Original article

SOCIODEMOGRAPHIC AND CLINICAL FACTORS ASSOCIATED WITH HAND GRIP STRENGTH AND GAIT SPEED IN LONG-LIVING ELDERLY

Maria Helena Lenardt[1], Clóris Regina Blanski Grden[2], Jacy Aurelia Vieira de Sousa[2], Susanne Elero Betiolli[3], Péricles Martim Reche[4], Tânia Maria Lourenço[5]

ABSTRACT: Abstract Cross-sectional research to investigate the association between sociodemographic and clinical factors and the components hand grip strength and gait speed in long-living elderly. The sample included 243 long-living elderly from three primary health care services in Curitiba, Paraná, between January 2013 and September 2015. A significant association was identified between hand grip strength and sex (p=0.001), age (p=0.001), marital status (p=0.001), housing (p=0.001), falls in previous year (p=0.03), urine loss (p=0.001), use of cane (p=0.001) and walker (p=0.001). The gait speed was associated with sex (p=0.001), age (p=0.001), marital status (p=0.001), housing (p=0.001), falls in previous year (p=0.03), urine loss (p=0.001), use of cane (p=0.001) and walker (p=0.001). It is highlighted that the assessment of hand grip strength and gait speed helps to identify functional changes in long-living elderly and plays a fundamental role in the management of the physical frailty syndrome.
DESCRIPTORS: Frail elderly; Hand strength; Gait; Geriatric nursing.

FATORES SOCIODEMOGRÁFICOS E CLÍNICOS ASSOCIADOS À FORÇA DE PREENSÃO MANUAL E VELOCIDADE DA MARCHA EM LONGEVOS

RESUMO: Pesquisa transversal com o objetivo de investigar a associação entre fatores sociodemográficos e clínicos e os componentes força de preensão manual e velocidade da marcha em idosos longevos. A amostra contemplou 243 longevos, de três Unidades Básicas de Saúde de Curitiba, Paraná, entre janeiro de 2013 e setembro de 2015. Identificou-se associação significativa entre força de preensão manual e sexo (p=0,001), idade (p=0,001), estado civil (p=0,001), moradia (p=0,001), quedas no último ano (p=0,03), perda de urina (p=0,001), uso de bengala (p=0,001) e andador (p=0,001). A velocidade da marcha apresentou associação com sexo (p=0,001), idade (p=0,001), estado civil (p=0,001), moradia (p=0,001), quedas no último ano (p=0,03), perda de urina (p=0,001), uso de bengala (p=0,001) e andador (p=0,001). Destaca-se que a avaliação da força de preensão manual e velocidade da marcha auxiliam na identificação de alterações funcionais em longevos e constitui-se como parte fundamental na gestão da síndrome da fragilidade física.
DESCRITORES: Idoso fragilizado; Força da mão; Marcha; Enfermagem geriátrica.

FACTORES SOCIODEMOGRÁFICOS Y CLÍNICOS ASOCIADOS A LA FUERZA DE PRENSIÓN MANUAL Y VELOCIDAD DE MARCHA EN LONGEVOS

RESUMEN: Investigación transversal con objeto de investigar la asociación entre factores sociodemográficos y clínicos y los componentes fuerza de prensión manual y velocidad de marcha en ancianos longevos. La muestra incluyó a 243 longevos de tres Unidades Básicas de Salud de Curitiba, Paraná, entre enero de 2013 y septiembre de 2015. Fue identificada asociación significativa entre fuerza de prensión manual y sexo (p=0,001), edad (p=0,001), estado civil (p=0,001), morada (p=0,001), caídas en el último año (p=0,03), pérdida de orina (p=0,001), uso de bastón (p=0,001) y andador (p=0,001). La velocidad de marcha reveló asociación con sexo (p=0,001), edad (p=0,001), estado civil (p=0,001), morada (p=0,001), caídas en el último año (p=0,03), pérdida de orina (p=0,001), uso de bengala (p=0,001) y andador (p=0,001). Se destaca que la evaluación de la fuerza de prensión manual y velocidad de marcha ayudan en la identificación de alteraciones funcionales en longevos y representa parte fundamental en la gestión de la síndrome de la fragilidad física.
DESCRIPTORES: Anciano frágil; Fuerza de la mano; Marcha; Enfermería geriátrica.

[1]RN. Ph.D. in Nursing Philosophy. Professor, Graduate Nursing Program at Universidade Federal do Paraná. Curitiba, PR, Brazil.
[2]RN. Ph.D. in Nursing. Professor at Universidade Estadual de Ponta Grossa. Ponta Grossa, PR, Brazil.
[3]RN. Ph.D. in Nursing. Nursing Professor at Universidade Federal do Paraná. Curitiba, PR, Brazil.
[4]Pharmacist. Ph.D. in Collective Health. Professor at Universidade Estadual de Ponta Grossa. Ponta Grossa, PR, Brazil.
[5]RN. Ph.D. candidate in Nursing. Universidade Federal do Paraná. Curitiba, PR, Brazil.

Corresponding author:
Clóris Regina Blanski Grden
Universidade Estadual de Ponta Grossa
R. Teodoro Sampaio, 888 - 84036-070 - Ponta Grossa, PR, Brasil
E-mail: crkblanski@uepg.br

Received: 02/02/2017
Finalized: 06/07/2017

http://dx.doi.org/10.5380/ce.v22i3.50464

INTRODUCTION

The increased group of long-living elderly in Brazil and around the world has enlarged the percentage of individuals with chronic conditions, functional and cognitive capacity decline and dependence[1]. In this age range, persons with decreased physical reserves and increased vulnerability to internal and external stressors are identified, culminating in the development of the physical frailty syndrome[2].

Authors define it as a medical syndrome with multiple causes and related factors, characterized by the drop in strength and resistance, as well as by the reduced physiological function that increases the individual's vulnerability, who develops greater dependence and/or death[2-3].

The physical frailty phenotype has five clear clinical markers: weight loss, self-reported exhaustion, slow gait, weight loss, reduced hand grip strength and low level of physical activity[3]. Elderly are considered frail if they possess three or more markers of the syndrome; the pre-frail condition relates to individuals with one or two components; the absence of all characteristics defines the elderly as non-frail.

Among the markers, the hand grip strength (HGS) and gait speed (GS) stand out as important predictors of the physical frailty level in elderly[4]. Being indicators of general muscle strength, measuring these components is considered efficient to predict the morbidity and mortality[5].

In the assessment of physical frailty, researchers have identified these markers to be the most frequent in Spanish long-living elderly[6], in American elderly included in the Cardiovascular Health Study[3] and in the participants in the Frailty in Brazilian Elderly (FIBRA) project[7]. Some sociodemographic and clinical factors are highlighted in the current literature as contributing to the reduction of HGS in the elderly, including the female sex[8], advanced age[9] and health problems[10]. Regarding the drop in GS, studies appoint advanced age[11], cardiovascular diseases[12] and falls[13].

The health professionals, particularly the nurses' assessment of these components permits the identification of functional and muscle problems in the long-living elderly. These, in turn, can compromise the accomplishment of manual tasks, impose functional limitations, predispose to falls and loss of functional independence, besides interfering negatively in the ability to perform various functions that are essential for this population's activities of daily living.

In that perspective, the objective in this study was to investigate the association between sociodemographic and clinical factors and the components hand grip strength and gait speed in long-living elderly.

METHOD

Cross-sectional study, involving long-living elderly (≥80 years) community dwellers in the coverage area of three primary health care services (UBS) in the Health District Boa Vista, located in the city of Curitiba, Paraná, Brazil.

Stratified proportional sampling was used, so that none of the UBS was overestimated or underestimated. To calculate the sample, a beta power of 80% (1-ß), alpha significance level of 5% and a minimum significant difference of 10% between the proportions of frail long-living elderly were considered. From the population of 503 long-living elderly, 10% was added to the sample size due to the possibilities of losses and refusals, resulting in a final sample of 243 long-living elderly (Figure 1).

Figure 1 – Long-living elderly registered at the Primary Health Care services investigated. Curitiba, PR, Brazil, 2015

Primary Health Care services	Population (N)	Proportional Participation (%)	Sample (n)
Atuba	137	27.16	66
Bairro Alto	130	25.93	63
Santa Cândida	236	46.91	114
Total	**503**	**100**	**243**

The inclusion criteria were: a) age 80 years or older; b) being registered at one of the Primary Health Care services where the research was undertaken; c) score superior to the cut-off point in the application of the cognitive Mini-Mental State Examination (MMSE)[14], with 13 points corresponding to illiterate people, 18 to low and medium education and 26 to high education level[15].

Long-living elderly were excluded who were: physically unable to accomplish the proposed tests (bedridden, in wheelchair, with amputated limbs); in chemotherapy treatment; under chemotherapy treatment; and without the presence of a family caregiver during the home visit.

For the long-living elderly who were not cognitively able (n=36) to answer the research questions, the family caregiver was invited to participate. That person answered the sociodemographic and self-reported questions, for which the following inclusion criteria were listed: age ≥18 years; b) being a family caregiver; c) having lived with the elderly for at least three months.

Long-living elderly who were physically unable to accomplish the physical tests (n=15) and who were under chemotherapy treatment (n=one) were excluded.

The research was undertaken between January 2013 and September 2015 by scientific initiation grandees, Master's and Doctoral students with background training. A pilot study was conducted with ten long-living elderly to verify and adapt the instrument.

A sociodemographic questionnaire adapted from the Brazilian Institute of Geography and Statistics[16] was applied, as well as a clinical questionnaire inspired by Parts II and III of the multidimensional Brazil Old Age Schedule (BOAS) questionnaire, validated to assess elderly populations[17-18], as well as the HGS and GS tests, assessed by means of the participants' mean scores.

The following sociodemographic variables were investigated: sex, age (ranked as octogenarian - ≥80 years till 89 years and nonagenarian long-living elderly -≥90 years till 99 years), marital status, education (ranked according to MMSE[15] cut-off points), housing arrangement and financial situation. The clinical variables included: self-referred diseases, medication use, hospitalizations, history of falls in the past 12 months and urine loss. The use of assistive technologies (cane, walker, crutch, corrective lenses) was included in the clinical characteristics, considering that they influence the elderly's health, the way they live and, therefore, are significant for the purpose of this study.

The HGS test was applied before two examiners, using a hydraulic dynamometer in kilogram/strength (Kgf), brand Jamar, following the recommendation of the American Society of Hand Therapists (ASHT) [19]. The elderly remained seated with the feet touching the floor; the upper limb being tested was placed with the shoulder in adduction, elbow joint flexed at 90º and forearm in the neutral position. The grip was adjusted in the elderly's dominant hand, so that the second phalange of the second, third and fourth fingers touched the curve of the device rod. The participant performed three holds with the dominant hand at one-minute intervals for the strength to return and the highest measure was observed[20].

To assess the gait speed, the elderly was instructed to walk six meters[5], as usual, on a level surface, signaled by four marks (start, one meter, five meters and end). To reduce the acceleration and deceleration effects, the test started at the second mark, interrupting the timing of the walk at the third mark. The digital chronometer measured the time in seconds to walk the four-meter distance. The gait speed was calculated in meters per second (m/s), in accordance with an international study on frailty in the elderly[3], for the sake of comparison.

The data were processed and analyzed using Stata® software version 12. Initially, the data were submitted to exploratory analysis and described using frequency measures, means and standard deviations (SD). The Kolmogorov-Smirnov was applied to verify the normality of the data. The test results complied with the premise of normal data distribution. Also considering the premises, residue analyses were applied, showing no evidence that the premise of homoscedasticity was violated or that a transformation of the response or explanatory variables was necessary. Next, the association between the independent variables and the dependent variable was verified using simple linear regression through Fisher's F-tests and Student's t-test. Significance was set at $p \leq 0.05$ to assess the results.

The research development complied with the Brazilian and international ethical standards for research involving human beings, with approval under registration CEP/SD: 156.413 from the Ethics

Committee for Research involving Human Beings, affiliated with the Health Sciences Sector at Universidade Federal do Paraná.

RESULTS

What the long-living elderly's sociodemographic characteristics are concerned, as shown in Table 1, the female sex was predominant (n=161; 66.3%), in the age range ≥80 till 89 years (n=220; 90.5%), with a minimum age of 80 years and maximum of 99 years (mean=84.4±3.8), widowed (n=158; 65%), low education (n=137; 56.4%) and who lived with relatives (n=144; 59.3%). Among the participants, 44.5% (n=108) considered that their financial situation was satisfactory.

Table 1 – Distribution of sociodemographic characteristics of long-living elderly. Curitiba, PR, Brazil, 2015

Variable	Classification	Total (%)
Sex	Female	161(66.3)
	Male	82(33.7)
Age	≥80 years till 89 years	220(90.5)
	≥90 years till 99 years	23(9.5)
Marital status	Widowed	158(65)
	Married	73(30)
	Single	12(5)
Education*	Illiterate	90(37)
	Low	137(56.4)
	Medium	10(4.1)
	High	6(2.5)
Housing arrangement	Alone	65(26.7)
	With relatives	144(59.3)
	With partner	34(14)
Financial situation	Unsatisfactory	47(19.3)
	Median	88(36.2)
	Satisfactory	108(44.5)

*Education: low (1-4 years unfinished); medium (4-8 unfinished); high (8 years or more)

As for the results of the HGS component, among the long-living elderly women, the highest and lowest measure were, respectively, 4 and 38 Kgf, with an average of 18.2 Kgf. For the long-living elderly men, the lowest hand grip strength was 10 Kgf and the highest 48 Kgf, averaging 28.9 Kgf.

Higher mean HGS measures were found for participants in the age range between ≥80 and 89 years (22.1 Kgf), married (26.1 Kgf), with medium education (22.7 Kgf), who lived with their partner (26.1 Kgf), with a financial situation reported as unsatisfactory (22.6 Kgf), who indicated no urinary incontinence (23.3 Kgf) and who do not use a walker (22.0 Kgf). The statistically significant variables for this component were: sex (p=0.001), age (p=0.01), marital status (p=0.001), whom the elderly lives with (p=0.001), urinary incontinence (p=0.001) and use of walker (p=0.001) (Table 2).

Table 2 – Distribution of sociodemographic and clinical characteristics of long-living elderly according to means and standard deviations of the markers HGS and GS. Curitiba, PR, Brazil, 2015 (continues)

	HGS			GS		
Variables	**Total**	**p-value†**	**95%CI**	**Total**	**p-value†**	**95%CI**
Sex		**0.001**	[-12.31;-9.37]		**0.001**	[-0.21;-0.57]
Male	28.9(±7.5)			0.70(±0.31)		
Female	18.2(±5.2)			0.56(±0.30)		
Age		**0.015**	[0.81;7.56]		**0.001**	[0.10;0.37]
≥80 till 89 years	22.1(±7.9)			0.63(±0.31)		
≥90 till 99 years	18(±7.4)			0.39(±0.22)		
Marital status		**0.001**	[-8.40;-4.20]		**0.001**	[-0.28;-0.12]
		0.111	[-8.20;0.85]		**0.007**	[-0.43;-0.67]
Married	26.1(±8.4)			0.75(±0.33)		
Single	22.4(±7.7)			0.50(±0.28)		
Widowed	19.8(±6.8)			0.54(±0.28)		
Education		0.939	[-6.84;6.32]		0.287	[-0.12;0.39]
		0.791	[-5.63;7.38]		0.253	[-0.11;0.40]
High	21.3(±6.8)	0.739	[-6.70;9.42]	0.47(±0.26)	0.711	[-0.25;0.37]
Illiterate	21.1(±7.5)			0.61(±0.33)		
Low	22.2(±8.0)			0.61(±0.30)		
Medium	22.7(±11.0)			0.53(±0.30)		
Housing		**0.001**	[-7.68;-1.86]		**0.001**	[-0.31;-0.88]
		0.001	[-8.90;-2.46]		**0.001**	[-0.35;-0.11]
Partner	26.1(±8.3)			0.78(±0.31)		
Relatives	21.4(±7.7)			0.58(±0.32)		
Alone	20.5(±7.3)			0.56(±0.25)		
Financial situation		0.352	[-4.14;1.48]		0.841	[-0.01;0.12]
		0.576	[-3.50;1.95]		0.361	[-0.15;0.57]
Unsatisfactory	22.6(±8.0)			0.62(±0.33)		
Median	21.3(±7.3)			0.63(±0.36)		
Satisfactory	21.8(±8.3)			0.57(±0.25)		
Illnesses		0.215	[-10.47;2.36]		0.837	[-0.22;0.27]
Yes	21.9 (7.9)			0.60(±0.31)		
No	17.8(±5.6)			0.63(±0.14)		
Medication		0.154	[-8.65;1.37]		0.259	[-0.31;0.83]
Yes	21.9(±8.0)			0.61(±0.31)		
No	18.3(±4.9)			0.50(±0.28)		
Falls (past year)		0.194	[-0.67;3.32]		**0.039**	[0.04;0.16]
Yes	21.1(±6.6)			0.56(±0.32)		
No	22.4(±8.8)			0.64(±0.30)		
Hospitalization (past year)		0.097	[-0.38;4.53]		0.105	[-0.17;0.18]
Yes	20.1(±8.3)			0.54(±0.25)		
No	22.2(±7.7)			0.62(±0.32)		
Urine loss		**0.004**	[0.91;4.48]		**0.001**	[0.76;0.23]
Yes	20.4(±6.7)			0.53(±0.26)		
No	23.3(±8.7)			0.68(±0.34)		
Cane		0.092	[-0.37;4.80]		**0.001**	[0.10;0.30]
Yes	20.0(±7.6)			0.44(±0.25)		
No	22.2(±7.9)			0.64(±0.31)		
Crutch		0.616	[-8.25;13.90]		0.538	[-0.30;0.56]
Yes	19.0(±9.9)			0.47(±0.48)		
No	21.8(±7.9)			0.61(±0.31)		

Walker		**0.005**	[2.41;13.43]	0.12(±0.51)	**0.001**	[0.29;071]
Yes	14.1(±5.6)			0.62(±0.30)		
No	22.0(±7.8)					
Corrective lenses		0.115	[-3.67;0.40]		0.08	[-0.15;0.09]
Yes	22.4(±8.3)			0.63(±0.32)		
No	20.8(±7.2)			0.56(±0.29)		

† Related to coefficient of Fisher's F-test and Student's t-test
HGS= Hand grip strength GS= Gait speed.

As for the marker gait speed, higher values represent a better test performance, that is, the fastest long-living elderly. Thus, the women obtained minimum and maximum speeds of 0.04 m/s and 1.83 m/s, respectively, averaging 0.56 m/s. For the men, the lowest GS was 0.11 m/s and the highest 1.95 m/s, averaging 0.70 m/s.

For the gait speed, the highest averages were identified in long-living men between ≥80 and 89 years of age (0.63 m/s), married (0.75 m/s), illiterate (0.61 m/s), with low education level (0.61 m/s), who lived with their partner (0.78 m/s), had a median financial situation (0.63 m/s), were not victims of falls in the previous year (0.64 m/s), did not refer urinary incontinence (0.68 m/s) and used neither a cane (0.60 m/s) nor walker (0.62 m/s). The variables that demonstrated statistical significance for this component were: sex (p=0.001), age (p=0.001), marital status (p=0.001), whom the elderly lives with (p=0.001), falls in the previous year (p=0.03), urinary incontinence (p=0.001), use of cane (p=0.001) and walker (p=0.001) (Table 2).

DISCUSSION

Among the participants, the mean HGS was significantly higher in men. Similar results were found in studies involving elderly[9,21] and long-lived elderly[10]. These findings can be attributed to the greater muscle mass reserve in male individuals, which can justify the greater production of strength in the group of long-lived men.

Independently of the sex, the mean HGS identified are found in the reference scores for the age range studied[19]. It is highlighted that hand grip strength values of 20 Kgf or lower are related to the risk for future dependence and worse health conditions[19], with negative outcomes for the elderly's functionality.

The lowest mean HGS was found in the participants between 90 and 99 years of age. The statistically significant association between age and the marker hand grip strength, identified in this study and in other studies[8-9], can be explained by the drop in the number and size of the muscle fibers, especially type II (rapid contraction) fibers, responsible for the production of muscle strength[22]. In the long-living elderly, the prevalence of muscle mass and strength loss is high and can compromise important indicators, such as gait speed, hand grip strength and energy[23].

The married long-living elderly who live with their partner presented significantly higher mean HGS than the widowed and single elderly who live alone. In a study of Korean elderly, aimed at investigating the association between the socioeconomic factors and reduced HGS, it was identified that the married elderly presented higher mean hand grip strength[24]. The condition of widowhood can contribute to social and family isolation, and the lack of encouragement by the partner can negatively affect the self-care actions.

In this research, the long-living elderly who did not mention urine loss presented lower mean HGS. Characterized as a geriatric syndrome, studies appoint a significant association between urinary incontinence and the marker hand grip strength[25].

The use of assistive technologies can facilitate the elderly's accomplishment of their daily activities and contribute to balance and support. Specifically concerning the walker, the participants who did

not use this device presented higher mean HGS. Nevertheless, no studies were found that specifically explored the relations between the use of this assistive technology and lower mean HGS.

In this study, the results identified for GS appointed that the women's (0.56 m/s) and the men's (0.70 m/s) mean values are inferior to the standard value (0.8 m/s) established in international studies[5]. One justification for these results is the characteristic of the sample (elderly aged 80 years or older), which may have contributed to reduce the values found. On the other hand, with age, the parameters involved in gait drop, such as pace length and speed[26]. It is highlighted that above-standard mean speed levels predict a higher life expectancy, while speed levels inferior to 0.5 m/s predict a worse health condition in the elderly[5].

In the cross-sectional study involving 316 elderly registered in the Family Health Strategy in the city of Lafaiete Coutinho, state of Bahia, the authors appoint that women present greater functional limitation in lower-limb strength/resistance and locomotion tests[27]. In addition, a significant difference was identified in the mean gait speed among the participants' age ranges. In the long-living elderly between 80 and 89 years of age, the mean GS was higher (0.63 m/s) when compared to the nonagenarians between 90 and 99 years of age (0.39 m/s). The literature appoints that, as age advances, the elderly tend to present lower gait speed[11].

In this research, a statistically significant association was identified between age and the markers HGS and GS, similarly to the cross-sectional study developed in Campinas with 689 community-dwelling elderly, aimed at investigating relations between the frailty syndrome and physical activity measures[11]. The authors identified that advanced age (80 years or older) contributes significantly to the reduction in hand grip strength (p=0.001) and gait speed (p=0.001).

Married long-living men who live with their partner obtained the best GS parameters. It can be affirmed that elderly people who feel responsible for their own and their family's survival, who are concerned with care for their partner and keep up an active social life tend to develop more daily activities and be more active. On the other hand, elderly living alone do not expect support for care[28], a situation that can influence the maintenance of health and the adaptive conducts in stress situations.

A significant association was found between reduced gait speed and self-report falls in the previous year (p=0.039). The drop in muscle mass associated with age has been appointed as an important factor in the relation between reduced GS and falls and can be related with greater disequilibrium and fear of falling[26]. Nevertheless, authors report that it is not clear whether the gait speed drops to avoid falls or to adapt to the fear of falling, resulting in gait changes[26]. With aging, people tend to adopt strategies to improve their stability and avoid disequilibrium, such as taking slow and short steps.

The study results revealed a significant association between urine loss and the marker GS, in which the long-living elderly who are continent present the highest mean speed. One study, aimed at analyzing the factors associated with urinary incontinence among elderly aged 60 years or older, with frailty criteria, concluded that suffering from urinary incontinence is associated with pre-frailty for any component[29]. This condition can be considered a limiting factor of mobility in the elderly, as the fear of experiencing constraint can make them reduce their activities of daily living and their physical exercise.

As for the use of assistive technologies, statistical significance was found for cane (p=0.001) and walker (p=0.001) use. This result differs from the research involving elderly in a state capital in the South of Brazil, which was aimed at investigating pre-frailty and the factors associated with this condition, considering the gait speed[12]. It is highlighted that the use of these devices can serve as facilitators and barriers to gait speed and functional independence[30].

The cross-sectional design was a limiting factor of the assessment between the cause-and-effect relations. In addition, the sample is representative of a local community and does not permit generalizations to other territories.

FINAL CONSIDERATIONS

A significant association was identified between the sociodemographic and clinical variables and the components HGS and GS in long-living elderly. As evidenced, this result is related with the mean results for the above components, which can effectively contribute to the development of the physical frailty syndrome in this population.

The markers investigated interfere significantly in the muscle function, which is considered a key element for the elderly people's global health, with a strong impact on functionality and independence. Geriatric nursing care should consider frequent assessments and detailed interventions related to lower and upper limb strength. Another effective care actions is related to the encouragement of exercise practice, especially to prevent sarcopenia and contribute to the delay of functional decline in the long-living elderly.

As physiological, sociodemographic and clinical factors interfere in the practice of physical exercise, geriatric care should also target the identification of barriers that contribute to physical inactivity and to the adaptation of the activities to the elderly.

The health professionals' assessment of the elderly's HGS and GS will support the development of geriatric care management for the physical frailty syndrome, with a view to minimizing the adverse health events and positively affecting the long-living elderly's quality of life.

REFERENCES

1. Age UK. Improving later life: understanding the oldest old.[Internet] 2013 [acesso em 09 jan 2016]. Disponível:http://www.ageuk.org.uk/Documents/EN-GB/For-professionals/Research/Improving%20Later%20Life%202%20WEB.pdf?dtrk=true%20.

2. Morley JE, Vellas B, van Kan GA, Anker SD, Bauer JM, Bernabei R, et al. Frailty consensus: a call to action. J Am Med Dir Assoc. [Internet] 2013;14(6) [acesso em 10 mar 2016]. Disponível: http://dx.doi.org/10.1016/j.jamda.2013.03.022.

3. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: evidence for a phenotype. J Gerontol A Biol Sci Med Sci. [Internet] 2001;56A(3) [acesso em 22 mar 2016]. Disponível: http://www.sld.cu/galerias/pdf/sitios/gericuba/fenotipo_frailty.pdf.

4. Odonkor CA, Schonberger RB, Dai F, Shelley KH, Silverman DG, Barash PG. New utility for an old tool: can a simple gait speed test predict ambulatory surgical discharge outcomes? Am J Phys Med Rehabil. [Internet] 2013;92(10) [acesso em 22 mar 2016]. Disponível: http://dx.doi.org/10.1097/PHM.0b013e3182a51ac5.

5. Studenski S, Perera S, Patel K, Rosano C, Faulkner K, Inzitari M, et al. Gait speed and survival in older adults. JAMA.[Internet] 2011;305(1)[acesso em 8 fev 2016]. Disponível:http://dx.doi.org/10.1001/jama.2010.1923.

6. Ferrer A, Formiga F, Sanz H, Monserrate E, Verges D, Grupo Octabaix. Successful aging and indicators of frailty in the elderly. Octabaix Study. Aten Primaria. [Internet] 2014;46(9) [acesso em 18 jun 2016]. Disponível:http://dx.doi.org/10.1016/j.aprim.2014.01.004.

7. Fattori A, Neri AL, Santimaria MR, Yassuda MS, Siqueira MEC. Indicadores de Fragilidade. In: Neri AL. (Org). Fragilidade e qualidade de vida na velhice. Campinas, SP: Editora Alínea; 2013.

8. Auyeung TW, Lee SWJ, Leung J, Kwok T, Woo J. Age-associated decline of muscle mass, grip strength hand gait speed: A 4-year longitudinal study of 3018 community-dwelling older Chinese. Geriatr Gerontol Int. [Internet] 2014;14(1) [acesso em 18 jun 2016]. Disponível: http://dx.doi.org/10.1111/ggi.12213.

9. Tveter AT, Dagfinrud H, Moseng T, Holm I. Health-related physical fitness measures: reference values and reference equations for use in clinical practice. Arch Phys Med Rehabil. [Internet] 2014;95(7) [acesso em 20 ago 2016]. Disponível:http://dx.doi.org/10.1016/j.apmr.2014.02.016.

10.Lenardt MH, Grden CRB, de Sousa JAV, Reche PM, Betiolli SE, Ribeiro DKMN.Factors associated with loss of handgrip strength in long-lived elderly. Rev. esc. enferm. USP. [Internet] 2014;48(6) [acesso em 20 ago 2016]. Disponível: http://dx.doi.org/10.1590/S0080-623420140000700007.

11. Bez JPO, Neri AL. Velocidade da marcha, força de preensão e saúde percebida em idosos: dados da Rede FIBRA Campinas, São Paulo, Brasil. Ciênc Saúde Coletiva. [Internet] 2014;19(8) [acesso em 20 dez 2016]. Disponível: http://dx.doi.org/10.1590/1413-81232014198.09592013.

12. Lenardt MH, Carneiro NHK, Betiolli SE, Ribeiro DKMN, Wachholz PA. Prevalence of pre-frailty for the component of gait speed in older adults. Rev. Latino-Am. Enfermagem. [Internet] 2013;21(3) [acesso em 2 dez 2016]. Disponível: http://dx.doi.org/10.1590/S0104-11692013000300012.

13. Clemson L, Kendig H, Mackenzie L, Browning C. Predictors of injurious falls and fear of falling differ: an 11-year longitudinal study of incident events in older people. J Aging Health. [Internet] 2015;27(2) [acesso em 2 mar 2016]. Disponível: http://dx.doi.org/10.1177/0898264314546716.

14. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state": a practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res. [Internet] 1975;12(3) [acesso em 10 fev 2016]. Disponível: http://dx.doi.org/10.1016/0022-3956(75)90026-6.

15. Bertolucci PHF, Brucki SMD, Campacci SR, Juliano Y. The Mini-Mental State Examination in a general population: impact of educational status. Arq. Neuro-Psiquiatr. [Internet] 1994;52(1) [acesso em 10 fev 2016]. Disponível: http://dx.doi.org/10.1590/S0004-282X1994000100001.

16. Instituto Brasileiro de Geografia e Estatística (IBGE). Censo Demográfico 2000 – Migração e deslocamento. Questionário da Amostra CD 1.02. [Internet] 2000 [acesso em 17 fev 2015]. Disponível: http://biblioteca.ibge.gov.br/pt/biblioteca-catalogo?view=detalhes&id=788.

17. Veras RP,Souza CAM, Cardoso RF, Milioli R, da Silva SD. Pesquisando populações idosas - A importância do instrumento e o treinamento de equipe: uma contribuição metodológica. Rev. Saúde Pública. [Internet] 1988;22(6) [acesso em 10 fev 2016]. Disponível: http://dx.doi.org/10.1590/S0034-89101988000600008.

18. Veras RP. País jovem com cabelos brancos: a saúde do idoso no Brasil. Rio de Janeiro: Relume Dumará; 1994.

19. Bohannon RW, Peolsson A, Massy-Westropp N, Desrosiers J, Bear-Lehman J. Reference values for adult grip strength measured with a Jamar dynamometer: a descriptive meta-analysis. Physiotherapy. [Internet] 2006;92(1) [acesso em 10 fev 2016]. Disponível: http://dx.doi.org/10.1016/j.physio.2005.05.003.

20. Hollak N, Soer R, van der Woude LH, Reneman MF. Towards a comprehensive functional capacity evaluation for hand function. Appl Ergon. [Internet] 2014;45(3) [acesso em 8 fev 2016]. Disponível: http://dx.doi.org/10.1016/j.apergo.2013.09.006.

21. Makizako H, Shimada H, Doi T, Tsutsumimoto K, Suzuki T. Impact of physical frailty on disability in community-dwelling older adults: a prospective cohort study. BMJ Open. [Internet] 2015;5(9) [acesso em 5 ago 2016]. Disponível: http://dx.doi.org/10.1136/bmjopen-2015-008462.

22. Demura S, Aoki H, Sugiura H. Gender differences in hand grip power in the elderly. Arch Gerontol Geriatr. [Internet] 2011;53(1) [acesso em 5 ago 2016]. Disponível: http://dx.doi.org/10.1016/j.archger.2010.06.002.

23. Kent-Braun JA, Callahan DM, Fay JL, Foulis SA, Buonaccorsi JP. Muscle weakness, fatigue, and torque variability: effects of age and mobility status. Muscle Nerve. [Internet] 2014;49(2) [acesso em 12 jun 2016]. Disponível:http://dx.doi.org/10.1002/mus.23903.

24. Quan S, Jeong JY, Kim DH. The relationship between smoking, socioeconomic status and grip strength among community-dwelling elderly men in Korea: Hallym Aging Study. Epidemiol Health. [Internet] 2013;(35) [acesso em 12 jun 2016]. Disponível:http://dx.doi.org/10.4178/epih/e2013001.

25.Kim H, Yoshida H, Hu X, Saito K, Yoshida Y, Kim M,et al. Association between self-reported urinary incontinence and musculoskeletal conditions in community-dwelling elderly women: a cross-sectional study. Neurourol Urodyn. [Internet] 2015;34(4) [acesso em 12 jun 2016]. Disponível: http://dx.doi.org/10.1002/nau.22567.

26. Moreira MA, Oliveira BS, de Moura KQ, Tapajós DM, Maciel ACC. Can the gait speed identify elderly with fear of falling?. Rev. bras. geriatr. gerontol.[Internet] 2013;16(1) [acesso em 1 jun 2016]. Disponível:http://dx.doi.org/10.1590/S1809-98232013000100008.

27. Pinheiro PA, Passos TDO, Coqueiro RS, Fernandes MH, Barbosa AR.Motor performance of the elderly in northeast Brazil: differences with ageand sex. Rev. esc. enferm.USP. [Internet] 2013;47(1) [acesso em 1 jun 2016].

Disponível: http://dx.doi.org/10.1590/S0080-62342013000100016.

28. de Oliveira DC, Neri AL, D'Elboux MJ. Variables related to the anticipated support for care in community-dwelling older adults. Rev. Latino-Am. Enfermagem. [Internet] 2013;21(3) [acesso em 10 jun 2016]. Disponível:http://dx.doi.org/10.1590/S0104-11692013000300013.

29.da Silva VA, D'Elboux MJ. Factors associated with urinary incontinence in elderly individuals who meet frailty criteria. Texto Contexto Enferm. [Internet] 2012;21(2) [acesso em 10 jun 2016]. Disponível:http://dx.doi.org/10.1590/S0104-07072012000200011.

30. Vieira RA, Guerra RO, Giacomin KC, Vasconcelos KSS, Andrade ACS, Pereira LSM,et al. Prevalence of frailty and associated factors in community-dwelling elderly in Belo Horizonte, Minas Gerais State, Brazil: data from the FIBRA study. Cad. Saúde Pública. [Internet] 2013;29(8) [acesso em 1 ago 2016]. Disponível:http://dx.doi.org/10.1590/0102-311X00126312.