Efficacy of telephone support as a tool for promoting daily physical activity in type 2 diabetic patients

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Abstract

Background: Type 2 diabetes mellitus (T2DM) is a highly prevalent public health problem. Although there is strong evidence supporting the essential role of physical activity in the management of T2DM, the prescription of physical activity has limited success in promoting changes in behavior. The purpose of the present study was to evaluate the impact of phone call support, over the course of five weeks, as an incentive to promote walking in type 2 diabetic patients with poor glycemic control.

Methods: A total of 54 type 2 diabetic patients with poor glycemic control (HbA1c ≥8%) were enrolled in a randomized controlled clinical trial that was conducted at an outpatient clinic. The intervention patients received one telephone call per week for 5 weeks to encourage activity in the form of walking. Control patients did not receive phone calls. The number of steps each subject took was recorded weekly using pedometers.

Results: Intervention group there was a significant increase in the number of steps per week between the first and last week compared to the control group (P<0.001). The absolute risk reduction was 75%, and it was necessary to provide phone call support for only three patients to obtain an increase in the number of the steps between the first and the last week of the study (NNT=3.0).

Conclusions: Our results suggest that the telephone call, a high cost-benefit approach, may be an efficient intervention for promoting physical activity improvement in type 2 diabetic patients with poor glycemic control.

Keywords: Pedometer, diabetes mellitus, physical activity, phone call support

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as hypertension and/or dyslipidemia) were enrolled in a randomized controlled clinical trial that was conducted in the outpatient clinic of a tertiary university hospital in São Paulo, Brazil. The study was approved by the Ethics Committee of the Medical School at the University of São Paulo. The protocol was written according to Declaration of Helsinki and followed the guidelines for Good Clinical Practice (GCP) [15].

Subjects who received a T2DM diagnosis by the Clinical Hospital–Faculty of Medicine of the University São Paulo at least 1 year prior to the study and who accepted the participation offer and signed the written informed consent were included in the study. All subjects had to have a phone number to receive phone contacts from researchers and had to agree to use a pedometer for 6 weeks. In addition, all subjects had to be capable of recording their number of steps taken per day.

Study subjects who did not agree to sign the written informed consent, were unable to answer the questionnaire, did not have a phone number, did not agree to use the pedometer for 6 weeks and who were unable to record their number of steps taken per day in a notebook were excluded.

All enrolled patients were introduced to the importance of performing physical activity and maintaining glycemic control. They were treated for diabetes according to the accepted international guidelines (oral therapies included sulfonylureas (n=29), metformin (n=29), insulin (n=29) and statins (n=29)). Medications and dosages were not changed as hypertension, dyslipidemia and osteoarthrosis (without as depression symptoms, personality profiles and quality of life measures. The parametric quantitative variables were described by their mean, standard error and t test. Non-parametric data were described using medians (25%-75% percentiles) and the Kruskal-Wallis test. The relative and absolute risks and the number needed to treat (NNT) were determined considering the response to the telephone call as incentive to increasing of the number of steps taken as defined event. A P value <0.05 was considered significant.

Results

Fifty-four patients were enrolled in the study (20 IG and 35 CG). Of these patients, 48 completed the study (19 IG subjects and 29 CG subjects). Six patients (one IG subjects and five CG subjects) were excluded due to difficulties concerning their use of the pedometers or their recording of information in the patient diary.

There were no significant differences in either the total scores in each domain of the FACIT questionnaire for assessing quality of life, the IPAQ questionnaire for assessing activity level, Prochaska’s transtheoretical model for changes in behavior and socioeconomic status (P>0.05 for all comparisons).

Several confounding factors were also analyzed. Data obtained with the Prime MD questionnaire showed that there were no differences in the mean scores for depression symptoms (mean±EP: CG: 4.4±0.6; IG: 4.5±0.7). There were no differences in personality profiles between the groups among the different domains.

At baseline, there were no significant differences between
the groups for clinical, anthropometric and socio-demographic data (P>0.05) (Table 1). The mean age±SE was: 58.8±1.6 years old. Twenty-one subjects were men (60.7±2.9 years old) and 33 were women (57.8±1.8 years old).

In the intervention group there was a significant increase in the number of steps per week between the first and last week compared to the control group (P<0.001) (Table 2). The absolute risk reduction was 75%, and it was necessary to provide phone call support for only three patients to obtain an increase in the number of the steps between the first and the last week of the study (NNT=3.0).

Discussion

In the present study, we showed that phone call support showed an absolute risk reduction of 75%. In addition, it was necessary to make weekly phone calls during the 5 weeks for just three patients to obtain one positive response concerning the increase of the number of steps in the last week. There were no differences in the baseline values of all clinical, socio-demographic and anthropometric factors between the groups as well as for other possible interfering variables that could modify the response to the stimuli for improving walking activity.

It is already known that in short term interventions; the use of pedometers during physical training improves physical activity levels [22]. However, due to the need for low-cost strategies, the focus of the present study was on the analysis of the effectiveness of phone call support in enhancing physical activity levels. Despite the poor glycemic control among the patients in our study, we found a significant improvement of walking activity among the patients who received support through phone calls. In addition, this positive result was obtained even without the involvement of a trained professional.

Considering possible strategies for improving physical activity, Green et al., (2002) evaluated phone call support in patients receiving primary care. However, type 1 or type 2 diabetic patients with cardiovascular complications were excluded from the study. The authors suggested that this intervention was adequate to increase the level of physical activity [23].

More recently, Goodarzi et al., (2012) verified the impact of the use of short message service (SMS) via mobile phone for the maintenance of adequate levels of blood glucose, lipids, creatinine and HbA1C of T2DM patients. The authors found that SMS via mobile phone was also an effective intervention for this type of population [24].

The current study identified a significant increase in number of steps in the intervention group. Considering this results, we showed that the use of the pedometer and verbal stimuli by phone calls were effective in increasing the number of steps and, therefore, physical activity. The physical activity has been the mode traditionally prescribed for diabetes prevention and management. It is known that the increment of the number of steps per day is a good target to use in interventions aiming increase of physical activity [25]. Only one week of aerobic training can improve whole-body insulin sensitivity in individuals.

Table 1. Metabolic and anthropometric variables of 54 type 2 diabetes mellitus subjects.

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<th>Control group</th>
<th>Intervention group</th>
<th>P value</th>
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<tbody>
<tr>
<td>Age-mean±SE</td>
<td>58.8±1.56</td>
<td>53.4±1.6</td>
<td>0.27</td>
</tr>
<tr>
<td>BMI (kg/m²)-mean±SE</td>
<td>29.8±0.9</td>
<td>30.1±1.3</td>
<td>0.82</td>
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<tr>
<td>Waist circumference 90 cm-mean±SE</td>
<td>102.5±2.9</td>
<td>106.1±6.9</td>
<td>0.5</td>
</tr>
<tr>
<td>Waist circumference 80 cm - mean±SE</td>
<td>101.6±3.6</td>
<td>97.8±4.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Systolic arterial pressure (mmHg)-median (25%-75% percentile)</td>
<td>133 (120-141)</td>
<td>133 (121-150)</td>
<td>0.95</td>
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<tr>
<td>Diastolic arterial pressure (mmHg)-mean±SE</td>
<td>74.3±2.3</td>
<td>75.2±1.6</td>
<td>0.79</td>
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<td>LDL (mg/dL)-mean±SE</td>
<td>97.3±6.1</td>
<td>89.0±5.0</td>
<td>0.35</td>
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<td>HDL (mg/dL) - mean±SE</td>
<td>54.6±3.7</td>
<td>61.6±3.6</td>
<td>0.24</td>
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<tr>
<td>Triglycerides (mg/dl)-median (25%-75% percentile)</td>
<td>122.5 (93-174)</td>
<td>112 (70.7-153)</td>
<td>0.34</td>
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1BMI=body mass index  
1LDL=low density lipoprotein  
1HDL=high density lipoprotein

Table 2. Mean and median (25%-75%) step numbers from pedometers between the basal week and the final week.

<table>
<thead>
<tr>
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<th>Control group (n=29)</th>
<th>Intervention group (n=19)</th>
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<tr>
<td>Basal week median (25%-75% percentile)</td>
<td>4911.5 (3669.5-7255.0)</td>
<td>6184.2 (5035.1-9574.8)</td>
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<tr>
<td>Last week median (25%-75% percentile)</td>
<td>4343.5 (2755.0-6929.3)</td>
<td>8813.7 (6604.9-11113.5)</td>
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</table>
| Basal week vs last week median (% change) | -11.56 | 42.51 | <0.001
with T2DM [26]. Moderate and vigorous aerobic training improve insulin sensitivity [27], albeit for only a period of hours to days [28], but a lesser intensity may also improve insulin action to some degree [27]. Training can enhance the responsiveness of skeletal muscles to insulin with increased expression and/or activity of proteins involved in glucose metabolism and insulin signaling. Moderate training may increase glycogen synthase activity and GLUT4 protein expression but not insulin signaling [29]. Fat oxidation is also a key aspect of improved insulin action, and training increases lipid storage in muscles and fat oxidation capacity [30].

It has also been previously shown that walking 2000 steps more than usual can prevent gradual weight gain [31]. Based on the multiple benefits between weight loss and T2DM, including prevention of cardiovascular events, reduction of the use of medications (due to the improvement of glycaemic control), of microvascular complications [32], as well as mortality [33], it is consequently concluded that increment of the level of physical activity enhanced with the increase of number of steps is clinically very useful. Thus, although in the present study we did not intend to evaluate the clinical outcomes of increasing the number of steps among T2DM patients with the phone calls, we have demonstrated a median increase of more than 2000 steps with this way of intervention, confirming the effectiveness of the technique in management of the T2DM population.

Plotnikoff et al., (2013), however, found no significant improvement in the level of physical activity or hemoglobin A1c in T2DM patients using distance education with print-based materials alongside pedometer use and telephone counseling, although this intervention did increase the steps counts between women [34].

Although IPAQ is considered adequate to show the activity level of the patients, the pedometers are able to give objective and quantitative data. Furthermore, in the present study we did not find any significant difference between the groups related to personality factors. This result may reduce the necessity for an extremely individualized treatment that takes aspects of peoples’ personalities into account, although the small sample size impairs the affirmation of this hypothesis.

We used the transtheoretical behavior change questionnaire developed by Prochaska and DiClemente (1992) to clarify the phase of behavior change of our patients and to determine the influence of these conditions on the studied outcome [19]. In accordance with our study, Ishiii et al., (2007) performed a controlled study using this model to improve the physical activity of 38 people without any prior disease. However, it is important to note that this study was underpowered to demonstrate an impact of “readiness to change” on outcomes. Thus, the negative finding could be a result of low power. The authors did not find any differences concerning the phase in which the patients were classified according to the Prochaska questionnaire [35]. It is probable that during a short intervention period, the impact of the phase of behavior may be less significant than for a longer time, when these behavior aspects need to be considered.

It is also well know that depression is associated with decreased self-care, including diet, behavior changes, and drug therapy adherence [36]. In the present study, we did not find any differences between the groups related to depression diagnoses (P>0.05). Finally, there were no differences concerning the evaluation of quality of life using the FACTI, either in the total score or in individual domains for baseline and post intervention analysis.

The present study had some limitations. The reduced number of patients enrolled might influence the multivariate logistic regression results. Studies including more patients for a longer time than the present study need to be performed to clarify these points. Another important limitation is that patients in the IG (1) and CG (5) were excluded from the study due to being unable to complete the diary, thus precluding any comparison between the “completers versus non-completers” in the intention-to-treat analysis.

Conclusions
In conclusion, phone call support was an efficient intervention for promoting walking in type 2 diabetic patients with poor glycemic control, constituting an interesting low-cost intervention for the prevention of complications in this group of patients.

Competing interests
The authors declare that they have no competing interests.

Authors’ contributions

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References


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