

The Quality of Family Relationships, Diabetes Self-Care, and Health Outcomes in Older Adults

Daniel David,^{1,2} Joanne Dalton,^{3,4} Cherlie Magny-Normilus,⁵ Maura Moran Brain,⁴ Tyler Linster,⁴ and Sei J. Lee^{1,6}

ABSTRACT

The purpose of the study was to investigate the relationship between family support, diabetes self-care, and health outcomes in older, community-dwelling adults. Using the theoretical framework of the Self-Care of Chronic Illness Theory and a cross-sectional design, 60 participants completed questionnaires related to diabetes self-care activities of the individual, supportive and non-supportive diabetes behaviors of the family, and the quality of family relations. Participants indicated that diabetes self-care behaviors were performed frequently, with exercise reported as the least-performed behavior. Multiple regression analyses revealed that the quality of family relations as measured by the Family Relationship Index contributed significantly (26.0%) to the variability in A1C levels ($R^2 = 0.260$, $F(1, 40) = 14.037$, $P = 0.001$). Neither family supportive behavior nor the quality of family relations contributed to diabetes self-care. It is recommended that health care providers include family members to assess diabetes family support and family relationships in the care of older adults with diabetes.

One-fourth of adults >65 years of age have diabetes, and half have prediabetes (1). The prevalence of diabetes in older adults is nearly triple general population estimates and poses unique challenges to older adults (2). Older adults with type 2 diabetes perform self-care behaviors that include testing of blood glucose levels, taking medications, exercising, following a proper diet, and monitoring for foot injury (3–5). However, unlike their younger counterparts, older adults often perform self-care behaviors in the context of higher comorbidity, polypharmacy, nascent cognitive impairment, and a decline in physical abilities (3), each of which may interfere with their ability to perform diabetes self-care activities and consequently affect their diabetes clinical outcomes.

Components of family behavior have an important role in diabe-

tes outcomes of older adults. These include both diabetes-specific supportive or nonsupportive behaviors and the social environment of family relationships. Family support has been identified as an important component of diabetes self-care (6–9). Although individuals with chronic disease rely on personal knowledge and skills, many seek support from family members. Family behaviors have been found to be associated with diabetes-related stress, general stress, depression and medication non-adherence (10), self-care and glycemic control (11), and diabetes self-care and diabetes management (12). Previous work suggests that specific diabetes-related behavior may be correlated with supportive and nonsupportive family behaviors (13). However, there is limited research exploring the association between family support, quality of family relationships, diabe-

¹San Francisco VA Medical Center, Geriatrics and Palliative Care, San Francisco, CA

²University of California San Francisco, School of Nursing, Department of Community Health Systems, San Francisco, CA

³Regis College, School of Nursing, Weston, MA

⁴Beth Israel Deaconess Medical Center, Boston, MA

⁵Yale University School of Nursing, West Haven, CT

⁶University of California San Francisco, School of Medicine, Division of Geriatrics and Palliative Care, San Francisco, CA

Corresponding author: Daniel David, Daniel.David@ucsf.edu

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tes self-care, and clinical outcomes in older adults.

In this study, the Self-Care of Chronic Illness Theory was used as a framework to investigate factors that may affect self-care and health outcomes in older adults with diabetes (14). It is a middle-range theory that integrates empirical clinical findings with broader conceptual frameworks to describe the process of maintaining the health of adults while managing a chronic illness. The major theoretical concepts are self-care maintenance, self-care monitoring, and self-care management. Collectively, these components support wellness as individuals maintain health-preserving behaviors, monitor for acute conditions, and respond to signs and symptoms of illness as needed. This theory hypothesizes that the factors that influence self-care are experience, skill, motivation, culture, confidence, habits, function, cognition, support from others, and access to care.

Older adults with diabetes leverage family support and self-care behavior to navigate wellness. This study investigates the influence of family support on diabetes self-care behaviors and outcomes. The quality and character of family relationships are hypothesized to support self-care maintenance, monitoring, and management. Specifically, the purpose of this study was to investigate the association of family factors (i.e., the quality of the family relationship and diabetes-specific family support) on diabetes outcomes (i.e., self-care activities and A1C levels) in older adults.

Research Questions

The two research questions addressed in this study were:

1. Do measures of family support and the quality of family relationships predict diabetes self-care activities in older adults?
2. Do measures of diabetes self-care, family support, and the quality of family relationships predict A1C levels?

Methods

Design and Sample

This was a cross-sectional study of participant responses to questionnaires. The study received approval from the institutional review board at Beth Israel Deaconess Medical Center in Boston, Mass. Participants were recruited between April 2014 and February 2017 from multiple providers of a large outpatient academic primary care practice. From a total population of 2,150 older adults with diabetes, 703 potential participants were pre-screened by their provider and then contacted by mail, phone, or in person at a clinic appointment. Sixty agreed to participate. Inclusion criteria were diagnosis of type 2 diabetes as a primary or secondary diagnosis; age ≥ 65 years of age; having living family members; having an alert and oriented mental status; having the ability to read, write, and speak English; and receiving care from an outpatient facility within the medical system from which they were recruited. Exclusion criteria were a history of dementia and memory deficit.

Procedure

Written informed consent was obtained from all participants. After providing consent, participants completed questionnaires with the assistance of the study staff in a private clinic room at the clinical research center. Patient characteristics, family characteristics, living status, and diabetes-related medical history were obtained by participant self-report and medical records review. Participants also completed questionnaires assessing diabetes self-care, supportive and nonsupportive diabetes-related family behavior, and the quality of their family relationships. Family support was also assessed with one open-ended question: "What is the one most important thing that your family member/caregiver does to help you manage your diabetes?"

Measures

The primary outcomes were diabetes self-care, measured with the Summary

of Diabetes Self-Care Activities (SDSCA) measure, and A1C levels, obtained from clinical laboratory values reported in the medical record in the preceding year. Additional measures included the Diabetes Family Behavior Checklist II (DFBC-II) and the Family Relationship Index (FRI).

Summary of Diabetes Self-Care Activities Measure

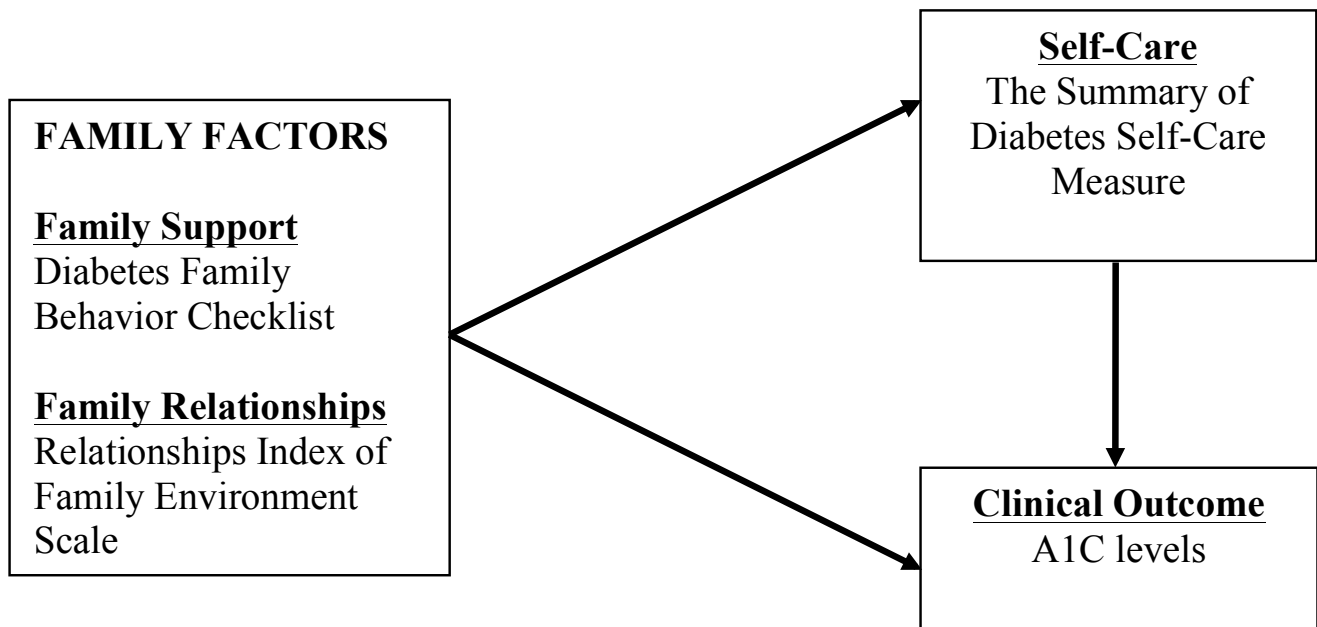
Participants' ability to manage their diabetes activities was measured with the SDSCA instrument (15). The SDSCA is a self-report instrument for assessing an individual's level of self-care in five areas: specific diet, exercise, blood glucose monitoring, foot care, and smoking. It includes an 11-item questionnaire asking participants to rate their performance of their diabetes self-care regimen in the last 7 days using a 7-point Likert scale. It has sound psychometric properties and has been associated with A1C levels in younger but not older people with diabetes (15,16).

Diabetes Family Behavior Checklist II

Family diabetes support was measured by the DFBC-II (17), a 20-item questionnaire using a 5-point Likert scale to measure the frequency of supportive and nonsupportive family behaviors in the areas of insulin injection, glucose testing, diet, and exercise. An example of a question related to supportive behavior is "How often does he/she [significant other] praise you for following your diet?" and a sample question related to nonsupportive behavior is "How often does he/she criticize you for not exercising regularly?" The instrument has sound psychometric properties and has been used in populations with type 1 and type 2 diabetes (10,11,18).

Family Relationship Index

The quality of family relationships was measured with the FRI of the Family Environment Scale (FES)–Real Form. This is a validated self-reported instrument that characterizes family relationships and the overall social



■ **FIGURE 1.** Theoretical linkages between concepts, measures, and study outcomes.

environment within the family on three subscales: cohesion, expressiveness, and conflict (19). Each subscale requires nine true/false responses to statements relating to family dynamics and produces a score of 0–9. Examples of items from the FRI include “My family members will really help and support each other” (Cohesion Subscale), “We tell each other about our personal problems” (Expressiveness Subscale), and “We will fight a lot in our family” (Conflict Subscale). Internal consistency for the FRI has been reported with a Cronbach’s α of 0.89, and good construct validity has been reported (20).

Statistical Analysis

Data were analyzed using SPSS version 22 (IBM Corp., Armonk, N.Y.). Descriptive statistics were used to describe the sample. Age-adjusted linear regression was used to assess variables associated with diabetes self-care and A1C. Variables in the regression model were determined a priori according to theoretical linkages investigating age, family-related variables, and diabetes self-care behavior (Figure 1). The presence of multicollinearity for each of the variables was measured using a tolerance threshold of <0.1. No col-

linearity was found in the regression models. In the rare case in which responses to individual questions were missing (<0.1% of data), an imputed mean was used to determine scores on summary measures. A *P* value of <0.05 was considered statistically significant. A minimum of 10 participants per variable was considered minimally sufficient for multiple regression analysis to avoid type II error (21).

Results

Patient Characteristics

Table 1 presents patient characteristics. There was an approximately equal number of men (*n* = 29, 48.3%) and women (*n* = 31, 51.7%). Participants were primarily white (*n* = 32, 53.3%) or black (*n* = 26, 43.3%), with a mean age of 75.3 years. Most participants were married, retired, and living with a spouse. Participants’ mean duration of diabetes was 18.3 years, and the most frequent comorbidity was hypertension. Health care utilization was assessed by documentation of “no-show” appointments in the medical records review and diabetes-related emergency room visits in the previous year. Participants had on average 0.9 no-show appointments. Only one

patient had an emergency room visit for diabetes. The mean A1C of participants was 7.3%.

Family Support for Disease Management: Qualitative Data

In response to the open-ended question “What is the one most important thing your family member/caregiver does to help you manage your diabetes?” most participants reported received help from spouses (*n* = 27) and children (*n* = 24). Using content analysis, results revealed that the most frequent self-care management behaviors were assistance with diet (*n* = 25) and social support (*n* = 15). Assistance with medications (*n* = 4) and physician visits (*n* = 4) were also reported. Twelve participants reported that they received no support from their family member.

Diabetes Self-Care, Family Relationship Quality, and Diabetes Family Behaviors

Table 2 presents the means, SDs, and possible scores for the DFBC-II, FRI, and SDSCA measures. The mean score for supportive behaviors (22.1) was higher than that for nonsupportive behaviors (16.2). Participants performed most diabetes self-care behaviors several times per week.

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TABLE 1. Participant Characteristics

Characteristics (n = 60)	Mean (SD), Range
Age, years	75.3 (6.1), 65–90
Duration of diabetes, years	18.3 (10.2), 2–43
Number of children	2.6 (1.8), 0–9
Compliance with visits: no shows	0.9 (2.0), 0–11
A1C, %	7.3 (1.2), 5.7–10.45
Number of emergency room visits	0.03 (0.2), 0–1
	n (%)
Sex	
Female	31 (51.7)
Male	29 (48.3)
Comorbidities	
Hypertension	54 (90)
Atrial fibrillation	6 (10)
Chronic obstructive pulmonary disease	2 (3.3)
Myocardial infarction	2 (3.4)
Race	
White	32 (53.3)
Black	26 (43.3)
Hispanic	1 (1.7)
Asian	1 (1.7)
Marital status	
Married	37 (61.7)
Divorced	4 (6.7)
Widowed	5 (8.3)
Not reported	14 (23.3)
Employment status	
Employed	10 (16.7)
Not employed	5 (5)
Retired	47 (78.3)
Living status	
Alone	20 (33.3)
With spouse	29 (48.3)
With family member	10 (16.7)
Other	1 (1.7)

Participants reported that adhering to a general healthy diet was performed most frequently. However, exercise was performed on fewer than half of the days of the week (mean 3.0, SD 2.5 days). In addition, participants perceived family relationships in a positive manner (14.8 of a possible score of 27).

Table 2 also presents values for those individuals with an A1C meeting the American Diabetes Association (ADA) general target for adults aged ≥ 65 years (A1C $< 7.5\%$). At an observational level, those with an A1C meeting the ADA guideline reported more supportive family behavior, less nonsupportive fam-

ily behavior, and a higher quality of family relationships. (Comparative statistical analyses between adults meeting and not meeting the A1C guideline were deferred because of the increased chance of a type 1 error with multiple comparisons.)

Factors Associated With Diabetes Self-Care Activities and A1C Levels

Linear regression analyses were conducted to determine factors that contribute to diabetes self-care activities and average A1C levels. Factors included in the model were determined a priori according to the theoretical framework and were entered as a single block. As presented in Table 3, none of the variables (age, FRI, family supportive behaviors, and family non-supportive behaviors) was significant in describing the variability in diabetes self-care behavior ($R^2 = 0.091$, $F[4, 39] = 0.974$, $P = 0.443$). However, these factors in combination with diabetes self-care activities significantly described 34% of the variability in A1C levels ($R^2 = 0.340$, $F[5, 36] = 3.704$, $P = 0.008$) (Table 4). Although the overall model was statistically significant, only one individual factor, the FRI, was significant. Simple linear regression of the FRI described 26.0% of the variability in A1C levels ($R^2 = 0.260$, $F[1, 40] = 14.037$, $P = 0.001$).

Discussion

This study investigated family dynamics that have the potential to influence diabetes outcomes. We found that the quality of family relationships (FRI) was a significant predictor of A1C levels in older adults. Although it was hypothesized that diabetes-specific supportive and nonsupportive family behaviors would be associated with diabetes self-care behavior, this was not supported by our findings.

Although diabetes-specific family behaviors were not associated with self-care, older adults were actively involved in diabetes self-care. Most diabetes self-care behaviors in older adults were performed frequently. Maintaining a proper diet was the

TABLE 2. DFBC-II, FRI, and Diabetes Self-Care Behavior Scores

	Mean (SD)	Mean (SD) in Those With A1C <7.5%* (n = 35)
DFBC-II		
Behavior score (range)		
Supportive behaviors (9–45)	22.07 (8.13)	24.57 (7.74)
Nonsupportive behaviors (7–35)	16.15 (6.39)	15.43 (5.98)
FRI		
Family relationship score (range)		
FRI overall (0–27)	14.76 (3.03)	15.93 (2.64)
Cohesion (0–9)	7.40 (1.86)	8.13 (1.31)
Expression (0–9)	5.54 (2.00)	5.94 (1.91)
Conflict (0–9)	1.76 (1.72)	1.71 (1.77)
SDSCA		
Self-care behavior score (range)		
SDSCA overall (0–7)	4.25 (1.21)	4.28 (1.40)
General diet (0–7)	5.35 (1.74)	5.37 (1.69)
Special diet (fruits/vegetables/fat) (0–7)	4.86 (1.63)	4.91 (1.71)
Exercise (0–7)	2.95 (2.52)	3.39 (2.60)
Blood glucose monitoring (0–7)	4.52 (2.69)	4.09 (2.77)
Foot care (0–7)	3.70 (1.96)	3.63 (2.08)

*ADA general guidelines for target A1C in adults ≥65 years of age.

most commonly performed self-care activity, and performing exercise was the least often performed behavior. These results suggest that characteristics of the family affect diabetes outcomes in older adults; however, self-care may largely be the result of individual efforts rather than self-care activities supported by family behaviors.

These findings contribute to the body of work that investigates the complexities of diabetes self-care and family support among patients of different ages. In this study, family diabetes supportive and nonsupportive behaviors and family relations were not found to be associated with diabetes self-care behaviors. This is inconsistent with other research findings (12,13,22). An explanation for this finding could be that many of the participants in this study reported that a moderate amount of family support was required to perform self-care activities. The homogeneity in this variable may diminish the ability to discern meaningful contributions of family behaviors that predict self-care behavior. Nevertheless, in

TABLE 3. Factors Contributing to Diabetes Self-Care

Variables	B	95.0% CI for B	Standardized B	P	R ²
Model (diabetes self-care)				0.443	0.091 (NS)
Age	-0.038	-0.096 to 0.020	-0.202	0.195	
Mean FRI total score	0.09	-0.055 to 0.236	0.226	0.216	
Mean family support score	-0.045	-0.119 to 0.029	-0.326	0.228	
Mean family nonsupport score	0.027	-0.059 to 0.114	0.154	0.525	

NS, not significant.

TABLE 4. Factors Contributing to A1C Levels

Variables	B	95.0% CI for B	Standardized B	P	R ²
Model (A1C)				0.008	0.340*
Age	0.002	-0.053 to 0.057	0.008	0.953	
Mean FRI total score	-0.146	-0.284 to -0.007	-0.339	0.040*	
Mean family support score	-0.062	-0.131 to 0.008	-0.425	0.079	
Mean family nonsupport score	0.036	-0.043 to 0.115	0.195	0.365	
Mean self-care behavior score	-0.161	-0.457 to 0.135	-0.157	0.277	

*P < 0.05.

response to the open-ended question, the participants reported that the two most important family behaviors were assistance with diet and social support. The evidence supports that older adults perceive diabetes-specific family support even if this support was not associated with a measurable outcome with regression analysis.

The quality of family relationships has the potential to affect diabetes-related outcomes. This has been shown in a broad age range of adults; however, evidence of the impact of family relationship quality on older adults has been limited. Kang et al. (23) completed a qualitative study using four focus groups that explored how older adults with diabetes and hypertension perceive and cope with chronic illness. Dalton and Matteis (13) found support for the relationship between positive family relationships and older adults' management of diabetes. Lister et al. (24) found a significant relationship between expressed emotion and diabetes self-care management in spouses. Pereira et al. (22) found that family relationships (marital adjustment, partner support, family coping, and family stress) were important factors in adherence to diabetes self-care behaviors and medications and recommended including partners in the plan of care. Mayberry et al. (16) found that diabetes self-care behavior measured by the SDSCA predicted A1C levels in younger adults, but the association did not hold among participants ≥ 65 years of age. Our findings were consistent with these previous findings.

This study has limitations in sample size and homogeneity. The small sample size ($n = 60$) and limited sampling (one clinical site and one region of the country) limit generalizability to other populations. Furthermore, given that the presence of cognitive difficulties was an exclusion criterion, the sample may have included a disproportionate number of higher-functioning older adults. Despite these limitations, the results provide support for the practice recommen-

dation of integrating the family in diabetes management of older adults to facilitate diabetes self-care behaviors and glucose control.

Although specific family behaviors were not found to affect diabetes self-care behaviors or A1C levels, the quality of family relationships significantly contributed to the variability in A1C in older adults. This finding has implications for practice and research. It is recommended that health care providers include family members in the care of older adults with diabetes to assess both diabetes family support and relationships. The character of patients' family dynamics may be a more important predictor of diabetes outcomes than specific educational/didactic family instruction. Providers are advised to recognize challenging family environments and facilitate family cohesiveness, expressiveness, and conflict resolution when appropriate.

Recent research into promising family-centered diabetes interventions holds promise for diabetes outcomes in adult patients (23,25,26). We suggest that future interventions that include family members need to be developed specifically for older adults. These interventions should include assessment of the character of the family relationships in addition to the supportive and nonsupportive behaviors that are part of the family dynamics. Further intervention research is recommended that includes larger samples of older adults with diabetes to provide more evidence for practice recommendations. More research is needed to identify which factors are associated with diabetes self-care behaviors and how the frequency of exercise can be increased in older adults.

Duality of Interest

No potential conflicts of interest relevant to this article were reported.

Author Contributions

D.D. and J.D. researched data, wrote the manuscript, contributed to discussion, and

reviewed/edited the manuscript. C.M.-N., M.M.B, T.L., and S.J.L contributed to discussion and reviewed/edited the manuscript. D.D. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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