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Original Article

Clinical and humanistic impact of a strategy aimed at the metabolic control of outpatients with diabetes mellitus

[Impacto clínico y humanístico de una estrategia dirigida al control metabólico de pacientes ambulatorios con diabetes mellitus]

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Abstract

Context: There are multiple methodologies for educating patients with diabetes, but they are carried out heterogeneously and intermittently with variable results, which do not always maintain the motivation and interest of the participants.

Aims: To evaluate the clinical and humanistic impact of a strategy aimed at the metabolic control of outpatients with diabetes mellitus through process and outcome indicators.

Methods: A strategy for the metabolic control of 53 outpatients with type 1 and 2 diabetes was implemented between September 2020 and November 2021 in the services of a Comprehensive Pharmaceutical Care Polyclinic. The strategy was based on the educational needs of the patients, the use of the theoretical model of personal development and social skills, the transtheoretical model of behavior change, and the design of educational interventions with participatory methods and techniques. Rubrics were used to assess the attitude and behavior of patients during the interventions. Metabolic control variables were measured before and after 14 months.

Results: The strategy had a clinical impact of 89.2% after 14 months. 90.6% of patients achieved positive attitudinal and behavioral change, 94.3% had a high level of knowledge, 90.6% were adherent, 81.1% achieved metabolic control, and 96.2% showed satisfaction with the interventions provided.

Conclusions: The implemented strategy based on behavioral models and behavioral change constitutes an effective method for patient metabolic control. The process and outcome indicators used to measure impact are effective tools for the continuous improvement of this type of strategy and constitute an innovative method of quality.

Keywords: behavioral theoretical models; clinical and humanistic impact; metabolic control; patients with diabetes.

Resumen

Contexto: Existen múltiples metodologías para educar a pacientes con diabetes, pero se realizan de forma heterogénea e intermitente con resultados variables, que no siempre mantienen la motivación y el interés de los participantes.

Objetivos: Evaluar el impacto clínico y humanístico de una estrategia dirigida al control metabólico de pacientes ambulatorios con diabetes mellitus a través de indicadores de proceso y resultado.

Métodos: Entre septiembre de 2020 y noviembre de 2021 se implementó una estrategia para el control metabólico de 53 pacientes ambulatorios con diabetes tipo 1 y 2 en los servicios de una Policlínica de Atención Farmacéutica Integral. La estrategia se basó en las necesidades educativas de los pacientes, el uso del modelo teórico de desarrollo personal y habilidades sociales, el modelo transteórico de cambio de conducta y el diseño de intervenciones educativas con métodos y técnicas participativas. Se utilizaron rúbricas para evaluar la actitud y el comportamiento de los pacientes durante las intervenciones. Se midieron variables de control metabólico antes y después de 14 meses.

Resultados: La estrategia tuvo un impacto clínico del 89,2% tras 14 meses. El 90,6% de los pacientes lograron un cambio actitudinal y conductual positivo, el 94,3% tenían un alto nivel de conocimientos, el 90,6% eran adherentes, el 81,1% alcanzaron el control metabólico y el 96,2% mostraron satisfacción con las intervenciones realizadas.

Conclusiones: La estrategia implementada basada en modelos conductuales y cambio conductual constituye un método eficaz para el control metabólico de los pacientes. Los indicadores de proceso y resultado utilizados para medir el impacto son herramientas eficaces para la mejora continua de este tipo de estrategia y constituyen un método innovador de calidad.

Palabras Clave: modelos teóricos conductuales; impacto clínico y humanístico; control metabólico; pacientes con diabetes.

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INTRODUCTION

Education of patients with diabetes should be encouraged since it has been shown that the degree of disease control is related to the educational level of the patient (Mohamed and Huassain, 2018).

There are multiple methodologies (Ilktac et al., 2017; Pousinho et al., 2016) for the education of patients with diabetes, but they are carried out in a heterogeneous and intermittent manner with variable results, which do not always support the motivation and interest of the participants (Saínz, 2003).

Behavioral change models and behavioral theories take into account psychological, social, and contextual factors such as emotions, habits, and routines (Michie and Johnston, 2012). These factors allow us to understand behavior and identify the factors that influence it, as well as dimensions that guarantee the development of effective intervention strategies (Darnton, 2008). However, the studies published on this topic do not offer information about the applied theory and its management in healthcare practice (McEachan et al., 2011).

The literature states that the theoretical model of personal development and social skills enables people to resist social pressure in the face of unhealthy behaviors and forms competencies to make responsible decisions for well-being, as well as the model that supports behavioral change related to health (transtheoretical model of behavior) allows you to work on maintaining behavioral change and preventing relapse (Garaigordobil and Peña, 2014; Hinojo and Fernández, 2002; Prochaska and Velicer, 1997).

Introducing theoretical foundations in the design and application of health promotion programs improves their effectiveness, which has been documented, but the evidence collected on which techniques are most appropriate is not frequent in the referenced studies. Interventions must stimulate the creation of communities and environments suitable for change, and their comprehensive evaluation is essential to understand health behavior change (Morrison et al., 2012).

The literature highlights that well-designed and implemented impact evaluations provide compelling and comprehensive evidence to make policy decisions, influence public opinion, and improve program performance (Gertler et al., 2017).

Mirabal et al. (2012) pointed out that measuring the impact of Public Health programs requires a tool that operationalizes the concept according to its particular characteristics and the fields of action of the subjects involved. The use of indicators to carry out evaluations allows an approach to reality to determine a final impact result.

This challenging issue motivated pharmacists, who develop their healthcare practice at the Comprehensive Pharmaceutical Care Polyclinic (CPCP) of the Institute of Health Sciences (ICSa) of the Autonomous University of the State of Hidalgo, Mexico (UAEH) to design a strategy aimed at metabolic control of outpatients with diabetes mellitus.

This study aimed to evaluate the clinical and humanistic impact of a strategy aimed at the metabolic control of outpatients with diabetes mellitus through process and outcome indicators.

MATERIAL AND METHODS

A prospective, randomized, and quantitative intervention study in health services and systems carried out in a sample of 53 outpatients with type 1 and 2 diabetes treated in the services of the Comprehensive Pharmaceutical Care Polyclinic (CPCP) of the Institute of Health Sciences (ICSa) of the Autonomous University of the State of Hidalgo (UAEH) in the period between September 2020 and November 2021.

The research project was approved by the Research Coordination and Postgraduate Studies and the Research Directorate of the UAEH, Mexico (UAEH-DI-29-ICSA-FAR-CF-2/ Comiteei.icsa2021/ 29). Additionally, it was reviewed and approved from a scientific, technical, and ethical point of view by the Pharmacy Academic Area and by the Professional Development Program for Educators (PRODEP) (DSA/103.5/16/10282).

The research was carried out in compliance with international standards for biomedical research and experimentation on human beings, established in the Declaration of Helsinki, for which the written informed consent given by the patients was taken into account at the time of the interview.

The objectives of the research and the benefits that the results would bring were explained to all patients and/or relatives or companions who attended the CPCP. They were informed that the surveys and interviews carried out were anonymous and that the absolute discretion of the results was guaranteed, without any lack of attention to the patient due to her opinions.

The strategy was implemented through a Standardized Operations Procedure (SOP) in which structure, process, and results indicators validated by experts (Bermúdez et al., 2019) designed according to

Donabedian principles were established (Donabedian, 2005).

The strategy was based on the educational needs of patients, the use of the theoretical model of personal development and social skills, the transtheoretical model of behavior change, and the design of educational interventions with participatory methods and techniques.

To identify educational needs, a semi-structured interview, a knowledge test, and the determination of adherence to treatment using the Morisky-Green test were used (Bermúdez et al., 2019). Also, the metabolic control of the patients was evaluated to corroborate their adherence to non-pharmacological and pharmacological treatment and to confirm the identified educational needs. To evaluate the metabolic control of the patients, Body Mass Index (BMI), glucose, cholesterol, triglyceride levels, and blood pressure were measured.

As part of the strategy, 14 interventions were designed based on the needs identified in the patients, and the theoretical model of personal development and social skills (Gil-Girbau et al., 2021), as well as the transtheoretical model of behavior, was used (Prochaska et al., 1994) to act on the patient in each planned activity.

The educational contents of each activity were adapted to the average age of the patients and their sociocultural level. The activities were selected taking as a premise the 3 moments of health education: informative, behavior change, and participatory (Peyrot, 2013).

The activities included educational talks, video debates, group discussions, sharing of anecdotes, role plays, dramatization, brainstorming, and delivery of brochures and training materials (Appendix 1).

Rubrics validated by experts (Bermúdez et al., 2019) were designed to evaluate the behavior and attitude of the patient, with criteria and indicators of competence, as well as scales to determine with greater precision, reliability, and objectivity, the changes in behavior and attitude of the patients and the fulfillment of the objectives of educational interventions, as well as feedback guidelines (Appendix 2).

The program was carried out for 14 months with monthly activities. In each educational session, the patient's knowledge, behavior, and attitude were evaluated using a rubric designed for these purposes (Appendix 2).

At the end of the 14 months of interventions, the knowledge test and the medication adherence test were reapplied. The patient's metabolic control, behavior, and attitude sustained during this period were measured, as well as the satisfaction with the services, which was evaluated through the application of a validated satisfaction survey (Bermúdez et al., 2019).

The indicators to measure the clinical and humanistic impact used were the following:

- PPAB: Percentage of patients who showed a positive attitude and behavior with respect to the total number of patients.
- PHK: Percentage of patients with a high level of knowledge after the health intervention.
- PAAHI: Percentage of adherent patients or those that adhere to the treatment after the health intervention.
- PAMC: Percentage of patients with adequate metabolic control after health intervention.
- CIHES: Clinical impact of the Health Education Service.
- HIHES: Humanistic impact of the Health Education Service.

The mathematical equations used to calculate each indicator and to obtain clinical and humanistic impact are described in Appendix 3.

Patients were considered to have a positive attitude when they frequently attended educational sessions or previously reported their absence; they participated actively and enthusiastically; shared doubts and concerns; cooperated in the activities carried out by the group; showed interest in the topics discussed; they were attentive to the questions that were asked at the end of the educational session.

Positive behavior was observed when the patients expressed themselves as positively motivated or in favor of the health intervention provided by the pharmacist, changed their lifestyles regarding the disease, and complied with the indicated treatments and the recommendations given during sessions.

The number of patients with positive attitudes and behavior (NPABHI) was obtained by using the rubrics applied during the educational interventions.

To calculate the PHK, the number of patients that reached levels 3 and 4 of the knowledge tests was taken. A high level of knowledge was determined when patients reached level 3 (the patient knows the disease and the treatment well) and level 4 (the patient knows the disease and the treatment very well). These values (levels 3 and 4) were added, and the result was divided by the total number of patients who received the HE services.

To obtain the PAAHI, the Morisky Green Test was used in the last evaluation at 14 months, once the planned educational interventions had finished.

The patient was considered to have adequate metabolic control (NPAMC) when he presented fasting blood glucose less than 110 mg/dL, total cholesterol less than 200 mg/dL, fasting triglycerides less than 150 mg/dL, blood pressure less than 120/80 mmHg, and BMI less than 25 kg/m^2, criteria established from the Official Mexican Standard NOM-015-SSA2-201850.

According to the result of the equation, the clinical impact was classified as:

• High clinical impact: When the index was greater than 80%.

• Moderate clinical impact: When the index was between 60–80%.

• Low clinical impact: When the index was less than 60%.

To measure the humanistic impact, the number of patients who stated satisfaction during the survey was recorded, and the impact was calculated by dividing this number by the total number of patients who received the service, multiplying the result by one hundred.

According to the result of the equation, the humanistic impact was classified as:

• High human impact: When the index was greater than 80%.

• Moderate human impact: When the index was between 60–80%.

• Low human impact: When the index was less than 60%.

Analytical studies

Key data on method validation must be provided and should typically include information on specificity, linearity, limit of detection, limit of quantification, accuracy, precision, intermediate precision, and some robustness studies. Information on the purity of reference compounds and on the methods used for the determination of purity must be given. Recoveries of extraction and sample pre-purification steps have to be indicated. Adequate statistical treatment of data is required. For more information regarding validation issues, prospective authors should also refer to ICH guidelines.

Statistical analysis

Descriptive statistics were performed for all the variables. Categorical qualitative variables were determined by estimating proportions and quantitative ones by estimating the mean and standard deviation (SD), both with their corresponding 95% confidence intervals.

For the bivariate analysis, the following statistical tests were used:

a) Comparison of means using the Student's t-test for the variables weight, BMI, glucose, cholesterol, triglycerides, and blood pressure, after checking the normality of the data.

b) The MCNemar test was used for paired categorical variables (adherence, behavior, and attitude)

c) The Wilcoxon test for non-dichotomous paired quantitative variables (knowledge)

d) The *Chi*^{2} test is used to analyze stratification by categories, age, gender, type of diabetes, personal pathological history, and time of evolution of the illness.

RESULTS

During the study period, 53 outpatients with diabetes were treated at a Comprehensive Pharmaceutical Care Polyclinic and received the HE services by the pharmacist. The following results were obtained:

Fig. 1 represents the educational needs identified in the sample. The conservation of medications and ignorance about drug interactions were the educational needs that were present in 100% of the study sample, followed by changes in lifestyle and diet (85.7%).

The educational program defined 14 interventions with a duration of 1 hour, adjusted to the characteristics of the participants (age, sex, educational level, socioeconomic level, interests, and motivation), as well as their knowledge, beliefs, values, abilities, and behaviors.

To fulfill the first moment of HE, the educational talks were selected; for the second and third moments, the video debate, the narration of anecdotes, the dramatization, the role-play, the group discussion, and the brainstorming were chosen.

It was determined that the discussion method, the problem method, and the situation method should be used in the different educational sessions to promote the exchange of experiences, the confrontation of beliefs, stimulation, and motivation. Active participatory techniques were established to evaluate, provide feedback, and consolidate knowledge imparted in each session. The most used techniques were alphabet soup, graffiti or wall of shame, questioning balls, stars, the best and the worst, and faces.

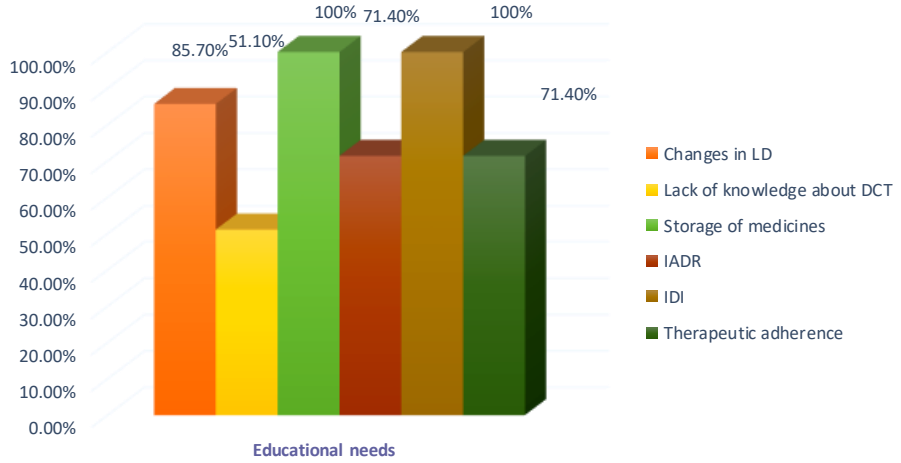

Figure 1. Educational needs identified in the sample.

Data were taken from the interview, the knowledge test, the adherence test, and the metabolic control. LD: lifestyle and diet, DCT: disease control tests, IADR: ignorance about adverse drug reactions, IDI: ignorance of drug interactions.

Table 1. Behavior of knowledge, attitude, and behavior.

Progress knowledge/behavior/attitude	Before the intervention (baseline)		After the intervention (14 months)	
	Number	%	Number	%
Conduct*				
Positive	21	39.6[a]	48	**90.5**[b]
Negative	32	**60.4**[a]	5	9.4[b]
Attitude*				
Positive	23	43.4[a]	48	90.5
Negative	30	**56.6**[a]	5	9.4[b]
Knowledge**				
Don't know	1	1.9[a]	0	0[b]
Bit	31	**58.5**[a]	3	5.7[b]
Good	20	37.8[a]	8	15[b]
Very well	1	1.9[a]	42	**79.3**[b]

Data were taken from the knowledge test, and the rubrics applied. *McNemar's, and **Wilcoxon signed-rank test. Different letters indicate significant differences for p≤0.05.

The educational program was implemented step by step following the established schedule. As can be seen in Table 1, at the beginning of the intervention, negative behavior and attitude prevailed in the sample (60.4% and 56.6%, respectively), and little knowledge about the disease and treatment (58.5%). However, at the end of the intervention, 90.5% had a positive behavior and attitude, and 79.3% knew the disease and treatment very well, with significant results from the statistical point of view for p≤0.05.

Regarding medication adherence, before the intervention, 62.2% of the patients were not adherent to their treatment; however, after 14 months of implementing the educational program, 90.5% of the sample were adherent to their treatment, and only 9.4% were not, a significant result for p≤0.05 (Fig. 2).

The results of metabolic control are represented in Table 2. After 12 months of educational interventions, patients achieved a statistically significant reduction for p≤0.05 in body weight, blood pressure, as well as glucose, cholesterol, and triglyceride levels, compared to the figures obtained before the interventions.

The educational interventions carried out generated an overall clinical impact of 89.2% because, at the end of the study, 90.6% of the patients had a positive attitude and behavior, 94.3% showed a high level of

knowledge, 90.6% were adherent to the treatment, and 81.1% achieved adequate metabolic control. Therefore, the clinical impact of the HE services implemented was high since the value achieved was above 80%.

Regarding the humanistic impact, Table 3 shows the results of the satisfaction survey. Patients agreed with the assertions that 1) the service allowed them to know better about the medications they used, 2) they learned about the need to comply with the treatment prescribed by the doctor, and 3) they acquired knowledge related to the disease they suffer from; resulting on the satisfaction of the patients with the service at 96.2%, therefore the humanistic impact of the HE service implemented was high since the value reached was above 80%.

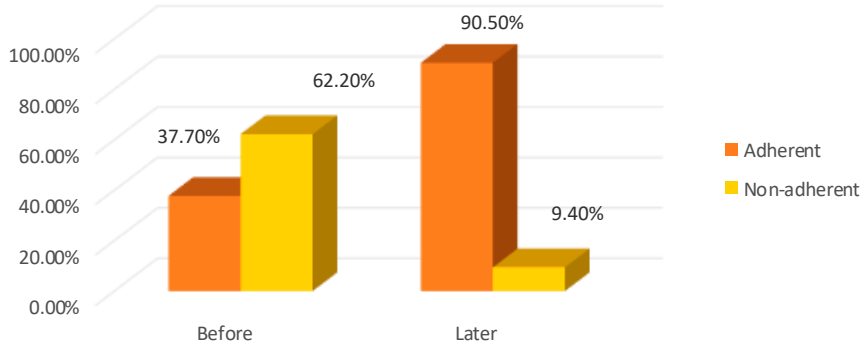

Figure 2. Therapeutic adherence before and after the intervention.
Data were taken from the therapeutic adherence test.

Table 2. Behavior of metabolic control indicators in the sample.

Metabolic control indicators	Before the intervention (baseline)		After the intervention (14 months)	
	Mean	SD	Mean	SD
BMI (Overweight BMI >25)	28.4[a]	5.2	27.3[b]	4.7
Blood pressure (Normal: Less than 120/80 mm Hg)				
Systolic	137.9[a]	27.2	127.7[b]	23.4
Diastolic	85.7[a]	10.7	79.4[b]	6.0
Glucose (Elevated >110 mg/dL)	155.6[a]	62.6	120.6[b]	15.8
Cholesterol (Elevated >200 mg/dL)	161.5[a]	47.0	152.5[b]	37.3
Triglycerides (Elevated >150 mg/dL)	182.0[a]	101.1	167.7[b]	88.9

Data taken from the data collection form. Hypothesis test for mean by T students. Different letters indicate significant differences for p≤0.05. BMI: body mass index. SD: standard deviation.

Table 3. Patient responses to the satisfaction survey.

Assertion	SD	D	NAND	A	TA
Learn more about the medications you use	-	2	-	10	**41**
Learn about the need to adhere to prescribed by the doctor.	-	1	2	2	**48**
Acquire knowledge related to the disease you suffer from.	-	-	3	2	**48**
Satisfaction with the service	Not satisfied: 2		**Satisfied: 51**		

SD: strongly disagree, D: disagree, NAND: neither agree nor disagree, A: agree, TA: totally agree.

DISCUSSION

This study has allowed us to better understand the educational needs of patients with diabetes in order to design targeted interventions with a high clinical and humanistic impact.

Lack of knowledge about drug interactions and keeping and storage of medications were the educational needs present in all the samples. However, in the reviewed literature, it is stated that Health Education programs aimed at patients with diabetes address issues related to the disease, treatment, and its alternatives, nutritional management, physical activity, personal strategies to cope with stress, how to measure blood glucose and how to prevent and treat chronic complications (Peyrot, 2013).

Duran et al. (2001) raised the importance of addressing the adverse reactions and interactions produced by the medications taken by patients with diabetes so that they can use them properly and adhere to their treatment.

The lack of knowledge about the keeping and storage of medicines was an educational need present in all the patients in the sample, a result similar to that obtained by Salmeron et al. (2015). In this sense, it is important to highlight that the sale of medicines in Mexico does not always include a prospectus, so this result is closely related to the Mexican reality and that of some other countries were not reading the prospectus, the technical language used in them and the lack of information about the drug in the dispensing process are identified as causes of inadequate medication storage by patients (Oenning et al., 2011).

These findings are similar to those referred to in other studies, which affirm the non-adherence to the pharmacological and non-pharmacological treatments of less than 30% of diagnosed diabetic patients since they have difficulties in understanding and incorporating the information they receive into their daily activities (Mohamed and Huassain, 2018).

The interventions that made up the strategy were designed based on several elements referred to in the literature on health education (such as the continuity of individual and group sessions, the design modeled on the educational needs identified in patients, and the use of participatory methods and techniques, depending on the objectives and characteristics of the people to be educated. In this way, they will be able to become protagonists and develop skills to make decisions and generate health (Eissen et al., 2017).

Armengol and Losada (2010) insist on the need to structure educational interventions according to the age and characteristics of the participants to achieve behavioral changes. Crook et al. (2019) conducted a study that allowed them to conclude the need to support educational interventions in pedagogical models that allow the patient to think and decide about her behavior regarding her health needs with the help of the educator.

The use of participatory methods and techniques in educational interventions was vital to obtain positive health outcomes. The literature highlights (Barceló et al., 2002; Riquelme, 2022) that learning is not achieved solely by giving advice/information and/or having group talks. A training program is required that guarantees active participation, promotes rational thinking, and develops skills for conscious decision-making and autonomy to adopt healthy behaviors (Barceló et al., 2002).

The rubrics used to measure the patient's attitude and behavior constituted a valuable tool to evaluate the changes experienced by patients during the interventions, and in turn, served as a guide to regulate learning and provide feedback in each educational activity (Wuyts et al. (2021).

The theoretical model of personal development and social skills, as well as the model that supports health-related behavior change (transtheoretical behavioral model) (Prochaska et al., 1994), used to design the intervention strategy, allowed the selection of educational interventions to promote behavioral changes and prevent relapses, in order to ensure that the patient with diabetes has the ability to reach the self-sustaining stage as proposed by Prochaska et al. (1994).

The implementation of the strategy determined the clinical and humanistic impact achieved. Patients evaluated the performance of pharmaceutical professionals through satisfaction surveys. In all the responses, it was recorded that the systematics, the time dedicated, the good treatment, the level of preparation, and the ethics of these professionals could favorably affect the change in behavior, the acceptance of the disease, and effective and safe care use of medications by patients.

The observed metabolic control of 81.1% of the participants could be an indicator of the positive impact that the pharmacist's attention has on the health results obtained.

It is recommended that hemoglobin A1c be included within the metabolic control parameters and, as a measure of humanistic impact, health-related quality of life (HRQoL).

In this sense, the WHO considers that HE is a fundamental part of the treatment of diabetes and an effective way to control the disease and prevent its complications (Organización Mundial de la Salud,

1991). Heine et al. (2021) noted that there is compelling evidence for patients with diabetes that health literacy interventions are effective in promoting knowledge, attitude, and behavior about the disease.

CONCLUSION

The strategy implemented for the metabolic control of the outpatient with diabetes had a high clinical and humanistic impact. Interventions based on the educational needs of patients with diabetes and that use the theoretical model of personal development and social skills, as well as the transtheoretical model of behavior, have proven to be valuable tools for the patient's metabolic control and can be extrapolated to patients with other chronic diseases treated at the first level of health care, so it is reproducible in any country to reduce the morbidity and mortality associated with diabetes mellitus and other chronic diseases.

The process and results indicators used allowed us to demonstrate the impact of the strategy. The methodology used to measure impact is a valuable instrument for improving the quality of care provided by health professionals.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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Concepts or ideas	x	x	x						x	x
Design		x		x			x			x
Definition of intellectual content		x	x					x	x	x
Literature search	x		x		x	x	x	x	x	x
Experimental studies	x									x
Data acquisition	x									x
Data analysis	x	x	x	x	x	x	x	x	x	x
Statistical analysis				x			x			
Manuscript preparation	x									
Manuscript editing		x								x
Manuscript review	x	x	x	x	x	x	x	x	x	

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Supplementary data

Appendix 1. Design of the educational program.

No.	Activity	Educational Objective	Contents	Human and material resources	Date and duration	Methods and Techniques	Grouping	Evaluation
4	Educational chat	Provide information on healthy eating habits	Healthy eating The plate of good eating	1 pharmacist Board Projector Healthy Eating Flyer	11/17/2020 1 hour	**Problem method:** Heuristic conversation **The technique or experiential dynamics:** Of animation lesson basketball	G15	The stars
5	Narration of anecdotes	Exchange experiences about eating habits	Healthy eating habits	1 pharmacist	12/17/2020 1 hour	**Situations method:** Incidents **Techniques or dynamics of analysis and deepening:** Association chain	G5	The best and the worst
6	Roleplay	Identify healthy and unhealthy eating habits	Healthy and unhealthy eating habits	2 pharmacists Table with healthy and unhealthy dishes	01/17/2021 1 hour	**Situations method:** Roleplay Techniques of expression, communication, and improvement of interpersonal **Relationships:** agree and disagree	G15	The graffiti or wall of shame
7	Dramatization	Demonstrate how to prepare healthy foods	Recipes to prepare healthy food	1 pharmacist 1 nutritionist A booklet with recipes to prepare healthy food Ingredients to prepare the recipes	02/17/2021 1 hour	**Situations method:** Simulation **Scan technique:** Learning in pairs	G15	Questioning ball
8	Brainstorm	Check the knowledge acquired about healthy eating habits	Healthy eating habits Personal control plan	1 pharmacist 1 nutritionist Board Flipchart Felt pens	03/17/2021 2 hours	**Discussion method:** Small group discussion **Creativity technique:** Brainstorming	G5	The faces
9	Educational chat	Provide information on the possible adverse reactions and drug interactions of each drug used by the patient	Adverse reactions and drug interactions	1 pharmacist Board Projector Bulletin on adverse reactions and drug interactions consumed by the patient	04/17/2021 1 hour	**Problem method:** Problematic Exposure **The technique of expression, communication, and improvement of interpersonal relationships** Head-to-head game (patient-pharmacist)	G15	The stars

Appendix 1. Design of the educational program (continued...)

No.	Activity	Educational Objective	Contents	Human and material resources	Date and duration	Methods and Techniques	Grouping	Evaluation
10	Narration of anecdotes	Exchange experiences on adverse reactions and interactions with medications consumed	Benefits and Risks of Medications	1 pharmacist	05/17/2021 1 hour	**Situations method:** Cases and incidents **Scan technique:** Exploration of ideas. **Creativity technique:** Bonus Technique Basic Priorities	G15	The best and the worst
11	Video discussion G5 The faces	Discuss how to avoid adverse reactions and interactions between medications used to treat diabetes and associated diseases	Adverse reactions and drug interactions are avoidable	1 pharmacist Board Projector	06/17/2021 1 hour	**Discussion method:** Small group discussion **Techniques or dynamics of analysis and deepening:** Association chain	G5	The faces
12	Educational chat	Provide information on the storage of medicines	The storage of medicines	1 pharmacist Board Projector	07/17/2021 1 hour	**Problem method:** Problematic exposure **The technique or experiential dynamics:** Of animation The boat is sinking	G15	Questionnaire
13	Agree and disagree	Discuss with patients the importance of complying with non-pharmacological and pharmacological treatment	The importance of adherence to non-pharmacological and pharmacological treatment	1 pharmacist Board Flipchart Felt pens	08/17/2021 1 hour	**Situations method:** Simulation **Creativity technique:** Bonus Technique Technique Consequences and sequels (C and S)	G15	The graffiti or wall of shame
14	Roleplay	Integrate the knowledge acquired in the solution of situations of the practical life of the diabetic	I know how to live with diabetes	1 pharmacist Board flipchart Felt pens	09/17/2021 1 hour	Discussion method: Small group discussion Creativity technique: Brainstorming	G5	The best and the worst

Appendix 2. Attitude and behavior rubrics.

ATTITUDE AND BEHAVIOR RUBRICS

Name: _____ Date: _____

CRITERIA	EXCELLENT	GOOD	FAIR	BAD	POINTS EARNED
Assistance	**(2)** Attend all sessions	**(1.5)** Attend 1 or 2 educational sessions due to personal situations and communicates it.	**(1.0)** Attend 6 educational sessions and do not communicate why or only communicate it on some occasions.	**(0)** Attend less than 6 sessions, and do not always communicate the reason for their absence.	
Participation	**(2)** Participate actively and enthusiastically, and discuss your doubts and concerns.	**(1.5)** Participate passively and unenthusiastically, comment on some doubts and concerns.	**(1.0)** Participate little, do not show enthusiasm and do not comment on doubts or concerns.	**(0)** Does not participate is apathetic.	
Cooperation	**(1)** Cooperate with the group in the activities that are carried out.	**(0.5)** Cooperate with some activities that are carried out.	**(0.25)** Only cooperate in an activity carried out by the group.	**(0)** Does not cooperate in any activity carried out by the group.	
Motivation	**(1)** Shows interest in the topic being addressed and is attentive throughout the session.	**(0.5)** Shows interest in the topic being addressed, but gets distracted once or twice during the entire session.	**(0.25)** Shows interest in the subject, but gets distracted more than twice.	**(0)** Shows no interest, and is distracted throughout the session.	
Comprehension	**(1)** Answer all the questions that are asked once the educational session is over.	**(0.5)** Only fails to answer 1 or 2 questions of those asked at the end of the educational session.	**(0.25)** Only answer 1 or 2 questions from those asked at the end of the educational session.	**(0)** Do not answer any of the questions asked at the end of the educational session.	
Change of lifestyles	**(2)** The patient shows weight loss, metabolic control of his disease, changes in his diet, and performs physical exercises.	**(1.5)** The patient manifests 3 evidence of changes in his lifestyle, of those mentioned above.	**(1.0)** The patient manifests 2 evidence of changes in her lifestyle, of those mentioned above.	**(0)** The patient does not manifest any evidence of changes in her lifestyle, of those mentioned above.	
Compliance with your treatment and guidance received	**(1)** The patient complies with his treatment and the guidelines received.	**(0.5)** The patient complies with his treatment and with some of the guidelines received.	**(0.25)** The patient complies with his treatment and with at least one of the guidelines received.	**(0)** The patient does not comply with his treatment, nor with the guidelines received.	
Total points					

Assessor: _____

Signature: _____

Appendix 3. Indicators and mathematical equation to measure clinical and humanistic impact.

Indicator	Mathematical equation
PPAB: Percentage of patients who showed a positive attitude and behavior with respect to the total number of patients.	$PPAB = \frac{NPABHI}{TPHES} \times 100$ NPABHI: Total number of patients with positive attitude and behavior during health interventions. TPHES: Total number of patients who received the Health Education Service.
PHK: Percentage of patients with a high level of knowledge after the health intervention.	$PHK = \frac{NPK3 + NPK4}{TPHES} \times 100$ NPK3: Number of patients with knowledge level 3. NPK4: Number of patients with knowledge level 4. TPHES: Total number of patients who received the Health Education Service.
PAAHI: Percentage of adherent patients or those that adhere to the treatment after the health intervention.	$PAAHI = \frac{NPA}{TPES} \times 100$ NPA: Number of adherent patients TPHES: Total number of patients who received the Health Education Service.
PAMC: Percentage of patients with adequate metabolic control after the health intervention.	$PAMC = \frac{NPAMC}{TPHES} \times 100$ NPAMC: number of patients with adequate metabolic control. TPHES: Total number of patients who received the Health Education Service.
CIHES: Clinical impact of the Health Education Service.	$CIHES = \frac{PPAB + PHK + PAAHI + PAMC}{4}$ 4: Total indicators evaluated.
HIHES: Humanistic impact of the Health Education Service.	$HIHES = \frac{TSP}{TPHES} \times 100$ TSP: total number of satisfied patients TPHES: Total number of patients who received the Health Education Service.