Rowan University

Rowan Digital Works

School of Osteopathic Medicine Faculty Scholarship

School of Osteopathic Medicine

8-1-2009

Depressive Symptoms and Marital Satisfaction in the Context of Chronic Disease: A Longitudinal Dyadic Analysis

Rachel Pruchno
Rowan University

Maureen Wilson-Genderson
University of Medicine and Dentistry of New Jersey

Francine P Cartwright
Rowan University

Recommended Citation

Depressive Symptoms and Marital Satisfaction in the Context of Chronic Disease: A Longitudinal Dyadic Analysis

Rachel A Pruchno, **Maureen Wilson-Genderson**, and **Francine P. Cartwright**

Abstract

These analyses examine the longitudinal relationships between depressive symptoms and marital satisfaction over a two year period of time as they are experienced by 315 patients with end stage renal disease (ESRD) and their spouses. Using multilevel modeling we examine both individual and cross-partner effects of depressive symptoms and marital satisfaction on patients and spouses, testing bidirectional causality. Results indicate that mean and time varying depressive symptoms of both patients and spouses are associated with their own marital satisfaction. Although mean marital satisfaction is associated with own depressive symptoms for both patients and spouses, time varying marital satisfaction does not affect depressive symptoms for either patients or spouses. Significant cross-partner effects reveal that both mean enduring and time varying depressive symptoms of the spouse affect marital satisfaction of the patients. Findings highlight the complex nature of the relationship between depressive symptoms and marital satisfaction in late life couples.

Keywords

marital satisfaction; depressive symptoms; multilevel modeling; marital dyad; late-life marriages

The robust cross-sectional associations between marital satisfaction and both diagnosed depression and depressive symptomatology (Davila, Karney, Hall, & Bradbury, 2003; Proulx, Helms, & Buehler, 2007; Whisman, 2001) has led investigators to develop longitudinal studies examining the extent and direction of causality between these constructs. However, research has been limited by an almost exclusive emphasis on samples of young, healthy newlyweds, and by analytic methods that treat the individual as the unit of analysis. (Beach, Davey, & Fincham, 1999; Davila et al., 2003; Fincham, Beach, Harold, & Osborne, 1997; Kurdek, 1998). Our analyses build on this literature, extending knowledge to the ways in which depressive symptoms relate to marital satisfaction among couples in late life marriages who are coping with the exigencies of chronic disease. The prevalence of these couples, at high risk for both depressive symptoms and marital dissatisfaction, will continue to increase as advances in medicine keep both members of couples functioning well into their later years. We examine depressive symptoms and marital satisfaction over a two year period of time as they are experienced by patients with end stage renal disease (ESRD) and their spouses, analyzing both individual and cross-partner effects and testing directionality from depressive symptoms to marital satisfaction and from marital satisfaction to depressive symptoms.

Conceptual Models and Empirical Findings

In their meta-analysis of studies examining the relationship between marital quality and individual well-being, Proulx et al. (2007) conclude that marital quality and psychological well-being are positively related both concurrently and over time, with higher levels of marital quality predicting greater psychological well-being. These findings derive largely from empirical studies testing the dominant marital discord model of depression (Beach, Sandeen, & O'Leary, 1990), a model positing that low-quality marriages lead to an increased risk of depression. Commenting on the magnitude of these relationships, Proulx et al. (2007) find that the cross-sectional mean effect size is moderate in strength, whereas the longitudinal mean effect size is small to moderate. They also find evidence that a host of variables, including sex, length of marriage, measurement of marital quality and well-being, year of data collection, number of waves of data, treatment of the dependent variable, and analytic strategy affect results.

The influence of these moderating and mediating effects suggests that our understanding of the direction of causality between marital satisfaction and depressive symptoms is wanting. An alternative model, proposed by Coyne (1976), suggests that depression predicts marital dissatisfaction. According to this view, the behavior of depressed individuals is aversive to their significant others. Although these significant others typically try to inhibit their negative responses to depressed individuals, they are often unsuccessful in doing so, and their negative responses reinforce depressive symptoms. A related perspective, the stress generation model advanced by Hammen (1991), Davila (2001), and Davila, Bradbury, Cohan, and Tochluk (1997) posits that individuals with low psychological well-being encounter stressful interactions with their spouses and that, in turn, these stressful interactions lead to reduced marital satisfaction.

Yet a third model suggests that the relationship between depression and marital satisfaction is bidirectional. This model argues the importance of simultaneously modeling the recurrent, episodic nature of depressive symptoms (Coyne & Benazon, 2001) and the more stable trajectory of marital satisfaction. Klinkman, Schwenk, and Coyne (1997) contend that depression is more of a chronic, episodic condition, like asthma than it is an acute, single-episode phenomenon, like appendicitis. As with asthma, most current episodes of depression are recurrences, and the best predictor of a future episode is having had a past episode (Coyne, Pepper, & Flynn, 1999). Longitudinal evidence regarding trajectories of marital satisfaction, on the other hand, is that of decline (Umberson, Williams, Powers, Liu, & Needham, 2006). Van Laningham, Johnson, and Amato (2001), in their analysis of data from a national 17-year, 5-wave panel sample, find evidence of declines in marital happiness, with the steepest declines occurring during the early and late years of marriage.

In one of the first studies attempting to disentangle reciprocal patterns of influences, Fincham et al. (1997) found that for newlywed men, depressive symptoms led to decreases in marital quality, whereas for newlywed women low marital quality increased depressive symptoms. In their recent analyses of eight waves of data from newlywed couples over four years of marriage, Davila et al. (2003) reported that while average marital satisfaction declined for both spouses over time, average depressive symptoms did not change systematically. Rather, depressive symptoms followed a pattern of waxing and waning, fluctuating at each assessment around each individual's mean level. Within this context, Davila et al. (2003) found support for bidirectional relationships over time, with depressive symptoms as likely to predict changes in martial satisfaction as marital satisfaction is to predict changes in depressive symptoms. Additional support for the bidirectional effects of marital satisfaction and depressive symptoms is provided by Choi and Marks (2008) who found that between the first two waves of data collection (a 5-year lag) depressive symptoms predicted increases in marital conflict while

between the last two waves (a 10-year lag) martial conflict predicted increases in depressive symptoms.

Older Couples

Findings from the few cross-sectional studies of older couples that have been conducted (Bookwala & Jacobs, 2004; Sandberg & Harper, 2000; Whisman, Uebelacker, Tolejko, Chatav, & McKelvie, 2006) are consistent with those from cross-sectional studies of younger couples, revealing that greater marital discord is associated with greater depression, lower life satisfaction, and lower self-esteem. In one of the few longitudinal studies of the relationship between depressive symptoms and marital discord in an older sample, Ulrich-Jakubowski, Russell, and O'Hara (1988) found that, unlike the pattern characterizing young adults, in which marital distress predicts increases in depressive symptoms, for older men, increased depressive symptoms predicted subsequent decline in marital adjustment over a 15 month period. Similarly, longitudinal research by Wright (1990) revealed that depressed mood predicted poorer marital satisfaction, while marital relationship did not predict mood.

These findings raise questions about whether the longitudinal relationship between marital satisfaction and depressive symptoms might differ for older couples than for younger couples. According to the socioemotional selectivity theory (Carstensen, 1991), while the rate of social interaction declines with age as relationships are lost through death and illness, overall emotional closeness to others increases. With age, close personal relationships, such as the marital relationship, increase in importance, as remaining relationships carry a larger proportion of the total amount of the person's emotional closeness (Whisman et al., 2006). Moreover, with age, comes the likelihood of declining health, and there is evidence that declining health may erode marital satisfaction (Booth & Johnson, 1994; Gagnon, Hersen, Kabacoff, & Van Hasselt, 1999; Levenson, Carstensen, & Gottman, 1993). Together these factors help explain why, in the face of stressful circumstances in late life, the contribution of marital relationships to mental health is complex (Bookwala & Franks, 2005). Tower and Kasl (1995, 1996), for example, find that marital closeness can buffer the stressful impact of living with a cognitively impaired or depressed spouse. Similarly, Bookwala and Franks (2005) found that respondents with physical disability who were in marriages marked by higher marital disagreement reported greater depressed affect than those with similar levels of physical disability who were in less conflictual marriages.

Cross-Partner Effects

Although most of the literature has focused attention on the role of one's own martial dissatisfaction and depressive symptoms over time, there is growing evidence that the marital satisfaction and depressive symptoms of partners impact one another. Katz, Monnier, Beach, Libet, and Shaw (2000), for example, found that female spouses of medical students were more likely to endorse depressive symptoms if their partners concurrently endorsed lower marital quality. Partner effects are likely to be important for couples in long-term marriages because with marital longevity comes a greater likelihood for lives to be entwined. In one of the few longitudinal studies to examine cross-partner effects in older couples, Sandberg and Harper (2000) report that husband's marital distress had an independent effect on wife's depression. Quirouette and Pushkar-Gold (1992) found that husbands' perceptions of the marriage, husbands' well-being, and husbands' physical health (in order of influence) predicted wives' well-being. None of the wives' characteristics had a significant relationship to husbands' well-being. A more recent study of married couples with adolescent children by Beach, Katz, Kim, and Brody (2003) found that spouses' own marital quality at baseline predicted their partners' depressive symptoms one year later, net of other predictors in the model. Cross-partner effects characterize other domains, as illustrated by our findings that the burden experienced by spouses affects not only their own well-being, but that of the patient (Wilson-Genderson,

Pruchno, & Cartwright, 2008) and that there are significant relationships between the self-rated health and depressive symptoms experienced by patients and spouses (Pruchno, Wilson-Genderson, & Cartwright, in press).

The Context of Chronic Illness

Couples in which one member suffers from end stage renal disease (ESRD) provide a rich context for understanding how changes in depressive symptoms and marital satisfaction affect one another. ESRD is a chronic illness in which the kidneys permanently fail. According to the U.S. Renal Data System (2008), each year in the United States over 400,000 people with ESRD are treated with hemodialysis, a life-sustaining invasive treatment in which waste materials are removed from the blood through a machine, compensating for a loss of kidney function. As in many chronic illnesses, patients with ESRD experience significant levels of depressive symptoms (Cukor et al., 2007; Finkelstein & Finkelstein, 2000; Hedayati, Bosworth, Kuchibhatla, Kimmel, & Szczech, 2006). There is evidence that ESRD affects the well-being of spouses as well as patients (Daneker, Kimmel, Ranich, & Peterson, 2001; Devins, Hunsley, Mandin, Taub, & Paul, 1997). Couples in which one partner has ESRD and is on hemodialysis must accommodate to an illness that requires patients to adhere to a strict treatment schedule. They also face health crises that are often unpredictable. In one of the few studies to examine the relationship between patient and spouse depressive symptoms in this population, Daneker et al. (2001) found a significant positive association between patient and spouse symptoms.

The Current Study

The analyses that follow build on both the marital discord model of depression and the stress generation model, testing the extent to which bi-directionality characterizes the longitudinal relationship between marital satisfaction and depressive symptoms. We address the following research questions:

1. How do patient and spouse levels of depressive symptoms and marital satisfaction change over time?

2. Do changes in own marital satisfaction affect the trajectory of own depressive symptoms?

3. Do changes in own depressive symptoms affect the trajectory of own martial satisfaction?

4. Does partner's marital satisfaction affect the trajectory of one's own depressive symptoms?

5. Do partner's depressive symptoms affect the trajectory of one's own marital satisfaction?

6. How do variables known to influence or be confounded with depressive symptoms and marital satisfaction, including sex, race, age, length of time on hemodialysis treatment, length of time married, number of kidney symptoms, and number of own health conditions affect patterns of change in depressive symptoms and marital satisfaction experienced by patients and spouses?

Methods

Sample

OPTIONS (Opinions and Preferences for Treatment in Older Nephrology patients and their Spouses) is a prospective longitudinal study of the effects that a chronic illness (ESRD) has on older couples. Inclusion criteria stipulated that patients be at least 55 years old, on

hemodialysis for at least 6 months, and married or partnered and cohabitating for at least five years. Patients and spouses had to be English speaking and free of cognitive, hearing, and speech impairments that would preclude their ability to answer questions on the telephone, abilities determined during the course of brief telephone screening interviews.

Participants were recruited using advertisements in newspapers and newsletters, referral from staff at dialysis centers, and a one-time mailing to a random sample of beneficiaries receiving financial assistance for dialysis treatment from the Centers for Medicare and Medicaid Services. Preliminary analyses revealed that participants identified through various recruitment strategies did not differ significantly on any of the focal variables in the current research. Detailed information regarding recruitment is available in Feild, Pruchno, Bewley, Lemay, and Levinsky (2006). Data for the analyses reported here were collected between May 2001 and June 2006. Demographic characteristic of the sample at T1 are presented in Table 1.

Procedures

Data were obtained from structured telephone interviews completed with patients and spouses. Prior to conducting each interview the verbal informed consent process approved by the UMDNJ- IRB was reviewed. Individuals participating in the T1 interviews were contacted annually and invited to participate in follow-up telephone interviews. Information about the number of people completing interviews at each time of assessment is presented in Figure 1. In order to protect confidentiality, patients and spouses were interviewed separately by different interviewers. Participants were asked to refrain from sharing their responses with their spouses. The mean time lapse between individual patient and spouse interviews was 6.77 days (SD = 21.60) at time 1, 11.69 days (SD = 19.36) at time 2, and 8.97 days (SD = 20.49) at time 3.

Analyses contrasting couples who completed the final interview (T3), those in which the patient died during the course of the study, and those in which the patient, spouse, or both persons voluntarily withdrew from the study found no significant differences on patient and spouse age, spouse years of education, years married, income, time on dialysis, spouse depressive symptoms, and sex. Couples completing the T3 interview included better educated patients and fewer Black couples than either those in which patient died or the couple withdrew. Those completing the T3 interview included patients who were less depressed, those who reported experiencing fewer kidney symptoms, and those reporting better health than couples in which the patient died. Couples who withdrew included spouses reporting poorer health than those in which the patient died. Over the course of the study none of the couples separated or divorced.

Measures

Depressive symptomatology was measured with the 20-item CES-D, an inventory assessing the frequency and severity with which symptoms of depression are experienced during the past week. It has been extensively validated (Lewinsohn, Hoberman, & Rosenbaum, 1988; Weissman, Sholamskas, Pottenger, Prusoff, & Locke, 1977) and is widely used in epidemiological studies of depression in the general population and the elderly (Nguyen & Zonderman, 2006). The instrument was administered and scored according to the procedures suggested by Radloff (1977). Each item was rated on a 4-point Likert scale, with higher scores indicating more depressive symptoms. Mean CES-D for patients at baseline was 9.5 (SD = 8.2), increasing to 10.1 (SD = 7.3) over time. Mean CES-D for spouses at baseline was 8.7 (SD = 8.2), increasing to 9.7 (SD = 8.2) over time. Chronbach alphas ranged from .82 to .88. Because the CES-D was positively skewed we created a log transformed version of this variable which improved its distributional properties. All analyses were run using the original and the transformed scales. Results are presented from analyses using the original CES-D scale; differences in findings using the transformed variable are noted.

Marital satisfaction was measured with 9 items from the Dyadic Adjustment Scale (DAS) developed by Spanier (1976). As one of the four sub-scales of the DAS, marital satisfaction reflects the degree to which each member of the couple is satisfied with the present state of the relationship. Self-reports to the following were garnered from patients and spouses: (1) How often do you discuss or consider divorce, separation, or terminating your relationship? (2) Do you or your spouse leave the house after a fight? (3) Do you think that things between you and your spouse are going well? (4) Do you confide in your spouse? (5) Do you regret that you married? (6) Do you and your spouse quarrel? (7) How often do you kiss your spouse? (8) How happy are you with your relationship? (9) How do you feel about the future of your relationship? Negatively phrased questions were recoded so that a higher score on the scale reflected greater marital satisfaction. Questions were scored following Spanier (1976). One item, 'How often do you and your mate "get on each other's nerves"?' from the original DAS Satisfaction subscale was unintentionally omitted during the data collection and is thus unavailable for these analyses. Patient mean marital satisfaction at baseline was 38.0 (SD = 4.4); mean at last interview was 37.9 (SD = 4.2). Mean spouse marital satisfaction at baseline was 37.0 (SD = 4.9), decreasing to 36.3 (SD = 5.7) over time. Chronbach alphas ranged from .75 to .84

Patient gender was coded as '0' for males; '1' for females. Time on dialysis was measured in months (M = 70.8, SD = 65.3). Race was coded as '1' for Black and '0' for White. Length of time married was measured in years (M = 41.2, SD = 13.2). The extent to which the patient experienced symptoms associated with kidney disease was measured with 15 items from the CHOICE Health Experience Questionnaire (Wu et al., 2001). Patients were asked whether they experienced symptoms such as dizziness, thirst, coughing or shortness of breath, and loss of appetite during the previous month using a 4-point scale Likert response scale ("0" = no problem, to "3" = severe problem). Higher scores indicated more severe symptoms. The mean score at T1 was 13.1 (SD = 7.4). Chronbach alpha was .81. Patients and spouses reported about whether they had each of the following chronic conditions: arthritis, breathing problems, heart trouble, hardening of the arteries, stomach ulcer, cancer, Parkinson's disease, diabetes, hypertension, stroke, circulation trouble, liver problems, serious vision problems, serious hearing problems, and bladder problems. Sums representing the number of conditions experienced by patients (M = 4.9, SD = 2.3) and by spouses (M = 3.1, SD = 2.1) at T1 were included as covariates.

Analytic Overview—Data were analyzed using the multivariate two-level model for longitudinal data (Lyons & Sayer, 2005a, 2005b; Lyons, Sayer, Archbold, Hornbrook, & Stewart, 2007; Raudenbush, Brennan, & Barnett, 1995) enabling simultaneous estimation of the unique effects for each dyad member as well as cross-partner effects while controlling for interdependencies in the data. Level 2 predictors were evaluated independently and simultaneously to examine the extent to which they improved model fit.

The components of the sequential models are tested and described along with the associated hypotheses, first modeling depressive symptoms as the outcome and then treating marital satisfaction as the outcome. The full Level 1 model predicting depressive symptoms is:

$Y_{ti} = \pi_{1i}(PATIENT_{ti}) + \pi_{2i}(SPOUSE_{ti}) + \pi_{3i}(TIME\ PATIENT_{ti}) + \pi_{4i}(TIME\ SPOUSE_{ti}) + \pi_{5i}(Time\text{-}varying\ Marital\ Satisfaction\ PATIENT\ Own_{ti}) + \pi_{6i}(Time\text{-}varying\ Marital\ Satisfaction\ PATIENT\ Other_{ti}) + \pi_{7i}(Time\text{-}varying\ Marital\ Satisfaction\ SPOUSE\ Own_{ti}) + \pi_{8i}(Time\text{-}varying\ marital\ Satisfaction\ SPOUSE\ Other_{ti}) + e_{ti}.$

The Level 2 equation is:

$\pi_{1i} = \beta_{10} + \beta_{11}$ (Mean Marital Satisfaction Patient) $+ \beta_{12}$ (Mean Marital Satisfaction Spouse) $+ r_{1i}$

$\pi_{2i} = \beta_{20} + \beta_{21}$ (Mean Marital Satisfaction Patient) $+ \beta_{22}$ (Mean Marital Satisfaction Spouse) $+ r_{2i}$

$\pi_{3i} = \beta_{30} + r_{3i}$

$\pi_{4i} = \beta_{40} + r_{4i}$

$\pi_{5i} = \beta_{50}$

$\pi_{6i} = \beta_{60}$

$\pi_{7i} = \beta_{70}$

$\pi_{8i} = \beta_{80}$

Combining the Level 1 and Level 2 equations into a single equation yields:

$Y_{ti} = \beta_{10} *(PATIENT_{ti}) + \beta_{11}$ (*Mean Marital Satisfaction Patient*)*Patient$_{ti}$ + β_{12} (*Mean Marital Satisfaction Spouse*)*Patient $_{ti}$ + β_{20} *(SPOUSE $_{ti}$) β_{21} (Mean Marital Satisfaction Patient)*(Spouse) $_{ti}$ + β_{22} (Mean Marital Satisfaction Spouse)*Spouse $_{ti}$ + β_{30} *(PATIENT TIME) $_+$ β_{40}*(SPOUSE TIME) $_+$ β_{50} *(Time-varying Marital Satisfaction PATIENT Own) $_+$ β_{60} *(Time-varying Marital Satisfaction PATIENT Other) $_+$ β_{70} *(Time-varying Marital Satisfaction SPOUSE Own) $_+$ β_{80} *(Time-varying Marital Satisfaction SPOUSE Other) $_+$ r_{1i}*(PATIENT $_{ti}$) $_+$ r_{2i}*(SPOUSE $_{ti}$) $_+$ r_{3i}*(PATIENT TIME $_{ti}$) $_+$ r_{4i}*(SPOUSE TIME $_{ti}$) $+ e_{ti}$*

Initial models predicting depressive symptoms and marital satisfaction were estimated with means only model; subsequent analyses tested the effects of time (slope). The equation indicates that a dyad's repeated measures of depressive symptoms (Y_{ti}) are modeled with an intercept for patient (π_{1i}) and spouse (π_{2i}) and a slope for patient (π_{3i}) and spouse (π_{4i}). At Level 2, each of these components (patient and spouse intercept and slope) is broken down into an overall average ($\beta_{10}, \beta_{20}, \beta_{30}, \beta_{40}$) and the variability of each individual's specific values around these averages ($r_{1i}, r_{2i}, r_{3i}, r_{4i}$).

Next marital satisfaction was added as a predictor of an individual's own depressive symptoms. Within-person centering (Raudenbush et al., 1995; Singer & Willett, 2003) was used such that the marital satisfaction score for each dyad member was centered around its own mean. Deviations from this mean were entered into the model as a time-varying covariate. Thus π_{5i}, estimates the degree to which fluctuations in marital satisfaction for the patient over the 2 years of the study are associated with changes in depressive symptoms for the patient, while controlling for the linear trajectory of depressive symptoms over time, and π_{7i} captures the same effect for the spouse. The time-invariant effects of marital satisfaction assess the association between average levels of marital satisfaction and depressive symptoms. This is tested by averaging the marital satisfaction scores for each individual over all points of measurement and entering it as a level 2 covariate (grand mean centered) for patient β_{11} and spouse β_{22}.

Finally for testing cross-partner effects the time-varying covariates representing the effect of patient marital satisfaction on spouse depressive symptoms (π_{8i}) and the effect of spouse marital satisfaction on patient depressive symptoms (π_{6i}) are added. Similarly we add the time invariant covariates representing the effect of mean patient marital satisfaction on spouse depressive symptoms (β_{21}) and the effect of mean spouse marital satisfaction on patient depressive symptoms (β_{12}).

Model covariates (sex, race, age, length of time on dialysis, length of time married and number of own health conditions, number of kidney symptoms) are omitted from these equations, but were included in all analyses All models were estimated using full information maximum likelihood (FIML) via HLM 6.04 (Raudenbush, Bryk & Congdon, 2004) including all available

data from all patients and spouses. Multivariate hypothesis testing in the HLM context was used to examine differences in the strength of the relationship between patient and spouse marital satisfaction and self-reported depressive symptoms for the patients and the spouses. These multivariate hypotheses control the Type I error rate and have a large sample chi-square distribution (Raudenbush & Bryk, 2002).

While HLM is able to handle missing data, a model analyzed with missing data will only render interpretable estimates if the data are missing completely at random or missing at random. Given that most of our sample attrition was not likely random, but rather associated with death of the patient, we tested the assumption of ignorability of missingness using the pattern-mixture approach for non-ignorable data following the procedures described by Atkins (2005), Little (1995) and Hedeker and Gibbons (1997). Dummy variables representing the most heavily represented patterns of missingness (patient died after T1, patient withdrew after T1, spouse withdrew after T1, patient died after T2, patient withdrew after T2, spouse withdrew after T2) as well as interactions between the dummy variables and the predictors were created. All models were individually tested with and without these dummy variables and the fixed effects for the dummy variables were examined for both patients and spouses. Following Atkins (2005) if the pattern mixture analyses revealed significant dummy effects, a weighted average of the missing and non-missing data was used in order to attain an unbiased estimate of the population parameter given the missing data. As such, where there were significant dummy effects we used the fixed effects coefficients for the intercept and slope for patients who were available for the T1 interview only and the patients not lost to follow up after T1 and then created the weighted average of the two sets of coefficients by multiplying each set by the percentage of complete data.

Results

1. How do patient and spouse levels of depressive symptoms and marital satisfaction change over time?

The model including the effect of time (linear) was adopted as the baseline for both patients and spouses as it provided a better fit, $\chi^2(9) = 24.4$, p<.001, (Table 2) than the means only model. There was a significant positive linear slope for depressive symptoms for both patients ($\pi_{3i} = .75$, p < .01) and spouses ($\pi_{4i} = .52$, p < .05). Multivariate hypothesis testing suggests that the initial status, $\chi^2(1) = 0.29$, p < .05, and rate of increase in patient depressive symptoms were not significantly greater than that for the spouses, $\chi^2(1) = 0.47$, p > .05. The coefficient of 0.75 for the linear effect of time for the patient indicates a change of 1.5 CES-D points over two years. Given the SD of 8.2 for patient CES-D at baseline this indicates a change of 0.18 SD units over two years. The coefficient of 0.52 for the linear effect of time for the spouse indicates a change of 1.04 CES-D points over two years. Given the SD of 7.3 for spouse CES-D at baseline this indicates a change of 0.14 SD units over two years. Tau correlations indicate a modest association between average patient and spouse depressive symptoms (.37) and a strong correlation between the linear rates of change for patient and spouse depressive symptoms (.80).

Examining marital satisfaction as the outcome finds that the linear model provided a better overall fit than the means only model, $\chi^2(9) = 25.1$, p < .01, (Table 2). For the spouses there was a significant negative linear slope to marital satisfaction scores ($\pi_{4i} = -.37$, p < .01), but the effect for patients was not statistically significant ($\pi_{3i} = -.12$, p > .05). The coefficient of -.37 for the linear effect of time for the patient indicates a change of .74 marital satisfaction points over two years. Given the SD of 4.9 for spouse marital satisfaction at baseline this indicates a change of 0.15 SD units over two years. The multivariate hypothesis test indicates that patient average marital satisfaction ($\pi_{1i} = 38.4$) was higher than average spouse marital satisfaction ($\pi_{2i} = 36.8$), $\chi^2(2) = 28.58$, p < .001. Tau correlations indicate a strong association

between average patient and spouse marital satisfaction scores (.65) and between the linear rates of change for patient and spouse marital satisfaction (.76).

2. Do changes in own marital satisfaction affect the trajectory of own depressive symptoms?

Estimates for the effects of changing marital satisfaction on trajectories of depressive symptoms are presented in columns 2 and 3 of Table 3. Own time-invariant marital satisfaction (mean covariate) is significantly negatively associated with both patient (β_{11} = -.52) and spouse (β_{22} = -.72) own depressive symptoms. Own time varying marital satisfaction is not significantly associated with either patient (π_{5i} = -.22) or spouse (π_{7i} = -.12) depressive symptoms.

3. Do changes in own depressive symptoms affect the trajectory of own marital satisfaction?

Estimates for the effects of changing depressive symptoms on trajectories of marital satisfaction are presented in columns 4 and 5 of Table 3. Time-invariant depressive symptoms (mean covariate) has a significant negative association with both patient (β_{11} = -.16) and spouse (β_{22} = -.21) marital satisfaction. In addition, time varying depressive symptoms has significant negative associations with both patient (β_{50} = -.10) and spouse (β_{70} = -.06) marital satisfaction. Although statistically significant, these effects would have to be considered modest in absolute terms. For example, the patient CES-D has a standard deviation of 8.2 at baseline, implying that a 1 SD change in CES-D would cause a .82 decline in marital satisfaction.

4. Does partner's marital satisfaction affect the trajectory of one's own depressive symptoms?

Estimates of the effects of partner's marital satisfaction on trajectories of own depressive symptoms are presented in columns 2 and 3 of Table 4. Time-varying patient marital satisfaction was significantly associated with spouse depressive symptoms (π_{8i} = -.70). However, this effect was not significant in the models run using depressive symptoms logged (π_{8i} = -0.05, p > .04). As such we do not interpret this effect. Neither the cross-partner mean effects nor the cross-partner time varying effect from spouse marital satisfaction to patient depressive symptoms were significant.

5. Do partner's depressive symptoms affect the trajectory of one's own marital satisfaction?

Estimates of these effects are presented in columns 4 and 5 of Table 4. Spouse mean (β_{12} = -.14) and time-varying (π_{6i} = -.04) depressive symptoms were both significantly associated with patient marital satisfaction. The cross-partner effects from patient depressive symptoms to spouse marital satisfaction were not significant.

6. How do variables known to influence depressive symptoms and marital satisfaction, including sex, race, age, length of time on hemodialysis treatment, kidney symptoms, length of time married, and number of own health conditions affect patterns of change in depressive symptoms and marital satisfaction experienced by patients and spouses?

Number of kidney symptoms was a significant covariate for patient depressive symptoms (more kidney symptoms associated with higher CES-D scores) in every model tested but had no significant association with spouse depressive symptoms. Kidney symptoms were not related to marital satisfaction for either patients or spouses. No other covariates were significant for patient or spouse in any other model tested.

Attrition Effects

Results of the pattern mixture analyses yielded no significant effects for any of the models depicting marital satisfaction as the outcome. The results of the pattern mixture analyses for

depressive symptoms revealed that the dummy code for patients who died after T1 was significantly associated with the patient's depressive symptom score in every model. This suggests that further exploration of the degree to which the model parameters would be the same for those only completing one interview as compared to those competing additional interviews. None of the other dummy variables were significant. As the influence of this dummy variable was the same in each of these models, we present the results of the cumulative model predicting patient depressive symptoms.

Mean patient CES-D for those not lost to follow up was 11.03, with a slope parameter of .98 as compared to the mean CES-D for those lost to follow up after initial interview 8.95 with a slope of .41. The estimated average intercept for patient CES-D scores with and without missing data (after T1) is: $11.3*.67 + 8.95*.33 = 10.52$. The estimated average slope for patient CES-D scores with and without missing data (after T1) is: $.90*.67 + .41*.33 = .8$. The results of the pattern mixture analyses suggest that both the patient average and change in depressive symptoms would be slightly higher if not for the loss of the patients after T1. It also affirms the pattern of the substantive results in the final models as the interpretation of the significant effects is not different once we control for those patients lost to follow up after T1.

Discussion

These analyses, like those from longitudinal studies of young, healthy newlyweds, indicate that the relationships between depressive symptoms and marital satisfaction are complex and bidirectional. Unlike findings from Davila et al.'s (2003) study of newlyweds, in which depressive symptoms ebb and flow, our data suggest that depressive symptoms of both patients with ESRD and their spouses increase over time. This should not be surprising given the nature of ESRD and the stresses associated with dealing with a chronic health condition. Moreover, our findings that, on average, patients and spouses have similar initial levels of depressive symptoms as well as similar rates of increase in these symptoms highlight the powerful effects that chronic illness has on married couples.

The pattern of findings for marital satisfaction is somewhat different. Here our data find that on average, patients are more satisfied with their marriages than are spouses. These results are consistent with Carstensen's (1991) socioemotional selectivity theory, reflecting the increasing salience that the marital relationship takes on for patients who may be forced to withdraw from other important social relationships. That marital satisfaction declines over time for spouses, but not for patients, may reflect a self-preservation strategy among spouses who withdraw from the marital relationship because they believe that the patient has limited time left to live. As ESRD progresses, spouses may find fewer benefits to the marriage as they look to a time when the patient will no longer play a salient role in their lives. Together these findings raise significant challenges regarding how couples coping with chronic illness should be counseled such that the well-being and marital satisfaction of both parties can be preserved.

These data provide support for Davila et al's (2003) suggestion that the individual trajectories of depressive symptoms and of marital satisfaction be simultaneously considered. Whether the increase we find in depressive symptoms is part of the normal ebb and flow of depressive symptoms or the result of coping with the stresses associated with ESRD, awaits further study. Moreover it is not clear whether the relative stability of marital satisfaction is a product of the long-term marriages we studied, the relatively short duration of time for which couples were followed, or the timing of our assessments relative to the experience of the patients' illness.

Consistent with earlier literature, our data indicate that an individual's mean marital satisfaction has a negative association with their own depressive symptoms and that an individual's mean depressive symptoms has a negative association with their own marital satisfaction. That these

means are associated with one another merely speaks to the consistent cross-sectional findings indicating that marital satisfaction and depressive symptoms vary with one another. However, our finding that time varying depressive symptoms of both patients and spouses are associated with their own marital satisfaction, but that time varying marital satisfaction does not affect depressive symptoms for either patients or spouses adds important knowledge regarding the directionality of the relationship between depressive symptoms and marital satisfaction. Over time, as patients and spouses become more depressed, their own marital satisfaction declines. This finding highlights the central role that depressive symptoms have for predicting marital satisfaction and also have important implications for targeting intervention efforts. Our data suggest that intervention strategies designed to diminish depressive symptoms should result in improved marital satisfaction. They also indicate that modifications to marital satisfaction would not result in less depressive symptoms. While clearly guidance regarding intervention strategies requires consistent results from multiple studies, our findings contribute to the dialogue regarding the relationship between depressive symptoms and marital satisfaction.

These findings provide greater support for Coyne's (1976) theory and the stress generation model advanced by Hammen (1991), Davila (2001), and Davila et al. (1997) than for the marital discord model of depression (Beach et al., 1990). Our results are also consistent with Ulrich-Jakubowski, Russell, and O'Hara's (1988) finding that for older men increased depressive symptoms predicted subsequent decline in marital adjustment over a 15 month period and Wright's (1990) study of older couples.

Generalization of findings must, however, be tempered by the nature of our sample, which included couples in long-term marriages who were coping with ESRD. However, our data suggest that, for such couples, increases in depressive symptoms result in diminished marital satisfaction. These findings are consistent with those reported by Choi and Marks (2008) who report that over the first two waves of data collection (a 5-year lag) depressive symptoms predicted increases in marital conflict. Our findings are also similar to those reported by Fincham et al. (1997) for newlywed men.

The pattern of findings regarding cross-partner effects highlight the importance of maintaining the couple as unit of analysis and analyzing data using models that control for correlated error. In addition to the way in which own depressive symptoms affect marital satisfaction described above, both spouse mean level of depressive symptoms and change in spouse level of depressive symptoms affect patient's marital satisfaction. As spouses become more depressed over time not only does their own marital satisfaction decline, but so too does the marital satisfaction of their partner (the patient). Because the well-being of the spouse affects the patient's degree of marital satisfaction, it is critical that strategies for maintaining the well-being of the spouse be developed. Cross-partner effects from depressive symptoms to marital satisfaction from patient to spouse are not evident.

There are a number of limitations to this study that must be acknowledged. First, although our data provide evidence of significant variation around the average experience of depressive symptoms for both patients and spouses, the covariates we examined, other than kidney symptoms, were not significant. Our findings may be due to the relatively homogeneous nature of our sample which included predominantly white couples in long-term marriages. Townsend, Miller, and Guo (2001) found that the effects of similar covariates varied as a function of the ethnic composition of the sample. Our failure to find gender effects is particularly surprising given results reported by Fincham et al. (1997), Katz et al. (2000), Sandberg and Harper (2000) and Quiroutte and Pushkar-Gold (1992). However, as close to 75% of the patients in our sample were men, the nature of this sample renders conclusions regarding gender unclear. Future research with adequate samples of men and women as patients are needed in order to separate the effects of gender from that of patient/spouse. Similarly, studies that examine the

effects of both individual and couple-level covariates will advance knowledge regarding the cause of the variation around the average trends. Second, because our study focused on ESRD, it is not clear how and whether findings generalize beyond this chronic condition. Future studies that include couples coping with conditions including cancer, heart disease, and arthritis may yield different results. Third, we focus on marital satisfaction, one of many dimensions of marital quality. Fourth, this study included couples having a range of experience with ESRD. Future research focused on adapting to a new chronic condition may yield different findings regarding the trajectories of depressive symptoms and marital satisfaction. Fifth, although collecting data from patients and spouses at three points in time is a significant advancement to the literature, we must acknowledge the limited ability to identify linear trends. Additional times of measurement would not only provide better estimates of linear trends, they would also enable the opportunity to examine quadratic and cubic patterns to the data. Moreover it also must be noted that the timing of the changes in depressive symptoms and marital satisfaction may not be in synch with the timing of our assessments, further limiting our understanding of the dynamic nature of these relationships. Detection of trends over time is also affected by the reduction in sample size due to attrition over the two years of the study. As a consequence the empirical Bayes estimates for slopes will be less reliable and more shrunken toward the fixed-effect estimates reducing the power to detect slope effects and possibly biasing the correlation estimate of intercept and slopes. Finally, although in this study we had a "patient" who was defined as the person with ESRD and a "spouse" who did not have ESRD, the realities of late-life couple demographics indicates that both husbands and wives will each have at least one, and perhaps more than one chronic health condition. As such, the typical older couple will be coping with multiple health conditions, each of which may present the couple with unique challenges. As research in this area moves forward it will be important to collect data from both members of the couple and to analyze such data maintaining the integrity of the couple, realizing that the terms "patient' and "spouse" may not adequately describe the nature of relationships between older spouses.

We caution also that these analyses examined depressive symptomatology which is distinguished from clinical depression. In our community-dwelling sample which had mean CES-D scores mirroring those in general community studies (where average scores are about 9.0; Radloff & Teri, 1986), it would be premature to suggest that our findings regarding the relationship between depressive symptoms and marital satisfaction could be generalized to couples in which either husband or wife had been diagnosed with clinical depression.

Nonetheless, findings from this study advance knowledge regarding the relationship between depressive symptoms and marital satisfaction in late-life couples. With data providing stronger evidence that changing depressive symptoms predict marital satisfaction than changing marital satisfaction predicts depressive symptoms for both patients and spouses, and that cross-partner effects are stronger from spouse depressive symptoms to patient marital satisfaction, we raise new questions about the forces underlying late-life marriages. Our data highlight the reciprocal causation that exists between couples, but also suggests that there is directionality within couples that can be identified.

Acknowledgments

References

Atkins DC. Using Multilevel Models to Analyze Couple and Family Treatment Data: Basic and Advanced Issues. Journal of Family Psychology 2005;19:98–110. [PubMed: 15796656]

Beach SRH, Davey A, Fincham FD. The time has come to talk of many things: A commentary on Kurdek (1998) and the emerging field of marital processes in depression. Journal of Family Psychology 1999;13:663–668.

Beach SRH, Katz J, Kim S, Brody GH. Prospective effects of marital satisfaction on depressive symptoms in established marriages: A dyadic model. Journal of Social and Personal Relationships 2003;20:355–371.

Beach, SRH.; Sandeen, EE.; O'Leary, KD. Depression in marriage: A model for etiology and treatment. New York: Guilford Press; 1990.

Bookwala J, Franks MM. Moderating role of marital quality in older adults' depressed affect: Beyond the main-effects model. Journal of Gerontology: Psychological Sciences 2005;60B:338–341.

Bookwala J, Jacobs J. Age, marital processes, and depressed affect. The Gerontologist 2004;44:328–338. [PubMed: 15197287]

Booth A, Johnson DR. Declining health and marital quality. Journal of Marriage and the Family 1994;56:218–223.

Cartensen LL. Socioemotional selectivity theory: Social activity in life-span context. Annual Review of Gerontology and Geriatrics 1991;11:195–217.

Choi H, Marks NF. Marital conflict, depressive symptoms, and functional impairment. Journal of Marriage and Family 2008;70:377–390. [PubMed: 18698378]

Coyne JC. Toward an interactional description of depression. Psychiatry 1976;39:28–40. [PubMed: 1257353]

Coyne, JC.; Benazon, NR. Effects of marital functioning on depression and implications for treatment. In: Beach, SRH., editor. Marital and family processes in depression: A scientific foundation for clinical practice. Washington, D.C.: APA; 2001. p. 25-43.

Coyne JC, Pepper CM, Flynn H. Significance of prior episodes of depression in two patient populations. Journal of Consulting and Clinical Psychology 1999;67:76–81. [PubMed: 10028211]

Cukor D, Coplan J, Brown C, Friedman S, Cromwell-Smith A, Peterson RA, et al. Depression and anxiety in urban hemodialysis patients. Clinical Journal of the American Society of Nephrology 2007;2:484–490. [PubMed: 17699455]

Daneker B, Kimmel PL, Ranich T, Peterson RA. Depression and marital dissatisfaction in patients with end-stage renal disease and in their spouses. Journal of Kidney Disease 2001;38:839–846.

Davila, J. Paths to unhappiness: The overlapping courses of depression and relationship dysfunction. In: Beach, SRH., editor. Marital and family processes in depression: A scientific foundation for clinical practice. Washington, DC: APA; 2001. p. 71-88.

Davila J, Bradbury TN, Cohan CL, Tochluk S. Marital functioning and depressive symptoms: Evidence for a stress generation model. Journal of Personality and Social Psychology 1997;73:849–861. [PubMed: 9325596]

Davila J, Karney BR, Hall TW, Bradbury TN. Depressive symptoms and marital satisfaction: Within-subject associations and the moderating effects of gender and neuroticism. Journal of Family Psychology 2003;17:557–570. [PubMed: 14640805]

Devins GM, Hunsley J, Mandin H, Taub KJ, Paul LC. The marital context of end-stage renal disease: Illness intrusiveness and perceived changes in the family environment. Annals of Behavioral Medicine 1997;19:325–332. [PubMed: 9706357]

Feild L, Pruchno RA, Bewley J, Lemay EP, Levinsky NG. Using probability vs. non-probability sampling to identify hard-to-access participants for health-related research: Costs and Contrasts. Journal of Aging and Health 2006;18:565–583. [PubMed: 16835390]

Fincham FD, Beach SRH, Harold GT, Osborne LN. Marital satisfaction and depression: Different causal relationships for men and women. Psychological Science 1997;8:351–357.

Finkelstein FO, Finklestein SH. Depression in chronic dialysis patients: Assessment and treatment. Nephrology Dialysis Transplantation 2000;15:1911–1913.

Gagnon MD, Hersen M, Kabacoff RI, Van Hasselt VB. Interpersonal and psychological correlates of marital dissatisfaction in later life: A review. Clinical Psychology Review 1999;19:359–378. [PubMed: 10097876]

Hammen C. The generation of stress in the course of unipolar depression. Journal of Abnormal Psychology 1991;100:555–561. [PubMed: 1757669]

Hedayati SS, Bosworth HB, Kuchibhatla M, Kimmel PL, Szczech LA. The predictive value of self-report scales compared with physician diagnosis of depression in hemodialysis patients. Kidney International 2006;69:1662–1668. [PubMed: 16598203]

Hedeker D, Gibbons RD. Application of random effects pattern-mixture models for missing data in longitudinal studies. Psychological Methods 1997;2:64–78.

Katz J, Monnier J, Beach SRH, Libet J, Shaw D. Individual and crossover effects of stress on adjustment: Social support and emotional contagion processes in medical student marriages. Journal of Marital and Family Therapy 2000;26:341–351. [PubMed: 10934680]

Klinkman MS, Schwenk TL, Coyne JC. Depression in primary care - More like asthma than appendicitis: The Michigan Depression Project. The Canadian Journal of Psychiatry 1997;42:966–973.

Kurdek LA. The nature and predictors of the trajectory of change in marital quality over the first 4 years of marriage for first-married husbands and wives. Journal of Family Psychology 1998;12:494–510.

Lewinsohn PM, Hoberman HM, Rosenbaum M. A prospective study of risk factors for unipolar depression. Journal of Abnormal Psychology 1988;97:251–264. [PubMed: 3192816]

Levenson RW, Carstensen LL, Gottman JM. Long-term marriage: Age, gender, and satisfaction. Psychology and Aging 1993;8:301–313. [PubMed: 8323733]

Little RJA. Modeling the drop-out mechanism in repeated-measures studies. Journal of the American Statistical Association 1995;90:1112–1121.

Lyons KS, Sayer AG. Longitudinal dyad models in family research. Journal of Marriage and Family 2005a;67:1048–1060.

Lyons KS, Sayer AG. Using multilevel modeling in caregiving research. Aging and Mental Health 2005b; 9:189–195. [PubMed: 16019272]

Lyons KS, Sayer AG, Archbold PG, Hornbrook MC, Stewart BJ. The enduring and contextual effects of physical health and depression on care-dyad mutuality. Research in Nursing & Health 2007;30:84–98. [PubMed: 17243110]

Nguyen HR, Zonderman AB. Relationship between age and aspects of depression: Consistency and reliability across two longitudinal studies. Psychology and Aging 2006;21:119–126. [PubMed: 16594797]

Proulx CM, Helms HM, Buehler C. Marital quality and personal well-being: A meta-analysis. Journal of Marriage and Family 2007;69:576–593.

Pruchno RA, Wilson-Genderson M, Cartwright FP. Self-rated health and depressive symptoms in patients with End Stage Renal Disease and their spouses: A longitudinal dyadic analysis of late-life marriages. Journal of Gerontology: Psychological Sciences. in press.

Quirouette C, Pushkar-Gold D. Spousal characteristics as predictors of well-being in older couples. International Journal of Aging and Human Development 1992;34:257–269. [PubMed: 1607215]

Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. Applied Psychological Measurement 1977;1:385–401.

Radloff LS, Teri L. Use of the Center for Epidemiological Studies-Depression scale with older adults. Clinical Gerontologist 1986;5(1/2):119–136.

Raudenbush SW, Brennan RT, Barnett RC. A multivariate hierarchical model for studying psychological change within married couples. Journal of Family Psychology 1995;9:161–174.

Raudenbush, SW.; Byrk, AS. Hierarchical Linear Models (Second Edition). Thousand Oaks, CA: Sage Publications; 2002.

Raudenbush, SW.; Bryk, AS.; Congdon, R. Hierarchical linear and non-linear modeling. Lincolnwood, IL: SSI; 2004.

Sandberg JG, Harper JM. In search of a marital distress model of depression in older marriages. Aging and Mental Health 2000;4:210–222.

Singer, JD.; Willet, JB. Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence. Oxford University Press; 2003.

Spanier GB. Measuring dyadic adjustment. Journal of Marriage and the Family 1976;38:15–28.

Tower RB, Kasl SV. Depressive symptoms across older spouses and the moderating effect of marital closeness. Psychology and Aging 1995;10:625–638. [PubMed: 8749590]

Tower RB, Kasl S. Gender, marital closeness, and depressive symptoms in elderly couples. Journal of Gerontology: Psychological Sciences 1996;51B:P115–P129.

Townsend A, Miller B, Guo S. Depressive symptomatology in middle-aged and older married couples: A dyadic analysis. Journal of Gerontology: Psychological Sciences 2001;56:S352–S364.

Ulrich-Jakubowski D, Russell DW, O'Hara MW. Marital adjustment difficulties: Cause or consequence of depressive symptomatology? Journal of Social and Clinical Psychology 1988;7:312–318.

Umberson D, Williams K, Powers DA, Liu H, Needham B. You make me sick: Marital quality and health over the life course. Journal of Health and Social Behavior 2006;47:1–16. [PubMed: 16583772]

United States Renal Data System. Annual Data Report on End-Stage Renal Disease in the United States. 2008. http://www.usrds.org/

Van Laningham J, Johnson DR, Amato P. Marital happiness, marital duration, and the U-shaped curve: Evidence from a five-wave panel study. Social Forces 2001;79:1313–1323.

Weissman MM, Sholamaskas D, Pottenger M, Prusoff BA, Locke BZ. Assessing depressive symptoms in five psychiatric populations: A validation study. American Journal of Epidemiology 1977;106:203–214. [PubMed: 900119]

Wilson-Genderson, M.; Pruchno, R.; Cartwright, FP. Effects of burden and satisfaction on psychological well-being of older ESRD patients and their spouses. University of Medicine and Dentistry of New Jersey, School of Osteopathic Medicine; Stratford, NJ: 2008. Manuscript submitted for publication

Whisman, MA. The association between depression and marital dissatisfaction. In: Beach, SRH., editor. Marital and family processes in depression: A scientific foundation for clinical practice. Washington, DC: APA; 2001. p. 3-24.

Whisman MA, Uebelacker LA, Tolejko N, Chatav Y, McKelvie M. Marital discord and well-being in older adults: Is the association confounded by personality? Psychology and Aging 2006;21:626–631. [PubMed: 16953724]

Wright LK. Mental health in older spouses: The dynamic interplay of resources, depression, quality of the marital relationship, and social participation. Issues in Mental Health Nursing 1990;11:49–70. [PubMed: 2298561]

Wu AW, Fink NE, Cagney KA, Bass E, Rubin HR, Meyer KB, et al. Developing a health-related quality-of-life measure for end-stage renal disease: The CHOICE health experience questionnaire. American Journal of Kidney Diseases 2001;37:11–12. [PubMed: 11136162]
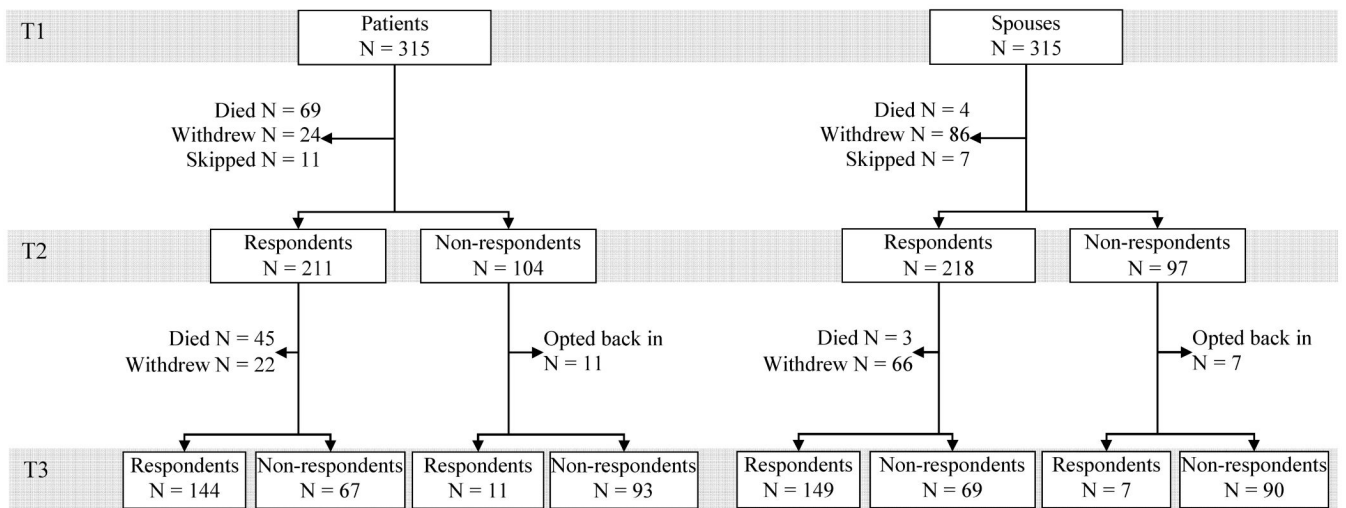
Figure 1.
Summary of patient and spouse interviews

Table 1

T1 Respondent Demographic Characteristics (N = 315 patients and 315 spouses)

	Mean (SD)	Minimum	Maximum
Patient age	69.8 (8.2)	55	91
Spouse age	67.9 (9.0)	38	87
Patient education (years)	14.2 (3.2)	3	20
Spouse education (years)	13.7 (2.6)	3	20
Years married	41.2 (13.2)	2	64
Household Income (annual)	$43,942 ($26,090)	$1,500	$110,000
Time on hemodialysis (months)	70.8 (65.4)	6	418
Patient gender (female)	27%		
Patient race:			
White	85.1%		
African American	10.8%		
Spouse race:			
White	85.1%		
African American	10.5%		

Table 2

Mean Trajectories of Depressive Symptoms and Marital Satisfaction Across 2 years

	Depressive Symptoms with Time (linear) Effect		Marital Satisfaction with Time (linear) Effect	
	Patient	**Spouse**	**Patient**	**Spouse**
	Parameter estimate SE	**Parameter estimate SE**	**Parameter estimate SE**	**Parameter estimate SE**
Fixed				
Intercept	9.3 (.52)***	9.0 (.54)***	38.4 (.30)***	36.8 (.34)***
Time	0.75 (.27)**	0.52 (.24)*	-0.12 (.12)	-0.37 (.12)**
Level 2 Covariate Kidney symptoms	0.42 (.06)***	0.09 (.07)	0.003 (.04)	0.04 (.05)
Random				
Residual	22.3 (1.6)		4.3 (.32)	
Intercept	30.7(4.3)***	46.6(5.5)***	15.5 (1.6)***	20.1 (1.9)***
Time	2.4(1.7)	2.6 (1.8)	0.29 (.32)	0.65 (.36)
Estimated parameters	28		28	
Deviance statistic	9004.14		7132.83	
Model Comparison χ^2(df)	24.4 (9)***		25.1(9)**	

Deviance statistics presented for the baseline model are based on comparison with the means only model (data not shown); Models run with covariates included: age, length of time married, gender, race (black), time on hemodialysis, number of health conditions, and number of kidney symptoms (patient model only);results shown for significant covariates only.

p < .05,

*
 p < .01,

**
 p < .001

***
. FIML, HLM 6.04.

Table 3

Associations Between Own Marital Satisfaction and Own Depressive Symptoms Over Time

	CES-D Outcome		Marital Satisfaction Outcome	
	Patient	**Spouse**	**Patient**	**Spouse**
	Parameter estimate SE	**Parameter estimate SE**	**Parameter estimate SE**	**Parameter estimate SE**
FIXED EFFECTS				
Intercept	9.5 (.44)***	8.7 (.50)***	38.3 (.28)***	36.8 (.31)***
Time	0.68 (.26)*	0.46 (.26)~	-0.04 (.12)	-0.32 (.12)**
Patient Mean Covariate	-0.52 (.12)***		-0.16 (.03)***	
Spouse Mean Covariate		-0.72 (.08)***		-0.21 (.03)***
Patient Time Varying Covariate	-0.22 (.24)		-0.10 (.02)***	
Spouse Time Varying Covariate		-0.12 (.22)		-0.06 (.02)**
Level 2 Covariate Kidney symptoms	0.42 (.06)***	0.11 (.08)	0.0007 (.003)	0.06 (.04)
RANDOM EFFECTS				
Residual	22.7 (1.7)		4.3 (.31)	
Intercept	25.1 (3.9)***	34.6 (4.6)***	13.5 (1.4)***	16.0 (1.6)***
Time	2.6 (1.8)	2.4 (1.7)	0.17 (.31)	0.44 (.33)
Estimated parameters	32		32	
Deviance statistic	8889.34		7034.0	
Model Comparison χ^2(df)	114.8 (4)***		98.9 (4)***	

~ $p < .10$,

* $p < .05$,

** $p < .01$,

*** $p < .001$. FIML, HLM 6.04.

Table 4

Own and Cross-partner Associations Between Marital Satisfaction and Depressive Symptoms Over Time

	CESD Outcome		Marital Satisfaction Outcome	
	Patient	**Spouse**	**Patient**	**Spouse**
	Parameter estimate SE	**Parameter estimate SE**	**Parameter estimate SE**	**Parameter estimate SE**
FIXED EFFECTS				
Intercept	9.5 (.46)***	9.0 (.49)***	38.4 (.24)***	36.9 (.32)***
Time	0.66 (.28)*	0.35 (.27)	.04 (.10)	-0.20 (.10)~
Patient Mean Covariate	-0.52 (.10)***	-0.14 (.11)	-0.15 (.03)***	-0.04 (.04)
Spouse Mean Covariate	0.02 (.09)	-0.65 (.09)***	**-0.14 (.04)*****	-0.28 (.04)***
Patient Time Varying Covariate	-0.16 (.25)	**-0.70 (.26)**	-0.10 (.02)***	-0.03 (.02)
Spouse Time Varying Covariate	-0.27 (.23)	-0.11 (.23)	**-0.04 (.02)***	-0.09 (.02)***
Level 2 Covariate Kidney Symptoms	0.43 (.06)***	0.11 (.09)	0.008 (.04)	0.08 (.04)
RANDOM EFFECTS				
Residual	22.3 (1.7)		3.8 (2.9)	
Intercept	25.0(3.9)***	33.1 (4.5)***	12.5 (1.3)***	15.7 (1.6)***
Time	2.9(1.8)	1.6 (1.7)	0.12 (.28)	0.30 (.20)
Estimated parameters	36		36	
Deviance statistic	8606.66		6720.0	
Model Comparison χ^2(df)	282.7 (4)***		314.0 (4)	

~p < .10,

*p < .05,

**p < .01,

***p < .001. FIML, HLM 6.04.