



## Effectiveness of clinical follow-up by telemonitoring for beneficiaries with chronic diseases in supplementary health

*Efetividade do gerenciamento clínico por telemonitoramento para beneficiários com doenças crônicas na saúde suplementar*

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### ABSTRACT

To verify the effectiveness of clinical follow-up by telemonitoring of beneficiaries with chronic diseases in supplementary health. Quasi-experimental study, from 2019, with beneficiaries of a medium-sized health plan operator in Paraná, state of Paraná. The only non-randomized group had 109 adults, independent for basic activities and who participated in this educational intervention, to support self-management, by monthly phone calls, coordinated by a nurse, for 12 months. Behavioral and clinical indicators were extracted from electronic medical records and compared using McNemar, Wilcoxon and paired t-tests. In the beginning, participants with healthy eating habits predominated. After the intervention, the occurrence of sufficient physical activity increased by 46.3% ( $p=0.690$ ) and the consumption of alcoholic beverages decreased by 78.0% ( $p=0.000$ ) and by 1.4% ( $p=0.005$ ), the body mass index. Such changes in the studied indicators suggest the effectiveness of clinical follow-up by telemonitoring in stimulating and maintaining healthy habits.

**Keyword:** Effectiveness. Health education. Self-management. Supplemental health. Program evaluation.

### RESUMO

Verificar a efetividade do gerenciamento clínico por telemonitoramento de beneficiários com doenças crônicas da saúde suplementar. Estudo quase-experimental, de 2019, com beneficiários de operadora de plano de saúde, de médio porte, do Paraná-PR. O único grupo não aleatorizado contou com 109 adultos, independentes para as atividades básicas e que participaram desta intervenção educativa, de suporte à autogestão, por telefonemas mensais, coordenada por enfermeiro, durante 12 meses. Os indicadores comportamentais e clínicos foram extraídos do prontuário eletrônico e comparados pelos testes de McNemar, Wilcoxon e T pareado. No início, predominaram participantes com hábitos alimentares saudáveis. Após a intervenção, aumentou em 46,3% ( $p=0,690$ ) a ocorrência de atividade física suficiente e diminuiu em 78,0% ( $p=0,000$ ) o consumo de bebida alcóolica, e em 1,4% ( $p=0,005$ ) o índice de massa corporal. Tais mudanças nos indicadores estudados sugerem a efetividade do gerenciamento clínico por telemonitoramento em estimular e manter hábitos saudáveis.

**Palavras-chave:** Autogestão. Avaliação de programas e projetos de saúde. Educação em saúde. Efetividade. Saúde suplementar.

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## INTRODUCTION

Worldwide, neoplasms, diabetes mellitus (DM), cardiovascular and respiratory diseases are the main chronic non-communicable diseases (NCDs). They challenge health systems, are disabling, lethal and influenced by modifiable behaviors, particularly among inactive and obese people, who want to be healthy but only achieve trivial changes in their lifestyle<sup>1-3</sup>.

In addition to compromising the quality of life of populations and the economy of countries, NCDs represent more than 70% health costs<sup>4</sup>. These costs tend to increase with population aging and can be amortized with the development of interventions to support self-management for people with NCDs through remote follow-up, such as telemonitoring<sup>5</sup>.

In turn, telemonitoring comprises the remote interaction between health professionals and people with NCDs, through a phone call or video call, for the exchange of clinical and behavioral data, identification of problems, clinical decision-making, discussion of therapeutic plans, education and training for self-management<sup>5</sup>.

As traditional medical care, focused on the disease and not on the needs of the person with NCDs, is costly and ineffective, education for self-management, based on collaborative care to overcome it, is recommended. Thus, the partnership between health professionals

and people with NCDs will favor the adoption and maintenance of healthy behaviors, capable of halting the progression of the disease, improving the quality of life and reducing the use of health services<sup>6</sup>.

On the other hand, new and diversified educational interventions to help self-management, with individual approach, by phone or other information and communication technologies (ICT), have a low cost and positive impact on social life and on the physiological, psychological and behavioral conditions of adults with NCDs, and research is required on their effectiveness in changing health behavior in the long term<sup>7</sup>.

When compared to traditional medical care, health promotion interventions for people with NCDs, with and without the use of ICT, were superior in promoting knowledge, attitudes and adherence to treatment, but there is a lack of research to explain their long-term effects on the clinical and behavioral results of these people, which motivated this study<sup>7-9</sup>.

Educational interventions to aid self-management comprise educational actions carried out by individual health professionals to motivate people with NCDs to adopt or sustain healthy behaviors<sup>7</sup>. As they can improve health and prevent or delay complications<sup>9,10</sup>, the aim of this study was to check the effectiveness of clinical follow-up by telemonitoring of

beneficiaries with chronic diseases in supplementary health.

## METHODS

This study was part of a larger research, approved by the Research Ethics Committee of the State University of Londrina, state of Paraná, Opinion 3.107.455 as of 07/01/2019, which evaluated the clinical follow-up by telemonitoring for people with arterial systemic hypertension (ASH) and DM of a Health Plan Operator (HPO), respecting all ethical procedures for national research involving human beings.

In the second half of 2019, this study was carried out, with a quasi-experimental design, single-group, non-randomized, based on the initial analysis and subsequent to an educational intervention. This methodology has been used in the analysis of programs and interventions that are underway to analyze whether their implementation corresponds to what was planned, as well as whether the intended objectives are being achieved<sup>11</sup>.

The clinical follow-up by telemonitoring for beneficiaries with NCDs studied was implemented in an HPO, located in the Central-South region of the state of Paraná, in the healthcare cooperative modality, responsible for approximately 30 thousand beneficiaries of health care plans, when 5.6% of them were classified as chronically ill.

Traditionally, beneficiaries with NCDs of the HPO in question performed consultations, with the cooperating physicians, and complementary exams, in the health services of the provider network, according to their free choice. As of December 2017, HPO started to offer, for up to 200 beneficiaries with NCDs, at low and medium clinical risk, clinical follow-up by telemonitoring.

This clinical follow-up by telemonitoring comprised an educational intervention to aid self-management of the disease, complementary to the usual medical follow-up, based on the Transtheoretical Model of behavior change and developed by professionals from the multidisciplinary health team and led by a nurse, by individual approach and phone call<sup>12</sup>.

Beneficiaries with NCDs could apply for clinical follow-up by telemonitoring, be referred by their treating physician, or invited by the HPO. After the presentation of the educational intervention and declaration of spontaneous and free adhesion of the beneficiaries, they started to receive a monthly phone call, previously scheduled and recorded, from one of the professionals of the health team, according to the schedule of twelve actions and procedures filed and registered in an electronic medical record.

The first and last phone call was performed by the nursing technician to obtain self-reported clinical data. Subsequently, the nurse checked whether the clinical risk was low or medium,

according to pre-established criteria in the protocol, and verified the readiness and stage of behavioral change of beneficiaries with NCDs. Then, the nursing technician guided them or clarified doubts about the self-measurement of capillary blood glucose or blood pressure with the digital device, the nurse agreed, supported and monitored the self-management goals and, along with the nutritionist and physiotherapist, advised them on the adoption of healthy lifestyle habits<sup>13</sup>.

The single study group consisted of all 109 beneficiaries who met the inclusion criteria: ASH and/or DM previously diagnosed by the attending physician; both sexes; age 18 years or older; independence for basic activities of daily living; 12 actions of the telemonitoring clinical follow-up protocol completed. Those whose self-reported behavioral and clinical indicators were not registered in the electronic medical record were excluded.

Sociodemographic data, readiness for behavioral change, motivational stage of behavior change, behavioral indicators, modifiable risk factors for NCDs and self-reported clinical indicators of beneficiaries of clinical follow-up by telemonitoring were the variables extracted from organized electronic medical records in a Microsoft Office Excel<sup>®</sup> spreadsheet, validated for the absence of inconsistencies by the double-entry technique and treated by the Statistical Package for Social Sciences<sup>®</sup> (SPSS) for Windows<sup>®</sup>, version 24.0.

Health indicators<sup>14</sup> (gender: male/female; age in years; education: 0-9, 10-12, 13 or more years of education; self-reported morbidity: ASH: yes/no, DM: yes/no, Concomitant ASH and DM: yes/no; multiple chronic diseases: yes/no; readiness for behavior change; motivational stage of behavior change) were the independent variables, described in relative frequency.

Readiness for behavior change indicates people's willingness to change their lifestyle<sup>15</sup> and was assessed by the question: What is your readiness to change your current lifestyle? The answers were rated as good (I recognize that my lifestyle is not healthy and I intend to change it); average (I recognize that my lifestyle is unhealthy and I don't intend to change it); bad (I don't recognize that my lifestyle is unhealthy and I don't intend to change it).

The motivational stage of behavior change, on the other hand, concerns both the moment in which the modification is the self-care support strategy to be used by health professionals<sup>15</sup>. It was evaluated by the question: What do you think about your current unhealthy habit?

The response options were based, respectively, on the five stages of the Transtheoretical Model of Behavioral Change (pre-contemplation, contemplation, preparation, action and maintenance): I don't think about changing this unhealthy habit; I'm thinking about changing this unhealthy habit, but I'm not quite sure about it yet; I decided to change this unhealthy habit and I don't know how

to do it; I have already started to change this unhealthy habit, but I have difficulties; I have already successfully implemented changing this habit.

The relative frequency of behavioral indicators and modifiable risk factors for self-reported NCDs was also described<sup>16</sup>: consumption of white meat six or less days a week or red meat for up to two days a week (adequate/inadequate); consumption of fruit, vegetables and vegetables five or more days a week (adequate/inadequate) and consumption of soft drinks less than five days a week (adequate/inadequate).

McNemar's test was applied to compare self-reported behavioral indicators, at the beginning and at the end of clinical follow-up, namely: sufficient physical activity: yes/no; tobacco use: yes/no; alcohol consumption: yes/no. These indicators are suggested for the evaluation of Latin American interventions for the prevention or reduction of risk factors for the main NCDs<sup>16</sup>.

The self-reported clinical indicators<sup>12</sup> were represented by the body mass index (BMI), in kg/m<sup>2</sup>; systolic

(SBP) and diastolic (DBP) blood pressure, in mmHg; glycemia (mg/dL), which were presented as median and interquartile range (IQR) (25th and 75th percentile) and compared by Wilcoxon test, due to non-normal distribution in the Kolmogorov-Smirnov test. Cholesterolemia values (mg/dL) were compared by the paired t-test and a significance level of  $p \leq 0.050$  was adopted for all statistical tests.

## RESULTS

Regarding the characteristics of participants under clinical follow-up by telemonitoring, women (67%) and beneficiaries who studied for less than 13 years (63.6%) prevailed. The mean age was 69 years, with a homogeneous variation between 26 and 88 years (Kolmogorov-Smirnov test: 0.20, IQR: 62.5-75.0).

The health indicators of the participants at the beginning of clinical follow-up by telemonitoring were listed in Table 1, highlighting the occurrence of healthy behaviors.

**Table 1.** Frequency of health indicators of participants under clinical follow-up by telemonitoring, Central-South Region of the State of Paraná, 2020

Health indicators	Frequency	
	Absolute (n)	Relative (%)
Self-reported morbidity		
Arterial hypertension	64	58.7
Diabetes mellitus	04	03.7
Hypertension and diabetes	41	37.6
Multimorbidity	59	54.1
High readiness for change	95	87.2
Active motivational stages	62	56.9
Healthy behaviors		
Enough physical activity	75	68.8
No smoking habit	107	98.2
Adequate consumption of meat	108	99.1
Adequate consumption of fruit and vegetables	105	96.3
Modifiable risk factors for chronic disease		
Alcohol consumption	95	87.2
Inappropriate consumption of soft drink	60	55.0
Overweight and obese	72	66.1

Note: N: number of times each health indicator was counted.

Source: Research data

After 12 months of clinical follow-up by telemonitoring, the percentage of participants who did not smoke was maintained (98.1%) while the prevalence of physically active individuals increased from 68.8% to 71.6%, but this increase was not statistically significant ( $p=0.690$ ).

Initially, 87.2% participants consumed alcohol, with 64.1% consuming it occasionally and 3.7% consuming it in excessive amounts. After 12 months of intervention, this behavior was maintained

by only 9.2% participants and this reduction was significant ( $p = 0.000$ ).

Regarding the clinical indicators of the participants, the median blood pressure, blood glucose and cholesterol levels, at the beginning and after clinical follow-up by telemonitoring, were close to the therapeutic goal. BMI was the only clinical indicator that showed a statistically significant reduction at the end of the studied intervention, see Table 2.

**Table 2.** Clinical indicators of participants under clinical follow-up by telemonitoring, at the beginning and at the end of this intervention, Central-South region of the state of Paraná, 2020

Clinical indicators	Start of intervention		End of intervention		Comparison test (p-value*)
	Median	IQR	Median	IQR	
<b>BMI</b>	27.8	(24.5 – 31.0)	27.4	(24.0 – 30.0)	<b>0.005**</b>
<b>SBP</b>	124.9	(120 – 130)	123.4	(120 – 130)	0.513**
<b>DBP</b>	77.3	(70 – 80)	77.5	(70 – 80)	0.888**
<b>Blood glucose</b>	103.6	(85 – 115)	103.3	(85 – 115)	0.888**
<b>Cholesterolemia</b>	172.9	(139 – 199.5)	172.1	(140 – 197.0)	0.793***

IQR: Interquartile range; BMI: body mass index; SBP: Systolic blood pressure; DBP: diastolic blood pressure  
 \* significance level of p-value  $\leq 0.050$ ; \*\* Wilcoxon Test; \*\*\* Paired t-test.  
 Source: Research data

To check whether any of the sociodemographic data (gender, age, education, readiness for behavior change and motivational stage of behavior change) was a predictor of BMI after 12 months under clinical follow-up by telemonitoring, a simple linear regression was used for each pair of variables, and none of them was statistically significant.

## DISCUSSION

The predominance of elderly women and beneficiaries with ASH and willing to adopt or maintain healthy behaviors in the studied population drew attention, as ASH and an unhealthy lifestyle are highly frequent among the elderly and predispose them to other health-compromising health problems<sup>17</sup>.

With a view to healthy aging, the control of NCDs and the prevention of deaths from NCDs, both the elderly population and public health policies claim that healthy eating, sufficient physical

activity and non-consumption of tobacco and alcohol are the priority healthy behaviors to be adopted by the elderly and encouraged by health professionals in all contacts with them<sup>18</sup>.

In order to take care of health, in addition to healthy behaviors, the elderly population also values self-management and clinical follow-up by telemonitoring is a promising strategy to increase their access to guidance on healthy habits and qualification of health education practices<sup>18,19</sup>.

In this perspective, it was observed that, upon entering clinical follow-up by telemonitoring, most participants adequately consumed meat, fruits, vegetables and legumes, did not consume tobacco, practiced enough physical activity, occasionally consumed alcoholic beverages and in non-abusive amounts, presented overweight, normal blood pressure values, glycemic value close to expected for fasting and desirable value for cholesterolemia.

A telephone survey with supplementary health beneficiaries found that the frequency of adequate consumption of fruits and vegetables was 29.4%, non-smoking was 92.1%, sufficient physical activity was 54.2%, non-abusive consumption of alcoholic beverages was 81.2%, and overweight was 53.7%<sup>16</sup>.

When compared to beneficiaries of the national supplemental health, the participants under clinical follow-up by telemonitoring had the highest frequencies of healthy habits. This represents the reach of the correct target audience, as people with NCDs, of low and medium complexity, are expected to have healthy habits and they are eligibility criteria for educational interventions, such as clinical follow-up by telemonitoring, which empower for self-management and support the maintenance of healthy lifestyles<sup>20</sup>.

Among the participants of a program of care to NCDs of an HPO in Curitiba, state of Paraná, ASH and dyslipidemia stood out among the risk factors, whereas among those of another HPO in Goiás, state of Goiás, stood out ASH, insufficient physical activity and dyslipidemia. For both, participation in these programs did not reduce hospital admissions, perhaps because, unlike this study, the beneficiaries of these HPOs had clinical complexity beyond that supported by clinical follow-up or because such programs were not effective in promoting healthy behaviors that stabilize the NCDs<sup>21</sup>.

While healthy behaviors were the focus of clinical follow-up by telemonitoring of this study, the control of DM, ASH, overweight and the encouragement of healthy eating were the main objectives of other interventions for prevention and health promotion for adults and elderly of the supplementary health, which argued that the availability of a lot of health information would produce self-management, quality of life and trustworthiness to HPO<sup>22</sup>.

It can be inferred that in supplementary health, biological interventions, centered on the disease and the prevention of risks, prevail, and that clinical follow-up by telemonitoring can consolidate health promotion if what is informed and prescribed by health professionals corresponds with the possibilities, beliefs, desires and interests of people with NCDs and provoke changes in behavior, autonomy and transformations in their way of living<sup>23</sup>.

It was also found that, after clinical follow-up by telemonitoring in question, beneficiaries with ASH and DM showed a significant reduction in alcohol consumption and BMI. Considering the average age of 69 years and the predominance of women among them, possibly both the decrease in alcohol intake and weight loss were influenced by a satisfactory family relationship, since this relationship was already significant among the elderly in a study held in Porto Alegre, state of Rio Grande do Sul<sup>24</sup>.

However, the drop in alcohol intake by participants in clinical follow-up by telemonitoring may also have been interfered with by some negative health condition and social determinants that refer this behavior to festive, sporting and cultural moments<sup>25</sup>.

Frequent vigilance and discouragement of these habits is recommended for people with NCDs, and the decrease in their frequency certainly favored the control of blood pressure, blood glucose and cholesterol levels among the participants in this study<sup>26,27</sup>.

Since self-efficacy corresponds to their training and motivation to perform important care, such as changing behavior, it can be said that the changes in the studied indicators point to the effectiveness of clinical follow-up by telemonitoring in providing self-efficacy to participants<sup>28</sup>.

The expected results of a care program for NCDs offered by an HPO in the state of São Paulo, were achieved, two years after its completion, were similar to those of this study and were expressed by the normalization of blood pressure by participants with ASH, reaching the goal blood glucose levels among those with DM and increased physical activity sufficient only by adults aged between 45 and 60 years<sup>29</sup>.

On the other hand, the beneficiaries of an HPO in the state of Minas Gerais, showed, after one year of participation in a follow-up program for NCDs, an improvement in their quality of life, specifically in social aspects; mental health

and pain, considering the effectiveness of follow-up by the multidisciplinary health team in the control and evolution of the disease<sup>30</sup>.

In the period from 2008 to 2013, the number of Brazilians who had three or more healthy behaviors grew and this was justified by the success of intersectoral public policies in promoting smoking cessation, the practice of sufficient physical activity and the regular consumption of fruit and vegetables, with the non-abusive consumption of alcohol being maintained in this period<sup>31</sup>.

Producing and promoting health are social and health needs, legitimized by public policies and that can be answered with the implementation of clinical follow-up by telemonitoring, which has been shown to be effective in facilitating the adoption and maintenance of healthy behaviors.

Clinical follow-up by telemonitoring was developed in the scope of supplementary health, by professionals from the multidisciplinary team, free from regulatory constraints for its application, and could be applied in the Unified Health Service (SUS), where publications on the use of telemonitoring and its expansion initiatives and the prevention of complications and the control of people with NCDs in primary health care stand out<sup>32</sup>.

The diversity of educational interventions for self-management and the scarcity of publications on clinical management by remote follow-up in

supplementary health limited the discussions in this study, as well as the use of self-reported data and the lack of information about the way of life of participants and how they take care of their health compromised the understanding of the observed behavior changes, which can be further explored.

The duration of NCDs and the use of medications were considered confounding variables and were not considered in the analysis of the effect of clinical follow-up by telemonitoring on unhealthy habits, as the duration of the educational intervention could be explored in the future.

## CONCLUSION

Changes observed in the behavior, physical activity and alcohol consumption, and clinical indicators, represented by the body mass index, of beneficiaries with NCDs, indicated the effectiveness of clinical follow-up by telemonitoring, that is, the reach of its purpose of intervening in the social determinants of NCDs and the production of positive effects on people's health status, with support for the adoption or maintenance of healthy habits, in real conditions of the supplementary health system.

As expected, the educational actions carried out by the multidisciplinary health team of clinical follow-up by telemonitoring helped beneficiaries with low and medium clinical risk to identify behaviors to be changed, make healthy

choices and overcome the challenges of managing chronic disease. They are a lightweight and low-cost technology that is feasible for changing the desired health care model, by the SUS and by supplementary health.

Our findings may may guide decision-making by managers about the macro- and micro-political processes of care production for people with NCDs and the future of clinical follow-up by telemonitoring, regarding its expansion or reproduction in other health systems, in addition to arouse the interest of researchers about the factors that contributed to the observed results, the perspectives of the participants and professionals of the multidisciplinary health team who carry out clinical follow-up by telemonitoring and the political and social processes that favor the healthy lifestyle of elderly women in supplementary health.

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