The impact of biological frailty syndrome on quality of life of nursing home residents

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1.1 Introduction

Increased longevity is a social success that also implicitly entails enormous challenges: adding years to life often implies the management of more geriatric syndromes and higher mortality and disability rates. Although disease and disability are not inevitable consequences of human ageing, the risk of being affected by them considerably increases with age ([Baltes & Smith, 2003](#)).

The concept of frailty is becoming increasingly relevant in the field of geriatric care, although its precise definition remains disputed ([Clegg, Young, Iliffe, Rikkert, & Rockwood, 2013](#)). Ageing is associated with a functional decline; however, its morbidity varies: the decline is faster and leads to increased morbidity and mortality in some individuals, yet others remain robust despite their advanced age. Clinicians and researchers use the notion of frailty to help them understand the heterogeneous nature of human ageing (Zaslavsky, Thompson, & Demiris, 2012) and the literature describes three main theoretical models to explain it. [Rockwood and Mitnitski \(2011\)](#) consider it to be a variable state of health resulting from the accumulation of deficits, [Fried et al. \(2001\)](#) understand it as an interrelated biological syndrome but differentiate it from disease and disability, and [Gobbens, Van Assen, Luijkx, and Schols \(2012\)](#) take a comprehensive view of frailty.

The proposal by [Fried et al. \(2001\)](#) has received a broad consensus, is widely used in clinics and in research ([Morley et al., 2013](#); [Santos-Eggimann, Cuénoud, Spagnoli, & Junod, 2009](#)), and represents considerable progress in the understanding and exploration the pathophysiology of frailty. They define frailty as a biological syndrome characterized by a decline in reserves and resistance to stressors resulting from an accumulation of deficits in multiple physiological systems, which causes vulnerability and adverse effects on health. The five frailty criteria that they proposed, the “*frailty phenotype*” (unintentional weight loss, muscular weakness, low energy, slow ambulation speed, and low physical activity) were extensively tested in the Cardiovascular Health Study (CHS). Those with none of the above components were considered as robust, whereas those with one or two components were considered as pre-frail and those with more than two components as frail. The CHS results showed that there was a greater tendency toward frailty in women, as well as an association between frailty and poorer health results: mortality, disability, and hospitalization. Numerous studies later used the same criteria and produced similar results ([De La Rica-Escuín et al., 2014](#); [Díaz De León, Tamez, Gutiérrez, Cedillo, & Torres, 2012](#); [Szanton, Allen, Seplaki, Bandeen-Roche, & Fried, 2009](#)).

Research has also revealed a number of important demographic, physical, and psychological factors that influence health conditions and health-related quality of life (HRQoL). For example, HRQoL tends to diminish as people age because the risk of developing chronic diseases and disabilities increases ([Weisscher, de Haan, & Vermeulen, 2007](#)). However, other factors also affect HRQoL in the elderly, including pain, environmental characteristics, cognitive decline, resilience, diminished perception of purpose in life, symptoms of depression, isolation, and loneliness also determine their scores ([Bowling & Iliffe, 2011](#); [Drageset et al., 2009](#); [Scocco, Fantoni, & Caon, 2006](#); [Sitoh et al., 2005](#)). Seniors who live in residencies tend to have more chronic diseases and disability problems than those living in the community ([Cordeiro, Paulino, Bessa, Borges, & Leite, 2015](#)), and in addition, as noted by [Murphy, Cooney, and Casey \(2014\)](#), the nursing home residential environment is routine and institutionalized which may compromise the HRQoL of its residents. Therefore, the focus in health care should not be limited only to treating disease: the attention given to nursing home residents must also include measures to improve their HRQoL scores. In this sense, evaluating the HRQoL in the residents of assisted-care homes would allow professionals to better understand the experiences of

these seniors regarding the impact personal health and environmental conditions have on the lives of these individuals (Sitoh et al., 2005).

Extensive literature is available on both frailty and HRQoL, but has not yet been sufficiently explored the association between these variables. Although a strong a priori association between frailty syndrome and HRQoL is expected, there is little evidence available that reveals the effect of frailty on HRQoL in elderly populations. These studies suggest an inverse relationship between frailty and HRQoL in community-dwelling seniors (Bilotta et al., 2010; Chang et al., 2012; Kojima, Iliffe, Jivraj, & Walters, 2016; Lin et al., 2011) and those who live in residencies for the elderly (Cordeiro et al., 2015; Kanwar et al., 2013). However, to our knowledge, still little is known about any possible gender differences in this respect. Studies do not usually offer analyses differentiated by sex, despite the fact that the experiences and consequences of being frail may substantially differ between men and women, especially in terms of its impact on HRQoL. Moreover, because frailty is a biological syndrome it is not clear how it impacts the mental dimension of the HRQoL.

The residential environment provides us with a good opportunity to study the characteristics of the relationship between frailty and HRQoL. The elderly living in residencies present a very high prevalence of frailty: Kojima (2015) estimates it at between 19% and 75.6% in his review, figures that are closely paralleled by the HRQoL scores (Sitoh et al., 2005). Therefore, the purpose of our study was to explore the differences in the prevalence of biological frailty syndrome between men and women in a population of seniors without severe cognitive decline who live in assisted-care residencies. In addition, we also studied the association between these two prevalencies and clinical and psychosocial variables, as well as their impact on the physical and mental dimensions of HRQoL.

2.2 Methods

2.1.2.1 Design

We used a cross-sectional, descriptive, multicentric, and multistage sampling design to examine the relationships between frailty and demographical, clinical, functional, psychological, and HRQoL variables in seniors without severe cognitive decline who live in assisted-care residencies in Cuenca, Spain. The ethics committee at the *Virgen de la Luz* hospital in Cuenca and the provincial social welfare delegation approved the study protocol. All of the participants gave their informed consent and the investigators promise to maintain the anonymity and confidentiality of the data.

2.2.2.2 Participants and setting

Residences for the elderly in Spain are heterogeneous in their size, facilities, and the economic cost to their occupants. In order to obtain a representative sample, in the first stage of the study we selected residences in the Cuenca health area using the inclusion criteria that they must provide a continuous nursing service and must have ~~more than 60~~ **> 60** places. Sixteen residences met these requirements and agreed to participate (nine in urban and seven in rural environments).

In the second stage, we selected the participants by systematic and proportional random sampling. We numerically ordered a list of elderly occupants at each residence and subsequently selected those in position three or a multiple of three at each one. According to these criteria, there were 600 potentially eligible participants. The exclusion criteria were: a medical diagnosis of dementia or a score of ~~less than 18~~ **< 18** in a cognitive examination (this cut-off point is used in the CHS by Fried et al. (2001) when validating the frailty syndrome markers); hospitalization during the data collection phase; presentation of neoplastic processes; or having been bedridden in the previous month. The main cause of exclusion (86.2%) was a diagnosis of dementia or severe cognitive decline (a highly prevalent problem in residencies for the elderly) followed by residents being bedridden (6.3%), hospitalizations during the data collection phase (4.7%), or those who did not wish to participate in the study (2.8%). Two-hundred-and eighty-one elderly residents finally met the inclusion criteria and gave their informed consent.

2.3.2.3 Measurements

The interviews were carried out in the residents' rooms and were conducted by previously trained researchers. We used a closed, structured questionnaire that included socio-demographic variables (age, sex, marital status, and education level), and used the following measurement instruments:

2.3.1.2.3.1 Frailty measures

Frailty was evaluated using criteria proposed by Fried et al. (2001) with some modifications that have been applied in other studies. Unintentional weight loss was determined by a positive response to any of the following questions: "In last year have you lost more than 4.5 Kg of weight without wanting to?" or "In the last year has your interest in food diminished resulting in you losing weight?" (Santos-Eggimann et al., 2009). Weakness was determined by a positive response to the following observation: "the subject has difficulty getting up from a chair without using their arms for support" (Ávila-Funes et al., 2011). Exhaustion was determined by a positive response to item 13 on the geriatric depression scale: "do you feel like you don't have any energy every day?" Slowness was determined as a positive response to the following observation: "it takes the subject more than five seconds to walk three meters" (Gallucci, Ongaro, Amici, & Regini, 2009). Low activity was determined as a positive response to any of the following questions: "Do you walk for less than 30 minutes a day on an ongoing basis?", "Do you sit for most of the day?" The elderly person was considered frail when they met at least three criteria and non-frail when they met one,

two, or no criteria.

2.3.2.2.3.2 *Health-related quality of life*

To evaluate the HRQoL we used the SF-12 (v2) questionnaire, a reduced version of the SF-36 (Ware, Kosinski, & Keller, 1996). The SF-12 is a generic instrument widely used to measure health status. It provides two summary measures of HRQoL, the physical component score (PCS) and the mental component score (MCS) which range from 0 to 100, with higher scores indicating a better HRQoL score.

2.3.3.2.3.3 *Co-morbidity*

Co-morbidity was determined by recording the presence or absence of the following chronic diseases on the participants clinical medical records: cardiovascular disease, hypertension, stroke, pulmonary disease, arthritis, diabetes mellitus, or mental disorders. Infectious diseases and acute problems were excluded. Comorbidity was calculated using the sum of the evaluated variables and ranged between 0 and 7.

2.3.4.2.3.4 *Physical function*

Functional capacity was assessed using the Barthel index (Mahoney & Barthel, 1965) which consists of 10 items and measures the degree of disability with respect to the activities of daily living (ADL): eating, washing, dressing, grooming, bowel control, urination control, toilet use, movement between places, ambulation, and stair climbing. It ranges from 0 to 100, and the higher the score, the greater the level of independence.

2.3.5.2.3.5 *Cognitive status*

Cognitive function was determined using the Spanish version (Lobo et al., 1999) of the mini mental-state examination [MMSE] (Folstein, Folstein, & McHugh, 1975). The MMSE is a simple and quick test that allows reliable and valid estimates of cognitive performance to be obtained. It ranges from 0 to 30, and the higher the score, the better the cognitive performance. As in the CHS study by Fried et al. (2001), a score of less than 18 < 18 was used as an exclusion criteria.

2.3.6.2.3.6 *Depression*

The 15-item version of the geriatric depression scale (GDS) adapted to, and validated for, Spanish (Sheikh & Yesavage, 1986) was used to evaluate mood. This scale does not include items concerning somatic complaints and was designed especially to evaluate depression in seniors; higher scores indicate the presence of more symptoms of depression.

2.4.2.4 *Data Analysis*

The statistical package SPSS (v22) was used to analyze the data. In order to find out which variables were associated with biological frailty syndrome, the participants were stratified into two groups, namely the non-frail and frail groups according to the criteria set out by Fried et al. (2001).

To test the association between frailty, other socio-demographic and clinical variables, and the HRQoL we used the Pearson χ^2 and Student t -tests for categorical or continuous variables respectively, and took a 95% confidence interval as the cut-off for significance ($p < 0.05$).

We subsequently developed different multivariate linear-regression models for men and women. All of them considered the PCS and MCS from the SF-12 as dependent variables, and controlled for age, comorbidity, functional status, frailty, and symptoms of depression.

3.3 *Results*

Two-hundred-and eighty-one elderly participants were included, 55% of them women. The age range was 65–94 years, and $\bar{x}$ = 81.99; 53.7% were frail, and women presented a higher prevalence of frailty than men (60% in women vs. 46% in men). Regarding frailty-associated criteria, more than half of the participants were affected by slow ambulation (68.6%) and scant physical activity (60.1%) and, with the exception of weight loss, all of the criteria were more frequent in women, although the difference was only significant for muscular weakness (Table 1).

Table 1 Prevalence of Frailty and percentage of clinical criteria in men and women.

alt-text: Table 1							
	Total n = 281		Men n = 126		Women n = 155		P value
Variable	n	%	n	%	n	%	

Nonfrail	13046.1	68	54.0	62	40.0	0.020
Frail (≥ 3 criteria)	15153.7	58	46.0	93	60.0	
Frailty criteria						
Slowness	19368.6	80	63.5	113	72.0	0.091
Low activity	16960.1	69	54.8	100	64.5	0.062
Weakness	13046.2	48	38.0	82	52.9	0.013
Exhaustion	11440.5	46	36.0	68	43.8	0.211
Unintentional weight loss	4716.7	25	19.8	22	14.2	0.207

With respect to the participants' characteristics in terms of frailty (Table 2), both frail men and women were significantly older and, in general, presented worse health results. Thus, we observed that older participants of either sex presented higher comorbidity, a higher prevalence of chronic respiratory diseases, were more frequently hospitalized, and had significantly worse functionality, mood, and physical- and mental-dimension (PCS and MCS) HRQoL scores. The mean SF-12 PCS was lower among both male (33.3 vs. 39.4, $p < 0.001$) and female (33.5 vs. 41.6, $p < 0.001$) frail residents compared to robust individuals. The mean SF-12 MCS was also lower among both male (51.2 vs. 56.7, $p < 0.05$) and female (47.4 vs. 51.8, $p < 0.05$) frail residents compared to non-frail participants. Frail women presented a significantly higher percentage of cardiac, vascular, and osteoarticular diseases, however frail men were hospitalized more often than frail women (56.9% vs. 39.8%).

Table 2 Characteristics of participants by frailty status.

alt-text: Table 2

	Men		Women	
	Nonfrail (n = 68)	Frail (n = 58)	Nonfrail (n = 62)	Frail (n = 93)
Age mean (SD)	79.8 (7.8)	82.8 (6.7)*	80.7 (8.4)	83.8 (6.7)*
Co-morbidities mean (SD)	1.4 (0.9)	1.9 (1.2)*	1.3 (1.2)	2.4 (1.2)**
Cardiovascular disease n %	13 19.1	15 25.8	6 9.7	21 22.5*
Hypertension n %	32 47.1	25 43.1	27 43.5	58 62.4*
Pulmonary disease n %	8 11.8	18 31.0**	3 4.8	20 21.5**
Diabetes mellitus n %	10 14.7	9 15.5	14 22.6	33 35.5
Arthritis n %	18 26.5	19 32.8	18 29.0	51 54.8**
Stroke n %	4 5.9	10 17.2*	4 6.5	9 9.7
Psychiatric disease n %	9 13.2	4 6.9	5 8.1	3 3.2
Hospitalization in past year n %	25 36.8	33 56.9*	15 24.2	37 39.8*
Activities of daily living. Mean (SD)	87.4 (22.0)	66.9 (30.1)**	88.7 (19.7)	66.0 (27.4)**
Geriatric depression scale. Mean (SD)	3.2 (2.1)	5.8 (3.1)**	3.7 (2.8)	5.9 (3.4)**
Health-related quality of life (SF-12)				

Physical component score mean (SD)	39.4 (6.4)	33.3 (8.9)**	41.6 (6.7)	33.5 (37.3)**
Mental component score mean (SD)	56.7 (19.6)	51.2 (14.0)*	51.8 (13.6)	47.4 (13.8)*

* p ≤ 0.05.

** p ≤ 0.001.

In terms of HRQoL, the linear-regression models using the SF-36 results developed for the PCS and MCS, included age, comorbidity, functional capacity to perform the ADLs, frailty, and symptoms of depression as predictor variables; all of them performed differently for men and women. The regression model for the SF-12 PCS (Table 3) better adjusted to women and explained 26% the variance. In both groups, after controlling for age, comorbidity, functional capacity to perform the ADLs, and symptoms of depression, being frail was a significant factor that adversely affected the SF-12 PSC, with a higher association strength than all of the other variables in women ($\beta = -0.388$; p = 0.000). In contrast, chronic comorbidity was significant in the model for men ($\beta = -0.251$; p = 0.003) and together with frailty ($\beta = -0.232$; p = 0.017) explained 20% the variance. Despite comorbidity being higher in women, when the functional capacity variable was added into the equation it had a larger relative effect ($\beta = -0.214$; p = 0.029) than comorbidity, which was not significant. On the contrary, and as seen in Table 4, models developed for the SF-12 MCS showed that symptoms of depression were the only factor that could help to explain 22% of variance for both men ($\beta = -0.492$; p = 0.000) and women ($\beta = -0.472$; p = 0.000).

Table 3 Multiple regression coefficients for physical component score of HRQL

alt-text: Table 3

Variables	Men			Women		
	β	B (IC 95%)	p value	β	B (IC 95%)	p value
Age	− 0.018	− 0.019 (− 0.200–0.162)	0.832	0.062	0.068 (− 0.087–0.22)	0.387
Co-morbidities	− 0.251	− 1.87 (− 3.09–0.65)	0.003	− 0.021	− 0.153 (− 1.31–1.0)	0.794
Activities of daily living	0.133	0.039 (− 0.013–0.09)	0.139	0.214	0.064 (0.018–0.11)	0.007
Geriatric depression scale	− 0.079	− 0.219 (− 0.72–0.28)	0.392	− 0.044	− 0.106 (− 0.457–0.245)	0.552
Frailty	− 0.232	− 3.81 (− 6.94–0.68)	0.017	− 0.388	− 6.42 (− 9.21–3.63)	0,000
R² adjusted	0.20			0,26		

Table 4 Multiple regression coefficients for mental component score of HRQoL

alt-text: Table 4

Variables	Men			Women		
	β	B (IC 95%)	p value	β	B (IC 95%)	p value
Age	0.014	− 0,02 (− 0.249–0.296)	0.865	0.012	0.023 (− 0.250–0.295)	0.871
Co-morbidities	0.016	0.182 (− 1.66–2.20)	0.846	− 0.044	− 0.546 (− 2.58–1.48)	0.597
Activities of daily living	0.055	0.025 (− 0.054–0.103)	0.535	0.081	0.042 (− 0.040–0.12)	0.316
Geriatric depression scale	− 0.492	− 2.09 (− 2.86–1.33)	0.000	− 0.472	− 1.93 (− 2.54–1.33)	0.000
Frailty	0.019	0.488 (− 4.23–5.21)	0.838	0.046	1.29 (3.61–6.20)	0.603
R² adjusted	0.22			0.22		

4.4 Discussion

Biological frailty syndrome is prevalent in elderly assisted-care home residents. In addition, the consequences of being frail are different between men and women. The most important finding from our work was that biological frailty syndrome plays a very relevant role in the physical dimension of the HRQoL and the impact of this in women is even higher than that produced by disability.

The prevalence of frailty in this population (53%) is higher than that found in elderly individuals living in the community, which, according to data from Santos-Eggimann et al. (2009), is between 8.5% and 27.3%. However, our result lies between the 50%–85% estimations suggested by other studies on populations of elderly residents living in assisted-care homes (De La Rica-Escuín et al., 2014; Kojima, 2015). These differences can be explained by the specific details of our population: old age, comorbidities, and disabilities, which are all factors related to frailty (Fried et al., 2001).

With regard to the higher prevalence of frailty in women, our results are consistent with those reported in other national and international studies (Fried et al., 2001; Santos-Eggimann et al., 2009). The diagnostic criteria for frailty syndrome are associated with physical condition and are linked with strength and mobility (Santos, Fernandes, Carneiro, & da Silva Coqueiro, 2016), and in this sense, older individuals—especially women—are biologically disadvantaged because they generally have lower muscular mass and strength (Syddall et al., 2009). Another reason is historical culture: it is common for the current generation of women of advanced age to have devoted the majority of their time to family and household care, their lives mainly being spent in more restricted private spaces, and thus they usually present with a worse initial physical condition (Fernandez-Bolaños et al., 2008). In addition, the higher levels of frailty found in women can also be explained by the fact that they have higher levels of comorbidities and are significantly affected by the increased presence of osteoarticular diseases that affect mobility (Orfila et al., 2006).

Of the frailty criteria, ambulation speed was slow in 68.6% of the participants in our study and may be the result of systemic failures that also induce a reduction in physical activity, which was the second most common frailty criteria (60.1%). Walking speed is considered to be a simple and accessible vitality indicator because it involves multiple organ systems, thus authors such as van Kan et al. (2010), argue that it can be used as the only measurement for evaluating frailty. Indeed, the study in elderly institutionalized adults performed by Kanwar et al. (2013) used ambulation speed as the only frailty criteria (evaluated in the same way as in our study, with a score of less than < 0.6 m/s considered to be frail); they detected 66% frailty in their participants, which is consistent with our own findings.

In our study, being frail, both in men and women, was associated with worse comorbidities, hospitalization, functional capacity to perform the ADLs, symptoms of depression, HRQoL scores, and both physical and mental dimension SF-12 results. Similarly, Masel, Graham, Reistetter, Markides, and Ottenbacher (2009) reported comparable results in their study on 1008 older Mexican Americans. However, despite the increased prevalence of frailty in women, it appears that frailty affects them differently to men, with the former being less frequently hospitalized. This may be due to the different patterns of morbidity in men and women: men more commonly present with cardiac and respiratory disease or ictus that later complicate, and generally require care that is more specialized.

In the literature, it is common to find that poor overall HRQoL scores in women are associated with higher comorbidity and disability (Orfila et al., 2006). However, according to our data, in women (after controlling for age, functional status, comorbidities, frailty, and depression), comorbidity is not relevant to understanding the physical quality of life dimensions (SF-12 PCS) because, for them, the PCS is most negatively affected by frailty itself as well as poor functional capacity. This suggests that although women accumulate more comorbid chronic diseases, for them the absolute number of these comorbidities is not as important as their functional impact: in the presence of frailty and disability, women tend to more negatively perceive their PCS.

With respect to the mental dimension of the HRQoL score, our results were better than for the physical dimension and, unlike the results reported by Chang et al. (2012), the SF-12 MCS scores we obtained were not affected by frailty but rather, by the increased presence of symptoms of depression. Similarly, studies on elderly participants indicate that they can cope relatively well with chronicity and disability, (which affects the HRQoL score specifically in the SF-12 PCS but not the SF-12 MCS) and this can be improved if they feel that adequate psychosocial care resources are available to them (Bowling & Iliffe, 2011).

Despite considering frailty as a fundamentally biological syndrome, many studies highlight the association between being frail and the presence of symptoms of depression (Bilotta et al., 2010). The relationship between frailty and depression is controversial; both disorders are frequent and can overlap in seniors (Buigues et al., 2015) but there is no easy explanation for this. Two hypotheses have been suggested, the first posits that vascular depression, characterized by slowness, fatigue, and muscular weakness is an early sign of, and risk factor for, frailty (Paulson & Lichtenberg, 2013), while the second highlights how the status of frailty implies a process of identity crisis that manifests itself as symptoms of psychological discomfort such as sadness and depression (Fillit & Butler, 2009), and according to its authors, this identity crisis complicates the evolution of frailty, worsens quality of life, and increases the caregivers' workload. The association between the two constructs cannot be fully explained by symptom overlap, suggesting that psychological vulnerability may be an important component of frailty (Lohman, Dumenci, & Mezuk, 2015).

In summary, HRQoL is a multidimensional construct that, as previously noted, is influenced by biological factors such as frailty as well as psychosocial factors including the presence of signs of depression. An improved HRQoL score implies that both aspects have been taken into account, resulting in the elderly person receiving comprehensive quality care.

5.5 Limitations and Strengths

Some limitations in our analysis should be considered. Firstly, the cross-sectional design of the study did not allow us to determine the causal relationship between the HRQoL dimension and frailty, nor allow us to clarify the paths of the HRQoL scores over time in both robust and frail participants. Secondly, to determine frailty we followed the criteria developed by Fried and colleagues, but as in other studies, we adapted it to suit the characteristics our population; this might have resulted in variations in the prevalence estimation rates. Finally, participant selection in our study may have been biased; from our perspective, the prevalence of frailty in elderly institutionalized participants may even be higher than our 53.9% finding because elderly residents with dementia and neoplastic processes were excluded from the study. However, in our opinion, these limitations did not significantly influence the results and that they contribute to improving knowledge about the impact of frailty and biopsychosocial factors on HRQoL, while highlighting differences in the form and consequences of frailty in men and women.

6.6 Clinical application and Conclusions

Elderly nursing home residents are very vulnerable and present high comorbidity, frailty, and disability, and so taking action to maintain their HRQoL scores should become a priority in care. Based on our results, as well as those from previous studies, we can conclude that frailty implies a decreased physical dimension in the HRQoL score, especially in women. Screening for frailty syndrome is an easy and inexpensive task for nurses that, without doubt, helps to identify already frail or pre-frail seniors, with a greater susceptibility to the adverse effects health, in particular, disability. Because frailty and physical condition are linked, it is essential to propose interventions that maintain and encourage mobility, given that the residential environment is already a restricted living space that promotes inactivity, which can have a debilitating effect on physical condition. HRQoL also has a mental dimension but so far, little attention has been paid to the psychological aspects linked to higher levels of frailty which can go unnoticed in clinical practice. Comprehensive care must include attention to the specific difficulties of frail elderly residents and must address the physical and emotional discomfort that accompanies these problems in an environment that favors neither activity nor the perception of control.

Declaration of conflicting interests

The authors declare that they have no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

- Ávila-Funes J-A, Pina-Escudero S-D, Aguilar-Navarro S., Gutiérrez-Robledo L-M, Ruiz-Arregui L. and Amieva H., Cognitive impairment and low physical activity are the components of frailty more strongly associated with disability, *Journal of Nutrition, Health & Aging* **15** (8), 2011, 683-689, <http://dx.doi.org/10.1007/s12603-011-0111-8>.
- Baltes P-B and Smith J., New frontiers in the future of aging: From successful aging of the young old to the dilemmas of the fourth age, *Gerontology* **49** (2), 2003, 123-135, <http://dx.doi.org/10.1159/000067946>.
- Bilotta C., Bowling A., Case A., Nicolini P., Mauri S., Castelli M. and Vergani C., Dimensions and correlates of quality of life according to frailty status: A cross-sectional study on community-dwelling older adults referred to an outpatient geriatric service in Italy, *Health and Quality of Life Outcomes* **8**, 2010, 56, <http://dx.doi.org/10.1186/1477-7525-8-56>.
- Bowling A. and Iliffe S., Psychological approach to successful ageing predicts future quality of life in older adults, *Health and Quality of Life Outcomes* **9** (1), 2011, 13, <http://dx.doi.org/10.1186/1477-7525-9-13>.
- Buigues C., Padilla-Sánchez C., Garrido J-F, Navarro-Martínez R., Ruiz-Ros V. and Cauli O., The relationship between depression and frailty syndrome: A systematic review, *Aging & Mental Health* **19** (9), 2015, 762-772, <http://dx.doi.org/10.1080/13607863.2014.967174>.
- Chang Y-W, Chen W-L, Lin F-G, Fang W-H, Yen M-Y, Hsieh C-C and Kao T-W, Frailty and its impact on health-related quality of life: A cross-sectional study on elder community-dwelling preventive health service users, *PloS One* **7** (5), 2012, <http://dx.doi.org/10.1371/journal.pone.0038079>.
- Clegg A., Young J., Iliffe S., Rikkert M-O and Rockwood K., Frailty in elderly people, *The Lancet* **Vol. 381**, 2013, 752-762, [http://dx.doi.org/10.1016/S0140-6736\(12\)62167-9](http://dx.doi.org/10.1016/S0140-6736(12)62167-9).
- Cordeiro L-M, Paulino J-D, Bessa M-E-P, Borges C-L and Leite S-F-P, Quality of life of frail and institutionalized elderly, *ACTA Paulista de Enfermagem* **28** (4), 2015, 361-366, <http://dx.doi.org/10.1590/1982-0194201500061>.
- De La Rica-Escuín M., González-Vaca J., Varela-Pérez R., Arjonilla-García M-D, Silva-Iglesias M., Oliver-Carbonell J-L and Abizanda P., Frailty and mortality or incident disability in institutionalized older adults: The final study, *Maturitas* **78** (4), 2014, 329-334, <http://dx.doi.org/10.1016/j.maturitas.2014.05.022>.
- Díaz De León E., Tamez H-E, Gutiérrez H., Cedillo J-A and Torres G., Frailty and its association with mortality, hospitalization and functional dependence in Mexicans aged 60-years or older, *Medicina Clínica* **138** (11).

2012, 468–474, <http://dx.doi.org/10.1016/j.medcli.2011.03.024>.

Drageset J., Natvig [G-K.G.K.](#), Eide [G-E.G.E.](#), Bondevik M., Nortvedt [M-W.M.W.](#) and Nygaard [H-A.H.A.](#), Health-related quality of life among old residents of nursing homes in Norway, *International Journal of Nursing Practice* **15** (5), 2009, 455–466, <http://dx.doi.org/10.1111/j.1440-172X.2009.01794.x>.

Fernandez-Bolaños M., Otero A., Zunzunegui [M-V.M.V.](#), Beland F., Alarcón T., De Hoyos C. and Castell [M-V.M.V.](#), Sex differences in the prevalence of frailty in a population aged 75 and older in Spain, *Journal of the American Geriatrics Society* **56** (12), 2008, 2370–2371, <http://dx.doi.org/10.1111/j.1532-5415.2008.02032.x>.

Fillit H. and Butler [R-N.R.N.](#), The frailty identity crisis, *Journal of the American Geriatrics Society* **57** (2), 2009, 348–352, <http://dx.doi.org/10.1111/j.1532-5415.2008.02104.x>.

Folstein [M-F.M.F.](#), Folstein [S-E.S.E.](#) and McHugh [P-R.P.R.](#), Mini-mental state: A practical method for grading the state of patients for the clinician, *Journal of Psychiatric Research* **12**, 1975, 189–198, [http://dx.doi.org/10.1016/0022-3956\(75\)90026-6](http://dx.doi.org/10.1016/0022-3956(75)90026-6).

Fried [L-P.L.P.](#), Tangen [C-M.C.M.](#), Walston J., Newman [A-B.A.B.](#), Hirsch C., Gottdiener J., ... McBurnie [M-A.M.A.](#), Frailty in older adults: Evidence for a phenotype, *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* **56** (3), 2001, M146–M157, <http://dx.doi.org/10.1093/gerona/56.3.M146>.

Gallucci M., Ongaro F., Amici [G-P.G.P.](#) and Regini C., Frailty, disability and survival in the elderly over the age of seventy: Evidence from “The Treviso Longeva (TRELONG) study”, *Archives of Gerontology and Geriatrics* **48** (3) 2009, 281–283, <http://dx.doi.org/10.1016/j.archger.2008.02.005>.

Gobbens R.J.J., Van Assen M.A.L.M., Luijckx K.G. and Schols J.M.G.A., The predictive validity of the tilburg frailty indicator: Disability, health care utilization, and quality of life in a population at risk, *Gerontologist* **52**, 2012, 619–631, <http://dx.doi.org/10.1093/geront/gnr135>.

van Kan [G-A.G.A.](#), Rolland Y., Houles M., Gillette-Guyonnet S., Soto M. and Vellas B., The assessment of frailty in older adults, *Clinics in Geriatric Medicine* 2010, <http://dx.doi.org/10.1016/j.cger.2010.02.002>.

Kanwar [A.A.](#), Singh M., Lennon R., Ghanta K., McNallan [S-M.S.M.](#) and Roger [V-L.V.L.](#), Frailty and health-related quality of life among residents of long-term care facilities, *Journal of Aging and Health* **25** (5), 2013, 792–802, <http://dx.doi.org/10.1177/0898264313493003>.

Kojima G., Prevalence of frailty in nursing homes: A systematic review and meta-analysis, *Journal of the American Medical Directors Association* 2015, <http://dx.doi.org/10.1016/j.jamda.2015.06.025>.

Kojima G., Iliffe S., Jivraj S. and Walters K., Association between frailty and quality of life among community-dwelling older people: A systematic review and meta-analysis, *Journal of Epidemiology and Community Health* 2016, <http://dx.doi.org/10.1136/jech-2015-206717>, (jech-2015-206717).

Lin [G-C.C.C.](#), Li [G-I.C.I.](#), Chang [C-K.C.K.](#), Liu [C-S.C.S.](#), Lin [G-H.C.H.](#), Meng [N-H.N.H.](#), ... Li [T-C.T.C.](#), Reduced health-related quality of life in elders with frailty: A cross-sectional study of community-dwelling elders in Taiwan, *Plo One* **6** (7), 2011, 1–7, <http://dx.doi.org/10.1371/journal.pone.0021841>.

Lobo A., Saz P., Marcos G., Día [J-L.J.L.](#), de la Cámara C., Ventura T., ... Aznar S., Revalidation and standardization of the cognition mini-exam (first Spanish version of the mini-mental status examination) in the general geriatric population, *Medicina Clínica* **112**, 1999, 767–774.

Lohman M., Dumenci L. and Mezuk B., Depression and frailty in late life: Evidence for a common vulnerability, *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* 2015, <http://dx.doi.org/10.1093/geronb/gbu180>.

Mahoney [F-I.F.I.](#) and Barthel [D-W.D.W.](#), Functional evaluation: The barthel index, *Maryland State Medical Journal* **14**, 1965, 61–65.

Masel [M-G.M.C.](#), Graham [J-E.J.E.](#), Reistetter [T-A.T.A.](#), Markides [K-S.K.S.](#) and Ottenbacher [K-J.K.J.](#), Frailty and health related quality of life in older Mexican Americans, *Health and Quality of Life Outcomes* **7**, 2009, 70, <http://dx.doi.org/10.1186/1477-7525-7-70>.

Morley [J-E.J.E.](#), Vellas B., Abellan van Kan G., Anker [S-D.S.D.](#), Bauer [J-M.J.M.](#), Bernabei R., ... Walston J., Frailty consensus: A call to action, *Journal of the American Medical Directors Association* **14** (6), 2013, 392–397, <http://dx.doi.org/10.1016/j.jamda.2013.03.022>.

- Murphy K., Cooney A. and Casey D., Improving the quality of life for older people in long-term care settings, *Journal of Comparative Effectiveness Research* **3** (3), 2014, 301-315, <http://dx.doi.org/10.2217/cer.14.20>.
- Orfila F., Ferrer M., Lamarca R., Tebe C., Domingo-Salvany A. and Alonso J., Gender differences in health-related quality of life among the elderly: The role of objective functional capacity and chronic conditions, *Social Science & Medicine (1982)* **63** (9), 2006, 2367-2380, <http://dx.doi.org/10.1016/j.socscimed.2006.06.017>.
- Paulson D. and Lichtenberg P-a-Pa, Vascular depression: An early warning sign of frailty, *Aging & Mental Health* **17** (1), 2013, 85-93, <http://dx.doi.org/10.1080/13607863.2012.692767>.
- Rockwood K. and Mitnitski A., Frailty defined by deficit accumulation and geriatric medicine defined by frailty, *Clinics in Geriatric Medicine* 2011, <http://dx.doi.org/10.1016/j.cger.2010.08.008>.
- Santos K-T-K-T, Fernandes M-H-M-H, Carneiro J-A-J-A and da Silva Coqueiro R., Motor performance tests as screening instruments for frailty in the older adults, *Applied Nursing Research* **32**, 2016, 80-84, <http://dx.doi.org/10.1016/j.apnr.2016.06.003>.
- Santos-Eggimann B., Cuénoud P., Spagnoli J. and Junod J., Prevalence of frailty in middle-aged and older community-dwelling Europeans living in 10 countries, *Journals of Gerontology: Series A Biological Sciences and Medical Sciences* **64** (6), 2009, 675-681, <http://dx.doi.org/10.1093/gerona/glp012>.
- Scocco P., Fantoni G. and Caon F., Role of depressive and cognitive status in self-reported evaluation of quality of life in older people: Comparing proxy and physician perspectives, *Age and Ageing* **35** (2), 2006, 166-171, <http://dx.doi.org/10.1093/ageing/afj026>.
- Sheikh R-L-R-L and Yesavage J-A-J-A, Geriatric depression scale (GDS). Recent evidence and development of a shorter version, *Clinical Gerontologist* **5** (July 2012), 1986, 165-173, http://dx.doi.org/10.1300/J018v05n01_09.
- Sitoh Y-Y-Y-Y, Lau T-G-T-G, Zochling J., Schwarz J., Chen J-S-J-S, March L-M-L-M, ... Cameron I-D-I-D, Determinants of health-related quality of life in institutionalized older persons in northern Sydney, *Internal Medicine Journal* **35** (2), 2005, 131-134, <http://dx.doi.org/10.1111/j.1445-5994.2004.00742.x>.
- Syddall H., Roberts H-C-H-C, Evandrou M., Cooper C., Bergman H. and Sayer A-A-A-A, Prevalence and correlates of frailty among community-dwelling older men and women: Findings from the Hertfordshire cohort study, *Age and Ageing* **39** (2), 2009, 197-203, <http://dx.doi.org/10.1093/ageing/afp204>.
- Szanton S-L-S-L, Allen J-K-J-K, Seplaki C-L-C-L, Bandeen-Roche K. and Fried L-P-L-P, Allostatic load and frailty in the women's health and aging studies, *Biological Research for Nursing* **10** (3), 2009, 248-256, <http://dx.doi.org/10.1177/1099800408323452>.
- Ware J., Kosinski M. and Keller S-D-S-D, A 12-item short-form health survey: Construction of scales and preliminary tests of reliability and validity, *Medical Care* **34** (3), 1996, 220-233, <http://dx.doi.org/10.2307/3766749>.
- Weisscher N., de Haan R-J-R-J and Vermeulen M., The impact of disease-related impairments on disability and health-related quality of life: A systematic review, *BMC Medical Research Methodology* **7**, 2007, 24, <http://dx.doi.org/10.1186/1471-2288-7-24>.

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