chapter ELEVEN

costs of end-stage renal disease

From the west the gentle breeze will come
And the fresh leaf on boughs now bare,
Moon will wax and sun will rise,
And the stars resume their courses...
Maïre Ni Mhac an tSí, “Lament”
Total Medicare spending in 2008 rose 10.8 percent, to nearly $453.9 billion, while costs for ESRD rose 13.2 percent, to $26.8 billion — 5.9 percent of the total Medicare budget, including Part D. While this seems a significant drop in expenditure levels, the ESRD component does not contain Part D costs, as the USRDS has not yet received the 2008 Part D data. Excluding Part D from general Medicare expenditures, the ESRD program consumes 6.6 percent of the budget, a figure consistent since 2004.

Within its overall ESRD expenditures, Medicare HMO costs rose 26.8 percent in 2008, to $2.7 billion. This annual increase has been consistent since 2003, when the new Medicare hierarchical payment model, with disease burden risk adjusters, was implemented for Medicare Advantage (HMOs). The degree of growth in overall expenditures, however, has not been seen since 2004. These changes are concurrent with a 3.1 percent increase in the prevalent Medicare ESRD population in 2008, to 453,443; the non-Medicare population grew 7.5 percent, to 94,539. Per person per year ESRD expenditures rose 7.3 percent — the largest increase since 1992.

These changes will require careful consideration, as the new bundled payment system — to be implemented in 2011 — is based on the fee-for-service utilization of past years. Growth in total Medicare expenditures includes 16.4 percent for total inpatient fees, 3.6 percent for outpatient fees, 9.1 percent for physician/supplier fees, 15.4 percent for skilled nursing, 5.5 percent for home health services, and 26.7 percent for hospice services.

Recent attention to therapies with erythropoiesis stimulating agents (ESAs) has raised awareness of their costs to the healthcare system. After rising each year since 1992 (including growth of 11–19 percent in 2002–2004) to reach nearly $2 billion, Medicare ESA costs were stable in 2004–2007, and in 2008 declined to a pre-2004 level of $1.8 billion. The First Average Sale Price payment for injectables was introduced in 2004 to control the cost shifting of margins, as investigations showed that many providers had very profitable discount agreements, accounting for
significant margins paid under the Medicare system. The composite rate payment was thus re-based, and the margins generated for injectables were addressed by allowing providers to receive only 6 percent above the sale price, monitored under quarterly reporting to CMS. There have been other changes in ESA payment policies as well, including limited billing when hemoglobin levels are greater than 13 g/dl for three months. These alterations, along with regular changes in package insert warnings regarding ESA safety, have led to reductions in both ESA dosing and hemoglobin levels. As shown below, use of other intravenous drugs continued to increase in 2008 — 12 percent for IV vitamin D, 4.8 percent for IV iron, and 13.2 percent for other injectables.

This year we have added new figures illustrating racial differences in expenditure patterns, and looking at costs by modality in matched hemodialysis and peritoneal dialysis populations. These analyses explore how racial differences in service utilization in the outpatient dialysis setting may be an important consideration in the new bundled payment system, and how variations in expenditure structures for hemodialysis and peritoneal dialysis may impact the way in which providers adapt to this new system.

The last two spreads of the chapter provide information on use of the Part D Medicare prescription drug benefit in the ESRD population, addressing the most frequent claims for medications, rank order by cost, and differences in use between the dialysis and transplant populations. Part D analyses are new this year, and we will provide greater detail in the 2011 ADR.

*Figure 11.1:* See page 484 for analytical methods. Period prevalent dialysis patients.
Total Medicare costs rose nearly 11 percent in 2008 — up from a 7 percent rise the previous year — to $454 billion. ESRD costs rose 13.2 percent, to $26.8 billion, and accounted for 5.9 percent of the Medicare budget. (Starting in 2006, total Medicare costs include Part D; ESRD data here, however, do not include Part D, making ESRD’s portion of Medicare costs appear lower than in prior years. Available Part D data is examined at the end of this chapter.)

The estimated number of point prevalent Medicare ESRD patients (Figure 11.3) rose 3.1 percent between 2007 and 2008, to more than 453,000, while the non-Medicare population rose 7.5 percent, to 94,539.

In 2008, the one-year change in total Medicare spending on ESRD rose to 9.8 percent, up from 3.6 percent the previous year. Costs per person per year rose 7.3 percent, up from 1.4 percent in 2007. By type of service, 37 percent of Medicare’s ESRD dollars were spent on inpatient services in 2008, 36 percent on outpatient care, and 20.5 percent on physician/supplier costs. Total Medicare expenditures by modality also rose at a greater rate in 2008 than in the previous year. Hemodialysis costs increased 9.3 percent (compared to 3.8 percent in 2007), to $19.4 billion. After a very slight decrease in 2007, costs for peritoneal dialysis rose 8.3 percent in 2008, to $1.04 billion, while those for transplant rose 10.2 percent, to $2.08 billion — 9.2 percent of total ESRD expenditures. Per person per year costs rose 5.5 percent for hemodialysis and 7.0–7.1 percent for peritoneal dialysis and transplant, to $77,506, $57,639, and $26,668, respectively.
Estimated Medicare costs for organ acquisition have grown nearly 102 percent since 2000, reaching $648 million in 2008. Transplant costs have increased at a rate of 123 percent, to $786 million. Between 2007 and 2008, however, costs for organ acquisition fell 2.2 percent, while transplant costs rose nearly 18 percent. + FIGURE II.11; see page 484 for analytical methods. Organ acquisition costs computed from CMS hospital reports (CMS form 2552-96). Transplant costs estimated from the 5 percent Medicare sample; include inpatient costs only.

Total per person per month (PPPM) costs during the transition to ESRD rise sharply after the initiation of therapy. For Medicare patients starting therapy in 2007, costs rose from $6,811 in the month before initiation to nearly $15,000 in the month following. In the younger MarketScan population the increase was five-fold, from $6,288 to $31,904. The pattern is similar for inpatient costs during the transition, with a six-fold rise in costs for MarketScan patients. After initiation, overall PPPM costs remain nearly twice as high for MarketScan patients compared to their Medicare counterparts; inpatient costs, in contrast, are nearly equal.

Among patients beginning therapy in 2007, inpatient costs for vascular access in the month after initiation were $1,389 and $1,963 for Medicare and MarketScan patients, respectively, while costs for cardiovascular hospitalizations reached $3,309 and $7,070 — twice as high for MarketScan patients as for those with Medicare coverage. + FIGURES II.8-10; see page 484 for analytical methods. Incident Medicare (age 67 & older) & MarketScan (younger than 65) ESRD patients, 2007.
PPPM ESRD costs vary by insurer. Inpatient/outpatient costs for MarketScan patients with a transplant during 2008 reached $12,815 — 66 percent more than the $7,733 incurred by their Medicare counterparts, and 12.3 percent greater than in 2007, compared to a 2.6 percent growth in Medicare costs. At $2,530, 2008 costs for MarketScan patients with a functioning graft were the same as in 2007, but 2.8 times higher than the $899 reported for Medicare patients.

Physician/supplier costs for those with a transplant in 2008 were also higher — 25 percent — for MarketScan patients. Costs for those on dialysis or with a functioning transplant, in contrast, were 30 and 70 percent higher in the Medicare population.  

While ESRD spending continues to rise, the 2008 distribution of costs by payor was nearly identical to that in 2000, with 61 percent attributed to Medicare paid claims and 22 percent to non-Medicare costs. PPPY costs for Zemplar in 2008 were $1,954, considerably higher than costs for the other main types of IV vitamin D. IV iron costs were $792 PPPY for Ferrlecit, $719 for Venofer, and $198 for INFeD.  

Per person per month costs for erythropoiesis stimulating agents (ESAs) and IV iron, and costs for IV vitamin D, both show a distinct geographic pattern, and are highest along the Gulf Coast and the Eastern Seaboard and lowest in the western half of the country. Costs average $581 and $149, respectively, in the upper quintile.  

Unadjusted PPPM costs (dollars) for injectables, by HSA, 2008
Total per person per year (PPPY) physician/supplier costs for vascular access declined for all access types in 2008, from 0.7 percent for catheters to 7.6 percent for arteriovenous (AV) grafts. Costs related to AV fistulas continue to fall from their peak in 2006, reaching $79 PPPY in 2008. The sharp drop in PPPY graft costs seen since 1991 is attributable to the number of graft insertions being performed. + Figure II.16; see page 484 for analytical methods. Period prevalent hemodialysis patients.

Per person per year costs for vascular access services performed by surgeons have fallen 39 percent since 1995, to $39.4 in 2008. Costs for services performed by nephrologists, in contrast, continue to increase, and at nearly $22 in 2008, are 11 times greater than in 2000. Anesthesiologist costs rose 18 percent in 2008, reaching $8.33. + Figure II.17; see page 484 for analytical methods. Period prevalent hemodialysis patients.

Per person per year costs for vascular access events are highest for patients with an AV graft or a catheter, reaching $8,683 and $6,402 in 2008. Costs for patients with an AV fistula, in contrast, were $3,480 — 60 percent lower than those for AV graft patients. Costs rose 7–17 percent for hemodialysis patients, but fell nearly 32 percent for those with a peritoneal dialysis catheter. + Figure II.18; see page 484 for analytical methods. Dialysis patients (Medicare); ESRD CPM data.

Per person per year total costs are greatest for patients with a catheter or AV graft, at $90,110 and $79,337 in 2008. Costs for patients with an AV fistula are 28 and 18 percent lower, respectively, at $64,701. After a growth in 2007 of 3.3 percent for catheter patients and 1.0–1.7 percent for those with a fistula or graft, costs in 2008 rose 12.8 and 8.2–8.6 percent. + Figure II.19; see page 484 for analytical methods. Dialysis patients (Medicare); ESRD CPM data.

Unadjusted per person per year costs for hospitalizations due to vascular access infection show no clear geographic pattern across the United States. Costs range from an average of $587 in the lowest quintile to $1,976 in the upper quintile. + Figure II.20; see page 485 for analytical methods. Period prevalent hemodialysis patients, 2008; unadjusted.

Unadjusted per person per year costs for vascular access costs ($) for vascular access infectious hospitalizations, by HSA, 2008.
Total per person per year (PPPY) outpatient expenditures in the prevalent dialysis population do not vary widely by race. In 2008, for example, costs were $29,063 for white patients, $30,821 for African Americans, and $28,132 for those of other races. *Figure II.21*; see page 485 for analytical methods. Period prevalent dialysis patients.

In the prevalent dialysis population, per person per year (PPPY) costs for laboratory tests are nearly equal for white and African American patients, at $1,737 and $1,707, respectively, in 2008. Costs for IV iron are also similar, at $714 and $752. Expenditures for erythropoiesis stimulating agents (ESAs) and IV vitamin D, in contrast, differ more by race. In 2008, African American dialysis patients incurred $6,277 PPPY for ESAs, 15 percent higher than the $5,455 incurred by white patients. And IV vitamin D costs reached $1,824 PPPY for African Americans, 78 percent greater than the $1,024 reported for whites.

Per person per year IV antibiotic costs in 2008 were $14.43 for white patients and $12.89 for African Americans; costs for patients of other races were $10.40 per patient per year. And costs for other injectables in 2008 were $194 overall and $222 and $166, respectively, in whites and African Americans.

The wide variations seen in PPPY costs for IV antibiotics and other injectables over time may in part be attributable to changes in payment rules and pricing limits instituted by CMS. *Figures II.22-27*; see page 485 for analytical methods. Period prevalent dialysis patients.
In 2008, total per person per year (PPPY) costs for inpatient hospitalizations differed little between white and African American patients, at $27,446 and $27,282, respectively. Hospitalization costs among patients of other races, however, were 15–16 percent lower, at $23,083. *Figure 11.28; see page 485 for analytical methods. Period prevalent dialysis patients.*

PPPY costs for cardiovascular hospitalizations have converged over time for white and African American dialysis patients, reaching $7,534 and $7,375 in 2008. Hospitalization costs for heart failure and fluid overload in 2008 were $1,860 overall and $1,877 and $1,903, respectively, in whites and African Americans. *Figure 11.29; see page 485 for analytical methods. Period prevalent dialysis patients.*

Overall PPPY hospitalization costs for infections have remained similar over time among white and African American dialysis patients, reaching $7,165 and $7,185 in 2008. Costs for hospitalizations related to bacteremia/septicemia stabilized in the later 1990s before beginning a steady increase; they have, however, also remained similar by race, reaching $2,328 for white patients and $2,178 for African Americans in 2008. PPPY expenditures for vascular access infections, in contrast, have remained higher among African American patients, in 2008 reaching $1,813—42 percent greater than the $1,279 incurred by their white counterparts. Costs for hospitalizations related to pneumonia show a different pattern by race; in 2008 they were 30 percent higher among white patients, at $904 compared to $698. *Figures 11.30–33; see page 485 for analytical methods. Period prevalent dialysis patients.*
In 2008, per person per year (PPPY) outpatient dialysis expenditures were 6.0 percent higher in African Americans than in whites, at $30,821 and $29,063, respectively. When comparing costs by modality in unmatched dialysis populations, those for hemodialysis were 26 percent higher than those for peritoneal dialysis. This difference was sustained among hemodialysis patients matched to peritoneal patients, at 25 percent for whites and 28 percent for African Americans. Figure II.34; see page 485 for analytical methods. Period prevalent dialysis patients, 2008.

In 2008, per person per year costs for laboratory tests were greater in both matched (hemodialysis to peritoneal dialysis) and unmatched hemodialysis populations than for patients on peritoneal dialysis. The difference, however, varies by race. In unmatched populations, costs for hemodialysis patients compared to peritoneal patients are 9.5 percent greater for whites, and 8.9 percent greater for African Americans. In matched dialysis populations, costs are 6.3 and 10.2 percent greater, respectively.

Costs for erythropoiesis stimulating agents (ESAs) are higher for hemodialysis than for peritoneal dialysis, and greater in African Americans than in whites. When comparing costs in unmatched hemodialysis and peritoneal populations, those for hemodialysis are 81.1 and 47.0 percent greater in whites and African Americans, respectively; in matched hemodialysis and peritoneal populations, hemodialysis costs are 76.0 and 48.8 percent higher.

Intravenous iron costs in matched dialysis populations are six times higher for hemodialysis patients than for peritoneal dialysis patients in both white and African Americans. Antibiotic costs for whites and African Americans in matched dialysis populations are 24 and 12 percent higher, respectively, for hemodialysis patients compared to those on peritoneal dialysis. Figures II.35–40; see page 485 for analytical methods. Period prevalent dialysis patients, 2008.
Per person per year (PPPY) inpatient dialysis expenditures are similar in whites and African Americans, at $27,446 and $27,382, respectively. Costs for unmatched hemodialysis populations are greater than those on peritoneal dialysis — 24 percent higher for whites, and 8 percent for African Americans. In matched dialysis populations, costs for whites on hemodialysis are 3 percent greater than costs for those on peritoneal dialysis, but are 7 percent lower in African Americans. *Figure II.41; see page 485 for analytical methods. Period prevalent dialysis patients, 2008.*

PPPY costs for cardiovascular and heart failure/fluid overload hospitalizations in unmatched and matched dialysis patients are greater for hemodialysis patients than for peritoneal patients. When compared to those of peritoneal dialysis patients, cardiovascular costs for matched hemodialysis patients are 8 and 11 percent greater, respectively, for whites and African Americans. *Figure II.42; see page 485 for analytical methods. Period prevalent dialysis patients, 2008.*

In both unmatched and matched dialysis populations, 2008 hospital costs for all infections are less for hemodialysis than for peritoneal dialysis. In the unmatched populations, hemodialysis costs are 8 percent lower for whites and 27 percent lower for African Americans, while in the matched populations, costs are 24 percent lower for whites and 41 percent lower for African Americans.

Hospitalization costs for bacteremia/sepsis in both unmatched and matched populations, in contrast, are greater for hemodialysis than for peritoneal dialysis. In the unmatched populations, hemodialysis costs are 73 percent greater for whites and 98 percent greater for African Americans. Differences in the matched dialysis populations are not as extreme, yet costs for hemodialysis patients remain 28–29 percent higher. *Figures II.43–46; see page 485 for analytical methods. Period prevalent dialysis patients, 2008.*
Total Part D Medicare expenditures reached $51.3 billion in 2007, and ESRD patients accounted for $1.3 billion — 2.4 percent — of these costs.

Not all drugs are covered through Part D. Notable exclusions include all over-the-counter medications (e.g. calcium carbonate), benzodiazepines, weight gain drugs, and vitamins and minerals (e.g. kidney-specific multivitamins, cholecalciferol, ergocalciferol, and phosphorus supplements). Prenatal vitamins and oral vitamin D hormones (calcitriol, paricalcitol, doxercalcirol) are covered, but not all plans cover all available products. In 2007, sevelamer HCl, cinacalcet, lanthanum carbonate, and calcium acetate — drugs used in bone and mineral disorder management — were in the top ten drugs in terms of total cost, accounting for $363 million. 

![Figure II.47](image)

### Table II.44

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<th>By net cost</th>
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PAGE 378

COSTS OF END-STAGE RENAL DISEASE

OVERVIEW OF MEDICARE PART D COSTS
Although beta blockers are used in a higher percentage of patients (see Chapter Five), Part D costs in 2007 were highest for dihydropyridine calcium-channel blockers (DP-CCBs). This reflects the fact that amlodipine recently went off patent, and that metoprolol (the most frequently used ESRD Part D drug in 2006–2007) has been available as a generic since the 1990s.

Following patterns of use, cardiovascular drug costs are lowest in white patients, and highest in African Americans and patients of other races. In the 2007 dialysis population, overall net Medicare Part D costs for the four cardiovascular drug classes were $31.30, $36.13, and $41.69 per person per month for whites, African Americans, and patients of other races, respectively, compared to $26.37, $38.71, and $33.35 in the transplant population.  

Following the patterns of medication use illustrated in Chapter Five (Figures 5.31–32), Medicare Part D net costs for statins far outweigh combined net costs for fibrates, bile acid sequestrants, cholesterol absorption inhibitors, and other cholesterol-lowering medications. Among white dialysis patients, for example, costs for statins reached $12.78 PPPM in 2007, compared to $4.24 for all other lipid lowering agents. In the African American transplant population, statin costs reached $17.04, compared to $5.53 for other agents. Use of lipid lowering agents is considerably higher in the transplant population than among dialysis patients.  

Following prevalent ESRD patients, enrolled in Part D all of 2007.
Oral cholecalciferol, ergocalciferol, and other precursor vitamin D products are categorized as vitamins and are excluded from the standard Part D benefit; we thus do not include them in these figures. Doxercalciferol, paricalcitol, and calcitriol, in contrast, are considered hormones under Part D and are covered under the standard Part D benefit, but individual plans are not required to carry all three products or all dosage forms. In 2007, the majority of dialysis patients received intravenous versions of these products during dialysis sessions. Dialysis-administered IV vitamin D is covered under Medicare Part B, not Part D, so these costs are also excluded from these figures. In 2007, use of oral vitamin D hormone was low in both the dialysis and transplant populations (see Chapter Five, Figures 5.33–34); PPPM costs were also comparatively low. + Figures II.52–53; see page 486 for analytical methods. Point prevalent ESRD patients, enrolled in Part D all of 2007.

Costs for phosphate binders are relatively high in the dialysis population. (Generic products were not available for these phosphate binders in 2007.) In 2007, PPPM net costs for sevelamer ranged from $53.21 in dialysis patients 75 and older to $112.75 in those 20–44. Costs were similar in whites and African Americans, at $83.60 and $86.98, and reached $113.35 in patients of other races. Although use of calcium acetate is 2–4 times higher than that of lanthanum carbonate (see Chapter Five, Figure 5.35), overall PPPM costs for calcium acetate are lower because of its lower market price.

Net PPPM costs for phosphate repletion agents in transplant patients are low, reflecting the low percentage of transplant patients using these products through Medicare Part D (see Figure 5.36 in Chapter Five). + Figures II.54–55; see page 486 for analytical methods. Point prevalent ESRD patients, enrolled in Part D all of 2007.
As shown in Table 11.a, insulin therapy is among the top three Part D prescription drugs by both frequency and net cost. Among dialysis patients with diabetes, PPPM net costs for insulin decline as age increases, although the percentage of patients using insulin does not vary as much by age (see Chapter Five, Figure 5.37). This suggests that newer, more expensive insulin products are being used in younger dialysis patients. By modality, insulin PPPM costs are higher in transplant patients, also suggesting a greater use of new agents.

In the transplant population, costs for thiazolidinediones (TZDs) are far lower than those for insulin. Costs are closer in the older dialysis population. No generic TZD products were available during 2007.

PPPM costs for cinacalcet, currently the sole calcimimetic on the market, rivaled that of sevelamer in 2007. Net costs decrease with age, from $107.86 in patients age 20–44 to $32.34 in those 75 and older. Costs by race are highest in African Americans, at $92.16 compared to $50.83 in whites and $52.20 among patients of other races.

In the transplant population, PPPM costs for diuretics are relatively low, despite high use (see Chapter Five, Figure 5.40). This reflects the wide availability of generic diuretics. Costs increase with age, paralleling patterns of use.
In 2008, the one-year change in total Medicare spending on ESRD rose to 9.8 percent, up from 3.6 percent the previous year. \textit{Figure} II.4

Between 2007 and 2008, estimated organ acquisition costs fell 2.2 percent, to $648 million; transplant costs, in contrast, rose nearly 18 percent, to $786 million. \textit{Figure} II.11

Inpatient/outpatient costs for MarketScan patients with a transplant during 2008 reached $12,815 — 66 percent more than the $7,733 incurred by their Medicare counterparts. \textit{Figure} II.12

Per person per year total costs are greatest for patients with a catheter or arteriovenous graft, at $90,110 and $79,337 in 2008; costs for patients with an AV fistula are 28 and 18 percent lower, at $64,701. \textit{Figure} II.19

In 2008, African American dialysis patients incurred $6,277 per person per year for erythropoiesis stimulating agents, 15 percent higher than the $5,465 incurred by white patients. \textit{Figure} II.23

Per person per year costs for cardiovascular hospitalizations have converged over time for white and African American dialysis patients, reaching $7,534 and $7,375 in 2008. \textit{Figure} II.29

Costs for erythropoiesis stimulating agents are noticeably higher for hemodialysis (both matched and unmatched populations) than for peritoneal dialysis, and greater in African Americans than in whites. \textit{Figure} II.36