EFFECTIVENESS OF TELEPHONE INTERVENTIONS AS A STRATEGY FOR GLYCEMIC CONTROL: AN INTEGRATIVE LITERATURE REVIEW

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ABSTRACT: The objective of this study was to analyze the effectiveness of telephone interventions as a strategy for glycemic control in adult Type 2 Diabetes Mellitus patients. An integrative literature review was undertaken in April and May 2011 through surveys in the Cochrane, PubMed/Medline, Lilacs and Cinahl databases. Nine studies complied with the inclusion criteria, mainly randomized controlled clinical trials. Concerning the time period analyzed in each study, it varied from eight weeks to twelve months. 1294 patients participated in the study, being 671 randomized to telephone follow-ups and 479 to usual care. In eight studies analyzed, glycemic control was based on the levels of glycated hemoglobin (HbA1c). The information found showed that the interventions are effective for glycemic control in patients who have type 2 Diabetes. Self-management was improved and possible complications of the disease were reduced.

DESCRIPTORS: Diabetes *mellitus*, type 2. Telephone interventions. Intervention-related studies. Nursing.

EFICÁCIA DE INTERVENÇÕES QUE UTILIZAM O TELEFONE COMO ESTRATÉGIA PARA O CONTROLE GLICÊMICO: REVISÃO INTEGRATIVA DA LITERATURA

RESUMO: Objetivou-se analisar a eficácia de intervenções que utilizam o telefone como estratégia para o controle glicêmico de adultos portadores de Diabetes *Mellitus* tipo 2. Trata-se de uma revisão integrativa da literatura realizada nos meses de abril e maio de 2011 através da busca nas bases de dados Cochrane, Pubmed/Medline, Lilacs e Cinahl. Nove estudos atenderam aos critérios de inclusão, prevalecendo dentre eles os ensaios clínicos randomizados controlados. Em relação ao tempo de acompanhamento houve variação de oito semanas a doze meses. Participaram dos estudos 1294 pacientes, sendo 671 randomizados para acompanhamento telefônico e 479 para os cuidados habituais. O controle glicêmico foi determinado por níveis de hemoglobina glicada (HbA1c) em oito estudos analisados. As informações encontradas demonstraram que as intervenções são eficazes no controle glicêmico dos pacientes que possuem Diabetes tipo 2. O autocontrole esteve melhorado e a diminuição das possíveis complicações da doença esteve potencializada.

DESCRITORES: Diabetes *mellitus* tipo 2. Telefone. Estudos de intervenção. Enfermagem.

EFICACIA DE INTERVENCIONES QUE UTILIZAN EL TELÉFONO COMO ESTRATEGIA PARA EL CONTROL GLUCÉMICO: REVISIÓN INTEGRADORA DE LA LITERATURA

RESUMEN: El objetivo fue analizar la eficacia de intervenciones que usan el teléfono como estrategia para el control glucémico de adultos con Diabetes *Mellitus* tipo 2. Se trata de una revisión integradora llevada a cabo de abril a mayo de 2011 a través de la búsqueda en las bases de datos Cochrane, PubMed/Medline, Lilacs y Cinahl. Nueve estudios cumplieron los criterios de inclusión, prevaleciendo entre ellos los ensayos aleatorios y controlados. Mientras al seguimiento, hubo variación de ocho semanas a doce meses. Participaron 1.294 pacientes, 671 aleatorios para seguimiento telefónico y 479 con atención habitual. El control de la glucemia fue determinado por niveles de hemoglobina glucosilada (HbA1c) en ocho estudios analizados. Las informaciones que se encontraron señalaron que las intervenciones son efectivas en el control glucémico de pacientes con Diabetes tipo 2. El autocontrol estuvo mejorado y la reducción de las posibles complicaciones de la enfermedad fue potencializada.

DESCRIPTORES: Diabetes *mellitus* tipo 2. Teléfono. Estudios de intervención. Enfermería.

INTRODUCTION

Due to its chronicity and potential for other complications, Type 2 Diabetes *Mellitus* (DM2) needs to be continuously managed by patients and health care professionals in order to reach ideal glycemic control.

The main strategies to manage DM2 have focused on patient education through both individual[1] and group[2-3] consultations.

Although satisfactory results have been achieved through the abovementioned strategies, the literature shows the use of new methods,[4-12] such as the use of telephone, internet, text messages (Short Messaging System - SMS) and video-conferencing, which reiterate the need for special approaches.

The telephone as an intervention strategy has been used in the health care scope since 1970, particularly in the medical field, both in relation to screening and monitoring of patients with chronic diseases such as DM2 and in providing health care advice. In this context, a number of benefits results from telephone interventions as a method, as follows: patients' quick access to health care professionals, the reduction of waiting periods for consultations, the reduction of time and costs related to patient transportation, as well as the chances of increased communication and assisting with the return of patients.[13]

In clinical nursing, telephone interventions appears as a potential tool for holistic care, which means an extension of health care action and represents an evolution of the traditional way of caring. Studies[4,10] show that nurses are involved in this strategy and perform activities varying from calling patients and supervising calls to patients to training people for this purpose.

Based on this, telephone interventions for DM2 patient care management may be an effective alternative to promote health, improving quality of life and reducing the risks of complications for these patients.[14]

Some academics,[15-16] however, have not found satisfactory results in relation to the impact of these interventions on clinical cases. As a result, new studies should be carried out with the aim of evaluating the real effectiveness of these strategies, in particular telephone interventions as an incentive method for glycemic control.

As a consequence, the purpose of this study is to analyze the effectiveness of telephone interventions as a strategy for glycemic control in adults suffering from DM2.

METHOD

In view of the proposed objective, an integrative review of the literature was chosen, which consists in developing a broad analysis of publications that contribute to discussions about the methods and research results, as well as in setting up ideas for carrying out further studies.[17]

Six stages were undertaken[17-19] for the development of this review and were based on: 1- selection of hypothetical scenarios or guiding questions for the review; 2- selection of the studies to be part of the sample; 3- definition of the characteristics of the studies; 4- critical analysis of the included studies; 5- interpretation and discussion of the results; and 6- presentation of the review.

The guiding question of the research was the following: What is the effectiveness of telephone interventions as a strategy for glycemic control in adults suffering from DM2?

The selection of the studies was independently and concomitantly carried out by three authors in April and May 2011, through online access of important databases in the health care field: Cochrane, PubMed/MEDLINE, LILACS and CINAHL.

The following controlled descriptors were crossed, which are present in DeCS/Mesh (Medical Subject Headings): Diabetes Mellitus; Type 2 Diabetes Mellitus; Telephone; Intervention Studies. The search for the studies was done through access of files available online.

In the Cochrane database, two descriptors were crossed: "diabetes mellitus" and "telephone", resulting in 172 matches. Further, the new descriptor "intervention studies" was included and this resulted in a total of 18 matches.

In the PubMed/MEDLINE database, the crossing between the descriptors "diabetes mellitus, type 2", "telephone" and "intervention studies" was done, totaling 46 studies, of which only 17 were fully available online. The crossing used in LILACS was of the descriptors "diabetes mellitus type 2" and "telephone", which resulted in the selection of seven studies.

In relation to CINAHL, the crossed descriptors were the following: "diabetes mellitus type 2" and "telephone", and 408 studies were initially found. Amongst them, 251 were available in full. After refining the search by topic/main title, using the words Diabetes Mellitus; Diabetes Mellitus, Non-Insulin-Dependent; Telephone and Glycemic Control, a total of 12 studies were found.

As for the sample selection, the following inclusion criteria were established: scientific articles related to the guiding question, written in English, Portuguese and Spanish. On the other hand, the following items were excluded: statements of informal cases, book chapters, dissertations, theses, reports, news, editorials, non-scientific articles, and the scientific articles that were not fully available online and were shown in more than one database.

Based on the publications selected during the search and strictly following the inclusion and exclusion criteria, each article's title and summary were read in order to select the final sample, which resulted in nine publications, two found in the Cochrane database, one in Pubmed/MEDLINE and six in CINAHL. No articles matched the inclusion criteria in the LILACS database.

In order to obtain the information about the selected articles, an instrument was used to ensure that all relevant information was extracted, therefore reducing the risk of errors in the transcription and guaranteeing precision during information checking. For that, the following aspects were considered: journal, title, author, year/country, objective, method, results and conclusion.[20]

Aiming to critically analyze the selected studies, the authors used their professional experiences to check the validity of the methods used.[21,22]

The articles were also divided into categories according to the evidence levels and recommendation degrees[23], as follows:

Evidence levels: 1- Systematic review with meta-analysis; 2- Large trial (>1000 patients); 3- Randomized clinical trial (<1000 patients); 4- Cohort (non-randomized); 5- Control case; 6- Case series; and 7- Expert opinion.

Recommendation levels: A - Sufficiently strong evidence to obtain a consensus; B - Non-permanent evidence; and C - Sufficiently strong evidence to contradict the conduct.

For the summary and discussion of the analysis resulting from the selected studies, a synoptic table was used to consider the criteria established in the abovementioned instrument. The presentation and discussion of the results were done in a descriptive way, so as to evaluate the applicability of the results found.

RESULTS

Nine scientific articles were analyzed in this integrative review which strictly followed the sample selection previously established, and a synoptic table of these selected articles is presented below, according to their journal, year/country, title, author, method used, objectives, results and conclusion (Table 1).

Table 1 – Presentation of the sample, according to journal, year, country, title, author, method, objective, results and conclusion. Fortaleza-CE, 2011

Journal Year Country	Title	Author/ Method used	Objective	Results	Conclusion
Diabetes Care 2005 United Kingdom	Pro-Active Call Center Treatment Support (PACCTS) to improve glucose control in type 2 diabetes	Young RJ, Taylor J, Friede T, Hollis S, Mason JM, Lee P, et al[14] Randomized clinical trial	To determine if the PACCTS can improve glycemic control in patients suffering from DM2	Reduction of 0.3% on the levels of glycated hemoglobin in the intervention group	PACCTS significantly improved the glycemic control in a white urban population presenting HbA1c> 7%
Advances in Nursing Science 2009 United States of America	The effects of isolated telephone interventions on glycemic control in type 2 Diabetes	Graziano JÁ, Gross CR[24] Systematic literature review	To evaluate the impact of isolated telephone interventions on glycemic control in adults suffering from DM2	Better levels of HbA1c in the intervention groups of the analyzed studies	The current evidence does not confirm that telephone interventions improve glycemic control in relation to DM2

Journal Year Country	Title	Author/ Method used	Objective	Results	Conclusion
Journal of Advanced Nursing 2003 Korea	Adherence to Diabetes control recommendations: impact of nurse telephone calls	Kim H, Oh J[25] Randomized clinical trial	To investigate the effect of telephone interventions in reducing HbA1c levels	Reduction in the levels of HbA1c	Telephone interventions carried out by nurses can improve HbA1c levels
Journal of Clinical Nursing 2007 Korea	Effect of the Diabetes outpatient intensive management program on glycemic control for type 2 Diabetic patients	Song MS, Kim HS[26] Randomized clinical trial	To examine the effect of an intensive outpatient management program (DOIMP) on glycemic control in patients suffering from DM2	The intervention group showed reduction in the levels of HbA1c and of fasting and postprandial glucose	The DOIMP can be effective in glycemic control
Advances in Nursing Science 2009 United States of America	A randomized controlled trial of an automated telephone intervention to improve glycemic control in type 2 Diabetes	Graziano JÁ, Gross CR[4] Randomized clinical trial	To evaluate the impact of automated telephone interventions to improve glycemic control in adults suffering from DM2	There was no statistically significant reduction in the levels of HbA1c in the intervention group	Regular telephone contact in between clinical consultations improves self-management behavior, reducing the levels of HbA1c
Diabetes Care 2003 United Kingdom	Evaluation of a nurse-care management system to improve outcomes in patients with complicated Diabetes	Taylor CB, Miller NH, Reilly KR, Greenwald G, Cunning D, Deeter A, et al[27] Randomized clinical trial	To evaluate the effectiveness of a system using telephone interventions as strategy to control the metabolism of patients suffering from Diabetes	Significant reduction in HbA1c levels in patients subject to interventions	A nurse-care management system can significantly improve metabolic control in patients suffering from Diabetes
MEDSURG-Nursing 2010 United States of America	Evidence-based practice protocol to improve glucose control in individuals with type 2 Diabetes *Mellitus*	Evans MM[28] Randomized clinical trial	To verify the effectiveness of telephone interventions on glycemic control in adults suffering from DM2	There was reduction of glycemic levels in patients subject to interventions	Telephone interventions were effective in reducing glycemic levels
Diabetes Care 2009 United States of America	Effects of self-management support on structure, process, and outcomes among vulnerable patients With Diabetes	Schillinger D, Handley M, Wang F, Hammer H[29] Randomized clinical trial	To compare the effects of self-management support on patients suffering from Type 2 Diabetes	Improvement of glycemic control in the group subject to telephone interventions	Telephone interventions carried out by nurses had a positive effect on self-management in patients suffering from Diabetes
J Behav Med 2009 United States of America	Effect of a brief, regular telephone intervention by paraprofessionals for type 2 Diabetes	Sacco WP, Malone JI, Morrison AD, Friedman A, Wells K[30] Randomized clinical trial	To evaluate the effects of telephone interventions on glycemic control in patients with Diabetes	Reduction of glycemic levels in the group subject to interventions	Improvement of diet, increase of physical activity, feet inspection and reduction of clinical symptoms

It can be noted that, from the selected studies, two were undertaken in the United Kingdom, two in Korea and five in the United States. In relation to the type of journal, five were published in general nursing magazines and four in medical magazines.

Concerning the research method, eight were randomized clinical trials and one was a systematic review. As for the evidence levels, one article belonged to level one, due to the fact that it was a systematic literature review, and eight were level three, due to their being randomized clinical trials with more than 1000 patients. Three publications had recommendation A (sufficiently strong evidence to obtain a consensus) and six recommendation B (non-permanent evidence).

The duration of each intervention, it varied from eight weeks to twelve months. The sample size of the selected studies varied from 12 to 508 people. In total, 1294 patients participated in the studies, being 671 randomized for telephone follow-ups and 479 for usual care, which was regularly provided by doctors and/or nurses in the health care centers the patients attended.

Glycemic control was determined by the levels of glycated hemoglobin (HbA1c) in eight studies, and the average variation of levels was compared between the intervention and control groups and/or final averages of HbA1c after the intervention.

The first study[14] evaluated the effectiveness of the program Pro-Active Call Centre Treatment Support, in which duly trained telephone operators contacted patients with diabetes once every three months when the HbA1c levels were below or equal to 7.0%, every seven weeks when the HbA1c levels were between 7.1% and 9.0% and monthly when the HbA1c levels were above 9.0%. Each call lasted twenty minutes and the advice provided included weight control, healthy diet, physical activity, stress and smoke control, preparation for change, adjustment to medication and blood glucose control. A target average reduction in HbA1c levels of 1% was established for the intervention group, but this was not achieved after twelve months. There was, however, an improvement of 0.3% in HbA1c levels in the intervention group when compared to the control group (p=0.003).

Seeking to evaluate the effect of telephone interventions on glycemic control in 119 patients suffering from DM2 for three months, researchers[4] used automated telephone messages, aimed at affecting their beliefs and attitudes in relation to self-management of DM2. The contents of the messages were focused on the severity of the disease, on the relation between hyperglycemia and other complications and on the benefits of self-managing glycemic control. Control group participants were provided with the usual care. There was a reduction of 1.13% in HbA1c levels in the intervention group (p=0.89). In the same year, through a systematic literature review[24] about the effects of telephone interventions on glycemic control, the same researchers found that, according to eight studies, HbA1c levels improved in intervention groups.

In another research,[25] the effect of telephone interventions on the reduction of HbA1c levels and on Diabetes control was studied. The intervention consisted of continuous health education for 12 weeks, focused on diet, exercises and adjustment to medication, as well as frequent monitoring of blood glucose levels. At the end of the process, a significant change in the percentage of HbA1c levels was observed in the intervention group (p<0.05), with an average variation of 1.2%.

Aiming to examine the effect of an intensive outpatient management program for Diabetes (DOIMP) which used telephone interventions as a strategy to improve glycemic control, researchers[26] carried out a clinical trial with 49 people who suffer from DM2. The randomized patients for the intervention group were included in the DOIMP and received information about Diabetes, which was provided by the multidisciplinary team, monitoring of other complications resulting from the disease and telephone advice during 12 weeks. At the end of the process, it was evidenced that the HbA1c levels decreased by 2.3% in the intervention group (p=0.001).

In a clinical trial,[27] the effectiveness of a health care management system carried out by nurses and directed at improving the clinical conditions of patients suffering from Diabetes was evaluated. 169 patients participated in the study and were divided into two groups. The intervention program included telephone calls as a strategy to provide information to patients. After twelve months, the researchers concluded that there was a reduction of 1.14% in HbA1c levels in the intervention group and 0.35% in relation to the control group (p=0.01).

Another clinical trial[28] carried out for a period of eight weeks involved 12 patients. The telephone calls lasted an average 15 to 20 minutes and provided information based on the American Diabetes Association.[31] Amongst the nine studies that were part of this review, this was the only one that did not use HbA1c as a parameter for glycemic control. Instead, fasting blood glucose was used and it was observed that the intervention group presented better levels of glucose when compared to the control group.

The effects of a Self-Management Support[29] (SMS) strategy for behavioral change were tested in 339 patients who were monitored for a period of 12 months. Metabolic control was evaluated through the measurement of HbA1c levels before and after the intervention, with a reduction of HbA1c levels from 9.3% to 8.7% in the intervention group (p=0.8). The study concluded that the

group subject to telephone interventions presented consistent improvement, which suggests that this type of SMS is particularly effective for vulnerable populations.

Lastly, another research[30] used an intervention based on "coaching" sessions, with the purpose of ensuring patients' understanding about the recommendations made in relation to their treatment and about adjustment monitoring, amongst others. The intervention included 62 patients who were provided with telephone sessions for a period of six months. Concerning glycemic control, a reduction from 8.4% to 7.4% was found in the intervention group.

DISCUSSION

Studies based on the use of telephone interventions as a strategy to promote continuous care of Diabetes patients have shown significant reductions in HbA1c levels.[13,32] In relation to this evidence, all studies that are part of this integrative review have shown reduction in HbA1c levels, four of them with statistical significance.[14,25-27]

Over the years, prolonged hyperglycemia can cause extensive and irreversible organic wounds, affecting the eyes, kidney, nerves, large and small vessels, as well as blood coagulation.[33] Findings from the United Kingdom Prospective Diabetes Study (UKPDS) confirm that the ideal glycemic control in patients with DM2 reduces the development and advancement of a large number of complications resulting from the disease.[34]

Differently from glycemic tests, which reflect the glycemic levels at the exact moment of measurement, the HbA1c tests indicate the average glucose levels from the last two to four months.[35] It could be noted, therefore, that most of the studies[4,14,24-27,29-30] in this integrative review used HbA1c to evaluate the glycemic control of the participants.

Although hemoglobin glycation occurs across the life span of the red blood cells, which is approximately 120 days, the most recent glucose levels most strongly influence the HbA1c levels within this period.[33] Therefore, the last two to three months need to be considered when measuring it, and this is an important recommendation when testing treatment effectiveness.[35]

Taking into consideration the measurement of HbA1c levels at the end of the interventions carried out in each of the analyzed studies in the present research, eight of them[4,24-30] complied with the recommendations of the Brazilian Diabetes Society (SBD) and measured the HbA1c levels after two,[28] three to six[4,25-26,30] and twelve months of intervention.[14,27,29]

The levels of HbA1c after the interventions confirm the lack of uniformity in the studies when associating the reduction of these levels with the monitoring period, which did not allow a general time period recommendation. Similarly, in a systematic review of the literature,[24] in which the period of interventions varied from three to twelve months, there was a significant reduction in HbA1c levels in half of the studies.

Amongst those researches with a monitoring period of only three months, two of them had a significant reduction in HbA1c levels.[25-26] The only research with a monitoring period of six months did not show a significant reduction,[30] and of the three others with a monitoring period of twelve months, two of them presented a statistically significant reduction in HbA1c levels[14,27] It is important to mention that the monitoring period was appointed as a limitation in some of the studies.[14,28-30]

Based on the UKPDS study,[34] it was established that HbA1c levels above 7.0% are associated to a greater risk of chronic complications, therefore being subject to more intensive treatments. In the present review, eight studies[4,14,24-27,29-30] included patients who had HbA1c levels above 7.0% at the beginning of the interventions. At the end of the interventions, however, and although there had been reduction of hemoglobin in all these patients, none of them achieved levels below 6.5%, as recommended.[35]

Telephone information was not provided by a professional nurse in only two of the analyzed studies. In one of them,[27] the telephone call was carried out by people duly trained by nurses and, in the other,[30] the telephone calls were done by psychology students, who were also duly trained.

As for the way telephone interventions were performed, in two studies,[4,29] the telephone calls were automated, and this reduced real-time contact with the patients. It is important to note that, in one of them,[29] in addition to the automated calls, direct contact with the nurse was possible whenever needed. No conclusion could be reached as to the most effective intervention in relation to the type of professional carrying out the calls and the manner in which these calls were made available, due to the fact that all study results showed improvement in HbA1c levels.

CONCLUSION

The information found showed that there was a mostly significant reduction in glycated hemoglobin and fasting blood glucose levels in patients included in the intervention group, leading to the conclusion that telephone intervention is an effective strategy in glycemic control of patients suffering from DM2. As a result, self-management by patients was improved, which consequently increased the reduction of potential complications resulting from the disease.

It is important to mention that the use of an integrative review as a research method in this study provided the nursing professionals with grounded and uniform knowledge to support decision making and clinical practice improvement, thus assisting in the implementation of effective interventions in the health care field.

One of the limitations of the present study is the fact that only four databases were consulted. Therefore, the inclusion of new databases is suggested to seek further studies on this theme. Therefore, new studies should be undertaken to achieve higher reliability levels as regards the actual effectiveness of programs using telephone intervention strategies.

The use of an integrative review as a method was considered relevant to achieve the proposed objective. Furthermore, gaps could be identified, indicating the need for further research.

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