

# Monthly phone calls and calendars to record falls rate in community-dwelling older adults included in a randomized clinical trial

*Telefonemas mensais e calendários como registro para a taxa de quedas de idosos da comunidade inseridos em um ensaio clínico randomizado*

*Llamadas telefónicas mensuales y calendarios como registro de tasa de caída de ancianos de una comunidad en un ensayo clínico aleatorizado*

Jéssica Cerutti de Oliveira<sup>1</sup>, Gláucia Helena Gonçalves<sup>2</sup>, Dayane Melo Campos<sup>3</sup>, Daniela Lemes Ferreira<sup>4</sup>, Nathany Clara da Silva<sup>5</sup>, Juliana Hotta Ansai<sup>6</sup>

**ABSTRACT** | This longitudinal study aimed to analyze monthly phone calls and calendars as a mean to record falls rate in community-dwelling older adults over 22 weeks, and to verify factors related to adherence to the falls calendar. Participants underwent an assessment composed by anamnesis, level of physical activity, neuropsychological measures, and mobility. They also received a schedule of falls that should be completed over 22 weeks, on the day(s) a fall occurred. Moreover, the volunteers received monthly phone calls to inquire about occurrence of falls over time. For data analysis, a  $\alpha=0.05$  significance level was adopted and the SPSS software (20.0) was used to perform statistical tests. The two tools were compared regarding “sensitivity” and “specificity.” In total, 52 older adults composed the final sample, with a mean age of 70.5 years old. The adherence to the calendar was 63.4% compared to phone calls. Of nine participants who reported falls by phone calls, three notified them in the calendar, resulting in a 33% sensitivity. Out of the 43 people who did not report falls by phone calls, 31 delivered the calendar without registration. Thus, the specificity of the calendar was 72%. Schooling level, Mini Mental State Exam score and the Addenbrooke’s Cognitive Examination

(revised version) score significantly influenced adherence to the calendar. In conclusion, there was a greater registration of falls by the monthly phone call compared to the calendar tool in community-dwelling older adults.

**Keywords** | Aging; Accidental Falls; Preventive Health Services.

**RESUMO** | Os objetivos deste estudo de caráter longitudinal prospectivo foram analisar telefonemas mensais e calendários como registro da taxa de quedas de idosos da comunidade ao longo de 22 semanas e verificar os fatores relacionados à adesão ao calendário de quedas. Os participantes passaram por avaliações de anamnese, nível de atividade física, medidas neuropsicológicas e mobilidade. Receberam também um calendário de quedas que deveria ser preenchido, ao longo das 22 semanas, no(s) dia(s) em que o evento ocorresse. Ademais, os idosos foram contatados mensalmente por telefone para o questionamento da ocorrência de quedas naquele período. Para análise dos dados, foi adotado nível de significância de  $\alpha=0,05$ , e para execução dos testes estatísticos foi utilizado o software SPSS 20.0. Os dois instrumentos foram comparados quanto à “sensibilidade”

<sup>1</sup>Universidade Federal de Mato Grosso do Sul (UFMS) – Campo Grande (MS), Brazil. E-mail: jessie.cerutti200598@gmail.com. ORCID-0000-0001-7528-0551

<sup>2</sup>Universidade Federal de Mato Grosso do Sul (UFMS) – Campo Grande (MS), Brazil. E-mail: glaucia.goncalves@ufms.br. ORCID-0000-0002-6130-4660

<sup>3</sup>Universidade Federal de Mato Grosso do Sul (UFMS) – Campo Grande (MS), Brazil. E-mail: dayanecampos2824@gmail.com. ORCID-0000-0003-2220-0292

<sup>4</sup>Universidade Federal de Mato Grosso do Sul (UFMS) – Campo Grande (MS), Brazil. E-mail: danielalemesferreira@gmail.com. ORCID-0000-0003-2685-8593

<sup>5</sup>Universidade Federal de Mato Grosso do Sul (UFMS) – Campo Grande (MS), Brazil. E-mail: nathanyclara6@gmail.com. ORCID-0000-0003-2492-5377

<sup>6</sup>Universidade Federal de São Carlos (Ufscar) – São Carlos (SP), Brazil. E-mail: jhansai@ufscar.br. ORCID-0000-0001-9873-3509

e à “especificidade.” Foram incluídos 52 idosos no estudo, com média de idade de 70,5 anos. A adesão ao método do calendário foi de 63,4% em comparação à estratégia dos telefonemas. Dos nove participantes que relataram quedas pelos telefonemas, três as notificaram no calendário, resultando em uma sensibilidade de 33%. Dos 43 idosos que não relataram quedas por telefonemas, 31 entregaram o calendário sem registro, o que resultou em uma especificidade do calendário de 72%. Anos de escolaridade, pontuação no Miniexame de Estado Mental e desempenho no exame cognitivo de Addenbrooke (versão revisada) influenciaram significativamente na adesão ao calendário de quedas. Concluiu-se que houve maior notificação de quedas pelo método do telefonema mensal em comparação ao do calendário em idosos da comunidade.

**Descritores** | Envelhecimento; Acidentes por Quedas; Serviços Preventivos de Saúde.

**RESUMEN** | Los objetivos de este estudio longitudinal prospectivo fueron evaluar llamadas telefónicas mensuales y calendarios como registro de la tasa de caída de ancianos en la comunidad durante 22 semanas, así como identificar los factores relacionados con la adherencia al calendario de caídas. Los participantes se sometieron a evaluaciones de anamnesis, nivel de actividad física, medidas

neuropsicológicas y movilidad. También recibieron un calendario de caídas que debían llenar, durante las 22 semanas, en el/los día/s de ocurrencia del evento. Además, los ancianos recibían llamadas telefónicas mensuales para informar la ocurrencia de caídas en ese periodo. Para el análisis de datos, se adoptó un nivel de significancia de  $\alpha=0,05$ , y se utilizó el software SPSS 20.0 para realizar las pruebas estadísticas. Los dos instrumentos se compararon con relación a la “sensibilidad” y “especificidad”. Participaron 52 ancianos en el estudio, con una edad media de 70,5 años. La adherencia al método del calendario fue del 63,4% en comparación con la estrategia de llamada telefónica. De los nueve participantes que informaron por llamadas telefónicas la ocurrencia de caídas, tres las relataron en el calendario, lo que da como resultado una sensibilidad del 33%. De los 43 ancianos que no informaron caídas, 31 entregaron el calendario sin registro, lo que resultó en una especificidad de calendario del 72%. El nivel educativo, las puntuaciones del Miniexamen del Estado Mental y el desempeño en el Examen Cognitivo de Addenbrooke (versión revisada) influyeron significativamente en la adherencia al calendario de caídas. Se concluyó que hubo mayor notificación de caídas con el método de llamada telefónica mensual en comparación con el método de calendario entre los ancianos de la comunidad.

**Palabras clave** | Envejecimiento; Accidentes por Caídas; Servicios Preventivos de Salud.

## INTRODUCTION

Population aging is a reality in developing countries, related to increased life expectancy and reduced mortality and fertility. Aging is a natural physiological process consisting of the progressive decline of organic functions, varying among individuals<sup>1</sup>. Estimates suggest that by 2060 in Brazil, life expectancy at birth will be 75 years or more; the same projection for the state of Mato Grosso do Sul (MS)<sup>2</sup>.

As the older adults population increases, special attention to public health issues, such as falls, are required. The prevalence of these accidents among the Brazilian older adults is 27.6%, involving mostly sedentary, obese, and older women<sup>3</sup>. Falls contribute to morbidity and mortality in the older adults and generate high costs for the Brazilian Unified Health System (SUS). In Campo Grande (MS), from January 2019 to March 2020 there were 1,182 hospitalizations due to falls in people aged 65 years or older<sup>4</sup>.

Risk factors associated with falls include cognitive decline, balance deficits, postural changes, gait disturbances,

sarcopenia, and reduced muscle tone and nerve conduction velocity<sup>5</sup>. Moreover, polypharmacy, chronic diseases (diabetes, hypertension, depression, obesity, cancer, musculoskeletal diseases), a slippery environment unfit for older adults, biological factors (sex and age), and reduced visual acuity are reasons for these events<sup>6</sup>. Falls are also caused by difficulty in maintaining postural stability, which generates increased body sway in situations or surfaces that require balance. Sensory and proprioceptive information transmission becomes slower and reduced with aging and, in addition, reduced muscle strength reduces balance<sup>7</sup>.

Considering the consequences of these events in older adults, such as fractures, hospitalizations, injuries, fear of future falls, loss of independence, and mortality, it is important to control such events in order to preserve the individual's health<sup>8</sup>. To this end, it is necessary to assess them accurately and reliably, especially to detect the effectiveness of interventions—such as aquatic physical exercise—in reducing the falls rate<sup>9</sup>.

The literature suggests different methods to track falls in older adults. These include self-reports of falls (recalled during assessment), phone calls, diaries, and calendars.

Phone calls seek to track falls in a specific period using a questionnaire, description of the event, and its outcomes. Phone calls may be influenced by the cognitive capacity of the individual, who underestimates or overestimates the occurrence of falls<sup>10</sup>.

The falls calendar is a validated instrument and considered the gold standard for its purpose, as it is more effective in monitoring falls when compared to retrospective memory. Diaries, in their turn, are a report of falls, in which one must record such accidents on the day they occurred, in order to avoid forgetfulness. Despite the accuracy, individuals present some difficulty in adhering to this instrument, especially those with cognitive impairments and advanced ages, leading to incomplete calendars or even failure to submit them for evaluation. Thus, contact with the older adults to remind them to fill out the calendar is necessary and benefits adherence to this tool<sup>11</sup>.

In Brazil, retrospective self-reports, calendars, and telephone interviews were introduced as alternatives for health professionals to control falls in older adults. When comparing fall monitoring by monthly phone calls over one year with fall recall over the past 12 months, self-reports underestimated falls by 32.8% and recurrent falls ( $\geq 2$  falls) by 50%; also, it had lower sensitivity compared to monthly phone calls<sup>12</sup>.

Regarding calendars use, Brazilian surveys have faced difficulties due to the lack of adherence by participants in filling them and the poor reliability of the data, due to the misunderstanding of the concept of “fall” and the need for assistance to complete them<sup>12-14</sup>. The Health Booklet for Older Adults—a strategy used by the SUS Primary Care for monitoring the health of the community’s older adults—contains a calendar of falls; however, the PHC team that fills it, transversely to the dialog with the older adult<sup>15</sup>.

There is no consensus among the authors about the most appropriate way to supervise falls in Brazilian older people and, moreover, little is known about the reasons that contribute to the completion of the calendars. Thus, it is necessary to identify which strategy is more effective for recording falls, and to investigate the factors that influence the adherence to this method.

This study aimed to analyze monthly phone calls and calendars as a record for falls rate in community-dwelling older adults included in a randomized clinical trial. Furthermore, we sought to compare the falls rate among the community’s older individuals between monthly phone calls and calendars over a 22-week period, and to verify aspects related to the adherence to the falls calendar.

## METHODOLOGY

### Study design

This is a prospective longitudinal study included in a randomized clinical trial—parallel group (control group and hydrotherapy group)—investigating the effects of an aquatic physical exercise protocol in 16 weeks of intervention and six weeks without physical exercise on falls and potentially modifiable risk factors in sedentary community-dwelling older adults.

### Sampling

The research was carried out at the Integrated School Clinic (CEI) and the Integrated Health Institute (INISA), both at the Universidade Federal de Mato Grosso do Sul (UFMS), with the authorization of those responsible for the locations. The eligibility criteria were: individuals aged 65 years or older; dwelling in the municipality of Campo Grande; non-institutionalized, and with the possibility of contact via telephone. The subjects were selected, via phone calls, among older people in the health care centers and CEI. The study was also disseminated by posters and social networks.

The inclusion criteria for participants were: ability to walk alone, with or without a mobility aid; reported initial availability to attend to the training twice per week; and availability for randomization.

The exclusion criteria adopted were: cardiovascular or infectious diseases described in the physical activity readiness medical examination<sup>16</sup>; individuals practicing regular and standardized physical exercise (twice or more times per week); Mini Mental State Examination (MEEM) score lower than the cut-off determined for each schooling level minus one standard deviation<sup>17</sup>; motor sequelae of stroke and/or other neurological disease affecting cognition and mobility; severe, uncorrected audiovisual disorder; urinary incontinence; open wounds; and sensitivity to chemicals used in pool water treatment. To estimate the sample size, the rule of at least ten cases of the outcome (success or failure, depending on which is rarer) was applied for each independent variable used in the logistic regression model<sup>18</sup>.

### Procedures

The participants were informed about the study objectives and evaluations and signed an informed

consent form, according to the recommendations of Resolution No. 466/2012 of the National Health Council. This work is registered in the Brazilian Registry of Clinical Trials (REBEC).

## Evaluation

The evaluation included a medical history and strategies to measure physical activity level, neuropsychological measures, and mobility. The tests used to collect the data were applied in a closed environment with minimal visual and auditory stimulation. The trained evaluators explained the tests to the participants in a clear, simple, and objective manner.

The participants were instructed to wear comfortable and appropriate clothes and shoes, to eat at least one hour before the evaluation, not to drink coffee or perform vigorous exercises on the day before the evaluation, to wear hearing and/or visual aids when necessary, and to present a medical certificate proving physical fitness for aquatic physical exercise.

The medical history contained clinical and sociodemographic data: name; age; marital status; schooling level; comorbidities; and history of falls in the last six months. In this section, the volunteer was asked about locations, outcomes, and how the episodes occurred. Fall was defined according to the concept of the Kellogg International Work Group<sup>19</sup>: “an event that results in a person unintentionally coming to the ground or another level below and that is not the consequence of a violent blow, loss of consciousness, sudden onset of paralysis, or epileptic seizure.”

The level of physical activity in the last 12 months was assessed by the Modified Baecke Questionnaire for Older Adults (MBQOA), validated for older adults population in Brazil. MBQOA obtained scores in the domains “household activities,” “sports activities,” and “leisure activities,” with specific questions and the relationship between type of activity, intensity, workload, and period of the year<sup>20</sup>.

As for neuropsychological measures, cognition, risk of depression, and fear of falling were assessed. For cognitive assessment, Addenbrooke’s Cognitive Examination (revised version, ACE-R) was used. ACE-R has six domains: orientation and attention (18 points); memory (26 points); verbal fluency (14 points); language (26 points); and visuospatial ability (16 points)<sup>21</sup>. The abbreviated geriatric depression scale (GDS) is validated for Brazilian Portuguese and frequently used for screening depression

in the older adults with 15 questions<sup>22</sup>. The Falls Efficacy Scale International (FES-I) assesses the older adult’s concern about falling when performing some instrumental and daily living activities. A score ranging from 23 to 30 suggests sporadic falls, whereas scores above 31 points suggests recurrent falls<sup>23</sup>.

To assess mobility, the timed up and go (TUG) test was used. The participants were allowed to wear usual footwear and a mobility aid when necessary. After the initial test, the participant sat in a chair with arms and trunk supported and was instructed on how to perform the test. From the verbal command “go,” the individual stood up, walked for three meters (with usual walking speed), turned 180° around a cone and returned to the chair to sit down. The exercise was timed by the evaluator from the moment the participant stood up until the moment they supported the arms and trunk back in the chair<sup>24</sup>.

## Falls calendar and monthly calls

Each volunteer received a falls calendar after the assessment. The calendar was supposed to be filled in, over the 22 weeks, with an “X” on the day(s) when there were fall(s). If there was a fall, the participant should answer at the end of the calendar, “How many times [did they fall that day]?”; “Where did they fall?”; “Were they hospitalized?”; “Did they have a fracture?”; “Did they hit their head?”; and “Other outcomes.” To avoid possible gaps in completing the falls calendar, the older adults were reminded once a month and instructed to place the calendars in a visible and constantly frequented location in the house<sup>11</sup>.

Furthermore, once a month, the participants were phone called and asked about the occurrence of falls in that period, the location, the number of falls, and the outcomes of these events: “Were there any fractures?”; “Hospitalizations?”; “Did you hit your head?”; “Other outcomes?” The number of phone call attempts for each participant was recorded.

## Data analysis

For the analyses, a  $\alpha=0.05$  significance level was adopted, and SPSS 20.0 software was used for statistical tests. Descriptive analysis of the data and point and interval estimation of the parameters of interest were performed.

The Kolmogorov-Smirnov normality test was applied to all continuous variables to verify data distribution. Since the normality hypothesis was rejected, the

z-score calculation was performed to standardize the quantitative data. To verify the differences between the “adherent” and “non-adherent” groups, the independent t-test and the chi-square test were adopted for quantitative and qualitative variables, respectively

To compare fall rates between calendars and phone calls, the chi-square test for association was used. Both recording instruments were compared for “sensitivity” and “specificity.” According to Ganz, Higashi, and Rubenstein<sup>25</sup>, sensitivity is the ratio of the number of individuals who recall falls during a period to the number of individuals who actually experienced falls in that period using a standard prospective monitoring tool—in this case, the instrument with the most falling record (phone calls). Specificity, on the other hand, is the ratio of the number of individuals who do not recall falling

during a given period to the number of individuals who actually did not fall during that period.

To verify the factors influencing adherence to the falls calendar (equal to or above the falls rate contained in the phone call), a bivariate logistic regression analysis was used.

## RESULTS

Among the 152 individuals eligible at screening, 52 were included in the research, subsequently randomized and allocated into the hydrotherapy group (n=26) and the control group (n=26). All 52 participants completed the falls assessment over the 22 weeks. Figure 1 the flow chart of the study participants.

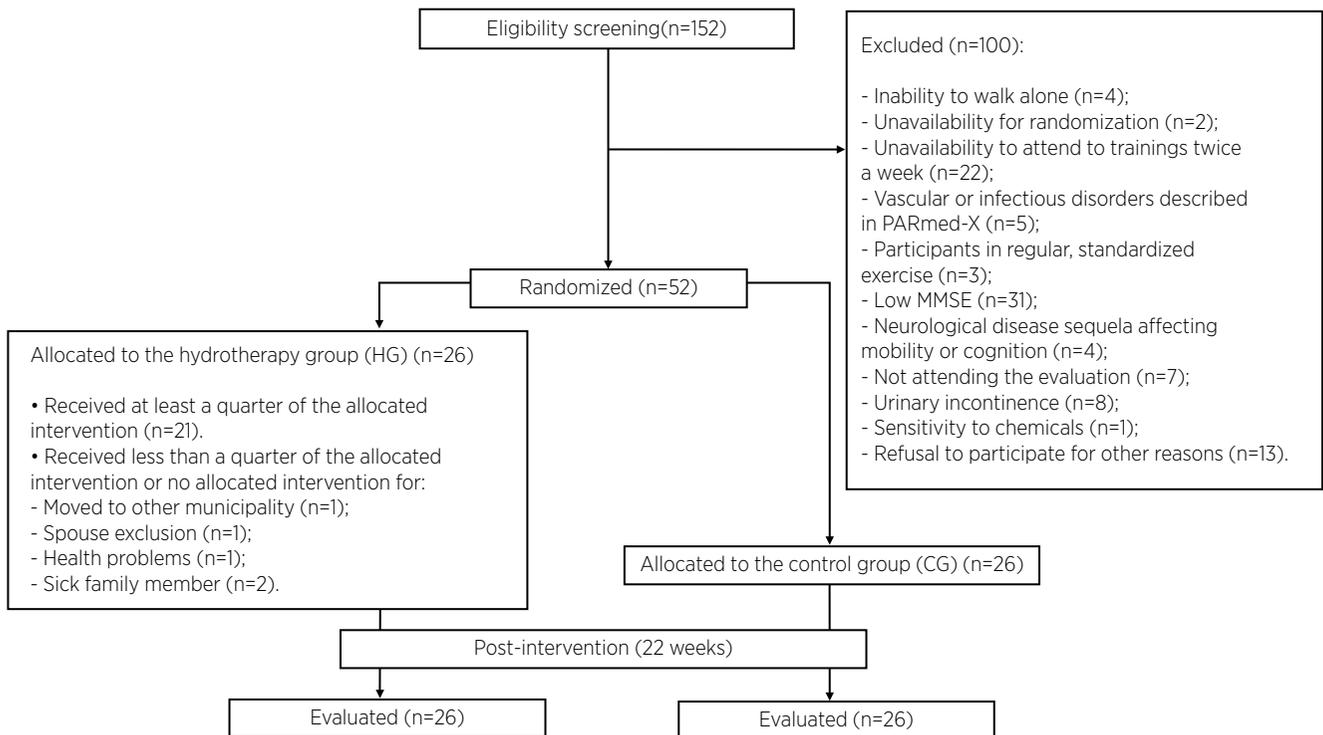


Figure 1. Participant flowchart

PARmed-X: physical activity readiness medical examination; MMSE: Mini Mental State Exam.

Table 1 show sociodemographic and clinical characteristics of participants. Among the 52 participants, 63.4% adhered to the calendar method compared to the phone call method. Adherence was considered for the participants who handed in and filled out the document according to occurrences equal to or

above those contained in the phone call. There was a significant difference between those who adhered and those who did not adhere to the calendar regarding schooling level and ACE-R variables. Those who did not adhere showed lower mean schooling level and lower performance on the ACE-R.

Table 1. Sociodemographic and clinical characteristics of the sample that adhered or not to the falls calendar (p<0.05)

Characteristic	Adherents (n=33)	Non-adherents (n=19)	P-value
Age, M±SD	70.5±4.3	70.9±4.2	0.767
Female, n (%)	27 (81.8%)	16 (84.2%)	0.826
Marital status, n (%)			0.115
Stable union	19 (57.6%)	9 (47.4%)	
Divorced	6 (18.2%)	2 (10.5%)	
Widowhood	5 (15.2%)	8 (42.1%)	
Single	0	3 (9.1%)	
Education, M±SD	7.55±5.06	4.42±3.20	<b>0.019</b>
Comorbidities			
Total number, M±SD	2.03±1.23	1.95±1.35	0.823
Diabetes, n (%)	9 (27.3%)	6 (31.6%)	0.741
SAH, n (%)	20 (60.6%)	13 (68.4%)	0.573
Falls in the last 6 months, n (%)	3 (9.1%)	3 (15.8%)	0.467
MBQOA, M±SD	5.37±4.56	0.63±2.75	0.769
ACE-R, M±SD	79.64±9.20	71.37±10.33	<b>0.004</b>
GDS, M±SD	2.70±2.49	3.95±2.83	0.104
FES-I, M±SD	24.24±4.43	23.47±6.17	0.605
TUG, M±SD	12.19±2.41	12.99± 3.08	0.305

M±SD: mean±standard deviation; n (%): number of individuals (percentage); MBQOA: Modified Baecke Questionnaire for Older Adults; ACE-R: Addenbrooke's cognitive examination (revised version); GDS: geriatric depression scale; FES-I: fall efficacy scale-international; TUG: timed up and go.

Table 2 shows the conformity between the falls reported in the monthly phone calls and the calendars. In this study, there were more falls recorded by the monthly phone calls. Of the nine participants who reported falls during phone calls, only three reported

the falls by the calendar, resulting in a 33% sensitivity. On the other hand, of the 43 participants who did not report falls from the phone calls, 31 handed in the calendar with no record of falls. Thus, the specificity of the calendar was 72%.

Table 2. Agreement between falls calendar and monthly phone calls (n=52) (p=0.042)

Monthly phone calls	Falls calendar			Total phone calls n (%)
	Delivered, no falls n (%)	Delivered, with falls n (%)	Lost or forgotten n (%)	
Fall, n (%)	2 (22.2%)	1 (11.1%)	6 (66.7%)	9 (100%)
No fall, n (%)	29 (67.4%)	2 (4.7%)	12 (28.9%)	43 (100%)
Calendar total, n (%)	31 (59.6%)	3 (5.8%)	18 (34.6%)	52 (100%)

n (%): number of participants (percentage).

During the monthly phone calls, in addition to being reminded about the calendars, participants were instructed as to how to fill them. Out of the 11 participants who reported falls, none required hospitalization. However, two older adults sought medical attention for pain or severe calf cramps. We also observed other outcomes, such as a dislocated finger and a hematoma. Backyard, street, stairs, and bathroom were reported as falls locations.

Table 3 shows the number of calls (over a six-month period) to contact the participants over the 22 weeks. The total number of attempts ranged from six to 32 times, with most of the sample showing six to eight call attempts.

Table 3. Number of phone calls in 22 weeks (n=52)

Number of phone calls	Number of individuals	%
6	10	19.2
7	15	28.8
8	9	17.3
9	5	9.6
10	3	5.8
11	2	3.8
12	1	1.9
13	1	1.9
14	2	3.8
15	2	3.8
16	1	1.9
32	1	1.9
<b>Total</b>	<b>52</b>	<b>100</b>

The factors that significantly interfered with the completion of the falls calendar were education, ACE-R performance and, in particular, MMSE score. Other clinical and sociodemographic factors, mobility, fear of falling, and risk of depression showed no significant influence on calendar adherence (Table 4).

Table 4. Factors related to adherence to the falls calendar (n=52) ( $p < 0.05$ )

Characteristic	OR (95% CI)	P-value
Age	0.980 (0.859-1.118)	0.762
Schooling level	1.195 (1.020-1.399)	<b>0.027</b>
Marital status	0.827 (0.471-1.452)	0.509
Sex	0.844 (0.185-3.849)	0.826
Comorbidities	1.054 (0.671-1.657)	0.819
HAS	0.710 (0.215-2.341)	0.574
Diabetes	0.813 (0.237-2.791)	0.742
Falls history	0.533 (0.096-2.953)	0.472
MMSE score	1.485 (1.120-1.970)	<b>0.006</b>
TUG	0.893 (0.720-1.107)	0.301
MBQOA score	1.023 (0.0881-1.188)	0.764
ACE-R score	1.090 (1.022-1.162)	<b>0.009</b>
FES-I score	1.031 (0.919-1.157)	0.598
GDS score	0.837 (0.672-1.042)	0.111

OR: odds ratio; CI: confidence interval; MMSE: Mini Mental State Examination; TUG: timed up and go; MBQOA: Modified Baecke Questionnaire for Older Adults; ACE-R: Addenbrooke's cognitive examination (revised version); GDS: geriatric depression scale; FES-I: fall efficacy scale-international.

## DISCUSSION

This prospective study aimed to analyze and to compare monthly phone calls and calendars as a record for the falls rate in community-dwelling older adults over a 22-week period, and to ascertain factors related to adherence to the falls calendar. The results indicated a 63.4% adherence to the calendar method compared to phone calls. Such adherence was significantly influenced by cognitive factors and schooling level.

Regarding rate of adherence to the falls calendar, our outcomes differ from some studies in developed countries, which have shown greater effectiveness and adherence to this method. In these studies, customized falls calendars were used, associated with monthly phone calls for completion and verbal and written training for use of the instrument, including instructions on the best location to place the calendar for easy viewing, completion of falls details, and return of the calendar each month to the research center by mail<sup>19,14,20</sup>.

In our study, each month participants were instructed and encouraged to recall their falls by phone and reminded during the call about completing the calendar. However,

the final delivery of the documents occurred only after the 22 weeks, due to the lack of financial resources to make the monthly delivery feasible and to cultural differences. This may have affected older adults' understanding of the importance of recording in monthly calendars concurrently with the phone calls.

Furthermore, underreporting of calendars may be caused by "denial" about falls, aging, and not wanting to record such events<sup>26</sup>. Even with guidance on how to fill it out, the calendar is still an instrument little used by health professionals in Brazil, hampering older adults adherence to it. Therefore, future studies should conduct more specific training on the use of this calendar, since it is a practical and important tool for fall detection.

Increased adherence to monthly phone calls was also found in a randomized clinical trial with Brazilian people aged 80 or older. This finding was attributed to the low schooling level of the sample and the difference in screening methods<sup>14</sup>. In this study, the bond established with the participants over the 22 weeks may have made them more comfortable reporting their falls over the phone. Furthermore, the current situation, with the COVID-19 pandemic and the "social isolation" factor, has reinforced the need for attention to this vulnerable population. Thus, during the analysis period, the phone calls went beyond the purpose of mere notification: general health monitoring of the participants was included in the process. This may have reinforced the importance of the monthly phone calls to the participants.

Regarding sensitivity and specificity, in a previous study, the calendar of falls showed a 75% sensitivity and the specificity of phone calls (three months apart) was 96%<sup>11</sup>. In our study, despite the low sensitivity compared to the monthly phone call data, the calendar showed a 72% specificity. Thus, the falls calendar seems to be a more effective strategy for identifying those older adults who do not fall frequently, whereas phone calls work better for individuals whose falls are recurrent. Most of the sample had six to eight attempts for phone calls over 22 weeks, which may indicate relatively low labor demand and cost, although more expensive than the calendar.

In this research, participants who did not adhere to the falls calendar had lower schooling level and lower cognitive performance on the tests when compared to those who did adhere. In a systematic review, neuropsychological impairment, use of sedative and hypnotic medications, and period of collection were found to influence fall recall for recording in calendars, diaries, postcards, or phone calls in community-dwelling older adults<sup>25</sup>.

The combination of monthly returned falls calendars and weekly phone calls seems to be more accurate, as it reduces the omission of data on falls in older adults with or without cognitive impairment<sup>25-27</sup>. We suggest health professionals to use calendars and phone calls complementarily, considering the significance of these records by the older adults or family members in preventing further falls and their public health consequences.

Our analysis has some limitations. Firstly, a minimum of one year of fall recall would be necessary to better answer our objective. Secondly, the pandemic situation may have negatively affected participants (whether physically and psychologically), which may have interfered with adherence to the falls calendar and monthly phone calls. Also, socioeconomic aspects were not evaluated in the initial period. Despite these limitations, in a short period of time we could verify which instrument is more effective for recording falls, considering participant adherence, sensitivity, specificity, and participant profile. Future studies of fall control in the older Brazilian population are necessary, in order to investigate the most efficient application of existing methods of fall recording.

## CONCLUSION

We conclude that there was greater notification of falls by the monthly phone call method compared to the calendar method in the sample of community-dwelling older Brazilians used. Furthermore, cognitive factors and schooling level exerted significant influence on the completion of the calendars. In clinical practice, the two registration methods are accurate for fall detection when complementarily applied.

## REFERENCES

1. Ministério da Saúde, Secretaria de Atenção à Saúde. Envelhecimento e saúde da pessoa idosa [Internet]. Brasília, DF: Ministério da Saúde; 2007 [cited 2019 Feb 28]. Available from: <http://bvsm.s.saude.gov.br/bvs/publicacoes/abcad19.pdf>
2. Instituto Brasileiro de Geografia e Estatística. Projeções e estimativas da população do Brasil e das Unidades de Federação [Internet]. Rio de Janeiro: IBGE; [cited 28 Feb 2019]. Available from: <http://www.ibge.gov.br/apps/populacao/projecao/index.html>
3. Siqueira FV, Facchini LA, Silveira DS, Piccini RX, Tomasi E, Thumé E, et al. Prevalence of falls in elderly in Brazil: a countrywide analysis. *Cad Saude Publica*. 2011;27(9):1819-26. doi: 10.1590/S0102-311X2011000900015.
4. Ministério da Saúde. DATASUS. Morbidade hospitalar do SUS por causas externas [Internet]. Brasília, DF: Ministério da Saúde; [cited 2020 Jan 12]. Available from: <http://tabnet.datasus.gov.br/cgi/tabcgi.exe?sih/cnv/fims.def>
5. Cruz DT, Leite ICG. Quedas e fatores associados em idosos residentes na comunidade. *Rev Bras Geriatr Gerontol*. 2018;21(5):532-41. doi: 10.1590/1981-22562018021.180034.
6. Prato SCF, Andrade SM, Cabrera MAS, Dip RM, Santos HG, Gomes Dellaroza MS, et al. Frequência e fatores associados a quedas em adultos com 55 anos e mais. *Rev Saude Publica*. 2017;51:37. doi: 10.1590/s1518-8787.2017051005409.
7. Osoba MY, Rao AK, Agrawal SK, Lalwani AK. Balance and gait in the elderly: a contemporary review. *Laryngoscope Investig Otolaryngol*. 2019;4(1):143-53. doi: 10.1002/lio2.252.
8. Araújo Neto AH, Patrício ACFA, Ferreira MAM, Rodrigues BFL, Santos TD, Rodrigues TDB, et al. Falls in institutionalized older adults: risks, consequences and antecedents. *Rev Bras Enferm*. 2017;70(4):719-25. doi: 10.1590/0034-7167-2017-0107.
9. Stark SL, Silianoff TJ, Kim HL, Conte JW, Morris JC. Tailored calendar journals to ascertain falls among older adults. *OTJR (Thorofare N J)*. 2015;35(1):53-9. doi: 10.1177/1539449214561764.
10. Mackenzie L, Byles J, D'Este C. Validation of self-reported fall events in intervention studies. *Clin Rehabil*. 2006;20(4):331-9. doi: 10.1191/0269215506cr947oa.
11. Hannan MT, Gagnon MM, Aneja J, Jones RN, Cupples LA, Lipsitz LA, et al. Optimizing the tracking of falls in studies of older participants: comparison of quarterly telephone recall with monthly falls calendars in the MOBILIZE Boston Study. *Am J Epidemiol*. 2010;171(9):1031-6. doi: 10.1093/aje/kwq024.
12. Garcia PA, Dias JMD, Silva SLA, Dias RC. Prospective monitoring and self-report of previous falls among older women at high risk of falls and fractures: a study of comparison and agreement. *Braz J Phys Ther*. 2015;19(3):218-26. doi: 10.1590/bjpt-rbf.2014.0095.
13. Almeida TL. Efeitos do treinamento físico multimodal na prevenção secundária de quedas em idosos: treinamento supervisionado e semissupervisionado [dissertation]. São Paulo: Universidade de São Paulo; 2011.
14. Ansaí JH, Aurichio TR, Gonçalves R, Rebelatto JR. Effects of two physical exercise protocols on physical performance related to falls in the oldest old: a randomized controlled trial. *Geriatr Gerontol Int*. 2016;16(4):492-9. doi: 10.1111/ggi.12497.
15. Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Ações Programáticas Estratégicas. Caderneta de saúde da pessoa idosa. Brasília, DF: Ministério da Saúde; 2017.
16. Canadian Society for Exercise Physiology. PARmed-X: physical activity readiness medical examination [Internet]. Ottawa: Canadian Society for Exercise Physiology; 2002 [cited 2019 Dec 10]. Available from: <https://www.chp.gov.hk/archive/epp/files/PARmed-X.pdf>
17. Herrera E Jr, Caramelli P, Silveira AS, Nitrini R. Epidemiologic survey of dementia in a community-dwelling Brazilian population. *Alzheimer Dis Assoc Disord*. 2002;16(2):103-8. doi: 10.1097/00002093-200204000-00007.
18. Peduzzi P, Concato J, Kemper E, Holford TR, Feinstein AR. A simulation study of the number of events per variable in logistic regression analysis. *J Clin Epidemiol*. 1996;49(12):1373-9. doi: 10.1016/S0895-4356(96)00236-3.

19. The prevention of falls in later life. A report of the Kellogg International Work Group on the Prevention of Falls by the Elderly. *Dan Med Bull.* 1987;34(Suppl 4):1-24.
20. Mazo GZ, Mota J, Benedetti TB, Barros MVG. Validade concorrente e reprodutibilidade: teste-reteste do questionário de Baecke modificado para idosos. *Rev Bras Ativ Fis Saude.* 2012;6(1):5-11. doi: 10.12820/rbafs.v.6n1p5-11.
21. Carvalho VA, Caramelli P. Brazilian adaptation of the Addenbrooke's Cognitive Examination-Revised (ACE-R). *Dement Neuropsychol.* 2007;1(2):212-6. doi: 10.1590/S1980-57642008DN10200015.
22. Paradela EMP, Lourenço RA, Veras RP. Validação da escala de depressão geriátrica em um ambulatório geral. *Rev Saude Publica.* 2005;39(6):918-23. doi: 10.1590/S0034-89102005000600008.
23. Camargos FFO, Dias RC, Dias JMD, Freire MTF. Adaptação transcultural e avaliação das propriedades psicométricas da Falls Efficacy Scale - International em idosos brasileiros (FES-1-BRASIL). *Braz J Phys Ther.* 2010;14(3):237-43. doi: 10.1590/S1413-35552010000300010.
24. Alexandre TS, Meira DM, Rico NC, Mizuta SK. Accuracy of Timed Up and Go Test for screening risk of falls among community-dwelling elderly. *Braz J Phys Ther.* 2012;16(5):381-8. doi: 10.1590/S1413-35552012005000041.
25. Ganz DA, Higashi T, Rubenstein LZ. Monitoring falls in cohort studies of community-dwelling older people: effect of the recall interval. *J Am Geriatr Soc.* 2005;53(12):2190-4. doi: 10.1111/j.1532-5415.2005.00509.x.
26. Adamczewska N, Vassallo M, Thomas PW, Thomas S, Barrado-Martín Y, Nyman SR. Feasibility and accuracy of different methods for collecting data on falls among older people with dementia. *Alzheimer Dis Assoc Disord.* 2020;34(4):362-5. doi: 10.1097/WAD.0000000000000364.
27. Taylor ME, Delbaere K, Lord SR, Mikolaizak S, Brodaty H, Close JCT. Neuropsychological, physical, and functional mobility measures associated with falls in cognitively impaired older adults. *J Gerontol A Biol Sci Med Sci.* 2014;69(8):987-95. doi: 10.1093/gerona/glt166.