

The Associations of Social Support and Other Psychosocial Factors with Mortality and Quality of Life in the Dialysis Outcomes and Practice Patterns Study

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Summary

Background and objectives This study aimed to investigate the influence of social support and other psychosocial factors on mortality, adherence to medical care recommendations, and physical quality of life among hemodialysis patients.

Design, setting, participants, & measurements Data on 32,332 hemodialysis patients enrolled in the Dialysis Outcomes and Practice Patterns Study (1996 to 2008) in 12 countries were analyzed. Social support and other psychosocial factors related to ESRD and its treatment were measured by patient self-reports of health interference with social activities, isolation, feeling like a burden, and support from family and dialysis staff. Cox regression and logistic regression were used to examine associations of baseline social support and other psychosocial factors with all-cause mortality and with other measured outcomes at baseline, adjusting for potential confounders.

Results Mortality was higher among patients reporting that their health interfered with social activities, were isolated, felt like a burden, and were dissatisfied with family support. Poorer family support and several psychosocial measures also were associated with lower adherence to the prescribed hemodialysis length and the recommended weight gain between sessions. Some international differences were observed. Poorer self-reported social support and other psychosocial factors were associated with poor physical quality of life.

Conclusions Poorer social support and other psychosocial factors are associated with higher mortality risk, lower adherence to medical care, and poorer physical quality of life in hemodialysis patients. More research is needed to assess whether interventions to improve social support and other psychosocial factors will lengthen survival and enhance quality of life.

Clin J Am Soc Nephrol 6: 142–152, 2011. doi: 10.2215/CJN.02340310

Introduction

The treatment of ESRD by dialysis creates considerable stress on patients, including potential changes in family relations and social life. Psychosocial factors have been associated with patients' subsequent adjustment to dialysis (1). Many studies have addressed the role of social support in predicting the course of chronic disease. Social support has been defined as the perception that an individual is a member of a complex network in which one can give and receive affection, aid, and obligation (2). Social support can be received from family members, friends, colleagues, and medical personnel. An important distinction is made between a person's number of relationships and a person's perception of the supportive value of social interactions. The former is usually referred to as the social network; the latter is referred to as perceived social support. Although there is no clear agreement on its definition, greater social support has been

linked to better health outcomes in community and clinical samples (3).

Among persons with ESRD, perceived social and family support has been associated with lower mortality risk (4,5). In recent research, perceived discrepancy between expected and received social support was associated with higher mortality, whereas frequency of interaction with members of one's social network was not associated with mortality (6). Quality of life (QoL) and adherence to medical care are also important outcomes to consider and have been associated with mortality (7–11). Several studies have examined the association between social support and patient adherence to medical care. Two studies found association between family/friends support and adherence with recommended fluid intake (12,13). Other studies have failed to show any link between social support and biochemical indicators of adherence and missed or shortened dialysis sessions (5,14). Inconsis-

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tency in these results may be explained by small sample sizes and/or inadequate control for medical and treatment variables. Other possible explanations are the lack of a consensus standard to define and measure adherence (15), the use of different measures of social support, and different cutoff values for sensitivity and specificity in each study.

Associations between social support and QoL have also been observed (16), although not consistently among dialysis patients. Tell *et al.* (17) found a strong association between perceived social support and several measures of health-related quality of life (HRQoL) in dialysis patients, whereas Vazquez *et al.* (18) did not.

The Dialysis Outcomes and Practice Patterns Study (DOPPS) is an international prospective cohort study of hemodialysis practices and outcomes (19). In addition to assessing clinical characteristics associated with mortality and other numerous clinical outcomes, the DOPPS permits the assessment of relevant patient-centered care issues such as adherence with treatment recommendations and HRQoL, as captured by the Kidney Disease Quality of Life Scale (KDQoL) (20). KDQoL measures different aspects of the concept of HRQoL and includes items that capture social support and other psychosocial factors. The main purpose of this study was to investigate associations between these self-reported measures and the following outcomes: mortality, adherence to medical care, and physical QoL.

Materials and Methods

Study Design and Data Sources

We analyzed enrollment data on patients in DOPPS I (1996 to 2001), II (2002 to 2004), and III (2005 to 2008). The DOPPS is a prospective cohort study of adult hemodialysis patients randomly selected for study participation from representative dialysis facilities in 12 countries. The DOPPS sampling plan and study design have been published (19,21).

We examined associations between several measures of social support and other psychosocial factors (assessed by patient self-reported opinions) with patient outcomes. For these analyses, data were available from 308 dialysis facilities in DOPPS I ($n = 12,465$ patients from seven countries: France, Germany, Italy, Japan, Spain, the United Kingdom, and the United States), from 320 dialysis facilities in DOPPS II ($n = 10,551$ patients from the same seven countries with the addition of Australia and New Zealand, Belgium, Canada, and Sweden), and from 297 dialysis facilities in DOPPS III ($n = 9316$ patients from the 12 countries in DOPPS II). Baseline data for patient demographics, comorbidities, and clinical characteristics were obtained at study entry for each study phase.

Measurement of Social Support and Other Psychosocial Factors

At DOPPS enrollment, participants were asked to complete a self-administered patient questionnaire that included questions from the KDQoL Short Form (KDQoL-SF) (22). From the KDQoL-SF, the study presented here used four key questions to evaluate social

support and three questions to evaluate other psychosocial factors. Each question was rated on a Likert scale and dichotomized for the purposes of our analysis (Table 1).

Two questions concerned support from family and friends (“dissatisfied with family time”; “dissatisfied with family support”), and two questions concerned encouragement and support from dialysis staff (“dissatisfied with staff encouragement to be independent”; “dissatisfied with staff support”). Psychosocial factors were measured with three questions regarding patients’ perception of the consequences of kidney disease on social relations (“health has interfered with social activities”; “felt like a burden to family”; and “isolated from people”; Table 1).

Marital and living status were not primary predictors in this study because these variables have been investigated previously in the DOPPS (11,20); however, they were treated as potential confounders.

Measurement of Adherence, Nutrition, and Physical QoL

Facility staff abstracted from patient medical records five baseline indicators of patient nonadherence to medical care: (1) skipping one or more hemodialysis sessions during the 30-day period before study enrollment, (2) shortening the hemodialysis session by >10 minutes during the 30-day period before enrollment, (3) interdialytic weight gain (IDWG) of >5.7% of dry weight, (4) serum phosphate level >7.5 mg/dl, and (5) serum potassium concentration >6.0 mEq/L. Detailed information about the importance of these measures has been published previously (11). Serum albumin level was also abstracted from patient medical records as a marker of nutrition/inflammation. For analysis, serum albumin level was dichotomized (≥ 3.5 versus <3.5 g/dl).

Physical QoL was derived from four KDQoL-SF subscales (physical functioning, role-physical, bodily pain, and general health) originally developed for the Short-Form Health Survey. Physical QoL scores were based on a scale of 1 to 100 with the higher score indicating better QoL. For analysis, the baseline physical QoL score was dichotomized at the median score (>35.5 versus ≤ 35.5).

Statistical Methods

Standard descriptive statistics were used to describe prevalent cross-sections of participants at study entry. Cox regression was used to estimate the hazard ratios of associations of social support and other psychosocial factors with mortality and withdrawal from dialysis. For the mortality outcome, we examined death due to (1) all causes, (2) cardiac disease, (3) cachexia, and (4) infections, with the latter three outcomes modeled as the primary cause of death. Logistic regression was used to estimate associations of social support and other psychosocial factors with indicators of adherence measures and physical QoL. All models included the following as covariates (potential confounders): age, sex, race, years with ESRD, marital status, living status, and 13 summary comorbidity classes including physician-diagnosed de-

Table 1 Scoring categorization for patient self-reported items

Question ^e	Patient Responses		Category B Referred to in Text as
	Category A (Reference): Higher Level of Social/Family Relations ^d	Category B: Lower Level of Social/Family Relations ^d	
Social support			
Concerning your family and friends, how satisfied are you with ^b			
1. The amount of time you are able to spend with your family and friends? ^b	Somewhat satisfied/very satisfied	Very dissatisfied/somewhat dissatisfied	Dissatisfied with family time
2. The support you receive from your family and friends? ^b	Somewhat satisfied/very satisfied	Very dissatisfied/somewhat dissatisfied	Dissatisfied with family support
How true or false are each of the following statements? ^c			
3. Dialysis staff encourages me to be as independent as possible. ^c	Definitely true/mostly true	Do not know /mostly false/ definitely false	Dissatisfied with staff encouragement to be independent
4. Dialysis staff supports me in coping with my kidney disease. ^c	Definitely true/mostly true	Do not know /mostly false/ definitely false	Dissatisfied with staff support
Other psychosocial factors			
5. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities? ^a	A little of the time/none of the time	All of the time/most of the time/some of the time	Health has interfered with social activities
6. I feel like a burden on my family. ^a	Do not know/mostly false/definitely false	Definitely true/mostly true	Felt like a burden to family
7. How much of the time during the past 4 weeks did you isolate yourself from people around you? ^b	None of the time/a little of the time/some of the time	A good bit of the time/most of the time/all of the time	Isolated from people

^aDOPPS I, II and III; ^bDOPPS I; ^cDOPPS I and III.^dAs dichotomized for use in regression models.^eQuestions 1 to 7 are from KDQoL-SF.

pression in psychiatric disorder (listed in Table 2), serum albumin, and single-pool Kt/V. Models were stratified by country and study phase and accounted for clustering of outcomes within facilities. Study participants were followed until the earliest of death, transplant, change of treatment modality, withdrawal from dialysis, transfer to another facility, or study end. Time at risk was defined as the period from study enrolment until the end of patient follow-up. All statistical analyses

were performed using SAS software, version 9.1 (SAS Institute, Cary, NC).

The percentage missing for each variable (Tables 2 and 3) ranged from 1% to 24%. To handle missing data analytically, IVEware software was used to perform multiple imputation using the sequential regression imputation method (23). Demographics, socioeconomic history, 13 summary comorbidities, indicators of patient nonadherences (all variables reported in Table 2), and

Table 2. Baseline demographic and clinical characteristics of DOPPS participants overall and by geographic region

Characteristic	Overall (<i>n</i> = 22,451) ^c	North America (<i>n</i> = 6807)	Europe- Australia/ New Zealand (<i>n</i> = 10,144)	Japan (<i>n</i> = 5500)	Percent Missing ^b
Demographics					
age, years (mean, SD)	61.5 (14.5)	60.8 (15.3)	62.5 (14.8)	60.4 (12.6)	–
male (%)	57.5	53.6	58.3	60.8	–
African American (%)	10.7	32.8	1.5	0.0	–
time on dialysis (mean, SD)	5.1 (5.7)	3.5 (3.9)	4.9 (5.6)	7.6 (6.8)	–
Comorbidities (%)					
coronary heart disease	43.6	56.8	43.5	27.5	–
congestive heart failure	30.9	43.9	30.7	15.0	–
other cardiac conditions	35.4	35.6	39.0	28.6	–
hypertension	77.1	87.2	77.0	64.8	–
peripheral vascular disease	24.2	28.4	27.6	12.7	–
cerebrovascular disease	15.7	17.5	16.2	12.7	–
diabetes	33.3	48.5	26.0	28.2	–
lung disease	10.4	14.8	12.0	1.9	–
cancer, excluding skin	10.9	11.7	12.6	6.5	–
gastrointestinal bleeding	5.6	7.6	5.2	3.7	–
neurologic disease	9.0	11.6	8.9	5.8	–
psychiatric disease	15.5	22.7	17.4	2.9	–
recurrent cellulitis	7.2	10.4	7.5	2.7	–
Education (%) ^a					4
high school or less	83.5	74.9	88.1	85.8	
attended college	16.5	25.1	11.9	14.2	
Occupational status (%) ^a					2
employed	16.6	10.4	11.9	32.8	
retired	40.9	38.6	56.0	15.8	
disabled	14.7	28.2	11.5	3.9	
unemployed	9.5	11.3	5.0	15.8	
homemaker, never employed	14.8	8.8	13.3	25.1	
unknown	3.5	2.8	2.3	6.7	
Living status (%) ^a					2
live alone	16.4	19.1	18.1	10.0	
live with family/friends	79.6	74.8	78.4	87.8	
live in nursing home	4.0	6.1	3.5	2.2	
Marital status (%) ^a					–
single	17.1	21.0	16.5	13.1	
married	60.9	49.9	61.7	73.0	
widowed	15.2	18.2	16.3	9.4	
divorced	6.9	10.9	5.4	4.5	
Nonadherence measure (%)					
skipped ≥ 1 hemodialysis session/month	4.1	8.4	1.9	3.3	7
shortened session by ≥ 10 minutes	12.0	20.5	10.7	5.0	7
IDWG $> 5.7\%$ of dry weight	10.1	12.1	6.5	13.8	11
serum phosphate > 7.5 mg/dl	11.9	13.7	11.2	11.1	4
serum potassium > 6 mEq/L	10.9	5.0	15.7	9.2	4
serum albumin < 3.5 g/dl	21.3	22.4	23.0	16.8	12
single-pool Kt/V < 1.2	24.2	17.9	25.2	30.1	24

^aColumns in designated category add to 100%.

^b $\leq 1\%$ missing values except as listed. Percentages shown in other columns are among patients without missing data.

^cRestricted to a representative, prevalent cross-section of patients enrolled at the start of DOPPS phase I, II, and III; replacement placements (*n* = 9881), enrolled during study follow-up, are excluded from this table but included in subsequent models.

Table 3. Percent distribution of social support and other psychosocial factors overall and by geographic region

	Percent of Patients				
	Overall (n = 32,332)	North America (n = 11,159)	Europe- Australia/ New Zealand (n = 14,566)	Japan (n = 6607)	Missing ^a
Dissatisfied with family time	23.8	29	20.6	16.2	9
Dissatisfied with family support	12.0	13.4	10.4	11.2	9
Dissatisfied with staff encouragement to be independent	21.4	20	18.7	29.3	13
Dissatisfied with staff support	14.1	12.9	11.5	21.1	12
Health has interfered with social activities	53.5	54.1	58.6	41	5
Felt like a burden to family	45.6	44.5	40.7	58.2	6
Isolated from people	12.0	12.3	13.5	9	8

^aPercentages shown in other columns are among patients without missing data.

physical QoL were used to impute missing baseline values of patient self-reported items (social support and other psychosocial factors) and covariate adjustments. Missing outcomes (physical QoL, indicators of patient nonadherence) were not imputed. Five samples of imputed data were generated. For each analysis, five estimates specific to each data set were generated and pooled to obtain the final estimate, with variance estimated using Rubin's formula (24).

Results

Patient Characteristics

Baseline clinical characteristics are presented in Table 2. The mean age was 61.5 years and the average time on dialysis was 5.1 years. The median follow-up time in the survival analysis was 1.76 years (maximum 5.4 years). More than half (60.9%) of the patients were married and 79.6% lived with family or friends. Concerning adherence indicators, 4.1% of patients skipped one or more hemodialysis sessions in a month, 12.0% shortened hemodialysis session by ≥ 10 minutes in a month, 10.1% had excessive IDWG, 11.9% had hyperphosphatemia, and 10.9% had hyperkalemia. 21.3% of patients had an albumin level < 3.5 g/dl.

It is interesting to note that patients from Japan had distinct characteristics regarding marital, living, and occupational status compared with patients in North America and Europe-Australia/New Zealand. A high percentage of Japanese patients were married and lived with family and friends. Most patients were employed or a homemaker, whereas in the other regions most patients were retired.

Distributions of Social Support and Other Psychosocial Factors

The percentage distribution of patient self-report of social support and other psychosocial factors by region are presented in Table 3. Notably, across DOPPS

phases (I to III), nearly half of the patients felt like a burden to family and felt that health has interfered with social activities. Regional specificities were observed. In Japan, more patients felt like a burden to family, but a smaller fraction felt that health interfered with social activities compared with the two other regions. Moreover, in Japan, patients expressed less dissatisfaction with family time and support, although they were more dissatisfied with staff encouragement and support.

All-Cause Mortality

All-cause mortality was higher in patients who reported feeling that their health has interfered with social activities (hazard ratio [HR] = 1.33; 95% confidence interval [CI] 1.26 to 1.40), isolated from people (HR = 1.28; 95% CI 1.12 to 1.45), felt like a burden to family (HR = 1.30; 95% CI 1.23 to 1.37), dissatisfied with family time (HR = 1.13; 95% CI 1.03 to 1.25), and dissatisfied with family support (HR = 1.14; 95% CI 1.02 to 1.28) (Table 4). The association of all-cause mortality with being dissatisfied with family support appeared to be substantially stronger in Japan (HR = 2.1; 95% CI 1.25 to 3.53) than in North America or in the Europe-Australia/New Zealand study region (Figure 1). For all of the other factors, the relationship of each social support and psychosocial factor with all-cause mortality was consistent and similar across regions and was consistent with the overall results stratified by country.

Cause-Specific Mortality

Health interference with social activities and feeling like a burden to family were significantly associated with cardiac, cachexia, and infection-related mortalities. The highest magnitude was observed for mortality due to cachexia (Table 4).

Table 4. Associations of patient self-reported social support and other psychosocial factors with mortality

	HR (95% CI)		
	All-Cause Mortality	Cardiac ^e	Cause-Specific Mortality Cachexia ^h Infection ⁱ
Dissatisfied with family time ^b	1.13 (1.03 to 1.25) ^f	1.13 (0.98 to 1.31)	1.29 (0.59 to 2.84)
Dissatisfied with family support ^b	1.14 (1.02 to 1.28) ^f	1.12 (0.91 to 1.39)	1.43 (0.53 to 3.84)
Dissatisfied with staff encouragement to be independent ^c	1.04 (0.96 to 1.13)	1.05 (0.93 to 1.19)	1.19 (0.69 to 2.07)
Dissatisfied with staff support ^c	1.08 (0.98 to 1.19)	1.03 (0.87 to 1.21)	1.21 (0.51 to 2.87)
Health has interfered with social activities ^a	1.33 (1.26 to 1.40) ^d	1.28 (1.16 to 1.41) ^d	1.57 (1.01 to 2.45) ^f
Felt like a burden to family ^a	1.30 (1.23 to 1.37) ^d	1.23 (1.12 to 1.35) ^d	1.45 (1.02 to 2.08) ^f
Isolated from people ^b	1.28 (1.12 to 1.45) ^e	1.13 (0.94 to 1.36)	1.73 (0.76 to 3.97)

Pooled across geographic regions. Region-specific mortality is in Figure 1. All models were adjusted for age, gender, race, time on dialysis, marital status, living status, 13 summary comorbidity classes, serum albumin, and single-pool Kt/V; stratified by country and phase; and accounted for facility clustering. Reference categories are in Table 1 (category A).
^aIn DOPPS I, II, and III: *n* = 32,046; ^bIn DOPPS I: *n* = 12,356; ^cIn DOPPS I and III: *n* = 21,592.
^d*P* < 0.0001; ^e*P* = 0.0001 to <0.01; ^f*P* = 0.01 to <0.05.

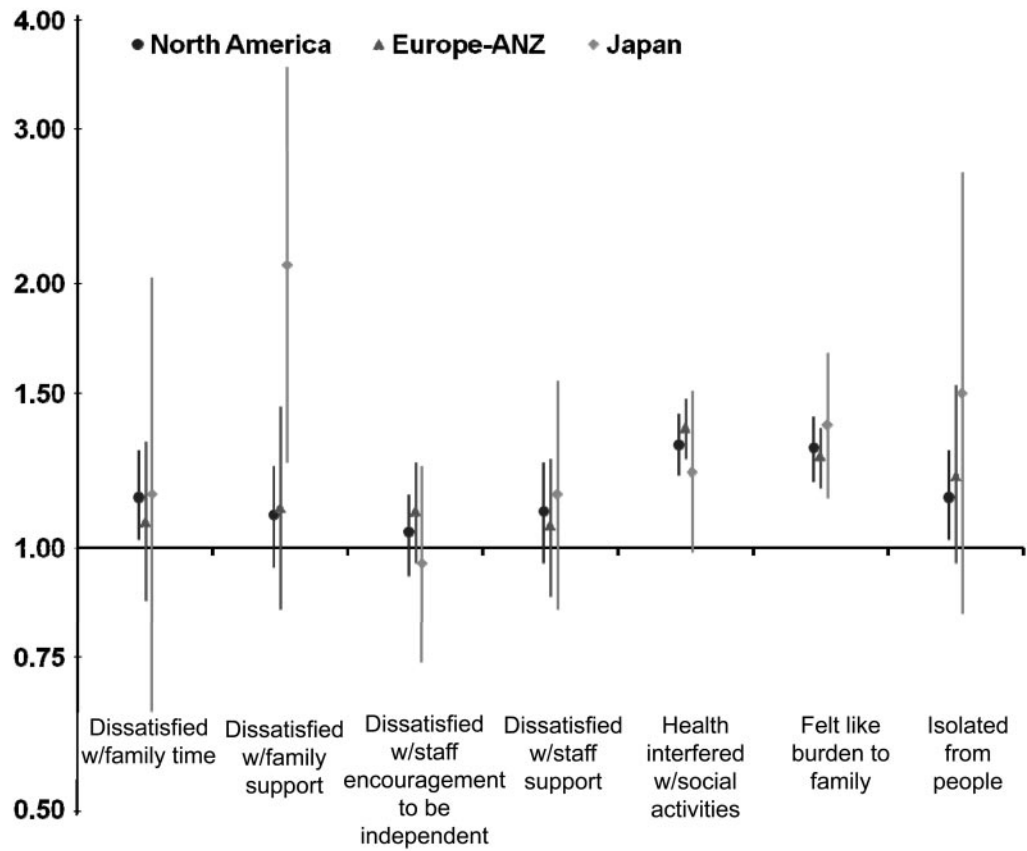
^gCardiac: primary cause of death reported as acute myocardial infarction, hyperkalemia, pericarditis including cardiac tamponade, atherosclerotic heart disease, cardiomyopathy, cardiac arrhythmia, cardiac arrest of unknown cause, valvular heart disease, pulmonary edema due to exogenous fluid, or congestive heart failure.

^hCachexia: primary cause of death reported as cachexia.

ⁱInfections: primary cause of death reported as septicemia due to vascular access or peritonitis or peripheral vascular disease (gangrene) or other causes, pulmonary infection (bacterial, fungal, or other), viral infection (CMV or other), tuberculosis, AIDS, or infections of other cause.

All-Cause Mortality, by Region

Hazard Ratio (95% CI)



	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
North America	1.14 (1.02,1.29) ^f	1.09 (0.95,1.24)	1.04 (0.93,1.15)	1.10 (0.96,1.25)	1.31 (1.21,1.42) ^d	1.30 (1.19,1.41) ^d	1.14 (1.02,1.29) ^f
Europe-ANZ	1.07 (0.87,1.32)	1.11 (0.85,1.45)	1.10 (0.96,1.25)	1.06 (0.88,1.26)	1.37 (1.26,1.48) ^d	1.27 (1.17,1.37) ^d	1.21 (0.96,1.53)
Japan	1.15 (0.65,2.03)	2.10 (1.25,3.53) ^e	0.96 (0.74,1.24)	1.15 (0.85,1.55)	1.22 (0.99,1.51)	1.38 (1.14,1.67) ^e	1.50 (0.84,2.68)

Figure 1. | Association of patient self-reported social support and other psychosocial factors with all-cause mortality, by region. Reference categories are listed in Table 1 (category A). DOPPS I, II, and III: *n* = 32,046. DOPPS I: *n* = 12,356. DOPPS I and III: *n* = 21,592. All models were adjusted for age, gender, race, time on dialysis, marital status, living status, 13 summary comorbidity classes, serum albumin, and single-pool Kt/V; stratified by phase; and accounted for facility clustering. ^aIn DOPPS I, II, and III: *n* = 32,046; ^cIn DOPPS I and III: *n* = 21,592. ^d*P* < 0.0001; ^e*P* = 0.0001 to <0.01; ^f*P* = 0.01 to <0.05.

Withdrawal from Dialysis

Associations with withdrawal from dialysis are presented by region (North America and Europe-Australia/New Zealand) in Figure 2. Japan was excluded when shown by region because it has very few withdrawal events. Health interference with social activities and feeling like a burden to family were associated with higher rates of withdrawal in North America and Europe-Australia/New Zealand. Dissatisfaction with family time was only associated with a higher rate of withdrawal in North America.

Indicators of Nonadherence

Lower levels of patient self-reported social support and other psychosocial factors were associated with ex-

cessive IDWG and higher likelihood to shorten hemodialysis session and to have hyperkalemia (Table 5). Regional variations were noted. In North America, dissatisfaction with family time was associated with higher likelihood to skip a hemodialysis session (HR = 1.39; 95% CI 1.39 to 1.83). Feeling like a burden to family was associated with higher likelihood to shorten hemodialysis session (HR = 1.14; 95% CI 1.01 to 1.28). In Europe-Australia/New Zealand, feeling like a burden to family was associated with higher likelihood to shorten hemodialysis session (HR = 1.13; 95% CI 1.13 to 1.26) and to have hyperkalemia (HR = 1.15; 95% CI 1.03 to 1.27). In Japan, patients' isolation and dissatisfaction with family time and

Dialysis Withdrawal, by Region

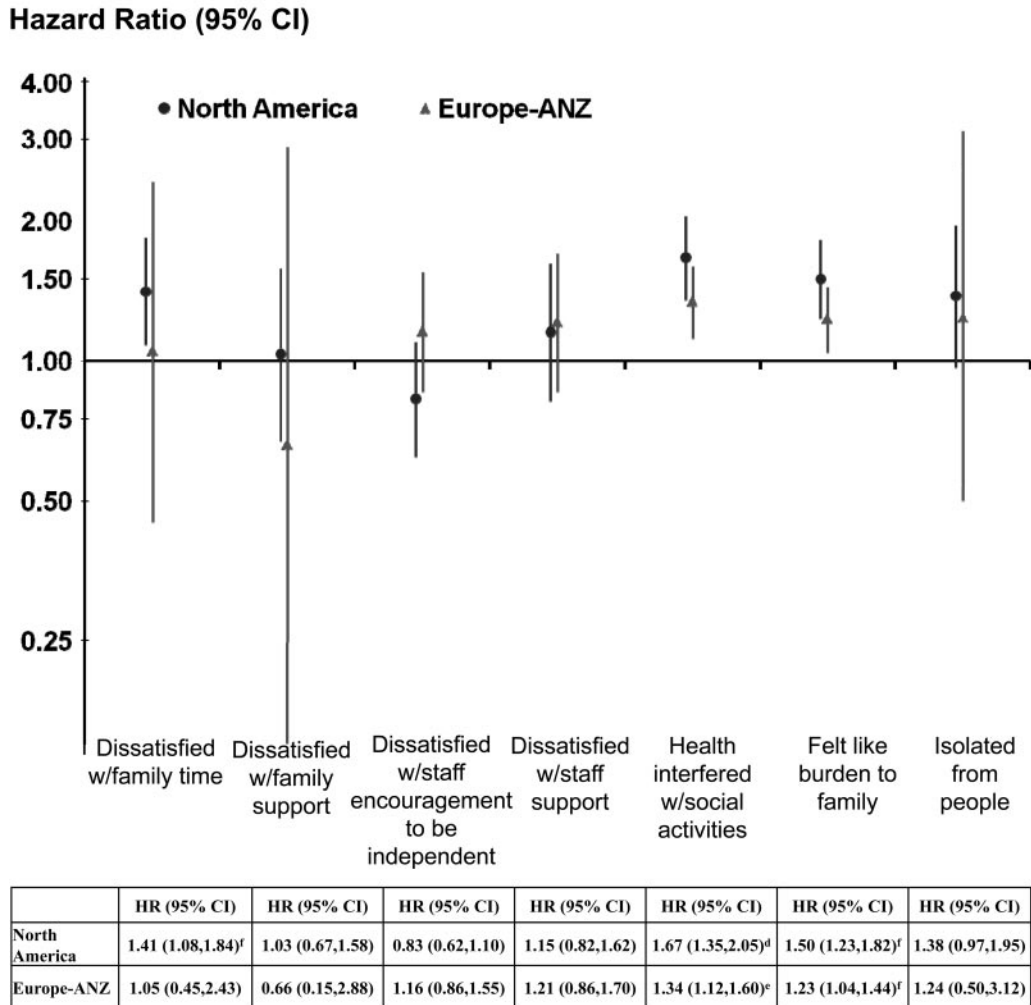


Figure 2. | Association of patient self-reported social support and other psychosocial factors with withdrawal from dialysis by region. Reference categories are listed in Table 1 (category A). DOPPS I, II, and III: *n* = 32,046. DOPPS I: *n* = 12,356. DOPPS I and III: *n* = 21,592. All models were adjusted for age, gender, race, time on dialysis, marital status, living status, 13 summary comorbidity classes, serum albumin, and single-pool Kt/V; stratified by phase; and accounted for facility clustering. Because very few withdrawal events are reported, Japan was not shown. ^aIn DOPPS I, II, and III: *n* = 32,046; ^bIn DOPPS I: *n* = 12,356. ^cIn DOPPS I and III: *n* = 21,592. ^d*P* < 0.0001; ^e*P* = 0.0001 to <0.01; ^f*P* = 0.01 to <0.05.

support were associated with excessive IDWG (HR = 2.01; 95% CI 1.28 to 3.14; HR = 1.51; 95% CI 1.07 to 2.14; HR = 1.50; 95% CI 1.00 to 2.24).

Albumin Levels

Lower psychosocial factor scores were associated with low serum albumin levels (Table 5). For each region, health interference with social activities and feeling like a burden to family were associated with low serum albumin levels.

Physical QoL

Lower levels of all seven patient self-reported social support and other psychosocial factors were associated with poor physical QoL (*P* < 0.0001) (Table 6). The poor physical QoL results within each region

were consistent with the overall estimates across regions.

Sensitivity Analyses

The primary analyses adjusted for diagnosis of any psychiatric disorder. Physician-diagnosed depression comprised 78% of these psychiatric disorders. The associations of social support and other psychosocial factors with mortality were similar when adjusted for physician-diagnosed depression instead of psychiatric disorder. In another analysis adjusted for patient-reported depressive symptoms (using Center for Epidemiologic Studies Depression Scale [CES-D]), the associations of social support and other psychosocial factors with mortality were similar, although modestly attenuated. For the mortality model, no interactions between social sup-

Table 5. Associations of social support and other psychosocial factors with indicators of patient nonadherence

	Odds Ratios by Nonadherence Indicator (95% CI)					
	IDWG >5.7% of Dry Weight	Skipped ≥1 HD Session/Month	Shorten Session by ≥10 Minutes	Phosphate > 7.5 mg/dl	Potassium > 6 mEq/L	Albumin <3.5 g/dl
Dissatisfied with family time ^b	1.18 (0.96 to 1.45)	1.13 (0.93 to 1.37)	1.06 (0.92 to 1.22)	0.93 (0.82 to 1.07)	1.09 (0.93 to 1.28)	1.10 (0.97 to 1.24)
Dissatisfied with family support ^b	1.27 (1.03 to 1.58) ^f	0.91 (0.71 to 1.17)	1.21 (0.99 to 1.47) ^g	0.98 (0.82 to 1.16)	1.14 (0.95 to 1.37)	0.96 (0.82 to 1.12)
Dissatisfied with staff encouragement to be independent ^c	1.15 (1.01 to 1.30) ^f	1.10 (0.93 to 1.29)	1.03 (0.93 to 1.15)	1.00 (0.89 to 1.11)	0.95 (0.85 to 1.08)	0.97 (0.88 to 1.05)
Dissatisfied with staff support ^c	1.11 (0.96 to 1.29)	0.99 (0.81 to 1.21)	1.06 (0.94 to 1.20)	1.01 (0.89 to 1.14)	0.97 (0.85 to 1.10)	0.93 (0.84 to 1.04)
Health has interfered with social activities ^a	1.12 (1.01 to 1.23) ^f	1.05 (0.93 to 1.18)	1.06 (0.98 to 1.15)	1.06 (0.98 to 1.14)	1.05 (0.96 to 1.14)	1.23 (1.16 to 1.31) ^d
Felt like a burden to family ^a	1.01 (0.92 to 1.11)	1.07 (0.96 to 1.19)	1.12 (1.04 to 1.21) ^e	0.98 (0.91 to 1.05)	1.10 (1.01 to 1.20) ^f	1.22 (1.16 to 1.30) ^d
Isolated from people ^b	1.22 (0.99 to 1.50) ^g	1.00 (0.79 to 1.27)	1.03 (0.87 to 1.22)	0.95 (0.79 to 1.15)	0.98 (0.79 to 1.22)	1.18 (1.02 to 1.37) ^f

All models were adjusted for age, gender, race, time on dialysis, marital status, living status, 13 summary comorbidity classes, serum albumin, single-pool Kt/V, country, and phase and accounted for facility clustering. Reference categories are in Table 1 (category A).

^aIn DOPPS I, II, and III: *n* = 25,839 to 30,020; ^bIn DOPPS I: *n* = 9206 to 10,807; ^cIn DOPPS I and III: *n* = 17,354 to 20,309.

^d*p* < 0.0001; ^e*p* = 0.0001 to <0.01; ^f*p* = 0.01 to <0.05; ^g*p* = 0.05 to 0.1.

port/psychosocial factors and psychiatric disorder, depression, or CES-D score were observed.

Discussion

This study shows strong associations between poorer social support, other psychosocial factors and a higher mortality rate, greater likelihood of nonadherence with medical care, and worse physical QoL. A strength of our study is that it is based on a much larger representative population than previous reports because it has international and multicultural dimensions.

Family and staff support measures were associated with higher mortality rates, a finding similar to that described previously by Christensen *et al.* (4) in a much smaller sample of 78 hemodialysis patients. Reporting that health has interfered with social activities, feeling isolated from people, feeling like a burden to family, and dissatisfaction with family time and support were associated with higher risk of all-cause mortality. These results are consistent with those from Kimmel *et al.* (5) who found that patients' social support and patients' perception of illness intrusiveness predict all-cause mortality. The study presented here shows two interesting results. First, regarding primary cause of mortality, social support measures seem to be less strongly associated with mortality than other psychosocial factors. Second, a cultural specificity was observed in Japan: being dissatisfied with family support was associated with an especially high mortality rate.

Previous studies have shown associations of social support with all-cause death but not with death due to specific causes. The study presented here gives additional insight into associations between psychosocial factors and mortality by demonstrating associations with a wide range of causes including cardiac causes, cachexia, and infection. Poorer psychosocial factors, as assessed by the interference of health/emotional problems with social activities and the feeling of being a burden to the family, were also associated with higher risk of withdrawal from dialysis.

Moreover, this study underlines the association between psychosocial factors and albumin level, an important biologic marker of nutritional status and possible inflammation. Health has interfered with social activities, feeling isolated from people, and felt like a burden to family were all associated with lower serum albumin levels. Previous studies have shown that low albumin and other markers of malnutrition/inflammation are associated with elevated overall and cardiovascular mortality (25). Additional studies are needed to assess whether hypoalbuminemia is possibly on the causal pathway between social factors and mortality.

Lower levels of family support and other psychosocial factors were associated with higher risk of nonadherence with medical care. These patterns of associations are consistent with those of previous studies (12,13). In the research presented here, cultural specificities were observed. In North America, dissatisfac-

Table 6. Associations of social support and other psychosocial factors with physical QoL

	OR by Physical QoL Score (95% CI) Physical Component Summary Score >35.5 versus ≤35.5
Dissatisfied with family time ^b	0.54 (0.48 to 0.61) ^d
Dissatisfied with family support ^b	0.74 (0.64 to 0.86) ^d
Dissatisfied with staff encouragement to be independent ^c	0.73 (0.67 to 0.80) ^d
Dissatisfied with the staff support ^c	0.76 (0.69 to 0.84) ^d
Health has interfered with social activities ^a	0.25 (0.24 to 0.27) ^d
Felt like a burden to family ^a	0.40 (0.38 to 0.43) ^d
Isolated from people ^b	0.39 (0.34 to 0.46) ^d

All models were adjusted for age, gender, race, time on dialysis, marital status, living status, 13 summary comorbidity classes, serum albumin, single-pool Kt/V, country, and phase and accounted for facility clustering. Reference categories are in Table 1 (category A).

^aIn DOPPS I, II, and III: *n* = 25,759 to 26,650; ^bIn DOPPS I: *n* = 9213 to 9664; ^cIn DOPPS I and III: *n* = 17,612 to 17,279.

^d*P* < 0.0001.

tion with family time and feeling like a burden to family were associated with nonadherence to prescribed hemodialysis sessions. In Europe-Australia/New Zealand, feeling like a burden to family was associated with nonadherence to hemodialysis session length and hyperkalemia. In Japan, patients' isolation and dissatisfaction with family time and support were associated with excessive IDWG. It is surprising to notice that staff encouragement and support were not associated with patient adherence and may not be able to overcome the possible stronger influence of other psychosocial factors and family support.

Few studies have examined associations between social relations and QoL in hemodialysis patients. The research presented here shows that higher social support and other psychosocial factors are associated with better physical QoL; these links were also found for each patient self-reported measure. Moreover, these associations were similar in North America, Europe-Australia/New Zealand, and Japan. These findings are consistent with observations from other studies (17,25) and emphasize the importance of family and staff support for the QoL of hemodialysis patients across cultures. A greater focus on increasing social support may improve QoL for hemodialysis patients and contribute to reducing rates of death and hospitalization in this patient population (10). We chose not to study the relations between social support and mental QoL because this component of QoL consists of social support items and is thus intrinsically correlated.

Several limitations in our study warrant mention. First, social support was measured with limited items from the KDQoL. Although future studies addressing similar questions should ideally use well established instruments that have proven reliable and valid, the reliability and validity of social support instruments that capture factors specific to hemodialysis and the lives of hemodialysis patients have not been estab-

lished. Second, this research focused on one dimension of social support (*i.e.*, perceptions about relationships with others). Other dimensions of social support (*e.g.*, social network size, frequency of contact with family and friends, participation in group activities, *etc.*) merit additional study. Third, it was not possible to assess whether the levels of social support and other psychosocial factors preceded or followed the initiation of dialysis, which should be viewed as a limitation especially for associations with adherence indicators and other outcomes assessed cross-sectionally at the initiation of the study. Social support and other psychosocial factors may vary over time and may be important to consider at the initiation of dialysis therapy. Nevertheless, our findings indicate that crude psychosocial indicators assessed at study entry inclusion can predict subsequent clinical outcomes in hemodialysis patients, particularly death and withdrawal from dialysis. A fourth limitation is confounding by health status because healthier patients may perceive higher levels of support, whereas sicker patients may believe they are a greater burden to others. Finally, the items measuring psychosocial factors may also indicate state of physical health. All indicators of health cannot be accounted for in observational studies.

Our research underscores the links between people's resources and their resiliency (26), with social support being considered here as a resource. In relation to the conservation of resources theory (27), people seek to obtain, retain, and protect resources. Therefore, the lack of resources tends to undermine patients' positive psychologic outcomes. Like a spiral of loss, illness can mobilize a patient's personal and social resources (*e.g.*, physical vigor, emotional robustness, cognitive ability, family love and availability). When confronted with stressful situations such as hemodialysis, the ability to seek and obtain support is necessary and salutogenic. Thus, the presence of supportive people who can be confided in and

whose caring is deemed important must be one of the most salient types of support.

In summary, this large international study demonstrates that several indicators of social support and other psychosocial factors are associated with mortality, adherence, nutrition, and physical QoL. In addition, the results corroborate the hypothesis that social-support interventions are needed to enhance patient global care (28). Feeling like a burden to family was consistently linked to the different adverse outcomes of our study, and interventions should probably focus on this feeling. The guilt patients often feel about being ill might prevent them from asking for support. Further studies are needed on the effect of family members' involvement on patients' feelings of being a burden, sense of support, and clinical outcomes.

Acknowledgments

DOPPS is administered by Arbor Research Collaborative for Health and is supported by scientific research grants from Amgen (since 1996), Kyowa Hakko Kirin (since 1999, in Japan), Genzyme (since 2009), and Abbott (since 2009) without restrictions on publications. Shauna Leighton of the Arbor Research Collaborative for Health provided editorial assistance.

Disclosures

None.

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Received: March 11, 2010 Accepted: August 11, 2010

Published online ahead of print. Publication date available at www.cjasn.org.