Original Article

Factors associated with the use of assistive technologies in elders in their home environments

Fatores associados ao uso de tecnologias assistivas em idosos em ambiente domiciliar

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ABSTRACT

Objective: to identify the factors associated with the use of assistive technologies by elders in their home environment. **Methods:** cross-sectional, analytical, and exploratory study with 127 elders capable of answering the data collection instruments. Analyses were carried out using Student's t, Pearson's correlation, and linear regression. **Results:** in regard to the type of assistive device used, 52.8% of interviewees used orthoses or prostheses, 48.8% used shower chairs, and 47.2% used wheelchairs. In the comparative analysis of the means, there was a statistically significant association between basic daily life activities and cognitive state. In basic daily life activities (r=0.52), as the score of the elderly in Katz's Index increases, the use of assistive devices also increases. In turn, as the Lawton and Brody Scale (r=-0.279) increases, the number of devices decreases. **Conclusion:** the prevalence of elders who use assistive devices in their homes was high, showing a direct association with their functional capacity and their performance of basic and instrumental daily life activities. **Contributions to practice:** this research contributes for the organization of elderly assistance by nursing workers, encouraging elder independence and autonomy.

Descriptors: Aged; Activities of Daily Living; Self-Help Devices; Home Care Services.

RESUMO

Objetivo: identificar fatores associados ao uso de tecnologias assistivas em idosos em ambiente domiciliar. **Métodos:** estudo transversal, analítico e exploratório, com 127 idosos capazes de responder aos instrumentos de coleta de dados. Para as análises foram utilizados os testes: t de Student, correlação de Pearson e regressão linear. **Resultados:** no que se refere ao tipo de dispositivos assistivos, 52,8% dos entrevistados utilizavam órteses ou próteses, 48,8% cadeira de banho e 47,2% cadeira de rodas. Na análise de comparação das médias, identificou-se significância estatística entre as atividades básicas da vida diária e o estado cognitivo. Nas atividades básicas de vida diária (r=0,52) à medida em que a pontuação do idoso no Índice de Katz aumenta, há aumento do uso de dispositivos assistivos. De maneira contrária, conforme a Escala de Lawton e Brody (r=-0,279) aumenta, o número de dispositivos diminui. **Conclusão:** a prevalência do uso de dispositivos assistivos por idosos no domicílio foi alta e apresentou associação com a capacidade funcional e a realização das atividades básicas e instrumentais da vida diária. **Contribuições para a prática:** a pesquisa contribui para a organização na assistência ao idoso pelo profissional de enfermagem, incentivando a independência e a autonomia do idoso.

Descritores: Idoso; Atividades Cotidianas; Tecnologia Assistiva; Serviços de Assistência Domiciliar.

Introduction

As a result of changes such as the demographic transition and the advance of science, which are taking place in Brazil and around the world, there has been a significant decline in fecundity rates and a concomitant decrease in death rates. Due to this conversion, the longevity of the population has remarkably increased worldwide, and Brazil is no exception[1].

In addition to a demographic transition, there was also an epidemiological one. The prevalence and incidence of noncommunicable diseases increased, leading to a search for health services and, as a result, professionals must be prepared to provide integral and high quality care to this population, who may be affected by functional and cognitive decline[1].

Ingrained in this setting, the process of aging is surround by conditions harmful to health, such as decreased functional reserve and, later, of organism functions, which is a considerable milestone in the reduction of one's functional capacity and cognitive conditions that leads to a reduction in physical mobility and other functions related with daily life activities[2]. Due to this gradual loss, the elder becomes increasingly dependent on the care of others and on the use of assistive devices, increasing public and private expenses[3].

The main goal of assistive devices is to minimize the dependence of elders as they carry out daily life activities, as well as social isolation and the vulnerabilities common to old age[4]. In addition to promoting the autonomy of the elder, the devices can be used as tools to reduce the impact of physiological changes caused by aging, especially when related with cognitive decline, which may lead the elder to depend entirely on others. These are the devices that aid in the provision of care[3-5].

The assistive devices, also known as assistive technologies, are classified as a health subitem, that is, as a practice related with integrated devices to improve one's wellbeing. These mechanisms include methodologies, devices, tools, or operating systems that can prevent secondary implications and compensate some deficiency or progressive loss of function[4].

According with a survey from the Ministry of Health, the assistive devices are yet to be widely distributed in health services. To do so, the Special Secretariat of Human Rights from the Republic Presidency created the Committee of Technical Aides, that seeks the full integration of technologies for persons with disabilities (PD) and elders, in order to increase the visibility of assistive devices and public policies that favor their distribution in public services. This commission proposes more actions to promote the accessibility to these devices and their inclusion in the community[6].

Actions such as this go hand to hand with those already targeted at minimizing the impact of dependence on the life of the elder and their relatives[7]. In Canada, researchers attempted to show the need for equality in the access to the services, especially for the elderly population, due to the fact that the prevalence of inabilities is greater among them than in the other age groups[3]. Nonetheless, the exact prevalence of the use of these tools is difficult to precisely determine, as it is difficult to find statistics about the assistive devices used by the elderly[4].

To enable the elder to maintain their independence, so they can carry out their daily life activities and be better included in society, assistive devices have been increasingly used as a strategy to decrease the impact of physical and cognitive changes caused by aging. Therefore, the recognition of the importance and need of these devices, both in academic and institutional fields, is yet to be developed, since there are few researches in the topic.

Elders who are part of the home care services already use these devices, but their functioning and cognitive state are not measured. It should be highlighted that this is not a simple numerical concern. Due to this lack of measurement, data that could aid in the construction of evidence-based care is scarce, as there are few Brazilian scientific works on the use of assistive technologies in elders that also survey their sociodemographic data.

Therefore, the goal of this research was to iden-

tify factors associated with the use of assistive technologies in elders in their home environment.

Methods

This is a cross-sectional, analytical, and exploratory research, with elders attended in the home care service from the Municipal Health Secretariat of Ribeirão Preto, in the state of São Paulo. This service has three multidisciplinary home care teams and was formalized in 1996. The teams are formed by nurses, physicians, physical therapists, nursing auxiliaries/technicians, a speech-language pathologists, a social worker, a dentist, a clinical nutritionist, administrative agents, drivers, and interns from the School-Enterprise Integration Center and partnered universities. This work was written according with recommendations from the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[8].

The population of the study were the users of the home care service. The coordinator made available a list of elders included in the visits of Multiprofessional Home Care Teams (AD), which are classified by the Ministry of Health as AD1, AD2, and AD3. The inclusion criteria were: being 60 years old or older, regardless of sex, and answering the instrument with or without aid from a companion. The list was filtered according with these criteria and the 160 elders who were in accordance with them were selected. The elders who did not answer the telephonic call after three consecutive attempts were excluded, as well as those who canceled the interviews near the date of collection more than two consecutive times.

The sample was by convenience and there was no need to calculate the sample size, since all elders who could participate was inserted in the research. All participants were contacted and accepted participating in the research. The study included 127 participants.

Data were collected in January 2018. Before the interview, all elders were contacted by phone, so they or their relatives could choose the best day and time, as long as it was within workdays and office hours. There

was no rescheduling or delay, since all interviews took place according with the schedule. The entire team of graduation and post-graduation students was previously trained to standardize data collection. Graduation students were accompanied by a post-graduation student and carried out the interview in the home of the participants. Each interview lasted for a mean of 40 minutes. All instruments were applied in the same day. No participant refused responding or abandoned the survey during collection.

The instruments used during data collection were a structured questionnaire with sociodemographic variables, self-reported diseases, Lawton and Brody's Scale, basic daily life activities (Katz's Index), and instrument about assistive technologies. They are described in the paragraphs below:

The sociodemographic questionnaire included: sex (male or female), age (complete years), marital status (single, married, widow, and divorced), educational level (years of study), who the person lives with, and self-reported diseases, which were later grouped by the researches according to the International Classification of Diseases and Health Related Issues (ICD-10).

The Mini-Mental State Examination (MMSE), in the version translated and validated for Brazil, is formed by questions grouped in seven categories, each designed to evaluate different specific cognitive functions. The scores that indicate cutoff points are determined according with the educational level: 20 for elders who never received formal education; 24 for those who studied up to 4 years; 26.5 for those who studied from 4 to 8 years; 28 for those who studied from 9 to 11 years; and 29 for those who studied for more than 11 years[9].

Lawton and Brody's Scale, translated and adapted for Portuguese, evaluates the ability of an individual to carry out instrumental daily life activities. Its score varies from 7 (greatest level of dependence) to 21 (complete independence). The lower the score, the greater the dependence. The elder can be categorized as fully dependent (7 points), partially dependent (8-20), or independent (21 points)[10].

Katz's Index was adapted and translated into Portuguese and used to evaluate the level of functional independence of the elder in basic daily life activities (BDLA). The higher the score, the higher the dependence. Its results may vary from 0, for the elder who is independent in all six functions, to 6, in the elder who depends on others to perform all their functions[11].

Finally, a questionnaire about assistive technologies was applied, in order to identify which devices were used by the elders or relatives in their daily life activities. This questionnaire was elaborated from an instrument used in Brazil and adapted for this research[12].

In regard to data analysis, the software Microsoft Excel® was used to tabulate the information in double input. Then, a consistency analysis was carried out to compare the inputs. Later, the data was transferred into the statistical software SPSS v. 25.0. Descriptive statistics analysis used mean, minimum and maximum, and standard deviation. The categorical variables were described as absolute and relative frequencies. For the bivariate analysis, we considered the prerequisites for the use of parametric tests (Student's t and Pearson's correlation), including normality, variance homogeneity, and linearity.

To associate the variable outcome (use of assistive devices) with the exploratory variables (sex, age, MMSE category with or without cognitive deficit, total Katz, number of self-reported diseases, and total (Lawton and Brody's), we used a multiple linear regression adjusted for age and sex. The criteria used to choose the variables were based on the literature review and in conceptual or clinical content.

This research was approved by the Municipal Health Secretariat from Ribeirão Preto/SP and by Ethics Committee at the Nursing School of Ribeirão Preto/*Universidade de São Paulo*, under protocol 2,203,979/2017 and Certificate of Submission for Ethical Appreciation No. 68529517.4.0000.5393.

Results

127 elders aged from 61 to 95 years old were interview. Their mean age was 79 years old (standard deviation (sd) = 8.97). The mean income of participants was R$ 997.88 (sd = R$ 601.62), and the minimum wage in 2018 was R$937.00. They reported a mean of 3.72 (sd=2.52) diseases. The most frequent diseases were anemia, arthritis, impaired hearing, cancer, emphysema, diabetes, depression, cardiac diseases, upper gastrointestinal disease, peripheral vascular disease, neurological disease, arterial hypertension, urinary incontinence, osteoporosis, constipation, back problems, and impaired vision.

The sample was mostly formed by elders who had partners and a three-generation family arrangement (with the elder, their children, and their grandchildren), using at least one assistive device to carry out their daily life activities. The most common devices were orthosis or prosthesis, bath chairs, and wheelchairs (Table 1).

Table 1 – Sociodemographic characteristics and the use of assistive technologies by elders attended in the Home Care Service (n=127). Ribeirão Preto, SP, Brazil, 2018

Sociodemographic variables	n (%)
Sex	
Female	70 (55.1)
Male	57 (44.9)
Marital status	
Has a partner	59 (46.5)
Does not have a partner	68 (53.7)
Family arrangement	
Three-generational arrangement (elder, children, and grandchildren)	78 (61.4)
Lives only with spouse	24 (18.9)
Alone	3 (2.4)
Others	22 (17.3)
Use of assistive technologies	
Yes	124 (97.6)
No	3 (2.4)
Assistive devices*	
Orthosis or prosthesis	67 (52.8)
Bath chair	63 (46.6)
Wheelchair	61 (48.0)
Walker	29 (22.8)
Support bars	29 (22.8)
Cane	20 (16.3)
Anti-slip rugs	15 (11.8)
Ramp	10 (7.9)
Hearing aid	6 (4.7)
Modified cutlery	3 (2.4)
Crutches	2 (1.6)
Elevated toilet seat	1 (0.8)

*The elders could select more than one assistive technology

In the analysis of their functional capacity, 69.4% of the 127 elders had some type of dependence for BDLA. 15.6% were dependent for all instrumental daily life activities, and 65.4% had cognitive impairments. In the analysis of the correlation between the educational level and the number of assistive technologies used by the elders, the values found were r = -0.47 and p=0.10. In regard to the influence of basic and instrumental activities on the number of assistive devices, a negative correlation was found (-0.71; p<0.001) for Lawton and Brody's Scale. The Katz Index showed a positive correlation (r=0.73), indicating that, as the functional dependence of the elder increases, there is a significant increase in the use of assistive devices. The comparison of the means of the cognitive state and the use of assistive technologies yielded a statistical significance of p<0.001) (Table 2).

Table 2 – Demographic characteristics, cognitive state, and mean number of devices used by elders in the Home Care Service. Ribeirão Preto, SP, Brazil, 2018

Variables	N	Mean	Standard deviation	p*
Sex				
Male	57	7.32	0.41	0.480
Female	70	6.94	0.34	
Age (years)				
60 – 79	58	6.91	3.24	0.490
> 80	69	7.28	2.67	
Marital status				
Has a partner	59	7.36	3.11	0.380
Does not have a partner	68	6.90	2.79	
Cognitive state				
Shows deficit	24	5.17	3.10	<0.001
No deficit	103	7.56	2.72	

*Student's t-test

In Table 3, the result of the linear regression analysis indicates that a higher functional dependence is associated to the number of assistive devices used. In the BADL (r=0.52), as the score of the elder in the Katz Index grows, the number of assistive devices also grows. As for the Lawton and Brody Scale (r=-0.279), as it increases, the number of devices decreases.

Table 3 – Multiple linear regression between demographic characteristics and daily life activities associated with the use of assistive devices by elders attended by the Home Care Service. Ribeirão Preto, SP, Brazil, 2018

Variables	Beta	p*
Age	- 0.002	0.909
Sex (Female)	-0.314	0.371
Basic daily life activities	0.516	<0.001
Instrumental daily life activities	- 0.279	<0.001

*Multivariate linear regression

Discussion

Our results included important findings for the care of the elder with physical limitations and compromised cognitive state. The first is in regard to the high prevalence of elders (97.6%) who use some form of assistive technologies, the most common of which were orthosis or prosthesis, bath chairs and wheelchairs. The second shows an association between the number of assistive devices and the increased functional dependence of the elder.

The elderly attended by the home care service have a significant number of diseases, cognitive impairment, and are functionally dependent for daily life activities. This set of factors showed that elders and their relatives use devices to maintain their autonomy, especially in regard to mobility.

The use of assistive technologies can help the elder carry out many basic activities, such as moving, cooking, and caring for the house. It is especially useful for activities related with self-care and the loss of motor function[13]. These technologies can also be used in case of cognitive alterations, to improve the quality of life as they increase functional capacity, autonomy, independence, and social inclusion[14], in addition to minimizing losses due to aging[13].

As previously seen, functional capacity decrease and fragility are common demands in health service, since these two factors, in addition to the comorbidities commonly prevalent among elders, lead to a

reduction in their independence and autonomy which has a direct relation with decreases in their quality of life. In this regard, we could notice an increase in the use of assistive devices to increase the autonomy and quality of life of elders, as these aid them in basic and instrumental daily life activities, increasing their independence[12].

Regarding the use of assistive devices and their impact on the daily lives of participants, a cross-sectional study showed that elders who used these devices were frailer than those who did not[15]. Movement difficulties may also be related with the frailty syndrome. Among frail elders, 27.3% used assistive technologies and 19.3% depended on the help of caregivers to move and carry out their daily activities[16].

A Brazilian cross-sectional study with 339 elders above 60 years old pointed out that their main need for help was in locomotion, and the strategies used to attend this physical demand were assistive devices (27.3%) and caregiver support (19.3%)[14]. Among elders who lived in the community or in long stay institutions inland São Paulo, the most used devices were those to reestablish physical mobility[2]. Nonetheless, the use of inadequate technologies and of technologies aimed at making the caregiver's work easier can give a false sense of security to the elder, since it can impair the abilities that they still preserve by replacing them with the use of assistive devices[17].

In a study carried out in the United States, elders used mobility devices both to improve locomotion and gain a better sense of security. This study pointed out, as an advantage, the fact that they had at their disposal devices that could aid the maintenance of their autonomy and aid them in body hygiene, such as the bath chair[18]. No cognitive assistive devices were mentioned, but technologies that enable the performance of daily life activities were.

As aging increases and elders become affected by functional or cognitive impairment, the Single Health System started to provide assistive devices, but only after Home Care began in Brazil, as a part of the Health Care Network, their distribution became pos-

sible, increasing the access of the patient and their relatives. Another improvement was the participation of the multiprofessional team, especially of the nursing team, in the guidance and follow up of the elder[15-19].

With the involvement of nurses, elders with cognitive impairment or difficulties carrying out daily life activities are encouraged to adhere to assistive technologies[15], especially those who depend on continuous care and whose caregiver are overworked, responsible for home care and for the care of the elder. In these cases, assistive technologies are a way to decrease this overload and facilitate care[16,19].

In Brazil, studies with elders are still scarce, and the prevalence of the use of these devices is still unknown. Considering this, the National Research on Assistive Technologies Innovation III was published. Its goal was publishing results and analysis that could subsidize public policies that can improve the quality of life and social inclusion of people with deficiencies, decreased mobility, and the elderly[7,19]. This was an important step to recognize that these technologies are important tools to encourage the autonomy and self-care of the elder, especially those with limitations.

In regard to the professional setting and the use of assistive devices, an exploratory, descriptive study showed that the use of these methods empowers the health team, as they can provide educational actions about the use of these products, increasing the adherence of the elders[14].

Health workers should be aware that the use with no adequate guidance can be harmful to the elder instead of helping them in their daily activities. Workers from the Better at Home program mentioned that mobility assistive devices, such as wheelchairs, canes, crutches, and the use of orthosis and prosthesis as support for articulation mobility, are the most common to maintain the autonomy of elders[19]. The low adherence to the use of items to improve mobility is related to the functional inability of elders[13].

The health worker must identify the use of the assistive technologies and its adequate and permanent use. This would allow the elder to be more in-

dependent, and thus, more satisfied as they carry out their different activities, while decreasing the burden over caregivers.

In this regard, health workers must actively educate and empower elders and caregivers, using the benefits that assistive devices bring for their autonomy. The continuous use of the devices, in addition to attending to the main demands of users, reduces the burden of caregivers, which results in effective, integral, quality assistance.

Study limitations

The limitations of this study were its non-probabilistic sample and the fact that this type of study does not allow for the establishment of causal relations. Nonetheless, it presents important results, that can shed a light on the use of assistive technologies and how it can be implemented and optimized in the home care service. The site of data contributed may have led to a selection bias, since the home care service attends to patients with impaired physical mobility.

Contributions to practice

In regard to the contributions of this study for the practice of health workers, our results are relevant for the formation and permanent education of home-care professionals. It also provides data on the assistive technologies that are most commonly used by elders to maintain their autonomy and functional independence, collaborating to the planning of assistance and of actions to prevent health issues.

Conclusion

There was an association between functionality and the use of assistive technologies by elders at home. The higher the functional dependency, the higher the use of assistive devices, since the more dependent the elder is for basic or instrumental daily life activities, the higher the number of devices will be. These findings can aid in the attention and follow up of elders by health services, in order to maintain the autonomy and self-care capabilities of elders at home.

Authors' contribution

Concept, project, analysis, and data interpretation: Silva LM, Souza AC, Fhon JRS, Rodrigues RAP.
Writing and relevant critical review of the intellectual content: Silva LM, Souza AC, Fhon JRS, Rodrigues RAP, Santos LA, Gomes MFCT.
Final approval of the version to be published: Silva LM, Souza AC, Fhon JRS, Rodrigues RAP.
The ones subscribed below hereby accept being responsible for all aspects of this work, and guarantee that any issues regarding the precision or integrity of any of its parts can be properly investigated and dealt with: Silva LM, Fhon JRS.

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