also presented as Figure 11.2.

vol 2 Table i.5 All-cause standardized mortality ratio, by unit affiliation, 2013

Affiliation	All	White	Black/African American	Asian	Native American	Hispanic
Overall	1.00 (0.99-1.01)	1.13 (1.13-1.14)	0.83 (0.83-0.84)	0.66 (0.64-0.68)	0.83 (0.78-0.88)	0.76 (0.75-0.77)
LDO						
DaVita	1.02 (1.01-1.03)	1.15 (1.14-1.17)	0.85 (0.83-0.87)	0.66 (0.63-0.70)	0.74 (0.66-0.82)	0.76 (0.74-0.79)
Fresenius	1.00 (0.99-1.02)	1.14 (1.12-1.15)	0.83 (0.81-0.85)	0.72 (0.68-0.77)	0.90 (0.80-1.02)	0.76 (0.73-0.78)
DCI	0.94 (0.90-0.97)	1.09 (1.04-1.14)	0.76 (0.72-0.81)	0.71 (0.54-0.91)	0.78 (0.60-1.01)	0.84 (0.71-0.98)
SDO	1.02 (1.01-1.04)	1.15 (1.13-1.18)	0.84 (0.81-0.87)	0.73 (0.68-0.79)	1.08 (0.86-1.35)	0.81 (0.77-0.85)
Hospital-based	0.98 (0.95-1.01)	1.14 (1.10-1.18)	0.79 (0.74-0.84)	0.64 (0.54-0.76)	0.80 (0.64-0.99)	0.71 (0.63-0.79)
Independent	1.02 (1.01-1.04)	1.17 (1.14-1.19)	0.83 (0.80-0.86)	0.72 (0.67-0.77)	0.81 (0.71-0.92)	0.82 (0.79-0.86)

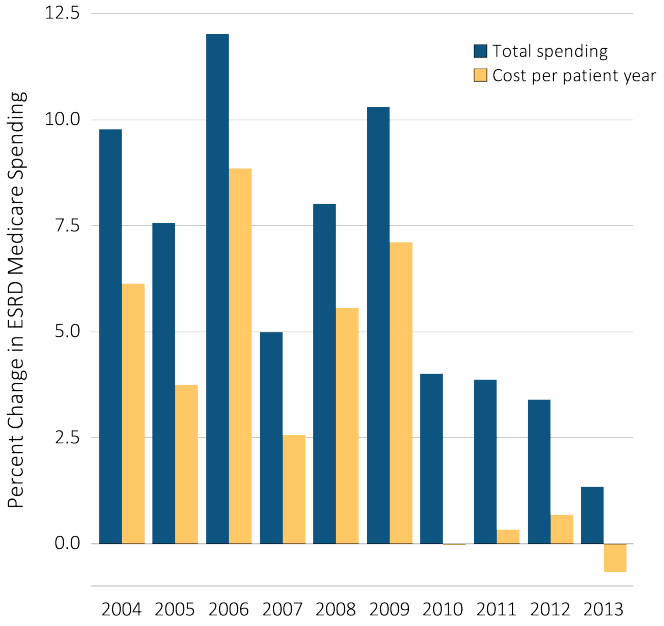
Data source: Special analyses, USRDS ESRD Database. Period prevalent dialysis patients; 95% confidence intervals are shown in parentheses. The overall measure is adjusted for patient age, race, ethnicity, sex, diabetes, duration of ESRD, nursing home status, patient comorbidities at incidence, body mass index (BMI) at incidence, and population death rates. The race-specific measures are adjusted for all the above characteristics except patient race. The Hispanic-specific measure is adjusted for all the above characteristics except patient ethnicity. Abbreviations: DCI, Dialysis Clinic, Inc.; LDO, large dialysis organizations; SDO, small dialysis organizations. This table is also presented as Table 10.2.

Figure i.22 displays the annual percentage change in Medicare ESRD spending for all ESRD patients for whom Medicare is the primary payer. Part D costs are included in these measures. However, as Part D is a voluntary component of the Medicare program; some recipients do not participate or have another source of pharmaceutical coverage (e.g., from an employer) and would not have medication claims represented in the Part D files.

For the fourth consecutive year, the annual increase in total Medicare ESRD spending for patients with primary payer status was less than 4%. In 2013, total Medicare paid claims for ESRD services and supplies increased by 1.3% to $29.7 billion (Figure i.23; for total and specific values see Reference Table K.4).

In 2013, ESRD spending per patient per year (PPPY) declined by 0.7%. Given that ESRD PPYY spending decreased or increased only slightly from 2009 to 2013, the growth in total ESRD costs during these years is almost entirely attributable to growth in the number of covered patients.

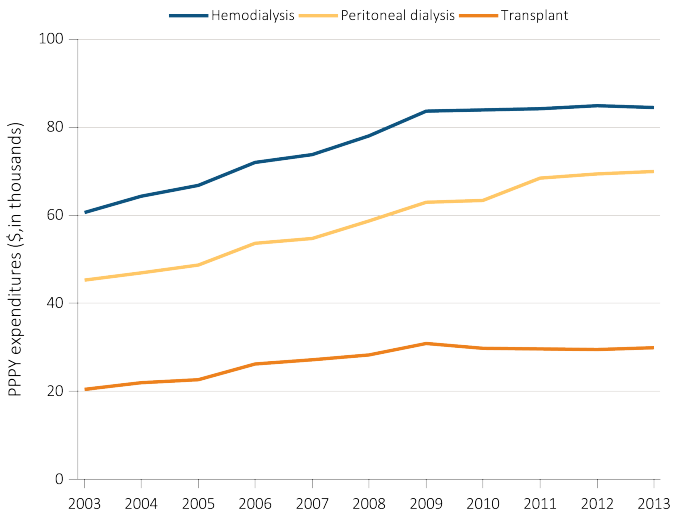
vol 2 Figure i.22 Annual percent change in Medicare ESRD spending



Data Source: Special analyses, USRDS ESRD Database; Reference Table K.4. Total Medicare ESRD costs from claims data; excludes claims with Medicare as secondary payer. Abbreviations: ESRD, end-stage renal disease. This graphic is also presented as Figure 11.4.

For hemodialysis, both total and PPPY spending were nearly flat between 2012 and 2013 (Figure i.23). Peritoneal dialysis total spending continued to grow, by 9.2% between 2012 and 2013 as the share of patients receiving peritoneal dialysis has continued to rise; peritoneal dialysis growth on a PPPY basis was moderate between 2012 and 2013 (0.8%), however, and peritoneal dialysis remains less costly on a per patient basis than hemodialysis. Finally, total and PPPY transplant spending has also remained consistent.

vol 2 Figure i.23 Total Medicare ESRD expenditures per person per year, by modality

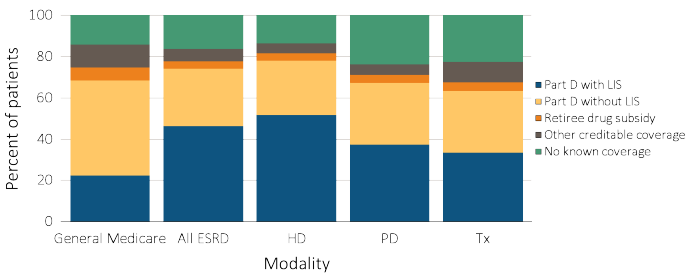


Data Source: Special analyses, USRDS ESRD Database; Reference Tables K.7, K.8, & K.9. Period prevalent ESRD patients; patients with Medicare as secondary payer are excluded. Abbreviations: ESRD, end-stage renal disease. This graphic is also presented as Figure 11.7.

Chapter 12: Part D Prescription Drug Coverage in Patients With ESRD

Overall, 74% of Medicare ESRD beneficiaries were enrolled in a Part D plan in 2013 (Figure i.24). By modality, enrollment is 78%, 67%, and 63% for hemodialysis, peritoneal dialysis and transplant patients, respectively, compared to 69% of general Medicare patients. Hemodialysis, peritoneal dialysis, and transplant patients with Part D receive the low-income subsidy (LIS) at a higher proportion, compared to general Medicare Part D enrollees, (66%, 56%, and 53% compared to 33%).

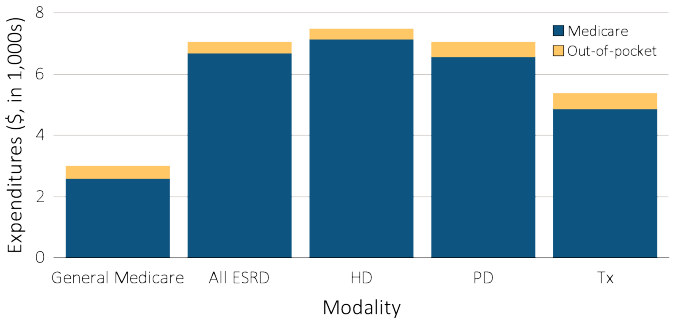
vol 2 Figure i.24 Sources of prescription drug coverage in Medicare ESRD enrollees, by population, 2013



Data source: Special analyses, USRDS ESRD Database. Point prevalent Medicare enrollees alive on January 1, 2013. Abbreviations: ESRD, end-stage renal disease; HD, hemodialysis; LIS, low-income subsidy; Part D, Medicare Part D Prescription drug coverage; PD, peritoneal dialysis; Tx, kidney transplant. This graphic is also presented as Figure 12.1.

In 2013, per patient per year Medicare Part D spending for ESRD patients was 2.6 times higher than for general Medicare patients, at $6,673 as compared to $2,592. By ESRD modality, hemodialysis patients had the highest per person per year (PPPY) Medicare costs in 2013, at $7,142, compared to $6,566 and $4,875 for peritoneal dialysis and transplant patients (Figure i.25).

vol 2 Figure i.25 Per person per year Medicare & out-of-pocket Part D spending for enrollees, 2013



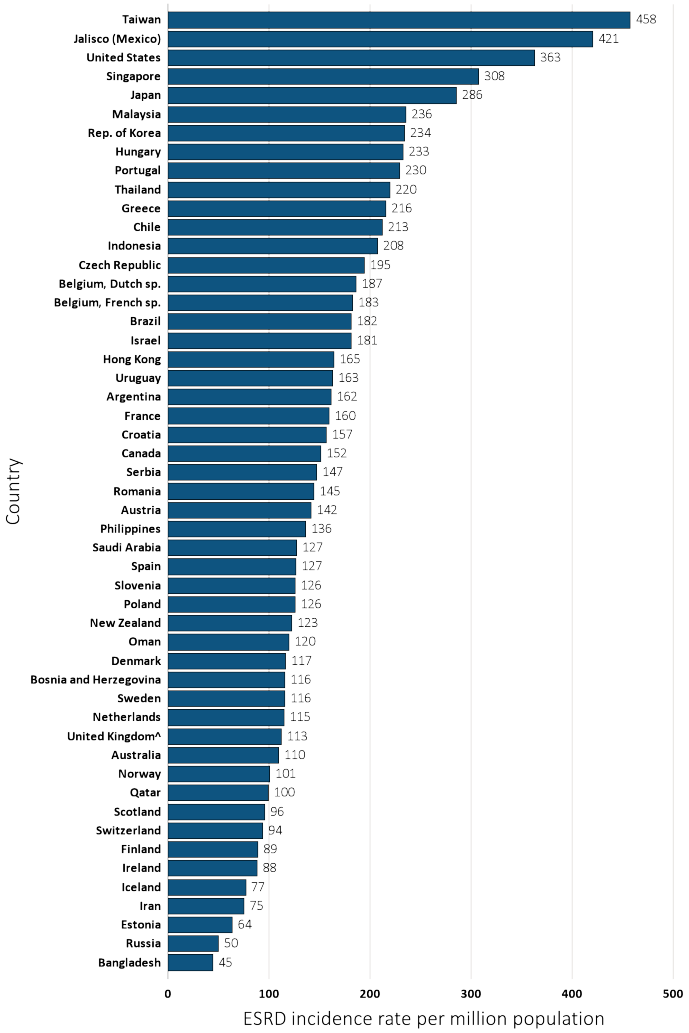
Data source: Special analyses, USRDS ESRD Database. Period prevalent Medicare enrollees alive on January 1, 2013, excluding those in Medicare Advantage Part D plans and Medicare secondary payer, using as-treated model (see method chapter for analytical methods). This graphic is also presented as Figure 12.5.a.

Chapter 13: International Comparisons

This chapter, expanded for 2015, examines treated ESRD from an international perspective. The number of countries and regions represented in this Annual Data Report has increased from 54 in 2014 to 57, with the addition of Estonia, Ireland, and Switzerland to this year's chapter. This work is made possible through the substantial efforts of many individuals from all participating countries, through collecting and contributing data for this international collaboration. The comparisons we present are intended to increase awareness of the international trends, similarities, and differences in key ESRD treatment measures. Data collection methods vary to some extent across countries, and therefore direct comparisons should be made with caution. Significant geographic variation in the incidence and prevalence of ESRD is seen by country (Figures i.26 and i.27).

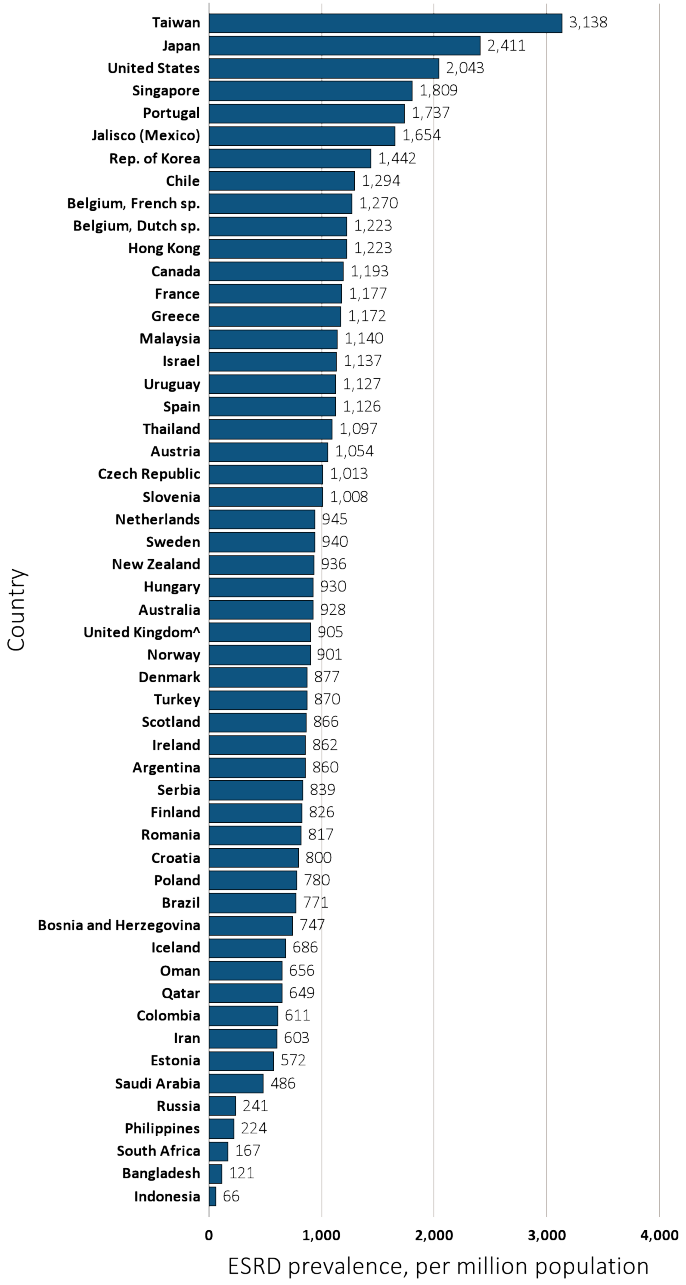
The chapter also covers variation in transplantation rates and living versus deceased kidney donations across countries. Finally, given the increasing diversity of countries represented in this International Comparisons chapter, this year we also introduce a comparison of a country's prevalence of treated ESRD with selected health and development indicators.

vol 2 Figure i.26 Incidence of treated ESRD, per million population, by country, 2013



Data source: Special analyses, USRDS ESRD Database. Data presented only for countries from which relevant information was available. All rates are unadjusted. ^United Kingdom: England, Wales, Northern Ireland (Scotland data reported separately). Data for Belgium do not include patients younger than 20. Data for Indonesia represent the West Java region. Data for France include 22 regions. Data for Spain include 18 of 19 regions. Abbreviations: ESRD, end-stage renal disease; sp., speaking. This graphic is also presented as Figure 13.2.

vol 2 **Figure i.27 Prevalence of treated ESRD per million population, by country, 2013**



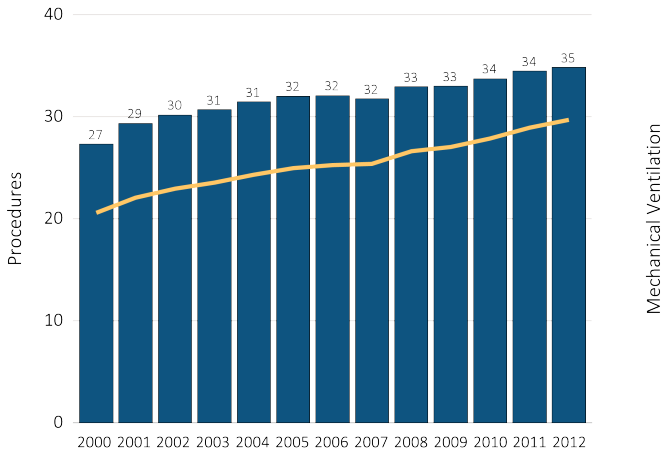
Data source: Special analyses, USRDS ESRD Database. Data presented only for countries from which relevant information was available. The prevalence is unadjusted and reflects prevalence at the end of 2013. ^United Kingdom: England, Wales, Northern Ireland (Scotland data reported separately). Japan and Taiwan include dialysis patients only. Data for Belgium do not include patients younger than 20. Data for Indonesia represent the West Java region. Data for Spain include 18 of 19 regions. Data for France include 22 regions. Abbreviations: ESRD, end-stage renal disease; sp., speaking. This graphic is also presented as Figure 13.8.

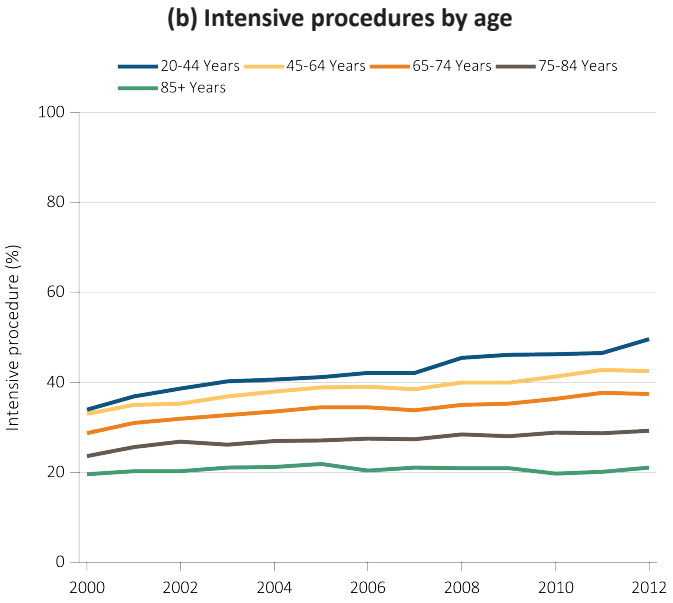
Chapter 14: USRDS Special Study Center on Palliative and End-of-Life Care

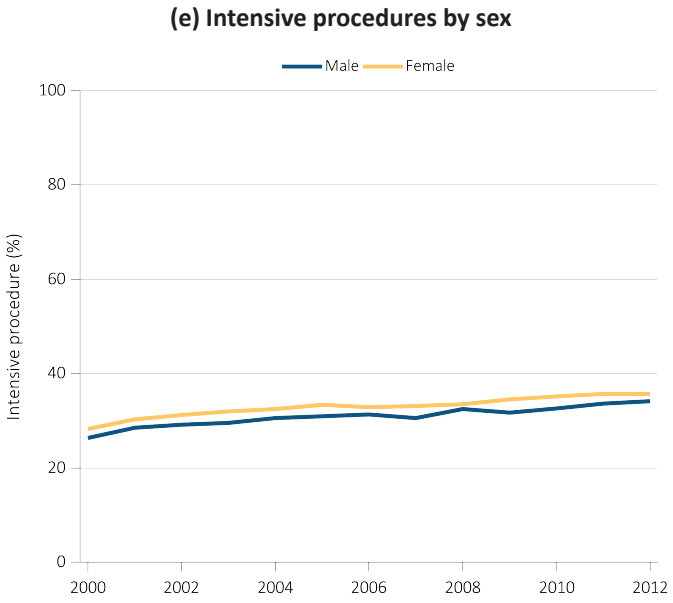
The limited survival of many patients with ESRD and their very high levels of disability, frailty, and functional impairment provide a strong rationale for efforts to integrate a more palliative and patient-centered approach to their care. The overarching goal of the USRDS Special Study Center (SSC) on Palliative and End-of-Life Care is to provide the nephrology community with innovative, rigorous, and nationally representative information about a domain of ESRD care for which little information is currently available to guide policy and practice. The percentage of Medicare beneficiaries with ESRD receiving an intensive procedure to prolong life during the last 90 days of life increased from 27% to 35% (Figure i.28). The percentage of Medicare beneficiaries with ESRD receiving hospice care at the time of death increased from 11% to 25% (Figure i.29). Most patients receive hospice services only after discontinuing dialysis treatments. From 2004-2012, hospice use prior to death increased from 59% to 80% among patients who discontinued dialysis treatments, but from only 5% to 7% among those who did not.

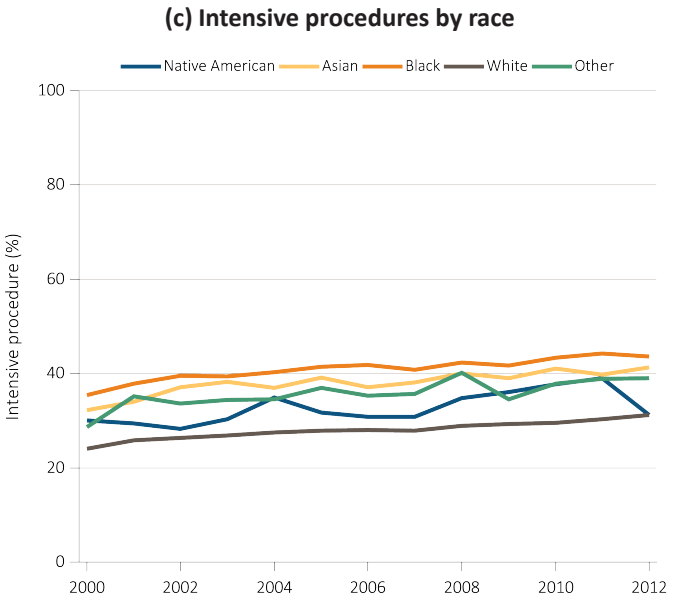
vol 2 **Figure i.28 Intensive procedures during the last 90 days of life among Medicare beneficiaries with ESRD overall, and by age, race, ethnicity, sex, and modality, 2000-2012**

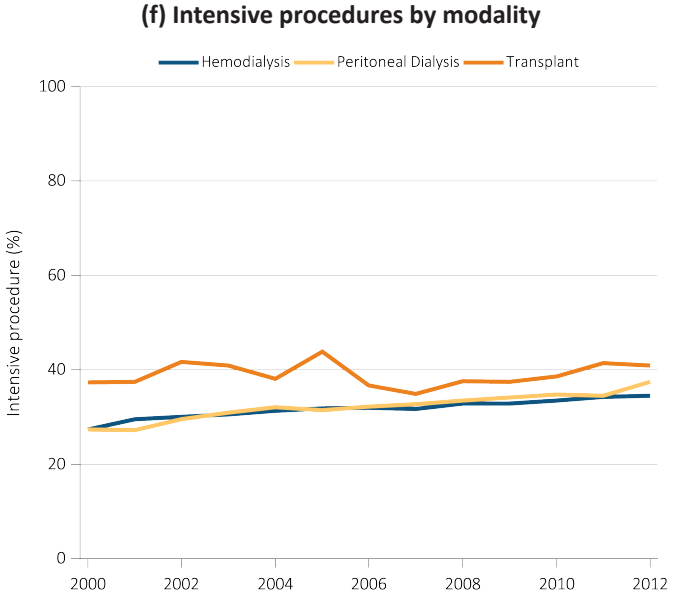
(a) Intensive procedures and mechanical ventilation by year, overall

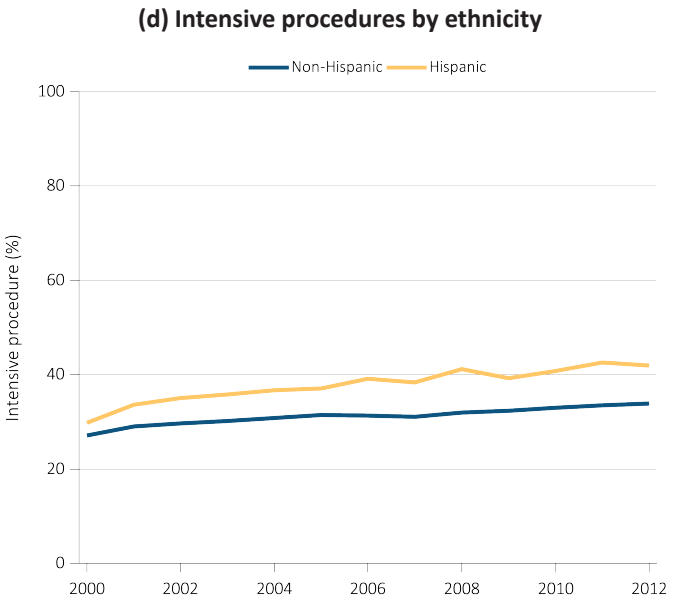






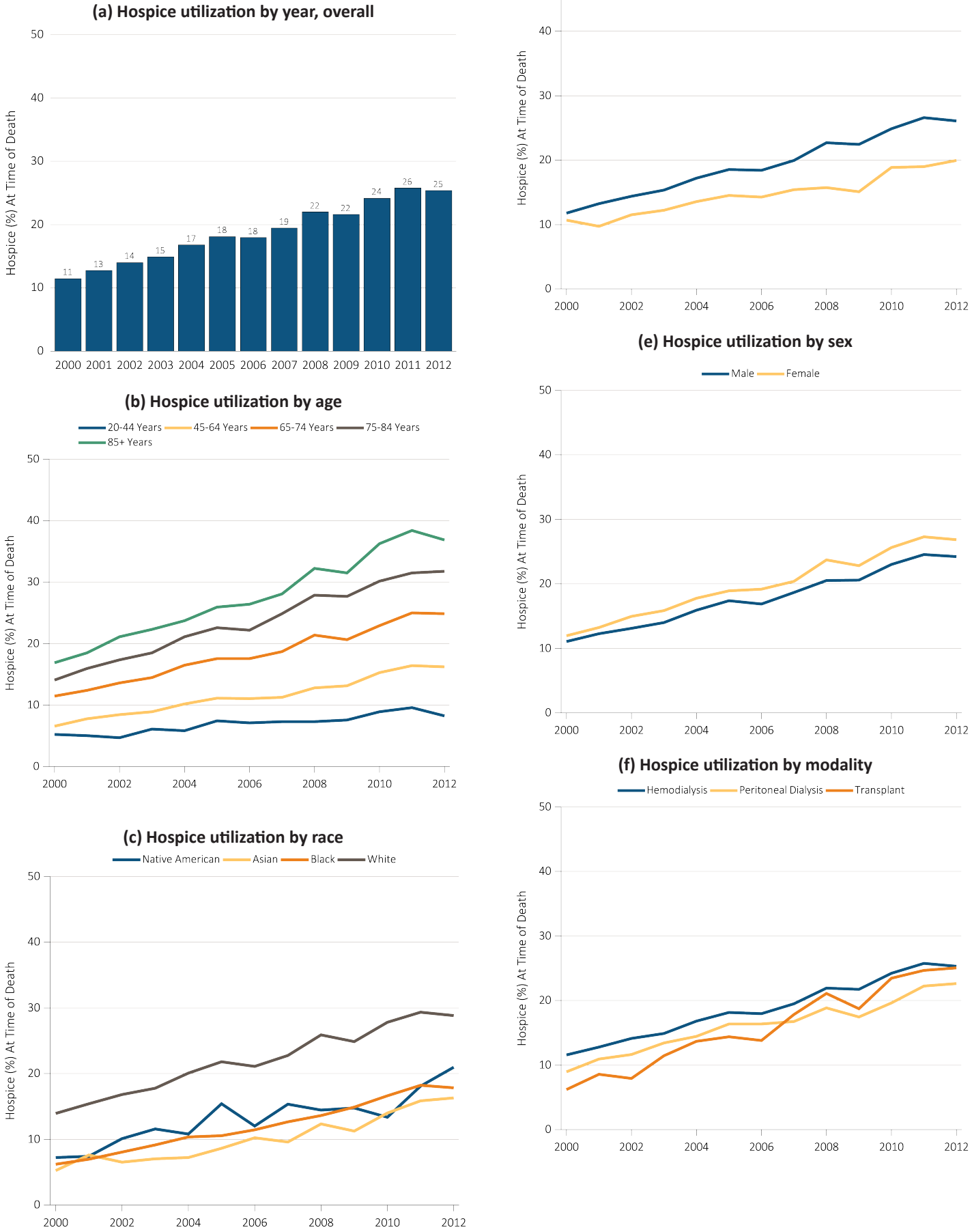




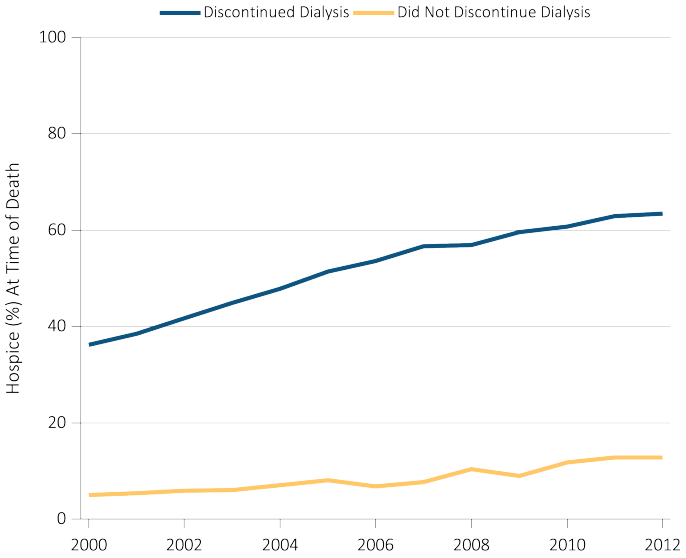


Data Source: Special analyses, USRDS ESRD Database (Medicare Institutional claims). Denominator population is all decedents with Medicare Parts A and B throughout the last 90 days of life. Intensive procedures were identified by ICD-9 procedure code search of Medicare Institutional claims from short and long stay hospitals. The yellow line in panel (a) denotes the percentage of patients who were intubated or received mechanical ventilation. This graphic is also presented as Figure 14.4.

vol 2 Figure i.29 Hospice utilization at the time of death among Medicare beneficiaries with ESRD overall, and by age, race, ethnicity, sex, modality, and whether dialysis was discontinued, 2000-2012



(g) Hospice utilization by whether patients discontinued dialysis before death



Data Source: Special analyses, USRDS ESRD Database. Denominator population is all decedents with Medicare Parts A and B throughout the last 90 days of life. Receipt of hospice care at the time of death was defined as having a claim in the Hospice SAF on or after the date of death or Discharge Status from hospice=40, 41, or 42. This graphic is also presented as Figure 14.7.

Notes