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Why are our words so different from our actions?

One of the subjects of most interest to the **Revista Brasileira de Geriatria e Gerontologia** is the model of healthcare available to the elderly. We are all concerned. The discussion about population aging brought about by the new epidemiological and demographic reality has (or should) lead to the development of a resolutive and effective model of health care for this group[1].

The change in the age configuration in Brazil, with the growth of the elderly segment, is a recent phenomenon. On the other hand, we have already gone beyond the novelty stage and the clichés that are well known and today accepted by everyone – even by those who do not put them into practice. Discussing the theoretical frameworks or policies that aim to ensure healthy aging – which means maintaining functional capacity and autonomy, as well as quality of life, in line with the principles and guidelines of the Unified Health System (SUS) and focusing on disease prevention – is laudable. Major Brazilian and international health organizations have argued in favor of this idea for many years[2]. But the next step is yet to be taken.

While these words are well received by health managers and professionals, little or few of these ideas are applied. So here we must ask: if everyone is discussing the issue and the solutions are already available at the decision-making tables, why has the situation remained the same? Why does the theory not translate into everyday life? Why do leaders and managers not encourage change? Below we list some topics that will bring additional elements to the discussion.

In order for the health sector – particularly the elderly segment – to reorganize itself, one item to be considered is mistrust. Today's society is suspicious of what is offered to it. In this climate, any proposal for change is viewed with reservations. Entities that are multifactorial and have been constructed over many years are difficult to transform. Changing a culture is not simple. We are aware of this problem.

Another obstacle is quality of care, which remains undervalued. It is a subject of enormous importance, which demands greater awareness among health professionals and society. It is argued that it is expensive to apply instruments that improve and provide training in care, accreditations and certifications, but better qualified and trained services are more effective in terms of cost, create less waste and provide better patient care results. In some countries, accreditation and the evaluation of quality indicators are mandatory requirements. In Brazil, however, volume is valued and rewarded, while a policy that stimulates quality is lacking. Patients do not always recognize this characteristic as a necessity, and both public and private health perceive it as an additional cost.

Another issue is the general understanding that care for the elderly goes beyond health. In addition to diagnosis and prescription, social participation, physical and mental activities are important elements to maintain functionality. But we still have great difficulty in understanding these actions as an integral part of care, especially in supplemental health. There is a tendency to separate "social" from "curative" actions.

It is also of fundamental importance, especially today, that quality information and medical records are effectively used by physicians and health professionals, allowing constant customer monitoring.

The pay model of health professionals should also be discussed. If we accept that they are poorly paid, why do we not pay for performance? Associating the discussion of results with the form of remuneration is a powerful inductive tool in the search for what is right. Thus, "pay for performance" or "payment by results" are synonymous in the struggle for alignment between access and quality of care. The change in the remuneration model based on this new care framework, focusing on results and not volume, necessarily results in a win-win model, in which all involved benefit, but especially the patient themselves.

In order to put into practice all the strategies necessary for healthy aging and quality of life, it is necessary to rethink and redesign care for the elderly, focusing on the individual and their particularities. This will bring benefits, quality and sustainability not only for the elderly population, but for the Brazilian health system as a whole[3].

Now that we know what is required, it is time we concentrate our efforts on turning the theory into a quality health model for everyone, including the elderly. We do not want the SUS to be fragmented, or to increase the number of bankruptcies of private health care companies.

One thing is certain: every year, the cost of health increases while the quality of care worsens. It is time to put into practice what everyone believes, but which we have yet to do.

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Dental Functionality: construction and validation of an oral health indicator for institutionalized elderly persons in the city of Natal, Rio Grande do Norte

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Abstract

Objective: to suggest a composite indicator that identifies the oral health condition of institutionalized elderly persons. *Method:* an observational and cross-sectional study was performed. A total of 315 elderly persons were investigated in long-stay care facilities for the elderly in the city of Natal, Rio Grande do Norte, Brazil. Such individuals underwent an epidemiological evaluation of their oral health conditions, based on the DMFT index, CPI and the PAL (periodontal attachment loss) index. Factor analysis was used to identify a relatively small number of common factors by principal component analysis. *Results*: five oral health variables were included in factor analysis, and using the Kaiser criterion, which considers the percentage of variance explained by the factors, a single factor which together explained 79.7% of the total variance of the variables included in the analysis model was selected. This factor was analyzed and interpreted according to the dimension to which it related, and was entitled the factor of Dental Functionality. *Conclusion*: this factor generated an objective indicator to characterize the oral health of the elderly in long-term care facilities for the elderly of Natal, Rio Grande do Norte, and represents a parameter for studies of the oral health outcomes of this elderly population. It also revealed a change in the dental profile of this population with more teeth present in the mouth and a reduction in edentulism.

Keywords: Health Status Indicators. Oral Health. Elderly.

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INTRODUCTION

Population aging is a worldwide phenomenon the evolution of which varies according to the degree of development of a country. In Brazil, the changes in the age structure of the population have occurred in an intense and accelerated manner. The speed at which the process of demographic and epidemiological transition has taken place in the country has resulted in a number of important issues for health managers and researchers, mainly due to the social and economic inequalities that have accompanied this process in recent decades[1-3].

Health services must adapt to the increasing demands of chronic diseases and disabilities, which are common to the elderly, especially in Brazil. At the same time, several studies have shown that the oral health of these individuals is neglected by the elderly, or even by public policies themselves. These studies reveal that the main dental health problems affecting the elderly population are tooth loss, periodontal disease, xerostomia and soft tissue injuries. These problems produce disabilities that are often not even perceived in the context in which these elderly people live, especially institutionalized elderly people[4-6].

When evaluating the distribution of oral health diseases, there are several indicators that try to measure oral conditions, facilitating the interpretation of the data obtained. However, this interpretation can often be impaired, as these indicators do not always present adequate accuracy, especially in relation to the elderly population[7].

Data from the most recent oral health survey conducted in Brazil, SB Brazil 2010, showed that 53.7% of individuals aged 65-74 years were edentulous, that is, more than half of the individuals investigated were found to be in the same situation when they were investigated using traditional indexes that measure oral health[8].

The DMFT index (number of decayed, missing and filled teeth), for example, is an effective tool for gauging the oral health conditions of the younger population. However, when it comes to the elderly population, this index loses accuracy, failing to discriminate the elderly from their oral health condition. It is understood, therefore, that the use of alternative indexes, such as functional edentulism, occluding tooth pairs, the presence of a shortened dental arch and number of molar teeth present is one option for assessing the oral health of these individuals, considering their particularities[9,10].

It has been found, however, that although the alternative indexes of oral health consider the particularities of the elderly population, they do so in an isolated manner, making it difficult to identify elderly persons who truly present an unfavorable oral health condition from such information. Therefore, the study in question proposes the construction and validation of an indicator composed of alternative indexes of oral health, which were applied among the institutionalized elderly in the city of Natal, Rio Grande do Norte, Brazil.

METHOD

Before beginning the study, the project was submitted to the Ethics Research Committee of the Universidade Federal do Rio Grande do Norte, under approval nº 263/11-P. The subjects, as well as their caregivers and tutors, were given information about the survey and signed a Free and Informed Consent Form, as established by the National Health Council under Resolution nº 466/2012.

Thus, the study employed a cross-sectional design, with the elderly persons individually examined as an observation and analysis unit. The sample consisted of individuals aged 60 years and older residing in Long Term Care Facilities for the Elderly (LTCFs), properly registered with the sanitary surveillance department of the city of Natal (Rio Grande do Norte). Of the 14 LTCFs in the municipality, two refused to participate and a third was closed. Therefore, data collection was performed at 11 LTCFs.

To obtain the sample all the elderly who were present in the LTCFs at the time of data collection were included. However, those with severe physical and/or mental limitations and restrictions, as well as those who were undergoing palliative care or had a serious infectious or other disease that prevented the collection of data, were excluded from the tests and, consequently, the study. Therefore, 315 individuals from the 400 residing in LTCFs in the

municipal region of Natal (Rio Grande do Norte) were interviewed and examined by November 2013, after which time the data collection was closed.

The procedures performed during data collection consisted of the application of a sociodemographic questionnaire and evaluation of the oral health conditions of the elderly persons through an intraoral examination. These procedures were carried out by previously trained examiners calibrated using the Kappa statistic, in order to ensure the uniformity of the understanding, interpretation and application of the evaluated criteria.

The clinical record for obtaining the data referring to the oral health conditions of the elderly was based on the dental record form of SB Brazil 2010[8], but with a field added relating to occluding tooth pairs. The socioeconomic and demographic questionnaire was the same as that used by the Health, Welfare and Aging Project (SABE)[11].

From the clinical record, alternative oral health indexes (presence of shortened dental arch, presence of anterior sextants, number of teeth with root caries, number of molar teeth and number of occluding tooth pairs) were obtained and dependent variables of the study. Therefore, these variables, since they represent dimensions of the oral health of the elderly, were included in factor analysis in order to produce the composite oral health indicator for these individuals.

A shortened dental arch was characterized by the presence of 10 pairs of anterior teeth in occlusion, that is, 20 teeth distributed from the 2nd pre-molar to the 2nd pre-molar in both arches[12]. To determine the presence of root caries the World Health Organization (WHO) probe was used to detect the presence of cavities in the region. Root caries were only considered when there was a need for separate restorative treatment.

The data collected through the socioeconomic-demographic questionnaire and the intraoral examination were organized in a database and analyzed using SPSS software version 20.0 (SPSS Inc.). Initially, a descriptive analysis of these variables and the selected socioeconomic-demographic variables was performed, which allowed the characterization of the sample according to the conditions investigated.

The alternative indexes of oral health were submitted to factor analysis, where they were reduced to factors by the analysis of main components, in order to produce the composite indicator. It was therefore initially observed whether the alternative indexes of oral health were sufficiently correlated with each other, guaranteeing the satisfactory extraction of the statistical variables. The correlation matrix, the sample correlation measure, the Bartlett sphericity test and the anti-image matrix were used as evaluation methods. With the confirmation of the applicability of the statistical model, we extracted the factors using the Kaiser technique, which informs us how much each factor explains the total variance of the model. The Varimax rotation method was selected to facilitate the interpretation of the factors produced.

RESULTS

The sociodemographic profile of the 315 individuals examined showed a significant predominance of female individuals, with elderly women representing 74.5% of the interviewees. The mean age was 81.8 (± 9.0) years and the mean institutionalization time was 5.4 (± 5.2) years. It was also observed that 71.1% of the sample resided in non-profit LTCFs.

Regarding oral health, of the 315 elderly evaluated, an average DMFT of 29.56 (± 4.4) was observed, in which the lost component represented 90.1% of the index. It was therefore verified that 289 individuals, that is, 91.7% of the sample did not have a shortened upper or lower arch. The mean number of molar teeth present was 0.87 (± 1.8), the number of occluding tooth pairs was 1.08 (± 2.6) and the mean number of decayed teeth was 0.59 (± 1.9).

In relation to the production of the composite indicator, the five variables representative of the alternative indexes that measured the oral health of the elderly were initially included in the factor analysis. Of these five variables (presence of shortened dental arch, presence of anterior sextants, number of teeth with root caries, number of molar

teeth and number of occluding tooth pairs), two (presence of a shortened dental arch and number of teeth with root caries) were excluded because they presented significant and perfect correlations with the other.

In order to confirm the applicability of the factor analysis, the correlation matrix of the three remaining variables (Table 1) was analyzed. This matrix had values higher than 0.30 and lower than 0.90, guaranteeing the applicability of the model.

Table 1. Matrix of correlations of oral health variables of elderly subjects submitted to factor analysis. Natal, Rio Grande do Norte, 2013.

Variables	Number of occluding tooth pairs	Number of molar teeth present	Presence of 2nd and 5th sextants
Number of occluding tooth pairs	1.000	0.844	0.637
Number of molar teeth present		1.000	0.599
Presence of 2nd and 5th sextants			1.000

Another way to evaluate the adequacy of the variables for the proposed factor analysis technique is based on the KMO (Kaiser-Meyer-Olkin) statistic, which is also considered a measure of the adequacy of the sample, with values close to 1 indicating the adequacy of the technique, and the Bartlett sphericity test, which should have a *p*-value in the range of statistical significance, indicating that there are significant correlations between the variables[13]. In the analysis of the present study, values of 0.686 for the KMO and the *p*-value of <0.001 for the Bartlett test were obtained, therefore corroborating the use of factor analysis.

The analysis of the anti-image matrix presented in Table 2 showed that none of the variables had a value lower than 0.5 in its principal diagonal, which again guarantees the application of the model in relation to the three variables selected. In addition, the analysis of the values outside the principal diagonal showed a weak partial correlation between the variables of the model, with values below 0.7, except for the partial correlation between the number of occluding pairs and number of molar teeth present variables, which had a correlation value of 0.748, although these exhibited a high commonality value (Table 3), justifying their permanence in the model. It can therefore be concluded that the selected variables correlate with each other, and are little influenced by other variables which were not studied or that did not participate in the factor analysis.

Based on the Kaiser criterion (Table 4), which extracts factors with eigenvalues greater than 1.0, the retention of a factor explaining 79.7% of the total variance of the variables included in the model was observed. Therefore, this factor represented the composite indicator capable of assessing the particularities related to the oral health of the elderly persons investigated, from the variables added to the model.

The rotated matrix in Table 5 shows the factorial loads of each of the variables that make up the factor (indicator) generated, showing that, in fact, *number of occluding tooth pairs, number of molars present* and *presence of the anterior sextants* are the variables which together best characterize the oral health of the elderly persons investigated. From the interpretation of Table 5, the constructed factor was denominated Dental Functionality.

Table 2. Anti-image matrix of oral health variables of elderly subjects submitted to factor analysis. Natal, Rio Grande do Norte, 2013.

Variables	Number of occluding tooth pairs	Number of molar teeth present	Present of 2nd and 5th sextants
Number of occluding tooth pairs	0.631	- 0.748	- 0.305
Number of molar teeth present	- 0.748	0.648	- 0.150
Presence of 2nd and 5th sextants	- 0.305	- 0.150	0.869

Table 3. Values of commonality of oral health variables of elderly subjects undergoing factor analysis. Natal, Rio Grande do Norte, 2013.

Variables	Commonalities
Number of occluding tooth pairs	0.871
Number of molar teeth present	0.845
Presence of 2nd and 5th sextants	0.676

Table 4. Anti-image matrix of oral health variables of elderly subjects submitted to factor analysis. Natal, Rio Grande do Norte, 2013.

Factor	Auto-value	Percentage of variance explained	Percentage of accumulated variance
1	2.392	79.74	79.74
2	0.453	15.11	94.84
3	0.155	5.16	100.00

Table 5. Rotated matrix of factorial loads of the representative factor of the oral health variables of the elderly. Natal, Rio Grande do Norte, 2013.

Variables	Factor 1
Number of occluding tooth pairs	0.933
Number of molar teeth present	0.919
Presence of 2nd and 5th sextants	0.822

The categorization of the Dental Functionality factor was performed based on the median of the factor scores generated for each of the individuals in the sample. Therefore, individuals with a factor score above the median had their oral health dichotomized as favorable, while those with a factor score below the median had their oral health classified as unfavorable.

Therefore, from the indicator produced, it was observed that the dental functionality of 177 individuals (56.2%) was classified as unfavorable, whereas dental functionality was favorable for the remaining 138 patients (43.8%). Among individuals with unfavorable dental functionality, 78.5% were from non-profit LTCFs, 76.3% were female, the mean age was 83.6 (± 8.95) and 53.7% self-declared themselves to be white. In contrast, of individuals with favorable dental functionality, 60.9% were from non-profit LTCFs, 71.7% were female, the mean age was 79.4 (±8.49) and 52.9% self-declared themselves to be white.

DISCUSSION

Health indicators are created to facilitate the quantification and evaluation of information on the state of health of the population[14], helping to control diseases and improving the concept of health and its social determinants. The formulation of indicators capable of reflecting health risk conditions from adverse environmental and social components is important for the diagnosis of health situations in a given population. In this sense, the Dental Functionality factor constructed allowed the identification of elderly individuals of LTCFs in Natal (Rio Grande do Norte) with unfavorable conditions in terms of the functionality of the dental elements present in a more specific and simple manner.

In the planning of programs and development of public policies aimed at oral health the use of epidemiological data measured through indices such as the DMFT, CPI and PAL is common[8]. However, these indices do not effectively discriminate between the oral health of the elderly, as these individuals present a high level of tooth loss and are internally homogeneous yet quite heterogeneous in relation to the other age groups.

This confirms the need for new indices capable of adequately categorizing the oral health condition of these elderly people, since the curative-invasive model, which is still deeply ingrained, has made these individuals equal in terms of oral health conditions. In this sense, we highlight institutionalized elderly persons, who become doubly excluded.

The variables *presence of upper and lower anterior sextant*, *occluding tooth pairs* and *presence of molar teeth*, referred to as alternative oral health indexes, are most capable of discriminating the oral health conditions of the institutionalized elderly persons of Natal, Rio Grande do Norte, as observed during the construction of the Dental Functionality indicator. These components express the same characteristic though different forms of measurement: the presence of dental elements, which is the most relevant characteristic of the population in question. This characteristic is important due to its negative consequences for general health, such as dietary restrictions, phonation, aesthetics, loss of pleasure in eating, and as a result, weight loss and malnutrition, as well as temporomandibular joint and muscle problems due to loss of the vertical dimension and joint problems resulting from the aging process[15].

As a limitation of the study, we did not include measurements of periodontal, stomatological and prosthesis conditions. The periodontal condition is of great relevance for the elderly population, and it was observed that only 1.8% of the elderly who participated in SB Brazil 2010 were free of periodontal problems, according to the Community Periodontal Index (CPI)[8].

Thus, the presence of teeth may be more harmful than their absence in some of these individuals due to the existence of periodontal disease infection foci. This situation is even more serious in the institutionalized geriatric population, due to their greater functional incapacity, with a consequent restriction in oral hygiene. In the study by Jerez-Roig et al.[16], 53.5% of institutionalized elderly persons in Natal had functional disability for one or more basic activities of daily living. Meanwhile literature also reveals that caregivers, whose role is to ensure the adequate oral hygiene of disabled elderly persons, are not in the habit of performing such care due to the lack of protocols, knowledge and adequate training[17,18].

The results reliably reflect the oral health conditions of the institutionalized elderly of Natal (Rio Grande do Norte), as data collection was performed in all the LTCFs and with all the elderly persons who met the inclusion criteria. However, in spite of employing a considerable sample size (more than 300 elderly persons), the findings of the present study have limitations in terms of the extrapolation of the results to other municipal regions in Brazil, as the outcome is influenced by local characteristics. Factors such as access to dental services in the past and present, as well as care for oral hygiene throughout life, vary among the regions of Brazil, as shown in the SB Brazil 2010 study[8].

Thus the Dental Functionality factor categorized represents an objective indicator that characterizes the oral health of the elderly of the LTCFs of the city of Natal, Rio Grande do Norte, serving as a parameter for studies with the outcome of the oral health of the institutionalized elderly population. The indicator also reveals a change in the profile of

this population, with more teeth in the mouth and reduced edentulism.

With the aim of returning to the research carried out and in view of the oral health conditions found, the team has begun the extension project *Oral health care of elderly people living in the municipal region of Natal, Rio Grande do Norte*, financed by the Universidade Federal do Rio Grande do Norte, performing weekly activities of health assistance and care for the elderly living in these LTCFs, as well as for elderly people living in households.

CONCLUSION

The Dental Functionality index created is capable of discriminating between the elderly population residing in Long-Term Care Facilities for the Elderly (LTCFs) of Natal, Rio Grande do Norte, based on the alternative indexes of oral health: presence of upper and lower anterior sextant, occluding tooth pairs and presence of molar teeth. The composition of the constructed indicator demonstrates the significant absence of dental elements, requiring oral rehabilitation actions so that elderly persons have adequate phonation, chewing comfort and aesthetic conditions.

This factor was therefore able to generate an objective indicator that characterizes the oral health of the elderly of the LTCFs in Natal, Rio Grande do Norte, serving as a parameter for studies that have as their outcome the oral health of this elderly population. In addition, it revealed a change in the profile of this population with increased numbers of teeth in the mouth and the reduction of edentulism, representing the emergence of a "new elderly".

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Prevalence of urinary incontinence among the elderly and relationship with physical and mental health indicators

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Abstract

Objective: to verify the prevalence of urinary incontinence and its relationship with physical and mental health indicators in the elderly population of Bagé, Rio Grande do Sul, Brazil. *Method:* a cross-sectional population-based study was conducted in 2008 with 1,593 elderly persons. Poisson regression was used for crude and adjusted analysis between the outcomes and the independent variables. *Results:* the prevalence of urinary incontinence was 20.7%, being 26.9% among women and 10.3% among men. The associated factors were female gender, age 70 to 74 and 75 years or over, yellow/brown/indigenous ethnicity/skin color and no schooling. The prevalence of functional disability, depression, cognitive deficit and very poor/poor self-perception of health was significantly higher in women with urinary incontinence. Among incontinent men, the same was observed with regard to functional disability and cognitive deficit. *Conclusion:* the occurrence of urinary incontinence in the elderly is frequent, especially in women, with a significant relationship with physical and mental health conditions in the elderly population. These results support the development of care strategies to prevent incontinence and minimize its health impacts.

Keywords: Health of the Elderly. Urinary Incontinence. Disabled Persons. Primary Health Care. Epidemiology.

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INTRODUCTION

While the physiological disorder of urinary incontinence (UI) is not inherent to the aging process, it tends to manifest itself more frequently with advancing age and is considered one of the main geriatric syndromes[1-3]. In this sense, the progressive increase in the absolute and relative number of elderly people due to increased life expectancy and population aging has led to an increase in the occurrence of UI[1,4].

The International Continence Society defines UI as any involuntary leakage of urine[5] and the condition is multifactorial in origin. Specialized literature shows that the factors associated with its occurrence are: the female gender and advanced age[6-8], non-Caucasian ethnicity[9] and the lack of or low levels of schooling[8-10]. Studies have shown UI as associated with diseases such as: infection of the urinary tract[11], arterial hypertension[12], diabetes mellitus[6,12-14], a history of cardiac disease[4], obesity[4,6,10], strokes[6,8,13,15], respiratory problems[8,15], depression[6], cognitive deficit[16], arthritis[12], arthrosis/rheumatism[17], prostatic hyperplasia[18], a history of falls[4,17], functional limitations, limited mobility or dependence[6,8,11,14,16,18], comorbidity[19] and frailty[17]. in addition to these conditions, UI may be associated with lifestyle habits such as sedentiarism[20]. There is also an association with polypharmacy[8], gynecological surgery, hysterectomies and the menopause in women[20], a negative self-assessment of health status[9,15,17] and poor quality of life [19].

The importance of this theme is not only because of the high prevalence of UI among the elderly population in the country[6,8,10,21], but due to its repercussions on physical, psychological and social aspects. UI tends to cause changes in the routine of the elderly, social isolation due to embarrassment and the loss of self-esteem, and impairments in quality of life[2,22]. In addition, embarrassment may prevent these individuals seeking professional help and diagnosis of the problem, making coexistence with this dysfunction permanent[2]. Although its symptoms are still underestimated or omitted due to the feeling of shame or because it is seen as part of the natural process of aging[1,8,23], UI is considered a major complaint in health care.

There are few population-based epidemiological surveys for the study of UI in the Brazilian elderly population[6,8,14,22], especially in relation to the magnitude of its relationship with other health indicators. Few studies have demonstrated the impact of UI on the physical and mental health conditions of the elderly population, reinforcing the importance of its use as a health marker for the investigation of other conditions, such as functional disability[24,25], depression[26-28], the self-perception of poor/very poor health[29,30] and cognitive deficit.

The aim of this study was to verify the prevalence of UI and its relationship with physical and mental health indicators in the elderly population living in the urban area of Bagé, Rio Grande do Sul, Brazil, in order to identify the magnitude of the problem and support the organization of care and health policies, mainly in the area of primary care.

METHOD

This cross-sectional population-based study was carried out between July and November 2008 with the elderly population living in the urban area of Bagé, located on the border of the state of Rio Grande do Sul (RS) and Uruguay. In the year of the study, approximately 122,461 inhabitants lived in this municipal region, of which 14,792 (12.0%) were elderly. Of the total population, 82% lived in the urban area. The coverage of the family health strategy in the region was 54%.

The sample size was calculated for a matric study that had as an outcome the "need for home care" and "receives home care"[31]. In this scenario, a sample of 1,530 individuals with a 95% confidence level was stipulated, and a statistical power of 80% was established to detect a relative risk of at least 1.5 for exposures affecting up to 4% of the population. For the calculation of the final sample, 10% for losses and refusals, 15% for confounding factors and a delineation effect of 1.3 were applied.

The criteria for inclusion were: individuals aged 60 years or older, living in private households, in the urban area of the municipal region of Bagé (RS), located in the areas covered by basic health care

services. The sampling process was carried out in two stages based on the area covered by all 20 Basic Health Units (BHU), with 15 Family Health Units and five traditional BHUs. The area of the BHUs was divided into micro areas, with the numerical identification of each block, randomly selecting the initial point of data collection and each of the blocks by the drawing of lots. In order to ensure that all households had the same probability of inclusion in the sample, systematic skipping was used and one in every six residences was visited to locate the elderly. All residents aged 60 years or older residing in selected households were invited to participate in the study. Households where it was not possible to perform Interviews after three attempts on different days and times were considered losses, and those where the elderly did not agree to answer the questionnaire were considered refusals[32].

Data collection was performed by duly trained interviewers using a questionnaire structured with pre-coded questions, answered by the elderly individuals themselves. In the case of disability, the questionnaire was applied to the caregiver.

The occurrence of "urinary incontinence" was investigated through the following questions: *Do you have trouble with leaking some urine and accidentally wetting yourself?; In the last 30 days, how often did this happen?; In what situations do you leak urine? Because of the problem of leaking urine, do you use liners, absorbent pads, or diapers?*. Using UI as a health marker, the following physical and mental health indicators were evaluated: Functional Disability for Activities of Daily Living (ADL) assessed by the Katz et al scale, screening for cognitive deficit assessed by the Mini Mental State Examination, depression evaluated by the Geriatric Depression Scale and Self-perception of Health[1].

The independent variables used were the demographic and socioeconomic variables: gender (female and male), age in complete years (60 to 64 years, 65 to 69 years, 70 to 74 years, 75 years or more), self-described skin color (white, black, yellow/ /brown/indigenous), economic classification according to the Brazilian Association of Research Companies (A/B, C, D/E) and schooling in full years (none, 1 to 7, 8 or more).

Data analysis was performed using the statistical program Stata version 12.0 (Stata Corporation, College Station, USA). Qualitative variables were expressed as absolute and relative frequencies and the quantitative variables as means and standard deviation (SD), with a 95% confidence interval (CI). Crude and adjusted analysis was performed using Poisson regression with robust variance adjustment to estimate the prevalence ratios (PRs) and their respective 95% CIs. An adjustment was made for demographic and socioeconomic variables. Associations with p value <0.05 were considered statistically significant.

The study was submitted to and approved by the Ethics Research Committee of the Universidade Federal de Pelotas under registration nº 15/08, following the precepts of Resolution nº 196/1996. The participants were informed about the research objectives and asked to read and sign a Free and Informed Consent Form.

RESULTS

A total of 1,593 elderly persons were interviewed, most of whom were female (62.8%). The mean age was 71.2 years (95% CI 63.0-79.4), ranging from 60 to 106 years, and the majority self-described their skin color as white (81.7%). There was a higher proportion of elderly married persons or those with companions (51.3%), and those who belonged to economic class C (38.9%). Regarding schooling, 23.9% reported not attending school and 54.5% had one to seven years of schooling. The majority of the elderly reported being retired (71.7%) (Table 1).

Table 1. Sociodemographic characteristics of sample of elderly population. Bagé, Rio Grande do Sul, 2008.

Variables	n (%)
Gender	
Male	593 (37.2)
Female	1000 (62.8)
Age	
60 to 64 years	400 (25.1)
65 to 69 years	374 (23.5)
70 to 74 years	322 (20.2)
75 years or more	497 (31.2)
Skin color/Ethnicity (self-reported)	
White	1252 (78.6)
Black	139 (8.7)
Yellow, brown, indigenous	202 (12.7)
Marital status*	
Married or with companion	816 (51.3)
Single or separated	238 (14.9)
Widowed	538 (33.8)
Economic classification – ABEP**	
A and B	429 (27.1)
C	615 (38.9)
D and E	537 (34.0)
Years of schooling*	
None	382 (23.9)
One to seven years	868 (54.5)
Eight to 20 years	342 (21.6)
Retired	
No	451 (28.3)
Yes	1142 (71.7)
Total	1593 (100)

ABEP= Brazilian Association of Research Companies. *1 loss. **12 losses.

The prevalence of UI was 20.7%. Of these, in the 30 days prior to the interview, 36.9% reported daily urine leakage, 39.4% weekly leakage and 23.5% monthly leakage. Among incontinent individuals, 33.4% reported using a diaper or liner, of which 20.9% used only when they left the house, 17.2% used only when sleeping and 61.8% used all the time.

The prevalence of UI was 26.9% among women and 10.3% among men (p=<0.001). It was 28.4% in elderly persons aged 75 years or more (p=<0.001); 27.9% among elderly people with yellow, brown or indigenous skin color (p=0.031); 20.3% among economic class D and E (p=0.622); and 26.3% among those without schooling (p=0.002), considering the total population (Table 2).

When verifying the prevalence of UI, stratified by gender, according to demographic and socioeconomic variables, it was possible to identify a significant increase in prevalence among women aged 75 years or older and those with yellow, brown or indigenous skin color. Among elderly men, the prevalence of UI was significantly higher in the age group of 70 to 74 and 75 years or older and among those with no schooling.

When assessing the relationship between UI and physical and mental health conditions, it was noted that, among the incontinent elderly population, there is a higher prevalence of functional disability, depression, cognitive deficit and a poor/very poor self-perception of health in both genders (Figure 1).

Table 2. Prevalence of urinary incontinence in the elderly according to the demographic and socioeconomic variables in the total sample and stratified by gender. Bagé, Rio Grande do Sul, 2008.

Variables	Urinary Incontinence					
	Total		Women		Men	
	%	cPR* (CI95%)	%	cPR* (CI95%)	%	cPR* (CI95%)
Gender		*p*=<0.001	-	-	-	-
Male	10.3	1.00	-	-	-	-
Female	26.9	2.61 (2.02-3.28)	-	-	-	-
Age		*p*=<0.001		*p*=<0.001		*p*=<0.001
60 to 64 years	13.8	1.00	20.0	1.00	3.9	1.00
65 to 69 years	17.4	1.26 (0.91-1.76)	23.6	1.18 (0.84-1.66)	7.1	1.83 (0.68-4.92)
70 to 74 years	21.4	1.56 (1.13-2.15)	27.8	1.39 (0.99-1.95)	11.7	3.03 (1.21-7.58)
75 years and over	28.4	2.07 (1.56-2.74)	33.8	1.69 (1.26-2.27)	17.9	4.61 (1.97-10.79)
Skin color		*p*=0.031		*p*=0.011		*p*=0.779
White	20.0	1.00	25.7	1.00	10.2	1.00
Black	17.3	0.86 (0.59-1.27)	21.1	0.82 (0.54-1.24)	10.2	1.01 (0.42-2.41)
Yellow or brown or indigenous	27.9	1.40 (1.09-1.79)	38.8	1.51 (1.17-1.94)	11.3	1.11 (0.57-2.17)
Economic class		*p*=0.622		*p*=0.056		*p*=0.124
A and B	21.7	1.00	30.8	1.00	8.5	1.00
C	20.5	0.95 (0.74-1.20)	27.1	0.88 (0.69-1.12)	8.9	1.05 (0.55-1.99)
D and E	20.3	0.94 (0.73-1.20)	23.9	0.77 (0.60-1.00)	13.6	1.59 (0.87-2.92)
Schooling (years of study)		*p*=0.002		*p*=0.069		*p*=0.002
Eight to 20 years	17.0	1.00	24.4	1.00	4.6	1.00
One to seven years	20.0	1.18 (0.90-1.54)	25.7	1.05 (0.80-1.39)	10.5	2.26 (0.97-5.25)
none	26.3	1.55 (1.16-2.08)	32.0	1.31 (0.97-1.77)	16.0	3.45 (1.44-8.27)

*cPR = crude Prevalence Ratio

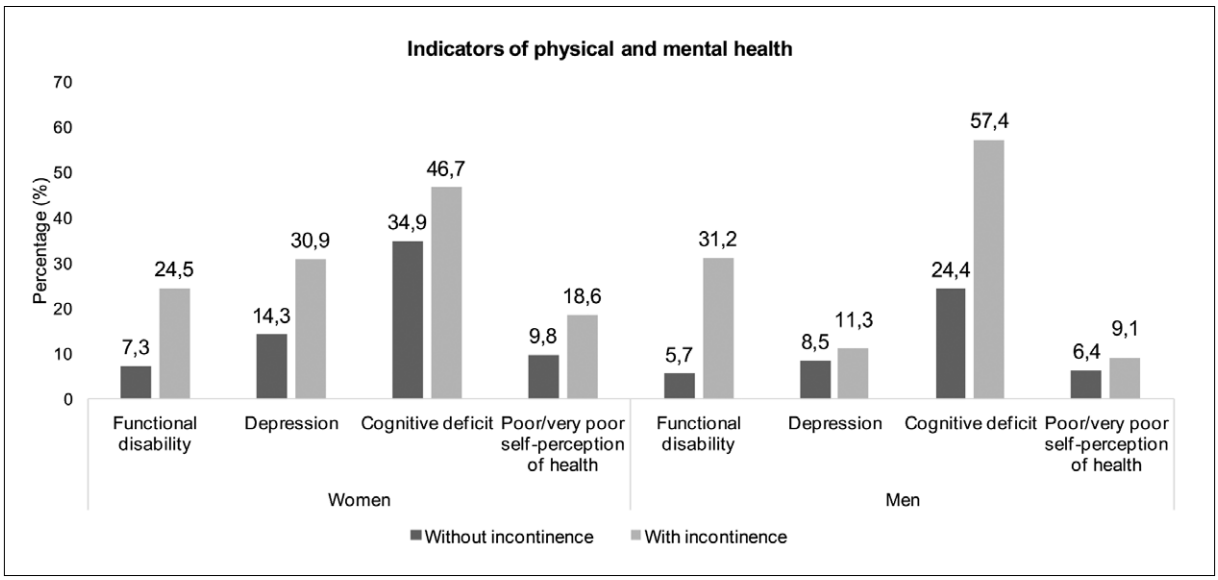

Figure 1. Proportional distribution of functional disability, depression, cognitive deficit and poor/very poor self-perception of health among the elderly with and without urinary incontinence, according to gender. Bagé, Rio Grande do Sul. 2008.

In crude analysis, functional impairment for ADL and cognitive deficit were found to be associated with the presence of UI in the male and female population. Depression and poor/very poor self-perception of health were associated only with women (Table 3).

Table 3. Association of indicators of functional disability, depression, cognitive deficit and poor/very poor self-perception of health and urinary incontinence in the elderly population, according to gender. Bagé, Rio Grande do Sul, 2008.

Variables	Urinary Incontinence##			
	cPR* (CI95%)	P	adjPR# (CI95%)	p
Women (1000)				
Functional disability **(1000)	3.38 (2.42; 4.72)	0.000	2.79 (2.03-3.85)	0.000
Depression (951)	2.16 (1.67; 2.81)	0.000	2.21 (1.69; 2.89)	0.000
Cognitive deficit (952)	1.34 (1.13; 1.58)	0.001	1.18 (1.02; 1.38)	0.027
Poor/very poor self-perception of health (965)	1.91 (1.36; 2.69)	0.000	1.86 (1.31-2.65)	0.001
Men (593)				
Functional disability**(592)	5.51 (3.31; 9.18)	0.000	4.45 (2.60; 7.62)	0.000
Depression (561)	1.34 (0.60; 3.00)	0.480	1.22 (0.53; 2.83)	0.645
Cognitive deficit (562)	2.35 (1.78; 3.10)	0.000	1.55 (1.18; 2.05)	0.002
Poor/very poor self- perception (575)	1.43 (0.58; 3.52)	0.433	1.13 (0.45; 2.88)	0.794

*cPR = Crude Prevalence Ratio

#adjPR = Prevalence Ratio adjusted for the variables: age, skin color, economic class and schooling.

**Functional disability for Activities of Daily Living (ADL)

##Used as a reference for the category "no".

In the analysis adjusted for demographic and socioeconomic variables, the physical and mental health indicators remained associated with UI in both sexes. Women with UI had, respectively, 2.8, 2.2, 1.2 and 1.9 times the odds of having functional disability for ADL, depression, cognitive deficit and poor/very poor self-perception. Among males, functional disability and cognitive deficit were 4.5 and 1.6 times greater, respectively, among those who had incontinence compared with those who did not.

DISCUSSION

The prevalence of UI reveals that the problem affects one in five elderly people in the municipality of Bagé (Rio Grande do Sul), with greater occurrence among women, those with advanced age, yellow, brown or indigenous skin color and those without schooling. Evaluating the health of the elderly population using the UI health marker, incontinent women showed a significantly higher prevalence of functional disability for ADL, depression, cognitive deficit and poor/very poor self-perception of health. Elderly men with UI had a higher prevalence of functional disability and cognitive deficit.

The findings on the general prevalence of UI corroborate the results of population-based studies conducted with elderly people in São Paulo (São Paulo)[6] and in Florianópolis (Santa Catarina)[8]. However, research on the prevalence of UI has shown great variability[7,11,12,17,19,21,33]. This may occur due to sample choice, the age and gender of the population investigated[33], the fact that prevalence is often higher among elderly persons in long-term institutions[19]; and the type of instrument used for UI assessment, whether self-reported or clinical diagnosis. This variability can also be explained by the adoption of different definitions for UI or even different methodologies[6]. It can also be attributed to cultural differences between regions in how UI is perceived by older adults[18].

As for the frequency of urine loss, the prevalence of elderly people who reported suffering from this

problem on a daily basis was higher than that observed in a study carried out with elderly women from a care center for the elderly in Pelotas (Rio Grande do Sul)[21] and women aged 18 to 89 years who sought cervical cancer screening in Florianópolis (Santa Catarina)[9]. The frequency and amount of urine leakage are due to several factors, such as: type of UI, elderly health status, comorbidities and degree of functional dependence[11].

Regarding the factors associated with UI, women presented a higher prevalence (26.9%) than men (10.3%). The self-reported prevalence of UI by the elderly was 36.3% in women and 17.0% in men in a study carried out in Florianópolis (Santa Catarina)[8], 26.2% in women and 11.8% in men in São Paulo (São Paulo)[6], 69.5% in women and 30.5% in men in Uberaba (Minas Gerais)[10], and 31.1% in women and 23.2% in men in Montes Claros (Minas Gerais)[17]. In a study in Korea with people 60 years of age or older, UI was reported in 6.5% of women[15] and 3.9% of men[18]. And in the USA, in a study with women and men aged 50 years or older, the prevalence of UI was 19.8 and 6.4%, respectively[7].

In all surveys, the female gender appears to be the most affected and associated with UI, which may be related to the differences between the length of the urethra; the anatomy of the pelvic floor; the effects of gestation and giving birth on UI mechanisms; and hormonal changes[6].

The tendency for the prevalence of UI to grow as the age of the elderly person increases has been identified by both Brazilian[6,8,11] and non-Brazilian studies[7,12]. Aging with increasing prevalence of comorbidities causes physiological changes. Thus, it is not surprising that advanced age is associated with the loss of bladder control, since urine control depends on a complex set of neurophysiological pathways, normal neuromuscular and connective tissue function, and adequate cognition and mobility[7].

In Bagé (Rio Grande do Sul), yellow, brown or indigenous skin color increased the occurrence of UI by 40% in relation to white elderly persons, corroborating the results of a study carried out in Florianópolis (SC)[9]. According to literature, white women have better knowledge about UI than black women and more frequently undergo surgical treatment[34]. Another hypothesis is that white elderly persons may have better socioeconomic conditions, which favors seeking out preventive measures.

In contrast, a survey conducted in the USA showed that being non-Hispanic white increased the chance of UI in relation to other ethnic groups[7]. Thus, it is difficult to know whether the racial disparities observed are due to actual differences or if there are differences in the level of knowledge about the problem or in reporting urinary dysfunction among the various ethnic-racial groups, according to accepted cultural norms[34].

In the present survey, the absence of schooling was related to a higher probability of UI. Similar results are found in literature[8,10]. Absence or low levels of schooling can make early detection and the seeking of treatment and preventive strategies difficult, as there may be a belief that UI is a natural consequence of the aging process[1]. In addition, healthcare professionals should use clear language that facilitates understanding in the socialization of information on the subject[10].

After adjustment for demographic and socioeconomic variables, it was possible to identify a higher prevalence of functional disability, depression, cognitive deficit and poor/very poor self-perception of health among elderly individuals with UI. These results show the necessity and importance of the evaluation of physical and mental health indicators in the elderly that relate to UI.

The relationship between UI and functional capacity has been verified in non-Brazilian studies[24,25]. Longitudinal research conducted in Norway has confirmed UI as a significant risk factor for decline in functional capacity among older women[24]. In a cohort study performed in the USA[25], older women with daily UI had a greater chance (OR=3.31) of functional difficulty or dependence than those who were continent, after adjusting for sociodemographic variables.

This study does not involve longitudinal follow-up and these results are likely to be the fruits of reverse causality, as while it is difficult to say that UI causes functional disability, the opposite can be stated[6,8,11,14,16,18]. One study[25] justifies this result

by stating that incontinent women reduce physical activity due to fear of accidental urine loss and, consequently, there is an increase in functional limitations.

In relation to depression, there are several publications that show UI as a risk factor for the disease. A survey[27] conducted with Norwegians showed that, after adjustments, women with UI had around a 1.60 greater chance of developing depressive disorder and anxiety compared to women without UI. Cross-sectional studies[26,28] with women over 50 years of age in the USA showed an increase in the prevalence of depression as the frequency and severity of UI increased.

Incontinent women often avoid social activities and thus have smaller social networks, which, in turn, have an impact on mental health and contribute to the development of depression[26]. However, we cannot disregard depression as a risk factor for UI, which was verified in a national cohort study[6].

The prevalence of cognitive deficit was significantly higher among those with incontinence than those who do not, in both genders, with a higher prevalence in incontinent men. While there is no evidence to show UI as a risk factor for cognitive deficit, this result makes clear the importance of assessing the condition in elderly individuals who report or have a diagnosis of UI. It is known that mental deficiency is an important risk factor for the development of incontinence[16], despite the scarcity of studies.

The prevalence of a poor/very poor self-perception of health increased among incontinent women, with no significant association among men. This association is expected considering the impact of UI on the psychosocial life of the elderly. In a population study[29] of elderly persons in Cuiabá (Mato Grosso) it was found that the self-assessment of poor and very poor health was 1.33 times higher among incontinent elderly than those who did not have UI. A study[30] performed with elderly individuals 65 years of age or older in Belém (PA) (n=571) and in Campinas (SP) (n=676), showed that in both cities negative self-assessment of health was associated with the presence of three or more signs and symptoms, including UI.

The association of depression and self-rated poor/very poor health with UI among women may be related to the fact that this population group tends to expose their feelings and health problems more than men. In addition, women account for more than 60% of the population of this study, and there is therefore greater power to find associations. It is also worth noting that most of the studies conducted with the elderly focus on the female population, and there is a need to broaden this theme among elderly men.

Among the limitations of the present study, we highlight the fact that the association between the types of UI and the health conditions studied was not investigated. There is also the possibility that the individuals of the study were in drug treatment for UI and at the time of data collection did not mention urine leakage. In a cross-sectional study, it is not possible to assess the temporal relationship of UI with functional disability, depression, cognitive deficit and poor/very poor health self-perception. It is suggested that longitudinal surveys are carried out to verify the causal relationship between the variables. It is also worth mentioning that while there is no biological plausibility that UI causes functional disability and cognitive deficit, the relationship of these conditions with incontinence is evident, highlighting the need to evaluate physical and mental health conditions in the practice of care of the elderly with a diagnosis of UI. These are common conditions in primary care and negatively affect the quality of life of the elderly. These findings may support public policies for the elderly population, strategies to prevent UI and its effects on the health of this population and the organization of treatment in primary health care.

CONCLUSION

The results of this study reveal that urinary incontinence is a frequent condition among the elderly, affecting one in five individuals. In addition, its prevalence is higher among the elderly, women, older elderly people, those with yellow or brown skin or indigenous, and those without schooling. Incontinence was related to physical and mental health indicators, with a higher occurrence of functional disability, depression, cognitive deficit and a poor/very poor self-perception of health in incontinent elderly persons.

Urinary incontinence should not be understood as a normal alteration of the physiology of aging, and thus health education actions and guidelines for individuals at all ages are required. In this sense, the training of health professionals regarding the approach to incontinence, methods of evaluation and early diagnosis, and knowledge about the risk factors is urgently needed. It is suggested that longitudinal studies are carried out to verify the relationship between incontinence and physical and mental health indicators, as well as the impact on the quality of life of the elderly.

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Development of an app as a tool to support research and the prevention of osteoporosis

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Abstract

Objective: to develop an app for the investigation and prevention of osteoporosis for use by health professionals. *Method*: the development of the app was performed in six steps: definition of the target audience; survey of validated osteoporosis risk assessment tools in Brazil; programming of the app through the progressive web; selection of data for the preparation of sections of the evaluation form and clinical recommendations; automated auditing and evaluation of the app by health professionals. *Results*: three screens were prepared for the app. These were based on the data extracted using the Osteorisk, Sapori and Frax tools for sociodemographic data (age, gender, weight, height and ethnicity), health (use of glucocorticoids, hormone replacement therapy, arthritis rheumatoid arthritis, secondary osteoporosis, previous low impact fractures, parents with a history of hip fractures) and health related behaviors (physical activity, alcohol intake and smoking). The appl followed the design pattern and functionalities of the osteoporosis adviser tool (OPAD). Regarding guidelines relating to clinical recommendations, the guidelines on osteoporosis and fall prevention in the elderly of the Ministry of Health and the Brazilian Society of Geriatrics and Gerontology, respectively, were taken as a basis. *Conclusion*: the app allows the early identification of patients presenting risk factors for osteoporosis and, based on these results, provides guidance on the preventive measures to be adopted, aiming at reducing complications resulting from fractures, hospitalizations, disabilities and deaths.

Keywords: Aging. Osteoporosis. Decision Making, Computer Assisted.

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INTRODUCTION

Brazil is a large country that includes states with isolated municipal regions, a multiethnic population and an unequal supply of specialized medical services that hamper epidemiological studies into the accurate prevalence of osteoporosis and its impact on public health costs, limiting the management of the disease[1]. This situation encourages greater use of telecare and apps and decision support tools in this area, and in turn to more publications in the application of mobile technology in health line of research[2]. -

The spread of information and communication technologies, with the global use of mobile devices and broadband expansion, has had major repercussions in the area of medicine. This technological configuration has enabled the development of web systems and specific applications for health professionals and patients. Examples include the Alzhe alert, which estimates the risk of a person developing Alzheimer's disease over the years, depending on their daily habits and activities[3]; and ADep (*Ayuda para depression* in Spanish), a free access program on psychoeducation and cognitive-behavioral intervention for depression, produced in Mexico[4].

In Brazil, other examples of these types of applications are Mobi-Frail (*Frágil Mobi)*, which seeks to identify characteristics of frailty in the elderly[5], and the Tech-Care (*CuidarTech*) "Foot Examination" app, a tool to assist in the assessment and classification of risk of developing diabetic foot for people with diabetes mellitus[6].

One of the great challenges facing Brazil is the aging of its population. Osteoporosis and fractures due to frailty are highlighted by high costs to public health, negatively impacting the quality of life of the elderly. In Brazilian studies, the reported prevalence of osteoporosis among postmenopausal women ranges from 15.0% to 33.0%[7]. In general, these studies also show a high prevalence of all types of fractures due to bone fragility, varying from 11.0 to 23.8%; and a moderate incidence of hip fractures in individuals over 50 years of age[8].

An epidemiological study of fractures of the proximal third of the femur in elderly patients treated at a teaching hospital in the central region of São Paulo showed that low-energy trauma was the cause of 92.9% of fractures, with an intra-hospital mortality rate of 7.1%[9]. It is estimated that 15.0% to 30.0% of patients with hip fractures die in the first year, often as a result of fracture complications, such as infections, venous thrombosis and pressure ulcers; or associated conditions, especially cardiovascular in nature[1].

Aiming to avoid these complications, several European, North American and Asian studies have demonstrated the clinical relevance of assessment tools that can be used to identify individuals at a higher risk of developing osteoporosis. Some of these tools, such as the simple calculated osteoporosis estimate (Score) and the Belgian risk ratio for osteoporosis (Osiris)[10], indicate that the early identification of risk factors is the main goal in the introduction of effective osteoporosis prevention strategies[11], which were considered in the elaboration of the application in the present study, known as *OSTEOGUIA* (OSTEOGUIDE).

The objective of this study was to develop a progressive web app to assist health professionals in the assessment and prevention of osteoporosis with content based on risk assessment tools available in literature.

METHOD

A study was performed to develop a low-cost app that can be used by any health service and is easy to install on mobile devices.

The steps for building the app involved the definition of the target audience; a survey of validated osteoporosis risk assessment tools in Brazil; programming of the app through the progressive web; selection of data for the sections of the assessment form and clinical recommendations; automated auditing and evaluation of the app by health professionals.

Target audience

As osteoporosis is a disease associated with aging, and that approximately 75% of Brazilians do not

have a private health plan[1], the target audience of the app was defined as health professionals working in the basic health, women's and geriatric areas of the Unified Health System (SUS).

Survey of validated osteoporosis risk assessment tools in Brazil

A survey of scientific publications was carried out in the Medline and Lilacs databases of the Virtual Health Library (VHL) and in the Capes journal portal, aiming to identify the validated risk assessment tools for osteoporosis in Brazil. The criteria for inclusion of articles were: publications available online, in Portuguese or English and published between 2005 and 2016. We excluded studies describing tools not evaluated for the Brazilian population. The descriptors used were: osteoporosis, risk factors, risk assessment and hip fractures. After the evaluation of the articles, three tools (Osteorisk, Sapori and Frax) were identified that served as basis for the creation of the app.

The Osteorisk tool is based on age and weight, and the evaluation of the Brazilian population sample showed an overall sensitivity to identify women with a high risk of osteoporosis of 86.5%. The simplicity of the app, its low cost and the savings generated make this tool an excellent screening method to identify women who are at higher risk of osteoporosis[12].

The Sapori tool identified that the main risk factors associated with low bone density and low impact fractures were: underweight; advanced age; white/Caucasian race/ethnicity; a family history of femoral fracture; current smoker and chronic use of glucocorticosteroids. Postmenopausal hormone therapy and regular physical activity played a protective role[13].

The Frax tool has an algorithm that calculates the risk of the patient suffering a fracture due to bone fragility in the next ten years, correlating the risk factors with the result of the bone mineral density of the femoral neck, measured by bone densitometry. The clinical risk factors assessed are: age; gender; body mass index (BMI); previous fractures; family history of femoral fracture; prolonged corticotherapy; current smoker; ingestion of more than three units of alcoholic beverage per day; secondary osteoporosis and rheumatoid arthritis[14].

Progressive web app programming

For programming the app open source technologies such as HTML, CCS, Java script and PHP were used. We chose to develop a progressive web app (PWA), a term used to denote a new software development methodology. Unlike traditional apps, a PWA can be seen as a hybrid evolution between regular web pages (or websites) and a mobile app. This new app model combines features offered by the most modern browsers with the advantages of using a mobile phone[15]. Throughout the development of this application we tried to meet the precepts established in software engineering.

Selection of data for preparation of the Assessment Form section and for clinical recommendations

The use of risk assessment tools should consider the profile of their population, as genetic, racial and anthropometric differences contribute to explain divergences in the incidence and prevalence of low bone density and fractures in several countries around the world[13]. The selection of data for the preparation of the assessment form was based on the three validated osteoporosis risk assessment tools in Brazil (Osteorisk, Sapori and Frax).

The weight and age data common to the three tools were used in the patient risk classification for low bone density which was based on the algorithm calculation of the Osteorisk tool: 0.2 *[(Weight in Kg) - (Age in years)]. Individuals are considered low risk when the result of the calculation is greater than 1, medium risk when the value is between -2 and 1 and high risk when the value is less than -2. This tool performs well, as shown in the work of Sen et al.[11] and Steiner et al.[12], with sensitivity of 86.5% in the identification of women at high risk for osteoporosis.

Family history, specifically parents with a history of femoral fracture, current smoking, chronic use of glucocorticoids and previous low impact fractures

were identified as risk factors associated with low bone density by the Sapori and Frax tools and were incorporated into the app.

The use of glucocorticoids followed the Frax recommendation to indicate a positive result if current oral glucocorticoid use was identified for more than 3 months with a prednisolone dose of 5 mg or more (or equivalent dose of other corticosteroids). Regarding alcohol consumption, the use of 3 units of alcohol or more per day was considered affirmative, in accordance with the Frax guidelines. A unit of alcohol varies little between different countries and is between 8-10 g of alcohol. This is equivalent to a standard glass of beer (285 ml), a measure of spirits (30 ml), an average glass of wine (120 ml) or a measure of aperitif (60 ml)[16].

For the definition of secondary osteoporosis, Frax considers whether the patient has a disease strongly associated with osteoporosis. This includes type I diabetes, osteogenesis imperfecta in adults, untreated hyperthyroidism, hypogonadism or premature menopause (<45 years), chronic malnutrition or malabsorption, and chronic liver disease[16].

According to the sample of the Sapori study, postmenopausal hormone therapy and regular physical activity in the previous year had a protective role. The app was configured to only signal these affirmations as positive for identified continuous cases during the previous year[13]. In this study, those of white/Caucasian race/ethnicity were considered to be at greater risk, with the definition of race at the discretion of the clinical judgment of the health professional.

The data used by the osteoporosis adviser (OPAD) tool, a clinical decision support system developed in Iceland, were not used in the OSTEOGUIA assessment form as there were no studies on its use and validation for the Brazilian population. However the design pattern, with fields for the inclusion of numerical values of anthropometric data and yes or no option buttons for risk factor items, were adopted. The functionality of offering recommendations on lifestyle, treatment and the timing of bone densitometry exams immediately after submission of the form were also followed[17].

With respect to the clinical recommendations for the adoption of preventive measures for osteoporosis, the application was based on the Clinical Protocol and Therapeutic Guidelines of Osteoporosis of the Ministry of Health (MS), Ordinance No. 451/201418, and the guidelines on prevention of falls among the elderly of the Brazilian Society of Geriatrics and Gerontology (SBGG)[19].

Automated Audit

To evaluate the performance of the app, Google's automated open source Lighthouse tool was used[20]. This provides a comprehensive audit of all aspects of the quality of a web app by performing a series of tests on the page, and generates a performance report based on those tests, displaying flaws and recommendations for improving the application. Lighthouse was run as an extension of Chrome, auditing the items listed in Table 1.

Chart 1. Items of app audited with Lighthouse tool. Rio de Janeiro, 2017.

Progressive Web App	Accessibility	Good Practices
Register a *service worker*	Elements use attributes correctly	Include *JavaScript front-end* libraries without security vulnerabilities
Respond with 200 code when *off-line*	ARIA attributes follow best practice	Avoid the app cache
Contain content when JavaScript is not available	Elements have discernible names	Avoid WebSQL DB
Use https	Elements describe content well	Use https
User can be asked to install the web app	Elements are well structured	Use http/2 for own resources

to be continued

Continuation of Chart 1

Progressive Web App	Accessibility	Good Practices
Configured for a personalized home screen	Specific page for valid language	Use passive listeners to improve scrolling performance
Address bar corresponds to brand colors	Meta Tags used correctly	Avoid mutation events in own scripts
Has a <meta *name* = *viewport*> tag with initial width or scale	Satisfactory color contrast	Avoid *document.write* ()
Content is sized correctly for viewport		Open external anchors using *rel* = *noopener*
Redirect http traffic for https		Avoid requesting geolocation permission on page load
Page loads quickly enough in 3G		- Avoid requesting notification permission on page load - Avoid discontinued APIs - Manifest's s*hort_name* won't be truncated when shown on home screen - Prevents users from pasting into password fields - Displays images with correct aspect ratio - No navigator error registered on console

ARIA= Accessible Rich Internet Applications.

APIs = Application Programming Interface.

Evaluation of app by health professionals

An evaluation of the prototype was carried out to discover the opinions of health professional users regarding the functionality, usability and reliability of the application. This model was presented and made available for use to the professionals of the Care Centre for the Elderly (NAI) of the Universidade do Estado do Rio de Janeiro (Uerj), from August to September 2017.

After the evaluation period, an online questionnaire was created using the Likert Scale with a score of 1 to 5, varying from totally disagree to fully agree. Scores over 4 were considered adequate. The volunteers evaluating OSTEOGUIA were required to answer questions that are generally used in software engineering to assess the technical quality of applications. These issues were based on studies that assess features such as the functionality, reliability, usability and efficiency of mobile apps[21].

The questionnaire included a question about the professional profile of the evaluators, who could be doctors, nurses, other health professionals or caregivers. For the validation of the online questionnaire, we sought to comply with NBR ISO/IEC 25062: 2011 of the Brazilian Association of Technical Standards (ABNT)[22], which recommends a minimum sampling of eight participants in the test stage.

After the evaluation phase of the prototype and corrections of the initial version, the application was sent for registration with the Institute of Technological Innovation of Uerj. Upon completion of this process, the app will be made available for free access on a secure hosting server on the Google Play Store.

Research Ethics

The development of this app followed the Guidelines and Norms Regulating Research Involving Human Beings, in accordance with the recommendations of resolution 466/2012 of the National Health Council. The project was approved by the Research Ethics Committee of the Universidade Estadual do Rio de Janeiro (Protocol No. 2706/17).

The volunteers were previously informed about the evaluation of the application, with only those who agreed to and signed the Free and Informed Consent Form allowed to participate.

RESULTS

Three screens were created for the OSTEOGUIA app, based on the data extracted using the Osteorisk, Sapori and Frax tools for sociodemographic data (age, gender, weight, height and ethnicity), health (use of glucocorticoids, therapy hormone replacement therapy, rheumatoid arthritis, secondary osteoporosis, previous low-impact fracture, parents with a history of hip fracture) and health-related behaviors (physical activity, alcohol intake, and smoking).

The assessment form screen was based on the design used by the OPAD tool with fields for the numerical completion of the age, weight, height and T-score values and yes or no option buttons for the risk factors to be evaluated.

The guidelines on osteoporosis and prevention of falls among the elderly of the Ministry of Health and the Brazilian Society of Geriatrics and Gerontology, respectively, were used as a basis for the guidelines relating to clinical recommendations.

The home screen features a fixed menu at the top that leads to five sections: three with interactive information on osteoporosis, risk factors, and densitometry; one that leads to the assessment form and one to the contact form (Figure 1).

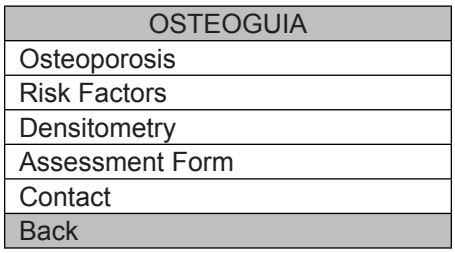

Figure 1. Reproduction of OSTEOGUIA app screen. Rio de Janeiro, 2017.

The Osteoporosis section provides interactive buttons that lead to screens with information on definition, etiology, epidemiology, mortality, falls, and a button with a tutorial on using the app in which a link to the bibliographic references is located.

The *Risk Factors* section details each important risk factor in the assessment of the patient, separated into two columns: modifiable and non-modifiable factors. Each risk factor is represented by a button that provides detailed information, including important data to be considered when completing the assessment form.

As the diagnosis of osteoporosis can also be made based on the measurement of bone mineral density by the dual X-ray densitometry technique, the Densitometry section provides recommendations for the examination, according to the guidelines of the Ministry of Health.

In the *Assessment Form* the health professional inserts the general details of the patient and the items related to the risk factors. (Figure 2).

The patient's general data is entered in the text fields and risk factors are selected using the yes or no options, following the design pattern of the OPAD tool, and then automatically transferred to the app algorithms. If the patient has undergone a bone densitometry exam of the lumbar spine, a field asks them to provide the numeric value of the T-Score obtained in the lumbar segment of L1-L4.

After submitting the assessment form the user is directed to the final screen, Results and Clinical Recommendations. Here a report provides the BMI of the patient, with an alert for underweight patients, the risk classification of the patient for low bone density and the densitometry result as classified by the World Health Organization (WHO), categorized as osteoporosis, low bone density (osteopenia) or normal (Figure 3).

OSTEOGUIA	
General data:	
Age:	
Weight:	Height:
Gender: o Male o Female	
Risk factors	
1- White/Caucasian race/ethnicity o No o Yes	
2- Current smoker o No o Yes	
3- Three or more units of alcohol per day o No o Yes	
4- Regular physical activity o No o Yes	
5- Use of glucocorticoids o No o Yes	
6- Hormone replacement therapy o No o Yes	
7- Rheumatoid arthritis o No o Yes	
8- Secondary osteoporosis o No o Yes	
9- Previous low impact fracture o No o Yes	
10- Parents with history of hip fracture o No o Yes	
Densitometry	
T-*Score* lumbar spine:	
Back	

Figure 2. Reproduction of OSTEOGUIA app screen. Rio de Janeiro, 2017.

OSTEOGUIA
Results and Clinical Recommendations
1- Body mass index BMI=17.2 Being underweight is a risk factor for osteoporosis
2- Classification of risk of patient for low bone density = High Risk
3- Result of densitometry exam, according to WHO classification = Osteoporosis
4- Smoking and excessive alcohol intake should be discouraged
5- Rheumatoid arthritis is associated with low bone mass
6- Use of glucocorticoid with a dose greater than 5 mg prednisone/day or equivalent for a period of 3 months or more has a higher predictive value for fracture risk
7- No other modifiable risk factors
Back

Figure 3. Reproduction of OSTEOGUIA app screen. Rio de Janeiro, 2017.

In the Contact section the user is provided with a form so that they can send a message to the app developers with questions, comments and suggestions.

In the automated audit, the app presented a performance of 82% in PWA characteristics, 89% in accessibility features and 100% in complying with good web development practices. Suggested indicators for improving accessibility relate to technical features that make content accessible to a user of assistive technology, such as a screen reader for the visually impaired. Improvements to the PWA features include improvements in server access such as https access redirection, which is a secure http, and improved image optimization for a better 3G connection experience.

Table 1 shows the data based on the responses of the evaluations performed by NAI/UERJ professionals. All seven evaluated items were approved, with an emphasis on the ease of use and reliability of the application, and 62.5% of professionals agreed with the use of the app. Eight professionals participated in this evaluation, and all identified themselves as doctors. The online questionnaire was available in the same trial period as the prototype.

Table 1. Responses to on-line questionnaire for the assessment of the OSTEOGUIA app. Rio de Janeiro, 2017.

Items	Questions	Mean (standard-deviation)
1	Would you like to use this app frequently in your day to day routine?	4.62 (±0.51)
2	Is the app easy to use?	5.00 (±0)
3	Could you use the app alone?	5.00 (±0)
4	Are the functions of the app well integrated?	4.62 (±0.51)
5	Are the functions of the app consistent?	4.50 (±1.41)
6	Do you think other people will be able to learn to use OSTEOGUIA quickly and easily?	4.75 (±0.46)
7	Do you think the use of the app is reliable?	5.00 (±0)

DISCUSSION

In the daily clinical practice of elderly health care, it has been observed that many patients only receive care and treatment for osteoporosis after a fall episode in which a fragility fracture is found. Danachi et al.[9] identified that simple and effective measures, such as early diagnosis, the treatment of osteoporosis and the regular practice of physical activities, were not adopted for elderly patients with a fracture of the proximal third of the femur.

Despite the many treatments available for the prevention and management of osteoporosis, with the effective reduction of vertebral and non-vertebral injuries, the majority of the Brazilian population still do not have access to early diagnosis and appropriate therapy for the disease[8]. The Brazilian government provides medication for osteoporosis through the SUS but, without adequate epidemiological knowledge, the implementation of public health programs is impaired [7].

Research released by the Brazilian Society of Clinical Medicine showed that around 72% to 93% of physicians said they were very interested in receiving information concerning the prevention and treatment of osteoporosis. At undergraduate or graduate level, 64% and 79% of students, respectively, had little or no exposure to osteoporosis. Only 22% of physicians reported having knowledge about the guidelines for the treatment and prevention of osteoporosis[23].

The OSTEOGUIA application was developed to try to fill this gap, seeking to identify the needs of health professionals and providing scientifically based information, aiming to provide a better service to the population which presents risk factors associated with osteoporosis.

The systematic review found that there are few clinical decision support applications in osteoporosis available and that most studies evaluating these tools do not incorporate the three main components in the assessment: risk factors, diagnosis and treatment[24].

Some tools, such as Osteorisk, Sapori and Frax, identify individuals at greater risk for fracture, optimizing the start of and adherence to treatment, resulting in a more effective selection of patients to undergo bone densitometry, as the doctor can request the examination for those who are most at risk by quantitatively weighing the clinical risk factors. In the *Score* study[13], the authors showed that unnecessary requests for bone densitometry could be reduced by up to 30%, and the Belgian Osiris (Osteoporosis Index Risk) study showed that recommendations for this test could be reduced by 55% if the instrument was correctly applied, avoiding its use among patients at low risk[13].

The OSTEOGUIA app incorporates the risk factors used by these tools with the advantages of portability and easy installation on mobile devices, adapting to any screen size by adopting a responsive design pattern. During the literature review, no online application for the use of the Osteorisk tool was identified. The Sapori tool was developed as an Excel tool and although an internet version of the Frax tool is available, the mobile app is not free.

The use of free coding tools allowed the development of a low cost app. In addition, the use of established web languages facilitates the maintenance and improvement of the app, which can be expanded by linking the assessment form to the registry in a structured database, allowing a more accurate statistical analysis with the possibility of developing new risk assessment tools that consider regional ethnic differences. The impact generated by the use of these tools in the long term and the analysis of the profile of patients in question is a possibility for extending this study.

Another feature that could be improved in the app is the provision of a statistical analysis correlating the risk factors and results of lumbar bone densitometry values with a representative population sample for the definition of sensitivity and specificity in identifying risk for osteoporosis. There is a tendency to develop such apps based on patient experience. In the next stage of this study, it is hoped that these users participate in the evaluation of OSTEOGUIA.

This progressive web app follows the new trend for the mobile web in its relative ease of development and user experience advantages, having the potential to meet the demand of health professionals working with osteoporosis.

As limitations of the present study, it should be noted that the online questionnaire applied to health professionals for the evaluation of the OSTEOGUIA app lacks a protocol for internal validation by the information technology sector of the institution. In addition, the low number of evaluators and the fact that only health professionals responded further limits the extrapolation of the results of this research.

CONCLUSION

The evaluation of the app created in terms of usability, functionality and reliability suggest the possible incorporation of this tool in the daily practice of health professionals. The OSTEOGUIA app enables the early identification of patients presenting risk factors for osteoporosis. Based on these results, the professional can provide guidance about the preventive measures to be adopted, aimed at a better quality of life, reducing complications such as fractures, hospitalizations, disabilities and deaths.

It should be emphasized that the clinical recommendations provided by the app are based on the Clinical Protocol and Therapeutic Guidelines for Osteoporosis of the Ministry of Health and the guidelines on the prevention of falls among the elderly of the Brazilian Society of Geriatrics and Gerontology. Therefore, although this app is easy to use and can be accessed by mobile devices, its guidelines are scientifically based. The implementation of the OSTEOGUIA app can bring benefits for the prevention of this disease in Brazil, allowing the reduction of the socioeconomic impact to the health services.

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Self-medication among participants of an Open University of the Third Age and associated factors

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Abstract

Objective: to identify the prevalence of self-medication, the therapeutic classes used without medical prescription, the symptoms treated with such medication and associated factors among participants of an Open University of the Third Age (OU3A). *Method*: a cross-sectional, descriptive and analytical study was carried out, the sample of which was composed of 138 OU3A attendees. To estimate the association between the variables, prevalence ratios (PR), confidence intervals (95% CI), the chi-squared test and Fisher's exact test were used. *Results*: the majority were aged 60-69 years (61.6%), were female (75.4%), had a health plan (63%) and claimed to self-medicate (59.4%, 95% CI, 0-64.8). The most frequently mentioned therapeutic classes were analgesics (31.9%), muscle relaxants (13.8%), anti-inflammatories (13.0%) and first-generation antihistamines (7.2%). The most commonly reported self-medication symptoms were muscle and joint pain (21.0%), headaches (10.1%) and colds and flu (8.7%). There was a significant association (p = 0.049) among those who self-medicated more frequently and anti-inflammatory use (PR = 1.46, 95% CI = 1.10-1.99). The complaint of muscular and articular pain exhibited a significant association with the diagnosis of arthrosis (p = 0.003, RP = 3.75, 95% CI = 2.07-6.76) and hypothyroidism (p = 0.002, RP = 2.77 ; 95% CI = 1.50-5.10). *Conclusion*: the most frequently mentioned reasons for self-medicating were previous experience using the drug and the certainty that it is safe. Most of the above medications are potentially inappropriate for the elderly. However, the elderly consider them safe and are unaware of the risks to which they expose them. They may also be unaware that pain treated by self-medication may be related to pre-existing diseases, which require the appropriate professional and treatment.

Keywords: Self Medication. Health of the Elderly. Drug Utilization. Drug-Related Side Effects and Adverse Reactions.

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INTRODUCTION

The practice known as responsible self-medication is recommended by the World Health Organization (WHO) as a way of relieving the public health system. The WHO considers self-medication a responsible practice when individuals, in treating their own symptoms and minor ailments, use approved and prescription medications without a medical prescription. Such drugs are supposedly safe as long as they are taken as directed in the packaging inserts and labels[1].

In the European Union and in countries such as the USA, Canada and Japan, self-medication is a well-established practice, and responsible self-medication is used primarily for the treatment of non-serious symptoms and illnesses, such as colds, flu, common headaches, some types of mycosis, muscle pain and other clinical conditions[1].

In Brazil, self-medication is a very common practice, according to a review published in 2015[2]. This review was based on Brazilian cross-sectional studies of high methodological quality that used population samples to analyze the use of drugs in the 15 days prior to the period of data collection. According to the survey, self-medication is exercised by about one-third of the adult population under the age of 65. For the authors of the study, the fact that Brazilians are living longer causes them to seek ways of avoiding the risks inherent in greater longevity, and medication use is seen as one of these means. The practice of self-medication becomes an important tool in this context.[2].

Between 2009 and 2015, pharmaceutical care workshops were offered at the Open University of the Third Age (OU3A) of the Universidade de São Paulo (USP). In these workshops, it was observed that the OU3A was predominantly made up of autonomous and socially active citizens with access to health services and who were medication users[3]. OU3A students, in general, have characteristics of successful and active aging[4]. In the OU3A context, participant health surveys enable the identification of the profile, demands and risk factors for negative outcomes among an elderly population that remains active and participatory. This knowledge favors the planning of actions aimed at maintaining functional capacity, autonomy and active aging.

An approach to self-medication, a practice which exposes the user, especially the elderly, to the risk of adverse events, requires delineable educational interventions that are applicable in the context of an OU3A. Based on the assumption that identifying the target audience is a key strategy for the successful planning of efficient health promotion actions, the objective of this study was to estimate the prevalence of self-medication, the classes of drug used without a prescription, the symptoms treated with the same and associated factors among individuals enrolled at the OU3A. We also sought to identify the reasons for adopting the practice, according to the participants.

METHOD

This cross-sectional, descriptive and analytical study was carried out at the OU3A of the School of Arts and Humanities (SAH) of USP. The survey began in the second half of 2016, when there were 243 students enrolled in the activities of OU3A of the SAH. In order to calculate the sample size needed for this research, a pilot study was conducted with 57 elderly people (the data of which were integrated into this study), of whom 32% reported self-medicating at times. Based on this estimated prevalence, a 95% confidence level and a standard error of 5%, the sample size was defined as 141 individuals.

Data were collected between August 2016 and October 2017. During recruitment, OU3A students were approached at the SAH and invited to participate in the survey, constituting a convenience sample. The inclusion criteria included students of both genders properly enrolled at the SAH OU3A. After the selection of those that fit the inclusion criteria, a total of 138 individuals were obtained.

A previously structured questionnaire was applied for data collection, in which the participants reported their age, gender, frequency of self-medication, reasons for self-medication, health problems, medicines used without a prescription and if they had a health plan.

For the question about the frequency of self-medication, four response options were provided: "always", "almost always", "sometimes", "almost never" (or "rarely") and "never". This categorization allowed us to estimate the frequency of self-medication. In

order to estimate the prevalence of self-medication, those who said they self-medicated "always," "almost always" or "sometimes" were considered practitioners of self-medication, irrespective of frequency, as well as those who reported that they "rarely" or "almost never" used medication without a prescription.

The questionnaire provided categories of motives for self-medication which could be selected by the participants and space to include other reasons. The pre-existing categories on the form were: "previous experience with the medicine or the health problem"; "have no health plan"; "advice from friends, family and neighbors"; " was sure about the safety of the drug"; "availability in pharmacies"; "money saving"; "time saving"; "lack of trust in doctors"; "lack of time to go to the surgery"; "delay in access to consultation or care"; "the health problem was not serious"; "recommendation of pharmacist or pharmacy assistant"; "recommendation of relatives or friends"; "advertising of medication".

The descriptive analysis of the data was performed by determining the measures of central tendency (mean) and dispersion (standard deviation) for the quantitative variables and the distribution of frequency and percentages (absolute and relative frequencies) for the categorical variables.

The prevalence rate was calculated according to the following formula:

$$\text{Prevalence} = \frac{\text{Nº of cases in a given location and period}}{\text{population of same location and period}} \times 100$$

In addition to the prevalence, the association between variables was estimated by bivariate analysis. To estimate the strength of the association, the prevalence ratio (PR) and its confidence intervals (95% CI) were used as an effect measure. In inferential analysis, this association was also evaluated through the following hypothesis tests: Pearson's chi-squared test and Fisher's exact test. The latter was used in cases in which the expected frequency was less than five. Associations with a significance level of 5% (p<0.05) were considered statistically significant. Data analysis was performed in the IBM SPSS Statistics package.

This research was approved by the Ethics Committee of EACH/USP, under approval number 1,354,768. All participants signed a Free and Informed Consent Form (FICF).

RESULTS

The sample consisted of 138 OU3A attendees. The mean age was 68.2 years (SD=6.4) and ranged from 56 to 84 years. Only three participants were aged between 56 and 59 years old. The majority were between 60 and 69 years old (n=85, 61.6%), were female (n=104, 75.4%), had a health plan (n=87, 63.0%) and said they practiced self-medication (n=82, 59.4%, 95% CI 54.0-64.8).

Table 1 shows the prevalence of self-medication according to frequency, the prevalence of the classes of drug used and the symptoms treated with self-medication. Individuals were considered practitioners of self-medication irrespective of whether they said they self-medicated "sometimes", "almost always" or "always" and also included those who reported that "rarely" or "almost never" used non-prescription medicines. One of the participants who self-medicated did not describe the frequency.

Of the medications consumed without medical prescription, the most frequently mentioned class was analgesics. Dipyrone was reported by 40 participants (29.0%). Among muscle relaxants, nonsteroidal anti-inflammatory drugs (NSAIDs) and antihistamines, the most commonly reported were Orphenadrine (n=15, 10.9%), Diclofenac (n=8, 5.8%) and Chlorpheniramine = (n=6, 4.4%).

The symptoms most frequently used to justify self-medication were muscle and joint pain, headache and colds and flu, reported by 55 participants (67.1%). The least frequent causes were heartburn, abdominal cramps, diarrhea, and an obstructed bowel.

Table 2 shows the association between self-medication, regardless of frequency, and the variables age, gender, reported diseases and presence or not of a health plan. There was no statistically significant association (p<0.05) between these variables and the practice of self-medication, irrespective of frequency,

although this practice was more common among patients with osteoarthritis and hypothyroidism. No significant association was found (p<0.05) when these variables were analyzed in relation to the frequency of self-medication.

When the frequency of self-medication was compared with the drug classes used without a prescription, the use of NSAIDs was significantly associated with a higher frequency of self-medication (p=0.049, PR=1.46, 95% CI =1.10-1,99) (Table 3).

Table 1. Prevalence of self-medication, classes of drugs used and symptoms attributed to the practice among participants of an OU3A. São Paulo, 2017.

Variables[a]	n (%)	CI95%[b]
Practice self-medication		
Sometimes, almost always or always	50 (36.2)	30.9; 45.5
Almost never	31 (22.5)	17.9; 27.1
Never	56 (40.6)	35.2; 46.0
Classes of medications		
Analgesics	44 (31.9)	26.8; 37.0
Muscle relaxants	19 (13.8)	10.0; 17.6
NSAIDs[c]	18 (13.0)	9.3; 16.7
Antihistamines	10 (7.3)	4.4; 10.0
Symptoms		
Muscle and joint pain	29 (21.0)	16.5; 25.5
Headache	14 (10.2)	6.8; 13.4
Gripes and colds	12 (8.7)	5.6; 11.8

[a]Excluded in cases in which the question related to the variable was not answered; [b]Confidence interval; [c]Non-steroidal anti-inflammatory drugs.

Table 2. Association between self-medication, irrespective of frequency, and variables studied among OU3A participants. São Paulo, 2017.

Variables	n (%)	PR[a] (CI95%[b])	p-value[c]
Gender			0.935
Male	20 (58.8)	1.00	
Female	62 (59.6)	1.01 (0.73; 1.40)	
Age range[d]			0.649
60-69	51 (60.0)	1.07 (0.79; 1.45)	
≥70	28 (56.0)	1.00	
Health Plan			0.670
Yes	54 (62.1)	1.07 (0.80; 1.42)	
No	28 (58.3)	1.00	
Diseases			
SAH[e]	56 (60.2)	1.04 (0.77; 1.41)	0.785
Diabetes	20 (54.1)	0.88 (0.63; 1.23)	0.437
Hypothyroidism	18 (72.0)	1.27 (0.95; 1.70)	0.157
Arthrosis	7 (77.8)	1.34 (0.92; 1.96)	0.213
Cardiac insufficiency	6 (42.9)	0.70 (0.38;1.30)	0.183

[a]Prevalence Ratio; [b]Confidence Interval; [c]Pearson's chi-squared test or Fisher's exact test; [d]Excluding three participants who were under 60 years of age (between 56 and 59 years); [e]Systemic Arterial Hypertension.

Table 3. Association between drug classes used without medical prescription, attributed symptoms and frequency of self-medication among participants of the OU3A. São Paulo, 2017.

	Practices self-medication				
	Sometimes. almost always. always		Almost never		
Variable	n (%)	PR[a] (CI95%[b])	n (%)	PR (CI95%)	*p*-value[c]
Drugs classes					
Analgesics	25 (61.0)	0.98 (0.69;1.38)	16 (39.0)	1.04 (0.60;1.81)	0.888
NSAIDs[e]	14 (82.4)	1.46 (1.10;1.99)	3 (17.6)	0.40 (0.14;1.17)	**0.049**
Muscle relaxants	13 (68.4)	1.15 (0.79;1.66)	6 (31.6)	0.78 (0.38;1.62)	0.493
Antihistamines	5 (50.0)	0.79 (0.41;1.50)	5 (50.0)	1.37 (0.68;2.73)	0.415
Symptoms					
Muscle and joint pain	19 (67.9)	1.16 (0.83;1.63)	9 (32.1)	0.77 (0.41;1.45)	0.409
Headache	9 (64.3)	1.05 (0.68;1.62)	5 (35.7)	0.62 (0.43;2.00)	0.829
Cold and flu	7 (58.3)	0.94 (0.56;1.56)	5 (41.7)	1.11 (0.53-2.31)	0.793

[a]Prevalence Ratio; [b]Confidence Interval; [c]Pearson's chi-squared test or Fisher's exact test; [d] Excluded in cases in which the question related to the variable was not answered; [e]Non-steroidal anti-inflammatory drugs.

As muscle/joint pain and headaches were the most prevalent complaints among those who self-medicated, the association between these complaints and the diseases mentioned was investigated (Table 4). The diagnosis of arthrosis (p=0.003, PR = 3.75, CI95%=2.07-6.76) and hypothyroidism (p =0.002, PR=2.77, CI95% =1.50-5.10) exhibited a significant association with the complaint of muscle and joint pain. The presence of hypothyroidism and osteoarthritis also had a significant association (p=0.010, PR=3.59, 95% CI=1.76-7.29).

Table 5 presents the reasons for self-medication, according to the participants. The most frequent reasons were the fact that the medication had been prescribed before, previous experience with the medicine, being sure that the medicine is safe, advice of relatives or friends, and the non-serious nature of the health or illness problem.

Table 4. Association between reports of pain treated with self-medication and reported diseases among participants of the OU3A, São Paulo, 2017.

	Muscle and joint pain			Headache		
Variable[a]	n (%)	PR[b] (CI95%[c])	*p*-value[d]	n (%)	PR (CI95%)	*p*-value
Diseases						
SAH[e]	20 (21.5)	1.10 (0.53;2.17)	0.839	9 (9.7)	0.87 (0.31;2.45)	0.504
Diabetes	9 (24.3)	1.23 (0.62;2.45)	0.594	1 (2.7)	0.21 (0.28;1.55)	0.670
Hypothyroidism	11 (44.0)	2.77 (1.50;5.10)	0.002	3 (12.0)	1.24 (0.37;4.10)	0.484
Arthrosis	6 (66.7)	3.75 (2.07;6.76)	0.003	1 (11.1)	1.10 (0.16;7.51)	0.630
Cardiac insufficiency	3 (21.4)	1.02 (0.35;2.95)	0.599	3 (21.4)	2.416 (0.76;7.64)	0.154

[a]Excluded in cases in which the question related to the variable was not answered [b]Prevalence of Ratio; [c]Confidence Interval; [d]Pearson's Chi-squared test or Fisher's exact test; [e]Systemic arterial hypertension.

Table 5. Reasons for self-medication, according to the participants of the OU3A. São Paulo, São Paulo, 2017.

Reasons for self-medication	n (%)
Medication had already been prescribed before. on another occasion	33 (40.2)
Had used the medication before	28 (34.2)
Was sure that the medicine is safe	21 (25.6)
Advice of relatives or friends	20 (24.4)
The health or illness problem was not serious	17 (20.7)
Previous experience with the health or illness problem	15 (18.3)
Recommendation of pharmacist or pharmacy assistant	11 (13.4)
Availability in pharmacies	10 (12.2)
Do not have medical insurance	7 (8.5)
Advertising of medication	7 (8.5)
Problem would have gone by time medical care was obtained	6 (7.3)
Lack of trust in doctors for diagnosis and treatment	6 (7.3)
Save money	4 (4.9)
Save time	2 (2.4)
Lack of doctors in health centers	1 (1.2)
Know what doctors will prescribe	1 (1.2)
Could not wait for appointment to relieve discomfort	1 (1.2)
In great pain	1 (1.2)
Because pain will pass	1 (1.2)
Takes too long to get appointment	1 (1.2)
Doctor did not resolve problem when last occurred	1 (1.2)
Information given by doctors on TV	1 (1.2)
Prevention	1 (1.2)

DISCUSSION

Self-medication is widespread among the elderly. A survey of 934 elderly residents in Goiânia (GO) found that almost 36% practiced self-medication, similar to other Brazilian studies[5]. However, in some studies, the practice is even more common. In a study with 344 elderly people conducted in Salgueiro (Pernambuco), 60% self-medicated. Individuals who do not practice physical activity used more medications on their own, which, for the authors, suggested that people who maintain healthier lifestyles resort less to medicines[6].

In the present study, most participants were practitioners of self-medication. The most prevalent therapeutic classes were analgesics, muscle relaxants, NSAIDs and first-generation antihistamines. The prevalence of analgesic and non-prescription NSAID use was similar to that found in other studies[5,7].

It was also found that one of the main reasons for self-medication, according to the participants, was being sure of the safety of using these drugs. This was the main reason for self-medication in a recent study conducted with elderly people in Iran[8]. However, muscle relaxants, NSAIDs and first-generation antihistamines are for the most part potentially inappropriate for the elderly. Muscle relaxants and first-generation antihistamines have anticholinergic effects and consequently increase the risk of falls and fractures. NSAIDs increase the risk of ulcer and gastrointestinal bleeding[9].

In a cross-sectional population-based study of 1,451 elderly in Pelotas, Rio Grande do Sul, in 2014, the association of the practice of self-medication with

the use of drugs that were potentially inappropriate for the elderly remained even after adjusting for the other variables studied. For the authors, this indicates the need to raise awareness among the elderly to avoid the consumption of over-the-counter medications[10].

Potentially inappropriate drugs for the elderly are those that should be avoided or used with caution in this age group. Therefore, the prescription of these drugs requires consideration of the risk-benefit relationship, the availability of alternative agents and non-pharmacological resources, the choice of the lowest required dose, the potential drug interactions and the monitoring of the effects on the patient[11]. However, in Brazil, self-medication is stimulated by the misconception that the drug in question is a simple, risk-free commodity. In part, this is due to exposure to abusive advertising of drugs, which are made available to the consumer (through self-service) and also because the user often does not ask the pharmacist for advice when going to the pharmacy or drugstore[1]. This situation is particularly worrying when the user is elderly and the "merchandise" is inappropriate for the age group, especially when the individuals in question are not aware of the risks.

It is also noted that the practice of self-medication is not restricted to prescription-only, over-the-counter (OTC) medicines. In every case, the dispensation of medicines, exempt or not from prescription, should be understood as a process of health care. Even the dispensing of non-prescription drugs is not free of instruction[1]. When accompanied by appropriate guidance, the risks related to the use of medicines are reduced. This care is especially important when the dispensed medications are anticholinergic.

Free access to these drugs, especially when unprotected, raises the risk of adverse reactions. This happens for several reasons. First, unrestricted selling and advertising create the illusion that these products are innocuous and harmless, which no medication can be. This image, however, can increase consumption and excessive and irresponsible use. Secondly, these drugs are better known by their trade names than by their active principles. There are several trade names for the same drug, raising the possibility of overdosage. In addition, the associated use of these drugs by the same individual increases the anticholinergic load - a cumulative effect of the simultaneous use of more than one anticholinergic drug - and therefore, the risk of adverse reactions.

Such reactions may also be mistaken for symptoms of disease or clinical conditions and result in the prescription of another drug without the "symptom" being recognized as an adverse reaction. This situation characterizes what we know as the iatrogenic cascade. Cognitive decline, confusion, delirium, urinary retention, constipation, and visual disturbances are common adverse effects that may be - and are - confounded with symptoms of illness.

In the older age group, self-medication is mainly carried out to mitigate suffering such as pain[4]. In fact, in the present study, muscle and joint pain was prevalent among the symptoms treated with self-medication. On the other hand, this symptom has been associated with the presence of arthrosis and hypothyroidism, conditions that require appropriate professional treatment. The pain possibly associated with preexisting diseases may indicate that they are not being treated properly. Appropriate medical treatment can promote control of symptoms and thus reduce self-medication.

In short, the practice of self-medication exposes the individual, especially the elderly, to the risk of adverse events and iatrogenesis, subjecting them to functional impairments that may impair their autonomy and their capacity to participate. Tackling this practice through educational actions can reduce the associated risks.

In addition, it is important to explain to the individual the basis for the guidelines and instructions they receive. In USP OU3A pharmaceutical care workshops, participants begin to adhere to and follow the instructions when they know the reasons on which they are based. The patient is autonomous in decision making and may disregard the guidelines if they consider them irrelevant[12].

This type of educational approach is fully delineated and applicable in the context of the OU3A. Actions of this kind are consistent with collective health, which is a social practice that is transformative in nature, involving the studies of health conditions that seek to protect and promote health, quality of life and the social well-being of individuals and

the community[13]. This approach can be practiced in different organizations and institutions and by different agents, within and outside the spaces conventionally recognized as the health sector[14].

In fact, it is fundamental that such guidelines and educational actions on self-medication are carried out, developed and expanded in the most varied contexts of attention and care for the elderly. Likewise, further studies on the characterization and factors associated with self-medication by the elderly, especially follow-up, case-control and qualitative studies, are needed to provide more detailed, precise and accurate information about these relationships. In the present study, the findings were limited by several aspects, such as sample size, which made a more profound analysis of the potential associations between variables difficult. Also, due to the cross-sectional design of the study, it was not possible to determine the direction of the associations identified, which can be achieved in follow-up studies. In addition, the information obtained is subject to memory bias, as it is self-reported, that is, based only on the reports of the participants.

CONCLUSION

There was a predominance of practitioners of self-medication among participants from the Open University of the Third Age and most of the medications described were potentially inappropriate for the elderly persons involved, although they considered them safe. Muscle and joint pain, which stood out among the symptoms treated with self-medication, was associated with the presence of arthrosis and hypothyroidism, which require professional and appropriate treatment. Pain potentially associated with preexisting diseases may indicate that they are not being treated properly.

The practice of self-medication exposes the individual, especially the elderly, to the risk of adverse events, iatrogenesis, and the masking and aggravation of diseases, subjecting them to functional impairments that may compromise their autonomy and capacity for participation. Tackling this practice requires delineable and applicable educational actions in the context of Open Universities of the Third Age.

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Quality of life of elderly people who care for other elderly people with neurological diseases

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Abstract

Objective: to investigate the relationships between the perceived quality of life of elderly people who care for other elderly people with neurological diseases (dementia and strokes) and the gender, age and caregiver burden, diagnosis, functional dependence, and cognitive status of the care recipient. *Method:* 75 caregivers aged over 60 years were interviewed using the Quality of Life Scale (CASP-19) and Zarit Burden Interview. The levels of physical vulnerability of the elderly were identified through the Lawton and Brody questionnaires and the Katz scale and the cognitive assessment of elderly care recipients was assessed with the Clinical Dementia Rating. The data were analyzed by chi-squared test (for comparison of categorical variables), Mann-Whitney and Kruskal-Wallis U tests (for comparison of continuous variables). To study the associations between variables, univariate logistic regression analysis was performed, followed by multivariate logistic regression analysis. *Results*: the age, gender of the caregiver, type of neurological condition, and physical and cognitive functioning of the care recipient did not statistically influence the quality of life of the caregiver. Elderly caregivers with higher levels of burden (≥29) were 11.4 times more likely to have a worse quality of life score (CI: 3.16-36.77; p <0.001). *Conclusion*: the quality of life of the elderly caregiver is negatively influenced by the burden involved in caring for another elderly person. Identifying the negative emotional aspects of caregivers that negatively affect their quality of life should be considered a target for intervention by health teams.

Keywords: Quality of Life. Caregivers. Elderly.

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INTRODUCTION

One characteristic of the epidemiological changes that accompany population aging is the growth of the proportion of elderly persons with chronic-degenerative diseases. Among these diseases are strokes and dementias of various etiologies[1]. Diseases that generate significant physical and psychological impairments are also associated with a progressive loss of independence and autonomy, behavioral changes and the need for care of an instrumental, material, social and emotional nature[2].

The levels of physical and cognitive dependence associated with strokes and dementias range from difficulties in mobility to more complex levels of physical disability, which involve dependence in the performance of activities related to personal care[3]. These situations have a direct impact on the well-being of family caregivers, who generally perform their role without help or appropriate guidance. Caregivers often become involved in conflicts, anxiety, depression, stress, fears and experience a sense of burden that can have an impact on quality of life[4].

The World Health Organization[5] (WHO) defines quality of life as "*the individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns*". There are several factors that are related to the perceptions of quality of life of elderly caregivers, including the quality of personal relationships, sociodemographic characteristics such as age and gender, the degree of burden and the abilities to deal with dependent elderly recipients of care[6].

Population aging has repercussions on two important phenomena. Firstly, there are more people with neurological diseases such as dementias and/or strokes, who exhibit several physical and cognitive functional losses, and secondly, there are more elderly caregivers. The growing number of elderly people can lead to these individuals being burdened by a condition of dual vulnerability due to the burden of care and the aging process. Such situations may influence the psychological, physical and social health of caregivers, affecting their perception of quality of life. The variability of factors that influence quality of life and its subjectivity impose reflections on aging and make it essential understand the factors that contribute to the well-being of caregivers in each age group[7, 8].

Those involved in care are constantly exposed to depressive feelings and burden, which increases with the greater dependence of the care recipient and negatively influence the health of caregivers[9-11]. Positive and negative feelings, psychological conflicts, grief, fear and insecurity are common throughout the caring experience[6]. Caldeira et al.[12] state that this burden and the physical and cognitive frailty of the caregiver are strongly associated with low caregiver quality of life scores, and that this influences negative perceptions about satisfaction with life.

The psychological resources of caregivers to deal with difficult situations may be inadequate to meet their life needs and the needs of the elderly care recipient, resulting in negative personal perceptions about their quality of life. Engaging in the care of an elderly person often results in the caregiver setting aside their life in favor of assuming responsibility for the life of another, restricting their ability to care for their own health and resulting in negative effects on their quality of life[13, 14].

The present study aimed to investigate the relationships between the perceptions of quality of life of elderly caregivers of elderly people with neurological diseases (dementia and strokes) and gender, age and caregiver burden, as well as the diagnosis, functional dependence and cognitive status of the care recipient.

METHODS

The present study integrated the database of the study entitled "*The psychological well-being of elderly people who take care of other elderly people in a family context*", which had a convenience sample of 148 participants indicated by professionals linked to public and private services aimed at the elderly, such as elderly care clinics, home care and medical services.

These caregivers met the following inclusion criteria: age 60 or older, had been a caregiver for at least six months, and agree to participate in the survey. Caregivers who scored below the cutoff point of the Cognitive Abilities Screening Instrument -

Short Form (CASI-S) were excluded[15]. These cutoff points were 23 for elderly persons aged 60 to 69 years, and 20 for those aged 70 or older.

The Proc Power procedure of the SAS program (Statistical Analysis System) version 9.2 for Windows was used for the planning of the sample size required to analyze the correlation between the scores of the scales used in the database. The Pearson's correlation coefficient method with Fisher's transformation was applied, with a significance level of 5%, a test power of 80%, and a zero correlation of 0.00, giving a sample size of at least 46 caregivers. For a null correlation greater than 0.10, or closer to the minimum correlation of 0.40, the sample would be 78 caregivers. For a 90% test power, significance level of 1% and zero correlation of 0.10, the suggested sample would be 145 elderly family caregivers, the number reached in the database[16].

Of the sample of 148 caregivers, 50% cared for elderly persons with some type of dementia or stroke, 21% reported that their care recipients were immobile or had a physical disability, and 29% reported that the elderly had a chronic somatic illness. This information was obtained through an open question that aimed to identify the main medical diagnosis of each elderly care recipient. For the present study, 45 elderly people who cared for other elderly people with dementia and 30 elderly people who cared for elderly people with strokes were chosen from the above-mentioned base sample.

Trained interviewers collected data from the elderly who were recruited from households (62.7%), at private medical practices (25.3%) and in the Geriatric outpatient clinic of a University Hospital (12%) in the Greater Campinas Region. The mean duration of the interviews was 57 (+ 13.1) minutes.

Data collection took place from October 2014 to July 2015, following approval from the Research Ethics Committee of the Universidade Estadual de Campinas on 6/10/2014 (C.A.A.E. 35868514.8.0000.5404). The subjects confirmed their agreement to participate by signing a Free and Informed Consent Form. The present study complied with Resolution nº 196/96 on the Rights and Regulatory Guidelines on Research Involving Human Beings.

The variables of interest selected for the present study were: the gender, age, burden and perceived quality of life of elderly caregivers, and the type of illness (dementia or stroke) and levels of physical and cognitive dependence of the elderly care recipients.

The Zarit et al.[17] Burden Interview was used. This consists of 22 items with five points each (from 0 = never to 4 = always), which assess the caregiver's opinion about how much physical, psychological and social burden is involved in the care they provide[9,18]. The instrument generates a total score ranging from 0 to 88. The cutoff point for separating the caregivers with the lowest and highest burden is 8. The higher the score the greater the total perceived burden. In the present study the distribution of the total scores of participants was divided into terciles: 0 to 20 (low burden), 21-28 (moderate burden) and ≥29 (high burden). The three factors described by Bianchi[7] were also considered: factor 1 (role-related stress) composed of 10 items, factor 2 (intrapsychic stress) with 7 items and 3 factors (presence or absence of competencies and expectations related to care) with 5 items. These factors were identified by means of exploratory factorial analysis achieved following orthogonal varimax rotation and the commonality of the items of the Zarit Burden Interview Scale. [7]

To investigate the quality of life as perceived by the caregiver, the CASP-19 scale was used for individuals aged 55 years and over. This acronym designates control, autonomy, self-realization and pleasure, and is based on Maslow's basic human needs theory[19]. It has 19 items in Likert format (never = 0, occasionally = 1, almost always = 2 and always = 3), with a total score ranging from 0 to 57[20]. The scale has undergone semantic-cultural validation and validation of its construct, which is based on a structure composed of two factors, the first of which brings together items from the self-realization and pleasure domains and the second which includes items from the control and autonomy domains generated by confirmatory factorial analyzes[20,21].

The level of physical impairment of the elderly care recipients was assessed from the Lawton and Brody questionnaire (1969), in a version by Brito, Nunes and Yuaso and by the Katz (1963) scale validated for Brazil by Lino et al.[22], which investigated the help that each elderly person needed

to perform Basic Activities of Daily Living (BADL) and Instrumental Activities of Daily Living (IADL). Both have three response options: no help, partial help, or total help. The partial and total help options were included in one possibility – with help. The items of the two scales to which the answer was with help were counted and added together. The distribution was divided into terciles (1 to 8, 9 to 12 and 13 activities of daily living impaired).

The level of cognitive impairment of the elderly care recipients was assessed by the Clinical Dementia Rating – CDR[23]. This instrument assesses the degree of impairment of cognitive functions in people with suspected dementia. It is divided into six categories: memory, orientation, judgment & problem solving, community affairs, home & hobbies and personal care. Scores can range from 0 (no dementia) to 3 (severe dementia), with intermediate points 0.5 (uncertain or delayed diagnosis), 1 (mild dementia) and 2 (moderate dementia). The memory domain carries the most weight in the scoring[24].

The distributions of the caregiver scores on the quality of life and burden scales were submitted to the Kolmogorov-Smirnov test for the evaluation of normality. As the distributions were not normal, non-parametric tests (Chi-square and Fisher's Exact, Mann-Whitney and Kruskal-Wallis) were chosen to compare the two groups of caregivers according to the variables of interest. Fisher's Chi-square and Exact Tests were used to make comparisons between the nominal variables and the Mann-Whitney U-Test was used to compare the ordinal variables. To study the associations between the total score and the two factors of the perceived quality of life scale and the independent variables, univariate logistic regression analysis was performed, followed by multivariate logistic regression analysis. The significance level adopted for the statistical tests was 95%, or $p < 0.05$. The data were analyzed using the SAS System for Windows (Statistical Analysis System) software, version 9.2. for Windows[25].

RESULTS

Of the 75 caregivers, the majority were female (81.3%). The mean age was 69.8 (+7) years. There were no statistically significant differences between the caregivers of elderly people with dementia and caregivers of the elderly with strokes (Group A and Group B, respectively) in relation to the variables studied (Table 1).

Table 1. Frequencies of gender, age, burden and quality of life of the total sample of caregivers of elderly people with neurological diseases, Campinas, São Paulo, 2016.

			Group A*	Group B**	
Variable	Condition	n (total)	n (%)	n (%)	p-value
Gender	Men	14	10 (22.2)	4 (13.3)	0.333
	Women	61	35 (77.8)	26 (86.7)	
Age	60-64	23	11 (24.5)	12 (40.0)	0.339
	65-69	33	21 (46.7)	12 (40.0)	
	75 and +	19	13 (29.8)	6 (20.0)	
Burden	≤20	23	14 (31.1)	9 (30.0)	0.556
	21 to 28	27	18 (40.0)	9 (30.0)	
	≥29	25	13 (29.9)	12 (40.0)	
Role-related stress (Factor 1 of the burden scale)	≤ 9	25	15 (36.6)	10 (33.4)	0.056
	10 to 15	23	17 (33.0)	6 (20.0)	
	≥16	23	9 (41.0)	14 (46.6)	
Intrapsychic stress (Factor 2 of the burden scale)	≤1	27	17 (38.6)	10 (33.3)	0.692
	2 to 4	24	15 (34.2)	9 (30.0)	
	≥5	23	12 (27.3)	11 (36.7)	

to be continued

Continuation of Table 1

			Group A*	Group B**	
Variable	Condition	n (total)	n (%)	n (%)	p-value
Presence or absence of competencies and expectations related to care. (Factor 3 of the burden scale)	≤3	27	14 (34.1)	13 (43.3)	0.642
	4 a 9	22	14 (34.1)	8 (26.6)	
	≥10	24	15 (31.8)	9(30.0)	
Perceived quality of life	≤38	25	15 (35.0)	10 (33.2)	0.382
	39 a 46	24	12 (27.3)	12 (40.0)	
	≥47	26	18 (40.0)	8 (26.8)	
Sense of self-realization and pleasure (Factor 1 of perceived quality of life scale)	≤22	27	16 (37.2)	11 (36.6)	0.375
	23 a 26	21	10 (23.3)	11 (36.6)	
	≥27	25	17 (39.5)	8 (26.8)	
Sense of control and autonomy (Factor 2 of perceived quality of life scale)	≤9	20	12 (27.2)	8 (27.5)	0. 765
	10 a 12	27	15 (34.0)	12 (41.3)	
	≥13	26	17 (38.8)	9 (31.2)	

*Group A= Caregivers of elderly persons with dementia; **Group B= Caregivers of elderly persons who had suffered a stroke.

The independent variable with the most robust association with low quality of life score was the burden perceived by the caregivers. Caregivers with a higher total score in burden (≥29) had a greater chance of low quality of life scores than those with moderate and low burden scores (OR= 11.43; CI= 3.46 – 37.76). Caregivers with high scores for items that represent role-related stress (Factor 1 of the burden scale) had a higher chance of low quality of life scores. Caregivers who scored on the 2nd tercile of factor 3 of the perceived burden scale (presence or absence of competencies and expectations related to care) were 3.2 times more likely to have low perceived quality of life scores than those who scored in the third tercile and the reference value, according to univariate logistic regression analysis (Table 2).

Higher scores in total burden, role-related stress, intrapsychic stress and the presence or absence of skills and expectations connected to care resulted in greater chances of an outcome of self-realization and pleasure of the elderly caregivers (Factor 1 of CASP-19) (Table 3).

Table 2. Univariate logistic regression analysis for low scores in the quality of life scale of elderly caregivers of other elderly persons with neurological diseases, Campinas, São Paulo, 2016.

Variable	Categories	p-value	O.R*	CI 95% O.R**
Gender	Male (ref.)***	---	1.00	---
	Female	0.283	1.81	0.61 – 5.36
Age	60-64 years (ref.)	---	1.00	---
	65-74 years	0.233	1.83	0.68 – 4.91
	≥75 years	0.491	1.48	0.48 – 4.56
Diagnosis of Recipient of Care	Dementia (ref.)	---	1.00	---
	Stroke	0.496	1.34	0.57 – 3.15
Number of partially or totally impaired BADL and IADL**** of care recipients	1-8 (ref.)	---	1.00	---
	9-12	0.570	0.69	0.19 – 2.47
	13	0.903	1.06	0.42 – 2.68
Care recipient score in the measure of impairment of cognitive function	0-0.5 (ref.)	---	1.00	---
	1-2	0.319	1.85	0.55 – 6.17
	3	0.484	1.47	0.50 – 4.34

Continuation of Table 2

Variable	Categories	p-value	O.R*	CI 95% O.R**
Caregiver score in total perceived burden	≤20 (ref.)	---	1.00	---
	21-28	0.056	2.87	0.97 – 8.47
	≥29	<0.001	11.43	3.46 – 37.76
Caregiver score in role-related stress (factor 1 of burden scale)	≤9 (ref.)	---	1.00	---
	10-15	0.0100	4.33	1.43 – 13.15
	≥16	<0.001	7.89	2.48 – 25.06
Caregiver score in intrapsychic stress (factor 2 of burden scale)	≤1 (ref.)	--	1.00	---
	2-4	0.336	1.65	0.60 – 4.58
	≥5	0.090	2.46	0.87 – 7.00
Caregiver score in presence or absence of competences and expectations related to care (factor 3 of burden scale)	≤3 (ref.)	---	1.00	---
	4-9	0.030	3.28	1.12 – 9.58
	≥10	0.070	2.61	0.93 – 7.36

*Odds Ratio = Relative risk for worse quality of life; **Confidence interval of 95% relative risk; ***Reference level; **** Basic Activities of Daily Living - BADL and Instrumental Activities of Daily Living – IADL.

Table 3. Univariate logistic regression analysis for low sense of self-realization and pleasure scores in the quality of life of elderly caregivers of other elderly people with neurological diseases. Campinas, São Paulo, 2016.

Variables	Categories	p-valor	O.R.*	CI95% O.R.**
Gender of caregiver	Male (ref.)***	---	1.00	---
	Female	0.209	2.11	0.66 – 6.76
Age of caregiver	60-64 years (ref.)	---	1.00	---
	65-74 years	0.160	2.06	0.75 – 5.63
	≥75 years	0.725	1.22	0.40 – 3.76
Diagnosis of Recipient of Care	Dementia (ref.)	---	1.00	---
	Stroke	0.555	1.30	0.55 – 3.06
Number of partially or totally impaired BADL and IADL**** of care recipients	1-8 (ref.)	---	1.00	---
	9-12	0.687	0.77	0.21 – 2.76
	13	0.967	1.02	0.40 – 2.63
Care recipient score in the measure of impairment of cognitive function	0-0.5 (ref.)	---	1.00	---
	1-2	0.574	1.42	0.42 – 4.82
	3	0.731	1.21	0.40 – 3.67
Caregiver score in total perceived burden	≤20 (ref.)	---	1.00	---
	21-28	0.052	2.97	0.99 – 8.93
	≥29	<0.001	10.12	3.06 – 33.48
Caregiver score in role-related stress (factor 1 of burden scale)	≤9 (ref.)	---	1.00	---
	12-15	0.072	2.68	0.92 – 7.86
	≥16	0.003	5.35	1.74 – 16.40
Caregiver score in intrapsychic stress (factor 2 of burden scale)	≤1 (ref.)	---	1.00	---
	2-4	0.638	1.28	0.46 – 3.53
	≥5	0.009	4.36	1.44 – 13.18
Caregiver score in presence or absence of competences and expectations related to care (factor 3 of burden scale)	≤3 (ref.)	---	1.00	---
	4-9	0.148	2.22	0.76 – 6.53
	≥10	0.019	3.59	1.23 – 10.43

Odds Ratio = Relative risk for worse quality of life; **Confidence interval of 95% relative risk; ***Reference level; ** Basic Activities of Daily Living - BADL and Instrumental Activities of Daily Living – IADL.

Caregivers with higher total perceived burden scores and those with the highest levels of burden assessed by factor 1 (role-related stress) were 6.93 and 8.45 times more likely, respectively, to have low sense of control and autonomy scores than those that had moderate and low burden scores, as shown in table 4.

Table 4. Univariate logistic regression analysis for low sense of control and autonomy scores in the quality of life of elderly caregivers of other elderly persons with neurological diseases. Campinas, Brazil, 2015-2016.

Variables	Categories	*p-value*	O.R.*	CI 95% O.R**
Gender of caregiver	Male (ref.)***	---	1.00	---
	Female	0.212	2.06	0.66 – 6.41
Age of caregiver	60-64 years (ref.)	---	1.00	---
	65-74 years	0.513	0.72	0.26 – 1.94
	≥75 years	0.685	1.23	0.41 – 3.86
Diagnosis of Recipient of Care	Dementia (ref.)	---	1.00	---
	Stroke	0.663	1.21	0.51 – 2.88
Number of partially or totally impaired BADL and IADL**** of care recipients	1-8 (ref.)	---	1.00	---
	9-12	0.582	1.43	0.40 – 5.09
	13	0.752	0.86	0.34 – 2.20
Care recipient score in the measure of impairment of cognitive function	0-0.5 (ref.)	---	1.00	---
	1-2	0.834	1.14	0.34 – 3.76
	3	0.702	0.81	0.27 – 2.40
Caregiver score in total perceived burden	≤20 (ref.)	---	1.00	---
	21-28	0.173	2.12	0.72 – 6.21
	≥29	0.001	6.93	2.18 – 22.01
Caregiver score in role-related stress (factor 1 of burden scale)	≤9 (ref.)	---	1.00	---
	10-15	<0.001	8.45	2.60 – 27.53
	≥16	<0.001	8.45	2.57 – 27.84
Caregiver score in intrapsychic stress (factor 2 of burden scale)	≤1 (ref.)	---	1.00	---
	2-4	0.369	1.60	0.58 – 4.44
	≥5	0.215	1.94	0.68 – 5.55
Caregiver score in presence or absence of competences and expectations related to care (factor 3 of burden scale)	≤3 (ref.)	---	1.00	---
	4-9	0.246	1.87	0.65 – 5.41
	≥10	0.425	1.52	0.54 – 4.27

Odds Ratio = Relative risk for worse quality of life; **Confidence interval of 95% relative risk; ***Reference level; ** Basic Activities of Daily Living - BADL and Instrumental Activities of Daily Living – IADL.

Four blocks of variables were considered in hierarchical multivariate logistic regression analysis, the dependent variable of which was total quality of life perceived by the caregivers. In block 1 gender and age of caregivers were included; in block 2, the neurological diseases of the elderly; in block 3, the levels of physical and cognitive impairment of the elderly care recipients and; in block 4, the measures of perceived burden (total and in each of the three factors).

Based on the results of the hierarchical multivariate analysis, with the Stepwise criterion of variable selection, only the total score of the perceived burden scale was associated with a low total score on the perceived quality of life scale. The

elderly people with high total burden (≥29 points) were 10.8 times more likely to perceive lower levels of quality of life. (CI: 3.16 - 36.77, $p<0.001$).

DISCUSSION

The present study characterizes the profile of caregivers of the elderly in terms of gender, age, burden and perceived quality of life, in situations where the caregiver is also elderly. In addition, it describes the characteristics of the care recipients in terms of levels of physical and cognitive dependence and what influences these variables in the perception of quality of life of the elderly caregiver.

The predominance of elderly women in the study sample was similar to the findings of other studies[6, 26]. This corroborates the importance of the role of women in the task of caring, as within the family context women most frequently become caregivers[26]. However, being female did not influence the chance of perceiving a worse quality of life[7]. This finding is in contrast to the study by Lopes and Cachioni[6] which revealed that women involved in caring perceive more negatives than positives in the act of caring, in comparison with male caregivers.

It was also observed that being elderly is not related to a worse perception of quality of life. Lopes and Cachioni[6] affirm that the elderly have a more active and participative position in relation to care, a result of the psychologically positive vision that the elderly construct throughout life, which helps them to understand the negative situations of the daily act of caring[6]. There is disagreement among literature on this subject, however. In the study by Guerra et al.[27] which evaluated caregivers from different age groups, it was found that, in a statistically significant manner, caregivers aged ≥50 years are more likely to perceive a lower quality of life than younger caregivers. The authors justify these results by the conditions of frailty in aging, where the elderly caregivers present functional losses and a decline in their overall health.

The high or low levels of functionality in the elderly affected by the neurological diseases in question, namely strokes and dementia, did not exhibit significant differences in terms of association with perception of quality of life. Bianchi et al.[7] state that the elderly assume the care of other elderly people despite the psychological discomforts and physical demands of such care as they have an understanding of the difficult circumstances of life and are possibly less psychologically affected by the health situations of the elderly people in question. However, Thober, Creutzberg and Viegas[3] affirm that high levels of dependence among care recipients can impact the well-being of family caregivers, who generally perform their role without support or adequate guidance, adding to the negative effects on the health of caregivers[23]. Some studies[28,29] have shown that both strokes and dementia are diseases that negatively affect the quality of life of caregivers.

The data from the present study revealed that the perception of quality of life is strongly associated with caregiver burden. There are multiple factors that contribute to different perceptions of burden and denote poor perceptions of quality of life [30,31]. These include the occupational and financial impact and the loss of support caused by the disease, and difficulties arising from the lack of knowledge on how to deal with the symptoms of the disease. Costa et al.[32] affirm that changes in the lives of caregivers lead to a strong tendency towards neglecting one's own health, which contributes to the process of burden and, consequently, to a poor quality of life.

The higher levels of intrapsychic stress and expectations related to care demonstrated in this study were strongly associated with a declining perception of quality of life in the domain of self-realization and pleasure. Some studies[33] have already shown that when there is stress, burden, mental fatigue, there is, therefore, impairment to the perception of quality of life, also explained by the exhausting routine of managing daily activities, which often detract from feelings of pleasure.

On the other hand, intrapsychic stress, which combines feelings of anger, indecision about care and shame, did not have a statistically significant relationship with the perception of a worse quality of life and a worse sense of control and autonomy. According to Paulo and Pires[34] there is a tendency to neglect or minimize the problems that arise in situations of stress or tension, characteristics of the act of caring. In addition, because they are elderly caregivers, they tend to have a more enjoyable and

normative view about life. Additionally, a greater sense of personal control leads to more intense feelings of satisfaction, and thus psychic stress affects quality of life less.[7]

The presence or absence of competencies and expectations related to care, that is, the perception that one should be taking better care of the elderly care recipient, had a significant relationship with a worse overall quality of life. Literature[9] shows that if an elderly care recipient requires support beyond the expectations of the caregiver, it can lead to situations of stress or crisis, a fact that translates into perceptions of a lack of control over life with negative emotions about the quality of life of the caregiver. In addition, even those with a high sense of self-esteem can suffer negative influences from caring and feel sad and lacking in enthusiasm[27]. The perception that one should be doing more or taking better care of someone is constantly related to an expectation of self-efficacy that can circumstantially influence quality of life.[12]The difficulties experienced by caring for a highly dependent elderly person usually lead caregivers to relinquish their social relationships, resulting in negative effects on their sense of personal realization[27].

One limitation of the present study is the relatively small sample size which may have contributed to the statistical inferences. The data refer only to caregivers of patients with dementia or a stroke. Caring for the elderly with other diseases such as Parkinson's or multiple sclerosis may reveal different perceptions on the quality of life of the elderly caregiver. Furthermore, because it is a cross-sectional study, no conclusions can be drawn about causality. A longitudinal study may provide more accurate information about the situations that influence the quality of life of the elderly caregiver. Despite this, the data presented represent a step forward in understanding issues that encompass care in the lives of elderly caregivers.

CONCLUSION

The data revealed by the present study demonstrate that the perception of quality of life of elderly people who care for other elderly people with neurological diseases (dementia and strokes) is not negatively influenced by gender, age, diagnosis, and the functional dependence or cognitive status of the elderly care recipient, despite the critical events of aging. However, these same data reveal that perceived burden negatively influences the quality of life of the caregiver. This indicates the importance of increasing our knowledge of the circumstances that cause burden among elderly caregivers, so that the awareness of such individuals about the emotional situations they are experiencing can be raised and they can seek help in the appropriate health services.

In contributions to the field of study it is important to highlight that the present study contemplates a better understanding of the perception of quality of life of elderly caregivers, as a large part of related studies involve young individuals. Identifying the emotional and instrumental needs of elderly people that care for other elderly individuals is essential, as due to population aging this group is increasingly present in Brazil and throughout the world. Therefore, developing and applying new strategies of support and physical and psychological assistance for the elderly and primarily those who suffer from a daily burden of care is an emerging Geriatric and Gerontological practice.

It is therefore important to encourage health professionals to consciously reflect upon the difficulties that elderly caregivers face in their daily lives. Experience and knowledge about elderly caregivers is crucial to a proactive attitude towards the various difficulties experienced by this population segment. It is important that health professionals improve their recognition of elderly caregivers who feel emotionally and physically burdened.

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Factors associated with the hospitalization of the elderly: a national study

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Abstract

Objective: to analyze the factors associated with hospitalization among the Brazilian elderly based on multidimensional methodology. *Method:* a cross-sectional, quantitative study was performed with data from the National Health Survey (2013) population-based study. The sample was composed of 23,815 individuals over the age of 60 years. Hospitalization was considered the outcome variable and 53 independent variables were included, relating to: sociodemographic characteristics; limitations and illness; difficulties in performing basic and instrumental activities of daily living; use of health services and medical emergencies. *Results*: it was found that 10% of the elderly were hospitalized in the previous year. This event was related to: a negative self-perception of health (OR = 1.35); stopping performing any of their usual activities due to health reasons (OR = 2.14); difficulty going to the doctor (OR = 1.65) or walking alone (OR = 1.55); a recent search for a site, service or health professional for health-related care (OR = 1.47); increased frequency of annual medical visits (OR = 2.93) and household emergency (OR = 5.40). *Conclusion:* the results reinforce the fact that multiple factors are associated with the hospitalization of the elderly. The analysis of these associations has the potential to make health professionals and administrators aware of the need to improve health care for the elderly and to assist in the organization and planning of the actions of the entire health service network.

Keywords: Hospitalization. Health Services for the Aged. Risk Factors. Indicators of Health Services.

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INTRODUCTION

The interaction between physical and mental health, autonomy, social integration, family support and economic independence should all be considered when assessing the health of the elderly[1]. The challenge facing health systems is to provide comprehensive care for these users, who present unique physiological and clinical characteristics, with the potential to suffer disabilities that can impair their functional capacity[2].

Although aging involves limitations inherent in its process, this age group should be allowed the possibility of managing their own life with a view to maintaining independence and autonomy, for as long as possible, contributing to their quality of life.

Concern over the conditions required to maintain the quality of life of elderly people has also increased, as the profile of diseases among the elderly usually requires more resources, with a direct impact on health services and levels of hospital utilization, especially long-term use[3-5]. Knowledge of the hospitalization profile of this population is an important factor in the construction of indicators for the planning and monitoring of health actions and the allocation of government resources. From this perspective, when assessing the associations and probabilities of hospitalization in the elderly, it is possible to establish a relationship with the definition of health intervention priorities, as well as with preventive measures, as the elderly are the population at greatest risk.

However, due to the costs and operational complexity of carrying out population-based epidemiological studies, the use of national level databases, aimed at generating information not yet considered in health, is important. For the present study, the chosen source of information was the most recent National Health Survey (PNS), which presents a synthesis of the perception of health status, lifestyle and chronic diseases in Brazil.

Finally, identifying the associations related to the hospitalization of the elderly allows the improvement of health planning and management tools, guaranteeing the role of the elderly in the consolidation of decision-making processes in Brazilian health systems. Thus, the objective of the present study was to analyze the factors associated with hospitalization among the Brazilian elderly, based on a multidimensional methodological approach.

METHOD

This cross-sectional, quantitative study is based on National Health Survey (PNS) database, a research project promoted by the Ministry of Health and conducted in 2013 by the Brazilian Institute of Geography and Statistics (IBGE)[6].

The survey was carried out in the homes of the participants and employed a three-stage probabilistic sampling by cluster structure, with census sectors or group of census sectors the primary sampling units, households the secondary units and selected elderly residents the tertiary units[6]. The sample size was defined based on the level of precision desired for the estimates of some of the indicators of interest, resulting in information being gathered from 205,546 individuals[6]. Details on the sampling process and weighting are available in the PNS report[6]. The present study included only data from elderly individuals (N=23,815).

Data were collected through individual interviews and stored on handheld computers by calibrated researchers. Individuals older than 18 years participated in the study. The interview was based on three forms: household, relating to the characteristics of the household; a form relating to all the residents of the household; and an individual form, answered by a resident of the household aged 18 years or older, based on drawing by lots[6]. The present study considered exclusively the data of individuals over 60 years old, based on the last two forms.

The national survey was approved by the National Commission for Ethics in Research involving Human Subjects of the Ministry of Health, under approval number 328.159/2013.

The outcome variable "hospitalization" is the result of the question: "*Were you hospitalized for 24 hours or more in the last 12 months*?" with the answers: yes and no.

In the pre-exploration of data phase, all the variables present in the PNS corresponding to the population to be studied were listed, based on

literature, resulting in 53 variables of interest used to compose the independent variables. These related to: sociodemographic characteristics; limitations and illness; difficulties in performing basic and instrumental activities of daily living; use of health services and medical emergencies (Table 1). All the variables were treated, with the numerical variables transformed into categorical, while others were recategorized or dichotomized as recommended in literature. In addition, due to an imbalance, the classes of the outcome variable were balanced for each independent variable using the supervised WEKA Resample Filter method[7], in order to minimize possible biases of the results.

Chart 01. Description of the independent variables used in the study. National Health Survey. Brazil, 2013.

Sociodemographic characteristics	
Gender	Marital status
Age	Literacy
Skin color/ethnicity	Level of education
Live with spouse	Income
Condition and limitations of health	
Self-perception of general health condition	Has been bedridden
The presence of chronic illness, physical or mental, limits usual activities in some way.	Number of days bedridden
Have stopped performing any of usual activities for health reasons	Difficulty getting around
Number of days on which stopped performing usual activities for health reasons	Difficulty seeing
Difficulties in Basic Activities of Daily Living	
Presence of difficulty eating alone with a plate placed in front of you, including holding a fork, cutting food and drinking from a glass	Presence of difficulty showering alone including entering and exiting the shower or bathtub
Presence of difficulty in going to the bathroom alone including sitting and getting up from the toilet	Presence of difficulty walking from one room to another in the house
Presence of difficulty in dressing alone	Presence of difficulty lying down or getting up from the bed alone
Presence of difficulty sitting on or getting up from the chair alone	
Difficulties in performing Instrumental Activities of Daily Living	
Presence of difficulty shopping alone	Presence of difficulty managing finances alone
Presence of difficulty taking medicines alone	Presence of difficulty going to the doctor alone
Presence of difficulty using transport alone	Presence of difficulty managing finances alone (taking care of your own money)
Chronic diseases	
Presence of any chronic, physical or mental illness	Work-related musculoskeletal disorder
Diabetes	Arthritis
Hypertension	Depression
High Cholesterol	Chronic obstructive pulmonary disease
Stroke or stroke	Cancer
Chronic spinal problem	Chronic kidney problem

to be continued

Continuation of Chart 1

Use of health services	
Place where usually seeks care when you are sick	Usually seek care from the same place, doctor or health service when required
Time since last medical appointment	Place where last sought health care
Seeking a health facility, service or professional for care related to your own health in the last two weeks	Use of any integrative and complementary practice, including treatment such as acupuncture, homeopathy, medicinal plants and phytotherapy etc.
Had drugs prescribed at the last visit	Home emergency
Reason for the demand of the service	
Habits	
Consume alcoholic drinks	Perform physical activity
Use tobacco	

After the complete treatment of the database, the dimensionality reduction test was performed using the Correlation-based Feature Selection (CFS) algorithm with the 10-fold cross validation method[7]. This data mining test is recommended for use with a large set of data and variables, such as that proposed in the present study. The CFS algorithm evaluated, according to response patterns, the entire data set and the 53 variables at a single moment to search for variables that were closely related to the outcome variable, and not related to each other. It therefore considered not only the utility of the variables individually, but also the level of correlation between them, thereby eliminating any and all confounding relationships. The variables with nonexistent or weak or redundant relationships, which do not bring information to the model, are all eliminated by the algorithm, without the influence of the researcher being required. In this way, it is possible to validate the pure and strict relationships of the independent variables with the outcome variable, with much more precision than in other tests frequently used in the literature, creating a model with much greater predictive capacity[7].

Next, the variables related to hospitalization that made up the model were evaluated with logistic regression to measure the magnitude of the associations. The model had an explanatory capacity of 70.0%. All analyzes were performed in the WEKA environment[7].

RESULTS

In the results of the selection analysis for the reduction of dimensionality, it was found that the variables most strongly related to the hospitalization of Brazilian elderly people were: self-perception of general health condition; stopping performing any of their usual activities for health reasons; difficulty going to the doctor and walking alone; recently seeking a health facility, service or professional for care related to one's own health; frequency of annual medical consultation and household emergency.

The descriptive analysis revealed a prevalence of 10% of hospitalization in the previous year among the elderly. Table 1 shows the descriptive analysis of the independent variables that presented a relation with the hospitalization of Brazilian elderly persons. Table 2 shows the odds ratios of the elderly who required hospital admission in the previous year, according to the independent variables.

The majority of the elderly had a negative perception of their health (Table 1), and this perception was responsible for increasing the chances of hospitalization by 1.35 times in comparison with positive perception (Table 2). Still, the majority of the elderly investigated did not find the performance of any usual activities impossible for reasons of health, or have difficulty going to the doctor or walking alone (Table 1). However, when these limitations are present, the chances of hospitalization were 2.14; 1.65 and 1.55 times greater, respectively (Table 2).

A total of 78% of the respondents had needed to be treated in a health service in the two weeks prior to the collection of PNS data (Table 1). The number of medical appointments in the previous year was up to four for the majority of the elderly persons,

while 3% of the participants required emergency home care (Table 1). Seeking these services increased the chances of individuals needing hospitalization (Table 2).

Table 1. Descriptive analysis of the independent variables presenting a relationship with the hospitalization of Brazilian elderly people. Brazil, 2013.

Dependent variable		Total n(%)	Yes n(%)	No n(%)
Hospitalization		23815 (100)	2377 (10)	21438 (90)
Self-perception of general health condition	Positive	10461 (44)	597 (6)	9864 (94)
	Negative	13354 (56)	1780 (13)	11574 (87)
Failure to perform any of usual activities due to health	No	21141 (89)	1950 (9)	19488 (92)
	Yes	2674 (11)	724 (27)	1653 (62)
Difficulty going to doctor alone	No	18146 (76)	1293 (7)	16853 (93)
	Yes	5669 (24)	1084 (19)	4585 (81)
Difficulty walking alone	No	21779 (91)	19936 (92)	1843 (8)
	Yes	2036 (9)	534 (26)	1502 (74)
Recently sought a health facility, service or professional for treatment related to own health	No	5248 (22)	461 (9)	4787 (91)
	Yes	18567 (78)	1916(10)	16651 (90)
Frequency of medical consultation in last year	≥4 consultations	12467 (64)	956 (8)	11511 (92)
	>4 consultations	7036 (36)	1421 (20)	5615 (80)
Home emergency	No	23140 (97)	2035 (9)	21105 (91)
	Yes	675 (3)	342 (51)	333 (49)

Table 2. Odds ratio of hospitalization of the elderly according to independent variables. Brazil, 2013.

Variable	Odds Ratio (OR)
Self-perception of overall health	
Positive	1.00
Negative	1.35
Failure to perform any of usual activities due to health	
No	1.00
Yes	2.14
Difficulty going to doctor alone	
No	1.00
Yes	1.65
Difficulty walking alone	
No	1.00
Yes	1.55
Recently sought a health facility, service or professional for treatment related to own health.	
No	1.00
Yes	1.47
Frequency of medical consultation in last year	
Up to 04 consultations per year	1.00
Over 04 consultations per year	2.93
Home emergency	
No	1.00
Yes	5.40

DISCUSSION

In the present study, which considers the factors associated with hospital admission among the Brazilian elderly, a prevalence of hospitalization of 10% was found. During the aging process elderly people tend to exhibit several pathologies, which contributes to a greater risk of hospitalization due to acute and chronic situations[2,4,5]. Hospital admission is more frequent among the elderly, regardless of the outcome, with longer periods of hospitalization and increased costs[3,4], which demands the structuring of services and health programs. In this sense, research that supports the promotion of strategies to reduce such episodes, such as the present study, are important.

The results of the present study showed that elderly people with a poor perception of health had a 1.35 times greater chance of being hospitalized. This association was also found by the authors of a cross-sectional study, with a population base of 686 elderly people (p<0.006)[8]. It is common for the elderly to see themselves as having poor health, a fact explained by their morbidity, frailty and higher risk of mortality [9–13] conditions that result in a greater demand for health services, which may explain this finding[2,3,5,11].

One relevant fact that should be highlighted and which reinforces the importance of using self-perception of health as a health indicator is that chronic diseases alone did not exhibit a significant association with hospitalization. It can therefore be said that the general state of health goes beyond chronic conditions, and reinforces the theory that the complexity of the framework of health perceptions is much more related to subjective questions than to objective clinical demands.

Factors related to the functional ability of the elderly exhibited a strong relationship with the need for hospitalization. Authors have affirmed that functional capacity is a dynamic process and represents a central component of the health of the elderly[12,14,15], as the related limitations, which either arise from or cause a decline in health[12,14,15], can result in an increased need to use health services[2,3,12,14].

Elderly patients with episodes of hospitalization presented a greater chance of failing to perform any of their usual activities due to health reasons and a greater difficulty going to the doctor and walking alone (OR=2.14, OR=1.65 and OR=1.55, respectively). In a cross-sectional study involving 1,593 elderly people residing in the community, the authors found that being hospitalized at least once in the previous year resulted in around a 70% greater disability in basic activities and a 30% greater disability in instrumental activities[12]. A positive association between disability in instrumental activities and hospitalization was also found among elderly people from the state of Minas Gerais[14].

The associations between the consequences of functional disability and hospitalization may be related to the fact that such limitations express a poor state of health, resulting in this positive relationship, as shown by the results of the present study regarding individuals with a negative self-perception of health. Or, they may be explained, as found in literature, by the possibility of hospitalizations resulting in the aggravation of the functional condition of the elderly person[16–18].

Moreover, the context of disability can contribute to the explanation of the association between the reported need of the elderly to receive emergency care at home and hospitalization. Literature has indicated that the use of home care is associated with the difficulty of getting to a health service[12] requiring, therefore, health care in the individual's own home[14]. In addition, the emergency service is usually triggered when the patient is in a critical health situation, exposing the individual to extreme risks, requiring specialized, high complexity care[19].

It was also identified that the recent search for a health facility, service or professional for care relating to one's own health and having had more than four annual medical appointments were factors associated with hospitalization. It is understood that the regular use of the health service can be considered as an easing factor for entering the health system. In addition, the process of population aging contributes to the increased use of health services[10].

Researchers from the cross-sectional study with 96 elderly people in Rio Grande do Sul reported that a higher frequency of medical consultations increases the high risk of hospital admission by 83.3% in participants with more than six annual consultations[13]. According to the authors, these findings do not include the possibility of preventive consultations, but are related to the treatment of established diseases[13].

Therefore, a high frequency of medical consultations and having recently sought health services indicate that these individuals suffer morbidity and/or a worse health status, requiring more health care, and that evaluation by a medical professional allows the diagnosis of health problems, increasing the likelihood of hospital admission[13,20]. Investment in the training in care and continuous follow-up monitoring of hospitalized elderly persons is therefore required, especially in primary care, with the aim of acting to prevent unnecessary re-admissions and admissions.

The findings of the present study should be interpreted in the light of certain limitations, as in some cases the respondents were not the elderly themselves and part of the PNS data was provided by another resident of the household. However, studies have shown that the use of another respondent does not modify distribution or the associated factors[10].

In addition, surveys that evaluate the use of health services are subject to obstacles regarding quality of information due to memory bias. However, considering the seriousness of the event of hospitalization in people's lives, the probability of this bias is reduced[20].

The cross-sectional design was a limiting factor in the evaluation of the cause and effect relationships. However, this structure is widely used in several Brazilian and non-Brazilian surveys.

The main differentiating factor of the present is the study is its use of a significant number of independent variables, which include validated questions regarding socio-demographic characteristics, the ability to perform basic and instrumental activities of daily living, and objective and subjective factors related to health, as well as the use of health services. All were analyzed concomitantly, considering possible confounding and redundant factors that were eliminated during the attribute selection analysis, thus allowing a high degree of precision in identifying the factors most strongly associated with the hospitalization of the elderly. Another relevant point of this study is the size of the sample, which included data collection on a national level, representative of the elderly population of Brazil as a whole.

CONCLUSION

The study made it possible to identify the factors associated with the hospitalization of elderly people, raising the awareness of health professionals and managers about the need for improvements in health care for the elderly and assisting in the organization and planning of the actions of the entire health service network.

Special attention should be paid to elderly persons who do not assess their health condition positively and who present functional limitations in the performance of instrumental activities of daily living, such as failure to perform any of their usual activities, difficulty going to the doctor and walking alone. In addition, recently seeking health services or the overuse of the same, especially medical consultations and emergency home visits, should be carefully monitored.

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Use of digital game therapy among elderly persons undergoing dialytic treatment: cognitive aspects and depressive symptoms

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Abstract

Objective: to evaluate the presence of depressive symptoms and cognitive disorders before and after an intervention program with a digital therapeutic game among elderly persons undergoing hemodialysis. *Method:* a quasi-experimental study was carried out with 26 elderly patients on hemodialysis. For the data collection, a questionnaire relating to sociodemographic and health conditions, the Geriatric Depression Scale - 15 items and Addenbrooke's Cognitive Examination Revised were used. The intervention with the digital therapeutic game was performed over 5 sessions. *Results:* of the participants, 80.8% were male, with a mean age of 66.7 (± 5.8) years. The mean pre-intervention depressive symptom score was 3.9 (± 3.0) while post-intervention it was 2.8 (± 2.9), representing a statistically significant difference ($p = 0.005$). Regarding cognitive function, there was no statistically significant difference before and after the intervention. There was a statistically significant difference in the mean of the depressive symptom scores, which were lower after the intervention. In addition, there was no statistically significant difference in the mean of the cognitive assessments. *Conclusion:* intervention studies with patients undergoing hemodialysis treatment are still scarce and this study describes the positive results of an intervention with a digital therapeutic game, demonstrating improvement in the depressive symptoms of the participants.

Keywords: Aged. Cognition. Depression. Renal Insufficiency Chronic. Technology.

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INTRODUCTION

Chronic kidney disease (CKD) is a major current public health problem. According to the dialysis census carried out by the Brazilian Society of Nephrology in July 2016, the total estimated number of dialysis patients was 122,825, among whom 92.0% were undergoing hemodialysis treatment[1]. Hemodialysis treatment causes disruption to lifestyle, requiring the individual to adapt to this new condition[2,3]. In particular, it results in a restricted daily life, causing limitations that affect the physical, social and psychological aspects of the patient's life [3].

The presence of depressive symptoms can have an impact on the quality of life of dialysis patients, as well as compromising adherence to treatment, affecting motivation and resulting in cognitive deficit[3-5]. Literature has described a relationship between depressive symptoms and cognitive impairment[6]. In individuals with kidney disease, the prevalence of depressive symptoms varies from 16.0% to 27.0%[5,7] while for cognitive disorders it ranges from 30.3% to 79.9%[8-10].

According to a study with 100 individuals undergoing hemodialysis treatment, there is an inversely proportional relationship between depressive symptoms and quality of life, reinforcing the negative relationship between the two[5]. Likewise, the impact of cognitive deficit on these individuals can be seen in a literature update, which highlights deficits in the domains of attention, cognitive flexibility and learning[10].

The evolution of society in the area of digital technologies has allowed the use of digital game therapy (DGT) as a new form of intervention in the area of health. This involves games that have a desired therapeutic effect on the patients who play them[11], combining entertainment with the aim of improving quality of life[12], based on medical requirements to comply with a therapeutic purpose[13]. A literature review with meta-analysis found that computerized interventions can provide benefits for cognition, depression, and anxiety in individuals with dementia[14].

A systematic review study identified successful results in cognitive training with digital devices, especially motivation and engagement, emphasizing the importance of the development of these resources in mobile devices for cognitive stimulation[15]. When analyzing the effects of therapeutic games on depressive symptoms, a literature review showed that most studies report promising results and that users are more receptive to adhering to new technologies as a form of treatment, but further testing is needed so that their effectiveness can be generalized[16].

Interventions with digital games as a complementary tool for rehabilitation have been a frequent focus of research [17]. In hospital settings, the use of digital games provides pleasure and alleviates distress, anxiety, sadness and isolation[18]. However, studies that prove the effectiveness of such games among the elderly are still incipient.

In this context, the use of new resources to improve the quality of life of the elderly in hemodialysis treatment is important. The present study therefore aimed to evaluate the presence of depressive symptoms and cognitive disorders before and after an intervention program with digital game therapy among elderly persons on hemodialysis.

METHOD

A quasi-experimental study was carried out in a Renal Replacement Therapy Unit in a city in the state of São Paulo, Brazil. The participants were selected for convenience, and therefore, all the individuals who met the following inclusion criteria were invited: age 60 or older, undergoing hemodialysis treatment, no serious impairment of language/comprehension or severe auditory or visual difficulties. The exclusion criterion was undergoing hemodialysis treatment in the morning due to the influence of sleep on cognition.

At the time of data collection, the service treated 59 elderly persons, 13 of whom were excluded because they underwent treatment in the morning. Of the remaining 46 elderly persons, 33 fulfilled the inclusion criteria of the study. All were evaluated, but only 26 completed the five intervention sessions, and were then reassessed.

Data collection was performed in two stages, before and after intervention. Sociodemographic data and clinical information were collected through a questionnaire containing information on: gender,

age, marital status, ethnicity/skin color, schooling, number of medications used, duration of treatment and subjective health assessment.

For the screening of depressive symptoms, the Geriatric Depression Scale - 15 items (GDS-15) was used. The score varies from 0 to 15 points, with 0 to 5 normal, 6 to 10 representing mild depressive symptoms and 11 to 15 representing severe depressive symptoms[19]. For cognitive evaluation, the Addenbrooke's Cognitive Examination Revised (ACE-R) was used, which includes the domains attention/orientation, memory, verbal fluency, language and visuospatial processing. The overall score ranges from 0 to 100 points[20].

These instruments were applied prior to the hemodialysis session, or, if not possible, within the first two hours after treatment. Due to the possibility that some of the participants might have visual problems and/or a low educational level, the instrument was applied through an individual interview between August and December 2016.

Intervention

The intervention used the therapeutic game entitled *Playing is good for you!*, developed by the Laboratory of Flexible and Sustainable Interaction of the Computer Department of the Universidade Federal de São Carlos in partnership with health professionals and patients of the Hospital Espírita de Marília, with the aim of aiding the treatment of depressive symptoms and cognitive stimulation[20,21].

The development of the game involved a multi-professional team comprising doctors, nurses, occupational therapists and hospital patients, as well as undergraduate and postgraduate professors and students from the Computer (CD), Nursing (ND) and Gerontology (GD) departments of the Universidade Federal de São Carlos (UFSCar)[21].

A theoretical framework based on participatory design and organizational semiotics was used in order to provide a representative scenario of therapeutic activity, in which the patient performs a set of interactive activities, defined to meet pre-determined therapeutic goals[13,20,21].

Playing is good for you! aims to aid in the treatment of depressive symptoms and cognitive stimulation. In order to achieve these therapeutic goals, the development of the game included analysis of studies that considered the end-user not only as a player, but also as a patient, using language designed to meet the precepts of game therapy[11,20,21], combining medical requirements with an attractive design which seeks to maintain engagement and enable greater utilization of this feature as therapy. Thus, the study of patients with depressive symptoms and health professionals from the Hospital Espírita de Marília contributed to the creation and improvement of the game, resulting in a scenario in which accomplishing tasks of daily living is related to the stimuli of a perception of well-being.

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Likewise, the introduction of cognitive stimuli sought to guide the player in a simple manner to activities that required attention, orientation, memory, executive function, visuospatial processing and perception._

The game was developed using the Godot Game Engine which enabled its application on the Microsoft Windows 7 platform. This game consists of five modules: 1) *Dressing Room,* which incorporates an activity to stimulate looking after one's personal appearance. Message: "Looking after yourself is good for you!"; 2) *Garden,* with offers an activity to stimulate care and appreciation. Message: "Taking care of something is good!"; 3) *Lake*, which provides an activity to stimulate leisure and entertainment. Message: "Having fun is good for you!"; 4) *Kitchen and Garage*, which includes an activity to stimulate learning. Message: "Learning something is good for you!", as shown in Figure 1.

Source: Laboratory of Flexible and Sustainable Interaction of the Computer Department of the Universidade Federal de São Carlos, 2015.

Figure 1. Screens from the game *Playing is good for you*!

The elderly person has to perform each of the tasks proposed in the modules, making their choices from the available items, with the level of difficulty predefined by the accompanying health professional. At the end of each of the modules, the player receives a cognitive stimulation activity related to the completed module.

Five individual sessions, with an average duration of one hour, were carried out during the first two hours of the hemodialysis session. The room was for collective use, but the participants did not interact with other people during the intervention.

The laptop containing the game on the Windows 7 platform was delivered to the elderly individuals who were accompanied by a researcher to help them with navigation during the game. The first session was aimed at familiarizing the elderly with the laptop, since most participants had never had contact with such a device. In the following sessions the elderly persons tried all the scenarios of the game, with freedom of choice of the order in which they would be played. They began by choosing the module for interaction, guiding the arrow with the mouse or touch pad from the text instructions for the execution of the task in question, and at the end of the task an incentivizing message appeared on the screen. Subsequently, the activity of cognitive stimulation began, and at the end a congratulatory message, or motivating message for a new attempt, was provided.

The study complied with the guidelines relating to ethics in research involving human beings, and all the participants signed a Free and Informed Consent Form before the interview. The research project was approved by the Ethics Research Committee of the Universidade Federal de São Carlos (approval nº. 1.394.924/2016).

The data were analyzed using the *Statistical Package for the Social Sciences* (SPSS para *Windows*) program, version 22.0. Calculations of descriptive data analysis were performed. To statistically evaluate the significance of the difference in the GDS-15 and ACE-R mean scores before and after the intervention, the paired Student's t-test was performed. The significance level adopted for the statistical tests was $p \leq 0.05$.

RESULTS

Of the 26 elderly people evaluated, the majority were male (80.8%), with a mean age of 66.7 (±5.8) years, with greater distribution among the 60-69

age group (69.2%) and white ethnicity/skin color (42.3%). There was a predominance of individuals who were married/lived with a partner (69.3%), the mean number of years of study was 5.92 (±4.2), and 42.6% had studied from 1 to 4 years (Table 1).

The mean duration of treatment was 51.9 (±79.8) months, and 34.6% were treated within 1 to 12 months. Regarding the subjective evaluation of health, 50.0% of the elderly persons judged their health to be fair (Table 1).

Table 1. Distribution of elderly patients on hemodialysis (N=26) according to sociodemographic and clinical characteristics. São Carlos, São Paulo, 2016.

Variable	n (%)
Gender	
Male	21 (80.8)
Female	5 (19.2)
Age group (years)	
60-69	18 (69.3)
70-79	8 (30.7)
Ethnicity/skin color	
White	11 (42.3)
Mixed race/brown	8 (30.8)
Black	7 (26.9)
Marital status	
Married / live with partner	18 (69.3)
Single Children	3 (11.5)
Divorced / separated	3 (11.5)
Widowed	2 (7.7)
Schooling (years)	
Illiterate	2 (7.7)
1-4	12 (46.2)
5-8	5 (19.2)
≥9	7 (26.9)
Number of medications	
1-3	3 (11.5)
4-6	16 (61.6)
7-9	7 (26.9)
Duration of hemodialysis (months)	
1-12	9 (34.6)
13-36	6 (23.1)
37-60	5 (19.2)
≥61	6 (23.1)
Subjective evaluation of health	
Very good	2 (7.7)
Good	11 (42.3)
Fair	13 (50.0)

With regard to the pre-intervention screening of depressive symptoms, 69.2% (n=18) had no depressive symptoms, 26.9% (n=7) mild depressive symptoms and 3.8% (n =1) severe depressive symptoms. In the post-intervention assessment, 80.8% (n=21) had no depressive symptoms, 14.4% (n=4) mild depressive symptoms and 3.8% (n=1) severe depressive symptoms.

Regarding cognitive evaluation, 42.3% (n=11) of the elderly with kidney disease exhibited cognitive disorders, considering the cut-off scores for schooling levels.

In the pre- and post-intervention comparison, it was observed that the mean GDS-15 score decreased after the intervention with digital game therapy, with a statistically significant difference between the two periods (p=0.005). There was no statistically significant difference in cognitive assessment, either by domain or total score, from the pre to the post-intervention assessment (Table 2).

Table 2. Comparison of GDS-15 and Addenbrooke's Cognitive Examination Revised (ACE-R) before and after intervention among the elderly on hemodialysis. São Carlos, São Paulo, 2016.

Variables	Pre-intervention Mean (±sd)	Post-intervention Mean (±sd)	*p*-value
GDS-15	3.9 (±3.0)	2.8 (±2.9)	**0.005**
Total ACE-R	63.3 (±15.0)	63.9 (±14.9)	0.521
Attention / orientation	14.0 (±2.7)	14.4 (±2.7)	0.290
Memory	15.0 (±4.6)	15.5 (±4.6)	0.536
Verbal fluency	5.5 (±3.0)	6.3 (±2.4)	0.055
Language	19.6 (±4.7)	19.4 (±4.1)	0.625
Visual spatial processing	9.0 (±3.4)	8.3 (±3.0)	0.099

Student paired t-test; sd=standard deviation; ACE-R= *Addenbrooke's Cognitive Examination Revised.*

DISCUSSION

The participants were mostly male, with a mean age of 66.7 (± 5.8) years, lived with a partner, had a low level of schooling, and had been in treatment for one to 12 months. In terms of the subjective evaluation of health, half of the participants considered their health to be fair. The data obtained in the present study corroborated data found in literature in relation to individuals with CKD[5,22,23].

With regard to screening for depressive symptoms, it was found that 30.7% of the elderly had mild or severe depressive symptoms. The mean GDS-15 post-intervention score was lower than the pre-intervention score, and the difference between the two was statistically significant. A survey with 140 elderly persons found that elderly persons who used digital games, even occasionally, had a better psychological performance than elderly people who did not, thus reflecting successful aging[12].

Advances in modern medicine have resulted in an increase in the survival rate of people with CKD, but the physical and mental suffering resulting from the symptoms of the disease and its treatment can lead to depressive symptoms in this population[7,24]. A study conducted with people undergoing hemodialysis showed an association between depressive symptoms and an increased risk of mortality [25]. The interactions between depression and CKD are complex, bidirectional and multifactorial, and interventions should be sought that provide improvements in the quality of life of these individuals[26].

Digital games have great potential as technological innovations in the quest to improve the quality of life of the elderly, providing fun and developing physical, social and emotional aspects and cognitive abilities. However, studies that approach this theme among the elderly population are still incipient, and there is a need for targeted research among this audience[27].

A study that evaluated cognitive tests indicates that depression contributes significantly to lower scores in the evaluation of cognitive performance[28]. The present study did not find a statistically significant difference between the preintervention and the postintervention period in the means of the cognitive domains and the total ACE-R score. This result contradicts findings in literature, which find that digital games can help elderly people towards cognitive improvement, strengthening their self-image through a process of constant challenges and discovery of their abilities[13,29].

A literature review discusses the possibility of a cognitive stimulation intervention during hemodialysis and emphasizes the importance of improvement in cognition for such individuals in terms of performing activities of daily living and decision making[30]. A review of literature on digital games for the elderly identified significant improvements in processing speed, sustained attention, alertness, visuospatial working memory, cognitive flexibility, immediate and delayed visual memory, and visual-motor-spatial coordination[29].

Intervention studies with patients undergoing hemodialysis treatment are still scarce and the present study provides positive results of an intervention with DGT, demonstrating improvement in the depressive symptoms of the participants. It is hoped that the present study will contribute to the planning of strategies for health promotion and disability prevention, associated with depressive symptoms, among both the elderly and nephrology teams. The continuation of this line of research may contribute to improving the quality of life of these individuals.

However, one limitation of this study was the short period for post-intervention cognitive reassessment, contradicting literature that describes an interval of at least six months, taking into account the effects of learning in the responses to the evaluation instrument.

CONCLUSION

The data of the present study indicate that the majority of the elderly in dialysis were men aged between 60 and 69 years, married, white and with from one to four years of schooling. They had been in treatment for between one and 12 months, used four to six medications per day and assessed their health as fair.

Playing is good for you! was found to be important in the improvement of depressive symptoms in elderly people undergoing hemodialysis, but did not achieve significant results in relation to cognitive performance. Studies that further investigate effects on cognition, with longer time periods, are required.

In view of these results, intervention with digital game therapy can be considered beneficial, offering elderly persons in hemodialysis treatment an innovative tool with increasing potential in the area of mental health. It is worth noting, however, that it is not possible to generalize the results due to the short reevaluation period. It is hoped that this study will contribute to the development of strategies that assist in the planning and implementation of interventions that maintain and care for health, increasing the quality of life of elderly persons in hemodialysis.

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The link between cognitive state and general self-esteem among institutionalized elderly persons: can health condition serve as a mediating factor?

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Abstract

Objective: to assess whether the health condition of an elderly person can serve as a mediating factor between the cognitive state and general self-esteem of the institutionalized elderly. *Method:* a quantitative, cross-sectional correlational study was performed, based on the path analysis technique. The following instruments were used for data collection: the Mini-Mental State Examination, the Tinetti Performance Oriented Mobility Assessment, the Mini Nutritional Evaluation and the Rosenberg Self-Esteem Scale. *Results:* the sample was composed of 312 elderly patients of both genders (112 men and 200 women), with an average age of 83.39 (±7.09) years. Most of the elderly persons were widowed, with a low educational level, and had been institutionalized in Residential Care Facilities for the Elderly for on average 54.6 (±51.69) months. The mediating factor of health condition renders the link between the cognitive state and self-esteem of the elderly null. However, the analysis of the decomposition of the effects showed a significant indirect effect between the cognitive state and health condition. The total effect of cognitive state on the health condition of the elderly is significant, positive and direct. *Conclusion:* based on the results of this study we maintain that cognitive changes can affect the nutritional state and physical balance of the institutionalized elderly.

Keywords: Health Status. Cognition. Health of Institutionalized Elderly. Self-Esteem.

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INTRODUCTION

Many chronic diseases typical of old age are a threat to autonomy and independence[1]. These illnesses can lead to frailty, functional disability, institutionalization and even death.

Functional disability, with consequent loss of autonomy, represents a window of opportunity for the development of more meaningful nursing for the elderly, families and society[1-3]. Maintaining functionality plays a protective role in the process of physical, mental and social deterioration[4], ensuring the independence and autonomy required for healthy aging[5].

As age increases, there is a loss of concentration, memory and vital energy[6]. Deficits in cognitive performance are one of the most frequently mentioned factors in literature, with negative implications for the self-esteem of the elderly[7], especially memory disorders[8].

Self-esteem is a fundamental component of emotional survival[6] and an indicator of mental health, as it affects affective, social and psychological conditions[9].

Another factor that influences health condition is nutritional status[10,11], which is an indicator of health that is interrelated with several functions, including physical and psycho-cognitive capacity[12]. The consequences of malnutrition lead to changes in muscle function, a decrease in bone mass and the reduction of cognitive function, with a major impact on the physical and emotional condition of the elderly population[13]. An unhealthy nutritional pattern influences the functionality and well-being of the elderly, particularly those who are institutionalized[14].

Another relevant factor in health condition is body balance. Chronic-degenerative diseases are often associated with structural alterations that compromise posture and balance. Insecurity caused by body imbalance can lead to psychic changes such as irritability, loss of self-confidence, anxiety, depression and loss of self-esteem. Body balance disorders also lead to a restriction in daily and social life activities, which in turn are reflected in self-esteem[15,16].

Based on the above, the evaluation of the health condition must have an all-encompassing and multidimensional approach, including a physical, nutritional and cognitive assessment[17].

The present study aims to test whether the health condition of the elderly is a mediating factor in the association between cognitive state and self-esteem in institutionalized elderly persons.

The objective of this investigation is therefore translated into the following research question: does health status play a mediating role in the association between cognitive state and global self-esteem in the institutionalized elderly?

METHOD

A cross-sectional, exploratory *ex-post facto* study was performed. The typology of the study was random correlational, using the path analysis methodology (in a more *lato* sense for the methodologies of structural questions) to test the respective research question.

The participants of the study were from a region in the north of Portugal, Trás-os-Montes and Alto Douro, and were institutionalized in Long Term Care Facilities for the Elderly (LTCF).

A mapping of the LTCFs in the district of Vila Real was carried out based on the Social Charter[18]. A total of 56 such institutions were found, with legal status of Private Corporate Institutions. Telephone contact was made with the management of each institution to schedule a meeting for the presentation of the study and its objectives. A total of 25 institutions agreed to participate.

The sampling method used in data collection was of the simple random type. Each elderly person was assigned a number and a random selection of 30% of participants resident in each institution was made. This percentage was reset whenever the elderly person or their legal representative did not agree to participate in the study.

Data collection was carried out between August 2014 and July 2015, and was performed by the first author in a suitable location made available in each of the participating institutions.

The inclusion criteria were age 65 or older, of both genders, who were institutionalized in a LTCF and were available to participate in the study. Participants with cognitive deficit were excluded.

The Mini-Mental State Examination (MMSE) developed by Folstein et al.[19] in 1975 and adapted for the Portuguese population[20] was used to evaluate the cognitive ability of the participants. The MMSE has 30 questions, with one point assigned for each correctly issued response. The cut-off values for the Portuguese population were redefined in 2009[21]. This procedure is based on the literacy qualifications of the subjects stating that 22 points refers to between zero and two years of literacy, 24 relates to three to six years of literacy and 27 points is the cut-off value for elderly persons with seven or more years of literacy.

Body balance was evaluated using the Portuguese version of the *Tinetti Perfomance – Oriented Mobility Assessment* (POMA I)[22]. POMA I evaluates predisposition to falls through a set of tasks related to mobility and balance. The instrument has two aspects: the evaluation of static equilibrium by means of nine items (Tinetti Index)[23], two of which are scored between 0 and 1 and seven of which are scored between 0 and 2. The dynamic balance evaluation uses 10 items, eight of which are scored between 0 and 1 and two of which are scored between 0 and 2. In this study, the static balance subscale was used.

The nutritional evaluation of the participants was carried out using the questionnaire developed by the Nestlé Nutrition Institute (NNI), the Mini Nutritional Assessment (MNA)[24]. The instrument is composed of 18 questions, divided into two parts and grouped into four categories: anthropometric measurements, global assessment, dietary assessment and self-assessment of nutritional problems and health status. In the first phase, the MNA performs a screening with six questions assessing food intake, weight loss in the last three months, mobility, psychological stress or acute illness in the last three months, neuropsychological problems and body mass index (maximum score of 14 points). In the second phase, the questionnaire evaluates overall nutrition via 12 questions (maximum score of 16 points). Each question receives 1 point. The higher the overall score, the more fragile the nutritional status of the elderly person. This instrument has been translated, adapted and validated for the Portuguese population[25].

Overall self-esteem was evaluated with the Portuguese version of the Rosenberg Self-Esteem Scale (RSES)[26]. The RSES is a global measure of self-esteem consisting of ten items, five of which have a positive orientation and five of which have a negative orientation. The current response format is Likert-based with four response alternatives[26].

A sociodemographic questionnaire was used to collect data such as age, gender, marital status, schooling, time of institutionalization and daily medication consumption.

The mediator variable is health condition, which consists of the scores obtained in the MNA and POMA I, the predictive variable formed by cognitive ability and the criterion variable by the RSES scores. The statistical analysis used in this study was path analysis.

The sample used in this study was greater than that required *a priori* (N=100) for an analysis with an effect power of 0.1, a desired statistical power level of 0.8, using a latent variable and four observed variables, at a stipulated probability of 0.05. The testing of the mediating nature of health condition was performed through the Baron and Kenny method[27], namely the evaluation of the significance of the paths between predictor and mediator, predictor and criterion and also mediator and criterion. From this point, the significance of the Sobel test was tested[28] considering the non-standard regression values and standard error. The fit of the data to the tested model used several indices of goodness of fit according to the practices recommended for evaluation of the models of structural equations[29], namely chi-squared value (and degrees of freedom), chi-squared significance, the Comparative Fit Index (CFI), the Standardized Root Mean Square Residual (SRMR), the Root Mean Square Error of Approximation (RMSEA) and its confidence interval a of 90%.

Taking into account the age and schooling limitations of the participants, the questionnaires were administered in interview form. Ethical principles, including the confidentiality and secrecy of the data acquired (both in the collection and the treatment

of the data) were safeguarded. Free and informed consent was requested from the participants after personal clarification of the nature and objectives of the research. This project was approved by the Ethics Committee of the Instituto de Ciências Biomédicas Abel Salazar under registry number 166/2016.

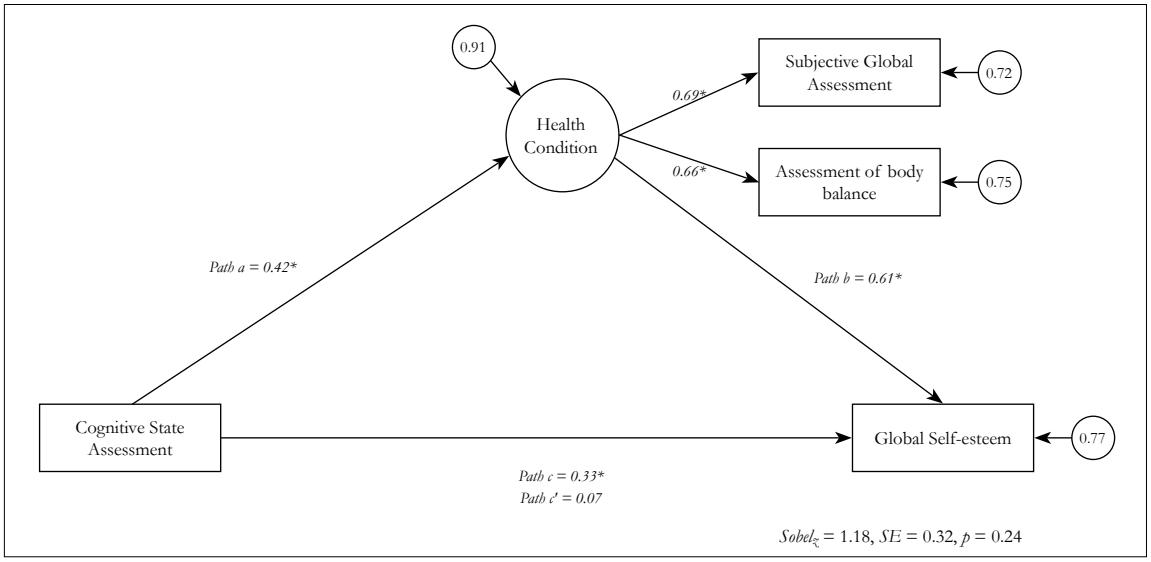
RESULTS

The sample consisted of 312 participants of both genders (112 men and 200 women), with a minimum age of 65 years and a maximum of 104 years [M =83.39; (+7.09)]. In terms of marital status, 17.30% (n=54) of the participants were married or in civil unions; 20.80% (n=65) were single; 59.90% (n=187) were widowers and 1.9% (n=6) were divorced. About half (49.90%, n=149) of the respondents were illiterate and 43.50% (n=135) reported three or four years of schooling. Only 4.4% (n=14) of the participants had more than five years of schooling. On average, the participants presented a history of institutionalization in their current facilities of 54.60 (+51.69) months. The daily consumption of medications was seven per day [M=7,10; (+3.19)]. Many of the participants had cognitive impairment (73.40%, n=229).

Health condition was tested as a mediator variable, having been constructed as a latent variable. The indicators introduced in this analysis were the Selective Global Assessment (SGA) and the Body Balance Assessment (BBA). The predictive variable in the study was cognitive ability assessed through the MMSE. The criterion or dependent variables are RSES scores (self-esteem) (Figure 1).

Path model - assumptions of mediation according to the classic four-step approach of Baron and Kenny[27]

The regression values between the variables of the model were initially tested and the associations recorded significant and positive values between: the predictor variable and the mediator variable, the mediator variable and the criterion variable between the predictor variable and the criterion variable. The Sobel test result indicated, however, that there was no mediation. Figure 1 summarizes the results.

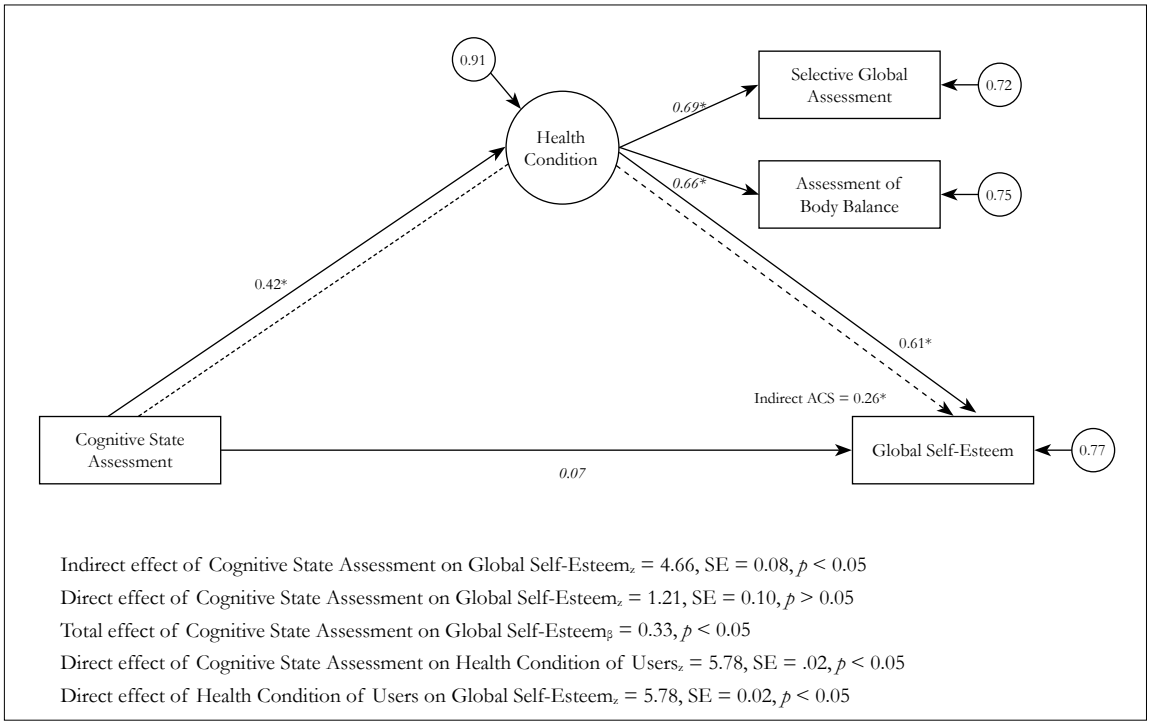


Regression, error, and disturbance values are standardized. Sobel$_z$ = z value of the Sobel test; SE = standard error; Values that do not have an asterisk are not significant (p>0.05); *p<0.05.

Figure 1. Test of mediation of health condition on the association between cognitive state assessment and global self-esteem.

The analysis of the decomposition of the effects indicated the significant indirect effect of cognitive state on self-esteem via health condition. The value of this effect was tested by subtracting the standardized values of the indirect effect from the value of the total predictor effect, revealing a small and non-significant direct value of the cognitive state assessment in global self-esteem. The total predictor impact on overall self-esteem is significant and of moderate magnitude, however. The results show that there is no mediation in the model.

Cognitive state had a positive effect on the health condition of the respondents. The model also indicates the existence of a significant, positive and elevated total effect of health condition on self-esteem. The total value of the weight of health condition in self-esteem is significant and positive although moderate. According to the total model, the standardized impact represented by the regression value which associates predictor and criterion directly is not significant. Figure 2 shows the total model and respective standardized beta values.



The dashed and dotted line are presented as indirect paths of the model (i.e., the indirect effects of the predictor variable on the criterion, via health condition, β=0.26); Regression, error, and disturbance values are standardized. The solid line shows the direct paths of the predictor variables, the variable tested as a mediator (β=0.42) and the criterion (β=0.07). The direct effect of the evaluation of health condition on the criterion is β=0.61; CSA = cognitive state assessment; SE = standard error, *$p \leq 0.05$.

Figure 2. Final model tested, showing direct and indirect effects.

DISCUSSION

Initially, it should be noted that the present study found no evidence of the mediation of health status in the association between cognitive state and global self-esteem. However, the positive effect of cognitive state on health condition was found, according to the authors, who report that the cognitive state has an effect on health status, well-being, quality of life and self-esteem. It is thus verified that the decline of cognitive state is a predisposing factor to a fragile health condition[30].

The impact of health status on self-esteem was shown to be significantly positive in this study. For some authors, the effects of aging, added to reduced

functionality, nutritional changes and body balance, often accompanied by a sedentary lifestyle, may result in losses in the health and quality of life of the elderly[14,16]. This multiplicity of associated factors leads to anticipated reductions in autonomy, the need for personal care and in some circumstances the impairment mobility, with the latter resulting in predictors of low levels of self-esteem[31]. These authors[31] recognize that the aging process entails the risk of the impairment of nutritional status, a danger that increases exponentially in the institutionalized elderly. There is a correlation between health condition and self-esteem, so studies should focus on the identification of factors that can be additional predictors of self-esteem deficits in the elderly[32]. Sedentarism, resulting from the decline of body balance, combined with a nutritional deficit, is associated with a reduction in functional capacity[16]. If, on the one hand, literature recognizes that the impairment of mobility may affect nutritional status, it also recognizes that there is a dispersion effect to this association, resulting in deficits in quality of life that negatively affect the self-esteem of the elderly[10,14]. Another study broadens the scope of these variables, stating that body balance disorders have a negative impact on social autonomy, activities of daily living, physical and mental security, and self-confidence, which in turn have a negative correlation with the well-being and self-esteem of the elderly[33]. Caveiro et al.[16] present evidence that body imbalance is one of the main factors that compromise the health status of the elderly, which is due to the reduction in participation in social activities and self-care, leading to emotional and psychic suffering.

It is also important to discuss the results of the adjustment of the data to the model given by the high RMSEA value, which is considered mediocre (RMSEA>0.06, with a greater upper limit in the IC_{RMSEA} *90% ≥0.08).* It should be noted that in samples that are considered large and with a high complexity model (perhaps considering here the existence of a latent factor with two indicators of different qualities) the RMSEA value increases, being one of the explanatory factors for the high value obtained. However, it should be reiterated that the other indexes of goodness of fit were adequate and even high for the cut-off values normally attributed to them.

The limitations of this study are mainly based on the type of sample, which was composed exclusively of elderly people institutionalized in non-profit facilities and limited to a region of northern Portugal, Trás-os-Montes and Alto Douro, making it impossible to generalize the results for the Portuguese population, and the use of a cross-sectional design that does not allow cause and effect relationships to be established. In future studies the inclusion of institutionalized elderly persons from other regions of the country is suggested, along with the comparative inclusion of elderly persons where care is provided through alternative solutions to hospitalization and the use of private hospitalization institutions.

CONCLUSION

This study reinforces the idea that the aging process interferes with the health condition, either through the diversity of physiological changes that occur, or the variability of intrapersonal variables, the psychological specifics of the elderly, or even through the specific social context of the same. The results support the assumption that cognitive and behavioral changes may affect the nutritional status and body balance of the elderly. In terms of nutritional status and cognitive capacity, there is a cause and effect circle with constant feedback, that is, nutritional impairments have a negative influence on cognitive function and impairments in the latter contribute to the impairment of nutritional status[34]. Thus, the maintenance of cognitive function requires an adequate and healthy nutritional status and vice versa. Impairments of cognitive function, meanwhile, lead to the loss or reduction of autonomy and independence, causing a decline in the condition of life of the elderly that in turn encompasses nutritional state. Thus, cognitive stimulation should be a prioritized technique in the approach of health professionals with the elderly.

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Telecare for the elderly: coercion, confidence and satisfaction associated with its use

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Abstract

Objective: to evaluate the expression of coercion, confidence and satisfaction with the use of telecare. *Method*: a cross-sectional study was carried out of prevalent cases with elderly residents in the city of Porto Alegre, Rio Grande do Sul, Brazil, who had already used telecare services. The sociodemographic variables used were: gender, age, schooling and marital status. In order to evaluate the perception of coercion, the Perceived Coercion Scale was applied in relation to the use of telecare and those responsible for deciding to use the technology. Confidence in the use of telecare technology and the satisfaction associated with its use were evaluated. Quantitative data analysis was performed using descriptive and inferential statistical measures. Means and standard deviations were used. Differences were assessed by analysis of variance, with a significance level of 5% ($p<0.05$). *Results*: the sample consisted of 25 elderly people who used telecare. When evaluating the distribution of the answers obtained, it was found that 11 (44%) of those interviewed did not perceive any coercion associated with their decision. The others had varying perceptions, with an average of 23%. Respondents expressed high confidence and satisfaction with telecare. *Conclusion*: the decision-making process associated with the use of telecare had a low perception of coercion, combined with high confidence and satisfaction with the use of the technology.

Keywords: Elder. Self-Help Devices. Coercion.

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INTRODUCTION

According to demographic data the worldwide elderly population is growing. This fact has led to considerable reflection and discussion, as old age results in physical, biological, psychological and social changes in the profile of the individual and the population itself[1]. Because of these changes, health systems in most countries are facing significant challenges. An example of this is the need for greater efficiency, quality and equity in health services, as well as the increased demand for health care in the patient's own home. Telecare has been developed, at least in part, due to the difficulty and cost associated with hiring staff to provide health and home care services[2].

Telecare is a functional and accessible form of technology, developed to meet the demand for the long-term care of the elderly[3]. This remote care technology consists of the use of home-installed equipment such as telephones and fall detectors that allow direct communication with a service center in the event of an emergency. This center assesses the type and severity of the situation to take appropriate measures to provide the necessary help to the user[4].

The use of this technology should not be considered a form of restriction on the autonomy of the elderly. On the contrary, it may allow them to feel safe to remain in their own home. Autonomy is a key factor for a good quality of life and a necessary skill of an appropriate decision-making process. Autonomy allows a more satisfactory life, as it allows the individual to maintain control of their own life and their independence[5].

However, old age is full of prejudices and stereotypes, which influence the care aimed at the elderly. Autonomy is poorly evaluated and it seems natural that care is the responsibility of family members, who may feel empowered to decide, guide, provide and manage the life of the elderly[6]. An overprotective family environment, where caregivers assume all the activities of the elderly for themselves, can lead to learned dependence, discouraging the elderly from exercising their autonomy [7].

In many situations of daily living, it can be seen that even health professionals underestimate the decision-making capacity of the elderly, providing superficial information about their treatment and diagnosis, which may impair the freedom of individuals to decide what they consider best for their care[8]. They are therefore able to coerce the elderly into making decisions that do not agree with their life and health.

The coercion is defined by Piaget as: "Any relation between two or more individuals in which an element of authority or prestige intervenes." Yet, according to the same author, coercion "exists to the extent that it is suffered, (...) regardless of the actual degree of reciprocity"[9].

In this context, the increasing use of new technologies in the care and monitoring of the elderly has raised questions about the effective participation and respect for the self-determination of the individuals involved. The evaluation of the degree of coercion perceived in the decision-making process and the degree of confidence and satisfaction about the use or non-use of these new assistive technologies can generate the possibility of assessing to what extent self-determination is preserved.

Thus, the objective of the present article was to evaluate the expression of coercion, confidence and satisfaction with the use of telecare of a group of elderly people who used this technology in Porto Alegre, Rio Grande do Sul, Brazil.

METHOD

A cross-sectional study of the prevalent case type was performed. The population studied was composed of elderly residents of the city of Porto Alegre (Rio Grande do Sul) who used telecare technology as clients of the company TecnoSenior, through its partner company IrisSenior. Contact was made with these two companies, and permission was asked to register their clients that already used the technology and that met the eligibility criteria of the research. The inclusion criteria were to be elderly, that is, a person aged 60 or over, and be already using telecare technology. The exclusion criterion of finding it impossible to understand participation in the research or the completion of the instrument as also applied.

The telecare companies provided the contact information of 73 elderly people and contact with potential participants was carried out by telephone.

Eighteen elderly people were not located. Thus, contact was made with the remaining 55 elderly, and 25 (45.45%) agreed to participate in the study (Figure 1). The research was carried out at the home of the elderly person by the researcher herself and a single evaluator.

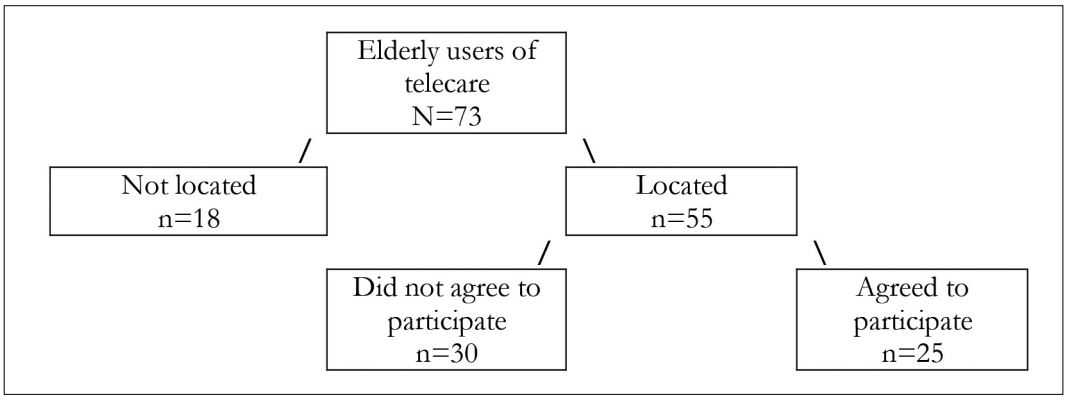


Figure 1. Flowchart of selection process of sample.

The sociodemographic variables used were: gender, age, schooling and marital status. To evaluate the perception of coercion, the Coercion Perception Scale was used in relation to the use of telecare with the question: "Who was responsible for making the decision to use this technology?". Confidence in the use of assistive technology and the satisfaction associated with its use were evaluated. These variables were obtained through visual analogue scales varying between 0% and 100%. The participant marked their perception in a range between these values, without any intermediate delimiter in a line 10 cm long, starting at 5% and ending at 100%.

The Coercion Perception Scale is derived from a scale for assessing coercion in psychiatric hospitalization, the MacArthur Admission Experience Survey, which is composed of 16 questions[10]. This instrument was developed by the MacArthur Coercion Study and validated for the Portuguese language spoken in Brazil by Taborda[11].

The Coercion Perception Scale, already translated and validated for Portuguese spoken in Brazil, was adapted for the use of telecare in the present study. This scale is composed of four sentences in which the participant must indicate whether they agree or disagree. The first two affirmations indicate a lack of associated coercion, that is, those who disagree demonstrate that there was a perception of coercion associated with the reported situation. In the last two questions, the reverse occurs as affirmative responses show a perception of coercion. The first question refers to the fact that the interviewee had sufficient opportunity to say if they wanted to use assistive technology. The second question concerns the opportunity to say what they wanted about the use of assistive technology. The third question concerns the fact that no one seemed interested in whether the participant wanted to use assistive technology. The last question concerns the fact that the participant's opinion on the use of assistive technology was not asked. An open question about who was in charge of the decision to use the technology was also added to the scale.

The instrument is self-applicable and in each response the participant chooses to indicate whether they agree or disagree. The responses can vary from 0 to 4 points, 0 representing the absence of coercion and 4 a perception of maximum coercion. In order to facilitate the understanding of the results of the sample as a whole, the four point scale was transferred into a percentage value. Thus, 0 point corresponds to 0% and 4 points correspond to a 100% perception of coercion.

Coercion can also be accompanied by individual responses to each of the issues, which assess the various perspectives of the decision-making process.

Data collection took place between December 2016 and March 2017. Data analysis was quantitative using descriptive and inferential statistical measures. Means and standard deviations were used. The differences were evaluated by analysis of variance, with a significance level of 5% (p<0.05).

The study was approved by the Scientific Commission of the Institute of Geriatrics and Gerontology (IGG) and by the Research Ethics Committee of the Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS) under nº 105166/2016. All the participants signed a Free and Informed Consent Form (FICF).

RESULTS

The sample consisted of 25 elderly individuals who had used telecare before the data collection. The mean age of the group was 82.24 years, ranging from 60 to 94 years. In the sample, 23 (92%) were female and only two (8%) were male. The majority of the participants, 15 (60%), were widowed. The average schooling was 13.58 years of study and the mode and median were 12 years (Table 1).

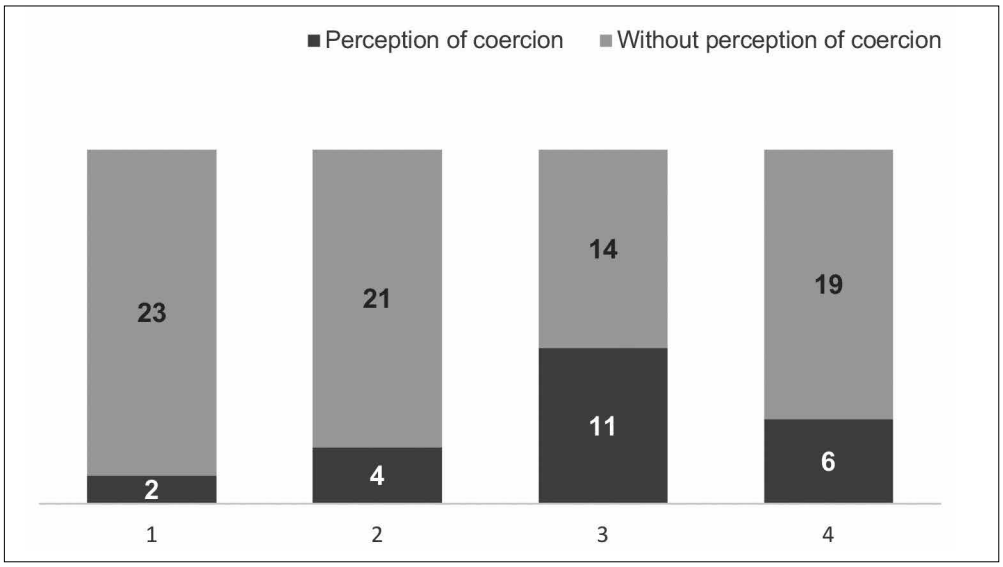
Of the elderly, the majority reported living alone (n=21; 84%) while only four (16%) described living with someone, which included a husband or wife, children and/or grandchildren.

The mean of the Coercion Perception Scale was 23% (+24), ranging from 0% to 75%. No participant exhibited a 100% perception of coercion in relation to telecare.

Most of the participants, 23 of the 25 elderly persons, reported having had the opportunity to say if they wanted to use telecare. Likewise, 21 of the 25 participants reported having had the opportunity to say what they wanted regarding the use of technology. The interest in knowing if the participant wanted to use this device provided more balanced answers, with 11 participants affirming that such interest existed and 14 not having this perception. Most of the participants, 19 of the 25 elderly persons, believed that their opinion was considered in the decision-making process about whether to use the technology (Figure 2).

Table 1. Sociodemographic data of users of telecare.

Sociodemographic data	n (%)	Mean and standard-deviation
Gender		
Female	23 (92)	
Male	2 (8)	
Age (in years)		82.24 (±6.71)
60|---70	1(4)	
70|--- 80	6 (24)	
80|--- 90	16 (64)	
90|---100	2 (8)	
Schooling (in years)		13.58 (±6.98)
1|--- 8	3 (12)	
9|---12	10 (40)	
<12	12 (48)	
Marital status		
Married	3 (12)	
Single/Separated	7 (28)	
Widowed	15 (60)	



Questions of Coercion Perception Scale:
1- did you have sufficient opportunity to say that you wished to use the technology;
2- did you have the opportunity to say what you wanted to say regarding its use;
3- was there interest in knowing if the participant wanted to use the technology;
4- was the opinion of the participant considered in the decision making process.

Figure 2. Individual responses to the four questions of the MacArthur Scale for Coercion Perception Assessment associated with the use of telecare technology (N=25).

When questioned about who was responsible for decision making, 12 (48%) elderly persons said they themselves were, 11 (44%) answered that their children were, one (4%) reported that a friend was and another (4%) said that their doctor had decided.

It is important to point out that the values of the perception of coercion obtained varied according to who made the decision, with difference results if it was a family member, a friend, a doctor or the elderly person themselves who made the decision to use the technology. The highest mean coercion value was observed when someone outside the family – a doctor or a friend – made the decision [M=1.50 (+0.71)]. When the decision was taken by relatives the average value was 1.18 (+1.08). Finally, the lowest mean coercion value was observed when the person interviewed took the decision [M=0.58 (+0.79)] (Table 2). There was no significant difference between the means for all the decision-making situations (p>0.05).

Table 2. Results regarding the decision maker in using telecare in relation to perceived coercion, confidence and satisfaction.

Responsible for decision to use telecare	Perception of coercion Mean (sd)	Confidence in technology Mean (sd)	Satisfaction with use Mean (sd)
User themselves	0.58 (±0.79)	83.92 (±19.88)	84.58 (±28.41)
Family members	1.18 (±1.08)	84.04 (±19.39)	84.82 (±15.29)
Someone outside family (doctor or friend)	1.50 (±0.71)	54.00 (±65.05)	32.00 (±31.11)

sd= standard-deviation.

A comparison of trust and satisfaction with use was made, and who played the biggest role in making the decision to use technology. The comparisons between the averages obtained with the users themselves or with relatives were not significant ($p>0.05$). It was not possible to make this comparison with the group outside the family as it only had two people.

DISCUSSION

The sample of the present study consisted of 25 elderly individuals, with a mean age of 82.24 years, ranging from 60 to 94 years. This sample is in line with other demographic data, which shows a global increase in the elderly population. These data also show an increase in the percentage of elderly people aged over 80 years old[1].

The majority of study participants were women, with a frequency of 92%. This proportion is higher than that observed in the general population, where women make up 50.4%. This increase in female participation in the sample using telecare may be due to the fact that women are more likely to seek health services and health care options and safety measures, with higher rates of adherence to prevention programs and the use of technologies[9].

The proportion of widows (60%) in this study agrees with the values described in other studies, which show data ranging from 60% to 70%[1,10].

Regarding the schooling of the participants, the average was 13.58 years of study. This value is higher than that observed in the wider Brazilian population, which is 7.8 years [11].

The proportion of individuals living alone in the present study was 84%, a result also found in another study, which may reflect the fact that the option to live alone can be through personal choice and also be a temporary stage in the life cycle of the individual. In addition, the proportion of people living alone is greater among older Brazilian elderly persons than younger elderly individuals, and this difference has grown over time[10]. In addition, people living alone are more likely to adopt telecare.

It is possible that living alone and using telecare are due to a relatively strong need for some kind of support compared to people who live with a partner or relative[3]. Since autonomy is the ability to control, handle and make personal decisions about how to live according to one's own rules, it can be altered by biological changes, functional incapacity, the loss of physical competence and economic factors, or other negative stereotypes associated with old age and social relations or social networks[12].

Thus, we understand the importance of studying decision-making regarding well-being in the aging process, as it is affected by significant events, such as retirement, health problems and the loss of loved ones[13]. Making a decision involves several skills such as being able to engage with the subject, understanding or evaluating the type of alternative between the various options and communicating one's preference while knowing the risks involved. These abilities are linked directly to the ability to exercise autonomy and to determine and execute one's own desires[14,15]. All these characteristics were present in the participants of this study.

The elderly persons were primarily responsible for making the decision to use telecare, with a frequency of 48%. Old age involves the necessity of making difficult choices, often related to the elderly's own health and the processes that may occur. The participation of the elderly in this process should not simply be the granting of assent or the delegation of the decision[16].

In another group within the sample (44%), relatives were responsible for making the decision to use telecare. Other studies have shown that the social network, represented by relatives, people close to the elderly person or caregivers, are those the elderly can rely on when deciding something or to whom they can delegate decision-making[17].

Autonomy can be one of the fundamental factors for a good quality of life and is a basic need in decision making, allowing a more satisfactory life, accompanied by the preservation of the capacity to maintain the making of choices during one's life trajectory and independence[18].

The understanding that the elderly should participate in the decision-making process based on their self-determination allows us to identify that elderly persons present themselves as the main actor in the process. It is therefore important that health actions are discussed not only for such individuals but with them, so that autonomy is preserved and allowed to grow. The quest for the right to act independently, which can be demonstrated by the confidence and satisfaction associated with the use of telecare, can enable a healthy and pleasant longevity for the aging population[19].

The limitations of the present study included the size of the sample and its geographical scope. We suggest that other studies with a larger sample size and greater diversity may be useful in the creation of new knowledge to allow a more detailed evaluation of the use of telecare among the elderly.

CONCLUSION

The elderly using telecare had a sociodemographic profile similar to that of the elderly population, with a higher percentage of women; a mean age of 82.24 years, ranging from 60 to 94 years, evidencing their longevity. The majority were widowed and lived alone.

The decision-making process associated with the use of assistive technology involved a low perception of coercion in almost all the participants of the research, demonstrating that the elderly remain autonomous in deciding about the management of their choices. The elderly had high confidence and satisfaction regarding the use of telecare. These results allow us to state that in the studied sample the use of this technology brings benefits, since in all variables evaluated the results were favorable.

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Is sedentary behavior an intervening factor in the practice of physical activity in the elderly?

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Abstract

Objective: the present study aimed to analyze the association between current sedentary behavior and the practice of physical activity among elderly persons in the city of Maringá in the state of Paraná. *Method*: a cross-sectional study of 970 elderly subjects was carried out, using the *International Physical Activity Questionnaire*. *Results*: the modeling of structural equations revealed that the sedentary behavior has a significant effect ($p < 0.05$) on the activities moderate and vigorous activities, explaining 3% and 4% of the variability of these variables. Specifically, it has been found that increased sedentary behavior has a ($\beta = 0.13$) and negative on vigorous activities ($\beta = -0.21$). *Conclusion*: the current state of sedentary behavior has a significant effect on moderate and vigorous activities.

Keywords: Sedentary Lifestyle. Motor Activity. Health of the Elderly.

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INTRODUCTION

The epidemiological and demographic transition in Brazil, combined with the process of urbanization and the advance of technology, have resulted in an increase in longevity and changes in the lifestyle adopted by the population[1,2]. An active lifestyle has been modified by the insufficient practice of physical activity and by sedentary behavior, which brings negative consequences for health and quality of life as we grow older[1-3].

Sedentary behavior and physical activity have different constructs. The first is related to the set of behaviors adopted in a seated or lying position where little energy is spent and which do not increase energy expenditure above resting levels (1.0 - 1.5 metabolic equivalent tasks - METs). Physical activity is defined as any body movement produced as a result of muscle contraction that results in caloric expenditure[3-8].

Researchers who have analyzed the impact of physical activity during the aging process through longitudinal studies have found that, as we age, levels of physical activity tend to decrease, while the time spent in sedentary activities tends to increase[1,2,9-12]. According to Amorim and Faria[13] and Chastin et al [14], factors that can contribute to this inverse relationship include the absence of facilitators and stimulators for the adoption of healthy habits and the presence of environmental barriers.

In view of the considerations presented, the present study sought to analyze the association between current sedentary behavior and the practice of physical activity of elderly persons in the city of Maringá, Paraná, Brazil.

METHOD

A quantitative, observational and cross-sectional study with an epidemiological approach was carried out.

The authors contacted the Department of Sports and Leisure to seek authorization for the collection of data from Gyms for the Third Age (GTA) of the city of Maringá, Paraná. Next, the same public organ provided information about the quantity and locations of GTAs spread around the municipal region (with the exception of the districts). Of the 57 GTAs identified, 23 were excluded from the survey due to the low prevalence of elderly users and/or the environmental and structural instability of the gyms. A total of 970 elderly people, intentionally chosen and selected for convenience, were therefore enrolled in the study. Elderly patients of both genders, who were users of at least one of the GTAs surveyed and retained their capacity for speech and hearing were included, allowing the questionnaires to be applied. Elderly users of walking aids or with neurological and dementia deficits reported by caregivers and/or relatives at the time of data collection were excluded. Also excluded were elderly individuals with possible cognitive deficits, assessed by the Mini Mental State Exam (MMSE)[15].

The cut-off points used for exclusion by the MMSE were 17 for illiterate individuals; 22 for elderly persons with an education of between 1 and 4 years; 24 for those with schooling between 5 and 8 years and 26 for those who had 9 years or more of schooling. These cut-off points were based on the criteria of Brucki, Nitrini and Caramelli[16]. Elderly persons classified below the specific cut off point for their level of schooling were excluded.

The physical activity level of the elderly was evaluated using the short version of the International Physical Activity Questionnaire (IPAQ). The level of physical activity was classified as sedentary, irregularly active, active or very active. Sedentary behavior was assessed through the average sitting time on a weekday and on a weekend day[17].

A team of ten researchers was previously trained and, after a pilot data collection, were distributed among the research sites. The researchers approached the elderly in the GTAs themselves, on different days of the week and at different times. Data collection took place between March and July 2017.

Preliminary analyzes. Preliminary data analysis was performed using the Kolmogorov Smirnov normality test. Spearman's correlation (non-parametric) was used to verify the relationship between the variables. According to the statistical recommendations, the following cut-off points were used for the correlation coefficients: $r < 0.40$ = weak correlation, $r > 0.40$ to 0.69 = moderate correlation, $r > 0.69$ = strong correlation[18,19].

The main analysis involved Structural Equation Modeling (SEM). The hypothetical model verified the existence of four latent factors (Sedentary Behavior, Light Activities, Moderate Activities and Vigorous Activities) from the observed variables of the questionnaires used. Similar procedures to generate latent variables from the dimensions of the questionnaires have been adopted by several researchers in the area of health[20,21]. In this way, the assumptions described in the hypothetical model were tested by SEM, verifying how sedentary behavior affects the practice of physical activity among the elderly.

SEM was tested using the two-step method: Step 1) specify and identify the submodel of the measurement by performing confirmatory factor analysis (CFA) of the measurement model; and Step 2) Specify and identify the structural submodel, establishing trajectories and errors for the endogenous variables[20]. The quality of fit of the model was analyzed according to the fit indices and the local fit was evaluated by the factorial loads and the reliability of the items. The maximum likelihood estimation method was used to estimate the parameters of the model. The existence of outliers was checked by means of the square Mahalanobis distance (D^2)[22]. Univariate distribution was also evaluated through asymmetry (ISkI <3.0) and kurtosis (IKuI <10), and multivariate distribution (Mardia coefficient for multivariate kurtosis)[23]. The indicators of the goodness of fit of the model (Absolute, Incremental and Parsimonious Fit) were: X^2/gl (values between 1.0 and 3.0 are satisfactory), Root Mean Square Error of Approximation (RMSEA) (less than 0.06), Tucker-Lewis index (TLI) and the Comparative Fit Index (CFI) close to 0.95)[24]. The interpretation of the coefficients of the trajectories had as a reference: little effect for factor loadings <0.20, medium effect for factor loadings up to 0.49 and great effect for factor loadings> 0.5021. The level of significance was set at p <0.05.

This study was approved by the Committee of Ethics in Research with Human Beings (CEP) of the Faculdade Metropolitana de Maringá, under approval number 2,255,102/2017. The elderly who agreed to participate in the study signed a free and informed consent form (FICF).

RESULTS

A total of 970 elderly men and women (428 men and 542 women) aged between 60 and 91 years (68.9 (± 6.9)) participated in the study. There was a prevalence of married elderly persons (62.1%), aged 60-69 years (60.4%), who were white (75.9%), retired (72.9%) and earned from 1 to 2 minimum wages (53.3%). It was also observed that the majority of the elderly had not finished high school (63.9%).

Table 1 shows the descriptive values of each of the study variables, as well as the correlation values between the variables. Sedentary behavior presented the following correlations with the practice of physical activity: time sitting during the week with days of walking (r=-0.19); minutes of walking per week (r=-0.08); days of moderate activity (r=-0.23); minutes of moderate activity per day (r=-0.10); minutes of moderate activity per week (r=-0.14); days of vigorous activity (r = -0.36); minutes of vigorous activity per day (r =-0.29) and minutes of vigorous activity per week (r=-0.34).

Table 1. Matrix of correlation between variables of sedentary behavior and practice of physical activity practice.

Variables	Sedentary Behavior		Practice of Physical Activity								
	1	2	3	4	5	6	7	8	9	10	11
1. Time sitting during week		0.81*	-0.19*	0.01	-0.08*	-0.23*	-0.10*	-0.14*	-0.36*	-0.29*	-0.34
2. Time sitting at weekend			-0.11*	0.05	-0.04	-0.23*	-0.12*	-0.16*	-0.30*	-0.27*	-0.29*
3. Days when walked				0.19*	0.55*	0.21*	-0.02	0.03	0.11*	0.09*	0.10*
4. Minutes walked p/ day					0.80*	-0.15*	0.05	-0.02	-0.10*	-0.02	-0.07*
5. Minutes walked p/ week						0.01	0.13*	0.12*	-0.02	0.04	0.01
6. Days of moderate activity							0.61*	0.79*	0.22*	0.21*	0.19*
7. Minutes of moderate activity p/ day								0.89*	0.08*	0.17*	0.11*
8. Minutes of moderate activity p/ week									0.15*	0.19*	0.17*
9. Days of vigorous activity										0.91*	0.97*
10. Minutes of vigorous activity p/ day											0.94*
11. Minutes of vigorous activity p/ week											
Mean	175.14	220.30	3.45	40.51	159.64	2.20	33.63	129.14	0.75	10.02	30.46
Standard-deviation	145.63	171.90	1.81	34.11	157.39	2.03	29.70	166.27	2.42	24.44	54.26

*Significant correlation – $p<0.05$.

Structural Equation Modeling

The measurement model (Step 1) with the submodels of the four latent variables exhibited acceptable indices [X^2 (38) = 274.25; p = 0.0001; X^2/gl = 3.21; CFI = 0.97; GFI = 0.95; TLI = 0.95; RMSEA = 0.08; p (RMSEA <0.05) = 0.001]. The quality of the local fit and the internal reliability of the items was also confirmed, with all trajectories obtaining significant factorial loadings ($p<0.05$) and >0.50. The hypothetical model was then analyzed (Step 2), verifying whether current sedentary behavior would affect the practice of light, moderate and vigorous physical activities among the elderly.

The model (M1) tested (Figure 1) presented sufficiently acceptable indicators of fit [X^2 (41) = 283.71; p = 0.001; X^2/gl = 5.920; CFI = 0.97; GFI = 0.95; TLI = 0.96; RMSEA = 0.08; p (RMSEA <0.05) = 0.001; AIC = 333.71; BIC = 544.64; MECVI = 0.35]. However, the regression coefficient (β = -0.03) of Sedentary Behavior for Light Activities did not present a significant effect (p = 0.065). The Light Activities variable was therefore excluded, and the model tested again.

The modified model (M2) presented significant trajectories ($p<0.05$) and satisfactory indicators of fit [X^2 (17) = 72.37; p = 0.001; X^2/gl = 3.26; CFI = 0.99; GFI = 0.98; TLI = 0.98; RMSEA = 0.06; p (RMSEA <0.05) = 0. 561; AIC = 110.37; BIC = 203.04; MECVI = 0.11] (Table 2).

The latent variables of Moderate Activities and Vigorous Activities were explained by 3% and 4%, respectively, by Sedentary Behavior in M2 (Figure 2). In the direct relationship established between Sedentary Behavior and Moderate Activities and Vigorous Activities, the effects were weak (β = 0.13 and β = -0.21), indicating that with each increase of

one standard deviation in the Sedentary Behavior unit there was an increase of 0.13 standard deviation in the Moderate Activities unit and a reduction of 0.21 standard deviation in the Vigorous Activities unit. In addition, the Bias-corrected confidence interval analysis generated by bootstrap replication revealed a significant effect of Sedentary Behavior on Moderate Activities and Vigorous Activities.

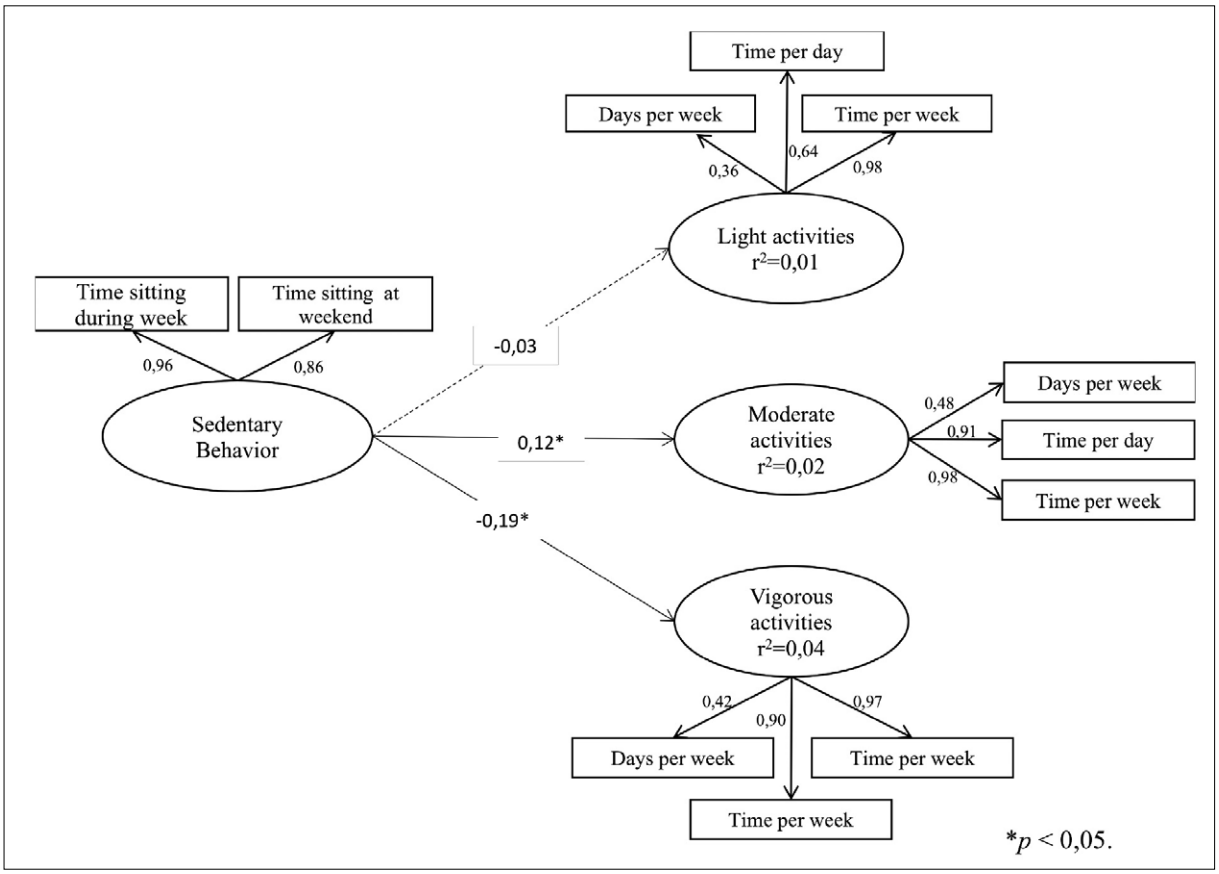

Figure 1. Structural model (M1) of the effect of sedentary behavior on the physical activity of the elderly.

Table 2. Comparison of indices of fit of the models proposed by the study.

Comparison between models	Model 1	Model 2*
Chi-squared	283,71	72,37
Degrees of freedom	41	17
p-value	0,001	0,001
X^2 standardized (X^2/gl**)	5,92	3,26
Adjusted Goodness of Fit Index	0,95	0,98
Root Mean Square Error of Approximation [CI*** 90%]	0,08 [0,07-0,09]	0,06 [0,04-0,07]
Tucker-Lewis index	0,96	0,98
Comparative Fit Index	0,97	0,99
Akaike Information criteria	333,71	110,37
Bayes Information criteria	544,64	203,04
Expected Cross Validation Index	0,35	0,11

*Model with best fit adopted;** Chi-square ratio by degrees of freedom; ***CI = Confidence Interval.

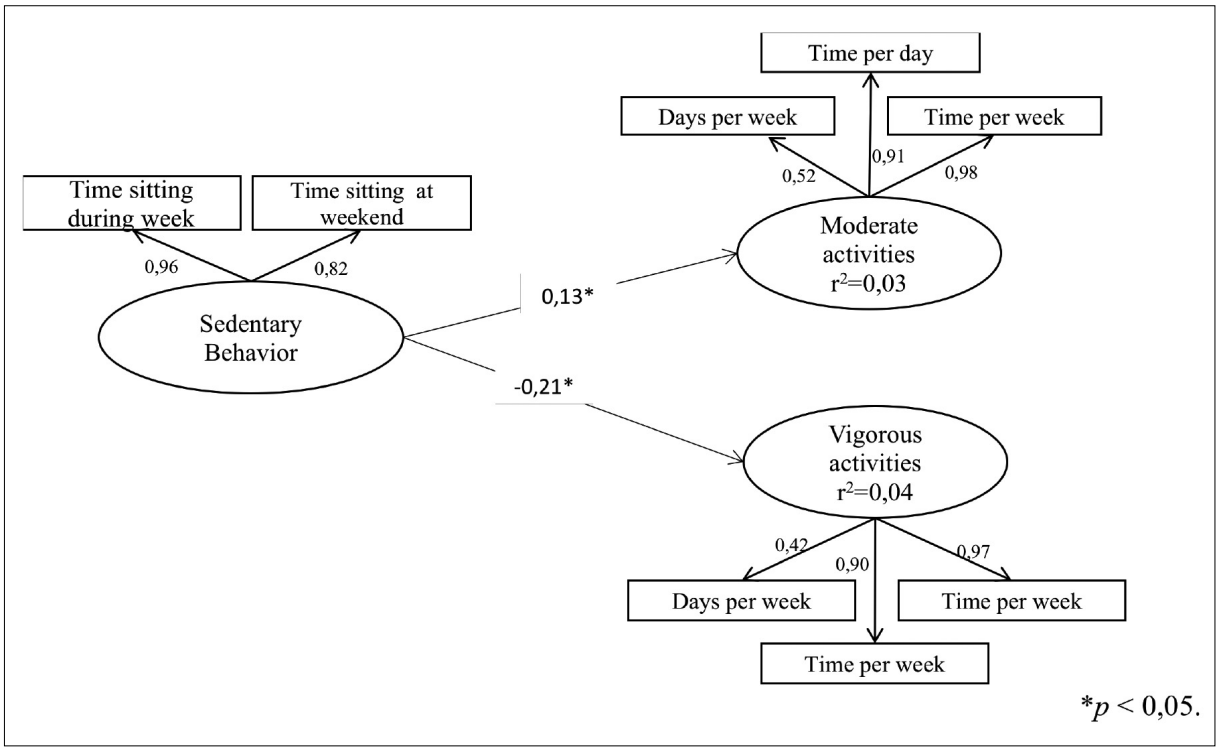

Figure 2. Structural model (M2) of the effect of sedentary behavior on the physical activity of the elderly.

Although the effects of the model are considered weak, the findings show that sedentary behavior negatively affects vigorous activities in the elderly and positively affects the performance of moderate activities.

DISCUSSION

The present study analyzed the effect of sedentary behavior on the practice of physical activity among elderly users of GTAs, finding that as the sedentary behavior of the elderly increases, the practice of vigorous physical activities decreases and that of moderate activities increases. In this sense, the present result sums up the evidence of factors that can interfere in the practice of physical activity by revealing the significant effect of sedentary behavior on moderate and vigorous activities[4,5,25]. It was observed that in general, sedentary behavior negatively affects the performance of vigorous activities in the elderly and positively affects the performance of moderate activities.

Many studies have already proven the importance of physical activity in promoting a more active and healthy lifestyle and also shown that sedentary behavior can negatively affect the health, functional capacity and quality of life of the elderly, who represent the most sedentary segment of society[3,4,5,7,16,25,26].

In the interests of active and healthy aging, the World Health Organization (WHO) advocates that elderly persons who are 65 years of age or older practice at least 150 minutes per week of moderate intensity activities or at least 75 minutes per week of vigorous intensity activities, or an equivalent combination of moderate and vigorous activities, in addition to their daily routine activities, in order to optimize cardiorespiratory fitness, muscle and bone condition and reduce the risks of chronic non-communicable diseases, depression and cognitive decline. When unable to follow these recommendations due to health and functional impairment, the elderly should be physically active to the extent their ability allows[27].

Some limitations of the present study should be highlighted. First is the fact that it is a cross-sectional study, which makes it difficult to assess the temporal relationship between sedentary behavior and the variables of interest, and so cause and effect cannot be established[28]. The investigation was performed only among elderly users of GTAs and in a single Brazilian municipal region, which does not reflect the reality and profile of the elderly in general. Finally, with regard to the specific questions used to assess sedentary behavior, there remains a lack of common use tools, which makes it difficult to compare the basis of the present discussion due to the fact that several forms of evaluation exist, including self-reporting, accelerometer use, IPAQ, and human activity profiling, among others[29].

For future investigations, studies with greater power for analyzing cause and effect analysis, preferably longitudinal in design, are suggested. The inclusion of other quantitative and more operational variables, such as the use of an accelerometer and the human activity profile, which provide more detailed information about the profile of the elderly and the presence of barriers and facilitators of the practice of physical activity, is recommended.

CONCLUSION

It can be concluded that the state of sedentary behavior negatively affects the performance of vigorous activities among the elderly and positively affects the performance of moderate activities.

Such a finding may provide indicators to support new forms of working and the development of strategies of adherence to these activities among the elderly to reduce the negative consequences of sedentary behavior and thus promote a more active and healthier lifestyle.

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Quality of life of elderly persons in Manaus measured by the Flanagan Scale

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Abstract

Objective: the aim of the present study was to evaluate the quality of life of elderly people enrolled in specialized elderly care centers in Manaus and compare the findings with the results of already published studies. *Method*: a cross-sectional study was conducted with 741 elderly people enrolled in three of the centers in the city, from November 2015 to March 2017 using a socioeconomic and demographic questionnaire and the Flanagan Quality of Life Scale (FQLS). Interviews were carried out by previously trained physiotherapy students of the Federal University of Amazonas. *Results*: the majority of the elderly were female, with a mean age of 69±6.6 years, married, retired but still working, with a low income and low educational level. When they assessed their quality of life, however, they appeared satisfied. When compared to populations in other countries and regions of Brazil, despite their low socioeconomic profile, they demonstrated a higher quality of life than populations of developed countries. Some domains of the scale were inverted in relation to the original scale. *Conclusion*: the results allow us to conclude that even elderly persons with low socioeconomic status are satisfied with their quality of life.

Keywords: Quality of Life. Elderly. Aging.

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INTRODUCTION

Population aging is a worldwide phenomenon, especially in developing countries. The World Health Organization (WHO) predicts that by 2025, elderly persons will number approximately 1.2 billion, with those aged 80 or over the fastest growing group. In Brazil, the elderly represent 14.3% of the population, with this proportion varying in different regions. The north and northeast regions have fewer elderly persons than other regions. In the state of Amazonas, however, the elderly population has grown 3.5% in ten years, surpassing the growth of adults and children. In Manaus, the elderly population has grown tenfold in the last 40 years[3].

The changes and wear caused by the aging process in the body can lead to a decline in the health condition of the elderly and their quality of life, forcing them to seek health services more frequently, especially those linked to the Unified Health System (SUS)[4].

The concept of quality of life is related to self-esteem and personal well-being and covers a series of aspects such as functional capacity, socioeconomic level, emotional state, social interaction, intellectual activity, self-care, health status, cultural, ethical and religious values, lifestyle, satisfaction with one's employment and/or daily activities and the environment in which one lives[5].

The Amazon region possesses a socio-cultural, economic, ethnic and macro-environmental diversity, resulting in the need for epidemiological studies on elderly persons living in these areas. This idea is further supported by the multifactorial and complex nature of the phenomenon of aging, which makes it difficult for all the variables that affect this phenomenon and the etiology of age-related diseases to be investigated at the same time, in a similar way, throughout the world[6]. In addition, the collection of information relating to the elderly receiving care through the SUS is extremely important, as it allows an understanding of aging among individuals living in the community. The objective of the present study was to evaluate the quality of life of elderly persons attending Integrated Care Centers for the Elderly (CAIMIs) in the city of Manaus.

METHOD

An epidemiological, cross-sectional, descriptive study was performed with elderly people registered at CAIMIs in the city of Manaus, in the state of Amazonas. These centers are intended for the outpatient care of the elderly, with three units distributed in the main areas of the city providing care for more than 75,000 registered elderly persons. The sample was selected for convenience, and was performed after a sample calculation. Individuals of both genders, aged 60 years and older, and registered at the health centers were included. Data collection was performed from November 2015 to March 2017 by five students of the physiotherapy course of the Universidade Federal do Amazonas, who received previous training in all the questionnaires used.

The sample was calculated based on an unknown prevalence of 50% for quality of life, with a 95% confidence level and 5% confidence interval, resulting in a minimum of 384 individuals. A correction factor was applied for the population. The inclusion criteria were: aged 60 years or over and registered with one of the three CAIMI units. As an exclusion criterion, elderly persons without the sufficient cognitive level to answer the questions of the questionnaires were excluded.

Data collection was carried out in a structured interview format, with the application of a socioeconomic questionnaire to obtain information regarding age, gender, schooling, income, marital status, retirement and work; and the Flanagan Quality of Life Scale (FQLS), translated and validated[7,8,9,10].

The FQLS was developed by the American psychologist John Flanagan in the mid-1970s. Using the critical incident technique, the study addressed approximately 3,000 North American individuals of both genders and different age groups. Participants were asked what important things had happened to them and how satisfied they were with these events. From the results obtained, 15 components were identified, grouped into five dimensions: physical and mental well-being, relations with other people, involvement in social, community and civic activities, personal development and fulfilment, and recreation. In the original Flanagan article, the Cronbach alpha

value is not reported, but in the study by Burckhardt et al. an alpha value of 0.82 to 0.92 was found, while in a test and re-test study, values varied from 0.78 to 0.84. In the present study, the alpha value obtained was 0.81, which is within the expected values for the validity of the instrument.

The 15 FQLS questions assess: 1) material well-being: home, food, financial situation; 2) health: physically fit and vigorous; 3) relationship with parents, siblings and other relatives: communicating, visiting and helping; 4) establishing a family: having and raising children; 5) close relationship with spouse, partner or significant other; 6) close friends: sharing interests, activities and opinions; 7) voluntarily helping and supporting other people; 8) participation in associations and activities of public interest; 9) learning: attending other courses for general knowledge; 10) self-knowledge: recognizing potential and limitations; 11) work (job or home): interesting, rewarding, worthwhile activity; 12) creative communication; 13) participation in active recreation; 14) listening to music, watching television or movies, reading or other such activity; 15) socializing: "making friends". A value of 1 to 7 was applied to each question, which corresponds respectively to: terrible; unhappy; mostly dissatisfied; mixed; mostly satisfied, pleased, delighted.

All the information collected was tabulated in a database distributed in spreadsheets. A descriptive analysis of the data was performed and, for the analysis of quality of life, factor analysis was performed with varimax rotation to obtain the domains defined by the scale. The Kaiser-Meyer-Olkin coefficient (KMO) was used to verify the factorization of the sample data. The KMO value was 0.843, indicating that the factor analysis is appropriate. The criterion for determining the factors was based on the scale. In the original study, five factors were proposed and, to verify the dimensions, the data were analyzed in this context. The factor loading value is shown in table 2 for each item. Varimax rotation was used as it was an orthogonal rotation and provided a better visualization of the factors.

The study was approved by the Research Ethics Committee of the Universidade Federal do Amazonas under number 786.685/2014, and complied with Resolution 466/12 of the National Health Council for Research with Human Beings, of the Department of Health.

RESULTS

A total of 741 elderly people aged 60 years and over were evaluated in the three CAIMI in the city of Manaus. The mean age was 69 (±6.6) years (60 to 102 years), the female gender was more prevalent (70.31%), 44.94% of those sampled were married or had a partner, 60.05% had not completed elementary school, and only 31 had completed the third grade. Although there was a predominance of retirees (72.74%), 79.76% still worked, 40.60% earned one minimum wage and 3.52% received over four times the minimum wage (Table 1).

The mean of the scores obtained in the FQLS was 80.07, with a minimum of 30 and a maximum of 105. The Cronbach α score was 0.8098, which confirms the good consistency of the instrument in response to the question of quality of life of the elderly.

Table 2 shows the descriptive analysis of the factor analysis obtained as the valid model, with the limit of 0.5 used as the cut-off point for the formation of factors. In this case, only 13 of the 15 items made up the factors. Two items presented a factor loading lower than the limit. This indicates that these items may not be important in the composition of the factor. According to the original article, each factor is expected to consist of three items, but this did not occur in the present study. The final result therefore considers only one item in the last factor.

Table 3 shows a comparison with other studies, using the means and standard deviation of each scale item.

The results of the present study exhibited some differences regarding the dimensions of the quality of life concept proposed by Flanagan[26] and those considered by the elderly to be of greatest importance in determining their quality of life, as shown in Table 4.

Table 1. Socioeconomic characteristics of elderly persons registered with CAIMI. Manaus, Amazonas, 2017.

Variable	n (%)
Gender	
Female	521 (70.31)
Male	220 (29.69)
Marital status	
Married/cohabiting	333 (44.94)
Divorced/single	191 (25.78)
Widowed	217 (29.28)
Schooling	
Nine years of schooling	88 (11.88)
From 1 to 8 years of schooling	445 (60.05)
12 years of schooling	144 (19.43)
From 9 to 11 years of schooling	21 (2.83)
Complete higher education	31 (3.37)
Illiterate/no schooling	18 (2.42)
Work	
Yes	591 (79.76)
No	150 (20.24)
Retired/receive pension	
Yes	539 (72.74)
No	202 (27.26)
Income	
Up to 1 minimum wage	300 (40.60)
2 minimum wages	230 (31.12)
3 minimum wages	134 (18.13)
≥4 minimum wages	75 (10.15)
Main income	
Yes	396 (53.51)
No	344 (46.49)

Minimum wage at time of study: beginning of study – R$788.00 (2015); end (2017) – R$937.00.

Table 2. Demonstration of the application of factor analysis and identification of the components that influenced the level of satisfaction with quality of life of the elderly in Manaus, Amazonas, 2017.

Flanagan Scale	Factor loading
Factor 1: Relationship with other persons (variance explained: 29%)	
Item 4: relationship with parents, siblings and other relatives.	0.77995
Item 3: establishing a family: having and raising children.	0.75332
Item 5: intimate relationship with spouse, partner or significant other.	0.55015
Item 6: close friends: sharing interests, activities and opinions.	0.51911
Factor 2: Recreation (explained variance: 11%)	
Item 12: creative communication	0.76407
Item 10: self-knowledge: recognizing potential and limitations	0.73199
Item 13: participation in active recreation	0.65341
Item 8: participation in associations and activities of public interest	0.51505

to be continued

Continuation of Table 2

Flanagan Scale	Factor loading
Factor 3: Community and civic activities (explained variance: 7%)	
Item 7: Voluntarily help and support other people	0.79922
Item 11: Work (job or at home)	0.71616
Factor 4: Physical and material wellbeing (explained variance: 7%)	
Item 2: Health: physically fit and vigorous	0.80317
Item 1: Material comfort: home, food and financial situation	0.60219
Factor 5: Personal development (explained variance: 6%)	
Item 9: Learning: attending other courses for general knowledge	0.64972

Table 3. Comparison of mean and standard deviation of the original FQLS version, three validated versions, the Botucatu-SP version and the version of the present study. Manaus, Amazonas, 2017.

Item	England	Sweden	Norway	Israel	Botucatu/SP*	Manaus/AM**
	N=584	N=100	N=282	N=100	N=361	N=741
1	5.6(±1.0)	5.7(±1.4)	5.5(±1.3)	4.3(±1.8)	5.9(±1.1)	5.6 (±1.5)
2	3.9(±1.4)	3.9(±1.6)	4.4(±1.5)	2.3(±1.5)	5.4(±1.4)	4.4(±2.0)
3	5.3(±1.1)	6.0(±1.0)	5.5(±1.5)	5.9(±1.2)	6.0(±1.0)	5.9(±1.1)
4	5.6(±1.2)	5.6(±1.6)	6.7(±1.2)	5.9(±1.2)	5.9(±1.2)	5.9(±1.0)
5	5.5(±1.4)	5.6(±1.6)	5.5(±1.6)	5.8(±1.2)	5.3(±1.7)	5.0(±1.4)
6	5.4(±1.1)	6.2(±0.9)	5.9(±1.1)	5.4(±1.6)	5.7(±1.2)	5.8(±1.0)
7	5.4(±0.9)	5.3(±1.2)	5.2(±1.2)	3.0(±2.0)	5.5(±1.3)	5.2(±1.3)
8	4.6(±1.2)	4.9(±1.6)	4.3(±1.6)	2.3(±1.9)	5.1(±1.3)	4.8(±1.4)
9	4.7(±1.2)	5.2(±1.4)	4.6(±1.5)	2.1(±1.6)	5.0(±1.5)	4.3(±1.1)
10	5.1(±1.1)	5.5(±1.2)	5.3(±1.1)	3.0(±1.8)	5.8(±1.2)	5.6(±1.2)
11	4.1(±1.4)	5.0(±1.5)	5.3(±1.4)	3.2(±1.8)	5.8(±1.4)	5.1(±1.3)
12	4.8(±1.2)	5.0(±1.4)	4.7(±1.6)	2.5(±1.7)	5.8(±1.2)	5.7(±1.1)
13	4.7(±1.2)	5.3(±1.3)	5.1(±1.4)	3.6(±1.9)	5.5(±1.5)	5.0(±1.3)
14	5.5(±0.9)	6.0(±1.0)	5.7(±1.1)	3.6(±2.0)	6.1(±1.3)	6.0(±0.9)
15	4.0(±1.5)	4.0(±1.7)	4.5(±1.6)	2.2(±1.5)	5.9(±1.4)	5.9(±1.1)

*São Paulo; **Amazonas.

Table 4. Comparison of FQLS dimensions and those identified in the sample. Manaus, Amazonas, 2017.

Dimensions of FQLS*	Dimensions identified in present study
Physical and material well-being	Relationship with other people
Relationship with other people	Recreation
Social, community and civic activities	Social, community and civic activities
Personal development and achievement	Physical and material well-being
Recreation	Personal development and achievement

*FQLS = Flanagan Quality of Life Scale

DISCUSSION

The number of studies that evaluate quality of life in different populations, including the elderly, has increased in recent times. The improvement of measurements, through the use of several types of questionnaires, and the identification of factors associated with quality of life, have been the focus of this type of study. As it is a subjective issue, the components responsible for a better or worse quality of life are not the same for all populations. Individual and cultural aspects should be taken into account at the time of evaluation.

The mean age of the subjects of the present study was 69 years and 70.31% of the sample was female, which confirms the trend of studies of the elderly[11-14]. However, because our sample was selected for convenience, there is a selective bias, which may explain the high percentage of women. It has been reported in several studies[15,16,17], however, that women tend to worry about and care for their health more than men, seeking out health services, whether private or public, resulting in many diseases being treated in their early stages, which is one of the factors responsible for the high rate of women who reach senior citizen age. In Brazil, women live, on average, eight years longer than men, in addition to being more concerned with their well-being in general, when compared to elderly men[18].

The results of the present study agree with several other studies in terms of schooling, marital status, and income[11,12,19,20]. The majority of the elderly in the sample did not complete elementary school, and the proportion of people with low educational levels increases with age. This may be due to the fact that the elderly persons of the sample, especially older individuals, did not have the culture or the opportunity to study for long when they were children, especially as adolescents, as they married and started a family very early in life, and had to start working while still very young[21]. According to the National Household Sample Survey (PNAD) 2016[22], the average number of years of study of the working elderly is 5.7 years. The majority are retired, an outcome found in the studies cited above. However, most of the elderly persons in the present study were still working, a finding which contradicts other studies[11,14]. This may be due to the city of Manaus having a higher cost of living than the cities of previous studies, which causes elderly persons to seek other ways to supplement their income, as most earn up to one minimum wage. This fact can also be explained by the fact that the majority of the individuals are the breadwinners of their family, and that due to the current economic situation in Brazil, the elderly are returning to the labor market to supplement their pensions, as many of the adults and young people in families are unemployed. This figure is confirmed by the PNAD 2016, which found an increase in the proportion of employed elderly people.

A high average score in the Flanagan scale was observed, showing that the population of the present study has a good quality of life. Thirteen out of the 15 scale items exhibited satisfactory factor loading. When the averages obtained in each item of the scale were compared, the population of the present study had several items with higher values than those observed among populations of developed countries, which have a higher income than this sample. However, for the elderly in the present study, the factor of income does not seem to be responsible for having a good quality of life. The last item of the scale, which refers to socialization - "making friends", both the population of the present study and that of Botucatu, São Paulo, obtained higher scores than those of other countries, which may suggest that Brazilian elderly persons are more sociable.

The 15 items of the FQLS are grouped into five dimensions, in this order: physical and material well-being, relationships with other people, social, community and civic activities, personal development and achievement, and recreation. However, when we compared the results of the population of the present study, the order of four of the domains were inverted. In Flanagan's initial proposal7, the physical and material well-being domain was the first dimension, while in the present study, the domain "relationships with other people" was more important for quality of life than that observed by Flanagan. This can be explained by the population studied by Flanagan, which has very different habits and cultures from that of the present study. In addition, Flanagan worked with a population of different age groups, which may contribute to a change in the order of the domains. For the older people in the study, relationships with other people, recreation and social, community and

civic activities are more important than physical and material well-being and personal development and achievement. The results of the present study also differed from a study performed in the city of Avaré, São Paulo[11]. In this study, physical and material well-being was the first domain and recreation was the last, corroborating the results obtained by Flanagan[7].

Santos *et al.*[23] analyzed the quality of life of the elderly using the same scale as the present study, and identified divergences in terms of the dimensions of the concept of quality of life proposed by Flanagan[7]. When evaluating 128 elderly people from the city of João Pessoa, Paraíba, they concluded that, for this population, personal development and achievement is the most important domain in determining quality of life. In their research, items 7 and 14 (7= voluntarily helping and supporting other people; 14= listening to music, watching television or movies, reading or other activities) had little influence and were discarded, as they did not obtain a factor loading within the established limit. In the present study, the highest averages were in items 14 and 15 (14= listening to music, watching television or movies, reading or other activities; 15 = socializing: "making friends"), which relate to the domain of recreation, which came first in our review. The lowest averages were in items 9 and 2. Item 9 evaluates learning, such as attending courses for general knowledge. These different results in the scale responses influenced the order of the dimensions, explaining the differences between the populations.

As a whole, the data of the present study are consistent with those obtained in other studies carried out with populations from other countries, as shown in Table 3. When comparing the results obtained with the FQLS for an English population, the present study identified a higher average in 11 of the 15 criteria evaluated. With Swedish and Norwegian population, only six and seven averages, respectively, were higher in the present study than in those populations. However, while the averages of the present study were not as disparate as in those studies, Brazilian elderly persons, both in Botucatu and Manaus, had a better final score than the populations from other countries, with only Israel well below the score obtained by the other studies. It can be said, therefore, that elderly persons, even from different countries, with different habits and cultures, are for the most part alike, even though they do not share similar socioeconomic characteristics. Quality of life must be understood as an active concept, which can be constructed and interpreted from the dialectical relations of the individual, and can present equivalences, contradictions and differences between individuals.

One of the limitations of this study was in relation to the sample, in which, because of convenience, the majority were women and had low levels of education and income. Additional samples, including larger proportions of men and people from different socioeconomic classes, are needed to provide additional evidence for these populations. In addition, quality of life studies of the elderly population using the same questionnaire are difficult to find.

CONCLUSION

Based on the data found, it can be said that the perspective of the quality of life and well-being of the elderly enrolled in the Integrated Care Centers for the Elderly in the city of Manaus is good. The majority of the elderly persons studied were women, married, with low levels of schooling and income, but with a good quality of life when evaluated by the Flanagan Quality of Life Scale. When compared to populations from developed countries using the same scale, the elderly in the present study have a better satisfaction with quality of life. The results suggest that demographic and socioeconomic aspects, although not favorable, had little influence on satisfaction with quality of life when evaluated by the Flanagan Quality of Life Scale.

It is important that more studies like this are carried out with the purpose of evaluating quality of life in samples from different locations. Furthermore, new studies should consider whether socioeconomic and demographic aspects exert any influence on quality of life when evaluated by the Flanagan Quality of Life Scale. Results of future studies may contribute to further improve prevention and health promotion actions in aging.

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Aging, mental health, and suicide. An integrative review

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Abstract

Objective: this integrative literature review aimed to systematize scientific production regarding the process of aging, mental health, and suicide. *Method*: the LILACS, MEDLINE, and PubMed databases were used to search for papers published between 2007 and 2017. The final analysis included 34 papers. *Result*: descriptive North American studies in English were most prevalent. The largest number of papers on the theme was published in 2013. The researchers used questionnaires and interviews as instruments for questions involving aging and suicidal ideation. The papers revealed an association of suicide or suicidal ideation in elderly persons who manifested anxiety, depressive symptoms, depression, physical diseases, low educational and socioeconomic levels, and chronic diseases. *Conclusion*: this integrative review reinforces the need for investment in public policies and spaces that offer receptiveness, listening, and safety for the aged population, as well as surveys with more robust methodologies to investigate the phenomenon under analysis.

Keywords: Aging. Suicide. Mental Health. Public Health.

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INTRODUCTION

In the twenty-first century population aging is resulting in almost 58 million new sexagenarians every year, making it clear that the phenomenon cannot be ignored. Furthermore, for every 84 male sexagenarians, there are 100 women of the same age, confirming the feminization of old age. This situation brings many challenges: social, economic and cultural, both individually and collectively (society), and above all within the family[1].

From the individual perspective, which reflects on the collective and familiar scenario, one can cite the changes brought about by aging itself, inherent phenomena and important fields of investigation and research. These modifications are not limited to biological aspects as a consequence of lifelong wear and tear, but also include psychosocial factors involving personality, life history, gender and socioeconomic context[2,3].

Physiologically, aging has a direct relationship with the incidence of chronic noncommunicable diseases (CNCD), such as cardiovascular and respiratory diseases, neoplasia and diabetes mellitus, resulting in functional disability and considerable changes in the habits and quality of life of the individual[3].

Researchers[4] have identified an association between chronic pathologies and their negative impact on the quality of life of the elderly. Depression is a risk factor for a poor prognosis of chronic diseases, affecting the individual's functional capacity and quality of life[4]. The presence of a physical illness may contribute to the worsening of depression, through its effect on direct brain function, or psychological and psychosocial effects. Thus, just as depression anticipates chronic diseases, so these pathologies accentuate depressive symptoms[4].

In relation to the contemporary events of old age, it has been seen that the more advanced the age, the greater the mortality rate in relation to attempts of suicide[5]. In its criteria for depressive states the Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition (DSM-V) includes factors such as recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or specific plan to commit suicide[6]. Suicidal ideation is understood as all the expressions, desires, thoughts and behaviors aimed at ending one's own life without the effectuation of the act. Self-extermination practices that do not achieve their goal are called suicide attempts[7].

Faced with such challenges and manifestations of aging, it is necessary to assess the means of research and investigation into the subject in order to allow a better analysis and understanding of those who face such events. The research question posed was: which aspects influence suicidal ideation in the elderly? In this way we tried to systematize the knowledge produced about the suicidal ideation of elderly persons.

METHOD

An integrative literature review was used as a research method. This methodology allows the synthesizing of the state of the art of knowledge about the subject of interest, following the steps: identification of the theme, selection of the hypothesis or research question; establishing of criteria for inclusion and exclusion of studies/ sampling; definition of the information to be extracted from the selected studies; evaluation of included studies; interpretation of results; and presentation of knowledge review/synthesis[8].

In order to carry out this integrative review, the following databases were selected: Latin American and Caribbean Health Sciences Literature (LILACS), MEDical Literature Analysis and Retrieval System (MEDLINE) and PubMed. The research was carried out between October and November 2017, and the collection was carried out simultaneously by two researchers. The following controlled descriptors in health were used: *"Aging"* and *"Mental Heath"* and *"Suicide"*.

We included only original, complete articles with an exclusively epidemiological methodology, which were available free online, published between the years 2007 and 2017, and in English, Portuguese and Spanish. In order to increase the reliability of the information from the databases, a manual search of available articles (search by hand) was carried out, based on the references of the articles already collected.

To analyze the data, the articles were translated and read, followed by the systematization and transcription of the extracted information, allowing the publications that met the inclusion criteria to be organized. The following information of interest was extracted: authors, article title, year of publication, country of origin, database, sample, study design, level of evidence, instruments and indexes used by researchers in the original study, results and synthesis of conclusions.

With the aim of analyzing the level of evidence, the following hierarchical classification was used: level I – evidence of results of meta-analysis from controlled clinical trials with randomization; level II – evidence of experimental design studies; level III – evidence of quasi-experimental studies; level IV for evidence obtained from non-experimental, descriptive or qualitative methodological approaches; level V for evidence of case or experience reports; and level VI for evidence based on expert opinions or standards or legislation[9].

RESULTS

The sample of this integrative review resulted in one article in the LILACS database (5.2%), one in PubMed (5.2%) and 17 in MEDLINE (89.4%) being found. From these texts, through a search by hand, five articles indexed in LILACS and ten in MEDLINE were also included. As four productions were repeated across the platforms, the search resulted in a total of 34 articles for final analysis, 27 from MEDLINE (79.4%), six from LILACS (17.6%) and one from PubMed (2.9%).

Figure 1 shows the steps of this integrative review.

In terms of the origin of the studies, 76.4% were from North America, 17.6% from Latin America and 5.8% from Europe. The English language was most prevalent (85.2%), followed by Portuguese (8.8%) and Spanish (5.8%). There was a considerable number of studies with a descriptive approach (88.2%), followed by those with a qualitative approach (11.7%), characterized as level IV in the hierarchical classification[9].

The analysis of selected articles showed that the 2013 was the year with the greatest number of publications (20.5%), followed by 2014 (17.6%); 2015 and 2010 (14.7%); 2007, 2009, 2011, 2012 and 2016 (5.8% each); and 2008 (2.9%). No article was found that met the criteria for inclusion in 2017. Table 1 presents a brief description of the articles selected for this integrative review, together with the synthesis of the results of the selected texts.

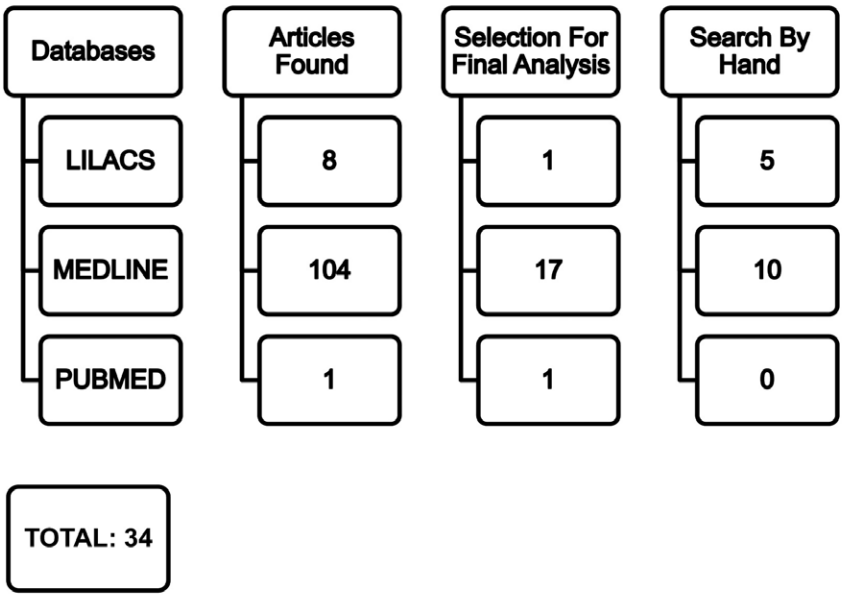

Figure 1. Flowchart of selection process of articles in sample, 2007-2017. Catalão, Goias, 2017.

Chart 1. Information of interest extracted from selected articles in the integrative review. Catalão, Goias, 2017.

Authors	Year, country, database, sample	Study design and instruments	Results	Synthesis of conclusions
Ayalon et al.[10]	2007, USA, MEDLINE, 15.590	Descriptive, questionnaire	Worse cognitive functioning, poorer health and greater mental suffering were associated with passive suicidal ideation and a younger age, the female gender, worse cognitive functioning and increased mental suffering were associated with active suicidal ideation.	Affliction and cognitive impairment are the only two variables that consistently predicted passive and active suicidal ideation.
Carmel et al.[11]	2013, USA, MEDLINE, 382,	Descriptive, structured interview	The will to live moderated, but did not mediate, the decline related to proximity to death.	Those with a high level of will to live did not exhibit a reduction in their satisfaction with life as death approached
Cavalcante et al.[12]	2012, Brazil, LILACS, 51	Qualitative methodology and semi-structured interview script, adapted for the study of the suicide of the elderly	It is crucial to understand the interaction between variables - psychiatric or clinical symptoms, risk and protective factors, personality traits, circumstantial events, family continuity, and health care capacity. Each interactive pattern reveals that suicide is multi-causal and singular.	It is important that health can be instrumentalized with means to identify, propose and ensure comprehensive care for the elderly - in research, care and public policy.
Ceará[13]	2009, Brazil, LILACS, 40,	Qualitative, MINI Plus, WHOQOL-bref and semi-structured interviews	A higher frequency of mental disorders in the study group with 15 (37.5%) cases. The risk of suicide was present in three (7.5%) participants.	Homosexuals have a greater frequency of mental disorders, but a better quality of life
Ciulla et al.[14]	2013, Brazil, MEDLINE, 530	Transversal Descriptive MINI Plus	Risk of suicide was found in 15.7% of the sample.	A high suicide risk rate was found
Chen et al.[15]	2010, USA, MEDLINE, 266	Descriptive, BSRS-%, GDS-15, MOS, SF-12.	The data revealed a significant relationship between quality of life and suicidal ideation.	The proposed model has the potential to help health professionals effectively design and implement their suicide prevention programs.
Conte et al.[16]	2015, Brazil, LILACS, 9,	Descriptive, semi-structured interview	The study, through three brief stories, questions the biomedical model in terms of treatment of at-risk situations and emphasizes, in integral health care is to be achieved, the importance of the concept of the Expanded Clinic.	Highlights the need to construct a line of care for the elderly population.

to be continued

Continuation of Chart 1

Authors	Year, country, database, sample	Study design and instruments	Results	Synthesis of conclusions
Cronin et al.[17]	2013, MEDLINE, Ireland, 8.504	Descriptive, TILDA	Describe potential advantages of the incorporation of new biometrics and technologies in population studies to advance the understanding of disorders related to aging.	A detailed description of the physical measurements will facilitate cross-national comparative research.
Dong et al.[18]	2015, USA, MEDLINE, 3.159	Descriptive, structured interview	The association was significant for older women, but not for older men.	Associations between ill-treatment and suicide ideation
Gilman et al.[19]	2013, USA, MEDLINE, 1.226	Descriptive, PROSPECT	The mean HDRS scores were significantly higher among participants with financial stress and with annual income below US $ 20,000.	There are marked social inequalities in depressive symptoms and suicidal ideation among the elderly.
Gómez-Restrepo et al.[20]	2014, Colombia, LILACS, 2.444	Descriptive-cross-sectional. Yesavage Geriatric Depression Scale.	A prevalence of depression of 26.3% was identified.	There is a prevalence of depression associated with factors such as: female gender, low schooling, no pension, hypertension, diagnosis of mental illness, hunger in the first 15 years of life and absence of leisure activities and poor self-perception.
Hall et al.[21]	2009, MEDLINE, USA, 18	Qualitative, structured interview	Residents revealed concerns related to disease, the social aspects of the experience of disease, and demonstrated the importance of preserving dignity. Some residents saw their symptoms and losses as related to old age and not to illness.	Although residents did not seem to feel anguish due to thoughts of impending death, they were distressed by the multiple losses they had experienced.
Heisel et al.[22]	2015, MEDLINE, USA, 173	Descriptive, GSIS (Geriatric Suicide Ideation Scale)	The Geriatric Suicide Ideation Scale was found to be strong in terms of reliability and consistency.	The results suggest the Geriatric Suicide Ideation Scale is a Strong measure among elderly persons residing in the community.
Hirsch et al.[23]	2007, USA, MEDLINE, 462	Descriptive, structured interview	Positive affect distinguished suicide ideators from non-recipients after controlling for age, gender, depression, negative affect, disease burden, activity, sociability, cognitive functioning, and physical functioning.	Clinical and theoretical formulations of late suicide should consider the role of positive affect.
Iliceto et al.[24]	2013, USA, MEDLINE, 655	Descriptive, self-reported questionnaires.	Associations between suicidal ideation and certain personalities.	Elderly persons and young adults may be similar in personality and psychopathology variables that predict suicidal ideation.

to be continued

Continuation of Chart 1

Authors	Year, country, database, sample	Study design and instruments	Results	Synthesis of conclusions
James et al.[25]	2011, USA, LILACS, 1.327	Descriptive, medical history and neurological and neuropsychological examinations	The risk of developing disabilities in activities of daily living decreased by 43%	Social activity is associated with a reduced risk of disability occurring in activities of daily living, mobility and instrumental activities.
Kane et al.[26]	2014, USA, MEDLINE, 37	Descriptive, structured interview	The interviewees related malnutrition, alcoholism, depression to the probability of committing suicide.	There were significant differences following educational work on aging and psychopathology.
McCarthy[27]	2010, USA, MEDLINE, 1 source of research	Descriptive, Google Internet search engine activity for suicide related terms between 2004–2009.	Google search volumes correlated with CDC statistics for both suicide and self-mutilation.	Monitoring changes in Internet search volumes can provide an indicator of suicide risk in the population.
Na et al.[28]	2016, USA, MEDLINE, 1.116	Descriptive, PHQ-9k	14.7% of Korean American elderly persons reported suicidal ideation.	Suicidal ideation without depressive syndromes was common among elderly Korean adults.
O'Riley et al.[29]	2014, USA, MEDLINE, 377	Descriptive, interviews at home	14% of the subjects considered current death or suicidal ideation	There were differences and similarities between the correlations of death and suicidal ideation.
Olsson et al.[30]	2016, USA, MEDLINE, 273	Descriptive, MADRS	Attempts at suicide had lower scores on the Mini-Mental State Examination (MMSE) and of the attempts, the mean MMSE score was lower among those with clinically severe attempts.	Older suicide attempts may involve cognitive deficits, which may, in part, be related to the attempt itself.
Ordóñez Monak et al.[31]	2014, Colombia, LILACS, 98	Descriptive-retrospective, reports of necropsy specialists	Suicides of this population group are mainly men, who have one of the highest rates compared to the majority of the population.	Suicide is a major public health problem
Rusching et al.[32]	2013, USA, MEDLINE, 248	Descriptive, MADRS	Perceived social support partially mediated the report.	Church attendance, rather than other indicators of religious involvement, has the strongest relationship with current suicidal ideation.
Segal et al.[33]	2015, USA, MEDLINE, 109	Descriptive, GSIS	The evaluation of depressive symptoms should be included in the assessment of the risk of suicide in old age.	Depressive characteristics are strongly related to the increase in suicidal thoughts and reduced resilience to suicide among older adults.

to be continued

Continuation of Chart 1

Authors	Year, country, database, sample	Study design and instruments	Results	Synthesis of conclusions
Shin et al.[34]	2012, USA, PubMed, 1.548-	Descriptive, demographic characteristics, physical diseases, MMSE, SGDS, BAI and physical exams	Anxiety and depression associated with suicidal ideation	It is suggested that there is an independent relationship between the state of physical health and suicidal behavior among the elderly.
Simon et al.[35]	2014, USA, MEDLINE, 3.159	Descriptive, structured interview.	No statistically significant associations were found between the general expectations of filial devotion and suicidal ideation in the last 2 weeks or in the last 12 months.	Lower levels of filial devotion were associated with a higher risk of suicidal ideation among Chinese elderly.
Sirey et al.[36]	2008, USA, MEDLINE, 403	Descriptive, structured interview	12.2% of the elderly reported clinically significant depression and 13.4% reported suicidal thoughts.	More than one in nine elderly people suffer from depression.
Sun et al.[37]	2010, USA, MEDLINE, 56.088,	Descriptive, Geriatric Depression Scale. (GSIS)	Depressive symptoms were associated with all-cause mortality only in men.	Depressive symptoms were associated with all-cause mortality in men and with suicide in both sexes.
Van Orden et al.[38]	2014, USA, MEDLINE, 377	Descriptive, interviews at home.	The results indicate that passive SI is rarely present in vulnerable elderly people in the absence of significant risk factors for suicide.	The death wish and the belief that life is worthless do not seem to be normative at the end of life.
Van Wijmen et al.[39]	2010, USA, MEDLINE, 6.824	Descriptive	Members frequently requested AD when they were already seriously ill.	Promotes the possibility of comparing the data of the present study with other studies with related subjects.
Wahlin et al.[40]	2015, USA, MEDLINE, 625	Descriptive, interview.	The prevalence was 45% and was more pronounced among older elderly persons (70%).	The prevalence of depressive symptoms among elderly people in rural Bangladesh is high.
Wiktorsson et al.[41]	2010, USA, MEDLINE, 103	Descriptive, MMSE	There was no association with dementia.	The results can help inform clinical decisions about suicide risk assessment in this vulnerable and growing age group.
Wong et al.[42]	2011, USA, MEDLINE, 1.999	Descriptive structured interview	Age-adjusted mortality rates in five years were 44.3 and 23.9 per 1,000 person/year for those who felt "useless" and those who did not, respectively.	Uselessness can be independently associated with all-cause mortality in elderly Chinese men.
Yan Ho et al.[43]	2013, England, MEDLINE, 16	Qualitative, qualitative interview.	The three main categories of themes of the Dignity Model were widely supported.	These findings highlight both a cultural dimension and a family dimension in the construct of dignity.

AD: *Advance Directive*; BAI: *Beck Anxiety Inventory*; BSRS-5: *Brief Symptom Rating Scale*; CDC: *Centers of Disease Control*; GDS-15: *Geriatric Depression Scale*; GSIS: Geriatric Suicide Ideation Scale; HDRS: *Hamilton Depression Rating Scale*; MADRS: *Montgomery-Åsberg Depression Rating Scale*; MINI Plus: *Mini International Neuropsychiatric Interview*; MMSE: *Mini Mental State Examination*; MOS: *Medical Outcomes Study*; PD: *Parkinson's Disease Questionnaire*; PHQ-9K: *Patient Health Questionnaire*; PROSPECT: *Prevention of Suicide in Primary Care Elderly: Collaborative Trial*; RFL: *Reasons for Living Scale;* SF-12: *Short-Form Health Survey*; SGDS: *Geriatric Depression Scale (Short Form)*; TILDA: *The Irish Longitudinal Study on Ageing;* WHOQOL-bref: *World Health Organization. Quality of Life-Bref*;

DISCUSSION

The majority of the articles found were from the MEDLINE database. The largest number of publications were published in 2013, followed by 2014, a fact that may be explained by the publication of the Good Health Adds Life To Years: Global Brief for World Health report by the World Health Organization (WHO) in 2012, which encouraged discussions on the phenomenon of aging and its impact on various sectors of society. The report presented data on the state of old age in the world, the demography and epidemiology of population aging, and possible actions on aging and health[44].

The investigation pointed out that 28 articles (82.3%) used the application of questionnaires and interviews, with the aim of investigating the aspects involved in aging and suicidal ideation. Instruments such as scales are useful for the detection of depressive symptoms self-reported by the elderly[45]. In addition, actions that require on-site examination of the relationships, interactions and lifestyles of the elderly are fundamental for establishing a relationship between aging and possible suicidal behavior. It is important to harmonize clinical and social evidence, as well as epidemiological data, with reports of the elderly themselves about their life trajectory and their reasons for giving up on living[46].

An association between suicide or suicidal ideation in the elderly and factors such as anxiety[34], depressive symptoms and depression[14, 20, 23, 26, 36, 37], physical and chronic diseases[16,25,31,34], low schooling[20], low socioeconomic status[19] and ill-treatment[25] was found. The studies indicate a relationship between physical health status, the absence of leisure activities and less social support and a greater possibility of suicide attempts[16,18,34]. Thus, higher levels of social and physical activity confer benefits to the health of the elderly, reducing daily disability and depressive symptoms that can lead to suicide[25].

It is known that elderly people with depression may have considerable cognitive and functional disorders, and that the changes due to aging may lead to certain alterations. It is observed that both cognitive impairment and mental suffering among the elderly increase the probability of suicidal ideation[10]. The most recurrent cognitive variations in depressed elderly persons are executive functions, attention deficit, and the slowing of processing[47].

As a multifactorial process, aging causes anatomical and functional changes in the body. Such alterations may result in the appearance of chronic and degenerative diseases[16,25,31,34], such as pulmonary diseases, arterial hypertension, osteoporosis, arthritis, dementias or mental disorders, heart diseases, arthrosis, rheumatism, stroke and cancer, reducing the functional capacity and quality of life of the elderly person[48]. All these factors increase the chances of suicidal ideation and suicide itself in the elderly[31].

Another finding observed in the analysis of the articles was the need to invest in reception, therapies, discussion circles, groups, forums and health conferences as health care strategies[16]. The absence of a space for listening and reception in the health and social services, as well as the lack of a health professional who can support elderly individuals, can increase their vulnerability to the risk of suicide[16], with such measures an effective protection against suicide.

There is a need for strategies that favor the prevention of mental disorders, the treatment of diseases with the inclusion of diagnostic procedures, early detection, correct medication, psychotherapy and the training of professionals and other persons involved with this population group[49]. The understanding of care in the quality of life as encompassing physical, psychological and social aspects allows the involvement of health professionals in the construction and effective implementation of suicide prevention programs in addition to potentializing opportunities of detection of the mental health needs of the elderly[15,36].

Limitations of the present study include the methodology used, considering its level of scientific evidence compared to other methodologies such as systematic reviews or a meta-analysis. However, through the hierarchical level of methodological classification, the present study identified a predominance of level IV studies, which suggests that new studies on suicide among the elderly employ

more robust methodologies and designs that produce consistent evidence.

CONCLUSION

The aspects related to suicidal ideation in the elderly were a low socioeconomic level, the presence of anxiety, depressive symptoms and depression, physical illnesses and chronic diseases. A multidimensional look at the phenomenon of suicide in the elderly is required, based on economic, psychological, physical and social factors, both by professionals who work in the field of aging and by the state, with public policies that support this population. Although the growth of the elderly population is an indisputable reality, the support given to such individuals has not advanced with the same speed. In this way, living spaces that offer physical and leisure activities, access to health care of all levels of complexity, social and family support avoiding isolation and solitude, can be considered actions that minimize or avoid suicidal ideation.

The reading of the original texts made it possible to understand the way aging, suicide and mental health issues have been treated in the scientific milieu. Nevertheless, the works studied addressed a relevant and complex topic of study, representing a significant source of knowledge for future research. The results of this review are relevant because, besides evidencing the associations between several factors found in literature and suicide, they also point out ways to promote physical and mental health among the elderly, thus reducing the risk of suicide among this population.

At the same time, the need for greater investment in the area of health is emphasized, strengthening existing public policies through intersectoral collaboration in the health care of the elderly.

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Deleterious effects of prolonged bed rest on the body systems of the elderly - a review

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Abstract

Objective: to describe the deleterious effects of prolonged bed rest on the body systems of the elderly. *Method:* an integrative-narrative review was carried out, with the following research question: *What are the effects of prolonged bed rest on the body systems of the elderly*? The PubMed and Virtual Health Library databases were searched with the following terms: "bed rest" and "elderly" with the Boolean operator "and". *Results:* a total of 1,639 articles were found. After application of the established criteria, nine articles remained, and 20 were added to maintain the citation of the primary source, giving a total of 29 articles. *Conclusion:* the immobility associated with prolonged bed rest is detrimental to the health of the elderly, as it affects several systems, such as the cardiovascular, pulmonary, gastrointestinal, musculoskeletal and urinary systems, which may lead to the onset of diseases in addition to those that led to bed rest.

Keywords: Health of the Elderly. Bed Rest. Comorbidity.

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INTRODUCTION

The human body usually remains in the orthostatic position, or seated, for approximately 16 hours each day, without great suffering. Prolonged time spent in bed, however, can generate several physiological disorders. There is a fear that lying down in bed may mean not being able to get up again[1]. Going to bed is a universal response to falling ill.

For almost a century, from the mid-1860s until 1950, bed rest was highly recommended for recovery from various illnesses and diseases[1,2]. From 1940, the usefulness of bed rest in the treatment of varying conditions began to change, mainly because of World War II. Wounded soldiers were treated and released faster, as there were many injured and few beds. It was observed that soldiers who spent less time in bed recovered from injuries and infections more quickly. From the 1950s onwards, the study of the effects of bed rest by the aerospace industry began, as it reproduces the condition of absence of gravity[3]. These studies concluded that long periods of immobility are detrimental to the health of all body systems, and also that inactivity is an important factor in the development of chronic-degenerative diseases, and is highly prevalent among the elderly[4].

Problems resulting from immobilization can complicate a primary disease or trauma and become a more serious problem than primary disorders[5]. The elderly are susceptible to other complications which are not directly related to the disease that led to hospitalization or a specific treatment, as they have reduced physiological reserve and are less able to adapt to stressors[6]. Studies have shown that 25% to 35% of elderly persons admitted to hospital because of a disease will lose functional independence in one or more activities of daily living, with the main losses being the ability to shower and dress, which can appear in only three days of hospitalization[7]. Due to the loss of such abilities and the deterioration of body systems caused by age and, especially, prolonged periods in bed, many elderly persons reside in long-term care facilities following hospitalization[8].

This review aimed to identify the deleterious effects of prolonged bed rest on the various body systems of the elderly.

METHOD

An integrative-narrative review was performed to survey the state of knowledge about the subject under study – disorders in the various body systems of the elderly relating to prolonged bed rest – through a broad analysis of multiple published studies. The narrative review seeks a qualitative analysis of a broad issue[9].

The research question was: *What are the effects of prolonged bed rest on the body systems of the elderly*? Articles were searched in the PubMed and Virtual Health Library (VHL) with the following terms: *bed rest* and *elderly* with the Boolean operator *and*.

The inclusion criteria were: articles that addressed the effects of bed rest with a target population of elderly persons over 60 years old, hospitalized or institutionalized without delimitation based on the disease or cause of hospitalization. We also selected articles that dealt with the two forms of prolonged bed rest, considering that excessive rest in hospital/hospitalization and its consequences may lead to extended institutionalization. Institutionalization increases the chance that bed rest will last longer, with ulcers being one of the consequences. The exclusion criteria were articles that were not in English, Portuguese or Spanish and were published more than five years ago, except for those used to maintain citations for the primary source.

RESULTS AND DISCUSSION

A total of 1,639 articles were found. After the application of the established criteria, nine articles remained, and 20 were added to maintain the citations of the primary source, giving a total of 29 articles.

The cardiovascular system undergoes deterioration with prolonged bed rest[11], as when the supine position is assumed, there is a redistribution of blood from the lower limbs to the thoracic cavity, leading to the redistribution of up to one liter of fluids in 24 hours of bed rest[1]. This redistribution of blood causes 11% of the total volume of blood to be redistributed from the vessels of the lower limbs to the thorax, with approximately 80% of this

volume entering the circulation, initially increasing the cardiac output, as a reduction in total plasma volume will occur later[10]. These same authors further claim that the cardiac workload increases by 20% when the body is recumbent, a rate which doubles in patients with pre-existing heart disease.

The review by Knight et al.[1] explains that when lying down, increased venous return leads to the stretching of the right atrium, which results in the release of atrial natriuretic peptide, a powerful diuretic that generates increased urine production, decreasing blood volume. This decrease in blood volume and consequently blood pressure is detected by the baroreceptors of the aorta and carotid arches, which then stimulate the release of the antidiuretic hormone which leads to water reabsorption and, therefore, the reduction of diuresis. In a healthy, mobile person these and other hormones efficiently maintain bodily fluid levels, but in long periods of bed rest the delicate balance between these hormones is impaired.

The resting heart rate increases one beat per minute for every two days of rest, with this increase resulting in a shorter diastolic time and shorter systolic ejection time, leaving the heart less able to respond to demands above baseline[11]. It can be concluded that shorter diastolic time results in lower coronary flow and, thus, a smaller amount of oxygen available for myocardial nutrition. Increased resting heart rate and the response of the heart rate to exercise is known as cardiac deconditioning. According to Topp et al.[2], after three to four weeks of bed rest, the resting heart rate increases from 11 to 14 beats per minute, while the exercise response rate increases from 30 to 40 beats per minute.

Postural hypotension is one of the most common cardiovascular complications of immobility[12] and can be observed after 20 hours of bed rest[1]. According to Mobily and Kelley[12], healthy men take about five weeks to regain posture after three weeks of immobilization. In a healthy and mobile person, the rapid fall in blood pressure that occurs upon standing is immediately detected by the baroreceptors, which quickly inform the cardiac center to increase the sympathetic stimulation of the heart, thus increasing cardiac output and blood pressure; and the vasomotor center, which increases sympathetic stimulus in the blood vessels of the lower limbs, resulting in partial vasoconstriction, diminishing the imprisonment of blood in the lower limbs[12]. The response to this chain of stimuli is impaired by the decrease in blood volume, which leads to a greater fall in blood pressure when the person assumes orthostatism. This low plasma also generates lower striation stimulus on the baroreceptors and is also caused by the inherent changes in age when the bedridden person is already elderly[11]. Dysregulation of orthostatic pressure is common among the elderly due to the aging process, and also due to association with other diseases [13].

Deep vein thrombosis is another common complication of prolonged bedrest[14]. The Virchow triad refers to the combination of three factors: venous stasis, hypercoagulability and damage to blood vessels; which together dramatically increase the chances of developing deep vein thrombosis. Prolonged bed rest triggers these three factors, increasing the chances of developing this condition by approximately 13%[1]. Saunders[11] states that deep vein thrombosis occurs more through blood stasis than by increased coagulation, and most patients fail to demonstrate signs and symptoms, as they have well developed collateral circulation, and the thrombus must be severe to cause clogging of the veins. Bed rest therefore becomes a risk factor for the development of thrombotic disease and pulmonary embolism, which can be fatal[15].

In the supine position the body weight restricts the movement of the rib cage, reducing the tidal volume. It is estimated that when a person is standing, 78% of the tidal volume is replaced by the movement of the rib cage, and when supine the movement of the chest cavity reduces this to 32%[1]. This restriction of the movement of the chest cavity leads to an increase in mechanical resistance, which, together with the increase in blood volume in the chest, leads to a reduction in total lung capacity and residual volume[15]. This decrease in residual volume may lead to the closure of the alveolar portions, which in combination with other changes leads to a lower concentration of oxygen in the blood, which may be sufficient to produce small disabilities in the elderly[11].

Immobility also leads to disorders in the movement of the eyelashes and, consequently, reduced secretion, which predisposes the patient to pneumonias[5]. When the patient is confined to the bed there is a tendency for the mucus to accumulate,

under the influence of gravity and the diminution of the tidal volume; this effect can be aggravated when the person is dehydrated, as the mucus becomes thicker and expectoration more difficult[1].

The elderly patient is already at increased risk of developing respiratory changes due to the anatomical changes of this system that occur with age, and this risk increases further when this group of patients is receiving sedative medications or those that compromise the functioning of the respiratory system[10]. According to the review by Knight et al.[1], prolonged bed rest dramatically increases the risk of respiratory tract infection.

Before describing the effects of immobility on the musculoskeletal system it should first be considered that muscles are most prevalent type of tissue in the body, representing approximately 45% of body weight[2]. The muscular system, with the help of the nervous system, provides mobility capacity as well as the ability to perform activities of daily living, and once there is muscle weakness or joint stiffness or a bone weakness generated by immobility and/or disuse, this system is put at increased risk of injury or infection[16].

Muscle strength is maintained by frequent maximum contraction tension, and short periods of bed rest are sufficient to cause the loss of muscle loss and strength[17], at a magnitude of 10 to 15% per week of disuse, and up to 5.5% per day of bed rest[10]. Nearly half of normal strength is lost through immobilization of three to five weeks[18]; besides the loss of strength, shortening of muscle fibers also occurs[5]. The number of sarcomeres (muscle filaments) decreases when the muscle is held in a shortened position, and the extent of atrophy is significantly increased when the muscle is maintained in such a position[16].

Antigravity muscles suffer greater strength loss than other muscles during inactivity[6], because they lose tone when there is no movement of weight[16]. This muscle group loses contractile protein and there is an increase of non-contractile tissue including collagen, while the number of muscle fibers remains unchanged[2].

Long periods of immobility affect both types of muscle fiber, but studies are conflicting for which type of atrophy acts more quickly. However, Topp et al.[2] affirm that type II fibers seem to atrophy more rapidly than type I fibers. According to Nigam et al.[17], this atrophy can occur with short periods of immobilization. Following 72 hours of limb immobilization, up to 14% atrophy of Type I fibers and 17% of Type II fibers was observed.

Aging leads to a decrease in muscle mass, leading to the loss of functional reserve along with a reduction in functional activity, which is explained by Sarabon and Rosker[8] as the loss of aerobic capacity generated by the reduction of the use of oxygen by the peripheral musculature and not by cardiac incompetence, which is aggravated by bed rest. Associated with sarcopenia, typical of aging, bed rest may increase the rate of muscle loss[19]. Bed rest results in lower resistance, strength and functional capacity among the elderly[20].

Even if reversible, long periods of rehabilitation are necessary for recovery, as considerably more time is required for conditioning than for deconditioning[21]. High impact, low intensity exercises are effective in the rehabilitation process[22], as the nutritional replacement of proteins alone is not enough to prevent the loss of muscle mass[23]. Most studies have found an association between loss of muscle strength and functional capacity and hospitalization and bed rest. However, Bodilsen et al.[24] reported an improvement in the strength and functional capacity of the elderly after hospitalization. In this study, the elderly did not undergo physiotherapy or obtain guidance, and only the variables were measured. It is also important to note that elderly persons who were unable to walk were excluded, leading to possible sample selection bias.

Tendons, ligaments and articular cartilage need movement to stay healthy, and deteriorate when the patient is immobile[16]. Contractures are defined as fixed deformities of the joints as a consequence of immobility, and occur because of the dynamic nature of the connective tissue[18]. When movement is restricted, the metabolic activity of the joints is altered, and these tissues suffer a marked increase of collagen, becoming more dense; and the fibers that involve the muscles, ligaments and tendons are shortened, resulting in an overall decrease in joint flexibility[10].

Changes in the structure and function of connective tissue, due to changes in collagen fiber, become apparent after six days of immobility, and these changes can persist even after the resumption of normal activities, according to the review by Nigam et al.[17]. Although all joints may be affected by immobilization, the hip, knee and ankle are the most susceptible due to the effects of gravity, and by the difficulty of full extension of the joints when sitting or lying down[10], and the contracture of these joints makes it difficult to perform movements of transference[18].

The primary function of the bones is the mechanical support for the tissues of the body and the maintenance of mineral homeostasis promoting the reserves of calcium, phosphorus, and magnesium salt[16]. The relationship between bone formation and resorption is influenced by stress on the bone, a phenomenon called Wolff's law. This law says that bone density is directly proportional to the stress placed on it[2].

During immobility, the process of bone formation ceases, but the activity of osteoclasts continues, resulting in loss of bone density, causing the bone to have a soft, weak structure. With a few days of rest the circulating calcium increases, and with three days there is an increase of calcium loss through the urine. If immobility is maintained there is a chance that renal calculus will form[16].

Creditor[25] states that vertebral bone loss is accelerated by 50 times when a healthy person is bedridden, and that four months is required to recover from loss that occurs within ten days of rest. In contrast, the study by Buehlmeier et al.[26] did not find accelerated bone loss among the elderly, but did identify such loss in younger men after 14 days of bed rest.

Urinary complications caused by immobilization include the development of renal calculi and urinary tract infection, which first appear due to changes in renal drainage and alterations in urinary calcium levels and pH[10].

When in a standing position, gravity plays a greater role in the drainage of urine from the kidneys, through the ureters to the bladder. In supine patients, meanwhile, urine is still transported from the kidneys to the bladder by peristaltic movements of the ureters[27]. When supine, drainage of the urine from the renal calices is impaired, increasing the precipitation time and aggregation of the crystalloids, resulting in an additional risk of renal calculus. In addition, the potential for the development of urinary tract infections increases during immobilization due to the predisposition to urinary stasis in both kidneys and the bladder, which allows the growth of bacteria[10]. Elderly patients with impaired mobility, especially those who are incontinent or suffer cognitive or functional impairment, may be at increased risk of developing urinary tract infections due to poor perineal hygiene.

When the bladder fills, there is pressure on its walls, the cervix and the urinary sphincter, stimulating urinary urgency. In the supine position, the effects of gravity are negative and the urge to urinate is reduced. This can lead to an overfull bladder, which leads to stretching of the muscles. After prolonged periods of time the stretch receptors lose the ability to be stimulated, leading to the loss of sensation of urinary urgency[27]. Another important alteration related to the bladder is that the absence of gravity hinders its complete emptying, which predisposes the growth of bacteria.

Immobility is the factor that most places the individual at risk of disorders in skin integrity[16]. Approximately 95% of pressure ulcers occur in five sites: the sacrum, ischial tuberosity, the greater trochanter, the ankle and the heel[28]. Once the tissue is damaged, the impairment of metabolism, especially with a negative nitrogen balance, becoming part of the problem of cure. In addition, the formation of pressure ulcers usually results in further immobilization, initiating a negative cycle of sequelae[10].

High pressure often occurs in hospitalized elderly persons, and usually develop with few hours of immobilization, while the frequency of ulcers can be accelerated in cases of incontinent patients[25]. It is estimated that more than two thirds of elderly persons living in long-term care facilities have one or more diseases that generate risk factors for the development of pressure ulcers[10]. Teasell and Dittmer[28] state that elderly persons over 70 years of age have a 70% chance of developing such pressure

ulcers, and that this will occur in the first two weeks of hospitalization.

Bed rest is commonly associated with reduced taste, smell and loss of appetite, leading to the disuse of the intestinal tract, which in turn leads to mucosal atrophy and shrinkage of glandular structures[27]. There is also a reduced sensation of thirst, which can easily evolve into dehydration. Decreased caloric demand, endocrine changes, anxiety and depression contribute to the loss of appetite[29].

Stomach transit time is 66% slower in the supine position in comparison with standing, which contributes to reduced appetite and decreased peristalsis, which leads many patients to exhibit symptoms of gastroesophageal reflux[15]. Another complicating factor is the difficulty in eating patients experience in the supine position, when they cannot assume the sitting position[5].

Constipation may be the main problem of immobilization in the elderly due to decreased bowel mobility, inadequate fiber and fluid intake associated with anorexia, the development of weakness of the evacuation muscles, the inability to respond to the urgency of evacuation, and inability to assume a seated position, making evacuation a difficult process for this population[10].

Another important problem related to bed rest and aging is the lower resistance of brain tissue to stressors related to inflammatory diseases and conditions[30]. These effects on neural tissue can also lead to alterations of the static balance by alteration not only of muscular mass but also of the neuromuscular component[31].

The present study addressed the deleterious effects of prolonged bed rest on the body systems of the elderly, with the exception of treatment and prevention. It is necessary to investigate these effects further, especially in relation to the most common diseases and disorders in this population range, such as femoral fractures, which are important causes of immobility.

One of the limitations of the present study was the limited number of recent publications on the subject. Further research in this area is suggested, as the incidence of chronic degenerative diseases increases the chances of prolonged bed rest and, consequently, the effects of such diseases. The study of the prevention and treatment of the effects of prolonged bed rest is also suggested.

CONCLUSION

The immobility associated with prolonged bed rest is detrimental to the health of the elderly as it affects several systems such as the cardiovascular, pulmonary, gastrointestinal, musculoskeletal and urinary systems, and may lead to the emergence of diseases in addition to those that initially caused the bed rest.

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