

# Influence of Family Caregiver Caring Behavior on COPD Patients' Self-Care Behavior in Taiwan

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**BACKGROUND:** COPD becomes a long-term burden on family members who serve as day-to-day caregivers, and causes healthcare systems to incur substantial costs. COPD is both preventable and treatable, and one important aspect of COPD treatment is patients' self-management. This study aimed to investigate relationships between self-management and the caregiver burden, and the influence of family caregivers' caring behavior on COPD patients' self-care behavior. **METHODS:** In a cross-sectional study conducted between March 2007 and January 2008, 192 pairs of COPD patients (age > 40 years, normal cognitive function) and their primary family caregivers were recruited to answer questionnaires measuring COPD characteristics and COPD knowledge (patients and caregivers); functional status, health beliefs, self-efficacy, and self-care (patients); and caring behavior and caregiver response (family members). All questionnaires were shown to have acceptable validity and reliability, and the data were analyzed using univariate and multivariate techniques. **RESULTS:** Patients' ages, scores in health belief, self-efficacy and disease-related knowledge were shown to correlate with patients' self-care behavior. Patients' self-care behavior was negatively correlated with family caregivers' caring behavior ( $\rho = -0.21, P = .003$ ), but positively with caring duration of family caregiver caring behavior ( $\rho = 0.15, P = .037$ ). Patients with a spouse as caregiver exhibited higher self-care ability than patients not married to their caregivers ( $P = .038$ ). However, patients' self-care behavior decreased with higher family caregivers' COPD knowledge ( $P = .041$ ) and caring behavior ( $P = .01$ ), and patients regularly taking medication exhibited low self-care scores. **CONCLUSIONS:** Family caregivers' caring behavior had a partial negative effect on COPD patients' self-care behavior. *Key words:* COPD; self-care behavior; disease care behavior; disease knowledge; self-efficacy; health beliefs; Taiwan. [Respir Care 2012;57(2):263–272. © 2012 Daedalus Enterprises]

## Introduction

Chronic obstructive pulmonary disease (COPD) results in millions of visits to medical care facilities annually. In

Taiwan, crude COPD mortality was unchanged from 1981 to 1993 (8.26–8.47 deaths per 100,000 population) and then increased steadily thereafter to 17.88 per 100,000 in 2002; after age standardization, mortality decreased from 8.6 to 4.91 per 100,000 population from 1981 to 1993 and

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then peaked at 7.36 per 100,000 in 1999.<sup>1</sup> The obstructive airway disease category, including COPD and other lower respiratory diseases, ranked seventh among leading causes of death in Taiwan in 2008, according to the government's annual report. As a chronic condition, COPD can be debilitating, become a long-term burden on family members who serve as day-to-day caregivers, and cause healthcare systems to incur substantial costs. COPD is both preventable and treatable.<sup>2</sup> One important aspect of COPD treatment is patient self-management. A study comparing patients with COPD and congestive heart failure found that COPD patients had lower self-efficacy and worse self-care behavior, attributable to differences in the nature of COPD versus congestive heart failure.<sup>3</sup>

Self-care behavior is a term that describes the skills needed by patients to adhere to COPD treatment regimens and change their health-related behavior in order to manage their symptoms and lead functional lives.<sup>4</sup> Self-care behavior requires education about the disease and its management, and psychological empowerment of the patients to participate fully in their own self-care. Self-care behavior can involve such important tasks as smoking cessation and regularly taking medications. In studies of professional caregivers such as nurses, additional education for COPD patients improved their disease knowledge and self-care behavior.<sup>5,6</sup> This improvement can lead to a reduction in COPD-related events and hospitalizations.<sup>5,6</sup> Although the published research on the effectiveness of self-management programs for COPD is insufficient and heterogeneous with regard to interventions, study populations, follow-up time, and outcome measures, a meta-review concluded that there was evidence of a significant reduction in hospital admissions and a small but significant improvement in health following education to improve self-care behavior.<sup>4</sup>

However, many if not most caregivers are family members rather than professionals. Family caregivers typically take care of the patients on a daily basis. These family caregivers lack the professional training to facilitate patient self-care behavior, which, when improved, may in turn help to reduce the caregiver burden. A fairly recent study measuring the relationships of caregivers and COPD patients and the associated caregiver burden concluded that COPD caused a significant impact on the quality of life of caregivers, and that the 2 most important predictors of the caregiver burden for COPD patients are the relationships between patients and their caregivers and the attitude and ability of caregivers.<sup>7</sup> Our clinical experience and previous studies<sup>5-7</sup> reveal that quality of life, caring behavior, and psychosocial adjustment of family caregivers are inevitably affected by the patient's physical and psychological conditions. As the patient's need for support increases, the caregiver may find it more difficult to meet those needs, and debate continues on whether more care-

## QUICK LOOK

### Current knowledge

COPD is a substantial cost burden to the healthcare system and a substantial burden on family and caregivers.

### What this paper contributes to our knowledge

The caring behavior of family caregivers can have a negative effect on the self-care behavior of COPD patients. Family may provide too much care, reducing the patient's self reliance.

giver care behavior will have a positive effect on the patient's self-management. In general, however, the influence of family caregivers on COPD patients' self-care behavior has been poorly explored in the literature, and evidence-based recommendations are needed.<sup>8</sup> The purpose of this study was to investigate the relationships between self-management and the caregiver burden, and the influence of family caregivers' caring behavior on self-care behavior in COPD patients. We hypothesized that family caregivers' caring behavior and caregivers' reactions to the caregiving work load would significantly affect the self-care behavior of COPD patients.

## Methods

### Participants

This study was conducted between March 2007 and January 2008. Study subjects were recruited from the outpatient departments of the hospitals of the research team. In this cross-sectional study, clinical thoracic patients and their family caregivers were selected by convenience sampling among volunteers in 3 medical centers and 3 regional hospitals in north-central Taiwan. Primary family caregivers were defined as family members who provided regular, almost day-to-day care for elder patients. Four hundred forty-nine patients diagnosed with COPD according to the definition suggested by the Global Initiative for Chronic Obstructive Lung Disease (GOLD)<sup>9</sup> were initially recruited for enrollment and volunteered to participate. All patients had signed the informed consent. COPD severity was graded according to lung function values by spirometry as follows: Stage 0, normal spirometry with chronic productive cough; Stage 1, mild; Stage 2, moderate; Stage 3, severe, or Stage 4, very severe.<sup>2</sup> After COPD severity was graded, patients with COPD severity of stage 0 (no. = 32) were excluded and the effective number of patients was 417. For these 417 patients, 406 caregivers were identified

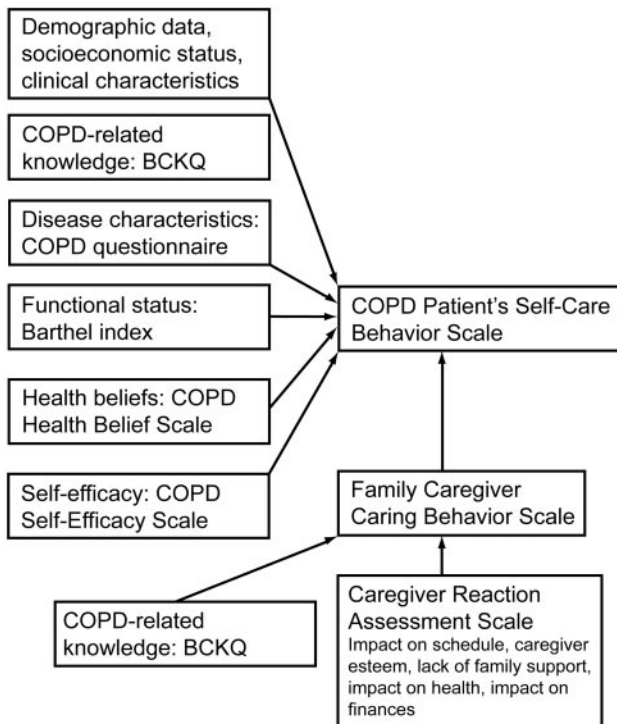


Fig. 1. Conceptual framework of COPD patient's self-care behavior. BCKQ = Bristol COPD Knowledge Questionnaire.

and signed the informed consent. However, Only 192 of these were primary family caregivers, constituting 192 pairs of patients and their primary family caregivers who were identified and included in this study. Inclusion criteria were age > 40 years and physician confirmation of COPD for patients, a family member was the caregiver, and normal cognitive functioning and the absence of psychiatric illness for patients and caregivers. All pairs of patients and caregivers were immediately given the questionnaires in an office near the out-patient department. By providing the questionnaires on site rather than by mail delivery, the response rate for the 192 pairs was 100%.

### Ethics

Since the patients and their family caregivers were selected from 6 hospitals, this study was approved by the institutional review board of individual hospitals. Written informed consent was obtained from all patients and their family members.

### Conceptual Framework

The conceptual framework for this study was modified from the model devised by Dunbar et al (2008).<sup>10</sup> The model, shown in Figure 1, provides direction for family-focused interventions that target the patient and family

knowledge and skills; family support, functioning, motivation, and behavior; as well as the family context to improve self-care and ultimately outcomes. It is based on a definition of self-management that includes self-care decisions and actions arising from self-care behavior, which are influenced by individual characteristics (age, sex, ethnicity, preferences, and patterns); clinical characteristics (acuity of illness, cognitive status, comorbidities, and self-care regimens); behavior characteristics (motivation, self-efficacy or confidence, mood states, and ability to adjust behavior altered by depression or anxiety); and prerequisite knowledge and skills to perform these behaviors.<sup>10</sup> Since this study investigated self-management and self-care activity within a family context, and cultural beliefs of participants may influence behavior, we also added health belief to the conceptual framework based on the health belief model proposed by Harvey and Lawson.<sup>11</sup>

### Measuring Instruments

Data were collected by administering 9 questionnaires to patients and family caregivers. All scales used have previously demonstrated validity and reliability (internal consistency), including establishing reference ranges for correlation coefficients as derived from the Spearman rank correlation in the manner of the London Chest Activity of Daily Living Scale for use in patients with COPD<sup>12</sup> and validation by expert review in which the experts on a panel specified their level of agreement to the stated items according to the method of Hyrkäs et al.<sup>13</sup> Modified scales were validated according to the method of Rubio et al,<sup>14</sup> which calculates content validity index (CVI) by computing the CVI for each item and dividing the number of experts who rated the item above 3 points by the total number of experts, which represents the proportion of experts who deemed each item as valid content; the instrument CVI was estimated by calculating the average CVI across items by the number of items.

The 9 questionnaires included:

For patients and caregivers:

- background information of COPD patients and their family caregivers
- disease-related knowledge scale, a modified version of the Bristol COPD Knowledge Questionnaire (BCKQ)<sup>15</sup>

For patients only:

- Disease Characteristics of COPD questionnaire with 3 subdomains (patient history of COPD, dyspnea severity measured by Borg categories scale,<sup>16</sup> an evaluation index for degree of breathing difficulty, and severity of COPD using the Global Initiative for Chronic Obstructive Lung Disease definition<sup>2</sup>)

- Functional status scale to measure patients' ability to perform activities of daily living using the Chinese version of the Barthel index<sup>17,18</sup>
- Chinese-language COPD Health Belief scale,<sup>19</sup> which was modified from the original to measure 4 components of the Champion Health Belief Model Scale<sup>20,21</sup>
- Modified COPD Self-Efficacy scale<sup>22</sup> to assess patients' confidence in their ability to avoid or manage breathing difficulties in specific situations
- Patient Self-Care Behavior Scale<sup>23</sup> modified based on a combination of Orem's Deficiency of Self-Care nursing theory,<sup>24</sup> a self-care behavior scale for heart failure patients,<sup>25</sup> international literature, and researchers' clinical experience with COPD patients

For caregivers only:

- Family caregiver caring behavior scale revised from Family Caregivers of Cancer Patients Care-Taking Scale<sup>26</sup>
- Caregiver Reaction Assessment scale using the Chinese translation of the Caregiver Reaction Assessment scale<sup>27</sup> to assess caregivers' perceptions of caregiving based on actual work load

All questionnaires were administered by inviting participants into an examining room individually, where they were asked to respond to the questions either by writing their answers or responding orally to the investigator.

All questionnaires are described in detail in the addendum of this report, including specific modifications (see the supplementary material related to this paper at <http://www.rcjournal.com>).

### Statistical Analyses

Continuous and categorical variables were presented as mean  $\pm$  SD and number (percentage), respectively. In univariate analysis, independent *t* tests and one-way analysis of variance (ANOVA) were performed to examine differences between the categorical variables and the patient's self-care behavior scale. Spearman's rank correlation was implemented to correlate continuous variables with the patients' self-care behavior scale, as implemented by Garrod et al.<sup>12</sup> Five levels of correlation were defined for the correlation coefficients: very weak ( $\rho \leq 0.2$ ), weak ( $0.2 < \rho \leq 0.4$ ), moderate ( $0.4 < \rho \leq 0.6$ ), strong ( $0.6 < \rho \leq 0.8$ ) and very strong ( $\rho > 0.8$ ). In multivariate analyses, factors with *P* values  $< .2$  in univariate analysis were put into a backward multivariate linear regression model to ascertain the effectors of the patient self-care behavior scale. Next, age, and sex were put into the backward multivariate linear regression model to control for their effects. The Cronbach  $\alpha$  coefficient was used to de-

termine the reliability and CVI for the validation of scales. All 2-sided statistics were performed by SPSS 15.0 statistical software (SPSS, Chicago, Illinois). Statistical significance was defined as a *P* value  $< .05$ .

### Results

Table 1 summarizes the characteristics of all 192 patients and their 192 family caregivers. The majority of the patients were elderly, married, unemployed men, and with less than a junior high school education. The majority of the family caregivers were younger, employed women, with an education level above senior high school, and low social economic status, who had been caring for the patient for a mean of 6.0 years, 6.1 days per week, and 13.7 hours per day. Slightly more than half of the family caregivers were the spouses of the patients. Half of the family caregivers were the sole patient caregivers on a daily basis and half had other help. Most caregivers did not report having a chronic illness themselves. Missing data included one patient without report of COPD severity, one patient without report of other chronic diseases, and 33 patients without indication of specified duration  $\geq 5$  years; these patients' data were excluded from analysis of variables without correction made for missing data.

Most patients self-reported having moderate or severe COPD and some reported having other chronic diseases, or that they had been hospitalized or visited an emergency ward, had suffered medication side effects, or had been intubated. The patients were fairly optimistic about their health. On average, the patients reported a very high functional status regarding performance of activities of daily living, but had extremely low confidence in their ability to avoid breathing difficulty while participating in certain activities.

Some patients had received COPD health education, and the average patient BCKQ score ( $21.6 \pm 5.6$ ) showed a moderate level of disease-related knowledge; however, family caregivers on average showed a much better understanding of COPD (BCKQ  $77.1 \pm 12.0$ ). Our data showed an average score ( $72.5 \pm 7.4$ ) slightly above the median of the range on the Caregiver Reaction Assessment scale (reaction of family caregivers to their caregiving burden). Likewise, a moderate score ( $104.4 \pm 33.7$ ) was shown on the family caregiver caring behavior scale (level of physical, social, and emotional care required of the caregivers).

Table 2 shows the results of the Spearman rank correlation between patients' self-care behavior scale and patients' age, Barthel index, Health Belief scale, self-efficacy scale, self-care scale, and total BCKQ scores. Patients' age and total scores on the Health Belief scale, self-efficacy scale, and BCKQ were positively correlated with patients' self-care behavior scale scores.

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Table 1. Characteristics of Study Participants

Characteristic	Patients (n = 192)	Family Caregivers (n = 192)
Age, mean $\pm$ SD, y	75.9 $\pm$ 8.9	51.8 $\pm$ 13.1
Sex, no. (%)		
Male	164 (85.4)	61 (31.8)
Female	28 (14.6)	131 (68.2)
Married, no. (%)*	153 (79.7)	171 (89.1)
Religious, no. (%)	139 (72.4)	153 (79.7)
Employed, no. (%)	15 (7.8)	103 (53.6)
Highest Educational Level, no. (%)		
Elementary school	100 (52.1)	55 (28.6)
Junior high school	35 (18.2)	26 (13.5)
Senior high school	24 (12.5)	56 (29.2)
College or above	33 (17.2)	55 (28.6)
Social Economic Status, no. (%)		
Low	119 (62.0)	101 (52.6)
Moderate	36 (18.8)	45 (23.4)
High	37 (19.8)	46 (24.0)
Rotary, no. (%)	NA	97 (50.5)
Smoking, no. (%)	160 (83.3)	NA
Severity of COPD, no. (%)†		
Mild	17 (8.9)	NA
Moderate	62 (32.5)	NA
Severe	81 (42.4)	NA
Very severe	31 (16.2)	NA
Living with caregiver, no. (%)	154 (80.2)	NA
Main caregiver, no. (%)	107 (55.7)	NA
None	6 (3.1)	NA
Spouse	107 (55.7)	NA
Son or daughter	67 (34.9)	NA
Cohabitant	2 (1.0)	NA
Nurse	8 (4.2)	NA
Others	2 (1.0)	NA
Weekly days of care, mean $\pm$ SD	NA	6.1 $\pm$ 2.0
Daily hours of care, mean $\pm$ SD	NA	13.7 $\pm$ 8.9
Duration of care, mean $\pm$ SD, y	NA	6.0 $\pm$ 5.4
Specified duration $\geq$ 5 y	74 (46.5)	NA
Other (chronic) disease	109 (57.1)	61 (31.8)
Health education, no. (%)	55 (28.6)	NA
Emergency ward, no. (%)	59 (30.7)	NA
Hospitalization, no. (%)	51 (26.6)	NA
Intubation, no. (%)	14 (7.3)	NA
Other care-needed person(s) in home, no. (%)	NA	37 (19.3)
Total score of BCKQ, mean $\pm$ SD	21.6 $\pm$ 5.6	77.1 $\pm$ 12.0
Scale of caregivers' responses, mean $\pm$ SD	NA	72.5 $\pm$ 7.4
Scale of family caregiver caring behaviors, mean $\pm$ SD	NA	104.4 $\pm$ 33.7
Barthel index, mean $\pm$ SD	96.9 $\pm$ 10.4	NA
Total score of Health Belief Model, mean $\pm$ SD	89.2 $\pm$ 7.5	NA
Self-Efficacy Scale, mean $\pm$ SD	3.5 $\pm$ 0.6	NA
Patient's Self-Care Behavior Scale, mean $\pm$ SD	90.7 $\pm$ 11.9	NA

\* Widow, widower, separated couple, married, or divorced people were included.

† The severity of COPD stage 1 was indicated as mild, stage 2 as moderate, stage 3 as severe, and stage 4 as very severe.

BCKQ = Bristol COPD Knowledge Questionnaire

NA = not applicable



Table 2. Correlational Analysis Between Patient Self-Care Behavior and (1) Patient Age, Barthel Index, Health Belief Model, Self-Efficacy Scale, Self-Care Scale and BCKQ Total Score, and (2) Family Caregiver Response, Care Behaviors, BCKQ, and Frequency of Care

Variable	$\rho$ ( $P$ )
<b>Patients</b>	
Age	0.16 (.03)
Barthel index	0.08 (.26)
Total score of Health Belief Scale	0.38 (< .001)
Self-Efficacy Scale	0.26 (< .001)
Total score of BCKQ	0.34 (< .001)
<b>Family Caregivers</b>	
Scale of caregivers' responses	0.12 (.09)
Scale of family caregiver caring behaviors	−0.21 (.003)
Family caregiver total score of BCKQ	−0.13 (.08)
Weekly days of care	0.11 (.14)
Daily hours of care	0.09 (.21)
Duration of care	0.15 (.037)

BCKQ = Bristol COPD Knowledge Questionnaire

Table 2 also shows the correlation between patients' self-care behavior and family caregiver response, care behavior, BCKQ, and frequency of care. The scale of family caregivers' caring behavior was negatively correlated with the patients' self-care behavior scale ( $\rho = -0.21$ ,  $P = .003$ ), suggesting that better caregiving may result in worse patient self-care behavior. In contrast, duration of family caregivers' care was positively correlated with patients' self-care behavior scale ( $\rho = 0.15$ ,  $P = .037$ ), suggesting that a longer duration of family caregivers' care may improve patients' self-care behavior.

Table 3 presents the comparison of patients' self-care behavior between patients' different categorical characteristics and between family caregivers' characteristics, respectively. Results indicate that the difference in patients' religious beliefs, specified duration, regularly taking medication, history of other diseases, side effect experiences, history of emergency ward visits, and history of hospitalization were related to the patients' self-care behavior scale scores. However, the comparison did not find any significant differences in patients' self-care behavior scores between different family caregivers' categorical characteristics (see Table 3).

Table 4 shows results of a simple linear regression model and stepwise multiple linear regression models to analyze the correlation between multiple factors and patients' self-care behavior scale. Variables that significantly correlated with patient self-care behavior from the correlational analysis were considered as factors for simple linear regression model. (See Table 2). Significant patients' characteristics ( $P < .2$ ) were also considered as factors related to patients' self-care behavior scale. The results of the simple

linear regression model showed that the average of patients' self-care behavior scale might be significantly correlated with some potential factors ( $P < .2$ ). All of the potential factors were included into following stepwise multiple linear regression analysis by controlling age and sex. After controlling for age and sex, stepwise multiple linear regression analysis (see Table 4) indicated that patients' self-care behavior scale score might be positively correlated with patient age ( $\beta = 0.24$ ;  $P = .048$ ), patients whose spouse was the primary caregiver ( $\beta = 3.22$ ;  $P = .038$ ), total Health Belief scale score ( $\beta = 0.33$ ;  $P = .003$ ), self-efficacy scale score ( $\beta = 4.61$ ;  $P = .001$ ), and patients' total BCKQ score ( $\beta = 0.41$ ;  $P = .006$ ). However, patients' self-care behavior scale score may be negatively correlated with family caregiver total BCKQ score by 0.13 ( $P = .041$ ) and the family caregiver care behavior scale score by 0.06 ( $P = .013$ ). The  $R^2$  of the stepwise multiple linear regression model was 0.316, indicating that 31.6% of variation of patients' self-care behavior scale score could be predicted by the multiple factors adjusting for patients' age and sex.

## Discussion

We investigated the relationships between self-management and the caregiver burden, and the influence of family caregivers' caring behavior on COPD patients' self-care behavior. The relationship between patients' self-care behavior and their caregivers' involvement was complex. Our major findings were that patients' self-care behavior was negatively correlated with family caregivers' caring behavior and their COPD knowledge, but positively correlated with the duration of care provided by a family caregiver, especially when the caregiver was the spouse. Patients with a spouse as caregiver exhibited higher self-care ability.

Our hypothesis was that family caregivers' caring behavior and caregiver reactions (perception of caregiving based on work load) might significantly affect COPD patients' self-care behavior. Relative to this, several aspects of familial caregiving were negatively associated with patients' self-care behavior, including higher levels of family caregivers' caring behavior and family caregivers' disease knowledge. These results likely reflect greater patient dependence on involved familial caregivers.

Although stepwise multiple linear regression analysis revealed a negative correlation between patients' self-care behavior and caregivers' care behavior (total BCKQ and family caregiver care behavior scale scores), a positive correlation was shown between duration of family caregivers' care and patients' self-care behavior. While these results show that longer duration of family caregivers' care may improve patients' self-care behavior, this may seem contradictory to the expectation that more caregiver

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Table 3. Comparison of Patients' Self-Care Behavior Between Patients' Different Categorical Characteristics, and Family Caregivers' Characteristics

Characteristic	Patients' Self-Care Behavior Scale for Patients' Characteristics	<i>P</i> *	Patients' Self-Care Behavior Scale for Family Caregivers' Characteristics	<i>P</i> †
Sex		.44		.22
Male	90.4 ± 12.1		89.1 ± 13.1	
Female	92.3 ± 11.1		91.4 ± 11.3	
Highest Educational Level		.12		.73
Elementary school	88.8 ± 12.1		92.4 ± 10.0	
Junior high school	92.9 ± 12.4		87.5 ± 14.8	
Senior high school	94.5 ± 7.9		89.8 ± 13.0	
College or above	91.2 ± 12.8		91.3 ± 11.1	
Social economic status		.21		.25
Low	90.0 ± 10.9		89.3 ± 12.5	
Moderate	93.7 ± 12.9		91.9 ± 11.2	
High	90.8 ± 13.8		92.4 ± 11.2	
Marriage		.08		NA
Single	87.6 ± 13.4			
Married‡	91.4 ± 11.5			
Religion		.038		.46
No	87.8 ± 11.9		89.4 ± 11.8	
Yes	91.8 ± 11.8		91.0 ± 12.0	
Employed		.34		.67
No	90.9 ± 11.8		91.1 ± 11.2	
Yes	87.8 ± 13.7		90.3 ± 12.6	
Smoking		.87	NA	NA
No	91.0 ± 9.5			
Yes	90.6 ± 12.4			
Spouse is the Main Caregiver		.052	NA	NA
No	88.8 ± 12.7			
Yes	92.2 ± 11.1			
Severity of COPD		.97	NA	NA
Mild	87.8 ± 13.2			
Moderate	90.7 ± 12.1			
Severe	90.1 ± 12.5			
Very severe	93.4 ± 9.2			
Specified Duration		.009	NA	NA
< 5 y	87.7 ± 13.5			
≥ 5 y	92.9 ± 11.0			
Other (Chronic) Disease		.001	NA	NA
No	87.4 ± 13.5			
Yes	93.0 ± 10.0			
Side Effect		< .001		NA
No	91.1 ± 11.7			
Yes	87.1 ± 12.3			
Had Patient Ever Had Health Education About COPD?		.16	NA	NA
No	90.2 ± 12.3			
Yes	91.8 ± 11.1			
Had Patient Ever Visited Emergency Ward?		.01	NA	NA
No	92.1 ± 11.5			
Yes	87.3 ± 12.4			
Had Patient Ever Had Intubation?		.44	NA	NA
No	90.8 ± 12.1			
Yes	88.3 ± 9.8			

± Values are mean ± SD.

\* The *P* values were derived from independent *t*-test or analysis of variance (ANOVA) for comparing the patients' Self-Care Behavior Scale among different categories of patients' characteristics.

† The *P* values were derived from independent *t*-test or ANOVA for comparing the patients' Self-Care Behavior Scale among different categories of health caregivers' characteristics.

‡ Widow, widower, separated couple, married, or divorced people were included.

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Table 4. Simple Linear Regression Model and Stepwise Multiple Linear Regression Model to Analyze the Correlation Between Multiple Factors and Patient's Self-Care Behavior Scale

Factors	Simple Linear Regression Model		Multiple Linear Regression Model	
	$\beta$ (95% CI)	P	$\beta$ (95% CI)	P
Patient's age	0.18 (−0.01 to 0.37)	.07*	0.24 (0.06 to 0.41)	.048†
Patient's sex (female vs male)	1.91 (−2.91 to 6.73)	.44	3.22 (−0.94 to 7.39)	.13
Highest Educational Level				
Elementary school vs college or above	1.07 (−3.41 to 5.56)	.64	ND	
Junior high school vs college or above	−3.75 (−9.35 to 1.85)	.19*	ND	
Senior high school vs college or above	−1.49 (−5.95 to 2.98)	.51	ND	
Marriage (married vs single)	3.78 (−0.42 to 7.98)	.08*	ND	
Religion (yes vs no)	3.98 (0.21 to 7.75)	.038*	ND	
Spouse is the main caregiver (yes vs no)	3.37 (−0.02 to 6.77)	.052*	3.22 (0.18 to 6.25)	.038†
Specified duration ( $\geq 5$ y vs $< 5$ y)‡	5.22 (1.33 to 9.11)	.009*	ND	
Other (chronic) disease‡ (yes vs no)	5.63 (2.27 to 8.99)	.001*	0.10 (−0.11 to 0.31)	.34
Side effect (yes vs no)	−4.37 (−8.73 to 0.001)	.050*	ND	
Had patient ever had health education about COPD? (yes vs no)	1.63 (−2.13 to 5.38)	.40	ND	
Had patient ever visited emergency ward? (yes vs no)	−4.81 (−8.44 to −1.19)	.01*	ND	
Patient's total Health Belief score	0.48 (0.26 to 0.69)	$< .001^*$	0.33 (0.12 to 0.54)	.003†
Patient's Self-Efficacy Scale	6.28 (3.49 to 9.07)	$< .001^*$	4.61 (2.01 to 7.21)	.001†
Patient's total BCKQ score	0.74 (0.46 to 1.03)	$< .001^*$	0.41 (0.12 to 0.70)	.006†
Family caregiver's total of BCKQ score	−0.17 (−0.31 to −0.03)	.02*	−0.13 (−0.26 to −0.01)	.041†
Duration of care by family members	0.19 (−0.13 to 0.50)	.24	0.23 (−0.04 to 0.50)	.10
Scale of family caregiver caring behaviors	−0.07 (−0.12 to −0.02)	.004*	−0.06 (−0.11 to −0.01)	0.013†

\*  $P = .2$ , potentially correlated with outcome, patient's self-care behavior scale in simple linear regression model.

†  $P = .05$ , significantly correlated with outcome, patient's self-care behavior scale in stepwise multiple linear regression model with controlling the age and sex.

‡ Missing data were found.

ND = no data (not calculated)

BCKQ = Bristol COPD Knowledge Questionnaire

assistance would be needed as COPD symptoms progress with time, and patients' self-care ability would decrease owing to greater breathlessness, cough, fatigue, and weakness. Previous reports show statistically significant positive relationships between family support and self-care behavior among COPD patients.<sup>28,29</sup> However, no studies report the quantitative investigation of the relationship between *duration* of family caregivers' care and COPD patients' self-care behavior, as we have done. In our study, although a definite positive relationship was shown, our interpretation is limited because the typically increasing severity of COPD, including symptoms such as breathlessness, cough, fatigue, and weakness, was not considered as a confounder when the relationship between self-care behavior and caregiver behavior was analyzed.

Our study also identified several patient-related factors that were significantly correlated with improved quality of patients' self-care behavior. These include patients' older age and higher levels of health belief, self-efficacy, and COPD-related knowledge. An unexpected finding was the lower scores in patients' self-care behavior among patients who were regularly taking medication. It is possible that

the higher scores concerning regularly taking medication and the lower self-care behavior scale scores were related to these patients having highly involved familial caregivers.

In a study utilizing different methodology, COPD patients' self-care behavior was found to be negatively influenced by depression, previous alcohol dependence, low self-efficacy, and less perceived influence over COPD symptoms, whereas patients with a self-management plan had better knowledge and self-care behavior.<sup>30</sup> Self-care behavior in this context is an aspect of the patient's self-management plan, described for our study as the skills needed by patients to adhere to COPD treatment regimens and to change their health behavior in order to manage their symptoms and lead functional lives. Although we did not specifically measure depression, history of alcohol dependence, or other psychopathology and its impact on patient self-care behavior and family caregiver caring behavior, we did arrive at a conclusion regarding the effect of self-efficacy. The results of this study make an important contribution to the literature, but in a direction unanticipated by other researchers. In their review of the literature



on caregivers of COPD patients, Caress et al stated that few research reports have been published on effective and appropriate training of family caregivers of COPD patients, and that knowledge of the needs of caregivers is critical so that they can have the information they need to maintain their own physical and emotional health.<sup>8</sup> Although we agree that caregivers' needs must be understood and met, our results appear to discourage intensive training and involvement of family member caregivers, placing the responsibility for disease management instead on COPD patients themselves and also on the nature of the patient/caregiver relationship. This tends to imply that the amount of caregiving needed, and therefore the related caregiver burden, may influence both the quality of life of caregivers and also the caregiver/patient relationship. Relative to this, Pinto et al in 2007 investigated the effects of COPD on caregivers' quality of life using a cross-sectional study conducted with 42 COPD patients and their caregivers; they concluded that COPD in a family member has a significant impact on the quality of the caregivers' lives and that the relationship between patients and their caregivers was an important predictor of the COPD burden.<sup>7</sup> In our study, a negative correlation between the scale of family caregiver caring behavior and the scale of self-care behavior of COPD patients showed that increasing the self-care behavior of COPD patients may reduce the burden on family caregivers providing day-to-day care. We also demonstrated a positive effect on patients' self-care behavior scale scores in patients whose spouse was the primary caregiver; patients whose spouse was caregiver exhibited higher self-care ability than patients not married to their caregivers. These findings may support the idea that a closer, more defined patient/caregiver relationship contributes to a reduced caregiver burden due to the patient's more willing role in self-care management, in other words, greater cooperation. This may also suggest placing less emphasis on intensive caregiver training and more emphasis on encouraging positive patient/caregiver relationships.

Another study, by Kanervisto et al in 2007,<sup>31</sup> agrees with this to some extent, suggesting that the needs of COPD patients at the social level, especially the relationship with spouses, include having peer support for encouragement, information about rehabilitation programs, and simply to help the COPD patients forget their own poor condition; they indicated further that spouses or other caregivers needed support from treating personnel to help maintain their supporting role in the lives of the COPD patients. In the present study, when spouses were the primary caregivers, we observed a reduced tendency toward poor self-care behavior among patients, perhaps because of the nature of the spousal relationship. This may indicate that spouses are appropriate primary caregivers when this is possible.

Strict generalizability of our results is limited to the population from which the sample was obtained. However, it is likely that many of these observations are applicable to the broader socio-cultural context of Taiwan and Southeast Asia to a significantly higher degree than results from other studies utilizing different populations. Although some general conclusions from this study could apply to other chronic diseases requiring patient self-care behavior, specific results may not be applicable to these patients. Likewise, the extent that these results apply to patients and caregivers in the context of end-stage terminal COPD is unknown.

Regarding possible future studies, we might examine further the negative correlation shown in this study between family caregivers' total score for the BCKQ instrument and their caregiver caring behavior score and patients' self-care behavior scores. Conducting a qualitative study comparing families that feel obligated to care for the elderly under the traditional Chinese concept of "filial piety" and families that do not respect the tradition may help determine whether the filial piety tradition may discourage patients from gaining confidence in their self-care abilities.

This study had several limitations, including that certain pairs of COPD patients and their caregivers had to be excluded because a family member was not the major caregiver. Additionally, the questionnaires, although they were well-documented tools shown to have acceptable content validity and reliability (internal consistency), had been modified for this study and may not have retained their original characteristics; they may also have response bias due to the nature of self-reporting. As mentioned above, another limitation is that the severity of COPD was not considered as a confounder when the relationship between self-care behavior and caregiver behavior was analyzed, which may somewhat restrict interpretation. The modest size of our study correlations must be noted as well, since this may also limit interpretation to some degree. Further study is warranted to support our conclusions.

## Conclusions

In conclusion, our findings indicate that rigorous caregiving is associated with less self-reliance among COPD patients and also that increasing COPD patients' self-care behavior may reduce the caregiver burden on relatives who provide day-to-day caregiving. The positive correlation between the duration of family caregivers' care and patients' self-care behavior may indicate that, with enough time, the relationships between familial caregiver and patient become more supportive of self-care behavior, or that the transition to appropriate self-care behavior is delayed by familial caregivers' tendency to over-care for the COPD patient. We further suggest that self-care behavior among

COPD patients could be improved by providing disease-related education to increase COPD knowledge among both patients and caregivers, and by training family caregivers to promote elder patients' independence and self-care ability. Also, reducing dependence on caregivers may empower patients to gain confidence in their ability to implement the necessary behaviors to manage symptoms and reduce hospitalizations.

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