Survival after Dialysis Discontinuation and Hospice Enrollment for ESRD

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Summary

Background and objectives Textbooks report that patients with ESRD survive for 7–10 days after discontinuation of dialysis. Studies describing actual survival are limited, however, and research has not defined patient characteristics that may be associated with longer or shorter survival times. The goals of this study were to determine the mean life expectancy of patients admitted to hospice after discontinuation of dialysis, and to identify independent predictors of survival time.

Design, setting, participants, & measurements Data for demographics, clinical characteristics, and survival were obtained from 10 hospices for patients with ESRD who discontinued dialysis before hospice admission. Data were collected for patients admitted between January 1, 2008 and May 15, 2012. All hospices were members of the Coalition of Hospices Organized to Investigate Comparative Effectiveness network, which obtains de-identified data from an electronic medical record.

Results Of 1947 patients who discontinued dialysis, the mean survival after hospice enrollment was 7.4 days (range, 0–40 days). Patients who discontinued dialysis had significantly shorter survival compared with other patients (n=124,673) with nonrenal hospice diagnoses (mean survival 54.4 days; hazard ratio, 2.96; 95% confidence interval, 2.82 to 3.09; $P<0.001$). A Cox proportional hazards model identified seven independent predictors of earlier mortality after dialysis discontinuation, including male sex, referral from a hospital, lower functional status (Palliative Performance Scale score), and the presence of peripheral edema.

Conclusions Patients who discontinue dialysis have significantly shorter survival than other hospice patients. Individual survival time varies greatly, but several variables can be used to predict survival and tailor a patient's care plan based on estimated prognosis.

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Introduction

The number of patients living with ESRD in the United States has risen steadily over the past 20 years (1). In 2010, >376,000 patients received hemodialysis and 30,000 received peritoneal dialysis (1). Older adults constitute the fastest growing subset of this population, even though these patients often experience a significant functional decline after they begin dialysis (1,2). Many of the patients who receive dialysis also have complex comorbid conditions. For instance, 7% of patients who started dialysis between 2007 and 2010 had a concurrent diagnosis of cancer (1), and two thirds of dialysis patients have moderate or severe cognitive impairment (3).

Some patients decide that the burdens of dialysis outweigh the potential benefits and choose to discontinue. In fact, between 2008 and 2010, >50,000 patients in the United States discontinued dialysis before death (1). A patient's right to make this decision has been affirmed in practice guidelines from the Renal Physicians Association and the American Society of Nephrology (4). Approximately half of the patients who stop dialysis subsequently enroll in hospice (5,6).

Although there is general agreement that patients may choose to discontinue dialysis and many patients do so every year, it is not known what factors determine these patients' survival time. For instance, two cohort studies reported a mean survival of 8 days from the last dialysis session, but both also described a large range in actual survival (1–46 days) (7,8). A third cohort study reported average survival of 12 days with an even wider range (1–150 days) (9). Individualized survival predictions would allow clinicians to better counsel patients and families about what to expect after dialysis discontinuation. Moreover, predictive models could facilitate development of care plans that anticipate increasing needs near the end of life. Therefore, the goals of this study were to describe survival among patients admitted to hospice after discontinuation of dialysis and to define independent predictors of survival time.

Materials and Methods

Patient data were extracted from the electronic medical records of 10 hospices in the Coalition of

Hospices Organized to Investigate Comparative Effectiveness (CHOICE) network (10). CHOICE is a research-focused collaborative of hospices that all use Suncoast Solutions Electronic Health Record software and that have agreed to share their data for research purposes. CHOICE projects are defined and approved by a steering committee composed of leaders from all hospices in the network. Hospices participating in this study range in size from 400 to 2700 patients per day and are located in New Mexico, California, Florida, Pennsylvania, Wisconsin, Michigan, Ohio, Texas (two hospices), and Kansas/Missouri. All are not-for-profit organizations.

CHOICE obtains data from a data warehouse that participating hospices use for tracking, quality measurement, and benchmarking. Warehouse data reside on a secure server that is managed by Suncoast Solutions. Extracted data are then stripped of identifiers in order to create a Health Insurance Portability and Accountability Act–compliant limited dataset that is transferred as an encrypted file to the University of Pennsylvania for analysis.

Patients were included if they were admitted to a participating hospice between January 1, 2008 and May 15, 2012. We first extracted a dataset containing basic demographic variables (age, sex, race) and diagnoses (admitting diagnosis and up to three additional diagnoses). Next, we used International Classification of Diseases (ninth revision) codes supplemented by hand-searching to define a subgroup of patients who had a primary admitting diagnosis of ESRD. We further restricted this subgroup to the patients who had discontinued dialysis before hospice enrollment.

Coding also included the site of care at the time of enrollment (home, long-term care facility, hospital, hospice inpatient unit). We also extracted clinical data elements that were markers of the severity of the illness and the complexity of care (*e.g.*, presence of pain, use of oxygen, presence of intravenous access). Although previous studies of mortality in dialysis patients have used the Charlson comorbidity index, this scale is not a plausible predictor of survival among patients in hospice who are typically in the last days of life. For these patients, we reasoned that a measure of functional status would offer a better picture of a patient's overall status. Therefore, we extracted Palliative Performance Scale (PPS) scores for each patient. The PPS is an 11-point scale (scored from 0 to 100 in 10-point increments) in which higher numbers indicate better function (11). Like the Karnofsky performance scale, the PPS assesses functional status. However, unlike the Karnofsky scale, which focuses on ambulation and self-care, the PPS assesses five domains: (*1*) ambulation (bed-bound to full); (*2*) activity (unable to work to normal); (*3*) self-care (completely dependent to completely independent); (*4*) intake (mouth care only to full diet); and (*5*) level of consciousness (drowsy or coma to fully alert). Scoring proceeds in this order, so that the first categories (*e.g.*, ambulation, activity) are given the greatest weights. We initially described the PPS score as a continuous variable. For ease of interpretation in calculating predicted survivals, in subsequent analysis we grouped PPS scores into two categories (0–20 and 30–100) based on previous studies of prognosis in hospice patients (12,13).

For each patient characteristic under consideration as a possible predictor of mortality, we compared patients admitted with a diagnosis of ESRD versus other patients using univariate logistic regression models. Next, for the entire sample, we examined the proportional hazards assumption by calculating Schoenfeld residuals (14). We used both univariate and multivariable Cox proportional hazards models to compare the survival rates of patients who were admitted to hospice with a diagnosis of renal failure versus other diagnoses, using forward stepwise regression to identify patient characteristics that were independently associated with survival. Finally, we used common characteristics to define subgroups of patients with distinct survival patterns and calculated predicted medians and confidence intervals (CIs) for each subgroup.

Stata statistical software (Stata MP2 version 11.0) was used for all analysis. The University of Pennsylvania Institutional Review Board provided approval for use of secondary data.

Results

A total of 1947 patients with a primary diagnosis of ESRD were admitted to the 10 participating hospices. All of these patients discontinued dialysis before hospice admission. These patients were compared with 124,673 patients with nonrenal primary diagnoses who were admitted to the participating hospices over the same time period (Table 1). Renal patients had a mean age of 78 years, most were white (n=1564; 80.3%), and half were men (n=977; 50.2%). Most patients (n=1028; 52.8%) were in a hospital or inpatient hospice unit at the time of hospice enrollment. Almost half of ESRD patients had PPS scores $\leq$20 (n=887; 45.6%), indicating fluctuating levels of consciousness, limited oral intake, and severely limited physical function.

Patients who discontinued dialysis had a mean survival of 7.4 days (interquartile range, 0–46 days) after hospice admission (median 4 days; interquartile range, 2–9 days). By comparison, hospice patients with nonrenal diagnoses had a mean survival of 54.4 days (median 19 days; interquartile range, 4–50 days). In a univariate Cox proportional hazards model, patients who discontinued dialysis had significantly shorter survival compared with other hospice patients (hazard ratio [HR], 2.96; 95% CI, 2.82 to 3.09; P<0.001). In a multivariable model adjusting for independent predictors of survival (age, PPS score, edema, presence of an advance directive, race, sex, initial site of care) (Table 2), patients who discontinued dialysis still had a significantly shorter survival (HR, 2.21; 95% CI, 2.09 to 2.33; P<0.001) (Table 2).

Among patients with renal failure who discontinued dialysis, several characteristics were identified as independent predictors of survival (Table 3). For instance, a higher (better) PPS score upon admission to hospice was strongly predictive of longer survival (HR, 0.39; 95% CI, 0.33 to 0.46). Patients who began their hospice care in hospitals or inpatient hospice units had a shorter survival than did patients who began their care at home (HR, 1.40; 95% CI, 1.23 to 1.59). Men had a shorter survival (HR, 1.12; 95% CI, 1.01 to 1.25), as did white patients (HR, 1.18; 95% CI, 0.99 to 1.40). The presence of peripheral edema on admission was also predictive of shorter survival (HR, 1.24; 95% CI,

Table 1. Characteristics of patients enrolled in hospice (*N*=126,620)

Patient Characteristics	Hospice Patients Who Discontinued Dialysis (*n*=1947)	Patients With a Nonrenal Hospice Diagnosis (*n*=124,673)	*P*
Age (yr)	78 (72–87)	77 (69–88)	0.11
Men	977 (50.2)	55,064 (44.2)	<0.001
Hospice			
0	49 (2.5)	6842 (5.5)	—
1	387 (19.9)	14,491 (5.5)	<0.001
2	34 (1.8)	3537 (11.6)	0.19
3	164 (8.4)	10,846 (2.8)	<0.001
4	138 (7.1)	11,182 (8.7)	0.001
5	461 (23.7)	30,424 (24.4)	<0.001
6	165 (8.5)	9967 (8.0)	<0.001
7	49 (2.5)	8304 (6.7)	0.34
8	51 (2.6)	2934 (2.4)	<0.001
9	449 (23.1)	26,146 (21)	<0.001
Admission year			
2008	380 (19.5)	23,666 (19)	—
2009	372 (19.1)	24,226 (19.4)	0.54
2010	412 (21.2)	24,934 (20.0)	0.69
2011	364 (18.7)	25,269 (20.3)	0.14
2012	419 (21.5)	26,578 (21.3)	0.80
Race			
White	1564 (80.3)	108,139 (86.7)	
Nonwhite	201 (10.3)	8359 (6.7)	
Missing	182 (9.4)	8175 (6.6)	
Initial site of care			
Home	538 (27.6)	62,995 (50.5)	—-
Nursing home or residential hospice facility	381 (19.6)	27,936 (22.4)	<0.001
Hospital or inpatient hospice unit	1028 (52.8)	33,742 (27.1)	<0.001
Married	557 (28.6)	38,491 (30.9)	0.03
Oxygen	623 (32.0)	44,997 (36.1)	0.75
Intravenous opioid	30 (1.5)	1508 (1.2)	0.19
Advance directive	501 (25.7)	38,416 (30.8)	<0.001
Do Not Resuscitate order	1049 (53.9)	68,717 (55.1)	0.28
Wound stage ≥2	110 (5.6)	9640 (7.7)	<0.001
Gastrostomy or jejunostomy tube	162 (8.3)	9884 (7.9)	0.53
Peripheral edema	488 (25.1)	38,441 (30.8)	<0.001
Palliative Performance Scale score			
0	409 (21.0)	159 (0.13)	<0.001
10	478 (24.6)	13,232 (10.6)	
20	423 (21.7)	12,607 (10.1)	
30	304 (15.6)	23,378 (18.8)	
40	110 (5.7)	28,921 (23.2)	
50	14 (0.7)	22,561 (18.1)	
60	1 (0.1)	5796 (4.7)	
70	1 (0.1)	1312 (1.1)	
80	0	246 (0.2)	
90	0	48 (0.04)	
100	0	13 (0.01)	
Missing	207 (10.6)	16,400 (13.2)	

Data are presented as *n* (%) or mean (interquartile range).

1.09 to 1.25) as was the use of oxygen (HR, 1.09; 95% CI, 1.08 to 1.21). Hospice site was not a significant predictor of mortality (*P*=0.28).

Next we calculated predicted mean survival times for subsets of patients based on characteristics that were independent predictors of mortality (Table 4). We elected to use the means rather than the medians in this study because all ESRD patients in this cohort died within 46 days. Patients with a PPS of 10–20 had an adjusted mean survival of 5.7 days (95% CI, 5.3 to 6.1). In comparison,

Table 2. Independent predictors of mortality based on multivariable Cox proportional hazards model (full sample: *N*=126,620)

	HR (95% CI)	*P*
Admitted with a primary diagnosis of renal failure after discontinuation of dialysis	2.21 (2.09 to 2.33)	<0.001
Advance directive	0.84 (0.83 to 0.85)	<0.001
Initial site of care		
Home	—	<0.001
Nursing home or residential hospice facility	0.91 (0.89 to 0.92)	<0.001
Hospital or inpatient hospice unit	1.77 (1.74 to 1.80)	
PPS score (>20)	0.49 (0.48 to 0.49)	<0.001
Men	1.24 (1.22 to 1.26)	<0.001
Age	1.01 (1.00 to 1.02)	<0.001
White race	1.04 (1.01 to 1.07)	0.002
Peripheral edema	1.25 (1.20 to 1.28)	0.03

HR, hazard ratio; CI, confidence interval; PPS, Palliative Performance Scale.

Table 3. Independent predictors of mortality among patients who discontinued dialysis based on multivariable Cox proportional hazards model (*n*=1947)

	HR (95% CI)	*P*
PPS score (>20)	0.39 (0.33 to 0.46)	<0.001
Initial site of care		
Home	—	
Nursing home or hospice residence	0.88 (0.76 to 1.02)	0.09
Hospital or inpatient hospice unit	1.40 (1.23 to 1.59)	<0.001
White	1.18 (0.99 to 1.40)	0.05
Men	1.12 (1.01 to 1.25)	0.03
Oxygen	1.09 (1.08 to 1.21)	0.03
Peripheral edema	1.24 (1.09 to 1.25)	0.003

HR, hazard ratio; CI, confidence interval; PPS, Palliative Performance Scale.

Table 4. Adjusted median survival from hospice admission of patients who discontinued dialysis based on multivariable Cox proportional hazards model

	Patients (*n*)	Adjusted Median Survival (d)
PPS score		
10–20	887	3 (1–4)
>20	853	7 (3–9)
Initial site of care		
Home	538	9 (6–12)
Nursing home or residential hospice	366	8 (5–11)
Hospital or inpatient hospice unit	567	4 (2–7)
Race		
White	1564	8 (5–12)
Nonwhite	201	5 (2–8)
Sex		
Men	977	6 (3–10)
Women	970	7 (4–9)
Oxygen use	696	6 (3–9)
No oxygen use	1251	7 (4–9)
Edema	783	4 (2–5)
No edema	1164	8 (5–11)

Data are presented as *n* or median (interquartile range). Medians are adjusted for PPS score, initial site of care, race (white versus nonwhite), sex, oxygen use, and presence of edema. PPS, Palliative Performance Scale.

patients with a PPS >20 had an adjusted mean survival of 14.0 days (95% CI, 12.9 to 15.2). Patients who were admitted to hospice at home had an adjusted mean survival of 10.0 days (95% CI, 9.1 to 10.8), which was similar to patients in nursing homes or hospice residences (10.4 days; 95% CI, 9.3 to 11.5). However, the adjusted mean survival for patients in hospitals or inpatient hospice units was much shorter (4.8 days; 95% CI, 4.3 to 5.3). Patients with peripheral edema had a shorter survival (6.4 days; 95% CI, 6.0 to 6.7) than did patients with no edema (12.9 days; 95% CI, 12.5 to 13.5). Men also had a shorter adjusted mean survival compared with women (6.8 days [95% CI, 6.5 to 7.1] versus 7.9 days [95% CI, 7.6 to 8.2]).

Among patients who were admitted for nonrenal diagnoses (*n*=124,673), 207 (0.2%) had a secondary diagnosis of ESRD. These patients had care plans that included dialysis, indicating that they continued dialysis at least initially. They were admitted to hospice with primary diagnoses of cancer (*n*=98; 47%), heart disease (*n*=69; 33%), dementia (*n*=8; 4%), debility (*n*=5; 2%), pulmonary disease (*n*=10; 5%), stroke (*n*=9; 4%), and other diagnoses (*n*=8; 4%). Compared with these patients, those who enrolled with a primary renal diagnosis were older (mean age 78 versus 69 years; rank sum test, $P<0.001$) and less likely to be white (nonmissing results: 201 of 1564 [11%] versus 37 of 197 [19%]; odds ratio, 0.56; 95% CI, 0.37 to 0.84; $P=0.003$). Patients with a primary renal diagnosis also had lower PPS scores (median 20 versus 30; rank sum test, $P<0.001$). However, the two groups were similar with respect to sex (men: 110 of 207 [53%] versus 977 of 1947 [50%]; odds ratio, 0.89; 95% CI, 0.66 to 1.20; $P=0.42$).

Patients admitted with a secondary renal diagnosis had a median survival of 14 days, compared with a median of 7 days for patients with a primary renal diagnosis. Patients with secondary diagnoses also had a much wider survival range (0–254 days; interquartile range, 6–30 days). In a univariate Cox proportional hazards model, patients with a secondary renal diagnosis had a longer survival (HR, 0.72; 95% CI, 0.66 to 0.78; $P<0.001$).

Discussion

Previous small cohort studies have reported typical survival times after discontinuation of dialysis of 7–12 days (7–9). This larger multisite study describes those patients admitted to hospice for end-of-life care, which is thus a somewhat different population. Nevertheless, the mean survival reported here of 7.4 days from hospice admission is consistent with prior studies.

This study also found significant variability in survival among patient subgroups. For instance, survival in our study varied from <1 day to 46 days, with a large interquartile range (2–9 days). Clinicians experience this individual variability frequently, and the resulting uncertainty about prognosis makes it difficult to plan for care. Although these differences are small in absolute terms, even a small variation in survival of a week is enough to affect decisions regarding care and information for patients and families. For instance, if it is likely that a patient will die in days rather than weeks, intensive palliative care and preparation are indicated. In particular, the hospice team will need to work with the patient and family to ensure that plans for care are in place at the time of death. Finally, family members should be counseled that death is likely to occur soon, so that they can make arrangements as needed.

This study identified several patient characteristics that clinicians could use to more accurately predict survival. Certain subsets of the population seem to have especially short survival, such as those patients who are admitted in a hospital or inpatient hospice unit. Patients who are bedbound with altered level of consciousness (PPS ≤20) also have especially short survival. In addition, patients with edema have shorter survival, suggesting that volume status affects prognosis. Using these characteristics, clinicians could begin to stratify patients according to predicted survival, allowing education and care planning to more accurately reflect prognosis.

The decision to stop dialysis is often difficult for both patients and families (15). Although the majority of family members eventually describe death after dialysis discontinuation as "peaceful," the period between the last dialysis treatment and death can be very stressful (16,17). In particular, families may question the decision to stop dialysis when patients die very soon after discontinuation. Family members also want accurate survival estimates to arrange caregivers, notify friends and relatives, and emotionally prepare for the expected death. Therefore, better prognostic predictions can facilitate more specific conversations about prognosis between clinicians, patients, and families (18).

Better prognostic information could also facilitate discussions about the optimal site of care after dialysis discontinuation. Former dialysis patients have unique symptom management needs at the end of life. They may be asymptomatic initially but then develop rapidly escalating symptoms related to uremia or volume overload. Pain, dyspnea, myoclonus, and secretions occur frequently as death approaches (19). Therefore, a patient who is likely to die very soon after dialysis discontinuation might benefit from inpatient care for frequent medication adjustments. On the other hand, a patient with a longer anticipated survival might be adequately managed at least initially in a home or nursing facility.

The results of this study also identify potentially important differences between patients with ESRD and the general hospice population. For instance, patients who discontinued dialysis had much shorter survival than other hospice patients. This difference persisted even after adjustment for independent predictors of survival such as site of care, PPS score, and age. Patients who are referred to hospice very close to the end of life generally have greater symptoms and needs for care, and providers must be ready to meet these needs in ESRD patients who have discontinued dialysis.

An unexpected finding of this study was that patients who discontinued dialysis were less likely to have advance directives. This is surprising, in light of the fact that ESRD patients have a high annual mortality rate (1). Moreover, hospitalizations and complications are common, and many patients have some degree of cognitive impairment (3,20,21). For all of these reasons, advance directives are likely to be particularly useful in this population.

This study also found that the proportion of patients who were admitted after discontinuation of dialysis varied widely among these hospices. The goal of this study was not to analyze referral patterns or to explore hospice characteristics that are associated with a higher prevalence of renal failure. Nevertheless, such heterogeneity is interesting because it suggests that some hospices may have more experience in the care of these patients. Further research is needed to explore whether these hospices are able to provide higher-quality care, with better outcomes.

Finally, this study is the first to describe the small cohort of patients with ESRD who continue dialysis at the time of hospice enrollment. We found that these patients generally have a better functional status, are younger, and have a better prognosis. These patients also have a much more variable survival, making prognostication for these patients very challenging.

Although these results have the potential to be very useful in guiding clinical care for patients with ESRD, this study has several limitations. First, our data did not include any objective measure of renal function such as creatinine or BUN. All of these ESRD patients were previously on dialysis, but it is possible that some retained limited renal function, which could have affected survival. Second, our data do not indicate whether patients were undergoing hemodialysis or peritoneal dialysis before hospice referral. It is unclear whether these two groups follow different trajectories of decline, so these characteristics should be a focus of future research.

Third, our study reports survival measured from admission to hospice. This is in contrast to previous studies that report survival from the last dialysis session. Because our data do not include a reliable date for the last dialysis session, it is not possible to use these results to determine typical survival from dialysis to death. Nevertheless, it is likely that hospice admission occurred within days of the last dialysis session. Therefore, average survival from the last dialysis session is probably only slightly longer than the mean survival from hospice admission reported in this study.

Fourth, the descriptions reported here of the population of patients who continued dialysis should be interpreted with caution. This represents a very small fraction of the total sample, and it is unknown whether the differences reported here between these patients and ESRD patients who stopped dialysis are generalizable. Further research is needed to better define this population, and to understand the trajectory of decisions that these patients and their families make about discontinuing dialysis in the setting of other serious life-threatening illnesses.

As the prevalence of ESRD continues to increase, the discontinuation of dialysis is likely to become a more common event. This study describes the average survival after hospice enrollment of about a week with significant variability between individuals. Future research could further define survival trajectories after dialysis discontinuation, including changes in functional status and symptom burden over time. Additional studies should target advance directives and decision making. Finally, clinicians would benefit from additional information regarding the family's experience of this process. Withdrawal of dialysis is analogous to withdrawal of other forms of life support; patients and families need as much information as possible to make informed decisions.

Disclosures

None.

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