The Effectiveness of Nurse-led Telephone Follow-up in Patients with Type 2 Diabetes Mellitus

Tip 2 Diabetes Mellitus Hastalarında Telefonla Hemşire Takibinin Etkileri

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Abstract

Objective: The purpose of this study was to investigate the effect of nurse telephone calls on glycemic parameters and adherence to diabetes control recommendations.

Materials and Methods: The intervention was applied to 35 patients with type 2 diabetes for 12 weeks and consisted of continued education and reinforcement of diet, exercise, medication adherence recommendations. The intervention was performed once a week for the first month and once every two weeks for the following months.

Conclusion: This study indicates that a nurse telephone intervention may improve glycemic parameters as well as diet, exercise, and medication adherence. *Turk Jem 2010; 14: 1-5*

Key words: Diabetes mellitus, telenursing, patient teaching

Özet

Amaç: Bu çalışmanın amacı hemşirelerin telefonla tip 2 diabetes mellitus hastalarını takip etmesinin glisemik değerler ve hastaların diyabetik tedaviye uyumu üzerine etkilerinin araştırılmasıdır.

Gereç ve Yöntemler: 35 tip 2 diabet hastasına 12 hafta boyunca diyet, egzersiz ve ilaç kullanımı hakkında başlangıçta ve takiben tekrarlayan bilgiler ile telefonfa eğitim verilmiştir. İlk bir ay içinde haftada bir takibeden aylarda ise her iki haftada bir çalışma uygulanmıştır.

Sonuç: Çalışmamızda telefonla hemşire takibinin glisemik parametrelere diyet, egzersiz ve ilaç uyumu kadar olumlu etkileri olabileceği sonucuna varılmıştır. *Türk Jem 2010; 14: 1-5*

Anahtar kelimeler: Diabetes mellitus, hemşirelikte telefonla hasta takibi, hasta eğitimi

Introduction

The prevalence of type 2 diabetes mellitus (T2DM) is rapidly increasing worldwide. According to the recent global estimates of the World Health Organization (WHO), there will be 300 million people with diabetes by the year 2025 (1,2). Extrapolating these results to the recent population census, nearly 2.6 million adults in Turkey may have diabetes, of whom 0.8 million may be unaware of their disease. Crude prevalence of diabetes mellitus is 7.2% in the Turkish community (3). Both in type 1 and type 2 diabetes poor glycemic controls resulting in prolonged high blood glucose levels are strongly related to the development of diabetic complications (4,5), such as retinopathy, neuropathy, and cardiovascular disease. These complications are associated with high medical costs (6), disability, and a reduction in quality of life (6,7).

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Diabetes care is complex and requires that many issues, beyond glycemic control, be addressed (8). Algorithms for diabetes care exist but may be complex and difficult for physicians to follow due to given patient load, diversity of patients seen, lack of information systems, and time constraints. Therefore, low-cost methods are required to maintain blood glucose concentrations close to the normal range (9). Telephone follow-up is increasingly used as a cost-effective method of communicating with patients as part of their follow-up care and has consistently been shown to be a feasible and effective way of providing support and information (10). With the advent of explosive growth in managed-care financing systems and the growing use of technology for the actual delivery of care, telephone nursing practice has become a major nursing role (11).

Regular follow-up by a nurse can help to monitor of the patient progress and reinforce health behaviours related to diabetes care (9, 12). Nurse telephone calls are useful to closely monitor the signs and symptoms of hypoglycaemia or hyperglycaemia, to review patients' compliance with drugs and healthy lifestyle practices, and to provide health education (13,14). Nurses are very effective in managing telephone consultation, perhaps even more effective than physicians (15). Reported benefits of telephone nursing include client education, increased client satisfaction, improved access to care, reduction of both drop-in visits and unnecessary visits, and reduced health care costs (16). In our country, telemedicine, such as video conference is mostly used in order to transfer medical information for the purpose of consulting and remote medical procedures, and also for education. In telemedicine practice used for follow-up, patient information is transferred to a specialist and after the assessment, the feedback is sent again with electronic devices (17). Following patients regularly via telephone by a nurse according to a special program may reduce hospital visits and it can also be an opportunity in order to educate patients. Nurse-led telephone follow-up of diabetic patients including providing education about diet, exercise, and treatment could be the next step in the evolution of our telemedicine system.

The purpose of this study is to investigate the effect of nurse telephone calls on glycemic parameters of patients with T2DM and adherence to diabetes control recommendations.

Materials and Methods

This was a single-center, prospective, 3-month follow-up study.

Sample

From November 2004 to July 2006, 35 consecutive patients with T2DM, examined in the Department of Internal Medicine, Gulhane Military Medical Academy, Turkey and t found to be eligible according to defined criteria, were recruited.

Patients with glycosylated haemoglobin (HbA1c) levels ≥6.5% and without acute disease or surgical operation that could impair control of diabetes, without any disease as Alzheimer's or chronic psychosis, did not need support to maintain their lives, without any serious complication that might cause hospitalization (advanced heart disease, uncontrolled hypertension, chronic renal disease requiring dialysis), and were settled in places that could be reached easily, were enrolled into the study. The selection criteria required the patients understanding of goals, methods, and procedures of the treatment.

Ethical Consideration

The study was approved by hospital ethics committee and signed informed consent was obtained from each patient before any study-related procedures were performed.

Intervention

After an assessment conducted by a specialized physician, the patients, reported as having insufficient diabetes education and poor diabetes control, were directed to the researcher as suitable for the study criteria. Patients who met the criteria were informed about the study. Phone interviews were conducted in a special room that was designated for the study. During the first interview, diabetic patient follow-up form was applied and metabolic control results were recorded. All forms were prepared by a researcher after exploration of the literature. The Diabetic Patient Follow-up Form evaluates characteristics as age, gender, education level, duration of diabetes, family history of diabetes, medication status, previous diabetes education and adherence to a diet, exercise, and medication. Patients, who followed a diet pattern planned by a dietician and consisted of three main meal and three snacks with 30-60 minutes of exercises at least three times a week, were accepted as adherent. Treatments were planned by the physician for every patient and were recorded on the follow-up form. When medication compliance was assessed through the telephone interview, we asked the patients whether they used the drugs according to the prescribed form or not. Patient who did not know the name and the usage of any drug were considered as inadaptable. Weight, height, body mass index (BMI), blood pressure, fasting blood glucose (FBG), postprandial blood glucose (PPBG), HbA1c, total cholesterol, triglyceride, high-density lipoprotein (HDL), and low-density lipoprotein cholesterol (LDL-C) were recorded on Metabolic Control Results Form. Height, weight and blood pressure values were measured by the researcher. BMI was calculated with formula of weight (kg) / [height]^2 (m^2).

In the first interview, an average of 30-minute diabetes education was given to each patient by the researcher. The education was about the nature and risk factors of the disease, diet, exercise, drug therapy, hypoglycaemia and hyperglycaemia management. Problems in the control of the disease were identified and education about these problems was given to the patients individually by the researcher. In case of necessity, the cooperation of a research nurse, a dietician and doctor was guaranteed. Relatives of patients were also included into the training, if possible.

Patients were called once a week in the first month and once every two weeks in the following months. On average, each patient was called eight times. In each call, diet, exercise, and medication adherence were questioned and additional problems were noted. Once a problem was detected, patients were informed about the problem and it was recorded to problems to be followed in the next communication section. All phone calls were recorded on Telephone Call Form. Problems identified during phone calls, solution suggestions, next interview dates, problems and evaluations that would be discussed at the next interview were recorded to this form.

At the end of the study, HbA1c levels and metabolic control parameters were studied and recorded on the Metabolic Control Results Form. Then, the first and the last measurement results were evaluated. The frequency of hospital visits of patients was calculated according to hospital records. The number of hospital visits of each patient for the period of three months before the study and during the follow-up was recorded and compared. Finally, Patient Satisfaction Questionnaire form was applied. This form was prepared in order to learn patient opinions about nurse-led telephone follow-up program, time of interviews, adequacy of knowledge, manner of approach, patient confidence, capability of the service, recommending the program for other patients, necessity of the service, suitability frequency of phone calls. Patient satisfaction was evaluated through "yes", "partly", and "no" answers of a nine-question form. During preparation of the form, we benefited from "patient satisfaction scale", which was build up by Hall et al. (18) and was widely used for patients having medical services.

Statistical Analysis

Results are given as mean±standard deviation and median (min-max). The difference between the results (before and after intervention) were compared with paired t-test, Wilcoxon signed-ranks test, and McNemar test as appropriate. SPSS for Windows 11.5 (Chihago, IL., USA) was used. $p<0.05$ was accepted as statistically significant.

Results

Table 1 summarizes the patients' demographic and clinical features at the beginning of the study. We studied 35 T2DM patients. Of 35 patients, 25 (71.4%) were female. All patients completed the study. The mean age of the patients was 55.9±10.4 years and the mean duration of diabetes was 5.2±3.7 years. 74.3% of patients did not attend diabetes education programs and 68.6% of them did not monitor the blood glucose level at home.

At the beginning of the study, most patients (91.4%) reported that they had insufficient knowledge about T2DM and its complications. Drug therapy non-compliance was found in 45.7% of patients. 77.1% of patients reported that they did not exercise regularly. 85.7% of patients reported that they did not follow the diet pattern. It was found that 60.0% of patients did not realize the importance of the disease (Table 2).

At the end of the study, there was a significant percentage change in HbA1c for the intervention group ($p<0.001$), with a mean percentage change of -1.1 (8.2% baseline to 7.1 at week 12). At week 12, reduction in FBG, PPBG, total cholesterol, LDL-C, BMI, systolic and diastolic blood pressure levels were also found statistically significant ($p < 0.05$). On the other hand, the reduction in triglyceride and HDL-cholesterol levels were not found statistically significant. Table 3 shows the metabolic results of the study group.

In the study group, diet ($p < 0.001$), exercise ($p < 0.001$), and drug use ($p = 0.004$) adherence at week 12 improved compared with the baseline (Table 4). In the beginning, 68.6% of patients monitored blood glucose level once every two months. At the end of the study, 60% of patients monitored the blood glucose level once every month and 31.4% once every week. This increase was found statistically significant ($p<0.001$). According to the questionnaire determining the patient satisfaction with the follow-up, it was found that all patients were satisfied with the nurse-led telephone follow-up.

The mean hospital visit was 1.86 during the study. When hospital visits three months before the study and during the follow-up were compared, a significant increase during follow-up period was found ($z=3.92$, $p<0.001$).

Discussion

This study showed that nurse-led telephone follow-up program can lead to significant improvements in metabolic parameters

Table 1. Demographic profiles of patients

Characteristics	Number (%)*
Age (years)	55.9±10.4
Gender	
Male	25 (71.4)
Female	10 (28.6)
Educational level	
Elementary school	24 (68.6)
High school and more	11 (34.4)
Duration of diabetes (years)	5.2±3.7
Family history of diabetes	20 (57.1)
Complications of the disease	
Coronary artery disease	6 (17.1)
Nephropathy	5 (14.3)
Retinopathy	8 (22.9)
Neuropathy	2 (5.7)
Drug use	
OHA**	29 (82.9)
OHA + insulin	6 (17.1)
Anti-hypertensive	24 (68.6)
Anti-hyperlipidemic	8 (22.9)
Acetylsalicylic acid	7 (20.0)
Patients who did not attend diabetes education programs	26 (74.3)
Patients who did not monitor the blood glucose level at home	24 (68.6)

*Data are shown as mean ± SD or n (%).
**OHA, oral hypoglycaemic agent.

Table 2. Causes of the noncompliance to diet, exercise and drug therapy according to the patient' explanations at the beginning (n=35)

Causes of the noncompliance	n (%)
Noncompliance to the drug therapy	16 (45.7)
Causes of noncompliance to drug therapy (n=16)*	
Forget to take drugs	7 (20.0)
End up taking drugs because of feeling good	6 (17.1)
Avoid to take drugs because of side effects	5 (14.3)
Problem with providing drugs on time	4 (11.4)
Bored take drugs for lifetime	1 (2.9)
Having difficulty in physical activities	30 (85.7)
Skipping meals/Taking Irregular meals	27 (77.1)
Considering the disease as unimportant	21 (60.0)
Think of "anyway, we are all going to die"	6 (17.1)

* More than one reason is present in a patient

including HbA1c and FBG, PPBG, total and LDL-C in patients with T2DM. Besides, there was a significant decrease observed in blood pressure and BMI after the follow-up.

Several studies have reported that strict glycemic control reduces the development and progression of long-term complications of diabetes mellitus (4,5). A reduction in HbA1c of only 1% is associated with a significant reduction in any diabetic complications, in particular, microvascular disease (5). Aubert et al. (9) conducted a randomized trial on diabetic patients and their results showed that patients in the nurse-care management group had mean decreases of 1.7 percentage points in HbA1c values and 43 mg/dl in FBG levels than patients in the usual care group. Piette et al. (19) also demonstrated that patients in a telephone disease management group with a nurse had a decrease of HbA1c level during the 1-year study period. In this study, there was a significant reduction in HbA1c of the non-compliance group (HbA1c ≥8%). For this reason, it was suggested that nurse-led telephone follow-up could be better for diabetic patients with HbA1c ≥8 (19). The results of the present study also may show that a nurse-led telephone intervention can improve glycemic control in patients with T2DM. We observed a 1.1% reduction of HbA1c after 12 weeks. It was suggested that besides telephone follow-up, diabetes education program, increased disease awareness, and positive lifestyle modifications (diet, exercise, drug therapy) could be the reason for improvements in glycemic parameters.

Our study revealed that nurse-led telephone follow-up contributed to improvement in adherence of the diet, exercise, and drug use ability after 12 weeks. In a study including volunteer patients, less compliance problem in drug therapy was observed in the patients followed by the phone compared to the control group (12). In another study, it was found that diet compliance in the phone follow-up group was better than the control group, but there was no significant difference found in treatment and diet compliance (20). Regarding the causes of noncompliance, disease awareness level was low among most patients and they assumed their disease was unimportant (Table 2). At the end of 12-week follow-up, improvements in metabolic parameters and diet, exercise, and drug therapy compliance could be the result of increased disease awareness, lifestyle modifications, and regular follow-up. We think that telephone follow-up contributes to this awareness.

Non-compliance with health behaviors is a common problem reported by patients themselves (21,22) and identified by nurses (23). Nurse-led follow-up has been found to significantly increase patients' self-efficacy in conducting self-care activities, including blood glucose monitoring (12). Wong et al. showed that there was no significant difference in medication adherence between the study and the control group. Maybe adherence to medication, as compared with adherence to other health behaviors, requires less modification of lifestyle (24). It was found by Chan et al.(21) that adherence to exercise and dietary guidelines was much lower than that to drug compliance and blood glucose monitoring. McNabb (25), in a review of studies, reported that adherence to exercise (30%) was lower than adherence to diet (70%).

The primary goal of the telephone nursing program is the efficient use of health care resources and provision of the appropriate level of care at the appropriate time (16). Some studies showed that lifestyle interventions for diabetic patients reduced medical costs by reducing hospital admissions and unplanned visits to health care professionals (26,27). In addition to these results, some reports have demonstrated that a nurse follow-up group had reduction in cost (28) and length of stay during hospitalization (26). In our study, we found increased number of hospital visits during the follow-up compared to the 3-month period before the study. Possible reasons are awareness of patients, increased frequency of controls due to

Table 4. Effect of the intervention on adherence (n=35)

Components	Baseline n (%)	Week 12 n (%)	p*
Diet adherence	1 (2.9)	24 (68.6)	<0.001
Exercise adherence	1 (2.9)	26 (74.3)	<0.001
Drug use adherence	18 (51.4)	30 (85.7)	0.004

*McNemar Test resultt

Table 3. Comparison of the metabolic parameter levels of 35 patients at baseline and week 12

Metabolic parameters	Baseline	Week 12	p
HbA1c (%)	8.2±1.4	7.1±1.3	<0.001**
FPG	155 (102-486)	126 (75-252)	<0.001*
PPBG	249 (92-408)	170 (90-356)	<0.001*
Triglyceride	155 (36-455)	140 (39-508)	0.063*
Total cholesterol	210.7±35.2	191.1±32.8	<0.001**
LDL-cholesterol	124.7±31.7	124.7±31.7	0.021**
HDL-cholesterol	46.7±6.6	46.8±6.7	0.945**
BMI	32.0±5.0	31.1±4.8	<0.001**
Systolic blood pressure	141.7±16.4	127.1±9.9	<0.001**
Diastolic blood pressure	85.8±10.4	80.3±5.1	0.002**

*Wilcoxon signed ranks test result
**Paired samples T-test result
Data are mean±SD, median (min-max).
Beginning of follow-up (n=35). End of follow-up (n=35).
HbA1c=glycosylated haemoglobin; FPG=fasting blood glucose
PPBG=postprandial blood glucose; BMI=body mass index.

increased knowledge and considering the disease as important. In this study, as we did not have enough data about the cost effectiveness of telephone follow-up, this issue is open for comments. Cost effectiveness of this short-period study might be increased as the frequency of hospital visits was increased. Nevertheless, our primary aim was to investigate the effect of nurse telephone calls on glycemic parameters. Long-term application of this intervention may possibly cause reduction in the frequency of hospital visits. As most patients (68.6%) in the study did not monitor their blood glucose levels at home, they went to hospitals, which could be the reason for the increased number of hospital visits. Interventions to improve glycemic control may help to prevent long-term complications, which may lead to cost savings that outweigh the costs of the intervention. Patients were satisfied with the nurse-led telephone follow-up. As the number of patients was limited, all patients could be satisfied with the follow-up. In a study about "Automated Telephone Disease Management (ATDM)" 85% of patients reported that they were satisfied with the ATDM calls and the result of this study supported our result. In the same study, 76% of patients reported that they personally would choose to receive such calls in the future (29).

Although the number of patients was low and the study period was short, this study showed that telephone follow-up can be used for the outpatient diabetes management. The number of patients was limited because the study was conducted by one researcher and every patient was followed for at least three months.

Conclusion

These findings indicate that a nurse telephone intervention may improve glycemic parameters including HbA1c, fasting blood glucose, postprandial blood glucose, as well as diet, exercise, and medication adherence.

In conclusion, in related clinics, a specialized nurse can be employed as a case director to meet counseling requirements of diabetic patients and this nurse-led phone follow-up program can be improved and comprehensively served.

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