

Effect of a counseling program for diabetic patients on their knowledge, health promoting lifestyle practices, and psychological status

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Abstract: Good diabetes care rests on a foundation of patient knowledge, which can modulate lifestyle. The aim of this study is to assess the effectiveness of the implementation of a bio-psychosocial counseling program for patients with diabetes mellitus (DM) in improving their knowledge and health promoting lifestyles, and consequently on their diabetes control and symptoms of anxiety and depression. This quasi-experimental study was carried out in the outpatient clinics of the National Institute of Diabetes and Endocrinology, on a convenience sample of 60 patients divided equally into a study group for implementation of the program, and a control group. Data collection was by an interview questionnaire assessing patient's knowledge, with the Health Promoting Life Style Profile (HPLP) scale, Beck Depression Inventory, and Hamilton anxiety scale. The researchers developed and implemented to the study group a counseling program responding to their identified bio-psychosocial needs. The work lasted from January to December 2007. The results showed that the study and control groups were similar in personal and disease characteristics. The knowledge in both groups had major deficiencies, but demonstrated significant improvements after the intervention in the study group ($p<0.001$). The group had also decreased incidence of reported attacks of hyperglycemia ($p=0.004$), with improvements in the scores of depression ($p<0.001$), anxiety ($p<0.001$), and all domains of health promoting lifestyle scale ($p<0.001$) after the program. No improvements were shown in the control group. The study concludes that a bio-psychosocial counseling program emphasizing knowledge and health promoting lifestyle practices can lead to better control of DM, with improvement in patients' levels of anxiety and depression. It is recommended to replicate the study using a true randomized clinical trial design for further confirmation. Meanwhile, specialized DM clinics should plan and implement similar counseling programs.

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1. Introduction

Diabetes mellitus is a multi-system disease related to abnormal insulin production, impaired insulin utilization or both (*O'Brien et al., 2007*). It is a chronic yet controllable disease that may affect the lifestyle of patients and their families (*Middleton, 2003*). The disease represents the fourth leading cause of global death by disease. It is expected to reach epidemic proportions in many regions throughout the world as life spans extend and societies adopt increasingly urban and modern lifestyles. The highest prevalence is in the Eastern Mediterranean and Middle East (9.2%) followed by North America (8.4%) (*International Diabetes Federation, 2007a, b*).

As other chronic diseases, diabetes may be associated with a variety of stressors brought about by the illness and its treatment. These include pain, disfigurement, impaired physical functioning, life-threat, permanent changes in lifestyle, dependency, self-management tasks, threats to dignity, diminished self-esteem, disruption of normal life transition, decreasing resources, and changes in future

perspectives. These disease-related stressors may play an important role in the development of anxiety and depression among patients (*Zhang et al., 2008*).

Good diabetes care rests on a foundation of patient knowledge, which can modulate lifestyle (*Drum and Zierenberg, 2000*). Lifestyle changes, including caloric restriction and exercise, can have significant benefits in reducing plasma levels of glucose and improving insulin resistance and dyslipidemia. Weight loss is the primary goal. Even a modest weight loss of 2.25 to 4.5 kg is associated with reductions in plasma glucose. As for drug therapy, agents available for lowering plasma glucose include insulin secretagogues α -glucosidase inhibitors, thiazolidinediones, biguanides, and insulin (*Foreyt, 2005*).

Since self-management requires knowledge, patient education has been increasingly recognized as an integral part of chronic disease management. Particularly in self-managed conditions such as diabetes mellitus, education is considered the cornerstone of overall diabetes management. This may help achieve optimal glycemic control, maintain

wellness and prevent diabetes-related complications (*Shan-et al. , 2005*). Thus, therapeutic education is an integral part of diabetes management (*Debaty et al., 2008*).

Although the efficacy of exercise and/or caloric restriction in the treatment of the metabolic syndrome is evident, promotion of such lifestyle changes still remains a challenge (*Janiszewski et al., 2008*). There is still a need for increased preventive measures, better health education and promotion, and a more supportive health care infrastructure (*Kohlway, 2008*). The aim of diabetes education is thus to achieve a high level of knowledge and self-care, resulting in good metabolic control and reduction in the risk of future severe micro/macrovacular complications (*Povlsen et al., 2005; Luk et al., 2008*).

Diabetes mellitus is a chronic disease that is expected to increase in developing countries, including Egypt, due to increased urbanization, westernization and economic development. The disease may have negative impacts not only on the patients, but also on their families, as well as the healthcare system. Being a self-managed disease, improving patients' knowledge and competencies in self-care activities is expected to have a positive impact on disease control, and consequently on patients' psychological state.

Therefore, the aim of this study is to assess the effectiveness of the implementation of a bio-psychosocial counseling program for patients with diabetes mellitus in improving their knowledge and health promoting lifestyles, and consequently on their diabetes control and symptoms of anxiety and depression. The research hypothesis was that the implementation of this bio-psychosocial counseling program for patient with diabetes mellitus can improve their knowledge and health promoting lifestyles, with consequent positive impact on their diabetes control and symptoms of anxiety and depression.

2. Subjects and Methods

Research design and setting: This study was carried out using a quasi-experimental with pre-post assessment in a study and a control groups. It took place in the outpatient clinics of the National Institute of Diabetes and Endocrinology.

Subjects: These consisted of a convenience sample of 60 patients attending the site who were divided equally into a study group for implementation of the counseling program, and a control group for comparison. The selection criteria were being adult up to 60 years old, diagnosed as diabetic within the last five years, and attending the study setting. Patients with other chronic diseases, physical

disabilities, or having chronic complication of diabetes mellitus were excluded.

Data collection tools: The researchers developed an interview questionnaire form that included a number of scales for data collection. It was based on pertinent literature and tools (*Dunning, 1994; Bullock and Henze, 2000; Grondner et al., 2000; Swearingen, 2003; Fain, 2005*). The tool content validity was ascertained by a panel of experts from nursing, medical faculty, and from the faculty of Arts for translation.

The first part of the tool covered the socio-demographic characteristics of the patients such as age, sex, occupation, marital status, monthly income, and educational level. The second part was concerned with the details of diabetes including glucose monitoring, as well as the weight and height. The third part was concerned with patient's knowledge about diabetes. It consisted of closed questions covering six aspects of knowledge as follows: general basic knowledge about diabetes (total score 39), acute complications (total score 32), self-management (total score 48), drug treatment (total score 18), foot care (total score 20), and safety measures (total score 25). A correct response was scored one and the incorrect zero.

The fourth part of the tool consisted of the Health Promoting Life Style Profile (HPLP) scale adapted from *Pender 1987; Pender, 1996* It provides information to develop an individualized health promotion plan that identifies lifestyle strengths and resources as well as areas for further growth. The scale consists of 48 items measuring six dimensions: self-actualization (13 items), health responsibilities (10 items), exercise (5 items), nutrition (6 items), interpersonal support (7 items), and stress management (7 items). The response to items is on a four-point Likert scale from never (1) to routinely (4). The total of each subscale is scored separately by summing up the responses. The total score ranges from 48 to 192, with higher scores indicating more frequently performing health promoting behaviors.

The fifth part was the Beck Depression Inventory developed by *Beck and Beck (1972)* and translated into Arabic by *Gharib (1996)*. It consists of 21 statements with four possible responses to help establish the existence of depression and to provide a guide to its severity. The patient is asked to pick up one response that best describes how he/she feels at that particular time or within the precedent two weeks. The responses are scored from zero for minimal to three for severe. The total score is 63, with a higher score indicating more severity.

The sixth part consisted of *Hamilton (1959)* anxiety scale. It consists of eight items defining a series of symptoms. Each item is rated on a 5-point

Likert scale ranging from not present (0) to severe (4). The total score is 40, with a higher score indicating more severity.

Counseling intervention: The researchers developed this intervention program according to the bio-psychosocial needs of the diabetic patient in order to modify his/her life style and consequently improve the diabetic control and the related psychological aspects. It was based on related literature (*Grondner et al, 2000; American diabetes Association, 2003; MacFarlane and Wally Mahmed, 2003; National Diabetes Education Program, 2004; Fain, 2005*). It was designed as a illustrative booklet in Arabic language to be easily understandable. It contained information about diabetes mellitus regarding definition and nature, risk factors, classification, clinical manifestations, complications, diagnosis, and treatment lines. It also addressed the lifestyle of diabetic patient concerning dietary habits, exercise, glucose monitoring, smoking, insulin therapy, foot care, safety measures, and stress management.

Pilot study: A pilot study was done on six diabetic patients with the same selection to test the tool applicability, clarity, arrangement of the items, and time needed for filling up. Based on the pilot results some questions and items were omitted, added or rephrased and the final form was developed. The pilot sample was not included in the main study sample.

Fieldwork: The selection of the patients, collection of data and implementation of the counseling intervention lasted over a period of 12 months starting from January 2007 to December 2007. The fieldwork started with the assessment phase, where baseline data were collected from patients in the study and control groups using the designed tool. Then, the counseling program was implemented to the study group patients in six sessions 20-40 minutes each, either individually or in groups of 3-4 patients. The teaching media included using posters and handouts, as well as demonstrations as urine analysis for glucose using strips, glucometer to test glucose in blood, and insulin injection. Then, the evaluation phase was done in both groups six months after implementation of the counseling program using the same tool.

Administrative design and ethical considerations: The researchers obtained official permissions to conduct the study from the general manager of the National Institute of Diabetes and Endocrinology, and the study proposal was approved by the Faculty of Nursing at Ain-shams University. The participants' informed consents were secured after explaining to them the aim of the study and its procedures. They were informed about their rights to refuse or withdraw at anytime without penalty, as

well as the confidentiality of any information. The study maneuvers could not cause any harm to participants.

Statistical analysis: Data entry and statistical analysis were done using SPSS 16.0 statistical software package. Quantitative continuous data were compared using Student t-test in case of comparisons between two independent groups. Qualitative categorical variables were compared using chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables was less than 5, Fisher exact test was used instead. Statistical significance was considered at p-value <0.05.

3. Results

Table 1 demonstrates that patients in the study and control group have similar personal characteristics. Although patients in the study group had slightly higher mean age, more males, more illiterate and less highly educated, more working, more smoking, and less per-capita income, none of these differences was statistically significant.

Similarly, Table 2 shows that patients in the two groups had close characteristics of their diabetes disease. The majority in both groups had type II diabetes, were on both oral and insulin treatment, and reported having episodes of hyperglycemia. About two-fifth in both groups reported self insulin injection. Meanwhile, only very few were monitoring their urine for glucose at home, and only one (3.3%) patient in the study group was monitoring blood glucose at home.

Table 3 points to major deficiencies in patients' knowledge about DM in both the study and control groups before the intervention. This is evident from comparing their means with the maximum score for each area, particularly the areas of safety precautions where the means (4.0 and 4.1) were less than one-seventh of the maximum score (30). It can also be noticed that the means were close in each area between the study and control groups. Meanwhile, the scores demonstrated statistically significant improvements after the intervention only in the study group ($p < 0.001$) in all areas. The mean scores reached very close to the maximum score in the areas of drug therapy (17.4 out of 18), and safety precautions (27.2 out of 28). No similar significant improvements could be seen in the control group scores.

Concerning the impact of the program on the occurrence of episodes of hypo- and hyperglycemia, Table 4 indicates that the incidence of reported attacks of hyperglycemia dropped to half (from 73.3% to 36.7%), and this drop was statistically significant ($p = 0.004$). Although the episodes of hypoglycemia decreased in the study group, the

difference was not statistically significant. No significant changes were noticed in the control group.

Table 5 shows that patients in the study and control groups had similar scores of BMI, depression, anxiety, and health promoting lifestyle scale before the intervention. Meanwhile, after implementation of the program, statistically significant improvements are noticed in the study group patients' scores of

depression ($p < 0.001$), anxiety ($p < 0.001$), and all domains of health promoting lifestyle scale ($p < 0.001$). Although their mean BMI decreased from obese (31.2) to overweight (29.4), the change could not reach statistical significance ($p = 0.061$). On the other hand, none of the scores of the control group patients demonstrated statistically significant improvement.

Table 1: Personal characteristics of diabetic patients in the study and control groups

	Group				X ² test	p-value
	Study (n=30)		Control (n=30)			
	No	%	No	%		
Gender:						
Male	10	33.3	6	20.0	1.36	0.240
Female	20	66.7	24	80.0		
Age (years):						
Mean±SD	46.1±11.7		41.2±8.0		1.89	0.060
Education:						
Illiterate	9	30.0	3	10.0	7.77	0.051
Read/write	11	36.7	8	26.7		
Basic/intermediate	9	30.0	13	43.3		
High	1	3.3	6	20.0		
Job:						
Housewife	14	46.7	20	66.7	2.44	0.110
Working	16	53.3	10	33.3		
Marital status:						
Unmarried	5	16.7	5	16.7	--	--
Married	25	83.3	25	83.3		
Per capita (LE) monthly income (mean±SD)	100.5±66.3		126.1±46.7		1.05	0.300
Smoking	12	40.0	11	36.7	0.07	0.790

(--) No valid test

Table 2: Characteristics of diabetes mellitus (DM) of diabetic patients in the study and control groups

	Group				X ² test	p-value
	Study (n=30)		Control (n=30)			
	No	%	No	%		
Type of diabetes:						
Type I	2	6.7	2	6.6	--	--
Type II	28	93.3	28	93.3		
Medication used:						
Oral	10	33.3	8	26.7	5.17	0.080
Insulin	4	13.3	0	0.0		
Both	16	53.3	22	73.3		
Episodes of hypoglycemia	8	26.7	9	30.0	0.08	0.770
Episodes of hyperglycemia	22	73.3	24	80.0	0.37	0.540
Monitor blood glucose at home	1	3.3	0	0.0	Fisher	1.000
Monitor urine glucose at home	5	16.7	1	3.3	Fisher	0.190
Self insulin injection	12	40.0	11	36.7	0.07	0.790

(--) No valid test

Table 3: Knowledge about diabetes mellitus among diabetic patients in the study and control groups before and after the intervention

Knowledge areas	Knowledge score (mean±SD)		t-test	p-value
	Pre (n=30)	FU (n=30)		
Study group				
Basics of DM (max 39)	10.2±2.2	25.5±1.5	31.47	<0.001*
Acute complications (max=32)	12.4±2.2	24.0±2.7	18.24	<0.001*
Self-management (max=48)	9.3±2.9	43.0±2.7	46.58	<0.001*
Drug therapy (max=18)	9.9±4.3	17.4±1.0	9.31	<0.001*
Foot care (max=20)	11.2±2.7	15.7±2.3	6.95	<0.001*
Safety precautions (max=28)	4.0±1.2	27.2±1.2	74.88	<0.001*
Control group				
Basics of DM (max 39)	10.4±2.4	10.4±2.2	0.00	1.00
Acute complications (max=32)	12.9±1.5	12.8±1.4	0.22	0.82
Self-management (max=48)	9.6±2.0	9.3±2.1	0.57	0.57
Drug therapy (max=18)	11.2±3.8	11.1±3.8	0.10	0.92
Foot care (max=20)	9.9±2.3	10.1±2.2	0.34	0.73
Safety precautions (max=30)	4.1±1.2	4.2±1.5	0.29	0.78

(*) Statistically significant at p<0.05

Table 4: Episodes of hypo- and hyperglycemia reported by diabetic patients in the study and control groups before and after the intervention

	Phase				X ² test	p-value
	Pre (n=30)		Post (n=30)			
	No	%	No	%		
Study group:						
Episodes of hypoglycemia	8	26.7	5	16.7	0.88	0.350
Episodes of hyperglycemia	22	73.3	11	36.7	8.15	0.004*
Control group:						
Episodes of hypoglycemia	9	30	10	33.3	0.08	0.780
Episodes of hyperglycemia	24	80	26	86.7	0.48	0.490

(*) Statistically significant at p<0.05

Table 5: Changes in BMI, depression, anxiety, and health promoting style profile scales among diabetic patients in the study and control groups before and after the intervention

	Score (mean±SD)		t-test	p-value
	Pre (n=30)	FU (n=30)		
Study group				
BMI	31.2±3.6	29.4±3.7	1.91	0.061
Health promoting life style profile				
Self actualization (max=52)	24.5±1.7	41.6±5.1	17.42	<0.001*
Health responsibility (max=40)	15.8±2.1	32.9±4.9	17.57	<0.001*
Exercise (max=20)	5.7±0.8	10.7±2.6	10.07	<0.001*
Nutrition (max=24)	10.9±1.3	18.5±2.4	15.25	<0.001*
Interpersonal support (max=28)	22.4±2.9	25.4±2.4	4.37	<0.001*
Stress management (max=28)	12.6±1.6	19.3±2.9	11.08	<0.001*
Total (max=192)	91.8±7.2	149.0±17.3	16.72	<0.001*
Depression (max=63)	23.0±8.7	9.1±4.4	7.81	<0.001*

Anxiety (max=40)	24.0±5.6	19.1±3.7	3.99	<0.001*
Control group				
BMI	32.3±3.9	33.0±3.9	0.69	0.49
Health promoting life style profile				
Self actualization (max=52)	24.4±2.4	24.7±1.8	0.55	0.59
Health responsibility (max=40)	13.2±2.1	13.5±2.2	0.54	0.59
Exercise (max=20)	5.6±0.9	5.7±1.1	0.39	0.70
Nutrition (max=24)	9.9±1.8	10.2±1.6	0.68	0.50
Interpersonal support (max=28)	16.2±1.6	16.8±1.5	1.50	0.14
Stress management (max=28)	11.9±1.4	12.4±1.4	1.38	0.17
Total (max=192)	80.3±6.0	82.6±5.5	1.55	0.13
Depression (max=63)	22.3±6.9	23.5±7.3	0.65	0.52
Anxiety (max=40)	24.0±5.5	25.4±5.4	0.99	0.32

(*) Statistically significant at $p < 0.05$

4. Discussion

This study was carried out with the hypothesis that the implementation of a bio-psychosocial counseling program for patients with diabetes mellitus can improve their knowledge and health promoting lifestyles, with consequent positive impact on their diabetes control and symptoms of anxiety and depression. The study findings lead to accepting the hypothesis since patients in the study group demonstrated significant improvements in their scores of knowledge and health promoting lifestyles, which were associated with significant improvements in their anxiety and depression scores, as well as decreases in the attacks of hyperglycemia. Although the BMI and attacks of hypoglycemia decreased, they did not reach statistical significance. Meanwhile, no similar improvements could be detected in the control group.

The majority of the patients in both groups were women, which reflects the known higher prevalence of diabetes among females (*Jain and Saraf, 2008; Roglic, 2009*). Their mean age lying in the middle age range is also compatible with the age distribution of diabetics in developing countries, reported to be in the age range 45 to 64 years (*Wild et al, 2004; Fabian et al., 2006*).

Type II diabetes turned to be the most prominent among patients in the study and control groups of the current study, which is in line with previous reports, which indicate that this type accounts for more than 95% of diabetes worldwide (*Stumvoll, 2005*). The disease is also typically associated with obesity (*Prokopenko et al., 2008*), which is consistent with the present study where the mean BMI indicates obesity in both groups. As for treatment, the majority of the patients in both groups were on insulin, either alone or combined. This is often the ultimate therapy as the disease progresses

since none of the traditional oral hypoglycemic agents can maintain glucose levels indefinitely and with time, many type 2 diabetics require exogenous insulin therapy (*Stefano and Pulizzi, 2006*).

The present study demonstrated that very few patients were self monitoring their glucose in urine and only one in blood. This is quite serious since this is the only way the diabetic patient could know the glucose level of change diet, exercise or medication accordingly (*Le Mone and Burke, 2008*). This may explain the high incidence of episodes of hypo- and hyperglycemia among them.

Knowledge is basic for adequate practice, and diabetic patients with deficient knowledge are not expected to be able to properly manage their disease. Therefore, one of the aims of the counseling program was to improve patients' knowledge. The findings actually indicated that patients in both study and control groups had major knowledge gaps particularly concerning self-management and safety precautions in diabetes. This low level of knowledge is in congruence with previous research on diabetic patients, which reported a considerable deficiency in the knowledge of diabetic patients (*Eid, 2007*).

As a consequence of low knowledge, it was expected that the Health Promoting Lifestyle Practices (HPLP) be low among patients in the current study. This was actually what has been found, where the scores of diabetic patients in both groups were low, and the total score in both was less than half of the maximal total score before the program. The finding is quite plausible since the patient who lacks knowledge is unable to carry out promoting lifestyle practices as nutrition, exercise, and stress management, and consequently will have low levels of self-actualization and health responsibility. Therefore, all these factors are inter-linked and

influence each other as emphasized by *Hoksonen et al. (2002)* and *Lam et al. (2004)*.

A diabetic patient with deficient knowledge and inadequate health promoting practices will not be able to control his/her diabetes. This would lead to more episodes of hypo/hyperglycemia, and associated psychological disorders as anxiety and depression. Therefore, the present study found scores indicating moderate degrees of anxiety and depression among patients in the study and control groups before the program. The findings are in agreement with previous research that reported anxiety and depression to be of common occurrence among diabetics (*Thomas et al., 2003; Surwit et al., 2005; Zhang et al., 2008*).

The implementation of the counseling program led to significant improvements in the knowledge of the patients in the study group. This success of the program can be attributed to its content and process. The content was responding to actual patients' needs of information, and not just theoretical knowledge. The process was interactive and based on adult learning principles. In line with this, *Hoey et al. (2001)* stressed that for patient education to be successful, consideration must be given to each patient's personal characteristic as age, work schedule, physical activity, eating patterns, as well as social situation and personality, cultural factors, in addition to actual information needs.

The results of the present study indicated significant improvements in the scores of HPLP among patients in the study group after implementation of the counseling program. This is undoubtedly related to the filling their knowledge gaps, in addition to their learning of self-management practices. In congruence with this, *Badr (2001)* stated that a counseling program can increase patients' level of information through the use of basic principles which are acceptance, understanding, respecting patients' feelings, empathy, communication and genuineness, and helping patients to make decisions for themselves according to available data and information. All of these can promote self-expression and social interaction leading to maintaining healthy minds and bodies. Similarly successful counseling programs have been reported (*Desouza and Nairy, 2004; Yoo et al., 2004; Sigal et al., 2007*).

An objective consequence of the improved knowledge and HPLP is the change in patient's BMI. According to the current study findings, the patients in the study group had their mean BMI shifted from obesity to overweight. Although the change was of borderline significance ($p=0.061$), it may be considered a good achievement given the short follow-up time. Moreover, no change was observed in the control group. This is a proof that the improvement in knowledge and HPLP was

successfully reflected in actual body weight control, which is of major importance in the control of diabetes as indicated by *Riccardi et al. (2003)* and *Simon et al. (2005)*. In fact, a 1-kg increase in body weight was shown to be associated with a 7.3% increase in the risk of type 2 diabetes (*Koh-Banerjee et al., 2004*).

Another important, although less objective, measure of the improvement in diabetes control is the number of episodes of hypo/hyperglycemia reported by the diabetic patients. The current study showed a significant decrease in the number of hyperglycemic episodes among patients in the study group, but not in the control group. This is certainly due to the better use of self-management measures based on improved knowledge and HPLP. The episodes of hypoglycemia also demonstrated some decreases, but this did not reach statistical significance probably because of the relatively lower frequency of these episodes, compared to hyperglycemia. In agreement with these present study findings, *Bendik et al. (2009)* showed that a structured teaching program is able to substantially decrease the frequency of severe hypo/hyperglycemic events.

The diabetic patient's psychological state is undoubtedly affected by the state of diabetic control. In the present study, patients in the study group demonstrated significant decreases in the scores of their anxiety and depression after implementation of the counseling program. No such improvement could be seen in the control group. This may be considered as an ultimate consequence of the counseling program. The finding is in line with *Debaty et al. (2008)* who clarified that education is probably therapeutic because it reduces anxiety and increases patient self-empowerment.

5. Conclusion and Recommendations

The study results lead to the conclusion that diabetic patients have major gaps in knowledge and information. A bio-psychosocial counseling program emphasizing knowledge and health promoting lifestyle practices is successful in filling the gaps, and leads to better control of diabetes in terms of episodes of hyperglycemia and obesity, with improvement in patients' levels of anxiety and depression. However, the findings should be interpreted with taking the study limitations into account. The quasi-experimental study design gives less strong evidence, compared to true clinical trials. Also, the assessment of the episodes of hypo/hyperglycemia was only dependent on patient's reporting, which could carry some bias.

Therefore, it is recommended to replicate the study using a true randomized clinical trial design for further confirmation. Meanwhile, specialized diabetes

mellitus clinic in health centers should assess the knowledge gaps of diabetic patients, and base their patient education on real needs in the form of counseling programs that include practical sessions for training diabetic patients in necessary self-management skills.

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