



Impact of the Internet⁺ Transitional Care on Knowledge, Attitudes, and Practice of Family Caregivers of Patients with Alzheimer's Disease: A Randomized Controlled Trial

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Abstract: Purpose: To determine the impact of the internet⁺ transitional care on knowledge, attitudes, and practice (KAP) of family caregivers of patients with Alzheimer's disease (AD) and analyze the practicability of the internet⁺ Medical Messenger and WeChat network support platforms. Background: The number of AD patients in China has exceeded 10 million, ranking first in the world. Home care is the main way of care for AD patients. We use the Internet platform to implement "online" combined with "offline" continuous care for AD patients and home caregivers, and provide personalized health education and guidance, so that caregivers can easily master disease-related knowledge, establish positive care beliefs, improve care ability, and promote the improvement of patients' caregivers' knowledge, attitude and practice. Method: The family caregivers of 77 patients with AD were randomly divided into two groups (intervention group [40 patients] and control group [37 patients]). The intervention group adopted the internet + transitional care, while the control group adopted traditional transitional care. The KAP of the two groups of family caregivers before intervention, 3 months after intervention, and 6 months after intervention were analyzed. Results: The KAP scores of the 77 family caregivers before intervention were 17.39 ± 2.92 , 33.42 ± 4.77 , and 57.65 ± 13.84 . There was no significant difference in the knowledge scores in the care ($t=1.89$, $P=0.062$) and symptom ($t=1.78$, $P=0.078$) dimensions 3 months after intervention, while there was a significant difference in the other KAP dimensions ($P<0.05$). Conclusions: The internet + transitional care improves the level to of KAP among family caregivers of patients with AD and the effect was proportional to time.

Keywords: Internet +, Transitional Care, AD, Family Caregiver, KAP

1. Introduction

Data from the Alzheimer's Disease International (ADI) has shown that there is an average of 1 new case of AD every 3 seconds worldwide. It is predicted that the total number of patients with AD in 2050 will be 2 times more than 2011 [1]. The number of patients with AD is increasing rapidly in China with an increase of > 300,000 new cases every year. Patients with AD have many co-morbidities and are heavily dependent on others for their lives. Thus, caregivers are under tremendous physical, psychological, and economic pressure. Family care is the main way to care for patients with AD [2]. The knowledge, attitudes, and practice (KAP) of family

caregivers reflects the care level and quality of caregivers, and directly affects the quality of life of caregivers and patients.

2. Samples

From June 2018 to June 2019, a convenient sampling method was used to investigate and research the family caregivers of patients with AD who were treated in a grade A class 3 hospital in Guangzhou, China from September 2017 to January 2019.

2.1. Inclusion Criteria

(1) AD patients must meet the diagnostic criteria for

Alzheimer's disease in the fifth edition of the Psychiatric Diagnosis and Statistics Manual issued by the American Psychiatric Association and the tenth edition of the International Classification of Diseases;

- (2) The home caregiver must be older than 18 and can provide physical and psychological help to the patient for more than 3 months;
- (3) Choose only one caregiver each family. When there are multiple caregivers at the same time in one family, choose the main caregiver and the one with the longest care time;
- (4) Caregivers can use smart-phones or computers to access the Internet, understand normal communication skills, and agree to participate in this survey.

2.2. Exclusion Criteria

- (1) The patient under care died during the study;
- (2) AD patients who have been cared for for a long time in the nursing home;
- (3) AD patients who have been hospitalized for a long time;
- (4) Caregivers who give up the participation in the study after the data began to be collected.

Finally, 77 family caregivers included were grouped using the random grouping system (40 in the intervention group and 37 in the control group).

3. Measures

The knowledge, attitude, and care ability level of the two groups of family caregivers of patients with AD were assessed by a general information questionnaire and the Alzheimer's Disease Knowledge Scale (ADKS) [3], Positive Aspects of Caregiving (PAC) [4], and Family Caregiving Task Inventory (FCTI) [5]. These scales have good reliability and validity, and are widely used in family caregivers of patients with chronic diseases such as dementia, stroke, cancer and so on. These scales were used to evaluate the caregiver's knowledge, positive feelings and care ability separately.

4. Methods

Patients with AD and their family caregivers were visited at home the current month, and 3 and 6 months after enrollment. The control group received traditional transitional care consisting of regular home visits. The study objects in the intervention group received internet + transitional care consisting of home visits + a platform of internet application.

4.1. Regular Home Visit

We communicated with the patient's family before the home visit. After obtaining the consent of the family and caregivers, made an appointment for the home visit. Patients with AD and their family caregivers were visited at home the current month, and 3 and 6 months after enrollment. Each home visit approximately lasted 60 minutes. The family care environment of patients with AD was assessed through home

visits, and disease care education and guidance were provided to families and home caregivers of patients with AD.

4.2. Internet + Transitional Care

On the basis of the home visit, "on-line + off-line" care of family caregivers of patients with AD was provided through the internet + Medical Messenger and WeChat network support platforms.

The internet + platform includes the following: ① "Medical Messenger" website allows a direct understanding of the latest developments in the treatment and care of AD, national and regional policies related to the care of patients with AD, announcements of activities organized by the hospital, community gratuitous treatment, transitional care team personnel information, and detailed operation procedures for consultation, enquiry, and application for visits. ② "Jinan Care House" WeChat applet: Consultation, enquiry, application and appointment for home visits, and check AD-related care knowledge (including prevention, treatment, care and exception handling, and emotional management). ③ WeChat communication group: Real-time communication, consultation, and sharing of care methods and experiences.

During the first visit, we explained the function of the internet + platform, demonstrated and guided the login method and operation procedures of the platform, issued operation manuals, and teach caregivers to log in to the platform, ensured that they could independently use the Internet platform. In the follow-up period, the home caregivers were urged to use the internet platform monthly, followed up on the use of the platform, and systematically monitor the length and frequency of the use of the internet+platform by the caregiver.

5. Results

5.1. Baseline Comparison of Patients with AD and Family Caregivers

A total of 77 AD patients were selected in this study, and their average age was (81.73 ± 7.27) years. According to the severity of cognitive impairment caused by the disease, the severity of AD symptoms is divided into mild, moderate and severe. MMSE: 30-21 points indicate mild dementia, 20-11 points indicate moderate dementia, ≤ 10 points indicate severe dementia. The patients in this study accounted for 55.9% of severe cases and 25.9% of moderate cases. The patient's self-care ability is divided according to the basic life activity ability (BADL) score: 61-100 points indicate completely independent without assistance; 41-60 points need a small amount of help; 21-40 points need great help; ≤ 20 points indicate completely dependent. In this study, 55.9% of patients were completely dependent on self-care ability.

The overall KAP scores of the 77 family caregivers before the intervention were 17.39 ± 2.92 , 33.42 ± 4.77 , and 57.65 ± 13.84 , respectively. There were no significant differences in the general information of patients and family caregivers between the two groups ($P > 0.05$). There was no significant difference

in the KAP scores of family caregivers between the two groups ($P>0.05$). The specific results are shown in Table 1.

Table 1. Baseline comparison of the two groups of patients and family caregivers.

Object	Item	Category	Intervention group (n=40) N (%)	Control group (n=37) N (%)	t/c^2 value	P value
Patient	Age ($\bar{x}\pm s$, years)		81.60±15.23	79.65±6.72	0.717	0.475 ^a
	Gender	Male	15 (37.5)	15 (40.5)	0.075	0.785 ^b
		Female	25 (62.5)	22 (59.5)		
	Degree of disease	Mild	7 (17.5)	7 (18.9)	1.825	0.401 ^c
		Moderate	8 (20.0)	12 (32.4)		
		Severe	25 (62.5)	18 (48.6)		
	Activities of daily living	Completely independent	4 (10.0)	7 (18.9)	-0.858	0.391 ^c
		Need a little help	8 (20.0)	6 (16.2)		
		Need great help	4 (10.0)	5 (13.5)		
	Age ($\bar{x}\pm s$, years)			55.28±10.62	58.84±11.63	1.405
Gender		Male	5 (12.5)	6 (16.2)	0.217	0.642 ^b
	Female	35 (87.5)	31 (83.8)			
Relationship with patient	Nurse	25 (62.5)	20 (54.1)	1.616	0.446 ^c	
	Spouse	7 (17.5)	11 (29.7)			
Religion	Children	8 (20.0)	6 (16.2)	0.000	1.000 ^b	
	No	38 (95.0)	35 (94.6)			
Nationality	Yes	2 (5.0)	2 (5.4)	1.557	0.212 ^b	
	Han	40 (100.0)	34 (91.9)			
Physical illness	National minority	0 (0.0)	3 (8.1)	0.277	0.598 ^b	
	No	24 (60.0)	20 (54.1)			
Medication	Yes	16 (40.0)	17 (45.9)	0.000	0.995 ^b	
	No	27 (67.5)	25 (67.6)			
Caregiver	Income level	Yes	13 (32.5)	12 (32.4)	-0.848	0.397 ^c
		≥10000 yuan/month	0 (0.0)	1 (2.7)		
		5000~yuan/month	16 (40.0)	9 (24.3)		
		3000~yuan/month	18 (45.0)	21 (56.8)		
		1000~yuan/month	3 (7.5)	3 (8.1)		
	Time of care	<1000 yuan/month	0 (0.0)	2 (5.4)	-0.703	0.482 ^c
		No income	3 (7.5)	1 (2.7)		
Sleep condition	>10 years	6 (15.0)	11 (29.7)	-0.134	0.893 ^c	
	6~10 years	6 (15.0)	5 (13.5)			
	4years~	3 (7.5)	4 (10.8)			
	1years~	15 (37.5)	7 (18.9)			
Appetite	7 months~	5 (12.5)	5 (13.5)	-0.331	0.740 ^c	
	4months~	5 (12.5)	5 (13.5)			
	Normal	12 (30.0)	13 (35.1)			
Educational level	Hard to fall asleep	8 (20.0)	5 (13.5)	2.580	0.896 ^c	
	Easy to wake up	20 (50.0)	19 (51.4)			
	Very good	13 (32.5)	13 (35.1)			
	Good	21 (52.5)	15 (40.5)			
Living condition	General	6 (15.0)	9 (24.3)	1.241	0.831 ^c	
	Illiterate	1 (2.5)	2 (5.4)			
	Primary school	8 (20.0)	10 (27.0)			
	Junior high school	17 (42.5)	12 (32.4)			
Knowledge (x±s, points)	High school and technical secondary school	9 (22.5)	7 (18.9)	-0.123	0.902 ^a	
	Junior college	3 (7.5)	2 (5.4)			
	Bachelor and above	2 (5.0)	4 (10.8)			
Attitudes/Belief (x±s, points)	Live alone	1 (2.5)	0 (0.0)	1.265	0.210 ^a	
	Live with spouse	12 (30.0)	12 (32.4)			
	Live with children	3 (7.5)	4 (10.8)			
Practice (x±s, points)	Live with others	24 (6.0)	21 (56.8)	-0.541	0.590 ^a	
		17.35±2.51	17.43±3.33			
			34.08±4.46	32.70±5.06		
			56.83±15.87	58.54±11.41		

a. T-test of two independent samples

b. c2 test of four-fold table data

c. c2 test of row × column table data

5.2. Changes in the Dimensions of KAP in the Two Groups of Family Caregivers at 3 and 6 Months

The t -test of the two samples was used to compare the scores of all dimensions of KAP at 3 and 6 months between the two groups of family caregivers. The specific results are

shown in Table 2. There was no significant difference in the knowledge scores in care ($t=1.89$, $P=0.062$) and symptom ($t=1.78$, $P=0.078$) dimensions 3 months after intervention. The scores of other dimensions of KAP were significantly different between the two groups ($P<0.05$).

Table 2. Comparison of scores of each dimension of KAP between the two groups of caregivers on after intervention ($\bar{x}\pm s$).

Dimension	3 months after intervention		t value	P value	6 months after intervention		t value	P value
	Intervention group	Control group			Intervention group	Control group		
Impact on life	2.85±0.36	2.49±0.65	3.065	0.003	2.98±0.16	2.43±0.60	4.327	0.000
Symptom	3.10±0.87	2.70±1.08	1.781	0.078	3.60±0.63	2.70±0.85	4.572	0.000
Treatment and management	3.80±0.46	3.35±0.89	2.814	0.006	3.93±0.27	3.51±0.65	4.785	0.000
Care	2.35±0.74	2.00±0.88	1.889	0.062	2.83±0.90	1.84±0.92	1.992	0.046
Evaluation and diagnosis	2.93±0.89	2.11±1.05	3.690	0.000	3.33±0.79	1.92±0.92	5.079	0.000
Course of disease	3.08±0.69	2.51±0.65	3.662	0.000	3.50±0.60	2.57±0.60	5.508	0.000
AD risk factors	3.88±1.28	3.24±1.40	2.057	0.043	4.93±0.92	3.14±1.38	2.142	0.035
Total knowledge score	21.98±2.43	18.41±3.34	5.377	0.000	24.80±2.27	17.95±3.25	9.609	0.000
Self-affirmation	20.7±2.17	17.7±2.08	6.173	0.000	26.85±2.45	21.08±2.68	7.588	0.000
Life outlook	12.03±1.35	10.43±2.01	4.118	0.000	12.63±1.35	10.16±1.79	4.275	0.000
Total attitudes/belief score	36.98±3.64	31.97±4.17	5.620	0.000	39.60±3.28	31.26±4.25	7.029	0.000
Adaption to the role of caregiver	6.60±1.71	8.62±1.78	-5.081	0.000	5.20±1.59	8.76±1.75	-8.005	0.000
Respond to needs and provide assistance	10.48±2.17	13.46±3.65	-4.404	0.000	9.55±1.97	14.54±2.99	-5.283	0.000
Handle personal emotions	7.53±2.09	10.54±2.81	-5.377	0.000	6.78±1.95	11.70±2.98	-6.333	0.000
Assess family and community resources	12.90±3.09	15.81±3.43	-3.925	0.000	11.48±3.33	16.78±3.03	-6.347	0.000
Adjust life to meet care needs	9.98±3.03	13.54±3.45	-4.823	0.000	9.13±2.86	15.00±3.12	-6.792	0.000
Total practice score	47.48±8.96	61.97±10.33	-6.590	0.000	42.13±9.26	66.78±10.11	-7.933	0.000

6. Discussion

The status quo of care KAP of family caregivers of patients with AD needs to be improved and targeted health education is needed in the follow-up of continuing care, which is consistent with the study of Jie [6]. Traditional transitional care cannot meet the needs of family caregivers for disease-related knowledge, care methods, and social support services. The introduction of the internet + transitional care into the health education of family caregivers of patients with AD effectively compensates for the caregivers' needs for KAP [7]. More and more internet technologies are used in health promotion activities to provide services for patients and caregivers. Research shows that family caregivers of patients with AD are very suitable for receiving care support services provided by mobile devices, such as the internet and smart phones [8]. Using of internet technology can help caregivers understand the disease process, increase disease knowledge, reduce anxiety [9], take effective care measures and ways to manage patients [10], and improve the KAP level of caregivers.

The home caregivers of the intervention group, after the monthly reminders and supervision during the follow-up, ensured the participation of the caregiver. During the follow-up process, the minimum frequency of logging in to the internet + transitional platform for the caregiver raise 2-3 times a month to 5-6 times a week, and the average duration of browsing information on the platform each time was 3.7 minutes. Caregivers stated that "most of the care knowledge and information are easily obtained through the platform". Caregiver B (female, 45 years old) said: "The care knowledge on the platform is very comprehensive, and you can use the fragmented time to understand the patient's care knowledge at any time and any place." Caregivers can use mobile communication devices from the Internet platform conveniently and quickly to learn how to take care, how to ensure safety and promote rehabilitation of the elderly through text, knowledge link, video and other ways from the internet

platform. Thus the caregivers can guide and help patients to form correct eating behavior, develop the method of regular toilet habit. The caregivers can assist bathing and dressing at patients' side, encourage patients to train their self-care ability. The caregivers also can identify and deal with the abnormal mental behavior problems, prevent dangerous events such as fall, loss and eating by mistake.

Greater than 80% of the patients surveyed in this study were moderate-to-severe in the degree of disease; 55.9% were completely dependent on others for life, with poor cognitive function and low self-care ability. Even if they were given a simple instruction, they could not complete it. They were very difficult to make a reasonable decision on their own life, causing caregivers to mistakenly think that they should take care of the patients immediately when the patients begin to have difficulties in self-care. In a short period of time, these deep-rooted ideas and experiences of family caregivers formed in the long-term care process cannot be corrected, and the patients' mental decline, mental symptoms, behavior disorders, and other symptoms are also difficult to improve. Therefore, there was no difference in the knowledge scores in care and symptom dimensions between the two groups of family caregivers 3 months after the intervention. As time went on, differences in scores in all dimensions of knowledge between the two groups of family caregivers began to appear 6 months after the intervention. As time went on, differences in scores in all dimensions of knowledge between the two groups of family caregivers began to appear 6 months after the intervention.

On the internet platform, caregivers can more truly express their feelings of care and release psychological pressure [11], which helps to enhance their confidence in care and improve their self-esteem and control over life [12]. Experts, psychological consultants, and other professionals of long-term care insurance are invited to participate in WeChat interactive platform to provide ways and methods of applying for social support, as well as psychological support and help to obtain social support [13] and promote the generation of

positive feelings of caregivers [14].

Through the internet + transitional care, caregivers can quickly identify potential risks in care activities and easily acquire support resources. The platform invited specialist nurse in transitional care center, neurologists, rehabilitation physicians, psychologists, long-term care insurance experts to form a multi-disciplinary collaborative team to jointly provide professional knowledge guidance for home caregivers. Through the network platform, medical staff can timely understand the care situation of patients with AD and solve problems in home care. When patient show abnormalities, family caregivers can get guidance and help through the WeChat video chatting, voice chatting and other ways, and can also apply for on-line visit, to meet the needs of care knowledge online and offline, promote the improvement of self-efficacy and care ability, and reduce the care burden [15].

7. Conclusions

Internet + transitional care improved the knowledge, behavior, and behavior of AD home caregivers. Medical staff use this internet platform to implement "online" combining with "offline" transitional care for AD patients and home caregivers, and provide them personalized health education and guidance. The caregivers could easily master disease-related knowledge and establish positive care beliefs to improve care ability. The internet + transitional care method is superior to the traditional care method. The longer the transitional care based on Internet+, the better the impact on knowledge, attitude and practice of home caregivers. After 6 months of intervention, the level of knowledge, belief and behavior of home caregivers was significantly improved.

The three scales selected in this study have good reliability and validity, which can reflect the KAP ability of caregivers; however, the correlation among all items needs to be verified, and a specific scale reflecting the KAP of family caregivers of patients with AD needs to be built in the future.

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