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Clinical Research Study

Functional Assessment of >18 Years Old Patients at Internal Medicine Ward—Relationship with In-Hospital and 30-Day Mortality

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ABSTRACT

Objective: To evaluate the connection between the items included in the AVD-DezIs score (a questionnaire about basic and instrumental activities of daily living and other topics related to social and personal life) and in-hospital and 30-day mortality after discharge.

Methods: Prospective cohort study of hospitalizations in the Internal Medicine ward from 2014 to 2020, including >18 years old patients with a fully completed AVD-DezIs. To identify in-hospital and 30 days mortality, univariate and multivariate logistic models were applied, including random effects if justified.

Results: A total of 19,771 episodes of hospitalization were included. In the univariate analysis, except for the presence of isolation and financial insufficiency, all the items were predictors of mortality in-hospital or within 30 days after discharge. In multivariate analysis, older age, male sex, longer hospital stay, higher Charlson score, deficiency in all four activities of daily living, deficiency in meal preparation and housekeeping, presence of pain/depression, immobility, and malnutrition are associated with a higher probability of in-hospital death whereas older age, male gender, higher Charlson score, longer length of hospital stay, deficiency in personal hygiene, ambulation, and eating habits, as well as the presence of incontinence and malnutrition, are associated with a higher probability of 30 days after discharge death.

Discussion/Conclusion: Except for isolation and financial insufficiency, all items were individually associated with the outcomes. When they are considered in conjunction and taking into account sex, age, comorbidities and length of stay, the predictive ability of in-hospital and 30 days mortality differed.

Introduction

According to the Center for Disease Control and Prevention, 1 in 4 adults (>18 years old) in the United States, or 61 million people, have at least one disability when considering earing; vision; cognition; mobility (serious difficulty walking or climbing stairs); self-care (difficulty dressing or bathing); or independent living (difficulty doing errands alone); and these disabilities are more common among 65 years or older.[1] This reality is close to the Portuguese one, where 17% of people aged 15-64 and around 50% of the elderly population, have difficulties or are unable to perform at least one daily activity.[2]

The functional assessment of individuals, which focuses on basic activities (ADL) and instrumental activities of daily living (IADL), as a health indicator, has been evaluated in different scenarios, mostly in elderly individuals.[3] Among the elderly (65+ years old), functional and cognitive capacity has proven to be an important predictor of hospital events and prognosis, namely functional decline, length of hospital stay, institutionalization needs, and death.[4-6] Socioeconomic context, not only in adulthood but also in childhood, has also been found to be associated with mortality and functional limitation.[7] Several reasons have been pointed out justifying a decline in autonomy and the ability to perform ADLs and IADLs, including age, cognitive and mental decline, musculoskeletal, neurological, circulatory, or sensory conditions that lead to reduced physical capacity, as well as social isolation, side effects of medications, acute illness, and hospitalization.[8,9] Considering the impact of all these factors on the prognosis of the elderly, comprehensive geriatric assessment should allow for the evaluation not only of functional capacity but also of mental health, auditory/visual ability, and the social conditions in which the elderly carry their day-to-day lives. It's also crucial to review medication and nutritional status[10,11] to identify factors that can be intervened upon, influencing the worsening of functional dependence, improving quality of life, and reducing morbidity.[12] Based on this background[3-12] and the need to identify practical needs that can be addressed in hospitalization (as social support), Martins et al.[11] constructed a score to apply to in-hospital medical ward elderly people, in Portugal, designated as AVD-DezIs, including 3 sections:

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ADLs, IADLs, and DezIs score, the latter focusing on various aspects of the individual's personal and social life. They have reported greatest disability among patients who died during hospitalization. However, it is not known whether it can be applied to younger individuals and whether these results can be extrapolated to most of patients admitted.

The objectives of this study are to validate the AVD-DezIs scale for individuals over 18 years of age and to determine whether there is a relationship between functional capacity and vital prognosis (in-hospital mortality and mortality within 30 days after discharge) in adults undergoing hospitalization in the Internal Medicine Department.

Materials and Methods

Study Design and Participants

Prospective cohort study of patients over 18 years of age, admitted to the Internal Medicine department, discharged between January 1, 2014 and December 31, 2020. Patients were selected per hospitalization episode and followed up to 30 days after discharge.

Variables, Data Sources, and Bias

For each hospitalization episode, the attending physicians filled out the AVD-DezIs form and the Charlson score, included due to the known association between comorbidities and disability. The AVD-DezIs index was created in 2012 and became mandatory for completion in 2013.[11] It consists of three sets of questions: a first part related to basic activities of daily living (evaluating ability to perform personal hygiene tasks, dress and undress, ambulation and feeding), a second part about instrumental activities of daily living (evaluating ability to take medications, meal preparation and housekeeping, using the telephone, leaving the house, using public transportation and manage money), and a final section (DezIs assessment) that covers various issues: presence of pain/depression/analgesic consumption; instability (falls/imbalances); immobility (osteoarticular/muscular dysfunction); incontinence/catheterization/use of diapers; starvation (calorie or protein-calorie malnutrition); dementia/delirium; insomnia; insecurity (sensory losses - visual and/or hearing); social isolation; financial insufficiency and polypharmacy (more than 5 drugs). For each item or question, there are three response options: "SR" if unanswered, "0" if there is no incapacity, and "1" if the response is positive for disability, with 20 being the maximum dysfunction value. The final functional index is translated into a percentage, with all items having the same weighting factor. Episodes without a complete AVD-DezIs index completion were excluded.

The Charlson score is an index that allows the measurement of disease severity/burden and the predictability of mortality.[13,14] Additionally, gender, age, length of hospital stay, in-hospital mortality, and readmissions to the Internal Medicine Department were included. Thirty-day mortality also required the use of the Electronic Health Record (HER-Medtrix EPR Health) and the National Health Service Information System for Death Certificates (SICO).

This study was reviewed by the Ethics Committee of the Hospital Center, which issued a favorable opinion.

Statistical Methods

Given that some individuals had multiple admissions during the analyzed period, like other studies,[15] the choice was made to use the hospitalization episode as the unit of analysis. This consideration led to the need to incorporate the dependence of observations from the same individual into the logistic regression models through random effects, resulting in mixed-effects models.

The analysis was conducted using SPSS®-v27.0 and R software-v 4.1.3, utilizing packages like "packagename," "StepReg," and "remotes." At the significance level, $P < .05$ (95% confidence interval) was considered significant.

The normality of continuous variables was assessed using the Kolmogorov–Smirnov test with Lilliefors significance correction. Continuous variables with a non-normal distribution were described by median and interquartile range (IQR) and compared using the nonparametric Mann–Whitney test. Categorical variables are presented by their absolute and relative frequencies. The association between categorical variables was evaluated using the $\chi 2$ test. Cronbach's Alpha was calculated to quantify the internal consistency of the scale, considering values above 0.9 as very good consistency, 0.8-0.9 as good, 0.7-0.8 as reasonable, 0.6-0.7 as weak, and below 0.6 as unacceptable. Univariate and multivariate logistic regression models were applied to identify predictive factors for the outcome variables of in-hospital mortality and mortality within 30 days after discharge. The model estimation was performed through Maximum Likelihood, numerically using the method of weighted least squares, based on Fisher's scoring method. The Odds ratio measure was used to estimate the association between the binary response variable and the covariates. The significance of covariates was assessed using the Wald test, and the model's goodness of fit was evaluated using a goodness-of-fit test based on the deviance function. Given the presence of individuals with multiple rehospitalizations throughout the period in which the study took place, a minimal baseline model with fixed effects and a baseline mixed model with random intercept for each patient's code were initially considered to test the impact of the random effect. To this effect, R functions "glm" and "glmer" were respectively used. Subsequently, the Akaike Information Criterion (AIC) of the two models was compared. If the AIC of the mixed model was lower (i.e., AIC glmer < AIC glm), it would justify the inclusion of the random effect. To confirm whether this reduction would warrant the adoption of the mixed model, the "Model Likelihood Ratio test" was also performed to assess whether the random effect significantly justified more variance.[16-18] This would be demonstrated by $P < .05$.

Results

There were 25,300 hospitalization episodes within the considered timeframe. 5,529 episodes were excluded due to incomplete AVD-DezIs index completion, leaving 19,771 (78.1%) episodes included in the analysis, corresponding to 13,030 patients (Supplementaty material Figure A.1). Description of included hospitalization episodes can be consulted at Supplementaty material, Table A.1. The median total AVD-DezIs reported was 7 (IQR 11): there was reported disability in at least 1 basic ADL, 2 instrumental activities, and 3 questions covered in DezIs (Table 1) in 50% of the episodes. The most frequently mentioned factor was the presence of polypharmacy. All assessed items are more common in the elderly, except for financial insufficiency. Among individuals under 65 years old, 50% exhibit disability in at least one of the evaluated questions.

Regardless of age group, very good internal consistency was observed for IDL and the global scale (Cronback's alfa of 0.938 and 0.925), good consistency for ADL (Cronback's alfa 0.895), and reasonable for DezIs (Cronback's alfa 0.737). In patients 18-64 years old, very good consistency was observed for ADL (Cronback's alfa 0.921), IDL (Cronback's alfa 0.924), and the global score (Cronback's alfa 0.917).

Functional Assessment and In-Hospital Mortality and 30-Day Mortality

There were 1,937 (9.8%) in-hospital deaths and 976 (5.5%) deaths within 30 days after discharge. The presence of disability was more common among individuals who passed away. Overall, patients who died in the hospital or within 30 days after discharge showed higher levels of disability in both basic activities (respectively 4 [2] vs. 1 [3], $P < .001$ and 3 [2] vs. 0 [3], $P < .001$) and instrumental activities (5 [2] vs. 2 [5], $P < .001$ in both contexts). Regarding the DezIs assessment, only the

Table 1
Comparison of Functional Evaluation Between Elderly and 18-64 Years Old Group.

	Total	18-64 Years	≥65 Years	*P*-Value**
Total disability for ADL (median [IQR])	1 (3)	0 (0)	2 (4)	< .001
Personal hygiene (n/%)	10354/52.4	810/18.3	9544/62.2	< .001
Dressing and undressing (n/%)	9301/47	698/15.7	8603/56.1	< .001
Ambulation (n/%)	7577/38.3	592/13.4	6985/45.5	< .001
Feeding oneself (n/%)	4767/24.1	387/8.7	4380/28.6	< .001
Total disability for IDL (median [IQR])	2 (5)	0 (1)	4 (5)	< .001
Taking medications (n/%)	9978/50.5	794/17.9	9184/59.9	< .001
Meal preparation and housekeeping (n/%)	11648/58.9	1114/25.1	10534/68.7	< .001
Using the telephone (n/%)	8037/40.7	525/11.8	7512/49	< .001
Leaving the house, using public transportation (n/%)	10895/55.1	887/20	10008/65.2	< .001
Manage money (n/%)	8737/44.2	641/14.5	8096/52.8	< .001
Total DezIs (median [IQR])	3 (4)	1 (3)	3 (3)	< .001
Presence of pain/depression/analgesic consumption (n/%)	8016/40.5	1445/32.6	6571/42.8	< .001
Instability (falls/imbalances) (n/%)	5767/29.2	455/10.3	5312/34.6	< .001
Immobility (osteoarticular/muscular dysfunction) (n/%)	7487/37.9	584/13.2	6903/45	< .001
Incontinence/catheterization/use of diapers (n/%)	6475/32.7	451/10.2	6024/39.3	< .001
Starvation (calorie or protein-calorie malnutrition) (n/%)	2592/13.1	421/9.5	2171/14.2	< .001
Dementia/delirium (n/%)	6051/30.6	371/8.4	5680/37	< .001
Insomnia (n/%)	6295/31.8	925/20.9	5370/35	< .001
Insecurity (sensory losses—visual and/or hearing) (n/%)	2812/14.2	198/4.5	2614/17	< .001
Social isolation (n/%)	1048/5.3	192/4.3	856/5.6	< .001
Financial insufficiency (n/%)	1120/5.7	387/8.7	733/4.8	< .001
Polypharmacy (more than 5 drugs) (n/%)	13425/67.9	1873/42.3	11552/75.3	< .001
Total AVD-DezIs Index	7 (11)	1 (4)	9 (10)	< .001

items “isolation” and “financial insufficiency” were not more frequent in those who died.

In-Hospital Mortality

Regardless of age, in the univariate analysis, except for isolation and financial insufficiency, all items included in basic activities, instrumental activities, and DezIs assessment were associated with a higher probability of in-hospital mortality (Table 2).

In the multivariate model that considers all items of the AVD-DezIs index, age, sex, length of hospital stay, and Charlson score (as shown in Table 2), it can be observed that, when adjusted for the other variables, older age, male sex, longer hospital stay, higher Charlson score, disability in all four considered activities of daily living, disability in meal preparation and housekeeping, presence of pain/depression, immobility, and malnutrition are associated with a higher probability of death with statistical significance. The presence of instability, insomnia, isolation, and polypharmacy show OR < 1, with $P < .05$, indicating a lower probability of the event occurring. According to the goodness-of-fit test based on the deviance function, there is no evidence to reject the null hypothesis, indicating a good model fit ($P = 1$).

When considering the model including only the 20 functional items, the ability to manage medication and money, use the telephone, leave the house, presence of incontinence, dementia/delirium and insecurity did not maintain significance as predictors of in-hospital mortality—AIC criterion 11,152 vs. 10,779 of the initial model. When comparing the best model that includes functional criteria along with age, sex, disease burden, and length of stay (Table 2) to the best model that includes only functional criteria, the former was found to be superior (Residual Deviance 10,733 vs. 11,112, $P < .001$).

Thirty Days Mortality

To study predictors of mortality within 30 days after discharge, a logistic regression model with random effects was used. In the univariate analysis, except for isolation and financial insufficiency, all the other items were associated with a higher probability of occurrence of the event of interest (Table 3).

Focusing on the multivariate model that considers all items of the AVD-DezIs index, age, sex, Charlson score, and length of hospital stay (Table 3), it can be observed that older age, male sex, Charlson score, length of hospital stay, disability in personal hygiene, ambulation, and eating, as well as the presence of incontinence and malnutrition, are associated with a higher likelihood of death. Focusing solely on the evaluation covered by the 20 items included in the score, disability in personal hygiene, ambulation, eating, meal preparation, presence of pain/depression/analgesic consumption, incontinence/catheterization/use of diapers, and malnutrition are associated with a higher likelihood of death within 30 days with statistical significance.

Discussion

In medical practice, it’s necessary to describe and measure the functional capacity of patients. Among the elderly there are several tools available such as Katz Index of Independence in Activities of Daily Living,[19] Lawton Instrumental Activities of Daily Living Scale,[20] Barthel Index,[21] and Self Care Index,[22] which was also applied to >18 years old patients in a study performed in Switzerland.[23] Easy-to-use tools are needed in practice including the utilization of forms and scores that cater to all individuals, regardless of their age.

The AVD-DezIs score, initially designed to be applied to elderly patients,[11] both in its entirety and by sections, exhibited good internal consistency across the data of 19,771 episodes, regardless of the age group (elderly vs. nonelderly), however, it is necessary to highlight that more than 50% of the patients were aged over 77 years. This observation aligns with previous descriptions and reflects a higher resource consumption among this age group.[24-26] Indeed, there has been an increase in the Portuguese elderly population compared to 2011, having reached 23.4%.[27] This trend is accompanied by a higher likelihood of chronic disease and disability.[25,11] Despite women having more frequent admissions than men, we observed higher mortality among men. The association between gender, comorbidity, and mortality isn’t entirely clear in the literature,[25,26] even though epidemiological data in this country show that life expectancy at birth and at 65 years of age is lower for males.[27]

In the studied sample, the in-hospital mortality rate and the 30-day mortality rate were similar to other published studies that reported 14.4% and 6.2%, respectively.[11,15,28,29] It was found that in at

Table 2
Univariate and Multivariate Analysis of In-Hospital Mortality in All Patients Analyzed.

Variable	In-Hospital Mortality					
	Univariate Analysis			Multivariate Analysis		
	Unadjusted OR	Confidence Interval 95%	*P*-Value	Adjusted OR	Confidence Interval 95%	*P*-Value
Age	1.03	**1.03-1.04**	**< .001**	1.01	**1.01-1.02**	**< .001**
male sex	1.22	**1.11-1.34**	**< .001**	1.42	**1.28-1.58**	**< .001**
Charlson score	1.32	**1.29-1.35**	**< .001**	1.23	**1.20-1.26**	**< .001**
Length of stay	1.01	**1.00-1.01**	**.008**	1.01	**1.00-1.01**	**.003**
Disability for ADL						
Bathing	6.08	**5.36-6.93**	**< .001**	1.34	**1.01-1.76**	**.042**
Dressing and undressing	5.93	**5.27-6.69**	**< .001**	1.68	**1.30-2.18**	**< .001**
Ambulation	4.53	**4.09-5.02**	**< .001**	1.22	**1.03-1.44**	**.023**
Feeding oneself	4.01	**3.65-4.42**	**< .001**	1.44	**1.25-1.66**	**< .001**
Disability for IDL						
Taking medications	4.45	**3.97-5.00**	**< .001**	0.82	0.66-1.02	.076
Meal preparation and housekeeping	6.38	**5.53-7.39**	**< .001**	1.72	**1.34-2.19**	**< .001**
Using the telephone	4.23	**3.82-4.69**	**< .001**	1.00	0.83-1.22	.960
Leaving the house, using public transportation	5.58	**4.91-6.37**	**< .001**	1.14	0.89-1.46	.310
Manage money	4.34	**3.90-4.83**	**< .001**	1.11	0.89-1.38	.356
DezIs						
Presence of pain/depression/analgesic consumption	1.95	**1.78-2.15**	**< .001**	1.37	**1.23-1.53**	**< .001**
Instability (falls/imbalances)	1.70	**1.54-1.87**	**< .001**	0.78	**0.70-0.88**	**< .001**
Immobility (osteoarticular/muscular dysfunction)	3.65	**3.31-4.03**	**< .001**	1.15	**1.01-1.32**	**.041**
Incontinence/catheterization/use of diapers	3.61	**3.28-3.98**	**< .001**	0.99	0.86-1.14	.893
Starvation (calorie or protein-calorie malnutrition)	3.92	**3.53-4.36**	**< .001**	1.96	**1.73-2.21**	**< .001**
Dementia/delirium	2.88	**2.62-3.17**	**< .001**	0.87	**0.77-1.00**	**.047**
Insomnia	1.54	**1.40-1.69**	**< .001**	0.85	**0.76-0.95**	**.004**
Insecurity (sensory losses—visual and/or hearing)	1.88	**1.68-2.11**	**< .001**	0.97	0.85-1.11	.697
Social isolation	1.16	0.94-1.40	.155	0.78	**0.62-0.98**	**.036**
Financial insufficiency	1.15	0.84-1.39	0.17	0.93	0.74-1.16	.540
Polypharmacy (more than 5 drugs)	1.48	**1.33-1.65**	**< .001**	0.76	**0.67-0.86**	**< .001**
Total ADL	1.71	**1.66-1.77**	**< .001**	1.47	**1.38-1.56**	**<.001**
Total IDL	1.49	**1.45-1.53**	**< .001**	1.11	**1.05-1.16**	**< .001**
Total DezIs	1.30	**1.28-1.33**	**< .001**	1.05	**1.02-1.08**	**< .001**
AVD-DezIs	1.17	**1.15-1.18**	**< .001**			

Bold values are statistically significant.

least half of the episodes, disability was reported in one basic ADLs, most frequently for personal hygiene. For instrumental ADLs, disability was reported in two activities, most commonly in meal preparation/household chores and leaving the house/using transportation. Except for the multivariate model for 30-day mortality in which the total for instrumental activities was not significant, the overall disability in both basic and instrumental ADLs predicted in-hospital and 30-day mortality, which aligns with the available literature.[15,28–32] The DezIs assessment provides a more comprehensive approach aiming to enhance health care through the integration of factors inherent to the individual (such as nutritional status and visual/auditory capacity) as well as environmental factors and medical care,[10] that may require intervention even at younger ages. When considering the partial DezIs total, this value was also predictive of the studied events; however, in contrast to what was observed for disability in basic and instrumental ADLs, not all items were associated with an excess risk for in-hospital mortality. Specifically regarding to this endpoint, in the univariate analysis, all factors translated to an excess risk, although the presence of isolation and financial insufficiency did not have statistical significance.

Focusing in in-hospital mortality, when these factors were adjusted for ADL and IDL, gender, age, Charlson score, and duration of hospitalization, it was observed that the presence of instability, insomnia, isolation, and polypharmacy had an odds ratio (OR) less than 1 with statistical significance. While the literature does associate higher mortality risk in the elderly with instability,[33] and isolation,[34] there are conflicting results regarding the presence of insomnia. Indeed, while some studies link insomnia to higher mortality,[35] others are more complex in their analysis, associating higher mortality with short sleep duration[36] or even lacking a documented association in a study involving individuals aged 30 to 102.[37] This could be related to methodological issues with different study designs and inclusion of different covariates. Similarly, the interpretation of data concerning polypharmacy is complex due to methodological issues. Polypharmacy can be defined purely numerically or be attributed to prescriptions exceeding clinically indicated levels. While polypharmacy can be associated with higher mortality,[38] other studies in the elderly have not shown this relationship, differentiating inappropriate drug prescriptions (associated with higher risk) from numerically defined polypharmacy, which does not show an association with mortality.[39] This variation in results might depend on the definition used, the presence of therapeutic indications, and the time elapsed since their introduction, which could limit long-term interpretation.[38] In the latest years new guidelines recommend prognosis-modifying drugs, which may have some role in the results of this study. The presence of starvation/caloric or caloric-protein malnutrition, was a predictor for all the analyzed events, being the item with the highest odds ratio (OR) in the considered models. The presence of malnutrition has been associated with increased morbidity, mortality, and functional decline,[40,41] with nutritional support linked to lower in-hospital and 30-day mortality, as well as reduced readmission rates within the same period.[42] This emphasizes the importance of screening for malnutrition and implementing effective measures. The multivariate models that included factors beyond the 20 global assessment items of the individual, such as age, gender, duration of hospitalization, and Charlson score, showed better performance. This suggests that the comprehensive assessment should also take these factors into account.

As far as we know, this is the first study that applies a global geriatric assessment to hospitalized adult individuals, with statistical robustness. In comparison to other studies, this analysis also has a positive aspect in its statistical methodology by considering the introduction of random

Table 3
Thirty Days Mortality Univariate and Multivariate Analysis in All Patients Analyzed.

30 Days Mortality						
Variable	Univariate Analysis			Multivariate Analysis		
	Unadjusted OR	Confidence interval 95%	*P*-Value	Adjusted OR	Confidence interval 95%*	*P*-Value
Age	1.04	**1.03-1.05**	**< .001**	1.01	**1.00-1.02**	**.022**
Male sex	1.36	**1.16-1.58**	**< .001**	1.57	**1.34-1.84**	**< .001**
Charlson score	1.39	**1.34-1.45**	**< .001**	1.26	**1.21-1.30**	**< .001**
Length of stay	1.01	**1.00-.02**	**< .001**	1.01	**1.00-1.02**	**.007**
Disability for ADL						
Bathing	6.21	**5.08-7.70**	**< .001**	1.58	**1.09-2.29**	**.015**
Dressing and undressing	5.89	**4.87-7.24**	**< .001**	1.12	0.79-1.59	.520
Ambulation	5.24	**4.41-6.30**	**< .001**	1.48	**1.15-1.77**	**.002**
Feeding oneself	4.84	**4.06-5.84**	**< .001**	1.43	**1.15-1.77**	**.001**
Disability for IDL						
Taking medications	4.97	**4.12-6.06**	**< .001**	1.02	0.75-1.40	.893
Meal preparation and housekeeping	5.91	**4.80-7.40**	**< .001**	1.30	0.94-1.80	.116
Using the telephone	4.50	**3.80-5.39**	**< .001**	0.89	0.67-1.18	.413
Leaving the house, using public transportation	5.38	**4.42-6.62**	**< .001**	0.99	0.70-1.39	.951
Manage money	4.7	**3.95-5.67**	**< .001**	1.12	0.81-1.53	.497
DezIs						
Presence of pain/depression/analgesic consumption	1.81	**1.56-2.11**	**< .001**	1.14	0.98-1.34	.110
Instability (falls/imbalances)	2.20	**1.89-2.57**	**< .001**	1.02	0.87-1.21	.770
Immobility (osteoarticular/muscular dysfunction)	3.94	**3.34-4.68**	**< .001**	1.11	0.91-1.35	.314
Incontinence/catheterization/use of diapers	4.61	**3.90-5.51**	**< .001**	1.27	**1.03-1.57**	**.026**
Starvation (calorie or protein-calorie malnutrition)	4.74	**3.94-5.73**	**< .001**	2.09	**1.73-2.53**	**< .001**
Dementia/delirium	3.28	**2.80-3.88**	**< .001**	0.84	0.69-1.03	.092
Insomnia	1.77	**1.52-2.06**	**< .001**	0.98	0.83-1.15	.802
Insecurity (sensory losses—visual and/or hearing)	1.89	**1.56-2.27**	**< .001**	0.84	0.69-1.03	.094
Social isolation	1.34	0.99-1.80	.056	0.81	0.58-1.12	.194
Financial insufficiency	1.34	0.99-1.78	.051	0.99	0.72-1.36	.953
Polypharmacy (more than 5 drugs)	1.97	**1.65-2.36**	**< .001**	0.94	0.78-1.13	.51
					Random effects	
					$\sigma 2$	3.29
					Marginal R2/Conditional R2	
					0.217/0.397	

Bold values are statistically significant.
* CI estimated in a normal distribution.

effects, which is more suitable for the type of data being analyzed. This score can identify patients with disabilities and facilitate the implementation of specific action protocols, improving the provision of care and aiming to reduce mortality.

Although initially designed as a census study, 21.9% (5,529) of hospitalization episodes were excluded due to incomplete AVD DezIs score completion. Considering that these episodes were related to older patients with longer hospital stays and higher in-hospital and 30-day mortality rates, there might have been an underestimation of documented associations.

This study also has other limitations, including the definition of factors used in the score construction, the lack of specification of the patient's living situation (home, nursing home, Continuing Care Unit) before admission and after discharge, type of caregiver, noninclusion of the reason for hospitalization/use of the healthcare system, as well as previous hospital admission and a high number of deaths without a completed score, which led to their exclusion from the analysis.

Conclusion

With exception of isolation and financial insufficiency, all items included in the score were individually associated with the in-hospital and 30 days mortality. When considered together and taking into account sex, age, comorbidities and length of stay, the predictive ability of in-hospital and 30 days mortality was different. Based on this study, it can be concluded that, in our sample, functional assessment focusing on basic activities, instrumental activities, and DezIs is crucial. It should be interpreted in conjunction with other factors such as age, gender, and duration of hospitalization. There is a need to review the formula for calculating overall disability, considering the varying predictive capacity of the included items, as well as the possibility of simplifying the score. It is essential to develop protocols for identifying and addressing factors whose presence increases the risk of adverse events, such as malnourishment

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Heloísa Ribeiro: Writing – original draft, Project administration, Methodology, Formal analysis, Conceptualization. **Yolanda Martins:** Writing – review & editing, Validation, Supervision, Conceptualization. **Isabel Natário:** Writing – review & editing, Supervision, Formal analysis, Conceptualization. **Luís Pedro Tavares:** Writing – review & editing, Conceptualization.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.1016/j.ajmo.2024.100074.

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