

# Chapter X

## The Economic Cost of ESRD and Medicare Spending for Alternative Modalities of Treatment

*Key Words:*

Transplantation  
Physician specialty  
Peritoneal dialysis cost  
Cost of ESRD

Hemodialysis cost  
Medicare claims  
Physician and supplier files  
Consumer price index

This 1998 Annual Data Report (ADR) of the USRDS updates last year's analysis of the economic cost of End-Stage Renal Disease (ESRD) and Medicare spending for alternative treatment approaches. 1996 data are now included, as are Medicare inpatient "pass through" payments for costs such as medical education and capital investments. In addition to updating previously reported information, a detailed breakout of physician/supplier spending by physician specialty and supplier type is reported for the first time. This chapter is divided into three sections. In the first section, we present estimates of the total monetary cost of direct patient care for patients in the United States with ESRD. In addition, there is a presentation of recent shifts and trends in these estimates of total direct cost of treating ESRD. These total direct cost estimates are derived from paid Medicare claims and other estimates including private resource use for direct patient care. Therefore, these cost estimates take the perspective of the payers.

The second section provides estimates of Medicare spending (payments) per time at risk on an "intent-to-treat" basis for ESRD treatment alternatives stratified by several patient

characteristics. The data in this study are derived from the USRDS database which contains information from the Medicare payment records as well as extensive epidemiological patient histories. The objective is to compare and contrast Medicare reimbursements (payments) per time at risk for different modalities of renal replacement therapy and different patient characteristics. The results provide information that would be useful in the determination of "capitation" payment rates, i.e., rates of spending per patient per time at risk. However, these results, which do not provide simultaneous comparison of survival alternatives and costs and are not estimated with consideration for right censoring, are not appropriate for determination of cost effectiveness of alternative modalities of treatment (Cox).

The third section of the report provides estimates, not previously available, of Medicare physician/supplier spending by physician specialty and supplier type for the years 1992-1996. Such information can be useful in understanding care patterns for ESRD patients as well as to inform managed care organizations or physicians/suppliers who are considering entering into capitated arrangements for specialty services. (The reader

should be advised that these “physician/supplier” data do not represent the entirety of Medicare Part B spending. Much of Medicare Part B spending, e.g. outpatient dialysis and most EPO, appears as Institutional Paid Claims).

In the 1996 and 1997 ADRs an error was made in labeling physician/supplier payment rows for physician/supplier dialysis categories affecting tables K-2, K-3, K-4, and K-7. Dependent values in Table X-1 were also affected. The error also led to errors in summing hemodialysis, peritoneal dialysis, and non-dialysis payments. The Table X-1 below describes the labeling error for 1995 intent-to-treat payments in the 1997 ADR.

The error in labeling led to errors in totaling payments for hemodialysis, peritoneal dialysis and non-dialysis payments. Hemodialysis payments in 1995 incorrectly totaled \$431 million (with the error in labeling) but would correctly total \$519 million (without the error). Peritoneal dialysis payments incorrectly totaled \$448 million (with the error) but would correctly total \$524 (without the error). The total for all physician/supplier dialysis payments incorrectly totaled \$969 million rather than \$955 million. Non-dialysis payments would be affected as

follows: incorrect total \$6,938 million (with error); correct total \$6,873 million (without error).

**Methods**

**Cost of ESRD and Medicare Spending by Modality**

These studies analyze Medicare costs (= reimbursements or spending) for patients treated with hemodialysis, CAPD/CCPD, or a renal transplant. The primary focus is ESRD patients prevalent on January 1, 1992 or incident at any time during 1992, 1993, 1994, 1995, or 1996. Patient age, gender, race, and cause of ESRD were obtained from the USRDS database. Treatment modality was determined using the Modality Sequence file from the USRDS database (See Chapter XIII). A secondary analysis focuses on total spending for 1996.

The total cost of direct medical care resources was estimated by combining the paid claims for Medicare-insured ESRD patients with other cost estimates of resource use. These other estimates included: 1) Medicare payments for ESRD patients not included in the paid claims system, 2) Medicare

**Effect of Labelling Errors in 1997 ADR  
Table X-1 on 1995 Intent-To-Treat  
Physician/Supplier Payments**

<b>PAYMENT VALUE IN MILLIONS</b>	<b>CORRECT LABEL</b>	<b>LABEL AS READ IN THE 1996 &amp; 1997 ADR*</b>
\$431	Hemodialysis	Hemodialysis
\$11	PD Catheter	Hemo. Home Supply
\$77	Hemo. Home Supply	Hemo. Unit Supply
\$0	Hemo. Unit Supply	Peritoneal Dialysis
\$76	Peritoneal Dialysis	PD Catheter
\$448	PD Home Supply	PD Home Supply

\* Table X-1 from the 1997 ADR

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Table X-1

patient obligations, 3) payments for patients enrolled in Employer Group Health Plans (EGHP) for whom Medicare is the “Secondary Payer” (MSP) for insurance, and 4) payments for ESRD patients residing in the United States who were not insured by Medicare. For the first time, inpatient institutional spending includes the Medicare “pass through” payments to hospitals for cost-based items such as medical education, capital investments, and malpractice insurance.

Medicare paid claims, used in both the cost of ESRD and the Medicare payments analyses, were obtained from HCFA Standard Analysis Files (SAF; HCFA 1993). These files are constructed for each year of service (determined by the service “to date” listed on the paid claim, where applicable) and are based on all final paid claims listed in the Common Working File by the end of July of the following year (HCFA 1993). The SAFs are organized by year and include all Medicare patients. This project used the SAFs for the calendar years 1992-96.

In order to identify all Medicare ESRD patients, a “finder file” was constructed that separated claims for ESRD patients from all other Medicare patients. This finder file, constructed from the patient identification numbers (IDs) in HCFA’s REBUS, yielded 560,637 patient IDs for the period 1977-96 after screening out deaths occurring before 1/1/92. Changes in patient IDs were tracked using information included in HCFA’s Enrollment Database (HCFA 1993). SAF (paid, final) claims were extracted for 558,132 patients in the 1992-96 period.

The SAFs are comprised of 7 files with claims classified as (originating from): 1) inpatient institutional, 2) outpatient institutional, 3) skilled nursing facility, 4) hospice, 5) home health agency, 6) physician and other supplier, and 7) durable medical equipment, which includes dialysis supplies, parenteral nutrition claims, iron supplement claims, and claims for immunosuppressives administration and supplies.

These SAF files, as selected by the finder file, contain claims for 558,132 patients and 1,092,679 patient years at risk during 1992-96. Using these estimates, Medicare spending for the 1992-96 period totaled \$40.18 billion including the “pass through” on inpatient claims.

Categories of payment in the reference tables in Section K and in Chapter X are classified as follows: for institutional claims, claims from the Inpatient HCFA SAF are categorized as Non-Transplant

Inpatient if they have a DRG other than 302 and as Transplant Inpatient if they have a DRG of 302. Claims from the HCFA Outpatient institutional SAF are categorized as Outpatient institutional if they have no dialysis revenue center code as Hemodialysis - Institutional, Peritoneal Dialysis - Institutional, or Other Dialysis - Institutional based on their revenue center code (note that payments for EPO that were included in these institutional claims cannot be separated from other institutional costs). The Skilled Nursing Facility, Home Health Agency, and Hospice categories are based on the HCFA SAF from which they are derived.

The physician/supplier claims are categorized based on the HCFA Common Procedure Coding System (HCPCS) codes with the following refinements: if the HCPCS code indicates that the claim is for dialysis and the HCFA Service Code indicates that the claim is for monthly capitation payments the claim is categorized as capitation; if the HCPCS code indicates that the claim is for dialysis supplies (hemodialysis or peritoneal dialysis), the HCFA place of service code is used to separate the dialysis supply claims into home supplies vs. unit supplies; for claims whose HCPCS codes are not ESRD specific (ie dialysis, dialysis supplies, EPO, immunosuppressive drugs, PD catheter related, transplant, vascular access, parenteral nutrition, ESRD capitation, and iron supplies or administration), claims are categorized based on HCPCS for the categories transportation, diagnostic laboratory or radiology, and durable medical equipment, and on the HCFA service code for Other Surgery, Other Medical Treatment, and Other Charges. Note that for many of the physician/supplier categories such as EPO, most of the actual Medicare payments occur embedded in the payments for institutional care, principally dialysis payments in the case of EPO.

In the new disaggregation of Part B payments by physician specialty or supplier type, patients known to have MSP status or whose Part B costs were less than \$675 per year were excluded on the presumption that Medicare was their secondary payer. If Medicare were the primary payer for these patients, the monthly capitation payment for dialysis-related nephrology care should place the patient above this threshold in about four months even if they received no other Part B services.

For patients incident during any calendar year, only costs occurring on or after the first day of ESRD (as defined in the PMMIS) were included. That is,

pre-ESRD Medicare spending and pre-ESRD time at risk were not included in calculating total Medicare spending or time at risk in either the total spending or in the intent-to-treat analysis. Likewise, patients whose ESRD start date occurred during a hospitalization had a linearly pro-rated portion of the costs for that hospitalization allocated to the ESRD period. The exception is transplantation. If the first ESRD service is a kidney transplant then the entire hospital stay is included as a cost even if the first day of ESRD occurs during that hospital stay.

The study start date for a patient in the intent-to-treat analysis (limited to 1992-96) was defined as the latest of the following:

- January 1, 1992.
- The first ESRD service date in the USRDS database for the patient.
- For dialysis patients, the beginning of any 1-month period in which the Medicare paid amount for outpatient dialysis was \$675 or more.

The last constraint was designed to exclude patients who were likely to have a Medicare Secondary Payer status even though the Medicare Enrollment Database did not identify them as such.

Patients with MSP status on or at any time following the study start date (identified from the Medicare Enrollment Database) were excluded from the intent-to-treat analysis. These patients were treated separately and excluded from the primary intent-to-treat model because it is impossible to characterize their total costs of care from payments by Medicare. Dialysis patients with insufficient activity (defined for outpatient dialysis as less than \$675/month for three consecutive months) are censored as lost to followup at the end of the 3-month period. This limit of \$675 per month would cover 6 to 7 dialysis treatments. This threshold was chosen because patients would normally be expected to have 12-13 treatments per month and even a patient skipping a one treatment per week would have at least 8 treatments monthly. Thus, a patient that does not meet this billing threshold is unlikely to have Medicare as his/her primary payer. This threshold was at the 10<sup>th</sup> percentile of Medicare dialysis spending (institutional outpatient plus physician and other suppliers) for all patients.

In the intent-to-treat analysis, patients entered the study only once during the 1992-96 period, with the exception of transplant patients. Dialysis patients who received a transplant during the study period

were censored at the transplant date and were then moved into a separate record as a transplant patient. All payments on paid claims for inpatient transplantation were added to the transplant cost record even though the inpatient stay may have begun during a period also covered by the dialysis record. Patients who had a functioning transplant at the start of the study window were kept in that modality until death or end of study, regardless of any modality changes.

In the intent-to-treat analysis, dialysis patients were removed from the analysis at the earliest of: death; 12/31/96; transplant (censored); 3 months with less than \$675 dialysis activity (censored). Patient periods at risk were determined by the “from” and “to” dates on the payment records. Unless noted otherwise, periods at risk for mortality and incurred costs were determined for each year with patients frequently counted in more than 1 year.

HCFA estimates that the SAF files include 98 percent of paid claims in a given year (HCFA 1993, Section E2, page 15). To account for this, the total dollar amount of SAF claims, as reported in Figure X-1, were raised by 2 percent. In order to maintain comparability to the Reference Tables, all other reported statistics are not adjusted for this reported undercount in the SAFs.

Patient financial obligations to Medicare, i.e. the coinsurance and deductible, were estimated as 18 percent of the sum of Medicare payments and patient obligations (see the 1995 ADR, Chapter X). Medicare rules for patient obligations are complicated, but generally include a nominal deductible (approximately \$100 per year) along with a 20 percent co-payment for approved outpatient charges (Part B). Inpatient (Part A) services require a deductible which approximates the allowable charge for the first hospital day. Additional patient obligations accrue for hospital stays longer than 60 days.

Kidney donor acquisition costs are not paid by Medicare through the fee-for-service DRG claims process and therefore are not directly included in the HCFA SAFs. Medicare pays these charges by inflating the cost of all Medicare inpatient stays (both ESRD and non-ESRD) by an amount equal to the institutional acquisition cost for all Medicare transplants and other “pass through” amounts. We estimated the Medicare payments for donor acquisitions as \$25,000 per acquisition for the 8,000 kidney transplants. The latter was the sum of paid

claims for Medicare kidney transplants as recorded in the PMMIS files (6/95). The estimate of \$25,000 per donor acquisition was made through detailed examination of the annual Hospital Cost Reports filed with HCFA (Eggers). We assumed an increase of 5 percent per year in total acquisition costs from 1993-96.

Also excluded from the claims process recorded in the HCFA SAFs are charges submitted by Health Maintenance Organizations (HMO) treating ESRD patients. We have estimated these Medicare payments as: [6,000 patients \* (the sum of the Part A and Part B Adjusted Average Per Capita Costs (AAPCC) per month) \* 12]. We used the 1995 AAPCC of \$1,438 per month (Part A Medicare) and \$2,040 per month (Part B Medicare) (HCFA, 1995). The 6,000 HMO patient count per year is only approximate.

Medicare makes separate payments to inpatient institutions for malpractice insurance, education, capital, and organ acquisition i.e. "pass through". Organ acquisition costs were estimated as described above. Estimates for the other three items were based on personal communication from Paul Eggers, Ph.D. at HCFA.

The intent-to-treat analysis for the entire 1992-96 period enlisted patients only once during the period, except for transplant patients as described above. Separate intent-to-treat analyses were performed for each year. Each of these annual analyses also enlisted patients only once during the period, except for transplant patients as described above. Patients who had any period of MSP status, as reported in HCFA's Enrollment Database between 1992 and 1996, were treated separately. Patients without any reported MSP during the 1992-96 period were entered into the "primary" intent-to-treat group. For both the primary intent-to-treat group and the MSP group, Medicare payments and survival times were aggregated separately but for identical periods at risk from 1992 through 1996.

Payments by Employer Group Health Insurance Plans are private (non-Federal) payments for Medicare ESRD patients and are not reported in the SAFs. We estimated these payments as follows: from the HCFA Enrollment Database, we identified the subset of Medicare patients recorded as being insured under a Medicare Secondary Payer for either all or part of the time they were included in the intent-

to-treat analysis. Some dialysis patients not identified in the HCFA Enrollment Database as having Medicare Secondary Payer status have very low dialysis billings in the HCFA claims database (see the discussion of study start time for the intent-to-treat analysis). Thus, it is likely that some MSP patients are not identified in the enrollment database and the EGHP payments identified here represent a very conservative estimate of private health insurance payments.

In this analysis, we assessed their Medicare payments per year at risk. We then calculated the difference between the average Medicare payments per year at risk for the MSP patients and the average Medicare payment per year at risk for patients without MSP status, the "primary" intent-to-treat group. This difference was taken to be the average amount paid by EGHPs for MSP patients. This result was then multiplied by the number of patient years at risk in the MSP group in order to derive an estimate of the total EGHP payments for the 1991-1994 period. One fourth of this total was assumed to arise in 1994. (See the 1996 ADR). The 1995 estimate is based on the 1994 estimate inflated by 5 percent.

The estimated expenditure for non-Medicare ESRD patients was 7.5 percent of total Medicare claims arising from all "finder file" patients plus patient obligations. This estimate of 7.5 percent is based on the count of non-Medicare dialysis patients (see Chapter XI) and non-Medicare incident kidney transplants.

Unless otherwise stated, spending accruing in different years has not been adjusted for inflation or discounted. Thus, the dollar amounts reported can be interpreted as approximating 1994 U.S. dollars. When 1996 estimates are provided these are 1996 current dollars.

Rates of increase in Medicare spending per patient year at risk were estimated from the primary intent-to-treat analysis by aggregating yearly spending estimates and yearly time at risk. The ratio of these estimates provides an estimate of the spending per patient year. This estimate is unadjusted for changes in patient characteristics, including age, sex, race, and diabetes. These estimates of spending change are compared to rates of change in the consumer price index as reported by the U.S. Department of Labor.

<b>Total Medicare Payments for ESRD by Source of Claim, 1992-96</b>			
<b>Category of Spending by Source of Claim</b>	<b>1996</b>	<b>Medicare Spending<sup>c</sup></b>	
	<b>Total SAF Payments<sup>a</sup></b>	<b>\$/Year at Risk</b>	
	<b>No Restrictions<sup>b</sup></b>	<b>Intent-to-Treat</b>	
	<b>\$Millions</b>	<b>1992-96</b>	<b>1996</b>
<i>Patient years at risk (YAR)</i>	<i>N.A.</i>	<i>827,565</i>	<i>192,965</i>
<b>Total Medicare Payments<sup>^</sup></b>	<b>\$9,960</b>	<b>\$41,376</b>	<b>\$44,187</b>
<b>Total - Institutional<sup>^</sup></b>	<b>8,032</b>	<b>33,398</b>	<b>35,797</b>
Inpatient <sup>^</sup>	3,798	15,917	16,490
Non-transplant inpatient <sup>^</sup>	3,478	14,234	15,020
Transplant inpatient <sup>^</sup>	190	954	931
Outpatient Institutional	407	1,590	1,781
Skilled Nursing Facility	223	644	985
Home Health Agency	348	1,118	1,539
Hospice	10	28	33
All Dialysis - Institutional	3,247	14,103	14,968
Hemodialysis - Institutional	2,956	12,765	13,664
Perit Dial - Institutional	286	1,308	1,281
Other Dial- Institutional	5	29	23
<b>Total - Physician/Supplier (Part B)</b>	<b>1,928</b>	<b>7,978</b>	<b>8,390</b>
Dialysis Physician/Supplier	236	1,152	1,014
Total Hemo - Physician/Supplier	112	579	485
Hemodialysis - Physician/Supplier	95	477	419
Hemodialysis - Home Supply	17	101	65
Hemodialysis Unit Supply	0	1	0
Total PD - Physician/Supplier	125	573	529
Non-dialysis - Physician/Supplier	1,692	6,826	7,377
PD Catheter - Physician/Supplier	3	12	11
Capitation - Physician/Supplier	330	1,212	1,478
Vascular Access - Physician/Supplier	115	544	509
Transplant - Physician/Supplier	20	31	29
Immunosuppressive - Physician/Supplier	39	108	183
Parenteral Nutrition	14	249	63
Other Surgical - Physician/Supplier	240	946	1,032
Other Medical - Physician/Supplier	272	1,017	1,160
Transportation - Physician/Supplier	186	833	846
Diag Lab/Rad - Physician/Supplier	297	1,247	1,316
DME - Physician/Supplier	85	291	371
Other Physician/Supplier	88	332	375

<sup>^</sup> with Hospital Pass Through; Medicare payments added to the DRG amount including kidney acquisition costs, medical malpractice insurance and medical education cost.

<sup>a</sup> 303,763 patients

<sup>b</sup> No Restrictions on Medicare Secondary Payer or \$/Month

<sup>c</sup> Excludes Medicare Secondary Payer

Source: Reference Tables K.1 and K.7

**Table X - 2**  
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**Table X-2**

## Results

### Financial Expenditures for Direct Patient Care of ESRD Patients in the United States, 1991-95

The Medicare SAF paid claims for ESRD patients totaled \$6.25 billion in 1992, \$7.10 billion in 1993, \$7.93 billion in 1994, \$8.94 billion in 1995, and

\$9.60 billion in 1996 for a total of \$40.18 billion over the 5-year period. The 1992-1995 totals were slightly higher than those reported last year (1997 ADR) due to the inclusion of inpatient pass through payments. The difference declined steadily over time, beginning at \$0.15 billion in 1992 and ending at \$0.11 billion in 1995. Our primary intent-to-treat analysis (excluding Medicare Secondary Payer patients and other patients with short or unusual periods of eligibility) included 86 percent of the total payments from 1992-96. The

remaining 14 percent includes the amount paid by Medicare as a secondary payer and for patients who were not included in the intent-treat-model due to either loss to followup or an uncertain modality assignment.

The first column of Table X-2 presents estimates of the total 1996 direct monetary cost of medical care for United States ESRD patients aggregated from HCFA paid SAF files. There are no restrictions for MSP or for periods of eligibility of any kind. These costs are the total payments by Medicare for all identified ESRD patients. The costs are subdivided into several categories of institutional payments (institutional source and dialysis) and several categories of physician/supplier payments (dialysis, ESRD related treatment such as vascular access, and other treatments). Among these categories, several show notable changes in 1996 compared to previous years. Payments to Skilled Nursing Facilities, Home

Health Agencies, and Hospices, while still representing a small share of ESRD spending, continue to rise rapidly (figures for 1992-96 can be found in Reference Table K-1). One category, physician capitation payments, experienced a substantial change in its trend. This category primarily consists of monthly capitation payments received by nephrologists for managing dialysis patients. From 1992-95, these payments were growing by about 8-10 percent annually (roughly the rate of increase in the number of patients). In 1996, these services were added to the Medicare fee schedule for physician payment and received a considerable raise. As a result, physician capitation payments rose by nearly 40 percent between 1995 and 1996.

The second column in Table X-2 presents estimates of 1992-1996 spending for ESRD patient medical care per year at risk from an intent-to-treat

### Estimated Total U.S. ESRD Costs, 1996

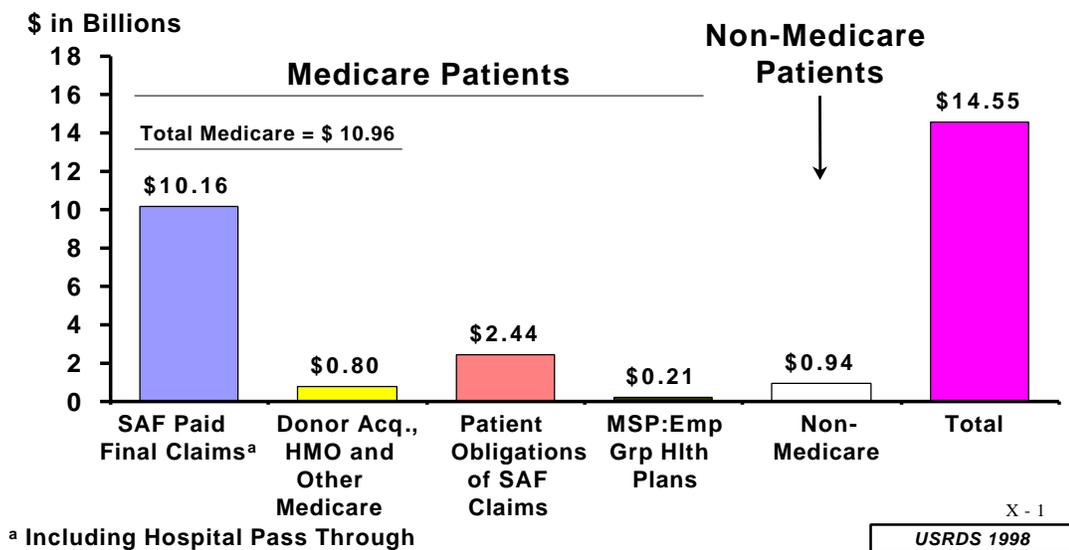


Figure X-1

Estimated total direct monetary cost of treating ESRD in the United States, 1996. Separate estimates of cost are reported according to patient eligibility for Medicare insurance. The estimated cost of treating Medicare ESRD patients includes the following components: total Medicare payments from the HCFA Standard Analysis File (SAF) claims; estimated Medicare payments for organ donor acquisition, patients enrolled in a Health Maintenance Organization (HMO) and other Medicare payments (includes education, capital and malpractice costs); patient obligations of Medicare claims; and payments by private sources for patients who are covered by an employer group health plan and for whom Medicare is a secondary insurance payer (MSP). Source: Reference Table K.1 and special analysis

analysis. The costs are again subdivided into institutional categories and physician/supplier categories, as in the first column. The third column of Table X-2 also presents spending estimates per year at risk, but for the 1996 period alone.

Total estimated direct medical payments for ESRD by public and private sources were \$14.55 billion during 1996 (Figure X-2). In the terminology of cost effectiveness, this total would represent the viewpoint of payers, both public and private. The estimated total Federal spending would be \$10.96 billion or 75 percent of the total estimated cost. This \$10.96 billion in Federal costs consists of SAF paid claims of \$9.96 billion adjusted to \$10.16 billion in order to account for the estimated 2 percent of bills that would not have been filed in time to enter the SAFs (see Methods) plus the estimated \$0.80 billion organ acquisition costs. Other Federal and state funding is provided through Medicaid and likely accounts for at least some of the patient obligations for SAF claims and payments for non-Medicare patients.

As reported in Figure X-1, \$10.16 billion (\$9.96

billion plus a 2 percent adjustment for the late arriving claims) was paid by Medicare in 1995 as reported in the SAF claims records. Patient obligations were estimated to be \$2.44 billion (see Figure X-1). There are no precise studies regarding how much of these obligations patients actually pay, but the speculation is that most of these obligations are paid by either insurance or philanthropy.

Employer Group Health Plans were estimated to have paid \$210 million in 1995 for the care of Medicare ESRD patients with Medicare as Secondary Insurer. This estimate of total spending for Employer Group Health Plans (EGHP) for ESRD is likely to be a minimum estimate since EGHP are reported to pay "retail prices," which are higher than the Medicare payment rate. The share of costs paid by EGHPs, though small, is likely to increase as the length of time during which the EGHP remains the primary payer was increased during 1997.

The distribution of health insurance coverage in 1996 for incident hemodialysis and peritoneal dialysis patients was reported in Figures X-2 and X-3 in the 1997 ADR. Overall, only about one-fifth of incident

### Changes in Medicare Payment Rates For ESRD and Changes in the Consumer Price Index, 1993- 96

Medicare Payments and Consumer Price Index	Change Per Year (%)		
	1993-94	1994-95	1995-96
Total Medicare ESRD Payment <sup>a</sup> (Per Patient Year at Risk)	2.2	3.8	4.5
Consumer Price Index (CPI) <sup>b</sup>			
General (All Items)	2.7	2.5	3.3
Medical	4.9	3.9	3.0
ESRD minus CPI			
General (All Items)	-0.5	1.3	1.2
Medical	-2.7	-0.1	1.5

<sup>a</sup> Medicare Spending Rates from Intent-to-Treat, not adjusted for changes in age and comorbidity.

Includes only patients and years at risk with Medicare Payments.

Excludes Medicare Secondary Payer patients.

Source: Reference Table K.7

<sup>b</sup> Source: US Department of Labor, Bureau of Labor Statistics. <http://stats.bls.gov/cpihome.html>.

**Table X - 3**  
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Table X-3

patients had Medicare as the sole insurer. Among those with multiple sources of insurance, the majority had non-Medicaid coverage.

Rates of Medicare spending increases for ESRD patients per year at risk are shown in Table X-3. These rates trended upward over the study period. From a 2.2 percent change per year in 1993-94, the rate has increased to a 3.8 percent change in 1994-95 and 4.5 percent in 1995-96. These spending increases are in nominal (non-inflation-adjusted) dollars.

To determine the real (inflation-adjusted) change in spending per ESRD patient, the nominal changes can be adjusted by either of two consumer price indices. The general consumer price index (CPI) would be the correct index to choose if one were examining rates of change in the context of what other social and economic purpose these ESRD costs could serve. A point of view which considers only the management of ESRD care on the other hand, would suggest the use of the medical component of the CPI.

Real resources per ESRD patient year rose between 1995 and 1996 using either price index (1.2 percent real increase using the general CPI; 1.5 percent using the medical CPI). Although this increase is not large in absolute terms, it represents a break with the experience of the preceding years. In the 1993-94 period, real spending per patient year at risk declined using either price index and in the 1994-95 period, real spending declined when using the medical component of the CPI. The measure of patient years at risk is not adjusted for changes in case mix (age, diabetes etc.). Therefore the changes in spending reported in Table X-3 can be attributed to several sources including changes in prices, changes in the volume or types of services provided to similar patients over time, or changes in the volume or types of services arising from changes in case mix severity.

Since the overall ESRD program costs grew by 11.4 percent between 1995 and 1996 (derived from Reference Table K.1) while nominal spending per patient year rose only 4.5 percent, the increase in the number of patients remained the primary source of growth in program expenditures. However, the relative contribution of spending per patient to overall cost growth was larger than in previous years.

**Limitations of this Research**

- The estimates for organ procurement and HMO payments by Medicare are particularly soft, as are

the estimates of payments from non-Medicare sources such as Employer Group Health Plans.

- There are a number of medical and non-medical costs that are not included in the tally shown in Figure X-1. These excluded costs include: outpatient drugs not paid by Medicare; costs of transportation not paid by Medicare; costs incurred by the Department of Veterans Affairs; and lost labor production in and out of the home. In addition, there are substantial transfer payments involved with ESRD such as Social Security Payments which are not technically a true cost of ESRD, but are nonetheless substantial items on the public policy agenda. While the cost of Medicaid payments for ESRD is included in the tally shown in Figure X-1, the Federal portion of these Medicaid costs is not identified. The Federal expenses for Medicaid insurance would be included in the patient obligations and in the cost of non-Medicare patients.
- There is evidence that not all claims make their way into the HCFA billing records. (Petronis; Sadler; Held). So the estimated spending from HCFA records may have a downward bias.

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**Medicare Spending for Alternative Modalities of Treatment**

**Introduction**

This study updates the analysis of Medicare spending for different treatment modalities for patients with chronic renal failure. The analyses were stratified by age, sex, race, and diabetes. However, no other adjustments for case mix severity were attempted. Since the data are observational (patients were not randomly assigned to treatment modalities), the results are presented with the caveat that there may be selection of patients with particular comorbidities into particular treatment modalities.

A secondary motivation for performing these analyses is the increasing proportion of Medicare's enrollees who are being treated in managed care alternatives to the traditional fee-for-service (FFS) system. In March 1997, 13.3 percent of all Medicare beneficiaries (not restricted to ESRD) were enrolled in at-risk Health Maintenance Organizations, a doubling of enrollment since 1994 (HCFA, Managed Care Market Penetration, Quarterly State/County Data Files, April 1997; GAO, 1995). Currently, the Health Care Financing Administration sets capitation rates paid to at-risk HMOs on the basis of Medicare spending in the FFS system. (This rate is called the

AAPCC for Adjusted Annual Per Capita Cost). These rates take ESRD status and the local price level into account, but a wide variety of additional predictors of costs are not explicitly used in the rate-setting process. To the extent that costs of care vary predictably with respect to patient characteristics that are not included in the rate-setting method, the incentives for at-risk HMOs to enroll and care for specific patients can be substantially affected.

Currently, the only Medicare ESRD patients who are in managed care are those who were enrolled in Medicare managed care prior to the onset of ESRD and who choose to remain in their managed care plans rather than switching to the traditional, fee-for-service Medicare program. With the initiation of

HCFA's ESRD managed care demonstration project, it seems unlikely that the Medicare ESRD program will continue to be "off limits" to managed care.

## Methods and Materials

See the Methods section at the beginning of this chapter.

## Results

For each patient, length of followup and Medicare costs during the followup period in the analysis were calculated. The total Medicare payments from the Standard Analysis Files for identified Medicare ESRD patients from January 1, 1992, until December

**Medicare Payments (\$1000s) Per Patient Year at Risk (YAR) by Age and Diabetic Status, 1992-1996 Intent-to-Treat Analyses<sup>a</sup>**

Age Group	Modality											
	All ESRD		Dialysis		HD		CAPD/CCPD		Other		TX <sup>b</sup>	
	PMT	YAR	PMT	YAR	PMT	YAR	PMT	YAR	PMT	YAR	PMT	YAR
All Patients												
All Ages	\$41	828	\$49	620	\$50	523	\$44	90	\$70	7	\$17	208
0-19 years	23	15	44	4	44	2	42	2	50	<1	15	10
20-44	31	221	44	115	44	90	41	24	52	1	16	105
45-64	40	288	48	210	48	175	45	32	59	2	18	79
65-74	50	199	52	186	52	161	46	23	77	2	22	13
75+	54	105	55	104	55	94	46	9	97	1	22	1
Diabetic												
All Ages	50	246	55	203	56	173	50	28	75	2	24	43
0-19	43	<1	55	<1	57	<1	*	*	*	*	31	<1
20-44	38	50	53	25	55	18	49	7	61	<1	23	25
45-64	49	101	54	84	54	71	51	13	65	1	27	16
65-74	56	72	56	71	57	62	51	7	81	1	32	2
75+	60	24	60	24	60	22	52	2	102	<1	37	<1
Nondiabetic												
All Ages	38	515	46	372	47	312	41	56	66	4	16	143
0-19	23	13	43	4	44	2	42	2	49	<1	15	9
20-44	29	150	41	81	42	64	38	16	48	1	15	69
45-64	35	167	44	112	44	93	40	18	54	1	16	55
65-74	47	112	49	103	49	88	43	14	73	1	21	10
75+	53	72	53	72	53	65	45	6	95	1	23	<1

<sup>a</sup> Excludes patients with Medicare Secondary Payer status at any time. Dialysis patients are censored at transplantation or end of study.

<sup>b</sup> Tx = Functioning transplant at 1/1/92 and new transplants thereafter; no censoring at graft failure.

PMT=Mean Medicare payment (\$1000s) per patient year at risk, 1992-1996

YAR=Years at risk (1000's) for the PMT estimate

\* = Insufficient data

Source: Reference Table K.5

Table X-4

USRDS 1998

**Table X-4**

31, 1996, were \$40.18 billion (Reference Table K.1). Eighty-six percent of these total program costs were incurred by patients who were included in the primary intent-to-treat model (Reference Table K.2). The remaining 14 percent of Medicare costs were incurred by patients with Medicare Secondary Payer status indicated in the HCFA system and other patients with low spending at some time during the study period, including patients who were lost to followup (see Methods) or who had insufficient billing information to establish that the patient had received a transplant

or was receiving regular dialysis. The latter two low-spending categories likely include patients for whom there was incomplete billing, patients with short treatment periods that were associated with very low spending, or possibly other patients with MSP sometime during the study period. See the Methods section earlier in this chapter for further details.

Table X-4 illustrates the Medicare payments per patient year at risk by treatment modality. Total Medicare spending per year at risk for all treatment

**Medicare Payments (\$1000s) Per Patient Year at Risk (YAR), by Age, Race, and Sex, 1992-1996 Intent to Treat Analyses<sup>a</sup>**

<b>Nondiabetic Patients</b>							
<b>Patient Age, Race, Sex</b>	<b>Modality</b>						
	<b>All ESRD</b>		<b>Dialysis<sup>b</sup></b>		<b>TX<sup>c</sup></b>		
	<b>PMT</b>	<b>YAR</b>	<b>PMT</b>	<b>YAR</b>	<b>PMT</b>	<b>YAR</b>	
All Ages							
Black Female	\$ 44	83	\$ 48	71	\$ 22	12	
Black Male	40	96	45	77	21	19	
White Female	38	134	48	93	14	41	
White Male	35	178	46	116	14	63	
Age 0-19 yrs.							
Black Female	34	1	47	1	22	1	
Black Male	30	2	44	1	20	1	
White Female	23	4	44	1	15	3	
White Male	19	5	41	1	12	4	
Age 20-44 yrs.							
Black Female	38	23	44	16	21	6	
Black Male	36	36	42	26	20	10	
White Female	25	34	41	15	13	19	
White Male	23	49	38	19	12	29	
Age 45-64 yrs.							
Black Female	42	29	45	25	21	5	
Black Male	39	38	43	30	22	8	
White Female	33	41	45	25	14	16	
White Male	30	52	42	28	15	23	
Age 65-74 yrs.							
Black Female	50	19	50	18	26	<1	
Black Male	47	14	48	13	27	1	
White Female	47	33	50	30	19	3	
White Male	45	42	48	37	21	5	
Age 75+ yrs.							
Black Female	56	11	56	11	*	*	
Black Male	53	7	53	7	22	<1	
White Female	54	23	54	23	19	<1	
White Male	51	30	51	30	25	<1	

<sup>a</sup> Excludes patients with Medicare Secondary Payer status at any time

<sup>b</sup> Censored only at transplantation or end of study.

<sup>c</sup> Tx = Functioning transplant at 1/1/92 and new transplants thereafter; no censoring at graft failure

PMT=Mean Medicare payment (\$1000s) per patient year at risk, 1992-1996

YAR=Years at risk (1000s) for the PMT estimate

\* = Insufficient data

Source: Reference Table K.5.

Table X-5

USRDS 1998

Table X-5

modalities combined was \$41K. There was considerable variance across modalities, however. While Medicare spending for all dialysis patients averaged \$49K per year, Medicare payments for transplant patients (not including payments for organ procurement) were only \$17K per year. Hemodialysis payments averaged \$50K per year whereas CAPD/CCPD payments combined averaged \$44K per year. Patients treated with other or uncertain (less than 60 days on a modality) dialysis were the most costly, averaging \$70K per year. The number of patients in this "other or uncertain" category represents less than 1 percent of total patient years at risk in the intent-to-treat model.

Results for five age groups (0-19, 20-44, 45-64, 65-74, and 75 years and older) are also presented in Table X-4. Annual costs for ESRD treatment rise steadily with age from a low of \$23K per person per year for ages 0-19 to a high of \$54K per person per year for the 75-and-older age group (134 percent increase between the youngest and oldest age groups). There is an increase of 25 percent from the youngest age group to the oldest for hemodialysis patients. The analogous age-related increase is 10 percent for CAPD/CCPD patients, 69 percent for patients with other and uncertain dialysis modality, and 43 percent for transplant patients. Thus, annual costs within any given modality do not rise as sharply with age as costs averaged across all treatment modalities. This finding can be attributed to the sharp decline in the ratio of transplanted to dialyzed patients with age. For example, transplants account for over two-thirds of all patient years at risk observed in the 0-19 age group, but represent less than one percent of years at risk in over 75 age group.

Cost per patient year at risk was higher for diabetics (\$50K) than for nondiabetics (\$38K). Care for diabetic ESRD patients was more costly in each of the five age groups (lower two panels of Table X-4). Table X-5 report spending per patient year at risk by age/race/sex/modality cells for nondiabetics. Table X-6 reports analogous information for diabetics. Again, diabetics have uniformly higher costs than nondiabetics in the same age/race/sex/modality cell.

For nondiabetics in all ESRD modalities (Table X-5), White males (\$35K) incurred the lowest Medicare spending per patient year at risk, followed by White females (\$38K), Black males (\$40K), and Black females (\$44K). Note that spending per patient

year at risk is almost identical across race/sex cells for dialysis patients, ranging from \$45K for Black males to \$48K for Black or White females. Thus, the differences by race and sex for all ESRD patients arise almost entirely from race and sex differences in the percent of patients in the lower cost, transplant modality. Whereas transplants accounted for more than one-third of the total, nondiabetic White male years at risk, transplants accounted for only one-seventh of total, nondiabetic Black female years at risk. Similar patterns are found among diabetic patients (Table X-6).

## Conclusions and Limitations

The USRDS/HCFA database is certainly rich and powerful. However this database is dynamic and not always complete. Certainly the system is constantly changing especially in the 1994-96 period (See Chapter XIII). There have been many changes in the USRDS and other databases in recent years and nearly everything changes in subtle and unmeasured ways, so some caution is warranted in the interpretation of these and all analyses.

The current analyses have used an intent-to-treat model. The primary reason for this was to try to determine a well-defined subpopulation that is known to be insured primarily by Medicare and for whom time at risk could be more precisely estimated. Neither of these objectives is easily achieved. We remain somewhat uncertain about whether and when a patient has MSP status. When this happens the financial indicators may be totally misleading or, in the worst case, only somewhat misleading. It is not easy to find a well defined population for which the spending and time at risk is precisely known.

These spending analyses clearly show that there are substantial differences in the patterns of resource utilization by patient demographics and by modality of treatment. Age, diabetes, and sex are easy to measure and verify and should make for reasonable indices on which to base payment for a capitation plan. However, within each of these groups there is still substantial variation, and there is always the possibility that providers and patients may well have information that would permit "gaming" the system (Brown et al, 1993). While such possibilities may suggest that using these demographic indicators may not be sufficient as the guide to setting capitation rates, there is no good reason to not use these indicators as a starting position.

**Medicare Payments (\$1000s) Per Patient Year at Risk (YAR),  
by Age, Race, and Sex, 1992-1996 Intent to Treat Analyses<sup>a</sup>**

**Diabetic Patients**

Patient Age, Race, Sex	Modality					
	All ESRD		Dialysis <sup>b</sup>		TX <sup>c</sup>	
	PMT	YAR	PMT	YAR	PMT	YAR
All Ages						
Black Female	\$54	51	\$55	48	\$34	3
Black Male	51	31	54	27	32	4
White Female	51	74	57	60	23	14
White Male	46	76	55	54	23	21
Age 0-19 yrs.	*	*	*	*	*	*
Age 20-44 yrs.						
Black Female	51	5	56	4	33	1
Black Male	48	5	53	4	33	1
White Female	35	16	55	6	22	9
White Male	34	22	51	9	21	13
Age 45-64 yrs.						
Black Female	52	23	54	22	33	2
Black Male	49	16	52	14	31	2
White Female	51	26	56	21	26	4
White Male	46	29	54	21	25	8
Age 65-74 yrs.						
Black Female	56	18	56	18	38	<1
Black Male	54	7	55	7	38	<1
White Female	58	24	58	24	33	<1
White Male	55	18	56	17	30	1
Age 75+ yrs.						
Black Female	60	5	61	5	*	*
Black Male	60	2	60	2	*	*
White Female	60	8	60	8	*	*
White Male	60	6	60	6	*	*

<sup>a</sup> Excludes patients with Medicare Secondary Payer status at any time

<sup>b</sup> Censored only at transplantation or end of study.

<sup>c</sup> Tx = Functioning transplant at 1/1/92 and new transplants thereafter; no censoring at graft failure

PMT=Mean Medicare payment (\$1000s) per patient year at risk, 1992-1996

YAR=Years at risk (1000s) for the PMT estimate

\* = Insufficient data

Source: Reference Table K.5.

Table X-6

USRDS 1998

Table X-6

These spending analyses are of course the pattern observed in the fee for service system. When incentives are changed, as under a managed care plan, in all likelihood there will be different patterns of spending. It remains to be seen if the costs can be lower and the quality of care as good or better under a managed care plan (Hirth and Held, 1998).

**Medicare Spending by Physician Specialty and Supplier Type**

In addition to the gross cost categories reported in Reference Table K.1, Medicare Part B physician/supplier payments have been disaggregated by physician specialty or type of supplier (Table X-7). This information can be useful in a managed care

**Total Medicare Payments per Patient Year at Risk for ESRD  
by Physician/Supplier "Specialty", 1992-1996**

<b>"Specialty"</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>Annual %Change 1992-1996</b>
<b>Total</b>	<b>\$9,112</b>	<b>\$9,121</b>	<b>\$11,235</b>	<b>\$9,233</b>	<b>\$9,651</b>	<b>1.4</b>
Pediatric Medicine <sup>a</sup>	1786	2048	2993	2543	2635	10.2
Nephrology	1910	1930	2367	1935	2177	3.3
Medical Supply Company	736	721	1031	1003	1007	8.2
Laboratory	796	857	1022	896	927	3.9
Ambulance Service Supplier	804	860	1151	928	912	3.2
Internal Medicine	774	649	823	647	727	-1.6
General Surgery	678	636	833	670	634	-1.7
Radiology (diagnostic & therapeutic)	309	319	426	394	427	8.5
Cardiology	274	278	399	303	310	3.2
Anesthesiology	304	288	360	283	287	-1.4
Multispecialty Clinic/Group Practice	204	204	305	233	262	6.5
Pharmacy <sup>b</sup>	.	1	227	205	187	-
Ophthalmology	158	156	207	176	170	1.9
Vascular Surgery	100	131	188	160	162	13.0
Thoracic Surgery	195	163	202	148	135	-8.8
General and Family Practice	108	103	147	115	123	3.3
Emergency Medicine	40	72	110	105	115	30.5
Gastroenterology	102	104	132	107	110	1.9
Urology	117	90	110	91	93	-5.5
Pulmonary Disease	65	69	94	81	89	8.0
Unknown	9	9	111	78	85	75.7
Orthopedic Surgery	65	66	85	80	81	5.4
Neurology	53	54	73	62	66	5.5
Hematology/Oncology	27	37	57	49	57	20.5
Infectious Disease	33	37	49	48	55	13.9
Pathology	63	59	70	56	53	-4.3
Therapeutic Services	29	33	48	45	51	14.9
Podiatry	28	31	44	44	49	15.1
Cardiac Surgery	23	27	40	33	35	10.7
Dermatology	24	27	34	33	34	8.7
Ambulatory Surgery Center	20	82	77	25	29	10.5
Psychiatry (includes Neuropsychiatry)	27	27	35	29	28	1.0
Obstetrics/Gynecology <sup>c</sup>	21	20	24	24	23	2.9
Endocrinology	15	20	27	23	24	12.6
Plastic and Reconstructive Surg	16	16	22	21	23	9.8
Otolaryngology	19	16	21	19	19	0.1
Geriatric Medicine <sup>d</sup>	9	11	14	14	16	15.4
Neurosurgery	12	12	16	14	16	6.6
Peripheral Vascular Disease	12	12	15	10	9	-6.1
Rheumatology	6	8	10	8	9	10.2
Optometry	5	5	8	8	8	14.4
Other Medical Care/Supplies	909	870	190	3	3	-75.7

<sup>a</sup> Pediatric Medicine rate uses years at risk for ages < 20

<sup>b</sup> Effective October 1993

<sup>c</sup> Obstetrics/Gynecology rate uses Females years at risk for Age 14+

<sup>d</sup> Geriatric Medicine rate uses years at risk for ages ≥ 65

Source: Reference Tables K.8.

Table X - 7

USRDS 1998

**Table X-7**

context. First, it provides an understanding of care patterns for ESRD patients that can aid an organization in ensuring that its provider panel is sufficiently broad to make available an appropriate array of services. Second, this disaggregation of spending by provider type can inform managed care organizations or physicians/ suppliers who are considering entering into capitated arrangements for specialty services whether or not the proposed rates are reasonable. Third, knowing which specialties have high and/or rapidly growing expenditures can help in targeting cost control efforts. Of course, this should only be used to indicate which areas are worthy of further study as the existence of high or growing expenditures is not sufficient to conclude that the spending is not medically and economically appropriate.

Overall physician/supplier spending is substantial, totaling \$9651 per year at risk in 1996. The categories in Table X-7 are ordered from highest to lowest by the amount of spending in 1996. At this time, the higher spending in 1994 appears anomalous and should be interpreted with caution. For all but three categories, the denominator for total spending is years at risk for all patients. The exceptions are those specialties that are only relevant to particular, identifiable demographic groups. The denominator for pediatric medicine is years at risk only for patients under 20 years of age. For geriatric medicine, the denominator is years at risk for patients over 64 years of age. Finally, for obstetrics/gynecology, the denominator is years at risk for female patients over the age of 13 years.

At the population level, the largest single category of physician/supplier spending is nephrology care, totaling \$2177 per patient year at risk. This represents nearly a quarter (22.6 percent) of physician/supplier expenditures. Given the update in the monthly capitation payment for dialysis-related nephrology care that occurred in 1996, this category can be expected to remain the largest for the foreseeable future. Some nephrology services may also have been billed under the "multispecialty clinic/group practice" category (\$262 per patient year at risk).

The second largest category of physician spending is for the primary care specialties, led by internal medicine at \$727 per patient year at risk. Adding general and family practice (\$123) and pediatrics (\$19 when using all patient years at risk as the denominator) and geriatric medicine (\$3 when using all years at risk as the denominator), spending for

primary care specialties totaled \$872 per patient year at risk. This represents 9 percent of all Part B physician/supplier spending and does not incorporate expenditures for primary care services provided by non-primary care specialists, particularly nephrologists or physicians in the "multispecialty clinic/group practice" category.

Spending for pediatric medicine per pediatric year at risk (\$2635) was almost three times the average primary care spending for all patients (\$872). While pediatric spending almost certainly includes some pediatric nephrology specialty care, there is little doubt that the primary care demands for pediatric ESRD patients are high. Any managed care plan enrolling pediatric ESRD patients should be able to provide optimal primary health care services as these patients tend to have complex medical issues requiring multidisciplinary care.

It is also interesting to note that expenditures on geriatric medicine, while growing, remain extremely small even when using the geriatric population as the denominator (\$16 in 1996). It is possible that some physicians specializing in geriatric medicine are coded under internal medicine, causing this number to be somewhat understated.

Emergency medicine expenditures grew at an annual rate of 30.5 percent between 1992 and 1996. A portion of these expenditures is likely to also represent primary care services. If so, the rapid growth rate is consistent with the interpretation that some ESRD patients do not have access to a regular source of primary care services.

Among the non-primary care, non-nephrology specialties, the largest expenditures are for general surgery (\$634 per patient year at risk; 6.6 percent of Part B physician/supplier spending), radiology (\$427; 4.4 percent), cardiology (\$310; 3.2 percent), and anesthesiology (\$287; 3.0 percent). The relatively high 1992-96 growth rates in the vascular surgery (13.0 percent annual growth) and diagnostic and therapeutic radiology (8.5 percent annual growth) categories may reflect a rising incidence of vascular access complications (see the 1997 ADR for a study of the costs of vascular access-related claims). This interpretation is consistent with research reporting a strong trend away from the type of vascular access (native arterio-venous fistula) that is associated with fewer complications (Hirth et al., 1996).

Three types of non-physician suppliers dominated non-physician Part B spending. Medical supply companies (\$1007 in 1996), laboratories (\$927), and

ambulance services (\$912) combined to account for 29.4 percent of all Part B physician/supplier spending for ESRD patients. The high level of spending for ambulance services was surprising and may warrant further investigation into whether or not many of these services were provided in non-emergent situations in which less costly transportation services could have been substituted.

## Conclusions and Limitations

This analysis of Medicare Part B physician/supplier expenditures by physician specialty or type of supplier provides substantially more detail on the type of services provided to ESRD patients than has previously been available. Nonetheless, classifying spending by type of provider is an imperfect proxy for spending by type of service. For example, some billings from nephrologists may represent primary care services rather than nephrology specialty care. Likewise, some categories such as multispecialty clinic/group practice are impossible to categorize by type of service. Finally, the sharp rise in spending observed in 1994 that did not carry over in the 1995-96 data suggests that the 1994 data be interpreted cautiously.

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