

# Chapter 3: Morbidity and Mortality

## Introduction

In this chapter we evaluate the morbidity and mortality of chronic kidney disease (CKD) patients continuously enrolled in Medicare. Each year's analysis sample is limited to patients aged 66 and older; employing a one-year entry period allows us to identify CKD and other medical conditions using ICD-9-CM (International Classification of Diseases, 9th revision, clinical modification) diagnosis codes from Medicare claims. Hospitalizations, services, and deaths are then reported for the following calendar year. For example, the rates reported for 2012 are based on events in 2012 for patients with and without CKD in 2011. We present results on mortality, then focus on hospitalizations, and end with an examination of patient re-admission to the hospital within 30 days of discharge from their first hospitalization of the calendar year (referred to as the index hospitalization).

Adjusted mortality rates are higher for Medicare patients with CKD than those without, and rates increase with CKD stage, a finding consistent with studies using biochemical measures to define CKD (serum creatinine with validated equations to estimate glomerular filtration rate; Matsushita et al., 2010). The co-occurrences of diabetes mellitus (DM) and cardiovascular disease (CVD) with CKD multiplies a patient's risk of death. This is clinically significant as cardiovascular risk factors are relatively undertreated in U.S. patients with CKD; we illustrate this through data on the disease awareness, treatment, and control of risk factors in the population-level National Health and Nutrition Examination Survey (NHANES) cohort shown in Chapter 1, CKD in the General Population. Clearly, early detection and active treatment are important considerations in reducing morbidity and mortality in the CKD population.

One consistent finding regarding hospitalization in the CKD population is an increasing rate of both overall and cause-specific admissions with advancing stages of CKD. When data are adjusted for age, race, sex, prior year hospitalization, and several comorbidities, CKD

patients are hospitalized at a rate of 0.40 admissions per patient year overall—0.35 for Stages 1-2, 0.40 for Stage 3, and 0.55 for Stages 4-5 (0.39 where stage is not specified). We have observed for more than a decade that rates of hospitalization for cardiovascular disease and infection also rise with CKD stage (Go et al., 2004). In general, hospitalizations in CKD patients also increase in the presence of underlying comorbidities, such as diabetes and cardiovascular disease.

Hospital readmissions are a key quality indicator for the Medicare program. In an attempt to lower the rate of readmission, the Medicare Hospital Readmission Reduction Program was instituted as part of the Patient Protection and Affordable Care Act, (CMS, 2010) reducing Medicare payments to hospitals with excess readmissions. Rates of rehospitalization for CKD patients are higher than those for patients without diagnosed CKD. In 2012, 24 percent of patients with CKD were readmitted within 30 days, compared to 17 percent of those without CKD. These rates have not changed significantly in the past decade, which is of major concern.

In Chapter 2, Identification and Care of Patients with Chronic Kidney Disease, we document the increasing recognition of CKD through analysis of diagnosis codes from Medicare claims. Chapter 1 reports the smaller increases in CKD prevalence in the general population as found in the NHANES. This population-based survey identifies CKD through single time point, estimates of glomerular filtration rates and albuminuria. The ascertainment of CKD cases through claims data has increased in recent years, likely resulting in decreased estimates of average disease severity as influenced by the early disease stage of those identified most recently. We adjust for co-morbid conditions, over time, but such adjustments are limited to the measures available from claims. Thus, changes in mortality and hospitalization rates should be viewed with some caution.

## Analytical Methods

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

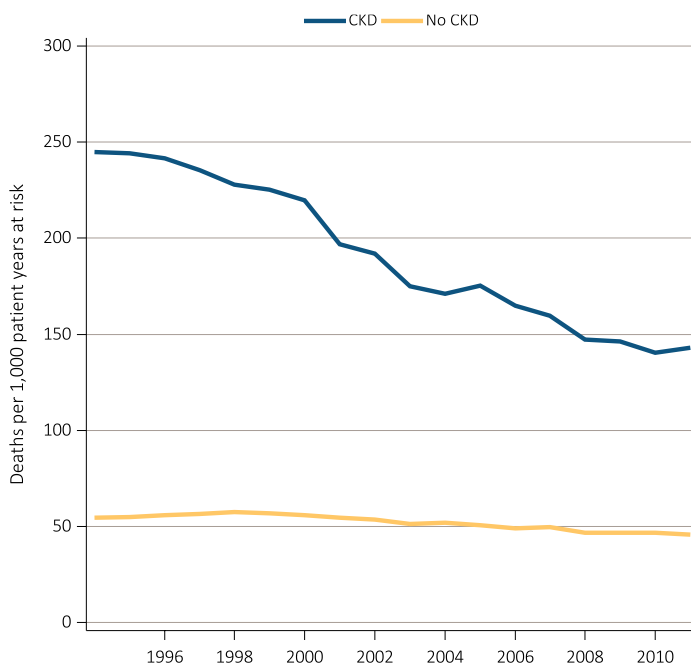
## Mortality Rates

Figure 3.1(a) presents the unadjusted mortality rates for Medicare patients age 66 and older, with and without CKD, over time. Unadjusted mortality in CKD patients has decreased by 42 percent since 1995, from 245 deaths per 1,000 patient years to 143 deaths in 2012. For those without CKD, the unadjusted rate decreased from 55 deaths per 1,000 patient years in 1995 to 46 deaths per 1,000 patient years in 2012, a reduction of 16 percent.

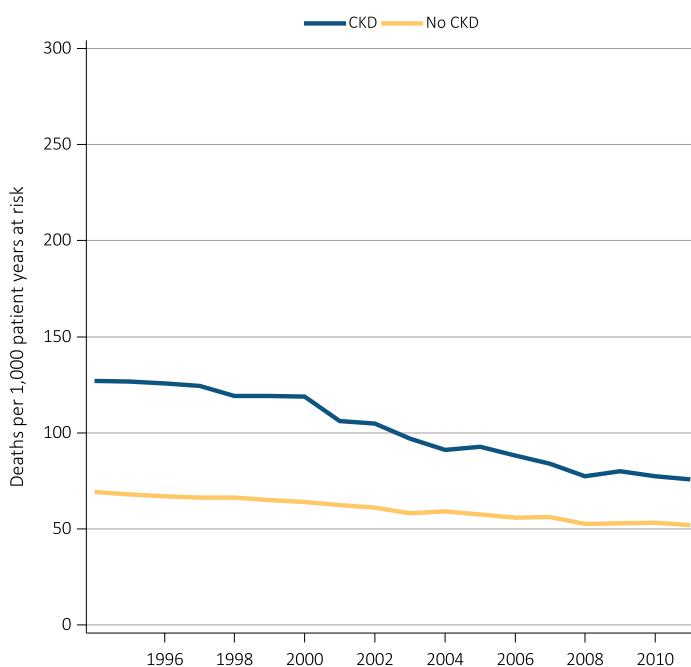
Adjusted mortality rates are shown in Figure 3.1(b). When adjusted for age, race, sex and health status (prior year hospitalization and comorbid conditions), the 2012 mortality rate for CKD patients is reduced considerably, to 76 deaths per 1,000 patient years at risk. Among those without CKD, adjustment for these factors results in a slightly higher mortality rate of 52 deaths per 1,000 patient years, as compared to the unadjusted rate of 46. One major contributor to the discrepancy between adjusted and unadjusted death rates is the relative age difference between those with CKD and those without. In 2012, the mean age of patients with CKD was 79.1 years, compared to 76.0 years for those without, and 76.3 years for the sample as a whole.

**vol 1 Figure 3.1 Unadjusted and adjusted all-cause mortality rates (per 1,000 patient years at risk) for Medicare patients aged 66 and older, by CKD status and year, 1995-2012**

### (a) Unadjusted



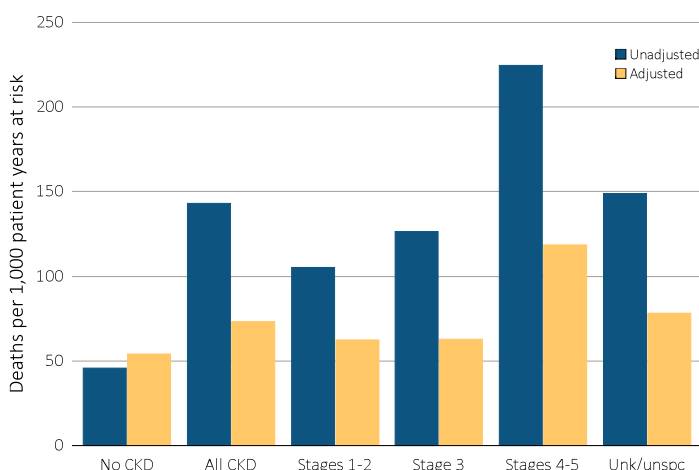
### (b) Adjusted



Data source: Medicare 5 percent sample. January 1 of each reported year point prevalent Medicare patients age 66 and older. Adj: age/sex/race/prior year hospitalization/comorbidities. Ref: 2012 patients. Abbreviations: CKD, chronic kidney disease.

As expected, unadjusted mortality rates increase with progressing stage of CKD, as shown in Figure 3.2, from 105 deaths per 1,000 patient years for those in Stages 1 and 2, to 127 for Stage 3, and 225 for Stages 4 and 5 (without ESRD; stages identified by the ICD-9-CM codes, see Table A). Those without an identified CKD stage or with a diagnosis code other than the 585 code series had an unadjusted mortality rate between that of Stage 3 and Stages 4-5, at 149 deaths per 1,000 patient years at risk. After adjustment, death rates were similar for Stages 1-2 and Stage 3, at 62 and 63 deaths per 1,000 patient years, respectively. Those with unspecified CKD stage had slightly higher death rates at 78 per 1,000 patient years. The adjusted rate for Stages 4-5 in 2012 was 119 deaths per 1,000 patient years at risk.

**vol 1 Figure 3.2 Unadjusted and adjusted all-cause mortality rates (per 1,000 patient years at risk) for Medicare patients aged 66 and older by CKD status and stage, 2012**



Data source: Medicare 5 percent sample. January 1, 2012 point prevalent Medicare patients age 66 and older. Adj: age/sex/race/prior year hospitalization/comorbidities. Ref: all patients, 2012. See Table A for CKD stage definitions. Abbreviations: CKD, chronic kidney disease; Unk/unspc, CKD stage unidentified.

**Table A. ICD-9-CM Codes**

- 585.1** Chronic kidney disease, Stage 1
- 585.2** Chronic kidney disease, Stage 2 (mild)
- 585.3** Chronic kidney disease, Stage 3 (moderate)
- 585.4** Chronic kidney disease, Stage 4 (severe)
- 585.5** Chronic kidney disease, Stage 5 (excludes 585.6: Stage 5, requiring chronic dialysis<sup>a</sup>)

CKD unspecified identified by multiple codes including 585.9, 250.4x, 403.9x & others. CKD stage estimates are from a single measurement. For clinical case definition, abnormalities should be present ≥ 3 months. a In USRDS analyses, patients with ICD-9-CM code 585.6 and no end-stage renal disease (ESRD) Medical Evidence form (CMS 2728) or other indication of ESRD are considered to have code 585.5; see the CKD Analytical Methods chapter for details.

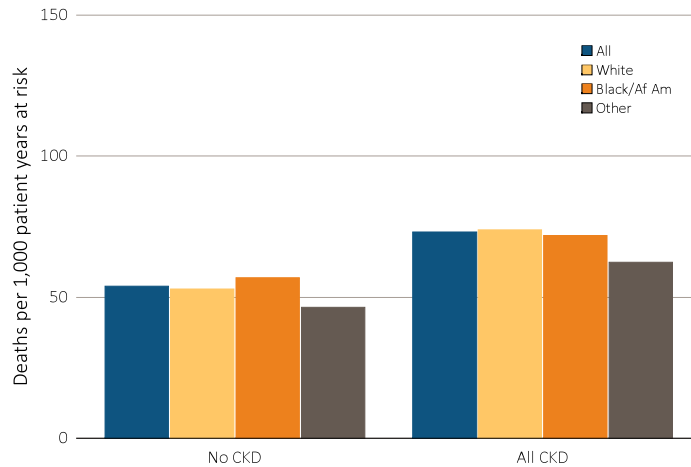
Table 3.1 lists mortality rates for several demographic subgroups of patients. Adjusted for patient demographics and co-morbid conditions, mortality among CKD patients (73.2/1000) is 36 percent greater than for the non CKD population (54.0/1000). As expected, all mortality rates increase somewhat dramatically with age. When adjusted for sex, race, prior year hospitalization and comorbidities, death rates increase 4.5 times, from 36 per 1,000 patient years for CKD patients aged 66-69, to 162 for CKD patients aged 85 and older. This same pattern is seen for unadjusted rates and among patients without CKD. Mortality is higher for men than women regardless of CKD status. Whites with CKD have higher mortality rates, both adjusted and unadjusted, than other race groups, although the adjusted rates for Blacks/African Americans and Whites are very similar. Among patients without CKD, Blacks/African Americans have slightly higher death rates, when adjusted for age, sex, prior year hospitalization, and comorbidities (see Figure 3.3).

**vol 1 Table 3.1 Unadjusted and adjusted mortality rates (per 1,000 patient years at risk) in Medicare patients, by age, sex, race, and CKD status, 2012**

|                    | Unadjusted |         | Adjusted |         |
|--------------------|------------|---------|----------|---------|
|                    | No CKD     | All CKD | No CKD   | All CKD |
| <b>All</b>         | 45.7       | 143.0   | 54.0     | 73.2    |
| <b>66-69</b>       | 15.3       | 69.1    | 22.8     | 35.8    |
| <b>70-74</b>       | 21.4       | 78.2    | 27.8     | 40.1    |
| <b>75-84</b>       | 44.6       | 125.5   | 47.5     | 66.4    |
| <b>85+</b>         | 138.3      | 261.7   | 129.9    | 161.9   |
| <b>Male</b>        | 46.4       | 149.4   | 58.5     | 77.4    |
| <b>Female</b>      | 45.2       | 137.3   | 49.4     | 71.0    |
| <b>White</b>       | 46.3       | 146.5   | 53.0     | 73.8    |
| <b>Black/Af Am</b> | 45.9       | 130.6   | 56.9     | 71.9    |
| <b>Other</b>       | 35.5       | 113.4   | 46.3     | 62.4    |

Data source: Medicare 5 percent sample. January 1, 2012 point prevalent patients age 66 and older. Adj: age/sex/race/prior year hospitalization/comorbidities. Ref: all patients, 2012. Abbreviations: Af Am, African American; CKD, chronic kidney disease.

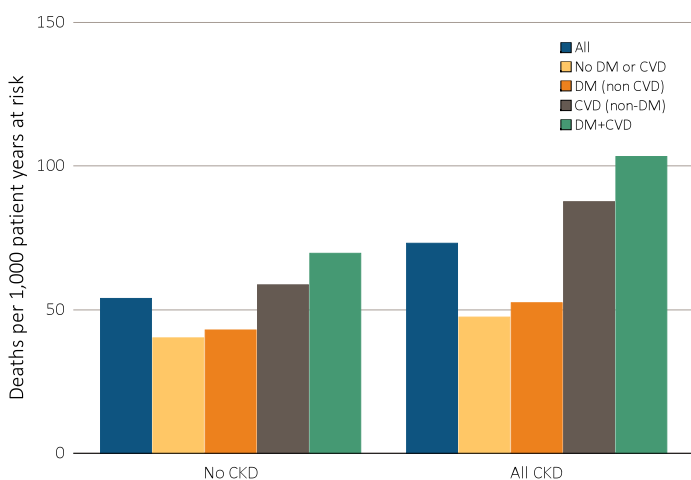
**vol 1 Figure 3.3 Adjusted mortality rates (per 1,000 patient years at risk) in Medicare patients aged 66 and older, by race and CKD status, 2012**



Data source: Medicare 5 percent sample. January 1, 2012 point prevalent patients age 66 and older. Adj: age/sex/race/prior year hospitalization/comorbidities. Ref: all patients, 2012. Abbreviations: Af Am, African American; CKD, chronic kidney disease.

Adjusted rates of mortality generally increase with patient health complexity. Figure 3.4 shows mortality rates by the presence of two common comorbidities of CKD – diabetes mellitus (DM) and cardiovascular disease (CVD). Focusing on patients with CKD, in 2012 those without DM or CVD had an adjusted mortality rate of 47 deaths per 1,000 patient years at risk, while those with both diabetes mellitus and cardiovascular disease had double the mortality rate, at 103 deaths per 1,000 patient years.

**vol 1 Figure 3.4 Adjusted mortality rates (per 1,000 patient years at risk) in Medicare patients aged 66 and older, by cardiovascular disease, diabetes mellitus, and CKD status, 2012**



Data source: Medicare 5 percent sample. January 1, 2012 point prevalent patients age 66 and older. Adj: age/sex/race/prior year hospitalization/comorbidities. Ref: all patients, 2012. Abbreviations: CKD, chronic kidney disease; CVD, cardiovascular disease; DM, diabetes mellitus.

## Hospitalization Rates

Table 3.2 shows 2012 all-cause hospitalization rates for older Medicare patients by whether they had identified CKD during 2011. The unadjusted rate for those with CKD was 749 hospitalizations per 1,000 patient years at risk, compared to an unadjusted rate of 282 for patients without CKD. Across demographic characteristics, the unadjusted hospitalization rate for patients with CKD is 2.5 to three times the corresponding rate for patients without CKD. Once adjustment is made for age, race, sex, prior year hospitalization, and comorbidities, the hospitalization rate for patients with CKD (404 per 1,000 patient years at risk) was 37 percent greater than for those without CKD (294 per 1,000). Similar to mortality rates, the adjusted hospitalization rate increases with age for all patients. In contrast to mortality findings, women with CKD had higher adjusted hospitalization rates than did men, while there was little difference by sex among patients without CKD.

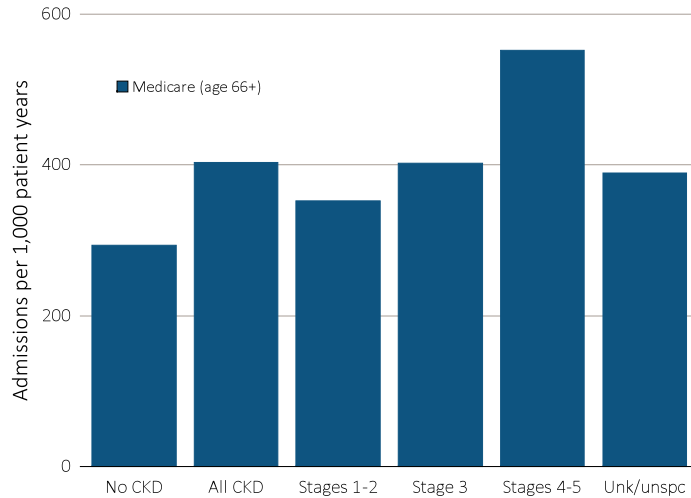
**vol 1 Table 3.2 Unadjusted and adjusted all-cause hospitalization rates (per 1,000 patient years at risk) for Medicare patients aged 66 and older, by CKD status, 2012**

|                    | Unadjusted |         | Adjusted |         |
|--------------------|------------|---------|----------|---------|
|                    | No CKD     | All CKD | No CKD   | All CKD |
| <b>All</b>         | 282        | 749     | 294      | 404     |
| <b>66–69</b>       | 183        | 639     | 232      | 345     |
| <b>70–74</b>       | 221        | 665     | 245      | 351     |
| <b>75–84</b>       | 315        | 754     | 305      | 412     |
| <b>85+</b>         | 467        | 868     | 425      | 505     |
| <b>Male</b>        | 276        | 744     | 297      | 396     |
| <b>Female</b>      | 287        | 753     | 292      | 410     |
| <b>White</b>       | 283        | 738     | 293      | 405     |
| <b>Black/Af Am</b> | 313        | 855     | 329      | 433     |
| <b>Other</b>       | 227        | 695     | 255      | 367     |

Data source: Medicare 5 percent sample. January 1, 2012 point prevalent patients age 66 and older. Adj: age/sex/race/prior year hospitalization/comorbidities. Ref: all patients, 2012. Abbreviations: Af Am, African American; CKD, chronic kidney disease.

Figure 3.5 shows the adjusted, all-cause hospitalization rates by stage of CKD. Even with adjustment for demographic and clinical factors, the rates of hospitalization increase with each progressive stage of CKD. Patients in Stage 1 or 2 had a 2012 hospitalization rate of 356 admissions per 1,000 patient years, increasing to 406 for patients in Stage 3 and 539 for Stages 4 and 5. Patients with diagnoses that do not specify stage of CKD had rates similar to those with Stage 3 CKD.

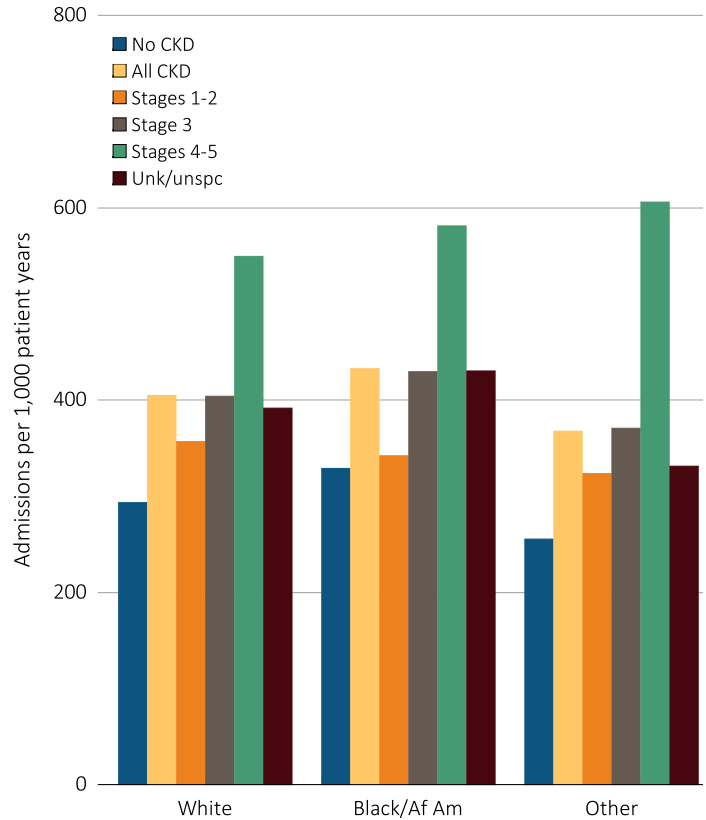
**vol 1 Figure 3.5 Adjusted all-cause hospitalization rates (per 1,000 patient years at risk) for Medicare patients aged 66 and older by CKD status and stage, 2012**



Data source: Medicare 5 percent sample. January 1, 2012 point prevalent Medicare patients, age 66 and older. Adj: age/sex/race/prior year hospitalization/comorbidity. Ref: all patients, 2012. See Table A for CKD stage definitions. Abbreviations: CKD, chronic kidney disease; Unk/unspc, CKD stage unidentified.

In 2012, hospitalization rates were slightly higher for Blacks/African Americans as compared to Whites, while those for patients of other races were the lowest of the three groups (see Figure 3.6). For patients with Stage 1 or 2 CKD, the hospitalization rates were similar by race, with Whites having the highest rate—324/1000 for other races, 342 for Blacks/African Americans, and 357 for Whites. Rates for Stage 3 were 371/1000 for other races, 404 for Whites, and 429 for Blacks/African Americans. However, among patients with Stage 4 or 5 CKD (not ESRD), those of other race had the highest hospitalization rate at 606 admissions per 1,000 patient years, compared to 549 for Whites and 581 for Blacks/African Americans. Again, patients without stage specified by their CKD diagnosis code had rates similar to Stage 3 CKD patients.

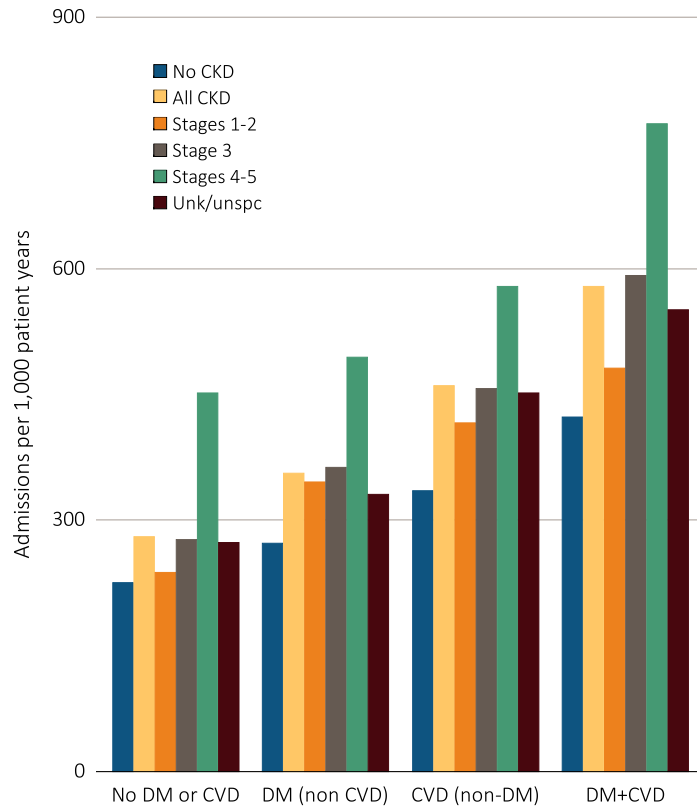
**vol 1 Figure 3.6 Adjusted all-cause hospitalization rates (per 1,000 patient years at risk) in Medicare patients aged 66 and older, by race, CKD status, and stage, 2012**



Data source: Medicare 5 percent sample. January 1, 2012 point prevalent Medicare patients, age 66 and older. Adj: age/sex/race/prior year hospitalization/comorbidity; rates by one factor are adjusted for the others. Ref: all patients, 2012. See Table A for CKD stage definitions. Abbreviations: Af Am, African American; CKD, chronic kidney disease; Unk/unspc, CKD stage unidentified.

Adjusted rates of hospitalization for all causes increased with the presence of diabetes mellitus and cardiovascular disease, for patients both with and without CKD (see Figure 3.7). In 2012, admissions per 1,000 patient years increased from 280 for CKD patients without DM or CVD, to 356 for CKD patients with only diabetes mellitus and 460 for those with only cardiovascular disease, to a high of 579 for CKD patients with both comorbidities. This additional comorbidity burden is most striking for patients with Stage 4 or 5 CKD; patients with both DM and CVD in addition to their late-stage CKD had an all-cause hospitalization rate of 773 admissions per 1,000 patient years, compared to only 451 for late-stage CKD patients without diabetes mellitus or cardiovascular disease.

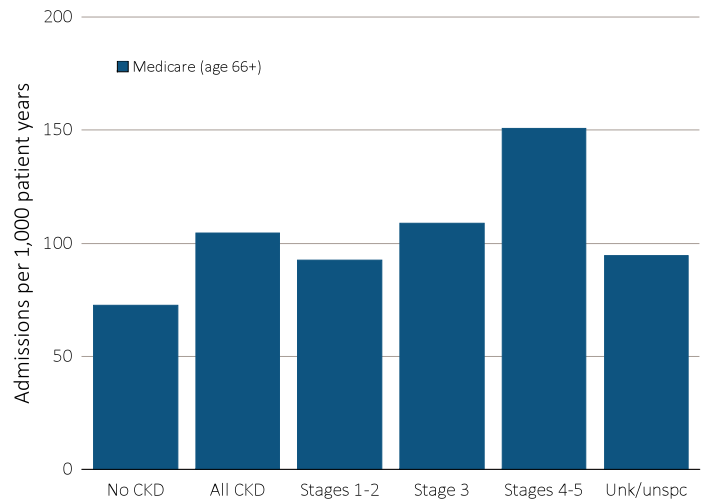
**vol 1 Figure 3.7 Adjusted all-cause hospitalization rates (per 1,000 patient years at risk) in Medicare patients aged 66 and older, by cardiovascular disease, diabetes mellitus, CKD status, and stage, 2012**



Data source: Medicare 5 percent sample. January 1, 2012 point prevalent Medicare patients, age 66 and older. Adj: age/sex/race/prior year hospitalization/comorbidity; rates by one factor are adjusted for the others. Ref: all patients, 2012. See Table A for CKD stage definitions. Abbreviations: CKD, chronic kidney disease; CVD, cardiovascular disease; DM, diabetes mellitus; Unk/unspc, CKD stage unidentified.

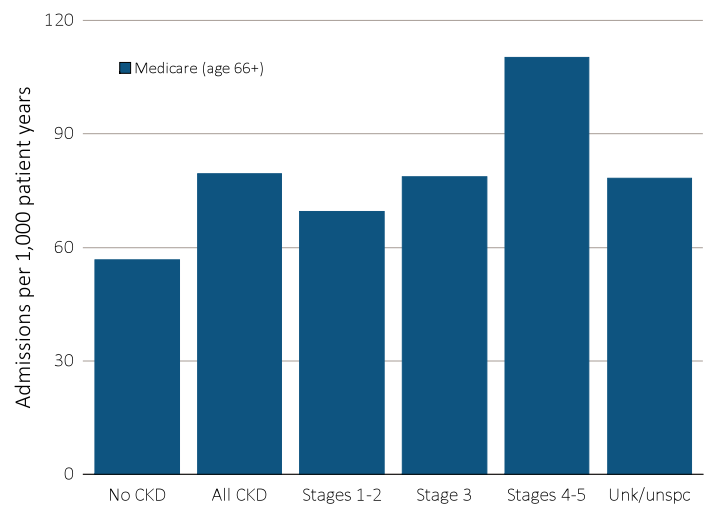
We present in Figures 3.8 through 3.10 hospitalization rates specific to CVD (23 percent), infection (19 percent), and all other cause categories (58 percent). Figure 3.8 shows the adjusted hospitalization rates for admissions with a primary diagnosis indicating CVD. The pattern of increase by stage of CKD for CVD hospitalizations is similar to that of all-cause hospitalizations. Among those with CKD, rates increase from 91 cardiovascular admissions per 1,000 patient years for those in Stages 1 and 2, to 107 for Stage 3, and 142 for Stages 4 and 5. This pattern also holds for hospitalization with a primary diagnosis code indicating infection, with rates increasing from 72 infection-related admissions per 1,000 patient years for CKD Stages 1 and 2, to 81 for Stage 3, and 112 for Stages 4 and 5 (see Figure 3.9).

**vol 1 Figure 3.8 Adjusted rates of hospitalization for cardiovascular disease (per 1,000 patient years at risk) in Medicare patients aged 66 and older, by CKD status and stage, 2012**



Data source: Medicare 5 percent sample. January 1, 2012 point prevalent Medicare patients, age 66 and older. Adj: age/sex/race/prior year hospitalization/comorbidity; rates by one factor are adjusted for the others. Ref: all patients, 2012. See Table A for CKD stage definitions. Abbreviations: CKD, chronic kidney disease; Unk/unspc, CKD stage unidentified.

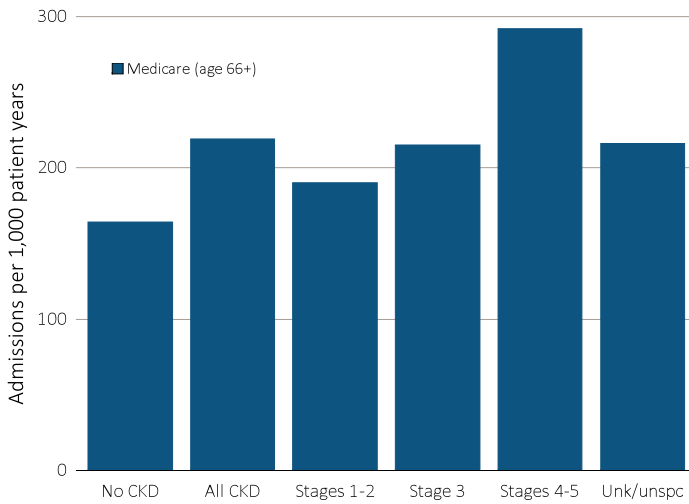
**vol 1 Figure 3.9 Adjusted rates of hospitalization for infection (per 1,000 patient years at risk) in Medicare patients aged 66 and older, by CKD status and stage, 2012**



Data source: Medicare 5 percent sample. January 1, 2012 point prevalent Medicare patients, age 66 and older. Adj: age/sex/race/prior year hospitalization/comorbidity; rates by one factor are adjusted for the others. Ref: all patients, 2012. See Table A for CKD stage definitions. Abbreviations: CKD, chronic kidney disease; Unk/unspc, CKD stage unidentified.

The majority of hospitalizations were for conditions other than those related to CVD or infection. Again, the pattern showed a similar CKD stage-related increase from 192 admissions per 1,000 for Stages 1-2, to 216 for Stage 3, and 284 for Stages 4 and 5, as shown in Figure 3.10.

**vol 1 Figure 3.10** Adjusted rates of hospitalization for causes other than cardiovascular disease or infection (per 1,000 patient years at risk) in Medicare patients aged 66 and older, by CKD status and stage, 2012

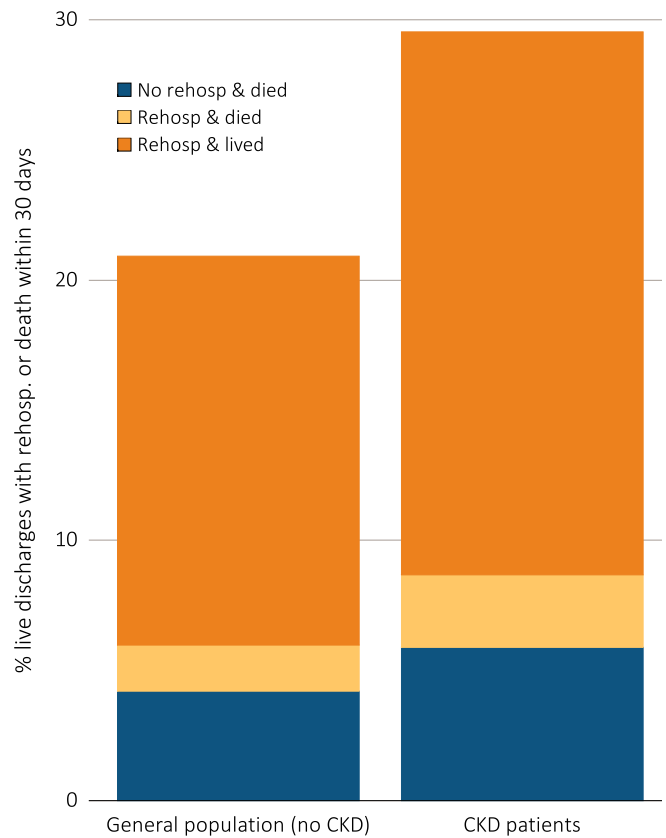


Data source: Medicare 5 percent sample. January 1, 2012 point prevalent Medicare patients, age 66 and older. Adj: age/sex/race/prior year hospitalization/comorbidity; rates by one factor are adjusted for the others. Ref: all patients, 2012. See Table A for CKD stage definitions. Abbreviations: CKD, chronic kidney disease; Unk/unspc, CKD stage unidentified.

### Rehospitalization

In 2012, the proportion of Medicare patients aged 66 and older who were re-admitted to the hospital within 30 days of discharge from a first, all-cause (index) hospitalization was 16.7 percent for those without CKD, and 23.7 percent for those with CKD (see Figure 3.11 and Table 3.3). Ten percent of the non-CKD patients that had been rehospitalized within 30 days had also died, representing 1.8 percent of the patients without CKD that were discharged alive from a first all-cause hospitalization. Eleven percent of the patients with CKD that were rehospitalized had also died within 30 days of the initial discharge, or 2.8 percent of the live discharges. Among patients discharged alive from their first hospitalization and not rehospitalized within 30 days, 4.2 percent of those without CKD had died within 30 days, as had 5.9 percent of those with CKD.

**vol 1 Figure 3.11** Unadjusted percentage readmitted to the hospital within 30 days of discharge, among Medicare patients aged 66 and older, discharged alive from an all-cause index hospitalization between January 1 and December 1, by CKD status, 2012



Data source: Medicare 5 percent sample. January 1, 2012 point prevalent, Medicare patients age 66 and older, discharged alive from an all-cause index hospitalization between January 1, 2012, and December 1, 2012, unadjusted. Abbreviations: CKD, chronic kidney disease; Rehosp, rehospitalized.

All-cause rehospitalization within 30 days of live discharge from a first hospitalization is lower for those without CKD, but similar across the stages of CKD, rising slightly from 23 percent in Stages 1-2, to 24 percent in Stage 3 and 25 percent in Stages 4-5 (see Table 3.3). However, the proportion of patients that died within 30 days increases with the stage of CKD from 7.6 percent (Stages 1-2), to 8.1 percent (Stage 3), and 10.6 percent (Stages 4-5).

**vol 1 Table 3.3 Unadjusted percentage readmitted to the hospital within 30 days of discharge, among Medicare patients aged 66 and older, discharged alive from an all-cause index hospitalization between January 1 and December 1, by CKD status and stage, 2012**

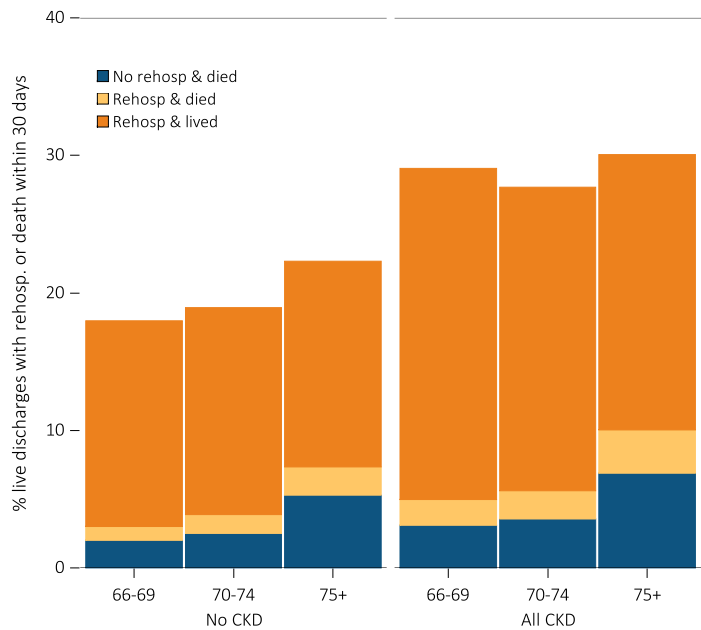
|  | No CKD | All CKD | Stages 1-2 | Stage 3 | Stages 4-5 | Unk/unspc |
|--|--------|---------|------------|---------|------------|-----------|
| <b>All</b>                             | 16.7   | 23.7    | 23.2       | 23.8    | 25.3       | 23.0      |
| <b>66-69</b>                           | 16.0   | 25.9    | 23.9       | 25.4    | 28.5       | 26.2      |
| <b>70-74</b>                           | 16.4   | 24.1    | 23.6       | 23.7    | 24.4       | 24.5      |
| <b>75-84</b>                           | 17.0   | 24.1    | 23.8       | 24.3    | 26.1       | 23.3      |
| <b>85+</b>                             | 17.0   | 21.8    | 21.5       | 22.7    | 23.4       | 20.2      |
| <b>Male</b>                            | 17.6   | 24.3    | 23.6       | 24.5    | 26.1       | 23.5      |
| <b>Female</b>                          | 16.1   | 23.1    | 22.8       | 23.3    | 24.6       | 22.5      |
| <b>White</b>                           | 16.5   | 23.2    | 22.8       | 23.3    | 24.6       | 22.7      |
| <b>Black/Af Am</b>                     | 18.7   | 26.2    | 26.4       | 26.4    | 26.8       | 25.7      |
| <b>Other</b>                           | 17.2   | 24.8    | 21.4       | 26.6    | 30.0       | 21.1      |
| <b>No rehospitalization &amp; died</b> | 4.2    | 5.9     | 5.1        | 5.4     | 7.2        | 6.1       |
| <b>Rehospitalization &amp; died</b>    | 1.8    | 2.8     | 2.5        | 2.7     | 3.4        | 2.7       |
| <b>Rehospitalization &amp; lived</b>   | 15.0   | 20.9    | 20.7       | 21.1    | 21.9       | 20.3      |

Data source: Medicare 5 percent sample. January 1, 2012 point prevalent, Medicare patients age 66 and older, discharged alive from an all-cause index hospitalization between January 1, 2012, and December 1, 2012; unadjusted. See Table A for CKD stage definitions. Abbreviations: Af Am, African American; CKD, chronic kidney disease; Unk/unspc, CKD stage unidentified.

Figure 3.12 presents the percentages of Medicare patients that are re-hospitalized or die within 30 days of discharge from an all-cause, index hospitalization. As seen in Table 3.3, rates of rehospitalization for patients with CKD decrease with age across all stages of CKD, while those for patients without CKD are similar across all age groups. This is likely due to the competing risk of interim death. For patients without CKD, the proportion either returning to the hospital or dying within 30 days increases with age, but there is no clear relationship for patients with CKD. However, comparison of those who died without rehospitalization with those who were rehospitalized and later died shows that overall percent of CKD patients dying within 30 of discharge does increase with age.

As shown in Figure 3.13, for both patients with and without CKD, Blacks/African Americans experience more re-admission or death within 30 days of discharge from an all-cause index hospitalization. This is primarily influenced by rehospitalization where the patient did not die within 30 days. For those without CKD, Blacks/African Americans and Whites have similar rates of patient death, either with or without rehospitalization, while deaths for those of other races are slightly lower. For CKD patients, however, White patients experience a higher rate of death within 30 days of discharge without having been re-hospitalized than do Blacks/African Americans and those of other races.

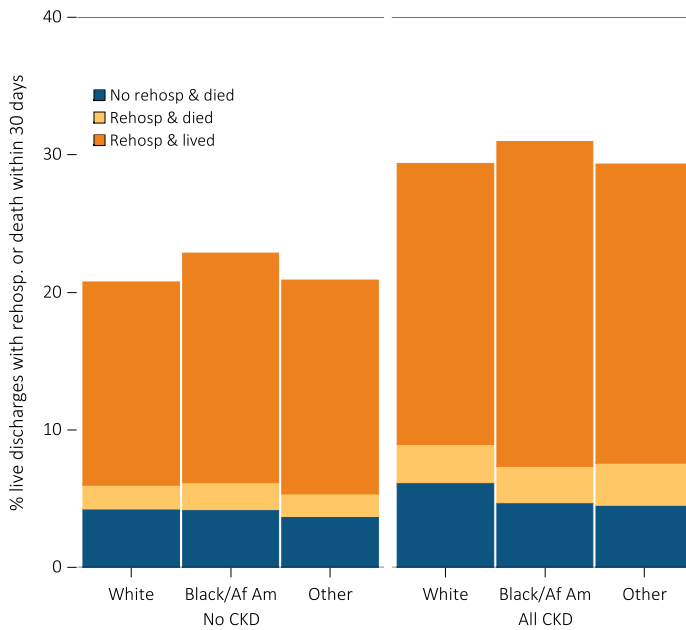
**vol 1 Figure 3.12 Unadjusted percentage readmitted to the hospital within 30 days of discharge, among Medicare patients aged 66 and older, discharged alive from an all-cause index hospitalization between January 1 and December 1, by age and CKD status, 2012**



Data source: Medicare 5 percent sample. January 1, 2012 point prevalent, Medicare patients age 66 and older, discharged alive from an all-cause index hospitalization between January 1, 2012, and December 1, 2012; unadjusted. Abbreviations: CKD, chronic kidney disease; Rehos, rehospitalized.



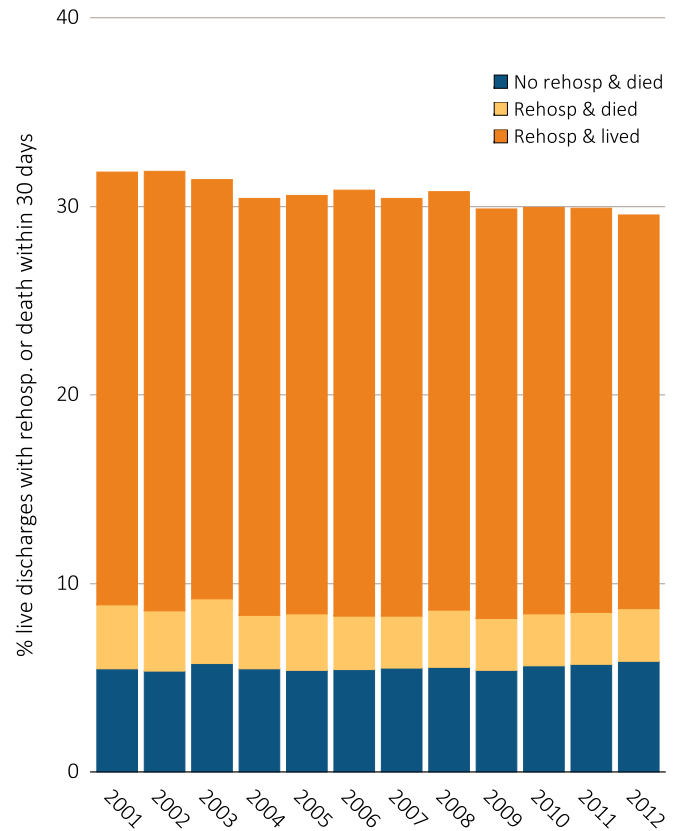
**vol 1 Figure 3.13** Unadjusted percentage readmitted to the hospital within 30 days of discharge, among Medicare patients aged 66 and older, discharged alive from an all-cause index hospitalization between January 1 and December 1, by race and CKD status, 2012



Data Source: Medicare 5 percent sample. January 1, 2012 point prevalent, Medicare patients age 66 and older, discharged alive from an all-cause index hospitalization between January 1, 2012, and December 1, 2012; unadjusted. Abbreviations: Af Am, African American; CKD, chronic kidney disease; Re hosp, rehospitalized.

Figure 3.14 presents rates of CKD patient re-hospitalization or death, over time. The combined outcomes have decreased slightly over the last 12 years, from 31.8 percent in 2001 to 29.5 percent in 2012. Much of this slight reduction occurred in the group that had been rehospitalized, but was still alive at 30 days following discharge, a rate that decreased from 23.0 percent in 2001 to 20.9 percent in 2012.

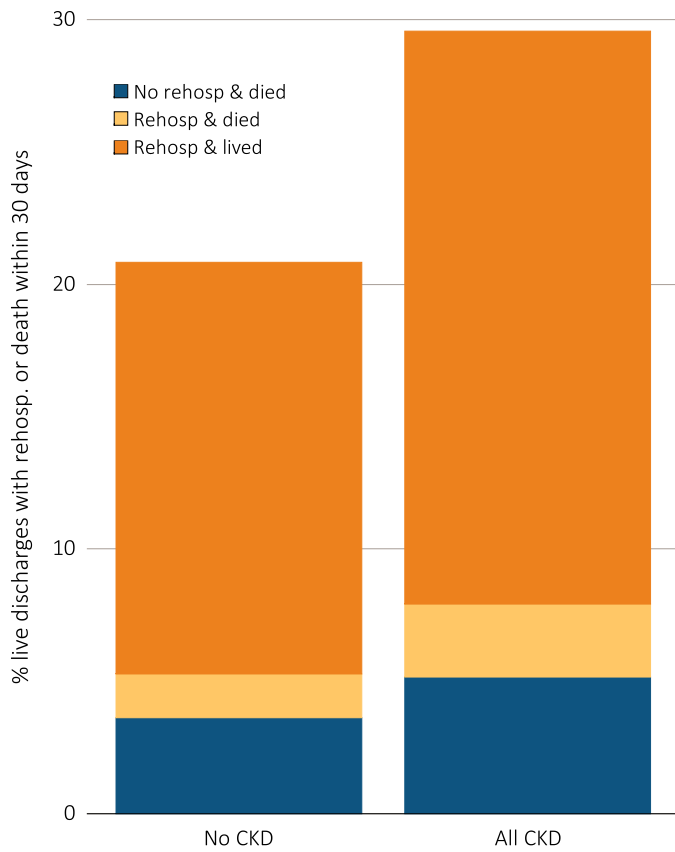
**vol 1 Figure 3.14** Adjusted percentage readmitted to the hospital within 30 days of discharge, among Medicare CKD patients aged 66 and older, discharged alive from an all-cause index hospitalization between January 1 and December 1, by year, 2001-2012



Data source: Medicare 5 percent sample. January 1 of each reported year point prevalent, Medicare patients age 66 and older with CKD (defined during the prior year) discharged alive from an all-cause index hospitalization between January 1 and December 1 of the reported year. Adj: age/sex/race. Ref: 2012. Abbreviations: CKD, chronic kidney disease; Re hosp, rehospitalized.

Figure 3.15 shows the death and rehospitalization percentages for Medicare patients (66 and older) that were discharged alive from a cardiovascular index hospitalization. The magnitude and pattern of these percentages are similar to those for all-cause index hospitalizations.

**vol 1 Figure 3.15 Unadjusted percentage readmitted to the hospital within 30 days of discharge, among Medicare patients aged 66 and older, discharged alive from a cardiovascular-related index hospitalization between January 1 and December 1, by CKD status, 2012**



Data Source: Medicare 5 percent sample. January 1, 2012 point prevalent, Medicare patients age 66 and older discharged alive from a cardiovascular-related index hospitalization between January 1, 2012, and December 1, 2012; unadjusted. Abbreviations: CKD, chronic kidney disease; Rehossp, rehospitalized.

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