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Adherence to the Low Sodium Diet in Patients with Heart Failure is Best When Family Members also Follow the Diet: A Multicenter Observational Study

Misook Lee Chung, PhD. RN [Associate Professor],

Co-Director, the RICH Heart Program. College of Nursing, University of Kentucky, Lexington

Terry A. Lennie, PhD. RN. FAAN [Professor and Associate Dean, PhD studies],

Co-Director, the RICH Heart Program. College of Nursing, University of Kentucky, Lexington

Gia Mudd-Martin, PhD. MPH. RN [Assistant Professor], and

College of Nursing, University of Kentucky, Lexington

Debra K. Moser, DNSc. RN. FAAN [Professor and Gill Endowed Chair]

Co-Director, the RICH Heart Program. College of Nursing, University of Kentucky, Lexington

Abstract

Background—Adherence to the low sodium diet (LSD) is difficult without continuous support from spouses or family members. Whether having a family member follow a LSD improves patient adherence has not been tested objectively.

Objective—To examine the effect of family adherence to a LSD on patient adherence to a LSD and to examine whether this effect differed by relationship status and living arrangement.

Methods—In this secondary data analysis, we analyzed data from 379 outpatients with HF who had objective evidence of adherence to a LSD (i.e., a 24-hour urinary sodium excretion). T-test, ANOVA, and logistic regressions were used to compare levels of adherence among groups that were categorized by family adherence to a LSD, relationship status, and living arrangement with family member and to predict the likelihood of being adherent to a LSD (24-hour urinary sodium excretion < 3000mg) by the groups.

Results—Compared to patients whose family did not followed a LSD, patients whose family member followed a LSD had lower average urinary sodium excretion (3651mg vs. 4280mg, $p=.003$) and were 1.6 times more likely to be adherent to a LSD (95% CI: 1.03 - 2.4, $p=.035$). Patients whose spouses followed the LSD had lower sodium excretion than patients whose spouses did not follow the LSD (3730mg vs. 4534mg, $p=.012$). Patients whose non-spousal family member followed a LSD were 4 times more likely to be adherent than patients whose spousal member did not follow a LSD (OR=3.94, 95% CI = 1.81-8.58, $p=.001$).

Conclusions—Living with a spouse or other family member improved patient adherence to LSD only when the spouse or family member also followed the LSD. These results suggest that

interventions aimed at improving LSD adherence should target patient and family member dyads to encourage family members to follow the LSD with patients.

Keywords

diet; sodium-restricted; social support; heart failure; patient adherence

Introduction

Dietary sodium restriction is a critical self-care task for patients with heart failure (HF). It is recommended that HF patients reduce daily sodium intake to manage their symptoms and to prevent worsening symptoms.¹ Excess dietary sodium intake resulting in sodium retention is a major precursor of hospitalization in patients with HF.²⁻⁴ One of every four patients with HF is readmitted to the hospital within 3 months of a discharge for exacerbation of HF and almost half of patients are readmitted within 6 months for an exacerbation of HF.⁵⁻⁸ Despite the importance of restricting sodium in the diet to prevent rehospitalization and reduce HF symptom burden, the prevalence of non-adherence to a LSD remains high. Estimates of non-adherence rates to a LSD in patients with HF ranged from 22% to 51%.⁹⁻¹²

Identifying factors associated with non-adherence to a LSD is fundamental to developing interventions to improve dietary adherence behaviors. Barriers to adherence to a LSD in patients with HF include lack of knowledge about LSD, poor taste of low sodium food, limited time to prepare low sodium food, cost, and difficulty understanding the prescribed dietary restrictions.¹³⁻¹⁵ Another important barrier is poor support from family members.^{14,16} Family members' lack of knowledge about the LSD and lack of support for following the diet negatively affects patients' adherence.^{14,16} Preparing meals and eating together are key components of the social interactions that occur in families. According to qualitative research by Bentley and colleagues,¹⁴ following a LSD contributed to conflict within some families. The investigators found that HF patients experienced frustration when family members did not understand diet restrictions and did not respect the patients' need to adhere to the diet.¹⁴ Patients also felt isolated when family members continued to eat foods high in sodium.¹⁴ There is some evidence to suggest that family support positively impacts patients' self-care behaviors and HF outcomes. There is, however, no research focused on the association of patient adherence to the LSD recommendation with family member adherence to the LSD recommendation.

The purposes of this study were to examine the association of family member adherence to a LSD on patient adherence and to examine whether this association differed by the family member relationship to the patient and living arrangement. We hypothesized that patients with family members who followed the LSD would have better adherence regardless of their relationship to family member and living arrangement. The specific aim of this study was to compare patient adherence to a LSD between groups that were categorized by (1) family member adherence to the LSD (i.e., family members followed the LSD versus family members did not follow the LSD), (2) relationship to family member (i.e., spousal versus non-spousal), and (3) living arrangement (i.e., living alone versus living with family member). Additionally, we sought to determine whether patient adherence was different

based on (1) the interaction of family member adherence to the LSD with relationship and (2) the interaction of family member adherence to the LSD with living arrangement.

Methods

Study design, setting, and participants

This was a secondary analysis of patient data from the HF Quality of Life Registry.¹⁷⁻¹⁹ In this analysis, we used data from the 379 patients who had full data on patient 24-hour urinary sodium excretion as a measure of patient adherence to the LSD, and on patient's report about whether or not their family members followed a LSD with them. Patients were included in this study if they had a confirmed diagnosis of preserved or non-preserved chronic HF and no terminal illness including cancer, end-stage liver or renal disease. All participants were recruited at outpatient cardiology clinics in Kentucky, Georgia, and Indiana.

Measures

Patient Adherence to LSD—Patient adherence to the LSD was assessed using 24-hour urinary sodium excretion (24-hour UNa). Because 95% of sodium intake is excreted, the 24-hour UNa reflects dietary sodium intake.²¹ The 24-hour UNa has been used previously to assess dietary adherence in patients with HF.^{9,16,20} A trained nurse researcher instructed patients to record the beginning and ending times of collection and the time and amount of each voiding using an urination log. Written instructions were also provided to ensure an accurate 24-hour urine collection. Participants received appropriate supplies for urine collection (i.e., urine bottles, urinal or collecting hat). Research assistants verified the completeness of the 24-hour urine collection by reviewing logs with participants.

Family Adherence to the LSD—Family adherence to the LSD was assessed using one item of the Dietary Sodium Restriction Questionnaire (DSRQ).^{15,16} Reliability (i.e. Cronbach's alpha .62 - .88) and construct validity of the DSRQ have been demonstrated.^{15,16} The item used was: 'Other members of my household eat the same low-salt foods as I do'. This item was rated on a 5-response scale with referent anchors of 'strongly agree' and 'strongly disagree'. Based on this item, we grouped patients into 2 groups (i.e., having a family member adherent to the LSD versus having a family member who did not follow the LSD). Having a family member adherent to the LSD was defined as a response by the patient to the item of 'strongly agree' and 'agree'.

Relationship status and living arrangement—Relationship status was defined as spousal and non-spousal based on the patient's marital status. Living status was assessed using a 2-category response item including 'living with family' and 'living alone'.

Descriptive variables—Demographic (i.e., gender, age, ethnicity, and education) and clinical characteristics (i.e., left ventricular ejection fraction, medication, co-morbidity, New York Heart Association class) were obtained to describe sample characteristics. These variables were collected using brief patient interview, a structured questionnaire and medical chart review.

Procedures

Approval was obtained from the Internal Review Board at each study site. Eligible patients were contacted in the outpatient clinics. After signed consent was obtained, patients completed questionnaires and were asked to collect 24-hour urine specimens. The urine samples were analyzed at the hospital laboratory at each site.

Data analysis

Descriptive statistics (i.e. mean, standard deviation, and percentile) were used to describe sample characteristics. Independent sample t-test and ANOVA were used to compare levels of adherence between groups using 24-h UNa. In this study, we used 24-hour UNa as a continuous variable to compare the levels of adherence between and among groups. After these bivariate analyses, we used 24-hour UNa as a categorical variable in logistic regression to examine the likelihood of patient adherence predicted by the various groups. According to the Heart Failure Society of America practice guideline,¹ 2000mg to 3000mg of sodium is recommended for typical patients with HF. In this study, 3000mg of urinary sodium excretion was used as the cut point of adherence to LSD. Patients whose 24-hour UNa was less than 3000mg were the adherent group and patients whose 24-hour UNa was 3000mg or greater were the non-adherent group. Data analyses were conducted using the SPSS version 20, with alpha set at .05.

Results

Patient characteristics are described in Table 1. The majority of patients in this study had a spouse and lived with a family member. Slightly less than half of patients reported that their family members followed the LSD. The mean patient 24-hour UNa was 4020 mg ($\pm$ 2020) and 35% of patients were classified as adherent to the LSD (24-hour UNa < 3000mg) (Table 2). There were no significant differences in education (high school vs. greater than high school), gender, age, taking diuretics, and ejection fraction among groups categorized by family member adherence, relationship status, and living arrangement, or among groups stratified by family member adherence and the LSD with relationship, or groups stratified by family member adherence with the LSD with living arrangement.

Comparison of patient adherence by family member adherence to LSD, relationship status, and living arrangement

Patients whose family members followed the LSD had lower 24-hour urinary sodium excretion than patients whose family members did not follow the LSD (Table 3). Participants whose family members followed the LSD had 629 mg less of urinary sodium excretion than patients whose family members did not follow the LSD ($p = .003$). However, there was no significant difference in levels of adherence between patients whose family member was a spouse and those whose family member was not a spouse, or between patients living with the family member and patients living alone (Table 3).

Adherence level based on group interactions

As shown on Table 3, levels of adherence to the LSD were significantly different among groups based on the interaction of relationship and family members' adherence to the LSD.

The results of Tukey post-hoc tests demonstrated that patients whose spouse was not adherent to the LSD had 804 mg more sodium excretion than those whose spouse was adherent to the LSD ($p = .012$) and 1139 mg more sodium excretion than those who had a non-spousal family member who was adherent to a LSD ($p = .015$).

Levels of adherence were different among patients based on the interaction of living arrangement and family member adherence to a LSD (Table 3). The post-hoc test revealed that patients who lived with a non-adherent family member had 760 mg more sodium excretion than those who lived with adherent family members ($p = .007$).

Likelihood of adherence by groups

Patients whose family member followed the LSD were 1.6 times more likely to be adherent than patients whose family member did not follow the LSD (Table 4). Patients with a non-spousal family member were 1.6 times more likely to be adherent than patients who had a spouse. When considered in the context of whether or not family members also followed the LSD, patients with a non-spousal family member who followed a LSD were 4 times more likely to be adherent than patients with a spouse who did not follow the LSD (Table 4). Because the adherence rate (24-hour UNa < 3000mg) was high (41.2%) in patients with a non-spousal family member, additional logistic regression was conducted to identify whether family member adherence to a LSD was associated with adherence among patients with a spousal family member and patients with a non-spousal family members, separately. We found that among patients with a non-spousal family member, those whose family member followed a LSD were 2.3 times more likely to be adherent to the LSD than patients whose family member did not follow the LSD (95% CI 1.09-4.9, $p = .029$). However, among patients with a spousal family member, following a LSD was not associated with their adherence (OR=1.7, 95% CI .96-2.99 $p = .068$).

Living arrangements did not predict patient adherence. However, of the patients living with family members, those whose family members followed a LSD were 1.9 times more likely to be adherent than patients whose family members did not follow a LSD.

Discussion

The major finding in this secondary data analysis was that when family members followed a LSD, patients were more adherent to the LSD regardless of their relationship to the patient and living arrangement. The differences in patient 24-hour urinary sodium excretion were 629 mg and 804 mg, respectively, depending on whether the adherent family member was a spouse or non-spousal family member. The most compelling finding was that having a family member who followed a LSD increased patients' likelihood of adherence to a LSD. An unexpected finding was that patients with a non-spousal family member were 4 times more likely to be adherent when their family member followed a LSD compared to patients with a spouse who did not follow a LSD. However, these findings may be influenced by the fact that half of the patients whose family member was not a spouse followed a LSD, while only one-third of patients with a spouse who followed a LSD.

High levels of spousal or family support contribute to improved outcomes for patients with HF including self-care, quality of life, and mortality.^{22,23} Living with a spouse or a close family member has been shown to provide some of the highest levels of social support. It would be presumed that patients living with a spouse or family member, therefore, receive high levels of support to follow a diet regimen, while patients living alone receive low levels of support. We, however, demonstrated that living with a spouse or family member did not guarantee dietary adherence behaviors. Only having a family member who also followed a LSD was associated with better adherence in the patient regardless of whether the person was a spouse or other family member. Therefore, by following the LSD, family members can provide a strong source of support for a patient in following a diet regimen that can be integral to success. When family members take a proactive role by following the LSD with patients they demonstrate a high level of instrumental support for patients' self-care efforts related to the LSD regimen. These results suggest that interventions aimed at improving LSD adherence should target patient and family member dyads to encourage family members to also follow the LSD.

The current clinical practice guideline for patients with HF emphasizes the importance of including family members in education and counseling about HF self-care regimens and recommends family members acquire the knowledge, skills, strategies, problem solving abilities, and motivation to help patients to actively adhere to treatment.²⁴ Family members' knowledge about LSD including reading food labels, selecting low sodium food, and cooking low sodium meals is fundamental to support patients' dietary adherence. Preparing meals and eating together are fundamental family social activities. Family members often shop for food and cook and eat meals together. As patients with HF have severe physical function limitation and symptom distress, family members may have more responsibility in shopping for and preparing foods. Thus, successful dietary adherence behavior in the patient requires support for family members. Interventions that incorporate education to support family members in their ability to do these things will be pivotal in successful self-care and should be included in all patient care plans.

Although effectiveness of family involvement in self-care has been explored extensively in chronic disease, little information is available on family involvement in dietary adherence among HF patients. Only one randomized controlled pilot study has been conducted to investigate the effectiveness of a family support on dietary sodium adherence in patient-family caregiver dyads.²⁵ The family intervention, called family partnership, was designed to enhancing family member autonomy support in addition to LSD education. Researchers reported that HF patients who received family partnership intervention with a family member decreased their urinary sodium excretion at 3-month follow up while patients who received only LSD education with a family member had no changes in sodium excretion. The importance of these findings are further supported by findings from other studies that patients may feel isolated from their family and have feelings of being disrespected when they follow a LSD but family members do not.¹⁴

Findings in this study suggest that encouraging family participation in the LSD may offer crucial support to patients and thereby maximize HF patients' dietary adherence behavior. Encouraging family members to follow a LSD follows general dietary recommendation for

all adults. The World Health Organization recommends that healthy adults consume less than 2000mg of sodium per day to prevent chronic disease.²⁶ Recommendations from the Dietary Guidelines for Americans 2010 include reducing daily sodium intake to less than 2300mg to avoid adverse health effects of sodium (i.e., hypertension) for adults.²⁷ Although there is good rationale to encourage family members to follow a LSD to benefit their own health, family intervention strategies have not been tested. Research is needed on the effects of interventions with family members to reduce dietary sodium intake in patients with HF using a randomized control trial design.

This secondary data analysis has limitations. First, data on family adherence to a LSD were obtained by a proxy assessment reported by patients, not from their family members or caregivers. Patient perceptions of family member adherence may differ from actual family adherence. However, subjective perceptions of patients are commonly used to assess family or social support. Second, data on family dynamics and reasons family members or spouses did not follow a LSD were not collected. Such data could potentially illuminate intervening influences on family participation in a LSD.

In summary, findings from this study provided evidence that family member participation in following a LSD contributes to improved dietary adherence in patients with HF. Persons with HF need support engaging in self-management of their condition, a crucial part of which is following a LSD. Family member adherence to the same LSD provides important support for HF patients. Our findings suggest that education and encouragement of family members' adherence to a LSD with patients may be beneficial and indicate the need for further investigation through a randomized control trial.

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References

1. Heart Failure Society of A. Lindenfeld J, Albert NM, et al. HFSA 2010 Comprehensive Heart Failure Practice Guideline. *J Cardiac Fail.* 2010; 16(6):e1–194.
2. Bennett SJ, Huster GA, Baker SL, et al. Characterization of the precipitants of hospitalization for heart failure decompensation. *Am J Crit Care.* 1998; 7(3):168–174. [PubMed: 9579241]
3. Vinson JM, Rich MW, Sperry JC, Shah AS, McNamara T. Early readmission of elderly patients with congestive heart failure. *J Am Ger Soc.* 1990; 38(12):1290–1295.
4. Tsuyuki RT, McKelvie RS, Arnold JM, et al. Acute precipitants of congestive heart failure exacerbations. *Archives of internal medicine.* 2001; 161(19):2337–2342. [PubMed: 11606149]

5. Miller LW, Missov ED. Epidemiology of heart failure. *Cardiol Clin*. 2001; 19(4):547–555. [PubMed: 11715176]
6. Krumholz HM, Parent EM, Tu N, et al. Readmission after hospitalization for congestive heart failure among Medicare beneficiaries. *Arch Intern Med*. 1997; 157(1):99–104. [PubMed: 8996046]
7. Starling RC. The heart failure pandemic: changing patterns, costs, and treatment strategies. *Cleve Clin J Med*. 1998; 65(7):351–358. [PubMed: 9679390]
8. Kimmelstiel CD, Konstam MA. Heart failure in women. *Cardiology*. 1995; 86(4):304–309. [PubMed: 7553705]
9. Chung ML, Moser DK, Lennie TA, et al. Gender differences in adherence to the sodium-restricted diet in patients with heart failure. *J Cardiac Fail*. 2006; 12(8):628–634.
10. Evangelista L, Doering LV, Dracup K, Westlake C, Hamilton M, Fonarow GC. Compliance behaviors of elderly patients with advanced heart failure. *J Cardiovasc Nurs*. 2003; 18(3):197–206. [PubMed: 12837010]
11. Evangelista LS, Berg J, Dracup K. Relationship between psychosocial variables and compliance in patients with heart failure. *Heart Lung*. 2001; 30(4):294–301. [PubMed: 11449216]
12. Neily JB, Toto KH, Gardner EB, et al. Potential contributing factors to noncompliance with dietary sodium restriction in patients with heart failure. *Am Heart J*. 2002; 143(1):29–33. [PubMed: 11773909]
13. Bennett SJ, Milgrom LB, Champion V, Huster GA. Beliefs about medication and dietary compliance in people with heart failure: an instrument development study. *Heart Lung*. 1997; 26(4):273–279. [PubMed: 9257137]
14. Bentley B, De Jong MJ, Moser DK, Peden AR. Factors related to nonadherence to low sodium diet recommendations in heart failure patients. *Eur J Cardiovasc Nurs*. 2005; 4(4):331–336. [PubMed: 15935733]
15. Bentley B, Lennie TA, Biddle M, Chung ML, Moser DK. Demonstration of psychometric soundness of the Dietary Sodium Restriction Questionnaire in patients with heart failure. *Heart Lung*. 2009; 38(2):121–128. [PubMed: 19254630]
16. Lennie TA, Worrall-Carter L, Hammash M, et al. Relationship of heart failure patients' knowledge, perceived barriers, and attitudes regarding low-sodium diet recommendations to adherence. *Prog Cardiovasc Nurs*. 2008; 23(1):6–11. [PubMed: 18326994]
17. Chung ML, Lennie TA, Dekker RL, Wu JR, Moser DK. Depressive symptoms and poor social support have a synergistic effect on event-free survival in patients with heart failure. *Heart Lung*. 2011; 40(6):492–501. [PubMed: 21453972]
18. Riegel B, Moser DK, Glaser D, et al. The Minnesota Living With Heart Failure Questionnaire: sensitivity to differences and responsiveness to intervention intensity in a clinical population. *Nursing Res*. 2002; 51(4):209–218.
19. Riegel B, Moser DK, Rayens MK, et al. Ethnic differences in quality of life in persons with heart failure. *J Cardiac Fail*. 2008; 14(1):41–47.
20. Lennie TA, Song EK, Wu JR, et al. Three Gram Sodium Intake is Associated With Longer Event-Free Survival Only in Patients With Advanced Heart Failure. *J Cardiac F*. 2011; 17(4):325–330.
21. Bates, CJ.; Thurnham, DI.; Bingham, SA.; Margetts, BM.; Nelson, M. Biochemical markers of nutrient intake.. In: Margetts, BM., editor. *Design in nutritional epidemiology*. Oxford University Press; Oxford, England: 1997. p. 170-240.
22. Bennett SJ, Perkins SM, Lane KA, Deer M, Brater DC, Murray MD. Social support and health-related quality of life in chronic heart failure patients. *Qual Life Res*. 2001; 10(8):671–682. [PubMed: 11871588]
23. Chung ML, Lennie TA, Riegel B, Wu JR, Dekker RL, Moser DK. Marital status as an independent predictor of event-free survival of patients with heart failure. *Am J Crit Care*. 2009; 18(6):562–570. [PubMed: 19880958]
24. Lindenfeld J, Albert NM, Boehmer JP, et al. HFSA 2010 Comprehensive Heart Failure Practice Guideline. *J Cardiac Fail*. 2010; 16(6):e1–194.
25. Dunbar SB, Clark PC, Deaton C, Smith AL, De AK, O'Brien MC. Family education and support interventions in heart failure: a pilot study. *Nursing Res*. 2005; 54(3):158–166.

26. World Health Organization. Diet, nutrition and the prevention of chronic diseases. Report of a Joint WHO/FAO Expert Consultation. World Health Organization; Geneva: 2003. WHO Technical Report Series. N0.916
27. U.S. Department of Agriculture. Dietary Guidelines for Americans. 2010. 2010; www.health.gov/dietaryguidelines/dga2005/document/pdf/DGA2005.pdf

Table 1

Characteristics of patients with HF (N = 379)

Characteristics	Mean $\pm$ SD or N (%)
Age, years	61.7 $\pm$ 11.7
Education, $\leq$ High school	151 (39.8%)
Gender, male	253 (66.8%)
Left ventricular ejection fraction, %	34.3 $\pm$ 13.8
Relationship status	
Spousal	231 (60.9%)
Non-spousal	148 (39.1%)
Living arrangement	
Living with family	(72%)
Living alone	(28%)
Ethnicity	
Caucasian	294 (77.6%)
African-American	80 (21.1%)
Others	5 (1.3%)
History of Hypertension	266 (70.2%)
History of Diabetes Mellitus	156 (41.2%)
NYHA class	
I-II	186 (49.1%)
III	145 (38.3%)
IV	43 (11.3%)
Medication	
ACE Inhibitors	258 (68.1%)
ARB	66 (17.4%)
Beta blockers	337 (88.9%)
Diuretics	287 (75.7%)
Digoxin	108 (28.5%)

Table 2

Adherence to low sodium diet using 24-hour sodium excretion

24-hour urine sodium excretion	N (%)
2000mg	55 (14.5%)
2001 – 2999mg	77 (20.3%)
3000 – 3999mg	86 (22.7%)
4000 – 4999mg	57 (15.0%)
5000 – 5999mg	44 (11.6%)
6000 – 6999mg	31 (8.2%)
7000mg	29 (7.7%)

Table 3

Comparison 24-hour urinary sodium excretion among groups

Variables	Group category	N	24-hour Urinary sodium excretion (mg)	P-value	post-hoc test (P < .05)
Family member adherence	Member adherent to LSD	156	3651 ± 1771	.003	N/A
	Member non-adherent to LSD	223	4280 ± 2144		
Relationship status	Spousal	231	4120 ± 3866	.232	N/A
	Non-spousal	148	3866 ± 2135		
Living arrangement	Lived with family member	273	4048 ± 1973	.677	N/A
	Lived alone		3952 ± 2147		
Family member adherence by relationship	Non-spousal member adherent to LSD ^a	37	3396 ± 1903	.004	a < d
	Spousal member adherent to LSD ^b	119	3730 ± 1729		b < d
	Non-spousal member non-adherent to LSD ^c	111	4023 ± 2192		
	Spousal member non-adherent to LSD ^d	112	4535 ± 2074		
Family member adherence by living arrangement	Patient lived with adherent family member ^a	132	3645 ± 1753	.012	a < c
	Patient did not live with adherent family member ^b	24	3685 ± 1911		
	Patient lived with non-adherent family member ^c	141	4425 ± 2095		
	Patient did not live with non-adherent family member ^d	82	4029 ± 2217		

Table 4

Odd ratios of being adherent to LSD (24-h UNa < 3000 mg) by groups

		% of patients being adherent	Odds ratio	95% CI	p-value
Family member adherence	Member non-adherent to LSD (reference)	30.5%			
	Member adherent to LSD	41.0%	1.59	1.03 – 2.43	.035
Relationship status	Spousal (reference)	30.7%			
	Non-spousal	41.2%	1.58	1.03 – 2.43	.037
Living status	Lived with family (reference)	33.0%			
	Lived alone	39.6%	1.33	.84 – 2.12	.223
Family member adherence by relationship	Spousal member non-adherent to LSD (reference)	25.0%			
	Non-spousal member non-adherent to LSD	36.0%	1.69	.95 – 3.01	.075
	Spousal member adherent to LSD	36.1%	1.70	.96 – 2.99	.068
	Non-spousal member adherent to LSD	56.8%	3.94	1.81 – 8.58	.001
Family member adherence by living arrangement	Patient lived with non-adherent family member (reference)	26.0%			
	Patient did not live with non-adherent family member	37.8%	1.71	.95 – 3.06	.072
	Patient lived with adherent family member	40.2%	1.87	1.13 – 3.15	.015
	Patient did not live with adherent family member	45.8%	2.38	.98 – 5.77	.055