CAN DIALYSIS PATIENTS BE ACCURATELY IDENTIFIED USING HEALTHCARE CLAIMS DATA?

Charu Taneja,¹ Ariel Berger,¹ Gary W. Inglese,² Lois Lamerato,³ James A. Sloand,² Greg G. Wolff,³ Michael Sheehan,³ and Gerry Oster¹

Policy Analysis Inc. (PAI),¹ Brookline, MA, USA; Baxter Healthcare Corporation,² McGaw Park, IL, USA; and Henry Ford Health System,³ Detroit, MI, USA

◆ **Background:** While health insurance claims data are often used to estimate the costs of renal replacement therapy in patients with end-stage renal disease (ESRD), the accuracy of methods used to identify patients receiving dialysis — especially peritoneal dialysis (PD) and hemodialysis (HD) — in these data is unknown.

◆ **Methods:** The study population consisted of all persons aged 18 – 63 years in a large US integrated health plan with ESRD and dialysis-related billing codes (i.e., diagnosis, procedures) on healthcare encounters between January 1, 2005, and December 31, 2008. Using billing codes for all healthcare encounters within 30 days of each patient's first dialysis-related claim ("index encounter"), we attempted to designate each study subject as either a "PD patient" or "HD patient." Using alternative windows of ± 30 days, ± 90 days, and ± 180 days around the index encounter, we reviewed patients' medical records to determine the dialysis modality actually received. We calculated the positive predictive value (PPV) for each dialysis-related billing code, using information in patients' medical records as the "gold standard."

◆ **Results:** We identified a total of 233 patients with evidence of ESRD and receipt of dialysis in healthcare claims data. Based on examination of billing codes, 43 and 173 study subjects were designated PD patients and HD patients, respectively (14 patients had evidence of PD and HD, and modality could not be ascertained for 31 patients). The PPV of codes used to identify PD patients was low based on a ± 30 -day medical record review window (34.9%), and increased with use of ± 90 -day and ± 180 -day windows (both 67.4%). The PPV for codes used to identify HD patients was uniformly high — 86.7% based on ± 30 -day review, 90.8% based on ± 90 -day review, and 93.1% based on ± 180 -day review.

◆ **Conclusions:** While HD patients could be accurately identified using billing codes in healthcare claims data, case identification was much more problematic for patients receiving PD.

Correspondence to: Gerry Oster, Policy Analysis, Inc. (PAI), Four Davis Court, Brookline, Massachusetts 02445, USA.
goster@pai2.com
Received 5 December 2012; accepted 15 April 2013.

Perit Dial Int 2014; 34(6):643–651 www.PDIConnect.com
epub ahead of print: 04 Feb 2014 doi: 10.3747/pdi.2012.00328

KEYWORDS: Peritoneal dialysis; hemodialysis; insurance claim review; claims analysis; medical records; methodology; epidemiologic methods; retrospective study.

Much of what we know about differences in clinical outcomes and costs of care between patients receiving hemodialysis (HD) versus peritoneal dialysis (PD) comes from analyses of Medicare claims data, since persons with end-stage renal disease (ESRD) are eligible for health insurance coverage under this federal program after the first three months of dialysis. Total annual healthcare expenditures have been reported to be significantly lower among Medicare enrollees receiving PD in comparison with those receiving HD (1,2).

In most studies to date, identification of patients who received PD versus HD has been based on various diagnosis and/or procedure codes used for third-party billing and reimbursement (2–6). To the best of our knowledge, however, the predictive accuracy of these techniques for identifying PD and HD patients in health insurance claims data is unknown. The possibility exists, therefore, that the dialysis modality that some patients actually received was incorrectly designated on claims. To shed light on this issue, we examined the predictive accuracy of various billing codes as a means of identifying patients who received PD versus HD, using information gleaned from electronic medical records (EMRs) as our "gold standard."

METHODS

DATA SOURCE

This retrospective study was conducted at Henry Ford Health System (HFHS), a comprehensive health system

that provides medical care to approximately 800,000 residents of Detroit, Michigan, and the surrounding areas, with 3.2 million patient contacts annually. Health Alliance Plan (HAP) is a wholly owned, not-for-profit health maintenance organization within HFHS that provides insurance for 475,000 persons, 125,000 of whom have elected HFHS facilities as their assigned site of care. Study subjects were drawn from the population of persons enrolled in HAP with HFHS assignment, nearly 20% of whom are aged 65 years or older.

HFHS uses a comprehensive multi-dimensional EMR system that provides clinicians and researchers with real-time access to computerized medical records ("CarePlus"). CarePlus maintains information on patient demographics, ambulatory care visits, clinical laboratory and radiology results, and inpatient admissions, as well as various other clinical and economic measures. HFHS also maintains a large administrative data warehouse containing information on all encounters with HFHS providers and facilities, including ambulatory care visits (outpatient clinic, emergency department), hospital admissions, healthcare services provided at non-HFHS sites, billing records generated within inpatient and outpatient settings, and outpatient prescription claims. Billing records include information on type of service, date of service, provider name and specialty, site of service and type of encounter, and diagnoses.

Information in CarePlus, while stored electronically, is not searchable and cannot be harvested in digital format; it therefore was extracted manually onto hard-copy case-report forms that were developed for use in this study. To ensure patient confidentiality and compliance with the Health Insurance Portability and Accountability Act (HIPAA) of 1996, no patient-identifying information was extracted. Each patient in the study sample was assigned a unique study identifier, which was used to link information from different sources. The study was approved by the HFHS Institutional Review Board.

STUDY SAMPLE

The source population for the study consisted of all persons, aged 18 – 63 years as of January 1, 2005, who were enrolled in HAP with HFHS assignment anytime between January 1, 2005, and December 31, 2008 (the "study period"). (In the US, patients aged 65 years or older receive insurance coverage through the Medicare program; since we did not have access to Medicare data, patients of this age were not included in our study sample. Medicare is also the program that provides health insurance to persons with ESRD aged < 65 years. However, because Medicare does not become the primary

payer for ESRD patients of this age until approximately 30 months following disease onset, we limited our attention to patients between the ages of 18 and 63 years as of the date of initiation of dialysis to eliminate problems of incomplete data capture.) Among these persons, we identified all those with evidence of ESRD and dialysis-related healthcare encounters during the study period.

Encounters related to dialysis were designated principally using diagnosis and/or procedure codes for dialysis-related services rendered in either outpatient or inpatient settings (a listing of all dialysis-related codes is included in the Appendices). The date of the first dialysis-related encounter was designated the "index encounter," and persons with less than one year of HAP enrollment following their index encounter were excluded from the study sample. Evidence of ESRD was ascertained based on presence of one or more healthcare encounters with International Classification of Diseases (ICD)-9-CM diagnosis code 585.6 during the year preceding the index encounter and/or the six-month period subsequent to it (patients were required to have a diagnosis of ESRD in the 12-month period preceding the date of the earliest claim for dialysis, and/or the 6-month period thereafter).

We classified all dialysis-related billing codes *a priori* as indicative of either PD or HD (Appendix A1 and A2). We then examined billing codes for all patients within 30 days of their index encounter, and designated (as feasible) each patient as receiving PD or HD; a 30-day period was used for review of billing codes, since the code for the index encounter often was not sufficiently descriptive to permit classification.

Following this designation using claims data only, trained medical abstractors reviewed each patient's medical record to determine the dialysis modality actually received, using alternative windows of ± 30 days, ± 90 days, and ± 180 days around the index encounter.

MEASURES AND ANALYSES

We examined the predictive accuracy of healthcare claims for designating patients as receiving PD versus HD, using information in the EMR as our "gold standard." Accordingly, patients were deemed "true-positives" if review of medical records revealed evidence of the designated dialysis modality; they were deemed "false-positives" if the designated dialysis modality could not be confirmed in this fashion.

We estimated the predictive accuracy of dialysis-related billing codes for PD and HD, respectively, in healthcare claims using positive predictive value (PPV), defined as the ratio of the total number of patients who were "true-positives" to the total number of patients who

were either “true-positives” or “false-positives”. Since PPV was anticipated to be dependent upon the timeframe employed for medical record review, we alternatively employed time windows of ± 30 days, ± 90 days, and ± 180 days around each patient’s index encounter (Figure 1). Ninety-five percent confidence intervals (95% CI) for PPV were estimated using a normal approximation of the binomial distribution.

RESULTS

We identified a total of 233 ESRD patients with evidence of dialysis-related encounters in healthcare claims data during the study period; 43 and 173 patients were designated as receiving PD and HD, respectively (14 patients had evidence of both modalities and were consequently included in both groups). Dialysis modality could not be determined for 31 patients (i.e., their billing codes were nonspecific). Most patients designated as receiving PD had healthcare encounters with current procedural terminology (CPT) code 49421 and/or 90945 (Table 1). Almost all patients designated as receiving HD had healthcare encounters with CPT codes 36145 or 90935, ICD-9-CM diagnosis code V56.0, and/or ICD-9-CM procedure codes 38.95 and 39.95.

The PPV of billing codes used to identify PD patients was low (34.9%) (95% CI: 20.6%, 49.1%) based on a ± 30 -day window (around the index date) for medical record review; it improved to 67.4% (53.4%, 81.4%) when the window for review was extended to either ± 90 days

or ± 180 days (Table 2). The PPV of billing codes used to identify HD patients was uniformly high: 86.7% (81.6%, 91.8%) at ± 30 days, 90.8% (86.4%, 95.1%) at ± 90 days, and 93.1% (89.3%, 96.8%) at ± 180 days (Table 3). Among the most commonly encountered codes, CPT-4 code 49421 had a low PPV (40.9%) for PD in a ± 30 -day window, but high (95.5%) with either a ± 90 -day or ± 180 -day window; the corresponding CPT-4 code for HD (36145) had high PPVs for HD at ± 30 days (89.3%), ± 90 days (92.9%), and ± 180 days (96.4%). Procedure codes for dialysis-related encounters had relatively low PPVs for PD and relatively high PPVs for HD irrespective of time window. For example, CPT-4 code 90945, which was designated *a priori* as PD-related, had a PPV of 31.8% at ± 30 days, 45.5% at ± 90 days, and 45.5% at ± 180 days; HD-related CPT-4 code 90935 had corresponding PPVs of 95.3%, 96.9%, and 96.9%, respectively. Other frequently used HD-related codes also had high (i.e., >90%) PPVs regardless of time window employed.

DISCUSSION

Our study is the first, to the best of our knowledge, to examine the predictive accuracy in healthcare claims data of billing (i.e., procedure, diagnosis) codes that are often used to identify ESRD patients who receive PD and HD. Our findings indicate that while patients who are receiving HD can be identified with reasonable accuracy, identification of patients receiving PD is much more problematic. Our findings raise potential concerns

Figure 1 — Illustration of estimation of positive predictive value.

TABLE 1
Frequently Noted PD- and HD-related Codes

Codes	Description	N (%)
PD-related codes		
CPT-4 procedure		
49420	Insertion of intraperitoneal cannula or catheter for drainage or dialysis; temporary	1 (2.3)
49421	Insertion of intraperitoneal cannula or catheter for drainage or dialysis; permanent	22 (51.2)
90945	Dialysis procedure other than hemodialysis (e.g., peritoneal dialysis, hemofiltration, or other continuous renal replacement therapies), with single physician evaluation	22 (51.2)
ICD-9-CM diagnosis		
V56.2	Fitting and adjustment of peritoneal dialysis catheter	2 (4.7)
996.68	Infection and inflammatory reaction due to vascular device, implant and graft (due to peritoneal dialysis catheter)	2 (4.7)
ICD-9-CM procedure		
54.98	Peritoneal dialysis (excludes peritoneal lavage)	2 (4.7)
HD-related Codes		
CPT-4 procedure		
36145	Arteriovenous shunt created for dialysis (cannula, fistula, or graft)	28 (16.2)
36800	Insertion of cannula for hemodialysis, other purpose (separate procedure); vein to vein	1 (0.6)
36832	Revision, open, arteriovenous fistula; without thrombectomy, autogenous or nonautogenous dialysis graft	1 (0.6)
36833	Revision, open, arteriovenous fistula; with thrombectomy, autogenous or nonautogenous dialysis graft	1 (0.6)
90935	Hemodialysis procedure with single physician evaluation	127 (73.4)
93990	Duplex scan of hemodialysis access (including arterial inflow, body of access and venous outflow)	5 (2.9)
ICD-9-CM diagnosis		
V56.0	Extracorporeal dialysis	33 (19.1)
V56.1	Fitting and adjustment of extracorporeal dialysis catheter	2 (1.2)
ICD-9-CM procedure		
38.95	Venous catheterization for renal dialysis	76 (43.9)
39.27	Arteriovenostomy for renal dialysis	3 (1.7)
39.95	Hemodialysis	122 (70.5)

PD = peritoneal dialysis; HD = hemodialysis; CPT-4 = current procedural terminology, 4th edition; ICD-9-CM = international classification of diseases, ninth revision, clinical modification.

about comparisons of PD and HD patients that are based on analyses of US healthcare claims data, as their findings are only as robust as the methods used to identify patients receiving these dialysis modalities.

There are two principal explanations for our findings. First, while the most frequently used codes used to identify HD patients were specific for this modality, those used to identify PD patients — CPT-4 codes 49421 and 90945 — were not. Although the PPV for the first of these codes was low (41%) using a 30-day window, it was quite high (96%) with both the 90-day and 180-day windows, suggesting that often there may be a substantial delay

between catheter placement and commencement of PD, indicative of the typically planned nature of this modality (i.e., while it can be used in emergency situations (7), there typically is a lag between catheter placement and initiation of PD to allow for recovery from surgery and the development of scar tissue that helps hold the catheter in place). The delay between surgery and dialysis initiation may be problematic in terms of evaluating clinical outcomes and costs, as the date of the procedure code does not approximate the date that PD is actually initiated. The PPV of the second code (i.e., CPT-4 90945) remained low irrespective of the window used for medical record

TABLE 2
PPVs of Individual PD-related Codes^a

PD-related codes	Evidence of receipt of PD in the EMR within		
	30 days ^b	90 days ^b	180 days ^b
CPT-4 codes			
49420	0 (0.0)	1 (100.0)	1 (100.0)
49421	9 (40.9)	21 (95.5)	21 (95.5)
90945	7 (31.8)	10 (45.5)	10 (45.5)
ICD-9-CM diagnosis codes			
V56.2	0 (0.0)	1 (50.0)	1 (50.0)
996.68	1 (50.0)	1 (50.0)	1 (50.0)
ICD-9-CM procedure codes			
54.98	1 (50.0)	1 (50.0)	1 (50.0)
Any PD-related code	15 (34.9)	29 (67.4)	29 (67.4)

PPV = positive predictive value; PD = peritoneal dialysis; EMR = electronic medical record; CPT-4 = current procedural terminology, 4th edition; ICD-9-CM = international classification of diseases, ninth revision, clinical modification.

^a Values are N (%).

^b Around the anchor date.

review, suggesting that it is commonly used for dialysis modalities other than PD (e.g., hemofiltration).

Second, the total number of patients with billing codes for PD was much lower than the number with such codes for HD (43 vs 173, respectively), and the number with dialysis confirmed through medical record review was even lower (29 vs 161). While both estimates yield a point-prevalence estimate for PD greater than the national average (18% and 15% vs ~7% (1,8)), robustness of findings is compromised with a small sample size. Furthermore, because the number of PD patients was relatively low, we were unable to assess the PPV of all codes that are available for reimbursement of PD. For example, there were no medical encounters with the accompanying PD-related CPT-4 code 90947.

In addition, billing directives from insurance companies are not always aligned with services rendered during visits. For example, the PD-related CPT-4 code 90945 had a PPV of only 46% over a $\pm$ 180-day window. It is possible that this code is used to bill for predialysis services, and that some patients are readied for PD, but ultimately receive HD instead. In a recent examination of 217 US patients who initiated dialysis at a single center, 124 (57%) opted for education on PD; only 48% of these patients (i.e., 59/124) began dialysis with this modality, however (9).

Limitations of our study should be noted. The extent to which coding practices for dialysis at HFHS reflect those at other health systems across the US is unknown. In fact,

TABLE 3
PPVs of HD-related Codes^a

HD-related codes	Evidence of receipt of HD in the EMR within		
	30 days ^b	90 days ^b	180 days ^b
CPT-4 codes			
36145	25 (89.3)	26 (92.9)	27 (96.4)
36800	1 (100.0)	1 (100.0)	1 (100.0)
36832	0 (0.0)	1 (100.0)	1 (100.0)
36833	1 (100.0)	1 (100.0)	1 (100.0)
90935	121 (95.3)	123 (96.9)	123 (96.9)
93990	1 (20.0)	2 (40.0)	3 (60.0)
ICD-9-CM diagnosis codes			
V56.0	31 (93.9)	31 (93.9)	31 (93.9)
V56.1	2 (100.0)	2 (100.0)	2 (100.0)
ICD-9-CM procedure codes			
38.95	66 (86.8)	70 (92.1)	71 (93.4)
39.27	3 (100.0)	3 (100.0)	3 (100.0)
39.95	112 (91.8)	116 (95.1)	118 (96.7)
Any HD-related code	150 (86.7)	157 (90.8)	161 (93.1)

PPV = positive predictive value; HD = hemodialysis; EMR = electronic medical record; CPT-4 = current procedural terminology, 4th edition; ICD-9-CM = international classification of diseases, ninth revision, clinical modification.

^a Values are N (%).

^b Of anchor date.

there is evidence suggesting that the specific administrative codes used to bill for dialysis-related care vary substantially by payer (3). Accordingly, the degree to which codes commonly used to identify dialysis patients in our study setting are used in other settings is unknown; similarly, the PPV of codes commonly used in other health plans but not at HFHS also is unknown. Similarly, we limited our attention to patients aged < 63 years to ensure that we could construct complete chronologies of care. While we have no reason to believe that diagnostic and procedure coding on healthcare claims differs substantially across third-party payers and therefore that our results would not be generalizable to persons aged 65 years or greater, this remains a limitation of our study. Finally, our sample size was small ($n = 233$), particularly with respect to the number of patients identified as receiving PD ($n=43$), which limits the robustness of our findings. Our results therefore should be confirmed in future research.

In conclusion, our findings suggest that ESRD patients who receive HD can be accurately identified using billing codes in healthcare claims data, but that similar identification of those receiving PD is more problematic. When undertaking retrospective studies using these methods

of case ascertainment, researchers should keep these problems firmly in mind.

DISCLOSURES

Support: Funding for this study was provided by Baxter Healthcare Corporation, McGaw Park, IL. Baxter Healthcare Corporation assisted with the interpretation of data, drafting of the manuscript, and the decision to submit the manuscript for publication.

Financial Disclosure: Ms. Taneja, Mr. Berger, and Dr. Oster are employees of Policy Analysis Inc., a contract research organization that has received funding from Baxter Healthcare Corporation as well as other biomedical firms. Dr. Lamerato, Mr. Wolff, and Mr. Sheehan are employees of Henry Ford Health System. Dr. Sloand is an employee of Baxter Healthcare Corporation, the sponsor of the study, and reports owning stock in that company. Mr. Inglese is a former employee of Baxter Healthcare Corporation, and is currently employed by Hollister Incorporated.

REFERENCES

1. United States, Department of Health and Human Services, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, US Renal Data System (USRDS). *USRDS 2012 Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States*. Bethesda, MD: USRDS; 2012.
2. Shih YC, Guo A, Just PM, Mujais S. Impact of initial dialysis modality and modality switches on Medicare expenditures on end-stage renal disease patients. *Kidney Int* 2005; 68:319–29.
3. Berger A, Edelsberg J, Inglese GW, Bhattacharyya SK, Oster G. Cost comparison of peritoneal dialysis versus hemodialysis in end-stage renal disease. *Am J Manag Care* 2009; 15:509–18.
4. Berger A, Edelsberg J, Inglese G, Bhattacharyya SK, Oster G. Identification of patients receiving peritoneal dialysis using health insurance claims data. *Clin Ther* 2009; 31:1321–34.
5. Robbins JD, Kim JJ, Zdon G, Chan WW, Jones J. Resource use and patient care associated with chronic kidney disease in a managed care setting. *J Manag Care Pharm* 2003; 9:238–47.
6. Winkelmayer WC, Glynn RJ, Mittleman MA, Levin R, Pliskin JS, Avorn J. Comparing mortality of elderly patients on hemodialysis versus peritoneal dialysis: A propensity score approach. *J Am Soc Nephrol* 2002; 13:2353–62.
7. Ghaffari A. Urgent-start peritoneal dialysis: A quality improvement report. *Am J Kidney Dis* 2012; 59:400–8.
8. Lo WK. Peritoneal dialysis utilization and outcome: What are we facing? *Perit Dial Int* 2007; 27(Suppl 2):S42–7.
9. Liebman SE, Bushinsky DA, Dolan JG, Veazie P. Differences between dialysis modality selection and initiation. *Am J Kidney Dis* 2012; 59:550–7.

APPENDIX A1 – PERITONEAL DIALYSIS-RELATED PROCEDURE/DIAGNOSIS CODES

Code	Code Type	Description
996.56	ICD-9-CM diagnosis	Mechanical complication due to peritoneal dialysis catheter
996.68	ICD-9-CM diagnosis	Infection and inflammatory reaction due to vascular device, implant and graft (due to peritoneal dialysis catheter)
V56.2	ICD-9-CM diagnosis	Fitting and adjustment of peritoneal dialysis catheter
V56.32	ICD-9-CM diagnosis	Encounter for adequacy testing for peritoneal dialysis
V56.8	ICD-9-CM diagnosis	Other dialysis—peritoneal dialysis
49420	CPT-4 procedure	Insertion of intraperitoneal cannula or catheter for drainage or dialysis; temporary
49421	CPT-4 procedure	Insertion of intraperitoneal cannula or catheter for drainage or dialysis; permanent
90945	CPT-4 procedure	Dialysis procedure other than hemodialysis (e.g., peritoneal dialysis, hemofiltration, or other continuous renal replacement therapies), with single physician evaluation
90947	CPT-4 procedure	Dialysis procedure other than hemodialysis (e.g., peritoneal dialysis, hemofiltration, or other continuous renal replacement therapies), requiring repeated physician evaluations, with or without substantial revision of dialysis prescription
A4653	HCPCS procedure	Peritoneal dialysis catheter anchoring device, belt, each
A4671	HCPCS procedure	Disposable cyclor set used with cyclor dialysis machine, each
A4672	HCPCS procedure	Drainage extension line, sterile, for dialysis, each
A4673	HCPCS procedure	Extension line with easy lock connectors, used with dialysis
A4719	HCPCS procedure	“Y set” tubing for peritoneal dialysis
A4720	HCPCS procedure	Dialysate solution, any concentration of dextrose, fluid volume greater than 249 cc, but less than or equal to 999 cc, for peritoneal dialysis

APPENDIX A1 (cont'd)

Code	Code Type	Description
A4721	HCPCS procedure	Dialysate solution, any concentration of dextrose, fluid volume greater than 999 cc but less than or equal to 1999 cc, for peritoneal dialysis
A4722	HCPCS procedure	Dialysate solution, any concentration of dextrose, fluid volume greater than 1999 cc but less than or equal to 2999 cc, for peritoneal dialysis
A4723	HCPCS procedure	Dialysate solution, any concentration of dextrose, fluid volume greater than 2999 cc but less than or equal to 3999 cc, for peritoneal dialysis
A4724	HCPCS procedure	Dialysate solution, any concentration of dextrose, fluid volume greater than 3999 cc but less than or equal to 4999 cc, for peritoneal dialysis
A4725	HCPCS procedure	Dialysate solution, any concentration of dextrose, fluid volume greater than 4999 cc but less than or equal to 5999 cc, for peritoneal dialysis
A4726	HCPCS procedure	Dialysate solution, any concentration of dextrose, fluid volume greater than 5999 cc, for peritoneal dialysis
A4728	HCPCS procedure	Dialysate solution, non-dextrose containing, 500 mL
A4760	HCPCS procedure	Dialysate solution test kit, for peritoneal dialysis, any type, each
A4765	HCPCS procedure	Dialysate concentrate, powder, additive for peritoneal dialysis, per packet
A4766	HCPCS procedure	Dialysate concentrate, solution, additive for peritoneal dialysis, per 10 mL
A4860	HCPCS procedure	Disposable catheter tips for peritoneal dialysis, per 10
A4880	HCPCS procedure	Storage tanks utilized in connection with water purification system, replacement tanks for dialysis
A4900	HCPCS procedure	Continuous ambulatory peritoneal dialysis (CAPD) supply kit
A4901	HCPCS procedure	Continuous cycling peritoneal dialysis (CCPD) supply kit
A4905	HCPCS procedure	Intermittent peritoneal dialysis (IPD) supply kit
E1632	HCPCS procedure	Wearable artificial kidney, each
E1592	HCPCS procedure	Automatic intermittent peritoneal dialysis system
E1594	HCPCS procedure	Cycler dialysis machine for peritoneal dialysis
E1630	HCPCS procedure	Reciprocating peritoneal dialysis system
E1634	HCPCS procedure	Peritoneal dialysis clamps, each
E1638	HCPCS procedure	Heating pad, for peritoneal dialysis, any size, each
E1640	HCPCS procedure	Replacement components for hemodialysis and/or peritoneal dialysis machines that are owned or being purchased by the patient

APPENDIX A2 – HEMODIALYSIS-RELATED PROCEDURE/DIAGNOSIS CODES

Code	Code Type	Description
38.95	ICD-9-CM procedure	Venous catheterization for renal dialysis
39.27	ICD-9-CM procedure	Arteriovenostomy for renal dialysis
39.42	ICD-9-CM procedure	Revision of arteriovenous shunt for renal dialysis
39.43	ICD-9-CM procedure	Removal of arteriovenous shunt for renal dialysis
39.95	ICD-9-CM procedure	Hemodialysis
458.21	ICD-9-CM diagnosis	Hypotension of hemodialysis
V56.0	ICD-9-CM diagnosis	Extracorporeal dialysis
V56.1	ICD-9-CM diagnosis	Fitting and adjustment of extracorporeal dialysis catheter
V56.31	ICD-9-CM diagnosis	Encounter for adequacy testing for HD
36145	CPT-4 procedure	Arteriovenous shunt created for dialysis (cannula, fistula, or graft)
36800	CPT-4 procedure	Insertion of cannula for hemodialysis, other purpose (separate procedure); vein to vein
36810	CPT-4 procedure	Insertion of cannula for hemodialysis, other purpose (separate procedure); arteriovenous, external
36815	CPT-4 procedure	Insertion of cannula for hemodialysis, other purpose (separate procedure); arteriovenous, external revision, or closure

APPENDIX A2 (cont'd)

Code	Code Type	Description
36831	CPT-4 procedure	Thrombectomy, open, arteriovenous fistula without revision, autogenous or nonautogenous dialysis graft
36832	CPT-4 procedure	Revision, open, arteriovenous fistula; without thrombectomy, autogenous or nonautogenous dialysis graft
36833	CPT-4 procedure	Revision, open, arteriovenous fistula; with thrombectomy, autogenous or nonautogenous dialysis graft
36838	CPT-4 procedure	Distal revascularization and interval ligation, upper extremity hemodialysis access (steal syndrome)
90935	CPT-4 procedure	Hemodialysis procedure with single physician evaluation
90937	CPT-4 procedure	Hemodialysis procedure requiring repeated evaluation(s) with or without substantial revision of dialysis prescription
90939	CPT-4 procedure	Hemodialysis access flow study to determine blood flow in grafts and arteriovenous fistulae by an indicator dilution method, hook-up; transcutaneous measurement and disconnection
90940	CPT-4 procedure	Hemodialysis access flow study to determine blood flow in grafts and arteriovenous fistulae by an indicator dilution method, hook-up; measurement and disconnection
93990	CPT-4 procedure	Duplex scan of hemodialysis access (including arterial inflow, body of access and venous outflow)
99512	CPT-4 procedure	Home visit for hemodialysis
A4674	HCPCS procedure	Chemicals/antiseptics solution used to clean/sterilize dialysis equipment, per 8 oz
A4680	HCPCS procedure	Activated carbon filter for hemodialysis
A4690	HCPCS procedure	Dialyzer (Artificial kidneys), all types/sizes, for hemodialysis
A4700	HCPCS procedure	Standard dialysate solution, each
A4705	HCPCS procedure	Bicarbonate dialysate solution, each
A4706	HCPCS procedure	Bicarbonate concentrate, solution, for hemodialysis, per gallon
A4707	HCPCS procedure	Bicarbonate concentrate, powder, for hemodialysis, per packet
A4708	HCPCS procedure	Acetate concentrate solution, for hemodialysis, per gallon
A4709	HCPCS procedure	Acid concentrate solution, for hemodialysis, per gallon
A4712	HCPCS procedure	Water, sterile, for injection, per 10 mL
A4714	HCPCS procedure	Treated water (deionized, distilled, or reverse osmosis) for peritoneal dialysis, per gallon
A4730	HCPCS procedure	Fistula cannulation set for hemodialysis
A4740	HCPCS procedure	Shunt accessory, for hemodialysis, any type
A4750	HCPCS procedure	Blood tubing, arterial or venous, for hemodialysis
A4755	HCPCS procedure	Blood tubing, arterial and venous combined, for hemodialysis
A4770	HCPCS procedure	Blood collection tube, vacuum, for dialysis, per 50
A4774	HCPCS procedure	Ammonia test strips, for dialysis, per 50
A4780	HCPCS procedure	Sterilizing agent for dialysis equipment, per gallon
A4790	HCPCS procedure	Cleansing agents for equipment for dialysis only
A4800	HCPCS procedure	Heparin for dialysis and antidote, any strength, porcine or beef, up to 1000 units, 10–30 mL (for parenteral use see b4216)
A4801	HCPCS procedure	Heparin, any type, for hemodialysis, per 1000 units
A4802	HCPCS procedure	Protamine sulfate, for hemodialysis, per 50 mg
A4820	HCPCS procedure	Hemodialysis kit supplies
A4850	HCPCS procedure	Hemostats with rubber tips for dialysis
A4870	HCPCS procedure	Plumbing and/or electrical work for home hemodialysis equipment
A4890	HCPCS procedure	Contracts, repair and maintenance for hemodialysis equipment
A4918	HCPCS procedure	Venous pressure clamp, for hemodialysis
A4919	HCPCS procedure	Dialyzer holder, each
A4929	HCPCS procedure	Tourniquet for dialysis, each
E1510	HCPCS procedure	Kidney, dialysate delivery syst. kidney machine, pump recirculating, air removal system, flowrate meter, power off, heater and temperature control with alarm, i.v. poles, pressure gauge, concentrate container

APPENDIX A2 (cont'd)

Code	Code Type	Description
E1520	HCPCS procedure	Heparin infusion pump for hemodialysis
E1530	HCPCS procedure	Air bubble detector for hemodialysis, each, replacement
E1540	HCPCS procedure	Pressure alarm for hemodialysis, each, replacement
E1550	HCPCS procedure	Bath conductivity meter for hemodialysis
E1560	HCPCS procedure	Blood leak detector for hemodialysis, each, replacement
E1575	HCPCS procedure	Transducer protectors/fluid barriers, for hemodialysis, any size, per 10
E1580	HCPCS procedure	Unipuncture control system for hemodialysis
E1590	HCPCS procedure	Hemodialysis machine
E1600	HCPCS procedure	Delivery and/or installation charges for hemodialysis equipment
E1610	HCPCS procedure	Reverse osmosis water purification system, for hemodialysis
E1615	HCPCS procedure	Deionizer water purification system, for hemodialysis
E1620	HCPCS procedure	Blood pump for hemodialysis, replacement
E1625	HCPCS procedure	Water softening system, for hemodialysis
E1635	HCPCS procedure	Compact (portable) travel hemodialyzer system
E1636	HCPCS procedure	Sorbent cartridges, for hemodialysis, per 10