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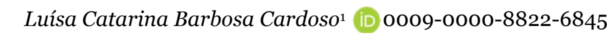
Functional assessment for discharge planning in a Convalescence Unit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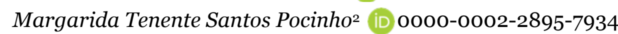
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ABSTRACT

Introduction: Functionality is the most important concept in the rehabilitation of users in a Convalescent Unit. At the end of the 30-day hospitalisation, individuals are discharged to their homes or the need for another type of response must be assessed.
Objectives: To identify a functional level that determines the post-discharge destination of patients in a Convalescent Unit and to study whether other factors, such as the socio-family situation, may influence the patients' discharge destination.
Methodology: Observational study in 290 individuals with various pathologies. We collected values of the Barthel Index and the Functional Independence Measure on admission and at discharge from the Convalescent Unit. We applied Receiver Operating Characteristic curves to calculate the cut-off point in Barthel Index and Functional Independence Measure at discharge based on the discharge destiny, as well as related the post-discharge destiny, functionality, and socio-familial situation.
Results: We refer to a cut-off point ≥80 for Barthel Index and ≥114 for Functional Independence Measure, representing a high probability of returning home at the end of the hospitalisation, and values below the cut-off points indicate the need for other responses from the Network and social services. Individuals living alone, even with good functional levels, require other responses from the Network.
Conclusion: Assessing functionality and socio-familial circumstances at the time of discharge, significantly enhances the ability to predict the need for additional resources.

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INFORMAÇÃO DO ARTIGO

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RESUMO

Introdução: A funcionalidade é o conceito mais importante na reabilitação dos utentes em uma Unidade de Convalescença. No final do internamento de 30 dias os indivíduos têm alta para o domicílio ou tem de ser avaliada a necessidade de outro tipo de resposta.
Objetivos: Identificar o nível funcional que determina o destino pós-alta dos doentes internados numa Unidade de Convalescença e estudar se outros fatores, como a situação sociofamiliar, podem influenciar o destino pós-alta dos doentes.
Metodologia: Estudo observacional com 290 indivíduos com várias patologias. Recolhemos os valores do Índice de Barthel e da Medida de Independência Funcional na admissão e na alta da UC. Aplicamos curvas Características de Operação do Recetor para calcular o ponto de corte no Índice de Barthel e na Medida de Independência Funcional na alta com base no destino após a alta, bem como relacionámos o destino pós-alta, funcionalidade e situação sociofamiliar.
Resultados: Encontrámos um ponto de corte ≥80 para o Índice de Barthel e ≥114 para a Medida de Independência Funcional, representando uma alta probabilidade de retorno para casa no final do internamento, e valores abaixo dos pontos de corte indicam a necessidade de outras respostas da Rede ou de serviços sociais. Indivíduos que vivem sozinhos, mesmo com bons níveis funcionais, requerem outras respostas da Rede.
Conclusão: A avaliação da funcionalidade e da situação sociofamiliar no momento da alta aumenta exponencialmente a previsibilidade do aumento de recursos.

Introduction

The human aging process is individualized and complex, occurring in the biological, psychological, and social domains. With advancing age, difficulties in adapting to new events are amplified and adverse changes occur in the cognitive and intellectual spheres.[1]

In the European Union (EU), Portugal ranks third in terms of the highest rate of aging among the resident population. The phenomenon of population aging, which is of great magnitude, is particularly evident in developed and developing countries.[2]

According to the United Nations (UN), 250 million people over the age of 60 have moderate or severe functional problems, and approximately 46% of the world's population in these age groups have some form of disability.[3]

Physiological changes characteristic of aging, combined with individual, educational, socio-environmental, community, and political factors, create conditions conducive to the development of multimorbidities, which in turn are often associated with the development of functional limitations.[4]

Functional capacity is an important indicator of elderly health, as its decline carries the risk of loss of independence and autonomy in performing daily activities such as self-care.[5] The most evident manifestation of poor health status in the population is the loss of functionality and a decrease in autonomy in Activities of Daily Living (ADLs).[6] Decreased functional capacity is a predictor of institutionalization, with a consequent increase in family burden.[7]

The World Health Organization (WHO) report for the decade 2021-2030 highlights the importance of implementing procedures that improve the functional capacity of older adults. To this end, it presents four areas of action centred on how we think and act with older adults and aging; ensuring that the community fosters the skills of the elderly; providing integrated and person-centred care and services based on their needs; and finally, providing access to Long-Term Care (LTC) for those who need it.[8]

The National Network of Integrated Continuing Care (RNCCI - Portuguese acronym) is a set of health and social support interventions focused on the overall recovery of people in a state of dependency, mostly from hospitalisation with a loss of autonomy. The Network has several types of care that vary in length of stay and care objectives.[9]

Convalescence Units (CU) aim to rehabilitate patients with post-acute or chronically decompensated pathology, with predictable rehabilitation within 30 days. According to Ramos, Lopes et al.[10] in general, users with greater difficulty in ADLs, lower levels of functional autonomy, and poorer cognitive status are more likely to use continuing care. Variables such as sex, age, and disability status are determining factors in the use of continuing care.[11]

A crucial dimension in the development and maintenance of RNCCI is related to how it incorporates the health needs of the Portuguese population and how it will be reconfigured to present the health gains of its users.[12]

Determining a functional level at discharge and identifying other factors that may influence patients' discharge

destinations enables CU care teams to implement strategies to minimize barriers and enable communication with caregivers in preparation for discharge.

Therefore, functional assessment is essential for care planning and for teams to plan discharge from Network Units.

The aims of this study were to identify a functional level that determines the post-discharge destination of patients in a CU and to study whether other factors, such as the socio-family situation, may influence the patients' discharge destination.

Methodology

Sample and criteria

Data collection began in November 2022, following approval from the Ethics Committees, Scientific Councils, and Administration. The study we conducted was observational, retrospective, cross-sectional, and analytical, as we aimed to identify correlations, understand, and describe phenomena of relationships between variables. It is also a predictive study, as we used data to predict future outcomes, patterns, and anticipate events, enabling decisions to be made based on forecasts. The study population consisted of all patients in the Convalescent Unit of HNSA - Seia, ULS Guarda, within the RNCCI.

The study sample comprised all CU patients admitted between June 1, 2020, and May 31, 2022. We defined the following inclusion criteria: patients aged 50 years or older, as the population only contained 6 individuals aged between 39 and 44 years, raising the possibility of bias due to the age disparity; patients whose diagnosed pathology falls within the areas of neurology, musculoskeletal, and other areas of internal medicine diseases. We defined the following exclusion criteria: patients who were not assessed by the two scales used in functional assessment; patients who were not assessed twice (admission and discharge from the unit); patients discharged from the unit to acute, discharge at their request, or death.

When we applied the criteria, we obtained a sample size of 290 patients (n=290).

Measuring tools and data

All patients admitted to the Unit are assessed by applying the Barthel Index (BI) and the Functional Independence Measure (FIM) on admission and at discharge.

The BI assesses functional status and the level of autonomy in activities of daily living. The index values range from 0 to 100, where 0 represents total dependence and 100 is defined as independence in activities of daily living. In 2007 Araújo et al.[13] conducted a study in the northern region of Portugal, where they adapted and validated the BI for the Portuguese population. The original measurement instrument verified a high internal consistency (α = 0.93).[14] In the validation of the index in the Portuguese population, high internal consistency (α = 0.96) which suggests a good reliability of this instrument.[13] The FIM was designed in 1983 by a "Task Force to Develop a Uniform Data System for Medical Rehabilitation" (UDSMR), adapted by a group of researchers to the European Portuguese language and widely used in studies in this version.[15] A group of researchers, physiatrists from the Rehabilitation Medicine Division of Clinical Hospital of the Medical Faculty of São Paulo, Riberto et al.[16] performed the validation into Portuguese. In this work, they demonstrated the high reproducibility of the Brazilian version, not identifying problems of cultural equivalence.[17] The author McDowell[18] reviewed several published articles on inter-rater reliability and calculated the mean values of inter-rater and the test-retest coefficient, both of which were 0.92, and the corresponding medians were 0.95.

One of the researchers collected the patient data from the sample using a file containing the daily records of the professional practice of these researchers and the other physiotherapists at the UC. The data we collected were gender; age; diagnosis; values of the assessment instruments applied at admission and discharge (BI and FIM); days of hospitalisation in the unit; post-discharge destination and socio-family situation. We grouped the patients according to their socio-family situation: into lived alone; lived with family members (spouse, siblings, children, nephews); lived in institutions. In the CU, the physiotherapists applied the scales to each patient within the first 48 hours after admission to the unit and within the 48 hours preceding discharge. We grouped the patients' admission diagnoses according to the 11th Revision of the International Classification of Diseases (ICD-11).

Data analysis

We decided to use ROC curves (Receiver Operating Characteristic), although this is a graphical technique commonly used in research to assess the discriminative capacity of a test between positive and negative results (disease, absence of disease), and the use of the Youden Index to determine the cut-off point on the curve.[19]

For this study, we dichotomized the discharge destination into two groups: those who were discharged to home or discharge to home with the support of the Integrated Continuous Care Teams (ICCT) - positives, and those who were discharged to an institutional setting (Medium Term Rehabilitation Unit (MTRU), Long-Term Maintenance Units (LTMU), Residential Structure for Elderly People (RSEP)) - negatives. In this investigation, we applied the ROC curve to identify the relevant cut-off point, to evaluate the effectiveness and accuracy of the measurement methods used. We use the ROC curve retrospectively to statistically calculate the cut-off point for FIM and BI scores at discharge,

based on post-discharge destination. The utility of the cut-off point is evaluated in terms of sensitivity and specificity of this cut-off value to correctly classify positive and negative cases, respectively.

The Area Under the Curve (AUC) reflects how well the test can distinguish between positives and negatives. The AUC summarizes the discriminative ability of a test. The higher the AUC, the better the test, to be perfect would have an AUC of 1.0. The AUC provides an estimate of the probability of correctly detecting an individual or case (test accuracy); an AUC of 0.8 reflects an 80% chance of correct classification. AUC values are interpreted as: 0.5 (no discriminative power); 0.5 - 0.7 (weak discrimination); 0.7 - 0.8 (acceptable discrimination); 0.8 - 0.9 (good discrimination); >0.9 (exceptional discrimination).[19,20]

The statistical analysis involved measures of descriptive statistics (absolute and relative frequencies, means, and their respective standard deviations) and inferential statistics. We assessed the normality of distribution using the Shapiro-Wilk test. The significance level for rejecting the null hypothesis was set at $\alpha \leq 0.05$. In the inferential analysis, we used Pearson's correlation to assess the correlation between BI and FIM values at admission and discharge, as well as to examine the relationship between functional capacity (BI and FIM) and patient age. The BI and the FIM are two instruments that both measure dependency in activities of daily living, but the MIF also assesses changes in language, social relationships, and memory. Understanding how these measuring instruments relate to each other allows us to determine if the individuals in the sample exhibit cognitive changes that affect the relationship between the instruments. We used the paired t-test to verify functional capacity gains, comparing the values at discharge with those at admission for both BI and FIM. To determine the effect size of the gains, we applied Cohen's d. To assess significant differences in functional capacity related to patient diseases, we applied the Kruskal-Wallis test to compare the means (BI and FIM) for each disease classified in ICD11 at admission and discharge. We employed ROC curves with the Youden Index to determine a cut-off point for BI and FIM related to discharge destination. To examine the relationship between functional capacity above and below the cut-off point and discharge destination, we used the Chi-square test of independence. We checked the assumption of the Chi-square test that no more than 20% of cells have expected frequencies below 5. In situations where this assumption was not satisfied, we used the Chi-square test by Monte Carlo simulation. We analysed differences with the support of standardized adjusted residuals.

We performed statistical analysis using SPSS® (Statistical Package for the Social Sciences) version 28.0 for Windows. The ROC curves and the Youden Index were performed using MedCalc® (Statistical Software) version 20.218.

Ethical procedures

This study commenced following approval by the Board of Directors of ULS Guarda (Minutes No. 22/2022, which includes the ruling of the Ethics Committee of Health ULS Guarda, dated 18/10/2022), the Ethics Committee of the Faculty of Medicine of the University of Coimbra with the opinion Proc. CE-095/2022, and approval by the Scientific Council of University of Coimbra on 15/09/2022. We obtained Informed consent from all participants, either in person or by telephone.

All procedures in this study were following ethical standards and complied with the principles of the Helsinki Declaration.

Results

Patients' characteristics

The sample consisted of 290 patients, with a mean age of 77.43 ± 9.867 with ranging from 50 to 96 years old, mostly living with family before admission to the CU. Characteristics such as gender, marital status, socio-familial situation, and entry diagnosis classified in the ICD-11 are present in table 1. Regarding the admission diagnosis, classified according to ICD-11, we needed twelve ICD-11 chapters to group the admission diagnoses of the patients, with trochanteric fractures being predominant with n= 69, and strokes with n= 67.

Table 1. Sample characterization.

	N	%
Gender		
Female	167	57,6%
Male	123	42,4%
Marital status		
Single	36	12,4%
Married	127	43,8%
Widowed	109	37,6%
Divorced	18	6,2%
Socio-family situation		
Alone	111	38,3%
Family members	173	59,7%
Institution	6	2,1%
CID 11		
Chap. 1 - Certain infectious or parasitic diseases	4	1,4%
Chap. 2 - Neoplasms	13	4,5%
Chap. 5 - Endocrine, nutritional, or metabolic diseases	3	1,0%
Chap. 6 - Mental, behavioural, or neurodevelopmental disorders	4	1,4%
Chap. 8 - Nervous system diseases	80	27,6%
Chap. 11 - Diseases of the circulatory system	21	7,2%
Chap. 12 - Respiratory system diseases	21	7,2%
Chap. 13 - Diseases of the digestive system	9	3,1%
Chap. 15 - Diseases of the musculoskeletal system or connective tissue	3	1,0%
Chap. 16 - Diseases of the genitourinary system	8	2,8%
Chap. 22 - Injuries, poisoning or other consequences of external cause	102	35,2%
Chap. 24 - Factors influencing health status or contact with health services	22	7,6%
Total	290	100%

Characterization of the sample according, sex, marital status, social and family situation and the classification of the entry diagnosis according to the ICD-11. Chap - Chapters.

Regarding hospitalization days, the mean was 33.5 ± 13.1, with a maximum of 150 days and a minimum of 12 days. Most individuals, 73.8% (n=214), stayed up to 30 days, and 76 individuals over 30 days.

Most individuals in the sample, 65.5% (n=190), were discharged home and to home with support from ICCT, 25.5% of individuals (n=74) were referred to another type of network, namely MTRU, LTMU. Discharge to institutions was recorded in 9.0% of patients (n=26).

Inferential analysis - measurement tools

As the study used two measuring instruments to evaluate the functional level, it was necessary to understand the relationship between the two scales using Pearson's Correlation Coefficient. The correlation coefficient between BI and FIM at admission is statistically significant, positive, and extremely high ($r = 0.936$, $p < 0.001$). Thus, the higher the BI, the higher the FIM. The correlation coefficient between BI and FIM at discharge is statistically significant, positive, and extremely high ($r = 0.942$, $p < 0.001$).

When we compared the values of BI and FIM at admission and discharge to understand if individuals had functional gains, we found the following statistically significant differences: BI admission, mean 63.35 ± 27.65, BI discharge 82.42 ± 24.15; FIM admission, mean 89.13 ± 26.60, FIM discharge, mean 104.87 ± 23.1. Barthel scores are significantly higher at discharge, $t_{(289)} = 18.103$, $p < 0.001$. FIM scores are significantly higher at discharge, $t_{(289)} = 18.131$, $p < 0.001$. We used Cohen's Test (d) to compare functional gains and understand the effect size, comparing means in both groups. We obtained values of 1.063 for the difference in mean at discharge and admission on BI, and 1.065 for the difference in mean at discharge and admission on FIM. The effect is considered large as all values are above 0.80 in Cohen's d.

Due to the variety of pathologies present in the individuals, we verified whether there was a correlation between the types of diseases, classified by CID 11, and the functional values at admission and discharge, using the Kruskal-Wallis test. Differences in BI and FIM values at admission and discharge based on pathology were not statistically significant ($p > 0.05$).

Cut-off points

To identify a cut-off point, for functional level at discharge, we used BI and FIM values at discharge and ROC curves, dichotomized into two groups: those who were discharged to home and those who were discharged to an institutional setting (MTRU, LTMU, RSEP). The results obtained are shown in figure 1 and figure 2.

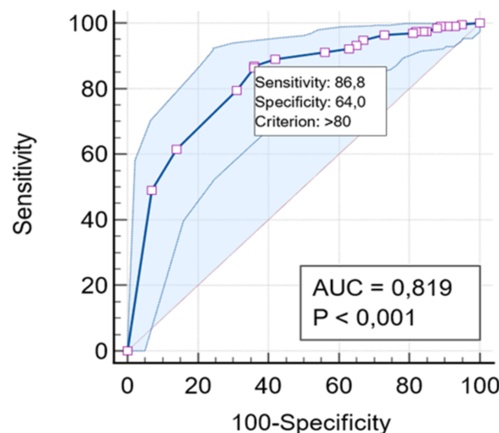

Figure 1. Determination of the Barthel Index (BI) cut-off point, by means of a receiver operating characteristic curve (ROC). The point with the highest Youden index, equal to sensitivity + specificity - 1, was defined as the upper cut-off point. Analysis of the ROC curve showed a point of 80 at BI at discharge. The area under the curve (AUC) was 0.81, with a sensitivity and specificity of 86.8% and 64%.

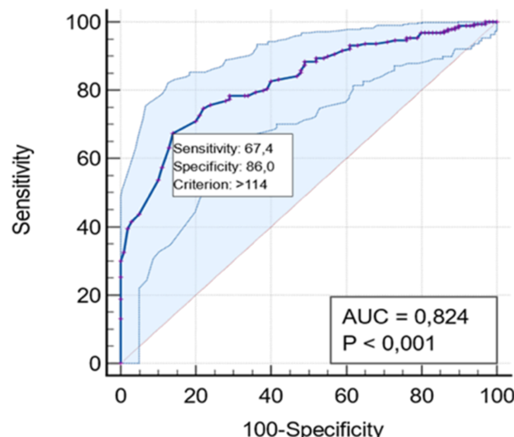

Figure 2. Determination of the cut-off point in the Functional Independence Measure (FIM) by means of a receiver operating characteristic (ROC) curve. The point with the highest Youden index, equal to sensitivity + specificity - 1, was defined as the upper cut-off point. Analysis of the ROC curve showed a point of 114 on FIM at discharge. The area under the curve (AUC) was 0.82, with a sensitivity and specificity of 67.4% and 86%.

Using ROC curves and the Youden Index, we obtained a cut-off point for BI of 80, with a statistically significant AUC of $p \leq 0.001$, with a 95% confidence interval of 0.770 to 0.819. We obtained a cut-off point for FIM of 114 with a statistically significant AUC of $p \leq 0.001$, with a 95% confidence interval of 0.775 to 0.866.

Using the cut-off points, as shown in table 2, we related the values above and below the cut-off points to the discharge destination of the patients in the sample. We found that most individuals with BI values above 80, $\chi^2_{(4)} = 75.243$, < 0.001, and FIM values above 114, $\chi^2_{(4)} = 70.644$, < 0.001, were discharged to home, while most patients with BI values below 80 and FIM values below 114 were discharged to other network or social responses.

Table 2. Barthel Index and Functional Independence Measure at discharge and the destination of discharge.

Destination discharge		BI		Total	FIM		Total
		< 80	≥ 80		<114	≥114	
Home	Frequency	20	156	176	52	124	176
	% BI/FIM	25,3%	**73,9%**	60,7%	38,5%	**80,0%**	60,7%
MTRU	Frequency	38	32	70	56	14	70
	% BI/FIM	**48,1%**	15,2%	24,1%	**41,5%**	9,0%	24,1%
LTMU	Frequency	2	2	4	2	2	4
	% BI/FIM	**2,5%**	0,9%	1,4%	**1,5%**	1,3%	1,4%
Institution	Frequency	18	8	26	22	4	26
	% BI/FIM	**22,8%**	3,8%	9%	**16,3%**	2,6%	9%
Home with ICCT	Frequency	1	13	14	3	11	14
	% BI/FIM	1,3%	**6,2%**	4,8%	2,2%	**7,1%**	4,8%
Total	Frequency	79	211	290	135	155	290
	% BI/FIM	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Description of the patients' discharge destination with the application of cut-off points. MTRU – Medium Term and Rehabilitation Unit; LTMU –Long-term Maintenance Unit; ICCT – Integrated Continued Care Team (Home-based teams); FIM – Functional Independence Measure; BI – Barthel Index.

Since there were patients with BI and FIM values above the cut-off points who were discharged to other network responses or institutions, we investigated whether there was a relationship between discharge destination, functionality, and socio-familial situation. From the observation of table 3, we found that most patients with BI values at discharge ≥80, $\chi^2_{(6)} = 54.354$, < 0.001, and FIM values at discharge ≥114, $\chi^2_{(6)} = 41.504$, < 0.001, who were referred to other network responses or institutions, lived alone. Most patients with final BI values <80 and FIM values <114, who returned to their pre-event situation, had support from family or institution.

Table 3. IB and FIM cut-off point at discharge and socio-family situation.

Groups		Socio-family situation			total
		Alone	Relatives	RSEP	
Barthel ≥ 80 e other response	Frequency	23	18	0	41
	% cut-off point	**56,1%**	43,9%	0,0%	100,0%
	% Socio-family sit.	20,7%	10,4%	0,0%	14,1%
Barthel ≥ 80 and pre-event	Frequency	62	107	1	170
	% cut-off point	36,5%	62,9%	0,6%	100,0%
	% Socio-family sit.	55,9%	61,8%	16,7%	58,6%
Barthel <80 e other response	Frequency	24	29	0	53
	% cut-off point	45,3%	54,7%	0,0%	100,0%
	% Socio-family sit.	21,6%	16,8%	0,0%	18,3%
Barthel <80 and pre-event	Frequency	2	19	5	26
	% cut-off point	7,7%	**73,1%**	**19,2%**	100,0%
	% Socio-family sit.	1,8%	11,0%	83,3%	9%
Total	Frequency	111	173	6	290
	% cut-off point	38,3%	59,7%	2,1%	100,0%
	% Socio-family sit.	100,0%	100,0%	100,0%	100,0%
Groups					
FIM ≥ 114 e other response	Frequency	14	6	0	20
	% cut-off point	**70,0%**	30,0%	0,0%	100,0%
	% Socio-family sit.	12,6%	3,5%	0,0%	6,9%
FIM ≥ 114 and pre-event	Frequency	54	81	0	135
	% cut-off point	40,0%	60,0%	0,0%	100,0%
	% Socio-family sit.	48,6%	46,8%	0,0%	46,6%
FIM < 114 e other response	Frequency	33	41	0	74
	% cut-off point	44,6%	55,4%	0,0%	100,0%
	% Socio-family sit.	29,7%	23,7%	0,0%	25,53%
FIM < 114 and pre-event	Frequency	10	45	6	61
	% cut-off point	16,4%	**73,8%**	**9,8%**	100,0%
	% Socio-family sit.	9,0%	26,0%	100,0%	21,0
Total	Frequency	111	173	6	290
	% cut-off point	38,3%	59,7%	2,1%	100,0%
	% Socio-family sit.	100,0%	100,0%	100,0%	100,0%

Relation between BI and FIM at discharge by the cut-off point of 80 and 114 respectively and the destination of the individuals at discharge: The pre-event being the return to the social or family situation or RSEP where they were prior to admission to the CU. FIM - Functional Independence Measure; BI - Barthel Index; sit. – Situation; RSEP- Residential Structure for Elderly People

Discussion

In this study sample with unique characteristics, the cut-off point found were 80 in the BI and 114 in the FIM, reflecting a probability of 81% and 82% respectively of returning home for patients who have a score equal to or higher than the cut-off points at the time of discharge. The hypothesis that a level of functional capacity exists at the time of discharge, above which determines the discharge destination of patients, is confirmed.

By applying the cut-off point, we found that most of patients (80.1% and 87.1%) with a functional level higher than 80 in the BI and 114 in the FIM, were discharge home (with or without support from an ICCT), thus confirming the hypothesis that patients with higher functional capacity are discharged home. These results are in line with other studies that refer to functionality as a determining factor in discharge to the home, referring to cut-off points found with ROC curves.[21] Other studies use cut-off points in standardized measurement instruments in the literature.[22,23] Regardless of the method, they are unanimously emphasizing the importance of evaluating functionality and its usefulness as a predictor of discharge and in care planning. We believe that analysing ROC curves is especially useful in samples with such heterogeneous characteristics as those in this study.

The sample in this study contained patients with different admission diagnoses, requiring twelve chapters of ICD-11 to classify them. Any disease classified in ICD-11 revealed a better or worse functional level both on admission and at discharge, the sample showing functional gains regardless of the disease.

In the present study, we also confirmed that patients with a lower functional level at the end of their stay in the CU (<80 BI and <114 FIM) require more social and other responses in the Network, as they mostly (73.4% by BI and 59.3% by FIM) went to other typologies of the Network or to institutions.

We also found that patients with good functional levels were referred to other Network responses or went to RSEP, there was a relationship with their socio-family situation, i.e., they were patients who did not have family support. It should be noted that patients with lower functional levels (<80 BI and <114 FIM) who returned to their pre-event situation (home or RSEP) had 92.3% and 83.6% family or institutional support. Portugal is one of the European countries where fewer elderly people live alone, 21.2% (the EU average is 31.4%), 48.4% with their spouse and 30.4% with other family members, they live mainly in rural areas, where there is a greater network of family support.[24,25] These results are consistent with other studies that indicate socio-familial situation as a factor influencing the discharge of patients from hospital or rehabilitation services, either due to the need to stay longer or to obtain higher levels of functional independence at discharge when living alone.[26–30] According to the Canadian Institute for Health Information[31] functionality is the strongest predictor of discharge to home, followed by family support. Functional impairment and cognitive changes, lack of social support, and living alone are predictive factors for institutionalization.[4]

Another factor to consider is the multimorbidity and age of the patients in the sample. Young adults have different characteristics that influence their recovery differently than older adults.[32,33] We therefore excluded six patients from the sample who were under 45 years old. Serrano-Alarcón and Perelman[34] reported in his study that Portuguese people over 50 years old have worse functional alterations compared to Italy and Spain. In this study, we found a relationship between age and functional level, as the functional level at entry worsened as age advanced, which is consistent with a study conducted in CU's in Portugal, indicating that the older the age, the greater the level of dependence.[35]

Cognitive changes could explain the referral to other typologies or institutions, although the FIM does address these dimensions to some extent by assessing communication, memory, problem-solving, and social interaction. However, this fact may be a limitation of this study, as we did not exclude patients with this problem.

Multimorbidity is increasingly present in the population, with an impact on functional capacity, quality of life, and increased healthcare expenditures[36–38], in this study, we do not quantify them, but their presence is transversal to all patients, conditioning the functionality of each person with varying degrees of impact. In a study by Marengoni et al.[37] reported that diseases and their combination may have worse effects on functional decline than comorbidities that individuals share. Shih et al.[39] reported in their study that comorbidities can influence performance, but functionality is a better predictor than comorbidities, stating that function improves independently of comorbidities, as we found in our study.

Conclusion

Patients who, at the end of their CU stay, are unable to achieve the necessary functional levels to return home lead to a duplication of Network responses, resulting in overutilization of the CU and increased healthcare expenditures. It is therefore necessary to have an assertive referral process, considering the functionality of patients as well as their family support. Functionality is a highly relevant concept in the therapeutic dimension of rehabilitation, but we cannot separate the socio-family component with a considerable influence on individuals' health and care planning. Determining the functional level at the time of discharge, as well as identifying other factors that may influence the patient's discharge destination, enables the UC care teams to

implement strategies that minimize barriers. This approach facilitates coordination with informal caregivers, neighbourhood networks, or social support institutions within the community. The goal is to integrate the patient into the community whenever possible, rather than resorting to institutionalization or continued care in the RNCCI.

We believe that it is necessary to replicate this study in other CUs to understand the behaviour of functionality and the impact of the social component on the referral and mobility of patients in the Network.

In conclusion, we identified a functional level through the assessment instruments, which predicts the discharge destination of patients from a CU. Discharge planning should consider the patient's socio-family situation, which also influences the destination of discharge, the socio-family support proved to be particularly important for the return home.

Limitations of the present study

One limitation, or caveat, in interpreting the results involves the fact that the specificity and sensitivity of the cut-off point provide information at a sample level of the diagnostic capacity of a measuring instrument, i.e., they do not provide an estimate of the probability of an individual experiencing a certain outcome. However, we can be used together with information on the prevalence of the outcome to determine the probability at an individual level.

Another limitation of the study was that it was a retrospective observational study, and the database did not include information on the accessibility and architectural barriers of the patient's home. The family support may have not only conditioned the return home, but also by the housing conditions. In another study, it would be important to use a measurement instrument such as the ICF, which considers barriers and facilitators in the assessment of functionality.

The fact that the study did not consider multimorbidities, and dementia processes may also have caused bias, especially in the results of individuals who acquired good functional capacity and did not return home.

Data collection occurred after the start of the Covid-19 pandemic. During this period, caregiver training for users was interrupted on the eve patients return home from the CU. This fact may also have influenced the results obtained, especially for patients who acquired good functional capacity and had family support but went to other care facilities.

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The authors provide all data supporting the results upon request.

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