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RESEARCH ARTICLE (ORIGINAL)

Effectiveness of rehabilitation nursing programs on balance, gait, and functional independence in hospitalized older people

Efetividade de programas de enfermagem de reabilitação no equilíbrio, marcha e independência funcional em idosos hospitalizados

Eficacia de los programas de enfermería de rehabilitación sobre el equilibrio, la marcha y la independencia funcional en ancianos hospitalizados

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Abstract

Background: The role of rehabilitation in balance, gait, and functional independence (BGFI) is essential for preventing functional decline in hospitalized older people.
Objective: To assess the effectiveness of a rehabilitation nursing exercise program (RNEP) on BGFI in hospitalized older people.
Methodology: A pre-experimental one-group pretest-posttest study was conducted with a non-probability convenience sample of 40 older people admitted to an Internal Medicine Unit. The intervention consisted of the implementation of a daily multicomponent RNEP that was created for this purpose. The questionnaire included a section for sociodemographic and clinical characterization, the Functional Independence Measure, and the Tinetti Test.
Results: After seven RNEP sessions, significant positive variations in the mean scores were found: 45% for balance ($p < 0.001$), 48.8% for gait ($p < 0.001$), and 15.5% for functional independence ($p < 0.001$), revealing the program's effectiveness.
Conclusion: The RNEP seems to be effective in improving and restoring BGFI in hospitalized older people, thus it should be systematically and daily applied to this population.

Keywords: elderly; rehabilitation nursing; postural balance; gait; physical functional performance; hospitalization

Resumo

Enquadramento: O papel da reabilitação no equilíbrio, marcha e independência funcional (EMIF), afigura-se relevante na prevenção do declínio funcional do idoso hospitalizado.
Objetivo: Avaliar a efetividade de um programa de exercícios de enfermagem de reabilitação (PEER) no EMIF em idosos hospitalizados.
Metodologia: Estudo pré-experimental de grupo único com pré-pós teste, em amostra não probabilística por conveniência, em 40 idosos internados num serviço de medicina interna. A intervenção consiste na implementação diária de um PEER multicomponente criado para o efeito.
O questionário inclui uma secção de caracterização sociodemográfica e clínica, Medida de Independência Funcional e teste de Tinetti.
Resultados: Após sete sessões do PEER observou-se variação positiva significativa de 45% na média de valores de equilíbrio ($p < 0,001$), de 48,8% na marcha ($p < 0,001$) e de 15,5% na independência funcional ($p < 0,001$), revelando a eficácia do programa.
Conclusão: O PEER parece ser efetivo na melhoria e restabelecimento do EMIF dos idosos hospitalizados, sugerindo-se a sua aplicação diária e sistematizada nesta população.

Palavras-chave: idoso; enfermagem em reabilitação; equilíbrio postural; marcha; desempenho físico funcional; hospitalização

Resumen

Marco contextual: El papel de la rehabilitación en el equilibrio, la marcha y la independencia funcional (EMIF) parece ser relevante en la prevención del deterioro funcional en ancianos hospitalizados.
Objetivo: Evaluar la eficacia de un programa de ejercicios de enfermería de rehabilitación (PEER) en el EMIF en ancianos hospitalizados.
Metodología: Estudio preexperimental de grupo único pretest y postest en una muestra no probabilística de conveniencia en 40 pacientes ancianos ingresados en un servicio de medicina interna. La intervención consiste en la aplicación diaria de un PEER multicomponente creado para este fin.
El cuestionario incluye una sección sociodemográfica y de caracterización clínica, la Medición de la Independencia Funcional y el test de Tinetti.
Resultados: Después de siete sesiones del PEER se observó una variación positiva significativa del 45% en la media de los valores de equilibrio ($p < 0,001$), del 48,8% en la marcha ($p < 0,001$) y del 15,5% en la independencia funcional ($p < 0,001$), lo que demuestra la eficacia del programa.
Conclusión: El PEER parece ser eficaz para mejorar y restaurar el EMIF de los ancianos hospitalizados, por lo que se sugiere su aplicación diaria y sistemática a esta población.

Palabras clave: anciano; enfermería en rehabilitación; equilibrio postural; marcha; rendimiento físico funcional; hospitalización

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Introduction

Population aging is becoming more and more a reality in today's societies resulting from the increase in longevity and consequent increase in average life expectancy and the decline in the birth rates. Considering that all forecasts indicate that this trend will continue over the next 50 years and that the number of hospitalized older people (people aged 65 years or more) is expected to increase considerably (Tavares et al., 2020), there is an urgent need to improve and redirect the provision of health care to these older populations.

Aging causes several physiological changes in organs and systems, which, according to Martins et al. (2017), can lead to balance deficits and gait alterations that predispose older people to falls and functional limitations. Thus, older people are more susceptible to disease and hospitalization, which may have a negative impact on their mobility. Functional decline may occur during hospitalization, and, in many cases, it cannot be attributed to the acute medical problem for which the person was admitted to the hospital, but rather to personal factors such as age, socio-economic status, vision and hearing problems, decreased mobility, decreased functional and cognitive status, and iatrogenic factors such as bed immobilization, infections, pressure ulcers, comorbidities, and balance disorders (Tavares et al., 2021).

Functional decline during hospitalization may lead to physical deconditioning and changes in strength, endurance, joint range of motion, among others, that will inevitably influence functional mobility and gait. Marques-Vieira et al. (2016) refer to the spiral of functional loss that can lead to a decline in gait ability, hindering access to a set of functional physical activities including self-care, instrumental, and work activities, with a consequent decrease in muscle strength. In turn, this decrease influences movement, leading to a vicious cycle between inactivity and weakness. In addition, gait instability will contribute to loss of balance in older people.

Given that most hospitalized older people have significant dependence levels, increased risk of falls, and even gait and balance disorders, this issue becomes more relevant, thus emerging the need to implement rehabilitation programs focused on balance training, muscle strength, and adequacy of walking aids (Martins et al., 2016). Nurses specialized in rehabilitation nursing play an essential role due to their specific competencies.

Based on these assumptions, this study aimed to assess the effectiveness of a rehabilitation nursing exercise program (RNEP) on balance, gait, and functional independence in hospitalized older people.

Background

The human aging process is associated with several structural and functional changes, from those in metabolism and damage to cells and systems to the resulting diseases. In older people, these aspects lead to disabilities in most organic systems, with the changes leading to the loss of musculoskeletal and cerebral integration being the main causes for mobility and balance changes (Esquenazi et al., 2014). In turn, gait and balance limitations are among the main predisposing and risk factors for older people's immobility syndrome (Martínez-Velilla et al., 2016).

Together with aging, functional capacity has been taking a prominent place that should be reflected upon. Although aging is not synonymous with disease and disability, it leads to a progressive reduction in functional capacity, which, in many cases, makes individuals dependent on others to meet the basic needs that they were previously able to meet with autonomy and independence (Marvanejo, 2017).

Fermento et al. (2019) argue that dependence cannot be seen as a watertight, permanent, and static condition, pointing to the importance of implementing adjusted and appropriate interventions that can modify, reduce, postpone, and even prevent it.

Considering the changes in self-care ability, rehabilitation nurses' interventions should focus on both maximizing individuals' functional potential and minimizing their disabilities (through adaptive strategies), allowing them to use their maximum self-care potential (Petronilho et al., 2017).

One of the competencies of rehabilitation nurses is to design and implement interventions aimed to "optimize and/or re-educate motor, sensory, cognitive, cardiorespiratory, feeding, elimination, and sexuality functions and the performance of Activities of Daily Living (ADLs)" and "implement motor and cardiorespiratory training programs" (Ordem dos Enfermeiros, 2019, p. 13566-13568).

These programs are important for maintaining/restoring mobility while maximizing self-care autonomy. On the other hand, it should be noted that improving hospitalized older people's mobility skills, namely balance and gait, may also improve the conditions for caring for these older people after hospital discharge. In the current demographic reality and socio-cultural context, many older people return home to be cared for by relatives (spouses or others) who are also part of the same age group, with dependence playing a potentially key role in the family's well-being and functional dynamics.

Research question

Does the implementation of the RNEP proposed in this study have a beneficial effect on hospitalized older people's balance, gait, and functional independence?

Methodology

A quantitative, pre-experimental, one-group pre-test-posttest study was carried out in a non-probability convenience sample consisting of 40 older people admitted to internal medicine units of a hospital in the central region of Portugal. The following inclusion criteria were applied: aged 65 years or older; impaired balance and gait

(Tinetti test); complete (up to 18 points) or modified dependence (up to 103 points; Functional Independence Measure); and acceptance of the implementation of the rehabilitation program. Data were collected during June and July 2018, after a positive opinion from the hospital's Ethics Committee (Opinion no. CHUC-135-17). Participation in the program was voluntary, with all participants signing the informed consent. The procedures were carried out following the ethical principles of the Declaration of Helsinki.

A data collection instrument was used to assess the variables. It included a section for sociodemographic characterization, a second one for clinical characterization, and two scales: (a) the Functional Independence Measure (Direção-Geral da Saúde, 2011) and (b) the Tinetti Test (Apóstolo, 2012).

The RNEP (Table 1) was built for this purpose following several steps: 1) an exhaustive review of the studies on the topic based on recent scientific evidence, taking into account the target population and the deficits under study; and 2) analysis of the latest international recommendations on physical activity for older people (type of exercise, intensity, duration, and frequency), studies on types of exercise and rehabilitation programs in frail older people (strength training, flexibility training, aerobic endurance, and balance training), studies on the results of multicomponent training in frail older people (balance, gait, and functional independence), and studies on principles of exercise prescription in frail older people. The RNEP was implemented by three rehabilitation nurses for 7 consecutive days. They carried out the program established by the researcher after being duly informed about its implementation. They assessed balance, gait, and functional independence in the first session with the patients and after the implementation of the seven RNEP sessions.

Table 1

Rehabilitation nursing exercise program

General characteristics of the exercise plan		
1 - Type of exercise: Multicomponent (strength training, flexibility training, balance training including vestibular rehabilitation, coordination and proprioception exercises, and aerobic endurance training) 2 - Intensity: Very mild to moderate; On a scale of 0-10 for perceived exertion, 5-6 for moderate intensity. 3 - Duration: 1 week or hospitalization period up to 4 weeks; 30-50 minutes per training session (including warm-up, fundamental part, and return to calm) that can be divided into periods of no less than 10 minutes. 4 - Frequency: daily. 5 - Progression: slow and gradual increase in duration, frequency, and intensity throughout the program.		
Warm-up	10 min; low intensity	Cyclic movement of the lower limbs on a cycle ergometer
Strength training	1 set – 10 repetitions; Mild intensity(40%-50% of 1-RM) to moderate intensity (60%-70% of 1-RM	1-“Hip flexion/extension” 2-“Hip abduction/adduction” 3-“Hip internal/external rotation” 4-“Knee flexion/extension” 5-“Plantar flexion” 6-“Plantar flexion” 7-“Bridge” 8-“Wall slides or standing squats” 9-“Sitting-up training”
Flexibility training	1 set of each exercise; 15-30 seconds each stretch	Passive joint mobilizations of the lower limbs with continuous static stretching (hip, knee, tibiotarsal, toes)
Balance training	About 10 minutes of training; 3 sets of each exercise, maintaining the balance position for 10 seconds each; during vestibular exercises, stimulation should last 1 to 2 minutes	1-“Keep eyes closed and feet together” 2- “Keep balance with one foot in front of the other” 3- “Alternate the load on the lower limbs” 4 - “Walking with one foot immediately in front of the other” 5- “Walking a straight line” 6- “Step exercises” 7- “Standing on one leg” 8 - “Weight-shifting (from one leg to the other)” 9 - “Standing with eyes closed and feet together on a foam surface” 10-“Walking on uneven ground” 11-“Walking while turning head side to side” Vestibular: 12-“Moving head up and down and turning head side to side, keeping the eyes focused on a target” 13-“While sitting, bend forward and pick up an object from the floor” Proprioception: 14-”Walking for alternate periods with eyes closed” 15-“Sitting or standing exercises with a dynamic cushion”
Aerobic endurance training	30 minutes per day (for periods of at least 10 minutes each); Mild (up to 4) to moderate intensity (5-6) on a 0-10 scale for perceived exertion	Walking (with changes of pace and direction) Going up and down stairs
Return to calm	10 min; low intensity adjusting the physiological response to the starting level	Cyclic movement of the lower limbs on a cycle ergometer
Other important considerations for training		
- Physical activity sessions should start with a warm-up and end with an appropriate “return to calm” - Beginners and people with physical deconditioning, chronic diseases, or functional limitations should participate in mild intensity and duration exercises - Progression in exercise should be individualized - Machine-based strength training sessions should be supervised by professionals, at least at the beginning of the program - Obese or overweight older people may benefit from a progression of at least 250 minutes per week of moderate-intensity exercise - 1-RM corresponds to the maximum amount of weight a person can lift for one repetition in the full range of motion - Multicomponent training programs should combine gradual increases in exercise volume, intensity, and complexity and muscular endurance, aerobic endurance, and balance exercises.		

Note. RM = repetition maximum.

The scales were applied before and after the implementation of the program. Then, the questionnaires were checked for completeness, and data were entered into a database for further statistical treatment using IBM SPSS Statistics, version 22.0 for Windows. Descriptive and inferential statistics were used. The skewness and kurtosis values were assessed to check for the normality of the variables. Parametric tests were used whenever the entire sample was used as a group. The Student's *t*-test for paired samples was used to compare the values of the functional capacity components (balance, gait, and functional independence) obtained before and after the implementation of the RNEP. In the statistical tests, 95% confidence intervals and/or a significance level of $p < 0.05$ were considered.

Results

As for the sociodemographic characteristics, participants ($n = 40$) were aged 65 to 91 years, with a mean age of 77 years, and were mostly men (75%; $n = 30$). The majority of them had completed the 4th grade (80%; $n = 32$), lived with their spouse (45%; $n = 18$), and their households consisted of one or two people (75%; $n = 30$). Concerning their clinical characteristics, 45% ($n = 18$) were hospitalized with a diagnosis of respiratory illness, had two or more clinical antecedents, were polymedicated (≥ 5 medications) with drugs that are part of pharmacological groups identified in the literature as causing potential balance and gait alterations, and had vision (90%; $n = 36$) and hearing problems (80%; $n = 32$).

Concerning balance, gait, and functional independence (Table 2), participants had low mean scores at the first moment of assessment, indicating severe deficits in the analyzed dimensions. However, after the implementation of the RNEP (7 consecutive days), the mean balance scores increased by 45% (from 1.73 to 8.93, with a maximum of 16), the mean gait scores by 48.8% (from 1.08 to 6.93, with a maximum of 12), and the mean functional independence scores by 15.5% (from 45.08 to 64.63, with a maximum of 126).

Table 2

Results for the variables of balance, gait, and functional independence before and after the program

		N	Min.	Max.	*M*	*SD*	SK/error	K/error	CV (%)
Balance (range 0-16)	1st Assessment	40	0.0	4.0	1.73	1.30	0.67	-1.16	75.14
	2nd Assessment	40	0.0	15.0	8.93	2.55	-0.32	5.99	28.56
Gait (range 0-12)	1st Assessment	40	0.0	4.0	1.08	1.44	2.83	-0.36	133.33
	2nd Assessment	40	0.0	12.0	6.93	3.35	-1.26	-0.82	48.34
Functional Independence (range 18-126)	1st Assessment	40	18.0	74.0	45.08	16.18	0.58	-1.44	35.90
	2nd Assessment	40	18.0	116.0	64.63	21.23	1.40	0.46	32.85

Note. M = mean; *SD* = standard deviation; SK = skewness; K = kurtosis; CV = coefficient of variation.

As far as functional capacity is concerned, at the first moment of assessment, 75% of participants had modified dependence (with assistance of 25% to 50% of the task). No case of independence was found. After implementation of the RNEP, participants with complete dependence decreased from 5% to 2.5%, participants with modified dependence (with assistance up to 50% of the task) decreased from 75% to 40%, participants with modified dependence (with assistance up to 25% of the task) increased from 20% to 52.5%, and participants with modified independence increased from 0% to 5% (Table 3).

Table 3

Assessment of functional independence by dependence levels

	1st Assessment		2nd Assessment	
Levels of Functional Dependence	*n*	%	*n*	%
Complete Dependence (18 points)	2	5.0	1	2.5
Modified Dependence with assistance up to 50% of the task (19-60 points)	30	75.0	16	40.0
Modified Dependence with assistance up to 25% of the task (61-103 points)	8	20.0	21	52.5
Modified Independence (104-125 points)	0	-	2	5.0
Complete Independence (126 points)	0	-	0	-
TOTAL	40	100.0	40	100.0

The inferential analysis revealed statistically significant associations between the two moments of assessment (before and after the intervention) regarding balance ($p < 0.001$), gait ($p < 0.001$), and functional independence ($p < 0.001$; Table 4).

Table 4

Student's t-test for the difference of means of balance, gait, and functional independence between the first and second assessment moments

Balance	*N*	*M*	*SD*	*t*	*p*
1st Assessment	40	1.73	1.30	-15.149	< 0.001
2nd Assessment	40	8.93	2.55		
Gait	N		*DP*	*t*	*p*
1st Assessment	40	1.08	1.44	-10.952	< 0.001
2nd Assessment	40	6.93	3.35		
Functional Independence	N		*DP*	*t*	*p*
1st Assessment	40	45.08	16.18	-9.805	< 0.001
2nd Assessment	40	64.63	21.23		

Note. M = mean; *SD* = standard deviation; *t* = Student's *t*-test; *p* = significance level.

Discussion

The sociodemographic characteristics of this sample are in line with other studies recently conducted in Portugal with similar populations (Marques-Vieira et al., 2016; Tavares et al., 2020). This group of older adults had a mean age of 77 years, with 52.5% in the 75-84 age group. Although it is known that age alone is not a determinant factor for decreased balance, gait, and functionality, many studies have found a strong association (Lobo, 2012). Similarly, this aspect may justify the low values found in the first assessment conducted in this study (and before implementation of the RNEP), with severe deficits in balance, gait, and functional independence.

The longitudinal comparison of the findings revealed statistically significant differences between both moments of assessment ($p < 0.001$), with a significant increase in older people's mean balance scores between the first and the second assessment (45%), that is, before and after implementation of the RNEP. Similarly, in a review of seven studies implementing multicomponent programs, Cadore et al. (2013) found a mean improvement in older people's balance ranging from 5% to 80%.

Concerning gait, the longitudinal comparison of the findings revealed statistically significant differences between both moments of assessment ($p < 0.001$), with a significant increase in older people's gait between the first and the second moments of assessment (48.8%). Cadore et al. (2013) also found a mean improvement in older people's gait ranging from 4% to 50% in six studies. Among these studies, three applied multicomponent training, two applied strength training, and one applied endurance training combined with yoga.

Rodrigues (2019) corroborates this finding by stating that, despite the multifactorial etiology of gait instability in old-

er people with mild to moderate functional impairment, interventions for reducing gait instability can effectively provide a more consistent and stable gait pattern.

The longitudinal comparison of the functional independence variable also revealed statistically significant differences between both moments of assessment ($p < 0.001$), with a 15.5% increase in older people's functional independence after implementation of the program. These data suggest that the multicomponent training implemented in the study leads to a significant improvement in older people's functional status. Other international studies, such as that conducted Martínez-Velilla et al. (2016), have reached the same conclusions, demonstrating the positive effect of multicomponent training in increasing the functional capacity of institutionalized older people with a very poor physical condition.

For these authors, exercise and rehabilitation programs are mechanisms that can prevent functional decline during hospitalization. They also mention that, due to its clinical, biological, and even economic benefits (already confirmed), exercise emerges as an important factor in the wide range of therapies available to health professionals. Rodrigues (2019) further states that multicomponent exercise programs are the most effective interventions to delay functional disability and other adverse events associated with frailty in older people. Moreover, Caldas et al. (2020) emphasize the ability of multicomponent training interventions to reduce the incidence of falls and, consequently, prevent disability, morbidity, and death.

The increase in functional capacity found in this study (after implementation of the RNEP) is even more significant when compared to the prevalence of functional decline during hospitalization found by Tavares et al. (2018), which was 54.5% at hospital discharge. Menezes et al. (2010) reinforce this aspect by directly associating hospitalization with a certain degree of immobility in any individual, which in older people can quickly trigger a process of functional decline. In a study on functional decline and the risk of falls in hospitalized older people, Sousa (2014) points out the close connection that seems to exist between a situation of acute illness and the loss of ability to self-perform ADLs.

It should be noted that none of the older adults receiving the rehabilitation nursing program showed any negative side effects, indicating that the characteristics of this training program were well adjusted in terms of type of exercise, intensity, duration, frequency, and progression to the target subjects' characteristics. The authors of this study are also unaware of similar studies carried out in hospitalized older people (undergoing an acute illness process) in Portugal.

In addition, these results point to the emerging need for nurses, particularly rehabilitation nurses, to invest more in the implementation of multicomponent programs (still underexplored) to maximize the functional potential of older people (hospitalized or in community settings) from a perspective of promotion and continuity of care and as one of the pillars of the National Health Service. This resource can be very beneficial for individuals, families, and society in general.

The limitations of the study include the use of a non-probability convenience sample, which hampered the generalization of results with statistical accuracy; the fact that all patients with these characteristics undergo rehabilitation programs in the institution where the study took place, which prevented the creation of a control group because it would not be ethically acceptable to exclude some of the hospitalized older people from these programs; the short periods of hospitalization, for which reason a period of assessment of the rehabilitation process of only one week was established, despite the 4-week period recommended in the literature.

Conclusion

Population aging is today an undeniable phenomenon that brings with it problems related to the loss of functional capacity, with social, familial, and economic consequences, among others. Therefore, at this level, there is a need for specific care capable of assuming a relevant role in facing these new challenges.

The hospitalized older patients in this study significantly improved their recovery potential. Positive variations of 45% were found in mean balance scores, 48.8% in gait, and 15.5% in functional independence, which reflects the effectiveness of this NREP.

The contributions of rehabilitation nursing to older people's loss of functional capacity are undeniable and confirmed every day in our hospital experience. Few studies have been conducted in this area, justifying the recommendation of the Portuguese nursing and midwifery regulator (Ordem dos Enfermeiros) in 2015 on the need to develop studies on the effectiveness of rehabilitation nursing interventions as a priority area for research in Portugal.

This study aimed to fill in this gap and demonstrate that these professionals can play an important role in preventing and even reversing functional decline during hospitalization (or even before) through the program presented and made available here. The authors of this study suggest its daily and systematized application in this population.

Despite the benefits of rehabilitation nurses' intervention during older people's hospitalization, the authors of this study believe that these interventions can be enhanced if implemented with the collaboration of primary health care professionals, particularly rehabilitation nurses who are part of integrated continuous care teams of the community care units, giving continuity to the rehabilitation process and maintaining the desired functional capacity.

Author contributions

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References

Apóstolo, J. L. (2012). *Instrumentos para avaliação em geriatria (geriatrics instruments)*. https://web. esenfc. pt/v02/include/download

Cadore, E. L., Rodríguez-Mañas, L., Sinclair, A., & Izquierdo, M. (2013). Effects of different exercise interventions on risk of falls, gait ability, and balance in physically frail older adults: A systematic review. *Rejuvenation Research*, *16*(2), 105-114. https://doi:10.1089/rej.2012.1397

Caldas, L. R., Albuquerque, M. R., Lopes, E., Moreira, A. C., Ribeiro, A. Q., & Carneiro-Júnior, M. A. (2020). Multicomponent physical training increases strength, agility and dynamic balance in middle-aged women. *Revista Brasileira de Fisiologia do Exercício, 19*(6), 478-488. https://doi.org/10.33233/rbfex.v19i6.4041

Direção-Geral da Saúde. (2011). *Acidente vascular cerebral: Prescrição de medicina física e de reabilitação*. https://www.dgs.pt/directrizes-da-dgs/normas-e-circulares-normativas/norma-n-0542011-de-27122011-jpg.aspx

Esquenazi, D., Silva, S. B., & Guimarães, M. A. (2014). Aspectos fisiopatológicos do envelhecimento humano e quedas em idosos. *Revista Hospital Universitário Pedro Ernesto*, *13*(2), 11-20. https://doi:10.12957/rhupe.2014.10124

Fermento, C., Martins, R., & Campos, S. (2019). Investimento pessoal e independência funcional: Estudo dos níveis e dos determinantes num grupo de idosos. *Revista Servir, 60*(1-2), 75-84. https://www.aceps.pt/images/Revista_SERVIR_final_24.12.pdf

Lobo, A. J. (2012). Relação entre aptidão física, atividade física e estabilidade postural. *Revista de Enfermagem Referência*, *3*(7), 123-130. https://doi:10.12707/RIII1181

Marques-Vieira, C. M., Sousa, L. M., Carias, J. F., & Caldeira, S. M. (2016). Nursing diagnosis" impaired walking" in elderly patients: Integrative literature review. *Revista Gaúcha de Enfermagem*, *36*(1),104-111. https://doi:10.1590/1983-1447.2015.01.48602

Martínez-Velilla, N., Cadore, E. L., Casas-Herrero, A., Idoate-Saralegui, F., & Izquierdo, M. (2016). Physical activity and early rehabilitation in hospitalized elderly medical patients: Systematic review of randomized clinical trials. *Journal of Nutrition, Health & Aging, 20*(7), 738-751. https://doi: 10.1007/s12603-016-0683-4

Martins, R., Andrade, A., Martins, C., & Campos, S. (2017). Physical activity in the elderly: Importance in balance and risk of falls. *The European Proceedings of Social & Behavioural Sciences*, 67-73. https://doi:10.15405/epsbs.2017.06.9

Martins, R., Campos, D., Moreira, H., Albuquerque, C., Andrade, A., & Martins, C. (2016). Prevalência e determinantes do risco de queda em idosos institucionalizados. *Millennium, 2*(esp.1), 185-192. http://revistas.rcaap.pt/millenium/article/viewFile/10062/7404

Marvanejo, D. J. (2017). *Funcionalidade dos utentes internados no domicílio em equipas de cuidados continuados integrados, ECCI: Intervenção do enfermeiro especialista em enfermagem de reabilitação* [Master's dissertation, Polytechnic Institute of Viseu]. Repositório Institucional do Instituto Politécnico de Viseu. https://repositorio.ipv.pt/bitstream/10400.19/4507/1/DuarteJoseDraqueMarvanejo%20Dm.pdf

Menezes, C., Oliveira, V. R., & Menezes, R. L. (2010). Repercussões da hospitalização na capacidade funcional de idosos. *Revista Movimenta*, *3*(2), 76-84. http://repositorio.unb.br/bitstream/10482/11682/1/ARTIGO_RepercussoesHospitalizacaoCapacidade.PDF

Ordem dos Enfermeiros. (2019). *Regulamento das competências específicas do Enfermeiro Especialista em Enfermagem de Reabilitação*. https://dre.pt/web/guest/pesquisa/-/search/122216893/details/normal?l=1

Petronilho, F. A., Pereira, C. M., Magalhães, A. I., Carvalho, D. M., Oliveira, J. M., Castro, P. R., & Machado, M. M. (2017). Evolução das pessoas dependentes no autocuidado acompanhadas na Rede Nacional de Cuidados Continuados Integrados. *Revista de Enfermagem Referência*, *14*(4), 39-48. https://doi.org/10.12707/RIV17027

Rodrigues, K. P. (2019). *Treinamento combinado versus multicomponente em parâmetros de saúde de mulheres de 50 a 75 anos: Associação com variantes genéticas* [Master's dissertation, University of São Paulo]. Repositório Institucional da Universidade de São Paulo. https://doi.org/10.11606/D.109.2020.tde-29112019-122600

Sousa, J. M. (2014). *Declínio funcional e o risco de queda no idoso hospitalizado* [Master's dissertation, Nursing School of Coimbra]. Repositório Institucional da Escola Superior de Enfermagem de Coimbra. http://repositorio.esenfc.pt/?url=IKixlQ81

Tavares, J. P., Grácio, J., & Nunes, L. V. (2020). Eficácia da implantação do cuidado centrado na funcionalidade no declínio funcional: Um estudo quase-experimental. *Revista de Enfermagem Referência, 5*(2), e20012. https://doi:10.12707/RV20012

Tavares, J., Grácio, J., & Nunes, L. (2018). Hospitalized older adults: Functional trajectory in a Portuguese hospital. *Revista de Enfermagem Referência*, *4*(18), 19–28. https://doi:10.12707/RIV18028

Tavares, J. P., Nunes, L. A., & Grácio, J. C. (2021). Pessoa idosa hospitalizada: Preditores do declínio funcional. *Revista Latino-Americana de Enfermagem*, *29*, e3399. https://doi.org/10.1590/1518-8345.3612.3399