As you float now, where I held you and let go, remember when fear cramps your heart what I told you: lie gently and wide to the light-year starts, lie back, and the sea will hold you.
The dialysis provider network continues to transform dramatically. On the next page we illustrate major changes over the past decade, showing consolidations that have resulted in two large, for-profit chains which now treat 60 percent of the dialysis population. Some of these ownership changes have already been documented on the Medicare costs reports, while a number of units announced as being owned by the larger chains have yet to provide final reports illustrating the transfer. On the following pages we present data on the length of time units have been under their current ownership, an issue which influences the policies and practices of individual units, as new owners imprint their own systems of care.

Anemia management has received increased attention in the last several years, with recent clinical trials showing adverse outcomes when hemoglobin levels are targeted to 13 g/dl and above. We have assessed this area in the last two ADRs, demonstrating how frequently target hemoglobin levels are exceeded, and showing that up to 40 percent of incident patients exceed 14 g/dl in the first six months of hemodialysis (see Chapter Five for additional data). This year we again look at new patients beginning ESRD therapy on dialysis, and address the likelihood of exceeding a hemoglobin of 12 g/dl as well as of falling below 10 g/dl once reaching 10 g/dl. On a provider level, DCI is the most consistent in meeting target hemoglobin levels, which we have assessed at between 10–12 g/dl; in 2006, the percentage of its patients with levels of 10–12 g/dl was higher than that found in other providers, and their patients remained at this level for longer periods of time.

The odds of exceeding a hemoglobin of 12 g/dl once reaching 11 g/dl are shown in Figure 10.9. In 2006, patients treated in DCI units were the least likely to exceed not only 14 g/dl, but also 13 and 12 g/dl. Patients in DaVita units were the most likely to go above levels of 13 and 14 g/dl. With the new FDA labeling for ESAs implemented in 2007, these patterns may begin to undergo significant changes.

Epoetin alpha’s ability to help patients avoid transfusions was the primary reason for its FDA approval in 1989. Now that anemia management is being addressed with ESAs and iron replacement, transfusion rates have been falling. Variations by provider may be due to different anemia treatment protocols, as well as to the medical complications of the patient population. The relationship of these rates to achieved hemoglobin levels reported on the ESA claims is less clear; DaVita patients, for example, tend to have higher hemoglobins compared to DCI patients. Hemoglobin variability is receiving increased attention, and may reflect either provider dosing practices or the effects of comorbidity and hospitalization events.

Provider management of bone and mineral disorders and of anemia requires a number of laboratory tests for monitoring. The composite rate payment system — a bundled payment for all dialysis services and monthly laboratory tests — was introduced in 1982. The labs include calcium, phosphorus, and a complete blood count. K/DOQI guidelines suggest quarterly monitoring of parathyroid hormone levels, while quarterly iron saturation and ferritin testing have been suggested for the monitoring of anemia treatment (K/DOQI guidelines suggest monthly iron saturations for the initial three months of therapy). The ordering of extra tests beyond those included has grown dramatically across providers, possibly reflecting changes in medical practice since the original composite rate was determined more than 20 years ago.

This year we again assess preventive care services delivered by providers. Among patients carrying a diagnosis of
diabetes, glycemic control testing has increased 15 percent since 2002–2003, with 77 percent of patients now receiving at least four glycosylated hemoglobin tests in a year. Lipid testing in this population has grown 28 percent, with nearly one in two patients receiving two or more tests within a year.

There has been little progress made, however, in rates of influenza vaccinations. Just 60 percent of patients are vaccinated, far from the CDC target of 90 percent. Vaccinations against pneumococcal pneumonia have increased 51 percent since 2001, reaching 22 percent overall — from a high of 39 percent in RCG units to a low of 16.3 percent in those owned by DCI.

For a number of years we have presented comparisons, by provider, of mortality and hospitalization ratios, and this year we give these comparisons by geographic region as well. Also, because of the recent consolidation of providers, we present outcomes across both larger groups and individual providers. Hospitalization ratios are very similar across the large groups, yet mortality ratios differ. Patients in hospital-based units, for example, continue to have high mortality ratios, though the level is lower than reported in the 2007 ADR. Of the large dialysis organizations, RCG and DCI have significantly lower mortality and hospitalization ratios than other providers. Ratios for small dialysis organizations, assessed here at a regional level, are lower in the Pacific region. And for hospital-based units, both mortality and hospitalization ratios are greatest in the East South Central and South Atlantic regions. We will continue to investigate the differences between hospital-based units and other providers to determine whether they are due to selection bias or actual differences in outcomes.

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**Highlights**

**Figure 10.3** The overall numbers of dialysis units and patients each increased 21.1 percent between 2001 and 2005. With its purchase of Gambro in 2005, DaVita experienced the largest growth — 169 percent in the number of units, and 145 percent in the number of patients. **Figure 10.9** The risk of reaching a hemoglobin of 13 or 14 g/dl is 29 and 37 percent higher, respectively, in units owned by DaVita, compared to patients in units that are independently owned. **Figure 10.21** Patients receiving dialysis services in units owned by DaVita are the most likely to receive four or more glycosylated hemoglobin tests, at 62.3 percent, while patients in hospital-based units are the least likely, at 44.1 percent.
**Figure 10.2** Between 2001 and 2006, the rate of growth in the number of dialysis units was highest in ESRD Networks 9 (Indiana, Kentucky, and Ohio) and 14 (Texas), at 36 percent. The number of units in Network 10 (Illinois) increased by 33.1 percent, while growth of 25 percent or more was evident in Networks 6, 11, 12, and 17. Growth in the number of patients was highest in Network 14, at 32.2 percent, demonstrating a rise proportional to the network’s unit growth.

**Figure 10.3** The overall numbers of dialysis units and patients each increased 21.1 percent between 2001 and 2005. With its purchase of Gambro in 2005, DaVita experienced the largest growth — 169 percent in the number of units, and 145 percent in the number of patients. Independent units saw a growth of 8–9 percent in both unit and patient counts, while the number of patients treated in hospital-based units fell nearly 6 percent, even with a growth of 1.3 percent in the number of hospital-based units.

**Figure 10.4** The number of units remaining under the same ownership for five or more years stayed relatively steady between 2001 and 2006, rising just from 59.2 to 60.8 percent. DaVita’s rapid growth is illustrated by the increase in units owned for shorter periods of time — in 2006, 34 percent of DaVita’s units had been owned for less than one year, and 21 percent for less than two. Among independently-owned units, in contrast, nearly 60 percent of units in 2006 had been owned for five or more years, up from 55 percent in 2001.

**Figure 10.5** This figure illustrates patient distribution by unit affiliation. Nearly 63 percent of patients are treated in units owned by one of the four large dialysis organizations (LDOs), while only 6.9 percent receive therapy in a unit owned by a small dialysis organization (SDO). Hospital-based and independent units account for 11.4 and 18.8 percent of patients, respectively.
Maps of individual unit locations illustrate the dramatic changes in ownership over the past decade. The density of chain-owned units has clearly increased in the eastern and southeastern portions of the country, but also in the Midwest and the western states. Regions of lower population density, such as the Dakotas and Montana, are more likely to have non-chain and hospital-based units. Both types of units are located across the country, though many of the hospital-based units are clustered in the Upper Midwest and the Northeast.
The National Kidney Foundation’s Kidney Disease Outcomes Quality Initiative (K/DOQI) recommends a target hemoglobin of 11–12 g/dl for dialysis patients. In 2006, 49.1 percent of patients treated with EPO had an average hemoglobin value for the year within this target. By unit affiliation, this number ranges from 42.7 percent among patients treated in DaVita units to 60 percent in DCI units.

Overall, 56.8 percent of dialysis patients achieve a hemoglobin of 10–12 g/dl for three months or greater. By unit affiliation, this number is highest in units owned by DCI, at nearly 69 percent, and lowest in DaVita units, at 46 percent.

After achieving a first hemoglobin of 13 g/dl or greater, the likelihood of achieving 12 g/dl or greater in the next six months is 22 percent higher for patients receiving treatment in units owned by NNA than for those in units that are independently owned; DCI patients are 8 percent less likely to reach 12 g/dl or greater compared to patients in independent units. The risk of reaching 13 or 14 g/dl is 29 and 37 percent higher, respectively, in units owned by DaVita, compared to patients in units that are independently owned.

After achieving a first hemoglobin of 10 g/dl or greater, the likelihood of achieving a level of less than 10 g/dl in the next six months is 21 percent higher for patients receiving treatment in units owned by NNA than for those in units that are independently owned. Patients in units owned by small dialysis organizations (SDOs) are 11 percent more likely to fall below a hemoglobin of 9 g/dl than those in independent units. And hospital-based patients are 13 percent more likely to fall below 8 g/dl than those who receive treatment in independently owned units.
In the point prevalent dialysis population, 31 percent of patients use Ferrlecit for their IV iron therapy, and 54 percent are placed on Venofer. This varies, however, by unit affiliation. In units owned by Fresenius, RCG, and small dialysis organizations, Ferrlecit is used by 45–47 percent of patients, while in units affiliated with DaVita 83 percent of patients receive Venofer.

Hemoglobin levels appeared to have been more closely regulated in 2006 than in 2001. In 2001, for example, the overall standard deviation (SD) of the yearly mean hemoglobin values for all patients was 1.01, compared to 0.94 in 2006. Fresenius and DCI show the tightest control of hemoglobin levels, with standard deviations of 0.82 and 0.80, respectively, while the most poorly regulated levels occur in units that are hospital-based, at 1.08 — this is far better, however, than the standard deviation of 1.24 in 2001.

The overall percentage of dialysis patients receiving a transfusion has fallen slightly, from 16.0 percent in 2001 to 14.3 percent in 2006. The proportion of patients with transfusion events is highest in independent and hospital-based units, at 15.9 and 15.3 percent, respectively. Little difference by unit affiliation exists in the percentage of patients receiving one, two, or three or more transfusions. Overall, 14.9 percent receive at least one transfusion, while 4.8 and 3.6 percent, respectively, receive two or three or more.
Cumulative probability of five or more calcium/phosphorus tests in the first six months of dialysis, by unit affiliation

2001
2006

0.0
0.1
0.2
0.3
0.4

2001
2006

0.0
0.1
0.2
0.3
0.4
0.5
0.6

2001
2006

0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8

10.16 Parathyroid hormone (PTH) is an important regulator of calcium and phosphorus levels in extracellular fluid. In 2006, the probability of five or more PTH tests in the first six months of dialysis was highest in DaVita/Gambro and DaVita units, at 0.56 and 0.55, respectively, compared to just 0.04 in DCI units, and to 0.46, 0.33, and 0.21 in SDOs, independently-owned units, and hospital-based units, respectively.

10.17 Iron metabolism can be evaluated through the use of iron saturation tests. In 2006, the probability of a patient receiving five or more tests in the six months following initiation of ESRD therapy was 0.64 overall. In units owned by large dialysis corporations, probabilities ranged from a low of 0.28 in DCI units to a high of 0.77 and 0.76 in units owned by Fresenius and DaVita. The probability of five or more tests was high as well in units owned by small dialysis organizations, at 0.78, and in independent and hospital-based units testing probabilities were 0.59 and 0.40, respectively.
Figure 10.18 Ferritin is an important protein which allows the body to store iron; ferritin levels are a direct indication of the amount of iron being stored. In 2006, the probability of receiving five or more ferritin tests in the first six months of dialysis was 0.27 overall, ranging from 0.19 to 0.35 in units owned by large dialysis corporations.

Figure 10.19 A complete blood count (CBC) is included in the composite rate for dialysis services and is an important diagnostic tool in the assessment of disease conditions. In 2006, the overall probability of a patient receiving five or more tests was 0.11. The probability was highest in independently owned and hospital-based units, at 0.13 and 0.20, respectively. In units owned by large dialysis chain organizations, the probabilities ranged from 0.07 to 0.09.

Figure 10.20 A prothrombin time test is used primarily to determine how quickly blood clots, and is often used to identify bleeding disorders and the efficacy of anticoagulant medications. Overall, the probability of five or more tests in the first six months of dialysis was 6.7 percent in 2006; units affiliated with small dialysis organizations are the most likely to perform five or more tests, at 8.3 percent, while for units independently owned or hospital-based the probability of five or more tests in 2006 was 7.5 percent.

Chain affiliation
- **All** All units
- **F** Fresenius
- **G** DaVita/Gambro (Gambro units were purchased by DaVita in October, 2005; CMS facility survey data for 2005 do not reflect this change)
- **DV** DaVita
- **RCG** Renal Care Group (RCG units purchased by Fresenius during 2006)
- **DCI** Dialysis Clinic, Inc.
- **NNA** National Nephrology Associates
- **SDOs** Small dialysis organizations (defined as 20–99 dialysis units; unit classification not used prior to 2005)
- **Ind** Independent units
- **HB** Hospital-based units
**Diabetic care**

- **10.21** Diabetic pts receiving 4+ HbA1c tests per year (point prevalent dialysis patients)
- **10.22** Diabetic patients receiving 2+ lipid tests per yr (point prevalent dialysis pts)
- **10.23** Diabetic pts with one diabetic eye exam per year (point prevalent dialysis pts)

**Vaccinations**

- **10.24** Influenza vaccinations, by unit affiliation (point prevalent dialysis patients)
- **10.25** Pneumonia vaccinations, by unit affiliation (point prevalent dialysis pts)
- **10.26** Hepatitis B vaccinations, by unit affiliation (point prevalent dialysis pts)

**Vitamin D**

- **10.27** Cumulative prob. of vitamin D use, by unit affiliation (incident dialysis pts, 2006)
- **10.28** Total months of vitamin D use during year, by unit affiliation (pt prev dial pts)
- **10.29** Vitamin D use, by type & unit affiliation (point prevalent dialysis pts, 2006)

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**Figure 10.21–23** The proportion of dialysis patients who receive four or more glycated hemoglobin tests (HbA1c) in a year increased from 49.6 percent in 2002–2003 to 57.0 percent in 2005–2006. Patients receiving dialysis services in units owned by DaVita are the most likely to receive four or more tests, at 62.3 percent, while patients in hospital-based units are the least likely, at 44.1 percent. Nearly half of all dialysis patients receive at least two lipid tests in a year, while 42.2 percent receive a yearly eye examination.

**Figure 10.24–26** Overall influenza vaccination rates remained disturbingly low in 2006, and actually declined slightly from 2003 rates, from 60.7 to 59.9 percent. By unit affiliation, rates in 2006 ranged from a low of 55.1 percent in DaVita units to a high of 66.9 percent in those owned by DCI. Vaccination rates for pneumococcal pneumonia showed a small increase between cohort years, but remained low in the latter time period, at 21.7 percent. And only one in four patients was vaccinated for hepatitis B in 2006.

**Figure 10.27–29** In months four through nine of ESRD therapy, the cumulative probability of vitamin D use is lowest in units owned by DCI — reaching only 0.4 by month nine — and in hospital-based units. In 2006, the average total months of vitamin D use ranged from 5.8 in DCI units to 8.5–8.7 in units owned by Fresenius, DaVita/Gambro, and the SDOs. Nearly 55 percent of DCI patients use Hectorol for vitamin D therapy; in DaVita/Gambro units, in contrast, 73–77 percent receive Zemplar.
Access use at the start of ESRD therapy varies little by unit affiliation. Four in five patients beginning therapy have a catheter, while a maturing or functional fistula is reported in 31–34 percent of new patients. Arteriovenous graft use varies most across affiliations, from 6.6 percent of those treated in hospital-based units to 10.7 and 11.0 percent of those in units owned by Gambro and small dialysis organizations, respectively.

Forty-four percent of incident hemodialysis patients starting therapy with a catheter have that access replaced with an internal access during the first six months of dialysis. By unit affiliation, this number ranges from 37 percent of patients in hospital-based units to 47 percent of those treated in units owned by Fresenius/RCG.

Access use at initiation, by unit affiliation

Access use at the start of ESRD therapy varies little by unit affiliation. Four in five patients beginning therapy have a catheter, while a maturing or functional fistula is reported in 31–34 percent of new patients. Arteriovenous graft use varies most across affiliations, from 6.6 percent of those treated in hospital-based units to 10.7 and 11.0 percent of those in units owned by Gambro and small dialysis organizations, respectively.

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This year we present new breakdowns of standardized hospitalization and mortality ratios by geographic region and by large versus small dialysis organizations (LDOs and SDOs). Hospitalization ratios differ little among LDOs, SDOs, and independent facilities; hospital-based facilities have a slightly lower (but statistically significant) ratio. The mortality ratio is lower in independent facilities, and higher in those that are hospital-based. By chain, both RCG and DCI have lower hospitalization and mortality ratios than other LDOs. Within the SDOs, three census divisions (ENC, MA, and WNC) have statistically significant higher hospitalization ratios, and only the Pacific division has a statistically significant lower hospitalization ratio. This division also has the only mortality ratio that is less than one and statistically significant. Among hospital-based facilities, the ENC and SA divisions stand out as having higher hospitalization and mortality ratios.
Among small dialysis organizations, the west north central region has generally lower mortality ratios than those found in other regions. Among hospital-based facilities, the east south central region has considerably higher mortality ratios than many other regions, while the mountain region has generally lower hospitalization and mortality ratios.

Chain affiliation
All units: F Fresenius & DaVita/ Gambro (Gambro units were purchased by DaVita in October, 2005; CMS facility survey data for 2005 do not reflect this change) DV DaVita RCG Renal Care Group (RCG units purchased by Fresenius during 2006) DCI Dialysis Clinic, Inc. NNA National Nephrology Associates SDOs Small dialysis organizations (defined as 20–99 dialysis units; unit classification not used prior to 2005) Ind Independent units HB Hospital-based units

To read the grids
Ratios are of column to row. In Figure 10.39, for example, the number 0.991 in column MA & row Pac is the SMR for the Mid-Atlantic division divided by the SMR for the Pacific division.

Numbers on the diagonal show each provider’s SMR or SHR for the year, with the national death or hospitalization rate as the reference.

A map of U.S. Census divisions can be found on the next page.
**Chapter Summary**

- **Percent change between 2001 & 2006 in the number of dialysis units & patients** (10.2) - 21
- **Number of units owned by the two largest chains, 2006** (10.3) - 1162
- **Percent of patients with hemoglobin of 10–12 g/dl for 3+ months, 2006** (10.8) - 57%
- **Percent of patients receiving Venofer as their IV iron therapy, 2006** (10.11) - 83%
- **Dialysis patients within the target hemoglobin of 11–<12 g/dl, 2006** (10.7) - 4 in 10
- **Percent of dialysis patients with a hgb of 10–12 g/dl for 3+ months, 2006** (10.8) - 57%
- **Percent of dialysis patients receiving at least one blood transfusion, 2006** (10.13) - 59%
- **Percent of diabetic dialysis patients receiving 4+ HbA1c tests in 2006** (10.21) - 50%
- **Percent of diabetic dialysis patients receiving 2+ lipid tests in 2006** (10.22) - 43%
- **Percent of patients receiving an influenza vaccination, 2006** (10.24) - 6 in 10
- **Percent of patients receiving an influenza vaccination, 2006** (10.24) - 46%
- **Total months of vitamin D use in 2006** (10.28) - 60
- **Percent of patients with hemoglobin of 10–12 g/dl for 3+ months, 2006** (10.8) - 8.6
- **Percent of diabetic dialysis patients receiving 4+ HbA1c tests in 2006** (10.21) - 8.5
- **Percent of diabetic dialysis patients receiving 2+ lipid tests in 2006** (10.22) - 5.8
- **Percent of patients receiving Venofer as their IV iron therapy, 2006** (10.11) - 8.5
- **Standardized hospitalization ratios, by Census Division, 2006** (10.35) - 1.6
- **Standardized mortality ratios, by Census Division, 2006** (10.35) - 1.3

U.S. Census Divisions listed on page 112–113.