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Review article

Effect of different types of self-management education in patients with diabetes

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ABSTRACT

Education plays an important role in diabetes mellitus (DM) treatment, as it enables patients to manage their disease. There is a wide range of tested educational interventions, and, to date, no universal model that can be standardized and recognized as effective for all individuals with the disease has been defined. This article aims to review the effect of different types of educational interventions for self-management of glycemic control in patients with DM type 2, in addition to define general recommendations for this treatment strategy.

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Efeito de diferentes modalidades de educação para o autocuidado a pacientes com diabetes

RESUMO

A educação é parte importante do tratamento do diabetes melito (DM), e é por meio dela que os pacientes são capacitados para realizar o gerenciamento da sua doença. Existe uma gama variada de intervenções educativas já testadas nos pacientes com DM, não havendo, até o momento, um modelo universal definido que possa ser padronizado e reconhecido como eficaz para todos os indivíduos com a doença. Este artigo tem por objetivo revisar o efeito das diferentes modalidades de intervenções educativas para o autocuidado no controle glicêmico de pacientes com DM tipo 2, além de definir recomendações gerais para a utilização desta estratégia de tratamento.

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Introduction

Diabetes mellitus (DM) has become a serious public health problem due to its high prevalence and to the chronic nature of the disease and its complications. The global prevalence of DM in adults is estimated to be 9%.¹ In Brazil, the prevalence was 7.6% in the 80's,² increasing in 2003 to 12% in men and 16% in women,³ and, recently, a population-based study carried out in the state of Rio Grande do Sul estimated that 12.4% of adults showed this condition.⁴ In Brazil, the direct costs of the disease vary between 2.5% and 15% of the annual budgets allocated for health care,⁵ which represents approximately US\$ 3.9 billion.⁶

The approach currently adopted in Brazil to treat DM is proving to be inefficient. Recently, a multicenter study carried out in four regions of the country (Northeast, Midwest, Southeast, and South) evidenced that only 10% of the patients with DM type 1 and 25% of those with DM type 2 showed an hemoglobin A1c test (HbA1c) below the target of 7%.⁷ These results likely arise from the difficulties patients face to adhere to the non-pharmacological measures recommended. However, the low efficacy of the available medications and failure to adhere to the drugs may be other factors, as only 50% of the patients with DM type 2 using two oral medications reach the target HbA1c levels.⁸ In addition to the adequate glycemic control, patients with DM requires interventions that act on other risk factors for their chronic complications, such as obesity, hypertension, dyslipidemia, and smoking.

Caring for a patient with DM includes interventions that are multidisciplinary and in all levels of health care.⁹ The success of these interventions depends on the patient's ability to change his/her lifestyle, maintain the recommended care, and also to take initiative to identify, resolve, or seek help for problems that arise over the time. The development of these abilities is fostered by education, and that is why the educational process is an important part of the comprehensive care for the patient with DM. The importance of health education was evidenced in patients with DM type 2 during ambulatory care in a university hospital member of the Brazilian Unified Health System (Sistema Único de Saúde – SUS).¹⁰ Patients consulting with a nurse practitioner showed a higher chance to obtain a HbA1c < 7% (OR: 3.29, *p* = 0.005).¹⁰ This benefit was subsequently confirmed in a randomized controlled trial (RCT).¹¹ However, more recent data question the effectiveness of education in improved glycemic control of patients with DM type 2.¹²

This study aimed to review the effect of different types of educational interventions for self-management of glycemic control of patients with DM type 2.

Education role in treatment of diabetes

Education is an important element in the treatment of patients with DM and the American Diabetes Association (ADA) recommends that all patients with DM should receive self-management education.¹³ As a result, in 2006, the National Standards for Diabetes Self-Management Education (DSME) was created, aiming to ensure the quality of self-management

education provided to patients with DM in several scenarios, based on scientific evidence. The main objectives of the DSME are to train patients to take decisions with respect to their disease by encouraging the self-management behavior, which would result in the resolution of problems with active collaboration of the healthcare team. These interventions could improve clinical results, the health status, and the quality of life of patients with DM. Participating organizations were the ADA, the Centers for Disease Control and Prevention (CDC), the Veteran's Health Administration, the Indian Health Service, and the American Pharmaceutical Association, in addition to other members of the community, such as DM patients, health service researchers who work with behavioral changes, nurse practitioners, nutritionists, and pharmacists.¹⁴

DM education establishes a partnership between the learner and the educator, aiming at the promotion of self-management. The main objective of the DSME is to train patients to take decisions regarding their treatment, turning them into the managers of their disease, and encouraging them to use the health system as a tool for its control, when necessary.¹⁵ Thus, the educational process increases patient autonomy. For this process to be successful, the patient must actively participate in the learning process, the knowledge of each person should be valued, and the time and space for exchange of information should also be ensured.^{5,16} Another important aspect is to define individual goals and to establish a continuous relationship with the patient, so he/she can undertake a greater responsibility for the care for his/her disease.¹⁷

As the care of patients with DM is multidisciplinary, health education should involve all professionals who maintain a direct contact with the patient: physician, nutritionist, nurse, dentist, psychologist, and social worker. Thus, a DM educational program should include the qualification of these professionals.^{5,18}

The expected results are improved metabolic control, reduced cardiovascular risk, and control of chronic complications related to diabetes by encouraging the proper use of the medication, regular meals, and adherence to an exercise program adapted to each patient.¹⁹

In the literature, there are several reports of effective educational interventions for DM, however, these studies are heterogeneous regarding the types of interventions and study populations, and there is no DM universal education program that can be standardized and deemed effective for all patients.^{9,20} The effect of educational interventions on glycemic control of patients with DM type 2 was summarized in several systematic reviews of RCT with meta-analysis.²¹⁻²³ In general, education improves patient knowledge about the disease, and reduces the HbA1c by 0.3% to 0.76%, depending on the review analyzed.^{17,24} Certain specific aspects of DM education are presented below.

Individual education vs. group education

The effect of group education was assessed in a systematic review with meta-analysis that included 11 studies (1,532 patients). An effect on HbA1c was observed in four to six

months (-1.4%; 95% CI: -0.8 to -1.9; $p < 0.01$), and maintained in 12-14 months (-0.8%; 95% CI: -0.7 to -1.0; $p < 0.01$) and until two years (-1.0%; 95% CI: -0.5 to -1.4; $p < 0.01$). In addition to the benefits in HbA1c, the intervention reduced the body mass index (BMI) (-1.6 kg/m²; 95% CI: -0.3 to -3.0; $p = 0.02$) and systolic pressure (-5 mmHg; 95% CI: -1 to -10; $p = 0.01$).²⁵ However, this systematic review included both RCTs and non-randomized studies, which has likely caused an overestimation of the actual effect of the interventions, and such impressive HbA1c results were not duplicated in a RCT recently published by the present group.¹¹ In cited study, patients were randomized to participate in a structured eight-hour group educational program conducted in two-hour weekly sessions. Patients were encouraged to actively participate in the meetings, asking questions and contributing with their experiences during the educational program. The group submitted to this program showed a reduction in the HbA1c of 0.41%, and this effect was maintained for one year.¹¹

Individual education was assessed in a systematic review of RCT with meta-analysis, including nine studies (1,359 patients). In the six studies that evaluated the effect of face-to-face education vs. usual treatment, no effect on the HbA1c was observed (-0.1%; 95% CI: -0.3 to 0.1; $p = 0.33$). However, in a subgroup analysis, the patients with baseline HbA1c > 8% showed a small benefit resulting from the intervention (-0.3%; 95% CI: -0.5 to -0.1; $p = 0.007$).²⁶ This systematic review compared the effect of the individual education with that carried out in groups, with no differences were observed.

A recently published RCT directly compared individual education (three monthly meetings with duration of one hour) with group education (four weekly meetings with duration of one hour).²⁷ Individual education was more effective (-0.51% HbA1c) than that performed in groups (-0.27%; $p = 0.01$), and the latter was comparable to the control group (-0.24%; $p = 0.83$). However, an increased number of patients randomized for group education did not complete the educational course (12.4% vs. 4.1%; $p < 0.01$), which could explain the lack of effect of this intervention in this study.

Need for reinforcements and importance of contact time

The effect of education on metabolic control of patients with DM appears to decrease over time after the end of the intervention. A systematic review of RCTs demonstrated that the greatest effect of education was observed immediately after the end of the intervention, with a reduction in the HbA1c by 0.76%, and a gradual reduction in the effect during follow-up (-0.26% after four months).¹⁷ These results are consistent with the basic principles of any educational process, in which repetition of information is necessary, as behavioral changes do not occur rapidly and vary from person to person. During the educational process, it is necessary to reinforce the themes addressed in order to provoke thoughts and emotional experiences, helping to consolidate educational experiences.²⁸

Another important aspect is the total contact time between patient and educator. A meta-analysis demonstrated that every hour of contact between the patient and the educator

reduced the HbA1c by 0.04%; thus, 23.6 hours of contact with the educator would be required to obtain a reduction of 1%.¹⁷

Education adapted to cultural differences of ethnic minorities

Cultural and language barriers can hinder communication between educator and patient. For this reason, several authors studied culturally-adapted education techniques.^{29,30} A systematic review of RCT with meta-analysis analyzed 11 studies (1,603 patients), and demonstrated that culturally adapted education reduced the HbA1c by 0.3% (95% CI: -0.6 to -0.01) in three months and by 0.6% (95% CI: -0.9 to -0.4) in six months, but no difference was observed in studies with 12 months of follow-up (-0.1%; 95% CI: -0.4 to 0.2). There was an improvement in knowledge scores up to 12 months, but no benefit regarding control of lipids, blood pressure, quality of life, or attitude change.³¹ A systematic review assessed the characteristics of successful interventions, and defined that a baseline HbA1c > 11%, interventions adjusted for the culture and age of the patient, group counseling and support, and participation of family members (partner and adult offspring) were the factors associated with the greatest benefit when education was provided to elderly people, blacks, and Hispanics.³²

Use of technology as an educational tool

The incorporation of new technologies in the educational process may contribute to improve the results obtained until now with classic techniques of DM education. A systematic review of RCTs assessed the impact of computerized interventions on the acquisition of knowledge and adjustment of medications in patients with DM.³³ Of a group of eight studies that assessed the use of computers as an educational tool, only three demonstrated a significant decrease in the HbA1c. A small effect on HbA1c (-0.028%; 95% CI: 0.02-0.03) was observed in studies that included adjustments in the insulin doses made through a computer program based on blood glucose measurement results.

Another technology that is being used to enhance the educational process for diabetic patients is the deliver of text messages to their mobile phones to enhance their educational process. A change of -0.8% (95% CI: -1.1 to -0.5) in the HbA1c was observed in patients with DM type submitted to this intervention.³⁴

Education conducted by different healthcare professionals

Different healthcare professionals may be responsible for providing education to patients with DM, but few studies were designed to assess whether there are differences when the educator is a doctor, a nurse, a nutritionist, a pharmacist, a psychologist, or a physical educator. A systematic review with meta-analysis (18 studies; 2,720 patients) showed a

similar effect on the HbA1c when the education was provided by a nurse (-0.71 ; $p = 0.022$) and by a nutritionist (-0.88 ; $p = 0.043$), but no statistically significant effect was observed in interventions by physicians (-1.8 ; $p = 0.229$).³⁵

Pharmaceutical care enables the patient to correctly use the prescribed medicines, which may reduce their adverse effects and increase their effectiveness. A systematic review with meta-analysis involving 16 RCTs (2,247 patients) found a significant change in the levels of the HbA1c in the group of patients that received interventions provided by pharmacists (-0.65% ; $p = 0.03$).³⁶ The interventions by pharmacists in the studies included in this systematic review were mostly educational (69% of the studies), but other types of pharmaceutical interventions were also used, such as management of medicines (61% of the studies).

Diabetic patients education provided by laypersons or by their peers

The cultural and language differences between the educator and the patient may interfere in the transmission of knowledge. Using members from the community of the patient as vectors of the educational process may result in more favorable outcomes. A RCT assessed the role of community health workers, who in Brazil are members of the Family Health Strategy (Estratégia da Saúde da Família – ESF), in the metabolic control of patients with DM type 2.³⁷ A non-statistically significant reduction in the HbA1c was evidenced in patients who consulted with nurses and community health workers (-0.8% ; $p = 0.137$). However, reductions were observed in triglyceride levels (-35.5 mg/dL; $p = 0.041$) and in diastolic blood pressure (-5.6 mmHg; $p = 0.042$) when compared to the control group.³⁷

Another interesting and innovative educational strategy was tested for six months on 244 patients with diabetes.³⁸ The self-management guided by a nurse was compared to a mutual support plan between peers, i.e., the DM patients themselves. The patients were trained for enhancing their skills of self-management and paired with another group of patients. The pairs of patients were encouraged to talk on a weekly basis, using a telephone platform that registered calls and provided reminders to promote contact with colleagues. These patients could also participate in optional group sessions at 1, 3 and 6 months. The peer support group showed a difference of -0.58% in HbA1c in comparison with the group guided by the nurse.

Use of empowering techniques

Empowering may be defined as the development of an individual's confidence in their own abilities. This technique provides patients with knowledge, skills, and responsibility to make changes in their behavior. It has the potential to improve health in general and to maximize the resources available,³⁹ perfectly fitting the DSME guidelines, which seeks to develop the patient's autonomy to manage the disease. Empowerment is based on four main bases,^{40,41} namely:

- power: to give power to the patients, delegating authority and responsibility in all levels of self-management. This means to give importance to and trust the patients, and to give them freedom and autonomy to act.
- motivation: to motivate patients by continuously encouraging them. This means to congratulate the proper control of their health, to praise the results obtained, to allow people to participate (by giving opinions and suggestions) and to be satisfied with the achievement of goals established with the team.
- development: to provide patients with means and tools (education). This means continuously educating, providing information and knowledge, teaching new techniques and skills, and exposing patients to new information regarding the treatment.
- leadership: to guide the patients, to define objectives and goals, to evaluate performance regarding their goals, and to provide feedback.

A RCT evaluated the effect of this intervention, carried out through groups led by physicians and based on structured goals for metabolic control. A reduction of $0.67 \pm 1.3\%$ in HbA1c was observed in comparison with the control group (education provided by a nurse and a nutritionist), and this effect was maintained up to one year after the end of the intervention.⁴²

Cost-effectiveness of diabetes education

The cost-effectiveness of DM education was assessed based on the results of the DESMOND RCT.⁴³ This multicenter study was performed in 13 centers of the United Kingdom, and included 823 newly-diagnosed adult patients with DM type 2 under primary care. After 12 months, the structured educational program reduced HbA1c similarly in the intervention (-1.49%) and control (-1.21%) groups. However, there was greater weight loss (-2.98 kg vs. -1.6 kg; $p = 0.027$) and higher probability of not smoking (OR 3.56; 95% CI: 1.11 to 11.45; $p = 0.033$) in the intervention group. Due to the association with weight loss and smoking cessation, the intervention was deemed cost-effective, despite the lack of evidence of higher reduction in the HbA1c in the group that was provided with education.⁴³

Recommendations for clinical practice

There is a wide range of tested educational interventions, and, until now, no universal model that can be standardized and recognized as effective for all individuals with the disease has been defined. Despite the great heterogeneity of the evidence, and the difficulties in standardizing interventions, some general recommendations based on the review of the available literature are presented below:

- DM education reduces HbA1c by approximately 0.5%, and the greatest effect is observed in patients with HbA1c $> 8\%$;
- DM education is cost-effective even when it has no direct effects on HbA1c;

- Individual and group education similarly reduce HbA1c; group education is more suitable for use in the public health area, as it reaches a higher number of individuals;
- The effect of such education decreases over time, and is proportional to the exposure time; therefore, intensification and longer time of contact with the educator should be considered when planning an educational program;
- Cultural adaptation and technology should be incorporated to the process;
- The type of professional responsible for providing education does not appear to influence the results obtained, and the use of community health workers and other patients should be encouraged;
- Empowering techniques, with development of individual abilities, appear to be particularly effective.

In conclusion, the educational process comprises an important part of DM treatment, as it enables patients to manage their disease. The learning process is complex, and its effectiveness will depend on factors that include self-management commitment of the patient, willingness to learn, family support, bond with the team, financial position, cultural influences, and beliefs and attitudes regarding health care.

Conflicts of interest

The authors declare no conflicts of interest.

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