Ownership Patterns of Dialysis Units and Peritoneal Dialysis in the United States: Utilization and Outcomes

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Background: Peritoneal dialysis (PD) provides outcomes similar to hemodialysis, but its use has decreased in the United States despite its potential for substantial taxpayer savings. We undertook this study to determine the relationship between dialysis unit ownership with PD use and outcomes.

Study Design: Observational study.

Setting & Participants: All incident dialysis patients (1996 to 2004) from the US Renal Data System.

Predictor: Large dialysis organization (LDO), defined as corporations owning 20 or more freestanding dialysis units located in more than 1 state.

Outcomes & Measurements: Odds for an incident dialysis patient undergoing PD and hazards for death on follow-up in incident PD patients for each of the 5 LDOs (non-LDO as reference).

Results: During the 9-year period, 785,531 patients started maintenance dialysis therapy; the proportion receiving care in LDOs increased from 39% to 63%. There were consistent differences in PD use. It was significantly lower in LDO 2 (adjusted odds ratio [OR], 0.66; 95% confidence interval [CI], 0.64 to 0.68), LDO 3 (OR, 0.82; 95% CI, 0.80 to 0.85), and LDO 4 (OR, 0.96; 95% CI, 0.92 to 0.995) and higher in LDO 1 (adjusted OR, 1.06; 95% CI, 1.02 to 1.11) and LDO 5 (adjusted OR, 1.09; 95% CI, 1.06 to 1.12). Between 2000 and 2004, LDO 2 had the least use and greatest risk of death (hazard ratio, 1.08; 95% CI, 1.02 to 1.14); LDO 1 had greater use and the lowest death risk (hazard ratio, 0.87; 95% CI, 0.78 to 0.96).

Limitations: Only cross-sectional associations can be described.

Conclusions: Three of the 5 LDOs had consistently lower PD use. Patients treated in the LDO with the lowest use of PD had the greatest risk of death. Understanding relationships among providers, physicians, and dialysis modality use may help devise strategies for increasing PD use in appropriate patients. This has the potential to reduce the cost of renal replacement therapy and further improve outcomes.

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INDEX WORDS: Peritoneal dialysis; hemodialysis; end-stage renal disease; modality selection; mortality; technique failure; leading dialysis organizations; chains.

Editorial, p. 194

In 2005, there were 341,319 patients with end-stage renal disease (ESRD) in the United States undergoing maintenance dialysis therapy. The entire ESRD program has an annual cost of $32 billion.[1] Although patients with ESRD accounted for 1.2% of the Medicare population, they represented 8.2% of expenses for the agency.[1] By 2020, the number of maintenance dialysis patients is projected to exceed 500,000 and thus the costs of ESRD therapy are expected to increase substantially.[1] With increasing constraints of the federal and state health care budgets, it would be reasonable to suggest that use of dialysis therapy modalities that decrease overall costs without compromising patient outcomes should be encouraged.

Of the different dialysis modalities, home dialysis is associated with the lowest costs.[2] Even after accounting for younger age, lower burden of other associated diseases, and greater probability of switching dialysis modalities, average ad-

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justed per-patient annual Medicare payments for peritoneal dialysis (PD; the dominant form of home dialysis) are significantly lower than for in-center maintenance hemodialysis (MHD).[3] Most patients do not have medical or social contraindications to dialyze at home.[4] However, in 2005, only 6.6% of incident patients with ESRD were treated with PD.[1] The vast majority of incident patients with ESRD report in surveys that PD is not offered to them as a treatment modality.[5] What is more concerning is that PD use has decreased substantially since 1996. Recent analyses also suggest that the decreases in PD use cannot be explained by such medical causes as increasing age, disease burden, or body size.[6] During the period that PD use has decreased, ownership patterns of dialysis units have changed dramatically, such that now most patients with ESRD receive their care in outpatient facilities owned by large dialysis organizations (LDOs). We undertook this study to test the hypothesis that there are consistent differences in PD use among different LDOs that cannot be explained by differences in patient characteristics. We also sought to test the null hypothesis that there was no relationship between unit ownership and outcomes of PD patients.

METHODS

Data Source

The study protocol was reviewed and approved as exempt by the Institutional Review Board at Los Angeles Biomedical Research Center (Torrance, CA). Data for all incident patients during the 9-year period 1996 through 2004 were obtained from the Patient and MEDEVID files of the US Renal Data System (USRDS). Data were linked to the RXHIST60 file to assign treatment modality. Data also were linked to the Facility File to identify LDO affiliation, if any.

Definitions

According to convention, the dialysis modality 90 days after the first service date and continuous treatment for at least 60 days (60-day rule) was considered to be the initial modality.[1] Similarly, unit affiliation was defined as the dialysis facility at which the patient was being treated on day 90 of ESRD. Organizations were defined as LDOs by using the USRDS definition of corporations owning 20 or more freestanding dialysis units located in more than 1 state.[1] The following 10 affiliations were identified during the study period; none, DaVita, Dialysis Clinics Inc, Everest, Fresenius, Gambro, National, Renal Care Group, Renal Treatment Centers, and Vivra. Four LDOs existed for only part of the study period (Everest, National, Renal Treatment Centers, and Vivra) and accounted for only 20,889 (2.7%) incident patients during 9 years. Thus, although each of the 9 LDOs was included in the multivariable models, presentation of results here is limited to 5 LDO providers and the non-LDO group. LDOs in this report were assigned random codes from LDO 1 through LDO 5. The presence/absence of various coexisting illnesses was determined from Medical Evidence Form 2728. The number of patients undergoing PD in the dialysis unit on December 31 of the calendar year of incidence of ESRD was defined as the PD census for the unit for the patient. To create categorical variables, data for census for all units with at least 1 PD patient on December 31, 2000, were divided into quartiles: fewer than 5, 5 to 10, 11 to 21, and more than 21 patients. These categories were used to define the PD census for the unit for the entire study period considered for survival analyses (2000 to 2004).

Statistical Analyses

Continuous data are expressed as mean ± SD, and categorical data, as percentages. Complete data were available for each covariate for at least 95% of the study population, except for serum albumin level (missing 26%) and hemoglobin level (missing 12%). Individuals with missing serum albumin values had a lower prevalence of each selected comorbid condition listed in Table 1 and were less likely to be treated with PD (PD use during 9-year study period, 8.0% versus 9.2% with albumin values available). Individuals with missing hemoglobin values had a slightly lower prevalence of each selected comorbid condition and risk factor listed in Table 1, but starting with 1998, were more likely to be undergoing PD on day 90 compared with individuals for whom the hemoglobin value was available.

In our previous studies using USRDS data, limiting analyses to only patients with complete data available did not materially change hazard ratios (HRs).[6] To use the data for all incident patients, missing covariate data were imputed by using the mean or median of the existing values, as appropriate. PD use was determined by the proportion of incident maintenance dialysis patients undergoing treatment with PD on day 90 of ESRD. Adjusted odds ratios (ORs) for PD use by unit ownership were calculated for each of the 9 incident cohorts and for the entire 9-year period by using logistic regression analysis. For these analyses, dummy variables were created for each of the 9 LDOs and entered into the model, with non-LDO units as the reference group. The other variables included in the models were age, sex, race, ethnicity, employment status, insurance, each of the 20 reported coexisting illnesses, body mass index, geographic location (18 ESRD networks), and laboratory data (hemoglobin, serum albumin, and estimated glomerular filtration rate). For the analysis using data for the entire 9-year period, incidence years were entered as additional covariates. The ORs for PD use in LDOs were similar regardless of whether laboratory variables were entered into the multivariate models; only the fully adjusted models are presented here.

Two different time-to-event analyses were performed using Cox proportional hazards models. In analyses of time to death, individuals were censored at the time of transplantation, transfer to MHD therapy or to a unit with a different affiliation, or last follow-up (September 27, 2006). In analyses of time to composite outcome of death or transfer to MHD therapy, participants were censored at the time of