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Hospitalization and Occurrence of Death in Frail Older Adults: An Integrative Review

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Abstract

Objective: To identify the relationship between hospitalization and occurrence of death among frail older adults in the scientific productions on the topic. **Method:** An integrative literature review is conducted by elaborating the research question, searching in the databases using descriptors, presenting and interpreting the results, and synthesizing the knowledge. **Results:** The search performed in April 2023 yielded 5804 studies, of which seven remained after applying the inclusion/exclusion criteria. There was an association between frailty and postoperative mortality in the older adults, $p < 0.01$; frail older adults subjected to surgical procedures presented 22 times higher mortality than their non-frail counterparts, $p < 0.01$; major non-cardiac elective surgeries in frail individuals presented a death risk at 1 year of 2.23 (95% CI: 2.08 - 2.40); and a 0.1 increase in the Frailty Index was associated with increased mortality (OR: 2.01; 95% CI: 1.66 - 2.42). **Conclusion:** An association was verified between frailty and in-hospital death, signaling frailty as a prognosis for negative outcomes. It is considered fundamental to assess frailty in frail aged people.

Keywords

Frail Elderly, Aged, 80 and Over, Hospitalization, Death, Review

1. Introduction

Hospitalization of older adults frequently represents a stressful event, resulting in cognitive decline, falls, *delirium*, infections, pressure injuries and mortality [1]. Therefore, the number of hospitalizations in Brazil for older adults (aged at least 60 years old) is disturbing. In 2019 alone, before the Coronavirus Disease-19 (COVID-19) pandemic, the number was 3,221,763, which corresponds to 26.44%

of all hospitalizations. Of these hospitalizations, 642,932 cases evolved to death.

It is observed that there is a difference in the number of deaths by Brazilian regions, with the Southeast region accounting for 49.46%, followed by the Northeast with 22.35% and the South with 16.96%. When analyzing the causes of these deaths, there was predominance of circulatory diseases with 710,104 (22.04%), respiratory diseases with 434,069 (13.47%) neoplastic diseases with 378,561 (11.75%) and digestive diseases with 340,073 (10.55%) [2].

In Curitiba (Brazil), the number of hospitalizations in 2019 was 166,769, of which 44,490 (26.67%) corresponded to older adults. Of these, 6,671 died during hospitalization [2].

Researchers on the topic of hospital admission assert that functional declines associated with hospitalization in older patients substantially prolong hospitalization times and increase the burden of post-discharge care, disability risk, death risk and medical expenses [3] [4].

Frailty stands out among the functional declines in hospitalized older adults, which can lead to negative outcomes such as delirium, low mobility, more falls and depression [5].

In a longitudinal follow-up study carried out in the Juiz de Fora city (Brazil) with a sample of 304 older adults, the mortality observed among non-frail older adults was 13.4% (n = 14), 24.7% in pre-frail older adults (n = 43) and 38.4% in frail individuals (n = 10); (p = 0.01) [6]. In another study carried out with patients in an intensive care unit at a university hospital from Florianópolis (Brazil), a significantly higher mortality rate ($p < 0.05$) was found in frail older adults, with frailty as a factor identified in 53% of the patients and a 37% mortality rate in the group of older adults participating in the study [7].

On the global stage, a longitudinal study with 1766 participants with a mean age of 83.4 years old, carried out in Melbourne (Australia), aimed at associating frailty at admission and discharge with mortality. It was observed that frailty was associated with in-hospital mortality (OR: 1.8; 95% CI: 1.4 - 2.4) [8].

In the same direction, a study carried out at the university hospital of Messina (Italy) with 156 older adults (≥65 years of age) aimed at identifying the patients' frailty upon hospital admission and discharge. It was verified that the frailty index at admission and discharge was a predictor of death risk (OR: 5.9; 95% CI: 2.0 - 17.5; p = 0.01) [9].

A systematic review with meta-analysis conducted in China analyzed 13 observational studies and totaled 64,279 older adults (≥65 years of age). The analyses indicated an association between frailty and mortality in patients admitted to the Intensive Care Unit. An association between frailty and in-hospital mortality was observed (RR: 1.73; 95% CI: 1.55 - 1.93) as well as with short-term (RR: 1.7; 95% CI: 1.45 - 1.98) and long-term (RR: 1.86; 95% CI: 1.44 - 2.42) mortality [10].

Another prospective cohort study, though conducted in a single center, was carried out in an Intensive Care Unit from Melbourne (Australia), involving 160 older adults with a mean age of 70 years old. In a 6-month time window, the frail

older adults evolved to death (24.1%) at a rate 3 times higher than their non-frail counterparts (8.8%) [11].

It is considered important to identify studies that observed death associated with frailty in hospitalized older adults, as the relationship between these variables remains little evidenced.

By identifying the current knowledge on the topic of death and frailty, the current study should provide contributions to gerontological care in the hospital context. In view of the above, this study aimed at identifying the relationship between hospitalization and the occurrence of deaths in frail older adults through an integrative literature review.

2. Method

This is an Integrative Literature Review (ILR), a method capable of synthesizing existing scientific knowledge on the topic to be studied [12]. To prepare the ILR, the following methodological stages were used: identification of the research question; sampling or literature search, categorization of the studies; evaluation of the studies included in the review; presentation and interpretation of the results: and knowledge synthesis [13].

In the first stage, the following research question was developed: "Which is the national and international scientific production on the relationship between hospitalization and the occurrence of death in frail older adults?" using the PICO strategy (P—Population or patient; I—Interest; C—Comparison; O—Outcomes/results) [14]. When replacing the words in the acronym, we have: "P" = Older adults; "I" = Frailty condition; "C" = Hospitalization and "O" = Death.

In the second stage, the following databases were chosen to search for articles: *Biblioteca Virtual em Saúde* (BVS) Portal, *Excerpta Medica DataBASE* (EMBASE), *Cumulative Index to Nursing and Allied Health Literature* (CINAHL) and *National Library of Medicine and National Institutes of Health* (PubMed). For the article search strategy, the following Descriptors in Health Sciences (*Descritores em Ciências da Saúde*, DeCS) were used, in English, Portuguese, Spanish and French: aged (*idoso*, *anciano*, *sujet âgé*); frail elderly (*idoso fragilizado*, *anciano frágil*, *personne âgée fragile*); aged, 80 and over (*idoso de* 80 *anos ou mais*, *anciano de* 80 *or más años*, *sujet âgé de* 80 *ans ou plus*); hospitalization (*hospitalização*, *hospitalización*, *hospitalisation*); and death (*morte*, *muerte*, *mort*). The search was directed using the "OR" and "AND" Boolean operators (**Table 1**).

The following inclusion criteria were established: being an observational study; being directly related to the topic; samples comprised by older adults; registered in any language; and without publication date limit. The exclusion criteria were as follows: case reports, letters to the editor, abstracts in conference proceedings, dissertations, reviews, theses and monographies.

The search was independently carried out in April 2023 by two researchers and resulted in 5804 studies, which were incorporated into a bibliography manager software program to remove duplicates, resulting in 5635. Of these, 1698

Table 1. Search strategies on portals and databases. Curitiba, Paraná, Brazil, 2023.

DATA BASE	SEARCH STRATEGY
BVS	(Idoso Fragilizado) OR (Adultos Idosos Fragilizados) OR (Idoso Debilitado) OR (Frail Elderly) OR (Frail Elder) OR (Frail Elders) OR (Frail Older Adult) OR (Frail Older Adults) OR (Anciano Frágil) OR (Anciano Debilitado) OR (Ancianos Debilitados) OR (Ancianos Fragilizados) OR (Personne âgée fragile) AND (Morte) OR (Falecimento) OR (Óbito) OR (Death) OR (Muerte) OR (Fallecimiento) OR (Mort) AND (Hospitalização) OR (Hospitalization) OR (Hospitalizations) OR (Hospitalización) OR (Hospitalisation)
EMBASE	'frail elderly':ti,ab,kw AND death:ti,ab,kw AND hospitalization:ti,ab,kw
CINAHL	TX frail elderly OR TX aged OR TX older OR TX older adults OR TX elderly patients OR TX older people AND TX hospitalization AND TX death
PubMed	(((((((("frail elderly"[Title/Abstract]) OR ("aged"[Title/Abstract])) OR ("older"[Title/Abstract])) OR ("older adults"[Title/Abstract])) OR ("elderly patients"[Title/Abstract])) OR ("older people"[Title/Abstract])) AND ("hospitalization"[Title/Abstract])) AND ("death"[Title/Abstract])

Source: the authors (2023). Caption: BVS: *Biblioteca Virtual em Saúde* Portal; EMBASE: *Excerpta Medica DataBASE*; CINAHL: *Cumulative Index to Nursing and Allied Health Literature*; PubMed: *National Library of Medicine and National Institutes of Health*.

articles were excluded by reading their titles and 3994 by reading their abstracts, resulting in the selection of 33 for full-reading. After this stage, 28 were excluded and another 2 studies were added that were identified from those chosen for the review, thus resulting in the inclusion of 7 studies. To minimize possible risks if bias when selecting the studies, if there was disagreement between both evaluators, a third reviewer assessed the possible divergences that arose in selection of the articles to make a final decision on their inclusion or exclusion. The *Preferred Reporting Items for Systematic Reviews and Meta-analyses* (PRISMA) [15] was employed to illustrate in detail the selection of the articles that made up the body of the integrative review **Figure 1**.

In the third stage of organizing and summarizing the content of each article, all the information to be extracted was defined: author (year of publication), journal, country of origin, objectives, results, study design, sample size, and scientific evidence level.

In the fourth stage, a critical reading of the articles was carried out with the objective of synthesizing the available information on the results and conclusions, in addition to classifying the evidence level of each study. For the current review, the studies were classified according to level of evidence (**Table 2**) based on the classification proposed by the *Oxford Centre for Evidence-Based Medicine* (2009) [16]. Regardless of the results of their methodological quality, all articles were subjected to data extraction and synthesis.

In the fifth stage, the results were analyzed and interpreted based on the research question of this integrative review. As fulfillment of the sixth stage, a knowledge synthesis from the articles analyzed and final considerations was carried out.

3. Results

Among the 7 studies analyzed, there was predominance of publications in 2020

Table 2. Characteristics of the studies that made up the integrative review corpus. Curitiba, Paraná, Brazil, 2023.

Author/ Year	*Journal*	*Country of origin*	*Objectives*	*Results*	*Study design*	*Sample size*	*Level of evidence*
Neuman *et al.*, 2013 [17]	Ann Surg Oncol	USA	To analyze overall survival at 90 days and 1 year after elective colectomy for stage I - III colon cancer from 1992 to 2005.	The overall survival after elective colectomy for colon cancer was 93.4% and 85.7% at 90 days and 1 year, respectively. Old age, male gender, frailty, increase in hospitalizations in the previous year and dementia were more strongly associated with decreased survival. Although only 4.4% of the patients were frail, there was a strong association with mortality, with an odds ratio of 8.4 (95% CI: 6.4 - 11.1).	Retrospective cohort	12,979	2B
Kim *et al.*, 2014 [18]	Jama Surg	KO	To develop a predictive model for adverse outcomes in elderly surgical patients.	In the model developed, high-risk patients (multidimensional frailty score > 5) presented a higher risk of postoperative mortality (OR: 9.01; 95% CI: 2.15 - 37.78, $p = 0.003$).	Longitudinal cohort	275	2C
McIssac; Bryson; Van Walrave, 2016 [19]	Jama Surg	USA	To evaluate the effect of patient frailty at the population level and its association with one-year postoperative mortality from elective major non-cardiac surgery.	After one year, 13.6% of the frail and 4.8% of the non-frail individuals died. The adjustment for sociodemographic and surgical confounders resulted in a risk ratio of 2.23 (95% CI: 2.08 - 2.40). There was an increased relative death risk in frail patients (RR: 35.5; 95% CI: 29.7 - 40.1) on the third postoperative day. The association between frailty and increased death risk decreased with patient age (HR: 2.66; 95% CI: 2.28 - 3.10 at age 65; HR: 1.63; 95% CI: 1.36 - 1.95 at age 90).	Longitudinal cohort	202,811	2B
Augustin *et al.*, 2016 [20]	Surgery	USA	To analyze the relationship between mFI and postoperative outcomes in patients undergoing pancreatectomy, using the National Surgical Quality Improvement Project database.	Death in the non-frail group was 0.6%, 1.1% for mild frailty, 3.1% for intermediate frailty and 11.1% for frailty, $p < 0.01$. The relationship between frailty and mortality showed that frail patients had a proportional mortality rate 22 times higher when compared to non-frail ones.	Cross-sectional	13,020	2C
Hubbard *et al.*, 2017 [21]	Age and Ageing	AU	To investigate the discriminative capacity of the InterRAI Comprehensive Geriatric Assessment-derived FI for acute care in relation to multiple adverse outcomes in inpatients.	A 0.1 increase in FI was significantly associated with hospitalization time > 28 days (OR: 1.29; 95% CI: 1.10 - 1.52), falls (OR: 1.29; 95% CI: 1.10 - 1.50), delirium (OR: 2.34; 95% CI: 2.08 - 2.63), incidence of pressure ulcers (OR: 1.51; 95% CI: 1.23 - 1.87) and mortality (OR: 2.01; 95% CI: 1.66 - 2.42).	Longitudinal cohort	1418	2B
Yuki *et al.*, 2018 [22]	Geriat Gerontol Int	JP	Evaluate the association between frailty and mortality.	Frailty was identified in men aged 65 - 74 years old and women aged 75 - 84 years old. Weakness and exhaustion prevailed. There was an association between frailty and death among Japanese older adults ($p < 0.01$).	Longitudinal cohort	841	2B
Belaunde *et al.*, 2020 [23]	Rev Cub Med Mil	CUB	To determine prognostic factors for mortality in frail older adults.	Frail older adults have a mortality risk of 62% (95% CI: 48 - 76), when compared to non-frail ones.	Longitudinal cohort	50	2B

Source: the authors (2023). Caption: USA: United States of America; KO: South Korea; mIF: modified Frailty Index; AU: Australia; FI: Fragility Index; JP: Japan; CUB: Cuba.

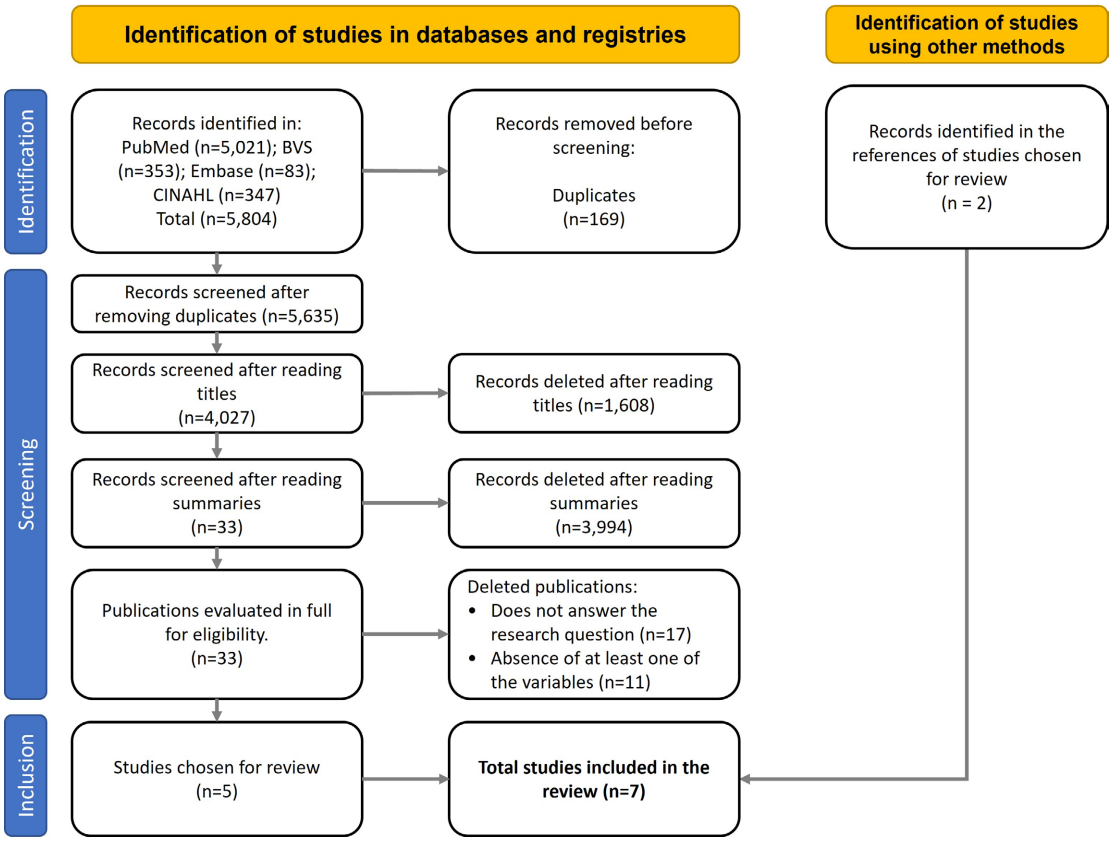

Figure 1. Prisma flowchart for study selection, Curitiba, Paraná, Brazil, 2023. Source: the authors (2023), adapted from Page *et al.*, (2021). Caption: BVS—*Biblioteca Virtual em Saúde* Portal; EMBASE—*Excerpta Medica DataBASE*; CINAHL—*Cumulative Index to Nursing and Allied Health Literature*; PubMed—*National Library of Medicine and National Institutes of Health*.

(n = 2; 28.56%), followed by 2013, 2014, 2016, 2017 and 2018 (n = 1; 14.28% each year). All articles were written in English (n = 7; 100%). There was predominance of publications in the *Jama Surgery* journal (n = 2; 28.56%) followed by *Surgery*, *Age And Aging*, *Geriatric Gerontology International* and *Annals of Surgical Oncology* and *Cuban Journal of Military Medicine* (n = 1; 14.28% each).

The sample size varied significantly, from 50 to 202,811 participants. In relation to the publications' countries of origin, the United States of America stood out (n = 3; 42.84%), followed by Australia, Japan, South Korea and Cuba (n = 1; 14.28% each). All publications found were made in international journals (n = 7; 100%); no studies carried out in Brazil were found in the databases consulted.

All studies had quantitative designs, with predominance of longitudinal cohort studies (n = 6; 85.72%). The level of evidence 2B classification was found in five articles (71.43%) and level 2C, in two (28.57%).

4. Discussion

Of the 7 studies analyzed, 5 related advanced age and frailty to an increased mortality risk in patients after surgery [17] [18] [19] [20] [22].

The relationship between frailty and postoperative mortality was evaluated in

two studies, one longitudinal on aging carried out in Japan (National Institute of Longevity Sciences) with 841 older adults, aged between 65 and 88 years old. Occurrence of 83 deaths was observed among the men (n = 13; 54.2%), frail (n = 43; 20.9%) and pre-frail in relation to the non-frail group (n = 27; 15.3%), $p < 0.01$; as well as 30 deaths among the women (n = 11; 21.2%), frail (n = 17; 6.8%), pre-frail (n = 2; 1.5%) and non-frail, $p < 0.01$. There was an association between frailty and death among Japanese older adults, $p < 0.0001$. Another study with retrospective analysis was developed with 13,020 patients from the National Surgical Quality Improvement Project database from 2005 to 2010 in the United States of America, with the objective of analyzing the relationship between mFI and postoperative results in patients subjected to pancreatectomy [20] [22]. It was observed that, in the relationship between frailty and mortality, the frail patients had a mortality rate 22 times higher when compared to their non-frail counterparts [20].

The postoperative risk for mortality was the target of a longitudinal study, conducted in the USA with a sample consisting of 202,811 older adults aged ≥ 65 years old, which aimed at evaluating frailty and the association with postoperative mortality following major elective non-cardiac surgeries over a 1-year period. The results pointed to 3.1% (n = 6289) frail older adults (mean age, 77 ± 7 years old). After 1 year, 13.6% of the frail and 4.8% of the non-frail had died. The adjustment for sociodemographic and surgical confounding factors resulted in frail older adults having a 2.23 higher death risk (95% CI: 2.08 - 2.40) when compared to non-frail. In addition, the interaction between frailty and postoperative time showed an increased relative death risk in frail patients (RR: 35.5; 95% CI: 29.7 - 40.1) on the third postoperative day. The association between frailty and death risk decreased with advancing age (HR: 2.66; 95% CI: 2.28 - 3.10 at 65 years old; HR: 1.63; 95% CI: 1.36 - 1.95 at 90 years old) [19].

Old age, male gender, frailty, increased previous hospitalizations and dementia were more strongly associated with decreased survival in the elderly in a retrospective study using data collected from the *Surveillance*, *Epidemiology*, *and End Results Program* (SEER) involving beneficiaries aged ≥ 80 years old and hospitalized for elective colectomy for stage I-III colon cancer. Data from 1992 to 2005 were analyzed for overall survival at 90 days and 1 year. Overall survival for the 12,979 aged patients subjected to elective colectomy for colon cancer was 93.4% and 85.7% at 90 days and 1 year, respectively. Although only 4.4% of the patients were identified as frail, there was a strong association with mortality, with an odds ratio of 8.4 (95% CI: 6.4 - 11.1) [17].

In this scenario of the relationship between mortality and frailty in the postoperative period [17] [19] [20] [21], a study developed in South Korea was identified, which aimed at developing a predictive model for adverse outcomes in aged surgical patients subjected to elective intermediate or high-risk surgeries. 275 older patients aged ≥ 65 years old were evaluated. A multidimensional frailty instrument was used and, with these data, a scoring model was created that pre-

dicted all-cause mortality rates more accurately than the *American Society of Anesthesiologists* (ASA) classification. Sensitivity and specificity for predicting the all-cause mortality rates were 84.0% and 69.2%, respectively, according to the model cutoff (>5 vs ≤5). High-risk patients (multidimensional frailty score > 5) had a higher risk of postoperative mortality (OR: 9.01; 95% CI: 2.15 - 37.78, $p = 0.003$) [18].

Mortality prediction was also highlighted in a longitudinal observational study carried out at the Internal Medicine service of the Central Military Hospital in Cuba, using a sample of 50 frail older adults (aged ≥ 60 years old) from the universe of 1,080 older adults hospitalized in a 12-month period. A 62% mortality rate (95% CI: 48 - 76) was identified in frail older adults. It was concluded that frailty can be predictive of adverse events in hospitalized patients [18] [23].

The use of instruments for identifying frailty was evaluated in a prospective cohort study carried out in Australia, as well as the discriminatory capacity of the Frailty Index (FI) instrument in relation to multiple adverse outcomes of patients admitted to 11 hospitals, and a sample of 1418 older adults aged ≥ 70 years old. A 0.1 increase in FI was associated with a greater likelihood of hospitalization time > 28 days (OR: 1.29; 95% CI: 1.10 - 1.52), falls (OR: 1.29; 95% CI: 1.10 - 1.50), delirium (OR: 2.34; 95% CI: 2.08 - 2.63), pressure ulcer incidence (OR: 1.51; 95% CI: 1.23 - 1.87) and mortality during hospitalization (OR: 2.01; 95% CI: 1.66 - 2.42) [21].

5. Conclusions

An association was found between frailty and death in the hospital context, which asserts frailty as a prognosis of negative outcomes. There was predominance of studies that identified an increased mortality risk in frail older patients during the postoperative period.

Therefore, it is considered fundamental to assess frailty in older adults upon hospital admission. When planning Nursing care for older adults, it would be relevant to adopt a predictive model for the early identification of frail patients and the use of instruments to classify frailty.

The absence of publications in Brazil on the relationship between frailty and in-hospital death, as well as their scarcity at the international level, corroborates the importance of future research studies in the area, aimed at evidencing frailty as a predictor of negative outcomes such as in-hospital death.

Conflicts of Interest

The authors declare that there are no conflicts of interest in publication of this article.

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