chapter THREE

care of patients with chronic kidney disease

I must go down to the seas again,
to the lonely seas and the sky,
And all I ask is a tall ship
and a star to steer her by.

John Masefield, “Sea Fever”
Patients with chronic kidney disease pose a unique challenge to the healthcare system. Adverse event rates are high, and the risk of death rises with CKD stage, as does the likelihood of reaching ESRD—a state of high morbidity, mortality, and cost.

Detection of CKD can be accomplished with simple tests such as serum creatinine and urine microalbumin. These tests have specific CPT service codes, and are covered by Medicare and by many private health plans. In the Medicare and fee-for-service employer group health plans (EGHPs), laboratory tests can be billed based on physician clinical management under a fee schedule. In other EGHP populations, however, global contracts for areas such as laboratory services may make it difficult to determine exactly which tests are ordered. This is particularly true for the MarketScan dataset, in that the self-insured groups are with companies that hold the funds for services. We have thus limited our analyses of laboratory data in this chapter to the Ingenix i3 dataset.

We first evaluate how frequently patients with diabetes, hypertension, or both diagnoses receive a urine microalbumin test. The probability of microalbumin testing within a year in Medicare CKD patients with diabetes has increased since 2001–2002, reaching 0.32 in 2007–2008. Among those with hypertension, the probability is now 0.04. Similar rates are noted among those with private insurance. Such data provide important evidence that providers are not screening at-risk patients at intervals recommended by the American Heart Association and the American Diabetes Association.

Not surprisingly, the probability of nephrologist referral among Medicare patients with diabetes or hypertension is relatively low, at 6–16 percent; rates are even lower for EGHP patients. Those also carrying a diagnosis of CKD, however, are 5–6 times more likely to visit a nephrologist.

The use of serum creatinine testing appears to be relatively high in the CKD population as a whole, exceeding 90 percent within a year among Medicare patients; only 28 percent of patients, in contrast, receive urine microalbumin testing in the same period, 30 percent receive a calcium/phosphorus measurement, and 21 percent receive parathyroid hormone testing. Approximately two-thirds of CKD patients do, however, receive lipid testing within a year — a positive finding, given their high cardiovascular event rates.
We next examine prescription drug therapy in the CKD population. Overall, 56–57 percent of Ingenix i3 and MarketScan patients with diagnosed CKD receive treatment with an ACEI, ARB, or renin inhibitor; this reaches 72–77 percent in those who also have diabetes or hypertension. But while use of medications such as beta blockers, dihydropyridine calcium channel blockers, and lipid lowering agents has been growing, bone and mineral therapy with oral vitamin D and/or phosphate binders is received by fewer than 10 percent of patients.

Lipid and glycemic control are important issues for CKD patients, who are at high risk of cardiovascular events and death. We show that two-thirds to three-fourths of patients have recommended control. These data do not, however, address progressive treatment over time of the same patients, an issue which needs to be examined. Also in question is the consistency of therapy, and whether doses are titrated to maximize their clinical benefit in relation to the progression of kidney disease.

Considering that a CKD patient is more likely to have a cardiovascular event and die than to reach ESRD, it is imperative to identify this high-risk population, to monitor risk factors for cardiovascular events and death, and to address the progression of kidney damage by monitoring kidney function and proteinuria. Although kidney protective treatment appears to be common, adherence to treatment and adjustments for diminishing kidney function are yet to be determined. The relatively high rates of such treatment may help explain the flattening of the overall rates of ESRD incidence illustrated in Volume Two, as well as the declines noted in subpopulations with glomerular disease, diabetes, and hypertension. There are, however, subpopulations which merit particular attention, including younger African Americans and Native Americans, who have increasing rates of obesity and diabetes, and, as shown in Chapter Two of Volume Two, higher rates of ESRD.

+ Figure 3.1: see page 167 for analytical methods. Medicare (age 65 & older) & Ingenix i3 (age 50–64) patients.
For Medicare patients 66 and older, the cumulative probability of a CKD claim at the end of one year increased steadily between 2002 and 2008 — rising, for example, from 0.16 to 0.22 for patients with both diabetes and congestive heart failure (CHF). Patients with both diagnoses are now 1.5–1.9 times more likely to have a claim than those with either diagnosis alone. In the younger MarketScan and Ingenix i3 populations, the probability of a CKD claim is 2.4–2.8 times more likely for those with both diagnoses than for those with only one.

Data on nephrologist claims show similar patterns. Among Medicare patients, the probability of a claim for those with both diagnoses rose from 0.1 in 2002 to 0.16 in 2008, and these patients are now 2.1–2.4 times more likely to see a nephrologist than are patients with only one diagnosis. In the younger populations, patients with diabetes and CHF are 3.2–3.3 times more likely to see a nephrologist than are those with diabetes alone.

Patterns differ in patients with diagnosed CKD. For 2008 Medicare patients, the cumulative probability of a nephrologist claim was 0.36–0.37 in those with diabetes alone or with CHF. Among Ingenix i3 patients, the probability was 0.45 for those with diabetes and CHF, compared to 0.35 for those with diabetes alone. Overall and in the diagnosed CKD population, the likelihood of a nephrologist visit is lowest in the MarketScan population. *Figures 3.2–4*; see page 167 for analytical methods.

December 31 point prevalent Medicare (age 66 & older) & MarketScan & Ingenix i3 (age 50–64) patients, surviving all of the listed year.
In the year after being diagnosed with CKD, the majority of patients—across datasets and diagnoses—visit a primary care physician. The cumulative probability of this visit ranges from 0.87 in the MarketScan population (age 50–64) to 0.95 among Medicare patients age 66 and older. Among patients with congestive heart failure in addition to their CKD, the cumulative probability of seeing a cardiologist within a year ranges from 0.72 among MarketScan patients to 0.83 in their Medicare counterparts.

While these patients have diagnosed CKD, the probability of nephrologist evaluation within a year of diagnosis is alarmingly low; patients in each cohort are more likely to see a cardiologist. In the CKD population as a whole, for example, approximately one in three Medicare and Ingenix i3 patients receive nephrology care; the probability drops to 0.28 for MarketScan patients. Figures 3.5–8; see page 168 for analytical methods. Medicare (age 66 & older) & MarketScan & Ingenix i3 (age 50–64) patients with CKD identified in 2007.
In the Medicare CKD population (age 65 and older), the cumulative probability of a urine microalbumin test at month 12 rises from 0.31 in patients with CKD of Stages 1–2 to 0.37 for those with Stage 3–5 CKD; in the younger Ingenix i3 population, in contrast, there is little difference by stage, with a probability of 0.39–0.40.

For the other laboratory evaluations examined here, the cumulative probability of testing at month 12 is consistently higher for Medicare CKD patients than for their counterparts in the Ingenix i3 database. Most Medicare patients with CKD, for example, receive creatinine testing, with an overall probability of 0.95. Testing is less frequent in the Ingenix i3 population, with a probability of 0.75 overall, and of 0.81 for patients with early-stage CKD.

In both datasets, the probability of calcium/phosphorus and parathyroid hormone (PTH) testing is considerably higher for patients with CKD of Stages 3–5 than for those with Stages 1–2. *Figures 3.9–12; see page 168 for analytical methods.* Medicare (age 65 & older) & Ingenix i3 (age 50–64) patients with CKD.
The cumulative probability of a Medicare CKD patient receiving lipid testing by month 12 is 0.71, regardless of CKD stage. For Ingenix i3 patients, the probability falls from 0.68 for Stages 1–2 to 0.62 for Stages 3–5. The probability of glycosylated hemoglobin (A1c) testing in the Medicare CKD population is also the same regardless of CKD stage, at 0.83, while among Ingenix i3 patients it ranges from 0.74 for patients in the later stages of CKD to 0.78 for those with Stages 1–2.

Hemoglobin testing among CKD patients is less likely in the Ingenix i3 population than it is for Medicare patients, at 0.68–0.72 compared to 0.88–0.93. The same is true for iron saturation testing, with a probability of 0.19 for Ingenix i3 patients with CKD of Stages 3–5, and of 0.30 for their Medicare counterparts. *Figures 3.13–16* see page 168 for analytical methods. Medicare (age 65 & older) & Ingenix i3 (age 50–64) patients with CKD.
These figures present data on medication use among CKD patients age 20–64 in employer group health plans. Among those with a diagnosis of diabetes or hypertension, 74–83 and 69–78 percent, respectively, have evidence of ACEI/ARB/renin inhibitor use; this is about 20 percentage points more than CKD patients without these diagnoses. Data in Chapter Seven, however, suggest that use decreases as CKD progresses towards ESRD.

Beta blockers are used by 67–80 percent of patients with CKD and congestive heart failure, and 40–54 percent of those with CKD and hypertension. In general, use is higher among Stage 3–5 CKD patients than among those with CKD of Stages 1–2.

Dihydropyridine calcium channel blocker use is also higher later in the course of CKD. Approximately one in three CKD patients with hypertension uses this medication.

Among patients with CKD and either diabetes or cardiovascular disease, 57–72 percent receive a lipid lowering agent — higher than the 47–49 percent of CKD patients overall. While use again rises by CKD stage, data from Chapter Seven show that just over 30 percent of CKD patients are on a lipid lowering agent in the first quarter after ESRD diagnosis, suggesting that some patients are taken off these medications when dialysis is initiated.  

**Figures 3.17–20:** See page 168 for analytical methods. Point prevalent MarketScan & Ingenix i3 CKD patients age 20–64.
Potassium-sparing diuretics or combination diuretic products (e.g., potassium-sparing plus thiazide diuretics) are rarely used in patients in any stage of CKD. Thiazide diuretics, in contrast, are used in more than 30 percent of CKD patients, and with almost equal frequency regardless of CKD stage — a surprising finding, given that they are generally not effective as a single agent in patients with an eGFR less than 30 ml/min/1.73 m². Use of loop diuretics is substantially higher among patients in the later stages of CKD, but is still at less than 40 percent.

Fewer than 15 percent of patients with Stage 3–5 CKD use an erythropoiesis stimulating agent (ESA), either EPO or DPO. Use of oral vitamin D is also low. Fewer than 10 percent of Stage 3–5 CKD patients receive calcitriol, paralleling the use of paricalcitol/doxercalciferol, and less than 0.5 percent receive an oral vitamin D nutritional supplement.

While few CKD patients receive phosphate binders in the year after the CKD-defining entry period, data in Chapter Seven show that use escalates in the two quarters prior to ESRD. Figures 3.21–3.24: See page 168 for analytical methods. Point prevalent MarketScan & Ingenix i3 CKD patients age 20–64.

**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. *)
- 585.6: Chronic kidney disease, unspecified

* In USRDS analyses, patients with ICD-9-CM code 585.6 are considered to have code 585.5. See Appendix A for details.

CKD stage estimates are from a single measurement. For clinical case definition, abnormalities should be present ≥ 3 months.
Twenty-five percent or more of patients with CKD defined by diagnosis codes and who are taking statins have total and LDL cholesterol exceeding the risk factor target levels for intervention of 200 and 100 mg/dl, respectively. *Figure 3.25; see page 168 for analytical methods. Prevalent Ingenix i3 CKD patients age 50–64, 2008. The lower & upper boundaries of the box indicate the 25th & 75th percentiles, the line within the box marks the median, & error bars represent the 10th & 90th percentiles.

Seventy-eight percent of CKD patients using statins have a controlled total cholesterol (less than 200 mg/dl), while 66 percent have a controlled LDL (less than 100 mg/dl). These numbers rise to 80 and 71 percent among patients with a combined diagnosis of CKD, diabetes, and congestive heart failure. *Figure 3.26; see page 168 for analytical methods. Prevalent Ingenix i3 CKD patients age 50–64, 2008.
Glycosylated hemoglobin (A1c) levels are lowest in diabetic patients using thiazolidinediones, and highest in those on insulin. Levels do not differ significantly in the presence of congestive heart failure. *Figure 3.27* see page 168 for analytical methods. Prevalent Ingenix i3 CKD patients age 50–64, 2008. The lower & upper boundaries of the box indicate the 25th & 75th percentiles, the line within the box marks the median, & error bars represent the 10th & 90th percentiles.

Just 28–29 percent of diabetic CKD patients using insulin have a controlled glycosylated hemoglobin (A1c) of less than 7 percent. This rises to 43–45 percent among patients using sulfonylureas, and to 50–53 percent among those using thiazolidinediones. *Figure 3.28*; see page 168 for analytical methods. Prevalent Ingenix i3 CKD patients age 50–64, 2008.
Overall and in the diagnosed CKD population, the likelihood of a nephrologist visit is lowest in the MarketScan population. **Figure 3.4**

In the CKD population as a whole, approximately one in three Medicare and Ingenix i3 patients will receive nephrology care; the probability drops to 0.28 for MarketScan patients. **Figure 3.5**

In the Medicare CKD population (age 65 and older), the cumulative probability of a urine microalbumin test at month 12 rises from 0.31 in patients with CKD of Stages 1–2 to 0.37 for those with Stage 3–5 CKD; in the younger Ingenix i3 population, in contrast, there is little difference by stage, with a probability of 0.39–0.40. **Figure 3.9**

Beta blockers are used by 72 percent of patients with CKD and congestive heart failure, and 45 percent of those with CKD and hypertension. In general, use is higher among Stage 3–5 CKD patients than among those with CKD of Stages 1–2. **Figure 3.18**

Twenty-five percent or more of patients with CKD defined by diagnosis codes and who are taking statins have total and LDL cholesterols exceeding the risk factor target levels for intervention of 200 and 100 mg/dl, respectively. **Figure 3.25**

Glycosylated hemoglobin (A1c) levels appear lowest in diabetic patients using thiazolidinediones, and highest in those on insulin. **Figure 3.28**