Chapter 5: Hospitalization

- On average, ESRD patients are admitted to the hospital nearly twice a year, and about 30% have an unplanned rehospitalization within the 30 days following discharge.
- Inpatient treatment represents a significant societal and financial burden, accounting for approximately 40% of total Medicare expenditures for dialysis patients.
- Over the past decade, the frequency of hospital admissions and resulting number of hospital days for ESRD patients have declined gradually, but fairly consistently. In 2013, the adjusted rate of admission for hemodialysis patients decreased to 1.7 per patient year, as compared to 2.1 in 2005, a reduction of 19.0%. During that same period, admission rates for peritoneal dialysis patients fell about 15.0% (to 1.7 in 2013, from 2.0 in 2005) and for transplant patients reduced by 18.2% (to 0.9 in 2013, from 1.1 in 2005).
- Hospitalizations due to cardiovascular events and those for vascular access infection fell by 29.0 and 61.0%, respectively.
- Patient groups with a higher risk of hospitalization (both overall and for most cause-specific diagnoses) included those aged 22–44 years or 75 years and older, females, Whites, Blacks/African Americans, and patients who had diabetes as their primary cause of kidney failure.
- Compared to older Medicare beneficiaries without a diagnosis of kidney disease (15.8%), patients with CKD and ESRD experienced rehospitalization rates of 22.3% and 34.8%, respectively.
- Among hemodialysis patients prevalent in 2013, 37.0% of discharges from a hospitalization for any cause were followed by a rehospitalization within 30 days.

Introduction

Admissions and readmissions to the hospital represent major burdens for patients with end-stage renal disease (ESRD). On average, ESRD patients are admitted to the hospital nearly twice a year, and about 30% have an unplanned rehospitalization within the 30 days following discharge (CMS, 2014). Given the disruption of everyday life stemming from dialysis treatment, hospital admissions and readmissions additionally compromise patients' well-being and quality of life, and are associated with adverse clinical outcomes for these patients. Furthermore, inpatient treatment represents a significant societal and financial burden, accounting for approximately 40% of total Medicare expenditures for dialysis patients (CMS, 2014).

Clinical studies in a broad range of settings have demonstrated that both improved health care and care coordination may reduce rates of unplanned or non-elective hospitalization and rehospitalization; some studies have suggested that a sizable portion of such readmissions may be preventable. Hence, monitoring trends in hospitalization and rehospitalization is a key to ensuring that quality of care is maintained, potential problems are identified, and cost-effective health care is provided. Informed care providers can respond with targeted strategies to prevent or minimize inappropriate admissions and reduce the incidence of rehospitalization.

Analytical Methods

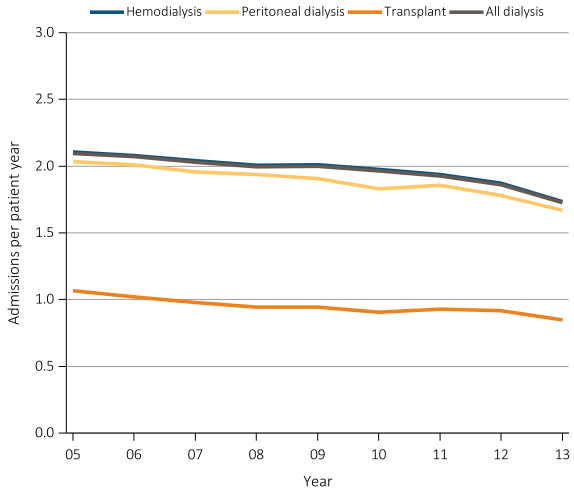
See the ESRD Analytical Methods chapter for an explanation of analytical methods used to generate the figures and tables in this chapter.

Trends in Hospitalization Rates

Over the past decade, the frequency of hospital admissions and resulting number of hospital days for ESRD patients have declined gradually, but fairly consistently. As shown in Figure 5.1, in 2013, the adjusted rate of admission for hemodialysis (HD) patients decreased to 1.7 per patient year (PPY), as compared to 2.1 in 2005, which is a reduction of 19.0%.

During that same period, rates for peritoneal dialysis (PD) patients fell about 15.0% (1.7 in 2013 from 2.0 in 2005) and for transplant patients reduced by 18.2% (0.9 in 2013 from 1.1 in 2005).

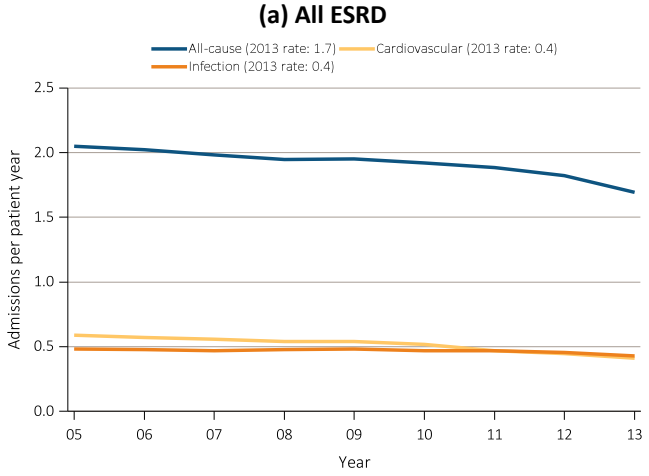
vol 2 Figure 5.1 Adjusted hospitalization rates for ESRD patients, by treatment modality, 2005-2013



Data Source: Reference Tables G.1, G.3, G.4, G.5, G.6, G.8, G.9, G.10, and special analyses, USRDS ESRD Database. Period prevalent ESRD patients; adjusted for age, sex, race, & primary cause of kidney failure; reference group, ESRD patients, 2011. Abbreviation: ESRD, end-stage renal disease.

In recent years, the Annual Data Report has highlighted cause-specific hospitalization as an important morbidity surveillance issue. Between 2005 and 2013, rates of hospitalizations due to any cause among ESRD patients declined from 2.05 to 1.69. The decline in hospitalizations due to infection (11.4% overall) was more pronounced among patients on PD (15.4%), and those with a transplant (14.2%) compared to HD patients (11.7%; see Figure 5.2). These improvements likely reflect, at least in part, targeted interventions to prevent and reduce infection rates, especially among PD and transplant patients. Hospital admissions resulting from other causes have also decreased over the same time period (e.g., a 57.2% decrease in hospitalizations for vascular access procedures).

vol 2 Figure 5.2 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 cause of kidney failure; ref: ESRD patients, 2011. Abbreviation: ESRD, end-stage renal disease.

All-cause hospitalization rates among adult HD patients decreased by 14.8% from 2004-2005 to 2012-2013 (see Table 5.1). Hospitalizations due to cardiovascular events and those for vascular access infection fell 29.0 and 61.0%, respectively. Patient groups with higher risk of hospitalization (both overall and for most cause-specific diagnoses) included those aged 22–44 years or 75 years and older, females,

Whites, Blacks/African Americans, and patients who had diabetes as their primary cause of kidney failure.

While the overall trends of decreasing hospitalization rates are encouraging, it is plausible that these global and cause-specific declines were influenced at least in part by changes in clinical care practices, CMS rules and terminology, and policies that emphasize greater utilization of ambulatory care services.

vol 2 **Table 5.1 Rates of all-cause & cause-specific hospitalization per patient year for adult hemodialysis patients, 2004-2013**

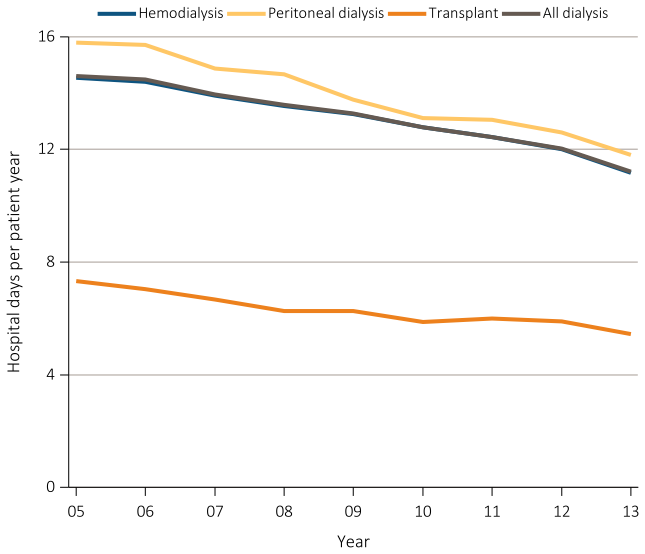
	All		Cardiovascular		Infection (any)		Vascular access infection	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
2004-2005	2.12	2.13	0.63	0.63	0.48	0.48	0.14	0.14
2006-2007	2.08	2.08	0.60	0.60	0.49	0.49	0.13	0.13
2008-2009	2.02	2.02	0.58	0.58	0.49	0.49	0.12	0.12
2010-2011	1.97	1.97	0.52	0.52	0.48	0.48	0.10	0.10
2012-2013	1.81	1.81	0.45	0.45	0.45	0.45	0.05	0.05
2012-2013								
Age								
22-44	1.79	1.96	0.36	0.37	0.42	0.46	0.07	0.08
45-64	1.76	1.76	0.42	0.42	0.43	0.43	0.05	0.06
65-74	1.86	1.82	0.49	0.48	0.46	0.45	0.05	0.05
75+	1.88	1.87	0.51	0.50	0.50	0.49	0.04	0.05
Sex								
Male	1.68	1.68	0.42	0.43	0.42	0.42	0.05	0.05
Female	1.99	1.98	0.48	0.48	0.49	0.49	0.06	0.06
Race								
White	1.86	1.85	0.46	0.45	0.49	0.48	0.05	0.05
Black/African American	1.80	1.83	0.45	0.46	0.41	0.43	0.06	0.06
Other race	1.43	1.40	0.35	0.34	0.39	0.38	0.04	0.04
Ethnicity								
Hispanic	1.70	1.70	0.41	0.41	0.44	0.44	0.05	0.05
Cause of Renal Failure								
Diabetes	2.00	2.03	0.49	0.49	0.50	0.50	0.05	0.06
Hypertension	1.68	1.68	0.46	0.46	0.40	0.40	0.05	0.05
Glomerulonephritis	1.55	1.56	0.36	0.38	0.39	0.39	0.05	0.05
Other	1.69	1.72	0.37	0.38	0.46	0.46	0.05	0.05

Data Source: Reference Tables G.3, G.13, and special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients aged 22 & older; adjusted for age, sex, race, ethnicity, & primary cause of kidney failure. Rates by one factor adjusted for the remaining three; reference group, hemodialysis patients, 2011. See Vol. 2, ESRD Analytical Methods for principal ICD-9-CM diagnosis codes included in each cause of hospitalization category.

Hospital Days

Continuing a downward trend seen since 2005, the number of total hospital days per patient year among all dialysis patients has decreased, from 14.6 to 11.2 (Figure 5.3). From 2005 to 2013, hospital days PPY decreased to 11.1 for HD patients, 11.7 for PD patients, and to 5.4 days for those receiving a kidney transplant.

vol 2 Figure 5.3 Adjusted hospital days for ESRD patients, by treatment modality, 2005-2013

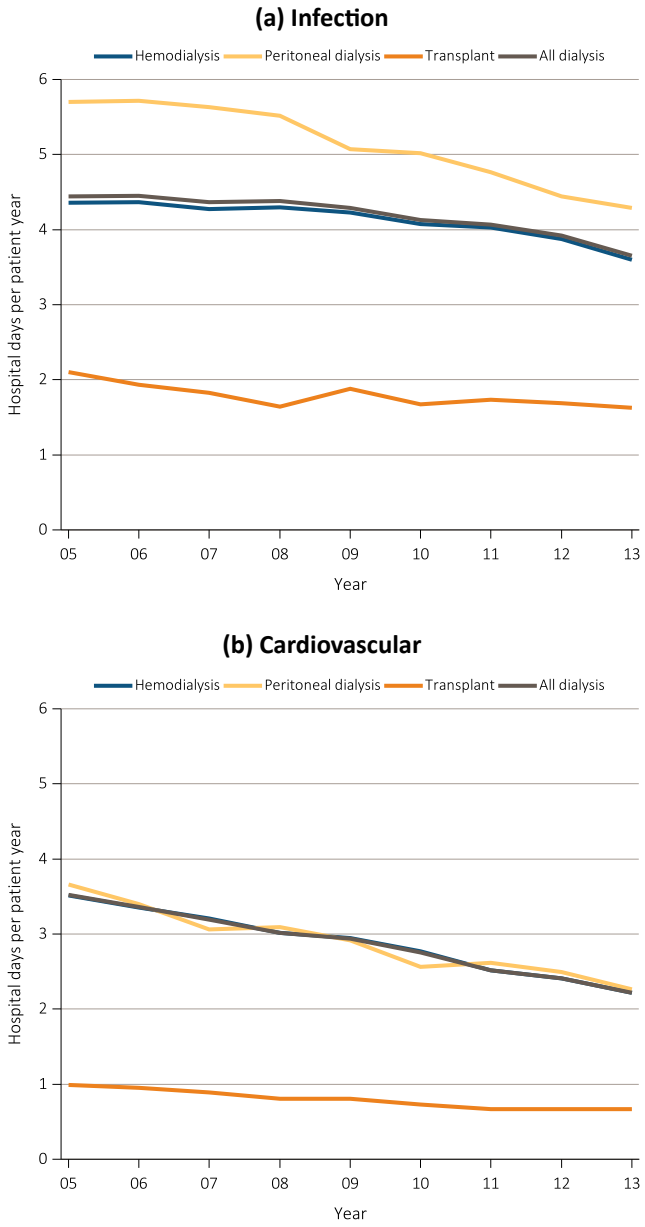


Data Source: Reference Tables G.1, G.3, G.4, G.5, G.6, G.8, G.9, G.10, and special analyses, USRDS ESRD Database. Period prevalent ESRD patients; adjusted for age, sex, race, & primary cause of kidney failure. Reference group: ESRD patients, 2011. Abbreviation: ESRD, end-stage renal disease.

With patient-specific adjustment, the number of infection-related hospital days per patient year decreased by 17.4% for HD patients, 24.8% for patients on PD, and 22.6% for patients with a kidney transplant. When restricted to cardiovascular hospitalizations, hospital days reduced by 37.0% for all dialysis patients, and 32.4% in those with a transplant.

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 2013, infection-related hospital days were 3.6 and 4.3 PPY, respectively, compared to 1.6 PPY for those with a transplant. Among patients with a cardiovascular admission, hospital days were 2.2 and 2.3 PPY for HD and PD patients, as compared to 0.7 PPY for those with a transplant.

vol 2 Figure 5.4 Adjusted hospital days for infection & cardiovascular causes, for ESRD patients by their treatment modality, 2005-2013



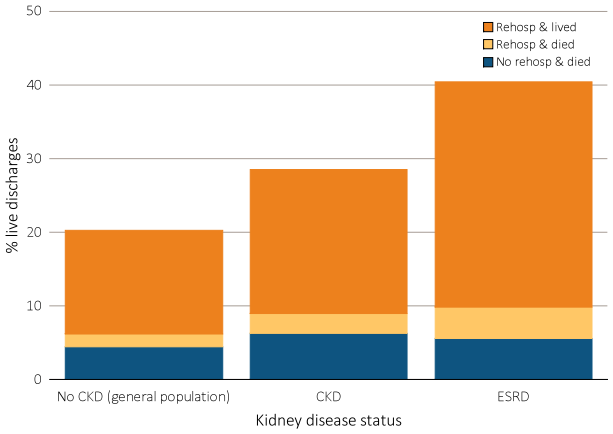
Data Source: Special analyses, USRDS ESRD Database. Period prevalent ESRD patients, adjusted for age, sex, race, & primary cause of kidney failure; reference group: ESRD patients, 2011. Abbreviation: ESRD, end-stage renal disease.

Rehospitalization

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

In this chapter rehospitalization/readmission is defined as a hospital admission occurring within 30 days of a hospital discharge. Hospital readmissions with associated death were more common among patients with chronic kidney disease (CKD) or ESRD than in the general population. Compared to older Medicare beneficiaries without a diagnosis of kidney disease (15.8%), patients with CKD and ESRD experienced rehospitalization rates of 22.3% and 34.8%, respectively (Figure 5.5). This held true for the combined outcomes of post-discharge death and/or rehospitalization—at 28.5 (CKD) and 40.5% (ESRD), versus only 20.3% for patients without diagnosed kidney disease.

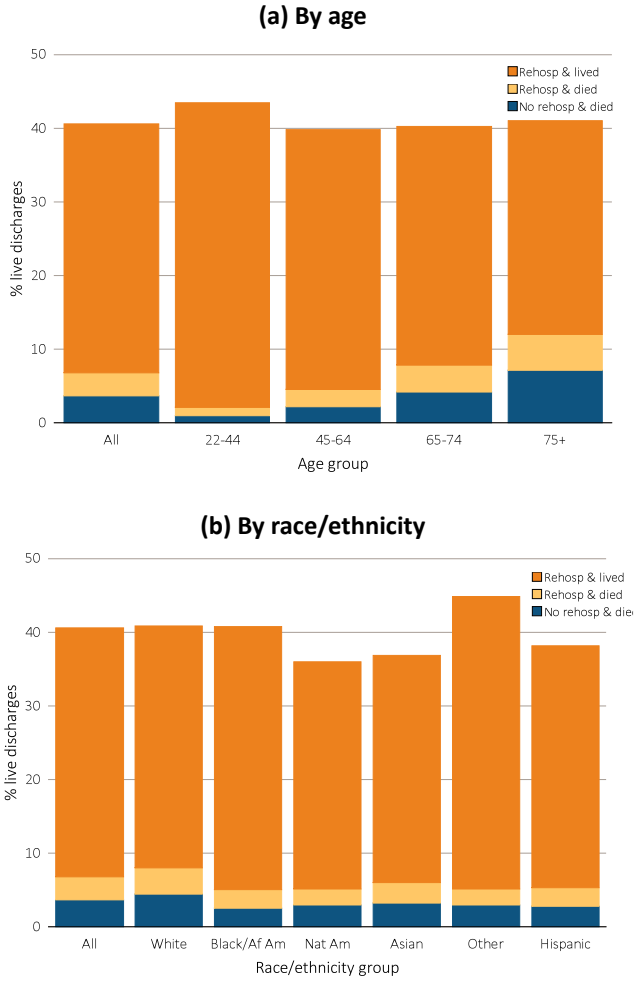
vol 2 Figure 5.5 Proportion of patients aged 66 & older discharged alive from the hospital who either were rehospitalized or died within 30 days of discharge, by kidney disease status, 2013



Data Source: Special analyses, USRDS ESRD Database and Medicare 5 percent sample. January 1, 2013 point prevalent Medicare patients aged 66 & older on December 31, 2012. For general Medicare: January 1, 2013 point prevalent, Medicare patients aged 66 & older, discharged alive from an all-cause index hospitalization between January 1, 2013, and December 1, 2013, unadjusted. CKD determined using claims for 2012. Abbreviations: CKD, chronic kidney disease; ESRD, end-stage renal disease; rehosp, rehospitalization.

Among HD patients prevalent in 2013, 37.0% of discharges from a hospitalization for any cause were followed by a rehospitalization within 30 days (see Figure 5.6a). For older patients, rehospitalization rates decreased as mortality increased, illustrating these competing risks, as death precluded the outcome of readmission. Rates of post-discharge death without rehospitalization, for example, were highest in patients aged 75 years and older, at 7.1%, while these patients had the lowest rehospitalization rates, at 33.9%.

vol 2 Figure 5.6 Proportion of hemodialysis patients discharged alive from the hospital who either were rehospitalized or died within 30 days of discharge, by demographic characteristics, 2013



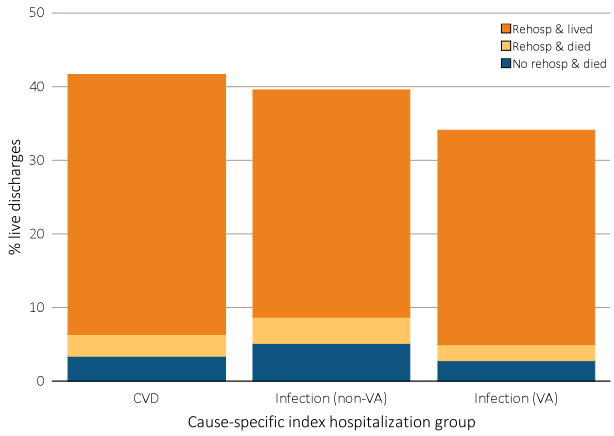
Data Source: Special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients, all ages, 2013; unadjusted. Includes live hospital discharges from January 1 to December 1, 2013. Cause-specific hospitalizations are defined by principal ICD-9-CM codes. See Vol. 2, ESRD Analytical Methods for principal ICD-9-CM diagnosis codes included in each cause of hospitalization category. Abbreviations: Af Am, African American; ESRD, end-stage renal disease; Nat Am, Native American; Other, other or unidentified race; rehosp, rehospitalization.

The highest rates of rehospitalization with survival occurred for adults aged 22 to 44 years—41.4% of their discharges were followed by a readmission within 30 days. For the two combined rehospitalization outcomes, the highest rates were again seen among patients aged 20–44 years, at 42.6%. The rate of survival following rehospitalization exceeded the two combined death outcomes for all age groups (33.9% vs. 6.7%), even in patients aged 75 and older, at 29.0% and 12.0%, respectively. These data showed that the observed, elevated rehospitalization rates among younger versus older groups was not fully due to the competing risk of mortality in the aged.

In examining the proportion of HD patients discharged alive who were either rehospitalized or died within 30 days of discharge, by their race & ethnicity, the highest rates were observed among the Other race group (39.6% vs. 41.9%), followed by Blacks (35.8% vs. 38.2%). The lowest such rates occurred among Native Americans, with 30.9% who were rehospitalized and lived, and 33.0% who were rehospitalized with the combined outcomes of either survival or death, respectively. The highest rate of post-discharge death occurred among White HD patients at 3.6%, possibly reflecting the older average age among White HD patients.

For all HD patients, the all-cause rehospitalization rate in 2013 was 37.0% (Figure 5.6a). For index hospitalizations due to cardiovascular, infection, and vascular access infections, patients' rehospitalization rates were 38.3, 34.5, and 31.3%, respectively (see Figure 5.7).

vol 2 Figure 5.7 Proportion of hemodialysis patients discharged alive that either were rehospitalized or died within 30 days of discharge, by cause of index hospitalization, 2013



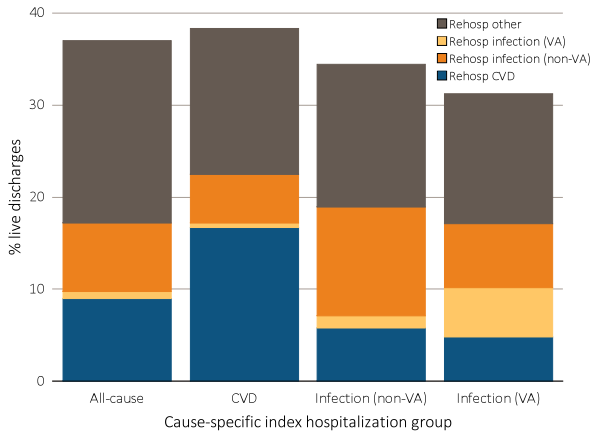
Data Source: Special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients, all ages, 2013, unadjusted. Includes live hospital discharges from January 1 to December 1, 2013. Cause-specific hospitalizations are defined by principal ICD-9-CM codes. See Vol. 2, ESRD Analytical Methods for principal ICD-9-CM diagnosis codes included in each cause of hospitalization category. Abbreviations: CVD, cardiovascular disease; ESRD, end-stage renal disease; rehosp, rehospitalization; VA, vascular access.

Figure 5.8 illustrates that rehospitalization in the 30 days following a hospital discharge doesn't always result from a similar diagnostic cause as the index hospitalization.

During 2013, of those admitted for treatment of cardiovascular issues and then soon rehospitalized, nearly half (43.6%) were admitted to treat the same or another cardiovascular condition. However, this pattern differed for those initially hospitalized to address vascular access infection (17.2%), and other types of infection (34.4%).The proportion of cause-specific readmission among those with an all-cause index hospitalization were also fairly low—with 24.2% returning for cardiovascular treatment, 2.1% with a vascular access infection, and 20.1% to address other types of infection.

The pattern of rehospitalization following an unrelated index hospitalization suggests the development of new conditions or complications of the original condition. These differences can in part be attributed to the nature of chronic conditions that typically do not resolve (i.e. CVD) versus acute conditions that are expected to resolve (i.e. infection).

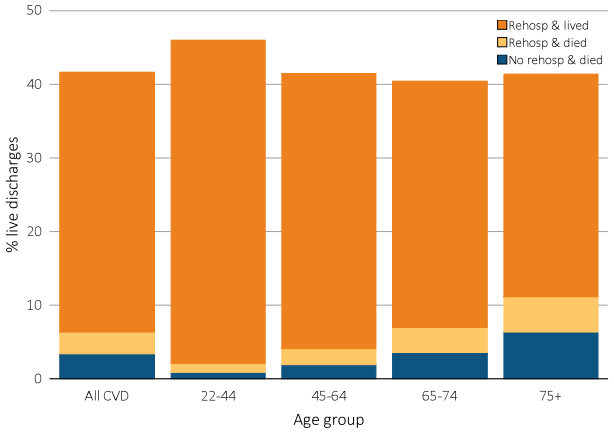
vol 2 Figure 5.8 Proportion of hemodialysis patients with cause-specific rehospitalizations within 30 days of discharge, by cause of index hospitalization, 2013



Data Source: Special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients, all ages, 2013, unadjusted. 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: CVD, cardiovascular disease; ESRD, end-stage renal disease; rehosp, rehospitalization; VA, vascular access.

Rehospitalization rates following discharge from a cardiovascular index hospitalization were slightly higher among younger adults, compared with all other age groups in which rehospitalization rates appear similar. In those aged 20–44, for example, 45.1% of such discharges were followed by a rehospitalization within 30 days (Figure 5.9). In general, these rates mirrored those for all-cause index hospitalizations (seen in Figure 5.5), although the rates for those aged 22-44 in Figure 5.9 were slightly higher.

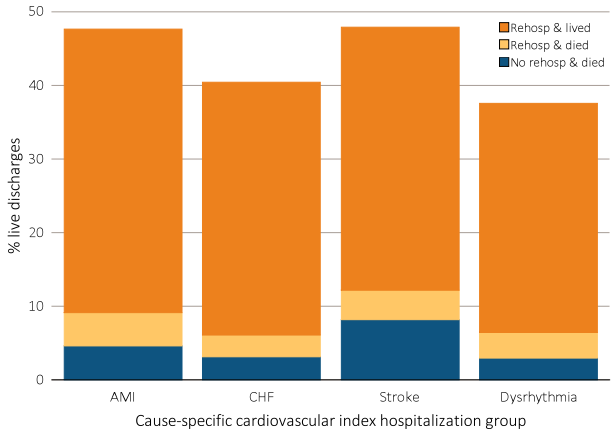
vol 2 Figure 5.9 Proportion of hemodialysis patients discharged alive that either were rehospitalized or died within 30 days of discharge for cardiovascular index hospitalization, by age, 2013



Data Source: Special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients, all ages, 2013, 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, 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: CVD, cardiovascular disease; ESRD, end-stage renal disease; rehosp, rehospitalization.

For cardiovascular index hospitalizations (Figure 5.10), rehospitalization occurred most frequently following discharge from treatment of acute myocardial infarction (AMI) and stroke, at 43.0 and 39.8%, respectively. The lowest rates occurred following discharge after dysrhythmia, at 34.6%. When not rehospitalized, stroke patients had the highest post-discharge mortality rate at 8.2%.

vol 2 Figure 5.10 Proportion of hemodialysis patients discharged alive that either were rehospitalized or died within 30 days of discharge for cardiovascular index hospitalization, by cause-specific cardiovascular index hospitalization, 2013



Data Source: Special analyses, USRDS ESRD Database. Period prevalent hemodialysis patients, all ages, 2013, unadjusted. 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: AMI, acute myocardial infarction; CHF, congestive heart failure; ESRD, end-stage renal disease; rehosp, rehospitalization.

As comorbid cardiovascular disease and its complications have a critical interaction with kidney disease of all types, this 2015 ADR features two chapters specifically addressing these issues—Volume1, Chapter 4 Cardiovascular Disease in Patients with CKD, and Volume 2, Chapter 9, Cardiovascular Disease in Patients with ESRD.

References

Center for Medicare and Medicaid Services (2014, June). Report for the Standardized Readmission Ratio. Retrieved October 23, 2015, from https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/ESRDQIP/Downloads/MeasureMethodologyeMethodologyReportfortheProposedSRRMeasure.pdf

Notes