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Caregivers of Alzheimer's disease patients often suffer from depression. Using a longitudinal treatment/control study, we examined the effects of a comprehensive support program on depression in spouse-caregivers. This psychosocial intervention program treats the primary caregiver and family members over the entire course of the disease through individual and family counseling, the continuous availability of ad hoc counseling, and support group participation. In the first year after intake, the control group became increasingly more depressed, whereas the treatment group remained stable. By the eighth month, treated caregivers were significantly less depressed than those in the control group. These results suggest that enhancing long-term social support can have a significant impact on depression in caregivers.

Key Words: Mental health, Elderly, Dementia

A Comprehensive Support Program: Effect on Depression in Spouse-Caregivers of AD Patients¹

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A multifaceted, structured intervention for spouse-caregivers of Alzheimer's disease (AD) patients was developed at the NYU-Aging and Dementia Research Center (NYU-ADRC) to enable caregivers to postpone or avoid nursing home placement of patients while minimizing the negative consequences of caregiving. A randomized treatment/control trial of the efficacy of this intervention has been under way since 1987. We previously reported that the intervention was effective in postponing or preventing institutionalization of AD patients in the first year after caregivers enrolled in the study (Mittelman et al., 1993). In this report, we focus on the effect of the intervention in alleviating depressive symptomatology in the caregivers during the same time period.

Living with and caring for a family member with AD has profound adverse effects on the mental health of caregivers. As many as 80% of caregivers of dementia patients have been reported to be suffering from chronic fatigue, depression or anger (Rabins, Mace, & Lucas, 1982). Depression, in particular, appears to

be significantly more likely among caregivers of AD patients than among others of the same age (Schulz, Visitainer, & Williamson, 1990).

Reported rates of depression among AD caregivers vary from 30% in a community sample (Kiecolt-Glaser, Dura, Speicher, Trask, & Glaser, 1991) to 46% of caregivers who sought help (Gallagher, Wrabetz, Lovett, Del Maestro, & Rose, 1989). Spouse-caregivers, who provide the most extensive care (Cohen et al., 1990), are particularly susceptible to stress and depression (Cantor, 1983; George & Gwyther, 1986). Depression scores have been reported to be elevated among spouse-caregivers compared to population norms (Lawton, Moss, Kleban, Glicksman, & Rovine, 1991; Schulz & Williamson, 1991) and community samples (George & Gwyther, 1986; Haley, Levine, Brown, Berry, & Hughes, 1987; Pruchno & Potashnik, 1989). Caring for a demented spouse is also generally reported to have a greater impact on well-being in general and depression in particular than caring for a physically impaired spouse (Baumgarten et al., 1992; Clipp & George, 1993; Moritz, Kasl, & Berkman, 1989).

There have been only a few systematic studies of interventions for caregivers of dementia patients in which alleviating caregiver depression was an intended outcome. These studies have demonstrated little or no effect on depression. For example, a short-term group intervention (Haley, Brown, & Levine, 1987) had no effect on depression in care-

¹The research was supported by Grant 1R01 MH42216 from the National Institute of Mental Health.

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givers. A treatment/control study of eight weekly 2-hour group meetings which included education, discussion, and role play did not demonstrate a statistically significant difference in change in symptoms of depression in the two groups of caregivers (Kahan, Kemp, Stapes, & Brummel-Smith, 1985). Caregivers who were offered respite services were no less depressed at the end of a year than control caregivers (Lawton, Brody, and Saperstein, 1989). A multicomponent intervention including home visits by nurses, as well as in-home respite and monthly support group participation, did not produce a statistically significant difference in depression in the treatment and control groups at follow-up, but the number of subjects was small and the attrition rate was high (Mohide et al., 1990). For an overview of recent studies of caregiver depression, see Knight, Lutzky, and Macofsky-Urban, 1993.

The intervention developed at the NYU-ADRC includes several treatment modalities to maximize formal and informal support for the caregivers. Individual and family counseling sessions are tailored to each specific situation, with a primary focus on increasing support for the spouse-caregiver from other family members. Caregivers join weekly support groups after the individual and family counseling sessions have been completed. In addition, the opportunity for ad hoc consultation at any time makes it possible for caregivers to receive help when they most need it. Because AD can last for as long as 20 years and is unpredictable both in its course and symptoms, the intervention was designed to provide continuous support for the primary caregiver and the family for as long as it is needed.

We hypothesized that because of the additional social support they received, caregivers in the treatment group would become less depressed or remain stable, while caregivers in the control group would become more depressed. There is evidence that social support and assistance from family and friends play an important role in maintaining the well-being, and particularly the mental health, of caregivers (George & Gwyther, 1986; Motenko, 1989). Family strain (Morycz, 1985) and frequency of contact with and help from the social network (Fiore, Becker, & Coppel, 1983) are highly correlated with caregiver depression. A longitudinal study found that a decline in support was related to an increase in depression (Schulz & Williamson, 1991). These studies suggest that although each caregiver has unique problems, all spouse-caregivers run the risk of isolation, and most caregivers would benefit from increased understanding and support from their families.

The NYU-ADRC study included regular structured follow-up interviews every four months during the first year after intake into the study, which provided information about the well-being of all spouse-caregivers in both the treatment and control groups. We evaluated the effects of the intervention on caregiver depression by comparing the change in depression in the treatment and control groups from baseline to the four-, eight- and twelve-month follow-ups. We used the results of other studies of depression in

caregivers to guide the choice of predictors to be considered for inclusion in the statistical analyses.

Female caregivers tend to be more depressed than male caregivers in cross-sectional studies of caregivers of dementia patients (Anthony-Bergstone, Zarit, & Gatz, 1988; Fitting, Rabins, Lucas, & Eastham, 1986; Pruchno & Resch, 1989). Several investigators reported that concern about adequacy of income was related to caregiver depression (Moritz, Kasl, & Berkman, 1989; Schulz, & Williamson, 1991).

Investigators have not found a relationship between caregiver depression and duration or severity of dementia (Cohen & Eisdorfer, 1988; Kiecolt-Glaser, Dura, Speicher, Trask & Glaser, 1991; Motenko, 1989; Pagel, Erdly, & Becker, 1987; Rankin, Haut, & Keefover, 1992), perhaps because behavioral disturbances, which are most prevalent in the middle stages of AD, have more of an impact on depression among family caregivers than cognitive decline (Baumgarten et al., 1992; Pruchno & Resch, 1989; Schultz & Williamson, 1991). Depression among caregivers also appears to be associated with the intensity of their reactions to the patient's memory behavior problems (Kiecolt-Glaser, Dyer, & Shuttleworth, 1988; Pearson, Teri, Wagner, Truax, & Logsdon, 1993).

A relationship has been consistently observed between depression and physical health among spouse-caregivers of cognitively impaired patients (Lawton et al., 1991; Moritz, Kasl, & Ostfeld, 1992; Pruchno & Resch, 1989; Rankin, Haut, & Keefover, 1992), whose physical health is worse than that of other caregivers (George & Gwyther, 1986). It has been suggested that those in better physical health are better able to withstand the demands of caregiving (Lawton et al., 1991). It is also possible that caregiving has deleterious effects on physical as well as mental health, or that poor physical health leads to depression.

Previous research on the effect of nursing home placement of patients on depression in caregivers has not produced consistent findings. For example, although one study of AD caregivers found that 55% of caregivers living with AD patients were clinically depressed while no caregiver living separately from the AD patient was depressed (Cohen & Eisdorfer, 1988), another study found an increase in depression among caregivers after placing the patient in an institution (Baumgarten et al., 1994).

In summary, a review of the literature suggested that the gender, financial problems, and physical health of the caregivers, the stage of dementia or number of behavioral disturbances of the patients, as well as whether the patients were still living at home, might be predictors of depression among caregivers.

We developed a model of the effects of characteristics of caregivers and patients on caregiver depression using data collected cross-sectionally at baseline. The longitudinal design of our intervention study made it possible to then use this model to assess the effects over time of the intervention and of changes in selected characteristics of caregivers and patients on change in depression. Because we con-

tinued to follow caregivers after the patients were institutionalized, we were also able to assess the effect of nursing home placement on depression.

Methods

Subjects

In order to be included in the study, the primary caregiver had to be married to and still living with a patient who had received a clinical diagnosis of AD. In addition, the patient or the spouse had to have at least one close relative living in the New York City metropolitan area. Primary caregivers who had received formal counseling or were participating in a support group were not eligible.

Caregivers were recruited for this study in several ways. Caregivers who accompany dementia patients to the NYU-Aging and Dementia Research Center for clinical evaluations fill out a comprehensive caregiver questionnaire as part of the routine assessment. This questionnaire was reviewed by the family counselors to determine eligibility for the Caregiver Intervention Study. This procedure resulted in the participation of 91 spouse-caregivers. In addition, the Alzheimer's Association of New York City referred many caregivers to the study. Other caregivers were recruited through contacts with day care centers and other agencies providing social services to the elderly in the New York metropolitan area.

Subject recruitment began in August 1987 and ended in February 1991. We recruited 209 caregivers, one of whom dropped out because she moved be-

fore finishing the baseline interview, and two of whom subsequently were dropped because the patient did not have an AD diagnosis. There were 206 spouse-caregivers who participated either for at least one year, or until the institutionalization of the patient or the death of the patient or caregiver, if that occurred first.

Sample Characteristics at Baseline

More than 40% of the spouse-caregivers in this study suffered potentially clinically significant levels of depressive symptomatology at baseline; 41.7% had scores on the Geriatric Depression Scale of 11 or higher, and 28.2% had scores of 14 or higher, scores that suggest a high probability of a diagnosis of clinical depression (Brink et al., 1982). The mean score at baseline was 9.75 and the standard deviation was 6.5, indicating a great deal of variability in this sample (see Table 1).

There were 120 female caregivers (58%) and 86 male caregivers (42%) in the study, most of whom were white (90%). Almost all (86%) were at least 60 years of age at baseline, and more than half (59%) were at least 70 years of age. At the time of the baseline interviews, 65 (32%) of the patients had moderate cognitive impairment (GDS = 4); 83 (40%) had moderately severe impairment (GDS = 5); and 58 (28%) had severe impairment (GDS = 6). One hundred and forty-four (144) caregivers (70%) were not employed (retired or homemakers), but 43 were employed full-time (21%) and an additional 19 (9%) were employed part-time. Most of the patients (86%) had annual incomes less than \$25,000, and half (51%)

Table 1. Study Variables at Baseline

Variable	Mean	SD	Range
Caregiver symptoms of depression	9.75	6.47	0-28
Caregiver physical health	5.80	1.49	3-10
Reaction to frequency of troublesome patient behaviors	81.91	53.89	0-288
Telephone calls from family and friends — days/month	17.97	13.91	0-31
Visits from family and friends — days/month	5.84	9.35	0-31
Help from family and friends — days/month	5.86	16.52	0-31
Family cohesion	35.93	7.47	10-50
Satisfaction with social network	2.53	1.36	1-6
Formal services used	3.73	1.96	0-11
Family income	37,864	27,480	2,500-140,000
Caregiver gender	Female 120 (58.3%) Male 86 (41.7%)		
Severity of patient impairment (GDS)	Moderate = 65 (31.5%) Moderately severe = 83 (40.3%) Severe = 58 (28.2%)		
Amount of paid help	None = 142 (68.9%) Several times/week = 38 (18.4%) Daily = 14 (6.8%) Day and night = 12 (5.8%)		
Worried about financial future	No = 82 (39.8%) Yes = 124 (60.2%)		
Amount of employment	None = 144 (69.9%) Part-time 19 (9.2%) Full-time 43 (20.9%)		

had incomes less than \$10,000. More than half the caregivers (60.2%) said they were worried about their financial futures.

Despite random assignment of subjects, 68 of the female caregivers (57%) were assigned to the control group, and 52 (43%) of the female caregivers were assigned to the treatment group. Thirty-five of the male caregivers (41%) were assigned to the control group, and 51 of the male caregivers (59%) were assigned to the treatment group. There were no other material differences between the treatment and control groups at baseline.

Procedure

At baseline, caregivers completed a comprehensive battery of questionnaires. Caregivers were randomly assigned to the treatment or control group immediately after the baseline interviews. There were 103 caregivers in the treatment group and 103 caregivers in the control group. All caregivers signed an informed consent to participate. Regular follow-up interviews were conducted every four months during the first year after baseline, and every 6 months thereafter, as long as the patient was alive.

If a patient or caregiver was institutionalized or died, the exact date of this event was recorded. The schedule of interviews remained unchanged for caregivers of patients in nursing homes, although the assessment was altered to eliminate questions which the caregiver would be unlikely to be able to answer accurately, such as those pertaining to the patient's health and behavior. The interview schedule was modified when a patient died, so that the next comprehensive assessment of caregiver well-being was administered one year later. Therefore, there are no interviews of caregivers after their spouses have died within the time frame of this report.

Each caregiver in the treatment group received all components of the intervention, and each has been provided with support continuously and for an unlimited period of time. (For more detail about the intervention, see Mittelman et al., 1993). Although one of the goals of the intervention was to prevent institutionalization, we continued to provide counseling after nursing home placement of the patient. Most caregivers continued to complete follow-up assessments after the institutionalization or death of the patient, and many caregivers are still actively participating in the study.

Four family counselors have been associated with this intervention study from its inception. They all have masters or doctoral degrees in social work, gerontology, or psychology, and have had experience working with families and knowledge of AD prior to their involvement in this study.

Components of Treatment

The *counseling component* of treatment consisted of six individual and family sessions within 4 months after intake into the program. One individual counseling session with the spouse took place immediately after the conclusion of the intake evaluation.

Four sessions of family counseling, custom-tailored in response to problems uncovered in the first individual session, were followed by an additional individual counseling session with the caregiver at the 4-month follow-up evaluation.

The counseling included role play and education about how to prevent problem patient behaviors, which enabled the caregivers to be in greater control of their environment. For example, if the patient is fidgety and the caregiver becomes aware that this behavior means the patient needs to go to the toilet, the caregiver may be able to avoid an episode of incontinence. If the caregiver gives the patient only one thing to eat at a time with only one utensil, the patient may not become confused and upset as he would when served in a normal fashion. As the condition of the patient changes, the caregiver must develop new strategies and appropriate responses to new situations. The fact that this intervention was not time-limited means that a trained counselor was (and still is) available to help the caregiver solve problems as the need arose.

At the conclusion of the formal counseling component of the treatment, 4 months after intake into the study, caregivers in the treatment group were required to join an AD caregiver support group which met regularly. There was no time limitation to membership in support groups.

The third component of the treatment consisted of informal consultation on an ad hoc basis with the family counselors, which could be initiated either by the spouse-caregiver or any participating family member. Counselors were available for telephone consultation at any time, including evenings and weekends in the event of a crisis. Caregivers in the treatment group received (and continue to receive) ad hoc counseling at any time.

The counselors taught caregivers in the treatment group how to reduce stress and to manage patients in order to reduce the frequency and intensity of troublesome behaviors and caregivers' reactions to these behaviors. Counselors also encouraged the caregivers to seek support from members of their social networks, and particularly from their families. The counselors emphasized the need for caregivers to care for themselves and to seek medical attention for themselves as well as the patient. Financial worries were directly addressed in counseling, both by encouraging caregivers to reallocate assets to take the patient's illness into account, and to apply for financial assistance if they were eligible.

No caregiver in the study was a "control" in the traditional sense of being completely deprived of treatment. All caregivers were told that they could telephone the counselors at any time. The control group received the standard assistance provided to all caregivers at the NYU-ADRC, which included resource information upon request, but no active intervention or formal counseling. The treatment/control study compared two levels of support, one formal with mandatory components, the other informal and only upon request. However, there were important differences in the level of support given

the two groups. For example, when treatment caregivers asked about resources, the counselors became actively involved in obtaining these resources, whereas the control caregivers received information about the resources and had to obtain them themselves. The control group members received no formal individual or family counseling. As a result, the counselors knew both families and primary caregivers in the treatment group, but only the caregivers in the control group. Although many caregivers in the control group chose to join support groups, the caregivers in the treatment group signed an "agreement" to join at the beginning of treatment, and were actively encouraged by counselors to do so.

The counselors provided interviews and counseling sessions in the caregivers' homes if they could not leave home. They scheduled these sessions at any time, including weekends and evenings. The interviews included questionnaires and unstructured probing. The counselors asked the questions in the assessment battery in a conversational manner, listened to the caregivers' problems, and did not insist on maintaining any particular order of questioning. Counselors maintained contact with caregivers in both the treatment and control groups by regularly mailing birthday cards, holiday greetings, and an NYU-ADRC newsletter to all participants. These procedures made it possible for counselors to develop a relationship with the caregivers in the study and maintain a very low attrition rate.

Attrition of Subjects From Baseline to Follow-up

Within the first year after baseline, only three caregivers refused to remain in the study (all in the treatment group), one of whom dropped out only after placing the patient in a nursing home. Three caregivers died before the twelve-month follow-up (all were in the control group). There were 35 nursing home placements, 11 in the treatment group and 24 in the control group, and 18 patient deaths (nine in the treatment group and nine in the control group) during that time (see Mittelman, Ferris, and Steinberg, 1993 for a full discussion of these outcomes). As a result of patient and caregiver deaths, as well as interviews closer in date and therefore assigned to a subsequent follow-up, we have information about the depression scale scores of 192 caregivers (93%) at the 4-month follow-up, 181 caregivers (88%) at the 8-month follow-up, and 173 caregivers (84%) for at least 12 months after intake into the study. There was no significant difference in the mean depression scale scores at baseline of caregivers who were available for follow-up in the first year and those who were not.

Measures

An assessment battery was completed at intake into the study as well as at all follow-up interviews which included evaluations of the physical and mental health of both the caregiver and the patient, the social environment, and the impact of the patient's illness on the caregiver. A comprehensive caregiver

questionnaire developed for this study includes questions about the demographic attributes of the caregiver and patient, and the frequency with which the caregiver received help from family and friends (such as visits, telephone calls, and patient sitting) and utilization of formal services. It also contains several questions about the financial status of the patient and caregiver, including caregiver income, patient income, and whether the caregiver is worried about his or her financial future.

Caregiver depression was measured with the Geriatric Depression Scale, a 30-item questionnaire in a yes/no format ($\alpha = .94$; Yesavage, Brink, Rose, & Adey, 1983). This scale was specially developed to be used with the elderly, and does not include questions about somatic complaints. Possible scores range from zero to 30. A cutoff score of 11 on this scale yielded a sensitivity of 84% and a specificity of 95%, while a cutoff of 14 yielded an 80% sensitivity and a 100% specificity (Brink et al., 1982).

The caregiver's reactions to troublesome patient behaviors were assessed with a summary score derived from the Memory and Behavior Problems Checklist by multiplying the frequency of each behavior by the caregiver's reaction to that behavior and summing the results over all behaviors ($\alpha = .80$; Zarit, Orr, & Zarit, 1985). The global severity of dementia of the patient was determined by a structured set of questions about patient functioning asked of the caregiver by the counselor (GDS; $\alpha = .83$; Reisberg, Ferris, de Leon, & Crook, 1988). The characteristics of the caregiver's social network, including the number and closeness of friends and relatives, and how satisfying the support provided by the network to the caregiver, were measured with the Stokes Social Network Scale ($\alpha = .92$; Stokes, 1983). The caregiver's physical health was assessed with a questionnaire adapted from the OARS (inter-rater reliability = .83; Duke University, 1978). The cohesiveness of the family was assessed with the FACES III questionnaire ($\alpha = .77$; Olson, Portner, & Lavee, 1987).

Data Analyses

The analyses were designed to investigate whether the change in the number of symptoms of depression was significantly different among caregivers in the treatment group and the control group in the first year after intake into the study. We hypothesized that caregivers in the treatment group would become less depressed or remain stable, while caregivers in the control group would become more depressed. We conducted an omnibus test of the difference between the treatment and control group over all time points (in the first year) simultaneously, intending to proceed with separate detailed analyses of change from baseline to each individual follow-up only if the global test indicated that such analyses were warranted.

Multivariate analysis of covariance was used for the global test. Number of symptoms of depression (Geriatric Depression Scale score) at baseline and the 4-, 8-, and 12-month follow-ups were the depen-

dent variables, and time and treatment group membership were the independent variables. A significant positive interaction between time and treatment group membership would indicate that the treatment and control groups were becoming increasingly different over time in the hypothesized direction. Gender of caregiver was included as a covariate in this and all other analyses. This was necessitated by the fact that of caregivers to the two groups, there was a substantial gender difference in the distribution of the two groups, in spite of random assignment (Mittelman et al., 1993).

Having confirmed that the treatment had an overall positive effect on depression, we conducted three separate hierarchical multiple regression analyses (Cohen & Cohen, 1983), corresponding to the three follow-ups (4, 8, and 12 months after baseline), to estimate the relationship between treatment group membership and change in number of symptoms of depression from baseline. In these analyses, we included other variables, in addition to treatment group membership, that might potentially be related to change in number of depressive symptoms.

Power considerations made it necessary to select only a few independent variables for inclusion in the analyses of change from baseline to follow-up. We conducted a preliminary hierarchical multiple regression analysis in which caregiver depression at baseline was the dependent variable. We selected, for the longitudinal analyses, variables that were significantly related ($p < .05$) to depression cross-sectionally.

Analysis of Caregiver Depression at Baseline. — On the basis of the results of previous studies of depression in caregivers, caregiver gender, income and financial worries, physical health, formal and informal social support, and caregiver reactions to problem patient behaviors were included in the model as potentially related to depression at baseline. Our clinical experience suggested that severity of dementia of the patient might also be related to caregiver depression. In addition, the design of the intervention was predicated on the expectation that the treatment would have a positive effect on the caregiver's perception of family cohesion, at least in part as a result of increased help, phone calls, and visits from family members. Because we anticipated that this would result in increased satisfaction with the social network, which in turn would decrease caregiver depression, these variables were also included as independent variables in the analysis of depression at baseline. Including these independent variables in the model enabled us to avoid attributing to the intervention an effect that was due to other sources, and to understand the source of the effectiveness of the intervention.

Treatment group membership, gender of caregiver, and financial worries were coded as dummy variables. Caregivers in the treatment group were coded "1" and those in the control group were coded "0." Female caregivers were coded "1" and male caregivers coded "0." Caregivers who said they

were worried about their financial futures were coded "1" and those who did not were coded "0." Thus, we could directly interpret the coefficient associated with each of these independent variables as the effect of being in the category coded "1" rather than in the category coded "0" on the dependent variable, number of symptoms of depression.

A network satisfaction scale was created by averaging three questions from the Social Network Questionnaire (general satisfaction, satisfaction with assistance, satisfaction with emotional support). A caregiver physical health scale was created by summing three questions about health, each on a 4-point scale, from the Physical Health Questionnaire (overall health, health compared to health 5 years ago and how much health gets in the way of doing what the caregiver wants to do). Help from family and friends was represented by a summary scale of the number of days in a month of patient sitting, taking the patient out, housekeeping, and shopping. These summary measures were developed as a result of factor analyses that have been described in a previous report (Mittelman et al., 1993). Formal support was represented by counting the number of support services the caregiver used in the prior 4 months (such as day care, legal or financial advisers, etc.).

In the analysis of caregiver depression at baseline, gender of caregiver was the first covariate entered into the model, followed by severity of dementia of the patient (GDS). Then, variables that we anticipated might be amenable to treatment were entered into the equation. We expected the intervention might have an indirect effect on caregiver health by encouraging the caregivers to take better care of themselves. We had observed that there was a large correlation between physical health and depression. We entered physical health into the equation immediately after the covariates so that the effects of all subsequently entered independent variables would be unaffected by the relationship between physical health and depression. The additional variables in the model included reaction to the frequency of troublesome patient behaviors, family cohesion and caregiver satisfaction with his or her social network, financial worries and income, and the amount of paid help and how many formal services were used.

Variables that measured the same or similar constructs, such as financial worries and income, were entered in sets to conserve power. The order of entry of independent variables in the analysis of depression at baseline was based on the presumed temporal order of these variables. We intended to preserve the same order of entry of variables in the analysis of change in depression as were specified in the cross-sectional analysis. If variables appeared to measure the same or similar constructs and were highly correlated with each other, we selected the variable that individually contributed the largest explanation of variance in depression at intake.

Change in Caregiver Depression in the First Year After Baseline. — We have information about the outcome within a year of intake into the study

(whether the patient was still at home, in a nursing home or had died, and whether the caregiver was still alive) for all 206 subjects who enrolled. However, not all caregivers were interviewed at all follow-up periods. A few caregivers refused to continue to participate after the patient was placed in a nursing home, and a few caregivers died in the first year after baseline. In addition, a few interviews were unavoidably so late that they actually were closer in time to the due date for the subsequent period than to the intended period. These excessively late interviews were therefore recoded to belong to that next period. Not all measures were applicable after the patient was placed in a nursing home, so some data were missing for the interview periods subsequent to these events. Caregivers of patients who had died were followed at a different schedule than other caregivers, with the first follow-up after the death of the patient being postponed until one year after that death. This means that if a patient died in the first year after baseline, there are no further data about caregiver depression in the first year after baseline. We investigated the possibility of bias resulting from dropping caregivers of patients for whom depression data were not available through the 12-month follow-up by comparing their mean depression scale scores at baseline to those of caregivers for whom we have complete data for 12 months using *t*-tests.

Data about a subject were not included in an analysis unless we had actual information about the dependent measure, depression scale score. However, if information was missing about independent variables because the patient had entered a nursing home, the mean values of the relevant measures for the group on which data were available at that time point were used for individuals for whom the data were missing. The mean is not an estimate, but a nonbiasing device to avoid loss of data (Cohen & Cohen, 1983). A dummy variable was included in the analysis to indicate that the patient was in a nursing home. This approach made it possible to maximize the power of the analyses by including the largest possible number of subjects, while avoiding the bias which might result from linear interpolation of missing data points (Cohen & Cohen, 1983).

In each analysis, depression at follow-up was the dependent variable, and depression at baseline was entered into the model before any other independent variable. Thus the regression coefficients associated with the variables entered in subsequent steps (and the explained variance) represent the effect of these variables on the *change* in depression from baseline. Covariates were entered into the model after baseline depression. Treatment group membership was entered into the model, and an assessment was made of its incremental effect with the covariates being held constant.

In the next stage, considered exploratory, other variables that could have been influenced by the treatment, or explain the effect of the treatment, were considered. Because we hypothesized that the effect of the intervention was due to change in these variables, rather than their values either at baseline

or at follow-up, we used the residuals of the variables, representing the variance at follow-up from which the effects of the baseline values had been removed. We calculated residuals for all independent variables (except caregiver gender) for each of the follow-ups. The independent variables were entered into the equation in an order that reflects their presumed causal priority. If the entry of these variables substantively altered the size of the treatment effect, or if any of them were statistically significant at this stage, this might suggest an explanation of the mechanism through which the treatment acted (Cohen & Cohen, 1983). Finally, we entered a dummy variable indicating whether the patient was in a nursing home or still at home. If this variable were significant, it would suggest that institutionalization had a significant effect on caregiver depression, and that the inclusion of mean values as estimates of information not available after patients were placed in nursing homes would have biased the results.

Results

Caregiver Depression at Baseline

Female caregivers entered the study with an average of three more symptoms of depression than male caregivers (as measured by scores on the Geriatric Depression Scale), a significant difference ($b = 3.13$, $t = 3.5$, $p < .001$) (see Table 2). In fact, 50% of the female caregivers had depression scores of 11 or higher (indicative of possible clinical depression), compared to 30% of male caregivers. Over and above the effect of caregiver gender, severity of patient dementia was associated with significantly more symptoms of depression among caregivers. A difference of one level in GDS was associated with almost two more symptoms of depression, on average ($b = 1.92$, $t = 3.47$, $p < .001$). It should be noted that treatment and control caregivers did not differ significantly in number of depressive symptoms at baseline after caregiver gender and patient GDS were taken into account.

The remaining variables in the model explained a further 34% of the variance in depression ($F = 10.9$, $p < .0001$). Poor physical health, entered into the equation immediately after the covariates, made the greatest single contribution to the variance in caregiver depression at baseline ($R^2 = .11$, $b = -1.48$, $t = -5.36$, $p < .0001$). We had expected that the effect of the intervention on depression would be due to the effect of an increase in the frequency of help, and visits and phone calls from family and friends. These variables, however, entered into the model next as a set, were not related to depression at baseline ($R^2 = .011$, $F = .97$, *n.s.*), and were therefore not included in the model of change in depression from baseline to follow-up. Nevertheless, the degree of family cohesion, entered next in the model, had a significant inverse relationship to caregiver depression ($b = -.20$, $t = -3.6$, $p < .001$). Beyond the effect of family cohesion, satisfaction with the social network was associated with significantly fewer symptoms of de-

Table 2. Summary of the Hierarchical Regression Analysis: Depression at Baseline ($n = 206$)^a

Step	Variable	<i>b</i>	(95% CI)	R ² Change
1	Caregiver female	3.13***	(1.37, 4.88)	.06***
2	Severity of patient dementia (GDS)	1.92***	(.83, 3.01)	.05***
3	Caregiver physical health	-1.48***	(-.93, -2.02)	.11***
4	Frequency of help from family members	.01	(-.04, .07)	.01
	Frequency of visits from family and friends	-.08	(-.18, .01)	
	Frequency of phone calls from family and friends	.01	(-.05, .07)	
5	Family cohesion	-.20***	(-.31, -.09)	.05***
6	Satisfaction with social network	-1.54**	(-.93, -2.16)	.08**
7	Worried about financial future	2.16**	(.62, 3.69)	.03*
	Family income	.00	(-.03, .02)	
8	Use of formal services	-.27	(-.66, .12)	.01
	Paid help at home	.59	(-.37, 1.56)	
9	Reaction to frequency of troublesome patient behaviors	.03***	(.02, .05)	.06***

Note. Unstandardized regression coefficients.

^aModel $F(13, 192) = 12.18, p < .001$; Unadjusted $R^2 = .45$, Adjusted $R^2 = .41$.

* $p < .05$; ** $p < .01$; *** $p < .001$.

pression at baseline ($b = -1.54, t = -4.9, p < .0001$), suggesting that the effect of network satisfaction included the effect of other social network factors on depression in addition to family cohesion. In the next step, two variables relating to finances, how worried the caregiver was about his or her financial future and family income, were entered as a set. This set was significantly related to depression at baseline ($R^2 = .026, F = 4.2, p < .05$). Since this effect was almost entirely due to the question about worry about financial future ($b = 2.16, t = 2.8, p < .01$), only this question was included in subsequent analyses of change in depression from baseline to follow-up. The number of formal services used and the amounts of paid help at home were entered into the equation together at the next step and were not significantly related to depression either together ($R^2 = .01, F = 1.41, n.s.$) or individually, so neither was included in the subsequent analyses. Finally, the caregiver's reaction to the patient's troublesome behavior was entered into the equation and was significantly related to depression ($b = .03, t = 4.52, p < .0001$).

Effect of the Intervention on Caregiver Depression in the First Year After Baseline

The correlation between depression at baseline and depression at each of the three follow-up periods was high (from baseline to 4-month follow-up, $r = .78, p < .001$; to 8-month follow-up, $r = .76, p < .001$; to 12-month follow-up, $r = .64, p < .001$). While the average change, in symptoms of depression from intake to follow-up was very small, there was enormous variability in the amount of change (from baseline to 4-month follow-up, average change = $.27, SD = 4.49$; from baseline to 8-month follow-up, average change = $.03, SD = 4.56$; from baseline to 12-month follow-up, average change = $-.10, SD = 5.55$). Most caregivers changed between 2 and 3 points from baseline to follow-up.

Although changes in depression were small for most caregivers, there were dramatic changes

(greater than one standard deviation of the baseline score) in a significant minority of caregivers by 12 months after intake. There were 44 caregivers (21%) whose depression scale scores changed more than one standard deviation of the baseline score (at least 7 points). The remaining 135 caregivers had a change of less than 7 points from baseline. Among the 22 caregivers who became at least 7 points less depressed by the 12-month follow-up, 15 (68%) were in the treatment group. Among the 22 caregivers who became at least 7 points more depressed by the 12-month follow-up, 16 (73%) were in the control group. This difference between the treatment and control groups is statistically significant ($\chi^2 = 7.4, p < .05$).

Multivariate Analysis. — Only subjects for whom depression scale data were available for all follow-ups in the first year ($n = 173$) were included. Multivariate analysis of covariance showed a significant interaction between time and treatment group membership (Wilks lambda = $.95$, approximate $F(3,167) = 2.74, p < .05$), indicating that the mean depression scale scores of caregivers in the treatment and control groups were changing in such a way as to become increasingly different during the first year after baseline. Caregiver gender, entered as a covariate in this analysis, was not significant.

Change in Depressive Symptomatology Among Caregivers From Baseline to the 4-, 8-, and 12-month Follow-ups. — The variance in depression at follow-up explained by the model was substantial ($R^2 = .72, F = 45.58, p < .001$ at the 4-month follow-up; $R^2 = .66, F = 32.87, p < .001$ at the 8-month follow-up; $R^2 = .62, F = 26.14, p < .001$ at the 12-month follow-up). Depression at baseline was entered into the model first, and was significantly related to depression at each follow-up (see Table 3), although the size of the effect of baseline depression decreased with time (from $R^2 = .61$ at the 4-month follow-up to $R^2 = .42$ at the 12-month follow-up). Thus, although the other variables in the model accounted for only a modest portion of the variance in the change (increase) in

Table 3. Summary of Hierarchical Regression Analysis: Change in Depression from Baseline to Follow-Up

Step	Variable	4-Month Follow-up		8-Month Follow-up		12-Month Follow-up	
		<i>b</i>	(95% CI)	<i>b</i>	(95% CI)	<i>b</i>	(95% CI)
1	Depression at baseline	.83***	(.74, .93)	.78	(.68, .88)	.66***	(.54, .78)
2	Caregiver female	.75	(-.55, 2.05)	-.42	(-1.80, .97)	.55	(-1.06, 2.17)
3	Increase in severity of dementia of patient	2.26**	(.79, 3.74)	.83	(-.45, 2.12)	.62	(-.78, 2.02)
4	Treatment group membership	-.71	(-1.96, .54)	-1.35*	(-2.66, -.05)	-2.91***	(-4.45, -1.36)
5	Improvement in caregiver physical health	-1.30***	(-.77, -1.83)	-.70**	(-1.23, -0.17)	-1.13***	(-1.53, -0.73)
6	Increase in family cohesion	-.19***	(-.30, -.08)	-.14*	(-.26, -.01)	-.17**	(-.29, -.05)
7	Increase in satisfaction with social network	-.70*	(-1.03, -1.37)	-.70*	(-1.05, -1.35)	-1.38***	(-1.70, -2.07)
8	Increase in worry about financial future	.58	(-.79, 1.96)	1.08	(-.29, 2.44)	1.44	(-.16, -3.05)
9	Increase in reaction to frequency of troublesome patient behaviors	.03***	(.01, .04)	.02*	(.00, .03)	.03***	(.01, .04)
10	Patient no longer at home	.75	(-1.88, 3.39)	.56	(-1.50, 2.62)	1.29	(-.86, 3.43)
	Model <i>F</i>	45.58***		32.87***		26.14***	
	Unadjusted <i>R</i> ²	.72		.66		.62	
	Adjusted <i>R</i> ²	.70		.64		.59	

Note. Unstandardized regression coefficients.
p* < .05; *p* < .01; ****p* < .001.

depression, their contributions were high, given the correlation between baseline and follow-up depression.

Gender of caregiver was entered into the model as a covariate in Step 2 and was not significantly related to change in depression at any follow-up. The variable representing the increase in severity of dementia (of one GDS level) at follow-up (residualized variable) was entered in Step 3 and was significant at only the 4-month follow-up (*b* = 2.26, *t* = 3.03, *p* < .01).

The effect of being in the treatment group rather than in the control group was entered into the model in Step 4. The size of the effect of group membership and its significance increased with the amount of time from baseline (*b* = -.71, *t* = -1.12, n.s. at the 4-month follow-up; *b* = -1.35, *t* = -2.05, *p* < .05 at the 8-month follow-up; *b* = -2.91, *t* = -3.72, *p* < .001 at the 12-month follow-up). By the 12-month follow-up, treatment group membership accounted for 23% of the variance that was explained by independent variables in the model after controlling for baseline depression.

When six potentially explanatory variables were entered as a set, they explained a significant portion of the variance in the change (increase) in caregiver depression from baseline to follow-up (*R*² = .09, *F* = 9.26, *p* < .001 at the 4-month follow-up; *R*² = .06, *F* = 3.97, *p* < .01 at the 8-month follow-up; *R*² = .15, *F* = 7.60, *p* < .001 at the 12-month follow-up). The effect of a deterioration in the physical health of the caregiver, entered in Step 5, on depression in the caregiver was significant at all three follow-up periods (*b* = -1.30, *t* = -4.84, *p* < .001 at the 4-month follow-up; *b* = -.70, *t* = -2.93, *p* < .001 at the 8-month follow-up; *b* = -1.13, *t* = -3.74, *p* < .001 at the 12-month follow-up). The effect of an increase in family cohesion, entered in Step 6, was associated with decreased depression at all three follow-ups (*b* = -.19, *t* = -3.34, *p* < .001 at the 4-month follow-up; *b* = -.14, *t* = -2.19, *p* < .05 at the 8-month follow-

up; *b* = -.17, *t* = -2.82, *p* < .01 at the 12-month follow-up). The effect of an increase in the caregiver's satisfaction with his or her social network, entered in Step 7, was also associated with decreased depression at all follow-ups (*b* = -.70, *t* = 2.07, *p* < .05 at the 4-month follow-up; *b* = -.70, *t* = 2.13, *p* < .05 at the 8-month follow-up; *b* = -1.38, *t* = 4.00, *p* < .001 at the 12-month follow-up). The effect of the caregiver becoming more worried about finances, entered in Step 8, was not significant at any follow-up. The effect of an increase in the caregiver's reaction to the problem behaviors of the patient, entered in Step 9, was significant at all three follow-up periods (*b* = .03, *t* = 3.42, *p* < .001 at the 4-month follow-up; *b* = .02, *t* = 2.50, *p* < .05 at the 8-month follow-up; *b* = .03, *t* = 3.66, *p* < .001 at the 12-month follow-up). Finally, a variable representing whether the patient was at home at the time of the follow-up, or had been placed in a nursing home, was entered into the equation. This variable was not significantly related at any follow-up to change in depression from baseline.

Discussion

The NYU Spouse-Caregiver Intervention Study demonstrates that an intervention which enhances social support has the potential for alleviating some of the deleterious effects of caregiving on mental health. It is important to note that the effect was not immediate in most cases, so that the average difference between the change in the treatment and control groups only became statistically significant 8 months after caregivers entered the study. The impact of the intervention on caregiver depression increased with each follow-up in the first year after subjects entered the study.

A major aspect of the intervention was individual and family counseling. A focus of the family counseling sessions was the resolution of conflict about the

care of the patient. Conflict among family members about their actions toward the primary caregiver is likely to result in symptoms of depression (Semple, 1992). Although there were only four family sessions, and they all occurred in the first 4 months after intake, the counselors were available to family members to resolve difficulties with the caregiver. It is interesting to note that the effect of change in family cohesion on change in depression was greatest during the period in which the formal family counseling sessions were held.

It has been suggested that depression in caregivers is related both to a sense of loss of control and mastery (Boss, 1993) and the self-blame for events over which they have little or no control (Pagel, Becker, & Coppel, 1985). The intervention may have helped to reduce depression because an important focus of the counseling was to make the caregivers more aware of the reasons for the patients' behavior and to teach them techniques for managing and interacting with the patients. Finding successful solutions to new problems enabled caregivers to feel a sense of mastery, which may have resulted in less depression.

Self-efficacy, social support, and depression are all related (Holahan & Holahan, 1987). Families sometimes inadvertently provide the wrong kind or amount of support to the primary caregivers, and it has been suggested that upsetting aspects of the social network are predictive of depression (Pagel et al., 1987). Caregivers in the treatment group were encouraged to ask their family members and friends for the kind and amount of support and help they needed. Furthermore, the quantity and timing of one of the components of this intervention, ad hoc counseling, were entirely under the control of the caregiver.

Cross-sectional observations about the relationships between depression and other characteristics were not necessarily replicated by the results of longitudinal observations. The results of cross-sectional analyses of our own data, as well as other studies, indicate that the gender of the caregiver is associated with depressive symptomatology. However, one longitudinal study found that although female caregivers were more depressed at intake than male caregivers, the male caregivers became more depressed over time (Schulz & Williamson, 1991). Although female caregivers in the NYU study were also considerably more depressed on average than male caregivers cross-sectionally at baseline, gender was not associated with change in depression over time. Women in general have been found to report more symptoms of depression than men, and the higher rates of depression among female caregivers than among male caregivers that have been observed in cross-sectional studies may be unrelated to caregiving.

Depression was also related cross-sectionally at baseline to the physical health of the caregiver, the reaction of caregivers to problem patient behaviors, family cohesion and general satisfaction with the support and assistance of the social network, and

worries about finances. It seemed logical that changes in these characteristics would result in changes in level of depression, and that the intervention would be effective by improving some of these characteristics. A major focus of the intervention is to make family members aware of the impact of the illness of the patient on the well-being of the spouse-caregiver and to make it possible for the spouse-caregiver to obtain appropriate help from family members. The results of our analyses suggest that the effect of the treatment on depression was to some extent through its impact on the satisfaction the caregiver was able to obtain from his or her social network, which was undoubtedly partly a result of the increase in family cohesion and participation in caregiving facilitated by the intervention. However, we were surprised by the fact that the level of depression appeared to be unrelated to specific manifestations of support such as visits, phone calls, or unpaid help by family members and friends.

Although financial worries were associated with depression cross-sectionally, alleviation of financial worries did not produce a corresponding alleviation of depression. Change in the caregiver's physical health continued to be related to increasing depression, regardless of the intervention.

Despite the fact that many investigators have reported that severity of dementia was unrelated to depression among caregivers, our clinical observations suggested that this might not be the case, and particularly, that a change in the patient's condition would have a great impact on depression in the caregiving spouse. Among the caregivers in this study, depression was related to severity of dementia at baseline and to increase in severity of dementia between baseline and the 4-month follow-up as well. Perhaps the inconsistency of this finding with those of other studies is due to the fact that at baseline the majority of the patients in this study were already in the middle stages of dementia, when problem behaviors are most common. Although most of the patients were still in the middle stages of the disease at the end of the first year, the frequency and severity of problem behaviors generally had increased.

There are several differences between this study and previous studies that might account for the demonstration of a relatively greater impact of this intervention on caregiver depression. Previous studies confined themselves to examining short-term effects of relatively short-term interventions, whereas the deterioration of an AD patient can continue for many years. The variability in depression among caregivers makes it necessary to have large samples to demonstrate a significant effect. Not only did we begin with large samples, but also there was a relatively low attrition rate in this study, even after nursing home placement of the patient. In addition, this study was confined to spouse-caregivers, and the relationship between the caregiver and the impaired person is a critical determinant of the effect of caregiving on psychological well-being (Lawton et al., 1991).

Caregivers who are not willing to travel to a re-

search clinic have been found to be more depressed and provide more hours of caregiving than those who are willing to travel (Dura, Haywood-Niler, & Kiecolt-Glaser, 1990). The counselors in the current study went to the caregivers' homes for both assessment and treatment if requested to do so. This may have resulted in our being able to recruit and retain caregivers who were more depressed and in need of intervention than those in previous intervention studies. On the other hand, the subjects of this study did not generally enroll because they were actively seeking help for depression. It is possible that if caregivers were selected on that basis, the intervention might have demonstrated an even greater effect.

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Received January 7, 1995

Accepted August 12, 1995