Factors Affecting Employment at Initiation of Dialysis

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Summary

Background and objectives Half the individuals who reach ESRD are working age (<65 years old) and many are at risk for job loss. Factors that contribute to job retention among working-age patients with chronic kidney disease before ESRD are unknown. The purpose of the study is to understand factors associated with maintaining employment among working-age patients with advanced kidney failure.

Design, setting, participants, & measurements In this retrospective study we reviewed the United States Renal Data System database (1992 through 2003) and selected all patients (n = 102,104) who were working age and employed 6 months before dialysis initiation. Factors that were examined for an association with maintaining employment status included demographics, comorbid conditions, ESRD cause, insurance, predialysis erythropoietin use, and dialysis modality.

Results Maintaining employment at the same level during the final 6 months before dialysis was more likely among (*1*) white men ages 30 to 49 years; (*2*) patients with either glomerulonephritis, cystic, or urologic causes of renal failure; (*3*) patients choosing peritoneal dialysis for their first treatment; (*4*) those with employer group or other health plans; and (*5*) erythropoietin usage before ESRD. Maintaining employment status was less likely among patients with congestive heart failure, cardiovascular disease, cancer, and other chronic illnesses.

Conclusions The rate of unemployment in working-age patients with chronic kidney disease and ESRD is high compared with that of the general population. Treating anemia with erythropoietin before kidney failure and educating patients about work-friendly home dialysis options might improve job retention.

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Introduction

Approximately 20 million Americans, 10.8% of the U.S. population, have chronic kidney disease (CKD) (1). Most of the estimated 712,290 Americans who reach end-stage renal disease (ESRD) by 2015 (2) will receive dialysis, and nearly half the 136,166 projected incident ESRD population will be of working age, under 65 years old (3).

Changes in employment levels are common among working-age people with ESRD. The rate of unemployment among working individuals in the United States is typically ≤10% (4), which is dramatically less than unemployment rates of incident dialysis patients. Large numbers of patients give up jobs or reduce work hours before or after initiating dialysis (5). Unemployment of working-age individuals is associated with greater physical and psychological problems such as anxiety, depression (6), and loss of self-esteem (7). Unemployment is also financially burdensome. Financial support for those who become unemployed while on dialysis is limited (8,9) and Social Security Disability Insurance replaces an average of only 44% of work earnings (9). In addition, private disability policies often limit any income from work, thereby reducing a person's incentive to work.

Loss of employment is not an inevitable consequence of ESRD for working-age individuals. Yet, it is unclear why some maintain employment as their kidneys fail, whereas others do not. One potential factor affecting employment is comorbid conditions such as anemia. The predominant symptom of untreated anemia is fatigue, which can negatively affect a person's ability to work (10). A second potential factor is dialysis modality. In-center hemodialysis usually requires three sessions per week, typically during the work day, with each session lasting 3 to 4 hours. In contrast, peritoneal dialysis is intrinsically more work-friendly than in-center hemodialysis as it allows patients to control when, where, and how they do their treatments. A third potential factor affecting employment is the type of health insurance the CKD patient has. Patients with employer group health plans may have more comprehensive coverage and lower out-of-pocket costs, which could motivate them to keep their jobs and their health plans.

Although only a small percentage of individuals continue employment after starting dialysis, a majority of the individuals who are unemployed have indicated that they would like to return to work either full- or part-time (5). In addition, Congress has as-

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serted that "the maximum practical number of patients who are suitable candidates for vocational rehabilitation services be given access to such services and encouraged to return to gainful employment" (http://www.ssa.gov/OP_Home/ssact/title18/1881.htm). Therefore, it would be beneficial to better understand the factors associated with maintaining employment levels among working-age patients with kidney failure who were employed 6 months before dialysis initiation.

Materials and Methods

Data Collection

Data were obtained from the United States Renal Data System (USRDS). We examined the database 1992 through 2003 (n = 354,098) and selected all incident patients between the ages of 18 and 64 years whose Medicare form indicated that they were employed part- or full-time 6 months before their first chronic dialysis treatment (n = 102,104). An inability to maintain employment was identified when, at initiation of treatment, patients reported they had changed employment from full- to part-time or from full- or part-time employment to any other status (retired, student, homemaker, *etc.*).

Certain variables in the aggregate data from the USRDS were first analyzed for an association with the inability to maintain employment. Variables examined were demographics (age, gender, and ethnicity), cause of kidney failure, comorbid conditions reported at initiation of dialysis from the Medicare CMS 2728 form (congestive heart failure, history of cardiovascular disease, history of cardiac arrest, chronic obstructive pulmonary disease, history of cancer, history of stroke, hypertension, diabetes mellitus, inability to ambulate or transfer, ethanol use, tobacco use, drug dependence, *etc.*), predialysis treatment for anemia with erythropoietin, type of first dialysis, and type of insurance.

We then examined the data to determine whether the National Kidney Foundation's (NKF) 1997 Dialysis Outcomes Quality Initiative (DOQI) guidelines for the treatment of anemia had a significant effect on employment levels. Assuming an 18-month period for the recommendations to be fully embraced by the nephrology community, we identified three distinct time frames 1992 through 1996, 1997 through 1998, and 1999 through 2003. Patients were then stratified by time periods depending upon the date of dialysis initiation. Data from each time frame were evaluated to see whether the DOQI guidelines had an identifiable effect on anemia management and whether this would significantly affect employment rates based on time frame.

As data were not identifiable and the sample size was so large, our institutional review board granted us exemption from a full committee review.

Data Analysis

When we analyzed the entire data set, univariate and multivariate logistic regression models assessed the relationship between demographic variables, medical history, other covariates, and level of employment. Relationships were summarized using odds ratios and 95% confidence intervals. An odds ratio >1.0 indicated an increased probability of maintaining the same level of employment whereas an odds ratio <1.0 indicated a reduced probability of maintaining the same level of employment. Given the large sample size, a nominal P value of ≤0.001 was considered statistically significant. For the analyses of the data by different time frames, univariate and multivariate analyses were used to examine the same variables as identified in evaluation of the whole data set. A P-interaction (P-int.) test was calculated to determine if a particular factor (*e.g.*, age) had a varying effect on employment across the time frames or if its effect remained constant. A significant P-int. test indicated that the factor had a varying effect across the time frames. A P-int. variable was deemed significant if it was ≤0.05. Analyses were performed using SAS Version 9.1 (SAS Institute, Cary, NC).

Results

Review of the USRDS database revealed that 71% of individuals were unemployed, which is significantly higher than the current 9.9% unemployment rate in the United States (April 2010).

Among working individuals initiating dialysis, those who were white, non-Hispanic, men, and those ages 30 to 49 years were significantly more likely to maintain the same level of employment at dialysis initiation as 6 months before initiation of chronic dialysis. Conversely, patients who were non-white, Hispanic, women, and aged 55 years and older were less likely to maintain their level of employment (Table 1). The associations with race, ethnicity, and sex were significant across all three time frames. The association for age was significant only in the 1999 through 2003 time frame. Interestingly, race was the only factor that had a significant P-interaction (P-int. = 0.0002).

Certain causes of ESRD were associated with the likelihood of maintaining employment. Patients with cystic kidney diseases, glomerulonephritis, or other urologic diseases were more likely to maintain the same level of employment as compared with patients with diabetes and hypertension (Table 1). These associations were significant across all three time frames, and there was no significant P-interaction.

Certain comorbidities were associated with a decreased likelihood of maintaining employment including congestive heart failure, ischemic heart disease, cardiac arrest, cerebrovascular disease, chronic obstructive pulmonary disease, cancer, and inability to ambulate (Table 2). These associations were significant across all three time frames. Inability to ambulate was the only factor that had a significant P-interaction (P-int. = 0.02). Interestingly, a diagnosis of diabetes—either with or without insulin dependence—did not affect ability to maintain the same level of employment (Table 2).

Certain lifestyle behaviors were associated with a decreased likelihood of maintaining employment, including alcohol dependence, drug dependence, and tobacco use (Table 2). These factors remained significant throughout the three time frames and there was no significant P-interaction.

Table 1. Affect of age, gender, race, and ESRD cause on maintaining employment

	1992 Through 1996		1997 Through 1998		1999 Through 2003		*P*-int
	OR [95% CI]	*P*	OR [95% CI]	*P*	OR [95% CI]	*P*	
Age group							0.21
15 to 19	1.27 [0.77 2.08]		0.83 [0.49 1.40]		0.79 [0.57 1.12]		
20 to 24	1.31 [1.06 1.61]		0.97 [0.79 1.19]		0.85 [0.75 0.97]		
25 to 29	1.18 [1.00 1.39]		0.96 [0.82 1.11]		0.97 [0.88 1.07]		
30 to 34	1.20 [1.03 1.39]		1.09 [0.95 1.25]		1.01 [0.92 1.09]		
35 to 39	1.27 [1.10 1.46]		1.09 [0.96 1.24]		1.02 [0.95 1.11]		
40 to 44	1.16 [1.02 1.32]		1.05 [0.94 1.18]		0.98 [0.91 1.05]		
45 to 49	1.09 [0.96 1.24]		1.04 [0.93 1.16]		1.05 [0.98 1.12]		
50 to 54	1.00		1.00		1.00		
55 to 59	0.99 [0.87 1.13]		0.86 [0.77 0.96]		0.87 [0.82 0.93]		
60 to 64	0.98 [0.84 1.14]		0.88 [0.77 1.00]		0.89 [0.82 0.97]		
				0.005		0.002	<0.001
Gender							0.60
women	0.79 [0.73 0.85]		0.81 [0.76 0.87]		0.78 [0.74 0.81]		
men	1.00		1.00		1.00		
		<0.001		<0.001		<0.001	
Race							<0.001
white	1.00		1.00		1.00		
black	0.62 [0.57 0.68]		0.69 [0.64 0.74]		0.75 [0.72 0.78]		
Asian	1.08 [0.90 1.29]		0.97 [0.82 1.14]		0.82 [0.74 0.90]		
Native American	1.00 [0.75 1.33]		0.93 [0.71 1.21]		0.99 [0.84 1.17]		
other	0.89 [0.59 1.36]		0.95 [0.68 1.34]		0.85 [0.73 0.98]		
Hispanic	0.65 [0.58 0.74]		0.67 [0.60 0.75]		0.68 [0.65 0.71]		0.76
		<0.001		<0.001		<0.001	
ESRD cause							–
diabetes	1.00		1.00		1.00		
HTN	0.99 [0.87 1.13]		1.04 [0.93 1.17]		1.02 [0.95 1.10]		
GN	1.23 [1.07 1.41]		1.25 [1.11 1.42]		1.22 [1.13 1.32]		
other	0.87 [0.76 1.01]		0.91 [0.80 1.03]		0.85 [0.78 0.92]		
cystic kidney	1.65 [1.36 2.01]		1.65 [1.38 1.98]		1.68 [1.50 1.87]		
other urologic	1.22 [0.92 1.60]		1.16 [0.89 1.52]		1.17 [1.00 1.38]		
		<0.001		<0.001		<0.001	

GN, Glomerulonephritis; HTN, hypertension; ESRD, End Stage Renal Disease; OR, odds ratio; CI, confidence interval; p-int, p interaction.

Erythropoietin

Of the 102,104 patients in our sample, only 28,978 (28.4%) received predialysis erythropoietin (EPO). Not surprisingly, the number of patients receiving EPO increased with each successive time frame (24.7%, 25.5%, and 30.7%, respectively). Patients receiving predialysis EPO were significantly more likely to maintain the same level of employment upon initiation of dialysis. Of the patients receiving predialysis EPO, 67% maintained the same level of employment from 6 months before initiation of dialysis. In contrast, of the patients not receiving predialysis erythropoietin, 57% maintained the same level of employment at initiation of dialysis from 6 months prior (Table 3). This association remained consistent throughout the three time frames and there was no significant *P*-interaction level.

Dialysis Modality

Overall, hemodialysis (HD) was the most common initial mode of dialysis with 82.5% (80,100) new dialysis patients being initiated on HD *versus* 17.5% (16,789) utilizing peritoneal dialysis (PD). Data for those patients who received a transplant as their initial modality of ESRD treatment were not evaluated. Those who maintained the same level of employment from 6 months prior were significantly more likely to start dialysis on some form of PD than on in-center HD. Among PD patients, 73% who used a continuous cycling peritoneal dialysis (CCPD) and 68% on continuous ambulatory peritoneal dialysis (CAPD) were working at the same level at dialysis initiation as 6 months before dialysis. In contrast, among those initiating HD, just 57% were working at the same level at dialysis initiation as 6 months before (Table 1). These associations were significant at the 1997 through 1998 and 1999 through 2003 time frames but there was no significant *P*-interaction. The number of patients who were on home hemodialysis was too small to draw any meaningful conclusions from the data (Table 4).

Insurance Coverage

Patients listing an employer group health plan or other medical insurance as their primary insurance were signif-

Table 2. Effect of certain conditions on maintaining employment

Condition	1992 Through 1996		1997 Through 1998		1999 Through 2003		*P*-int
	OR [95% CI]	*P*	OR [95% CI]	*P*	OR [95% CI]	*P*	
Inability to transfer	0.33 [0.15 0.69]	0.003	0.50 [0.25 0.99]	0.05	0.85 [0.54 1.34]	0.49	0.08
Alcohol	0.63 [0.47 0.85]	0.002	0.56 [0.43 0.74]	<0.001	0.56 [0.47 0.67]	<0.001	0.77
CVD	0.69 [0.55 0.86]	<0.001	0.60 [0.50 0.72]	<0.001	0.70 [0.62 0.79]	<0.001	0.39
Drugs	0.69 [0.48 0.99]	0.04	0.73 [0.53 1.02]	0.06	0.73 [0.60 0.89]	0.001	0.96
Cancer	0.70 [0.56 0.88]	0.002	0.82 [0.67 1.00]	0.05	0.73 [0.65 0.81]	<0.001	0.53
CHF	0.79 [0.71 0.88]	<0.001	0.79 [0.72 0.87]	<0.001	0.80 [0.76 0.85]	<0.001	0.93
Tobacco	0.85 [0.74 0.98]	0.03	0.77 [0.96 0.88]	<0.001	0.85 [0.79 0.93]	<0.001	0.42
Pericarditis	0.86 [0.63 1.19]	0.38	0.99 [0.43 1.36]	0.95	0.97 [0.77 1.21]	0.77	0.81
Arrhythmia	0.87 [0.67 1.13]	0.29	1.22 [0.79 1.55]	0.10	0.88 [0.76 1.02]	0.09	0.06
Inability to ambulate	0.88 [0.59 1.31]	0.52	0.64 [0.43 0.97]	0.03	0.45 [0.35 0.58]	<0.001	0.02
Ischemic heart disease	0.90 [0.78 1.04]	0.17	0.89 [0.79 1.01]	0.07	0.92 [0.85 0.99]	0.03	0.93
COPD	0.90 [0.70 1.15]	0.40	0.86 [0.69 1.07]	0.18	0.86 [0.75 0.98]	0.03	0.95
Cardiac arrest	0.98 [0.57 1.69]	0.96	0.64 [0.38 1.08]	0.09	0.55 [0.39 0.76]	<0.001	0.19
Diabetes (no insulin)	0.98 [0.88 1.09]	0.72	1.05 [0.95 1.16]	0.32	1.02 [0.96 1.08]	0.56	0.64
PVD	0.99 [0.84 1.16]	0.87	0.84 [0.73 0.97]	0.01	0.94 [0.86 1.02]	0.15	0.28
Anemia	1.02 [0.93 1.12]	0.72	0.98 [0.90 1.06]	0.59	1.01 [0.99 1.02]	0.34	0.33
HTN	1.06 [0.97 1.14]	0.19	1.11 [1.03 1.20]	0.009	1.06 [1.00 1.11]	0.03	0.55
Diabetes (insulin)	1.07 [0.95 1.20]	0.24	1.00 [0.90 1.11]	0.99	0.94 [0.89 1.00]	0.05	0.13
MI	1.08 [0.88 1.33]	0.47	0.90 [0.75 1.07]	0.23	0.94 [0.84 1.05]	0.30	0.38
Predialysis EPO use	1.22 [1.12 1.32]	<0.001	1.27 [1.18 1.37]	<0.001	1.29 [1.23 1.35]	<0.001	0.51

CVD, Coronary vascular disease; CHF, Congestive heart Failure; COPD, Chronic Obstructive Pulmonary Disease; PVD, Peripheral vascular Disease; HTN, Hypertension; MI, Myocardial Infarction; EPO, Erythropoeitin; OR, odds ratio; CI, confidence interval; p-int, p interaction.

icantly more likely to maintain their level of employment (68% and 65%, respectively). In contrast, those listing Medicaid, Medicare, or no medical insurance as their primary insurance were less likely to maintain employment. Of these individuals only 32% with Medicaid, 56% with Medicare, and 35% with no medical insurance maintained the same level of employment upon initiation of dialysis (Table 2). The associations for employer group health insurance, Medicaid, and no medical insurance remained significant for all three time frames. The associations for other types of medical insurance were significant for the 1997 through 1998 and 1999 through 2003 time frames. The association for Medicare coverage was significant only in the 1999 through 2003 time frame. A significant *P*-interaction was detected for Medicare coverage (*P*-int. = 0.04) and employer group coverage (*P*-int. = 0.02) (Table 5).

Discussion

The purpose of this study was to examine 10 years of data from the USRDS to identify nonmodifiable and modifiable factors affecting a person's ability to maintain their level of employment after initiating dialysis. Our study found that white men between the ages of 18 and 55 years were most likely to retain the same level of employment. In contrast, women, non-Caucasians, and those who were Hispanic were less likely to retain the same level of employment. Given the inherent limitations of the USRDS database, further studies are needed to better understand other factors that may also be contributing to an inability to maintain employment such as socioeconomic status and education level. A better understanding of these factors will help researchers and clinicians develop more effective interventions to help individuals maintain employment.

Inability to ambulate and stroke were the comorbidities most likely to render a person unable to maintain the same level of employment. We also found that individuals who had more comorbid conditions were less likely to maintain employment. Finally, we found that having combinations of certain comorbid conditions further decreased a person's ability to maintain employment. For example, a person with both congestive heart failure and ischemic heart disease would have an odds ratio of 0.72 (OR 0.79 × OR = 0.91) for maintaining employment *versus* a person with neither condition. It is interesting to note that the presence of diabetes (both insulin- and non–insulin-dependent) did not affect a person's ability to maintain employment. One possible explanation for this finding is that individuals with more severe diabetic complications had already stopped working earlier in the course of their kidney disease. Therefore, they may not have been included in our sample.

Our study found that persons who were treated with EPO for anemia, persons who chose peritoneal dialysis as their primary dialysis modality, and persons who had an employer group health plan as their primary payer were more likely to maintain the same level of employment at initiation of dialysis.

Patients treated with EPO for anemia were more likely to maintain their employment. This is probably due to the improvement of fatigue and well-being reported by ESRD patients treated with erythropoietin (11). Despite the increasing knowledge of the association of advanced

Table 3. Frequency of EPO use, dialysis type, and insurance type by employment status

	Employed (*N*, %)	Unemployed (*N*, %)
EPO use		
yes	19,482 (67%)	9496 (33%)
no	41,439 (57%)	31,417 (43%)
Primary type of dialysis		
CAPD	7983 (68%)	3725 (32%)
CCPD	3692 (73%)	1389 (27%)
hemodialysis	45,469 (57%)	34,631 (43%)
IPD	50 (54%)	42 (46%)
other	28 (78%)	8 (22%)
Insurance type		
Medicaid		
yes	2561 (32%)	5473 (68%)
no	58,505 (62%)	35,500 (38%)
DVA		
yes	460 (53%)	416 (47%)
no	60,604 (60%)	40,550 (40%)
Medicare		
yes	4373 (56%)	3383 (44%)
no	56,735 (60%)	37,612 (40%)
employer group		
yes	42,325 (68%)	19,469 (32%)
no	18,770 (47%)	21,504 (53%)
other		
yes	11,684 (65%)	6266 (35%)
no	49,425 (59%)	34,729 (41%)
none		
yes	4960 (35%)	9412 (65%)
no	56,149 (64%)	31,583 (36%)

EPO, Erythropoeitin; CAPD, Continuous ambulatory peritoneal dialysis; CCPD, Continuous cycling peritoneal dialysis; IPD, Intermittent peritoneal dialysis; DVA, Department of Veterans Affairs; OR, odds ratio; CI, confidence interval.

CKD and anemia (12), it is unfortunate that only 28.4% of our sample of working-age patients received EPO before dialysis initiation. Furthermore, because of the number of persons receiving EPO in our sample increased only by 6.1% after the 1997 KDOQI anemia guidelines were published, it appears that they did not significantly affect the number of persons being treated for anemia. Results from our study suggest that treating anemia when clinically indicated may help more people retain their employment. However, additional research is needed to clarify the optimal degree of anemia correction that can be safely implemented to optimize patient outcomes including maintaining employment.

Patients in our study who had maintained the same level of employment during the last 6 months before kidney failure were significantly more likely to choose PD as their initial treatment modality. In contrast, those who had not retained the same level of employment from 6 months before kidney failure were more likely to choose HD. Although it could be argued that those chose PD were more educated and more motivated to keep their employment, this finding is consistent with findings from previous studies (13,14). In general, PD allows more flexibility and control over one's treatment schedule and is associated with higher patient satisfaction than in-center hemodialysis (15,16). Despite these advantages, declining numbers of patients are initiating peritoneal dialysis (17) (18). The reasons for the decline are likely multifactorial. There is some concern of possible decreased survival (19,20) and increased risk of complications for certain patients (21). Other possible reasons for this decline are more systems related. In general, outpatient dialysis centers are primarily structured to deliver in-center HD care. Finally, many patients do not receive enough education regarding PD before kidney failure (22).

Ensuring that working-age patients are offered PD could be one means of helping them maintain employment. However, there are other options such as accom-

Table 4. Affect of dialysis setting and dialysis mode on maintaining employment

	1992 Through 1996		1997 Through 1998		1999 Through 2003		*P*-int
	OR [95% CI]	*P*	OR [95% CI]	p	OR [95% CI]	*P*	
Dialysis setting							0.27
dialysis facility	1.00		1.00		1.00		
home	0.98 [0.83 1.15]		0.80 [0.67 0.96]		1.01 [0.89 1.15]		
hospital inpatient	1.16 [1.02 1.33]		1.21 [1.06 1.38]		1.13 [1.01 1.26]		
		0.09	<0.001	0.08			
Primary type of dialysis							0.24
HD	1.00		1.00		1.00		
CAPD	1.27 [1.08 1.48]		1.54 1.30 1.82		1.40 [1.23 1.59]		
CCPD	1.37 [1.13 1.67]		2.04 1.66 2.52		1.61 [1.40 1.87]		
IPD	1.95 [0.82 4.60]		1.02 0.43 2.46		1.47 [0.64 3.37]		
other	2.13 [0.10 45.73]		0.00 – –		0.90	[0.13 6.10]	
		0.006		<0.001		<0.001	

HD, Hemodialysis; CAPD, Continuous ambulatory peritoneal dialysis; CCPD, Continuous cycling peritoneal dialysis; IPD, Intermittent peritoneal dialysis; OR, odds ratio CI, confidence interval; p-int, p interaction.

Table 5. Affect of insurance type on maintaining employment

Insurance Type	1992 Through 1996		1997 Through 1998		1999 Through 2003		*P*	*P*-int
	OR [95% CI]	*P*	OR [95% CI]	*P*	OR	95% CI		
Medicaid	0.40 [0.33 0.48]	<0.001	0.43 [0.36 0.51]	<0.001	0.39	0.35 0.43	<0.001	0.63
DVA	0.85 [0.58 1.23]	0.38	0.93 [0.65 1.34]	0.70	0.80	0.65 0.99	0.04	0.78
Medicare	0.98 [0.86 1.11]	0.76	0.91 [0.80 1.02]	0.11	0.81	0.74 0.88	<0.001	0.04
Employer group	1.73 [1.49 2.02]	<0.001	1.94 [1.67 2.25]	<0.001	1.51	1.36 1.67	<0.001	0.02
Other	1.27 [1.09 1.48]	0.003	1.49 [1.29 1.74]	<0.001	1.36	1.23 1.50	<0.001	0.33
None	0.43 [0.36 0.51]	<0.001	0.49 [0.41 0.58]	<0.001	0.43	0.38 0.48	<0.001	0.40

DVA, Department of Veterans Affairs; OR, odds ratio; CI, confidence interval; p-int, p interaction.

modating the work schedules of in-center HD patients or offering and promoting home hemodialysis. It was recently reported that dialysis centers offering later dialysis shifts (after 5:00 p.m.) and/or home HD training had higher employment rates than facilities that did not offer these options (14). Unfortunately, because of the very small number of people in our sample on home hemodialysis as well as the lack of data specific to dialysis shifts, we were unable to examine these factors.

The final factor associated with maintaining employment was having an employer group health plan or other insurance as a primary payer. Patients with Medicaid or Medicare as a primary payer or patients with no insurance were least likely to maintain employment. In general, patients with employer group health insurance or other insurance have access to better health care. Patients with access to better health care have fewer comorbid conditions and are at a lower risk of hospitalization after reaching kidney failure (23).

We recognize a likely association between type of health insurance and EPO use. Therefore, we examined this relationship in a *post hoc* analysis (Table 6). We found that persons with employer group coverage or other insurance were more likely to have been treated with EPO (Table 6). In contrast, patients with Medicaid or Medicare, both of which cover EPO for anemia of CKD, or no insurance were less likely to be prescribed EPO. We believe EPO treatment is one of the factors that allowed patients to maintain the same level of employment by decreasing their fatigue and risk of hospitalization. Further study of this relationship is warranted.

We acknowledge some potential limitations to our study. This study reflects a retrospective analysis of data from the USRDS on patients starting treatment for ESRD in the time frame 1992 through 2003. Because of its retrospective design, we can only report associations between variables. We cannot demonstrate cause and effect. Also, we were limited by the variables that we were able to analyze because of the limited data collected by the CMS 2728 form. For example, previous facility-based studies have noted that higher levels of education are associated with greater likelihood of em-

Table 6. Erythropoietin use as a function of insurance type

Insurance Type	1992 Through 1996		1997 Through 1998		1999 Through 2003	
	N (%)	*P*	N (%)	*P*	*N* (%)	*P*
Medicaid						
yes	339 (19.73)		376 (21.40)		1208 (26.61)	
no	4496 (25.17)	<0.001	5502 (25.85)	<0.001	17030 (31.18)	<0.001
Veterans Administration						
yes	35 (19.34)		47 (26.55)		164 (31.84)	
no	4797 (24.74)	0.093	5831 (25.50)	0.75	18074 (30.82)	<0.001
Medicare						
yes	666 (29.18)		474 (24.22)		1132 (33.36)	
no	4193 (24.17)	<0.001	5405 (25.63)	0.17	17108 (30.68)	0.001
Employer group						
yes	3203 (27.71)		3942 (28.55)		12407 (34.23)	
no	1643 (20.44)	<0.001	1937 (20.97)	<0.001	5833 (25.47)	<0.001
Other						
yes	1015 (28.73)		1185 (29.09)		3433 (33.37)	
no	3844 (23.87)	<0.001	4694 (24.74)	<0.001	14807 (30.30)	<0.001
None						
yes	332 (12.40)		390 (11.86)		1400 (16.67)	
no	4527 (26.70)	<0.001	5489 (27.78)	<0.001	16840 (33.18)	<0.001

ployment in patients with kidney failure (9). Because the CMS 2728 form does not collect data on education or socioeconomic level, we were unable to assess this relationship. We were also unable to account for center effects. A second limitation is the CMS 2728 form did not include data about comorbidities until 1995, which limits our data analysis for those years. A third limitation was the lack of patient-specific data available after dialysis began. Therefore, we were unable to determine if these factors remained significant or worsened after dialysis initiation as has been noted in other studies (24). Finally, we were unable to assess the reliability of the data collection as there is no consistent protocol for who completes the CMS 2728 forms across dialysis centers and the potential biases that may have occurred in the data collection process.

In conclusion, unemployment affects up to 75% of incident ESRD patients (5). This rate increases with time on dialysis (24). Unemployment in working-age adults is associated with greater physical and psychological problems (6) and loss of self-esteem (7). It also places an enormous economic burden on society. In 1972, Congress established the Medicare End-Stage Renal Disease program with the expectation that payment for dialysis would return patients to the work force as taxpaying citizens. However, Congress did not anticipate growth in this patient population, changing demographics, nor escalating costs to Medicare. Helping working-age patients keep their jobs offers the opportunity to offset societal costs and reduce the financial burden to Medicare and private disability programs. Further research is needed to determine whether interventions based on the findings of our study would be effective in helping patients with advancing chronic kidney disease maintain employment. Finally, the effect of job loss on ESRD patients and their families as well as the effect on government run programs such as Medicare needs further analysis.

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Disclosures

None.

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