

Basic self-care in older acute medical in-patients: a retrospective cohort study

Cecília Rodrigues, PhD Student in Nursing Sciences^{a,b,c,*}, Denisa Mendonça, PhD in Biostatistics^{a,d}, Maria Manuela Martins, PhD in Nursing Sciences^{e,f}

Abstract

Background: Older patients hospitalized for acute illness are vulnerable to decline in basic self-care. This functional decline determines future health needs and can lead to negative health outcomes.

Aim: To compare basic self-care needs in older acute medical in-patients between admission and discharge using the Nursing Patient Classification System data.

Design: Single-center, observational, and retrospective cohort study.

Methods: Data were collected between April 2015 and April 2016 and included 384 patients aged 65 or older admitted to a medical ward of a 580-bed teaching hospital in Portugal. Significant differences between groups of patients were assessed by analysis of variance and Kruskal–Wallis for continuous variables and by chi-squared test for categorical variables. Significant changes in the level of dependence were analyzed using McNemar–Bowker test.

Results: The mean age of the patients was 79.93 years (SD=7.49) and the majority were women (57.3%). There were no gender differences in length of stay. Oldest-old patients presented higher percentages of dependence on basic self-care, both at admission and at discharge. Younger-old patients improves in hygiene and personal care, toilet use, and movement ($P < .01$). However, it is also this group of patients who have the highest percentages of deterioration in eating ($P = .129$), toilet use, and movement ($P < .001$).

Conclusion: All patients are vulnerable to decline in basic self-care regardless their age. Use Nursing Patient Classification Systems to track progress in basic self-care between admission and discharge in older acute medical patients is an innovative and valid methodology. Based on the needs of nursing care, we were able to characterize older patients' needs and achieve health outcomes.

Abbreviations: ADL = activities of daily living, GRASP = Grace Reynolds Application of Peto, NPCS = Nursing Patient Classification Systems.

Keywords: activities of daily living, hospitalization, nursing, nursing patient classification systems, older, self-care

Introduction

There is some conceptual uniformity in measuring functioning of patients in terms of capacity for self-care or activities of daily living (ADL). Basic self-care or basic ADL refer to capacities required for personal care, including bathing, dressing, using the toilet, transferring from the bed to a chair, grooming, and eating.

Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

^a Doutoramento em Ciências de Enfermagem, Instituto de Ciências Biomédicas Abel Salazar, Universidade do Porto, ^b Medicina C, Departamento de Medicina, Centro Hospitalar do Porto, ^c Gabinete de Governação Clínica, Departamento da Qualidade, Centro Hospitalar do Porto, ^d EPIUnit, Instituto de Saúde Pública, Universidade do Porto, ^e Escola Superior de Enfermagem do Porto, ^f Grupo de Investigação NursID: Inovação e Desenvolvimento em Enfermagem—Centro de Investigação em Tecnologias e Serviços de Saúde (CINTESIS), Universidade do Porto, Porto, Portugal.

* Corresponding author. Centro Hospitalar do Porto, Porto, Portugal.
E-mail address: ceciliarodrigue@gmail.com (Cecília Rodrigues).

Copyright © 2018 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of PBJ-Associação Porto Biomedical/Porto Biomedical Society. All rights reserved.

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Porto Biomed. J. (2018) 3:1(e1)

Received: 26 April 2018 / Accepted: 4 May 2018

<http://dx.doi.org/10.1016/j.pbj.0000000000000001>

There is a large variability in measuring functioning of older hospitalized patients and a large variety of clinical definitions of functional decline.^{1–3} Buurman et al identified 5 different instruments to measure functioning: the Katz ADL index, the IADL scale of Lawton and Brody, the Barthel index, Functional Independence Measure, and Care Needs Assessment. Regarding the variety of clinical definitions of functional decline, for example, a decline of a 1 point in 1 study is equivalent to a 2% decrease in ADL functioning, while in other studies a decline of 1 point is equal to a 20% decrease ADL functioning.¹ These conceptual and metric barriers hamper the interpretation and comparison of functional outcome data of studies.

Nursing Patient Classification Systems (NPCS) have been developed to manage workloads by estimating the need for nursing resources through the identification and quantification of individual patients' care needs.⁴ An NPCS is a way of assessing the degree of patient dependency. This presupposes that in order to measure staffing needs, it is necessary to know the grade of dependence of patients on care given by nurses, that is, on care that the patient alone cannot perform without the nurse's support.

There is in use a diverse variety of NPCS.^{5,6} Most of them lack validity and reliability testing and evidence of the relationship to nursing outcomes.⁷ NPCS assesses and classifies patients according to their acuity, their need of care, as well as the nursing activities that are necessary to complete those care needs during a certain time period. NPCS play an important role in supporting nurse manager's decision making in organizing the care process and required resources. NPCS are used to optimize available

resources and provide estimations of nurse-to-patient ratios.⁸ Fasoli and Haddock identifies as criticisms of the NPCS (1) difficulties with measuring workload; (2) definitions and descriptions of nursing work are inadequate; (3) insufficient evidence of reliability and validity testing of NPCS; and (4) there is still a need to identify nursing sensitive performance indicators and outcomes.⁹ Despite criticism, and taking into account the type of information that the NPCS includes, namely the needs of patients for basic self-care, they should be considered to assess health outcomes, for example, by the analysis of the variation of basic self-care needs, between admission and discharge, in acutely hospitalized older medical patients.¹⁰ There is no knowledge of any research work undertaken to verify associations between NPCS grade parameters and patients outcomes.

In older people, an acute illness hospitalization often precipitates the loss of independence in basic self-care.¹¹⁻¹⁵ Approximately one-third of older patients' present functional deterioration at discharge when compared to their condition prior to admission to hospital, and this deterioration is not always related to the severity of the disease that led to the hospitalization or therapeutic interventions.^{3,11,16} A study found that 6.7% of older nondisabled patients developed new disability in basic ADL during medical illnesses requiring hospitalization.¹⁷ D'Onofrio et al describes a preadmission, in-hospital, and overall decline in basic ADL in 56.1%, 17.5%, and 43.4%, respectively, of the older patients admitted to an Acute Care Unit for Elders in Switzerland.¹⁸ Morris et al approach the hierarchy of the ADL and state that the early loss function is hygiene, the mid-loss functions are toilet use and locomotion, and the late loss function is eating. When there is only one remaining area in which the person is independent, there is a 62.9% chance that it is eating and only a 3.5% chance that it is hygiene.¹⁹

Methods

Aims

The aim of the study was to compare basic self-care in acutely hospitalized older medical patients between admission and discharge using the Nursing Patient Classification System data.

Design

The present study is a single-center, observational, and retrospective cohort study and is designed to be compliant with the recommendations of the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) statement.²⁰

Participants

The study included all patients admitted to 1 of the 3 medical wards of an urban central teaching hospital in Portugal, between April 2015 and April 2016 for an acute medical illness or exacerbation of a previous chronic condition. The unit had 28 beds, and most admissions (98%) were referred from the emergency service.

The inclusion criteria were

- Age: 65 years or older
- Able to ambulate at admission, with or without personal/technical assistance

The exclusion criteria were

- Duration of hospitalization in the medical ward ≤ 48 h
- Days in the hospital until arriving at the medical ward > 4 days

- Transfer to intensive/intermediate care unit after admission in the medical ward
- Deceased during hospitalization

The number of patients admitted to the ward during the study period determined the sample size.

Data collection

Considering the design of the study, a retrospective study, data were collected exclusively through the consultation of clinical records.

Nursing Patient Classification Systems

In Portugal, with the support of the Ministry of Health, a system of patient classification based on levels of dependency of nursing care began to be developed since 1984. The development of this tool, used in its construction, the GRASP System (Grace Reynolds Application of Peto).²¹ GRASP is an objective method of measuring nursing workload. It examines the individual needs of each patient and therefore is specific to each ward. It is a resource management system. GRASP methodology quantifies patient care and translates it into hours.

Portuguese NPCS include 9 areas of care^{22,23}: hygiene and personal care, eating, movement, toilet use, medication, treatments, vital signs and other assessments, health support and education activities, and evaluation and planning of care. Each patient is classified daily, in the morning shift, after breakfast and hygiene care, by their attending nurse. The hospital in which this analysis takes place has been using NPCS since March 2013 and all nurses have been trained in its use. The classifications performed daily by the nurses are periodically audited in order to guarantee the quality of the information. Similarly to other NPCS, studies on the validity the Portuguese NPCS are not yet available. However, this lack of studies on the validity of the NPCS is not relevant to this work because we only used a part of the information available in the NPCS, that is, we only use information about self-care.

The areas related to basic self-care included are hygiene and personal care, eating, movement, and toilet use. Patients are classified daily in each of these areas as Independent, Partial Aid, or Total Aid. A patient is classified as independent in a basic self-care activity if she/he is able to perform it alone or needs supervision/guidance. When a patient is unable to perform a basic self-care activity or requires the nurse's continued presence to perform, it is classified as Total Aid. When the patient needs encouragement or to be assisted in some actions to complete the basic self-care activity, it is classified as Partial Aid. If a patient who at the time of admission was classified as Total Aid and was classified as Partial Aid upon discharge, this patient is considered to have improved in their capacity for basic self-care during hospitalization. If the reverse is true, for example, transition from Independent to Partial Aid or transition from Partial Aid to Total Aid, this patient is considered to have declined their capacity for basic self-care.

Ethical considerations

This study was approved by the Board and the Hospital Ethics Committee (DEFI 2016.037). Given that the data were collected exclusively through electronic records, the ethics committee waived the informed consent collection. The Hospital Information Systems Service, with the consent of the Ethics Committee,

provided the list of patients admitted to the ward between April 2015 and April 2016. This list contained general information for each patient, such as gender, birthday date, hospital admission date, ward admission date, reason for admission, discharge date, transfer destination, daily NPCS score for each of the 9 areas of care. For the purpose of this investigation, Information Systems Service encrypted the identity of each patient, that is, we did not have access to the name or any unequivocal identification number of each patient.

Data analysis

For qualitative variables were calculated frequencies and for continuous variables were calculated statistics of central tendency and dispersion such as means, standard error, or median. Normality of continuous variables was checked graphically and through Kolmogorov–Smirnov and Shapiro–Wilk tests. Significant differences in continuous variables between groups were assessed by parametric tests (*t*-tests, analysis of variance) or nonparametric tests (Mann–Whitney *U*, Kruskal–Wallis). Proportions were compared using chi-squared test. Significant changes between admission and discharge in the level of dependence in ADL were analyzed using McNemar–Bowker test. The level of statistical significance was set at 0.05. Data were analyzed with SPSS package 24.0.

Results

During the study period, a total of 882 patients were admitted to the medical ward. Of these, 713 (80.8%) were aged 65 years or older and 384 patients met the defined inclusion criteria (Fig. 1).

Therefore, the study included 384 patients aged 65 years or older recruited from patients admitted into the medical ward. Patients were classified according to their ages in groups: 107 (27.9%) patients aged 65 to 74 years constituted young-old group, 158 (41.1%) patients aged 75 to 84 years constituted the middle-old group, and 119 (31.0%) patients aged ≥ 85 years constituted the oldest-old group. They had a mean age of 79.93 years ($SD=7.49$), a mean length of stay of 12.11 ($SD=9.03$) days and the majority were women (57.3%). Women had a median age higher than men (81.5 vs 78.5, $P=.01$) and there were no gender differences in length of stay, women and men had similar median length of stay (median=9 days). The main reasons for admission were respiratory, circulatory, or infectious diseases

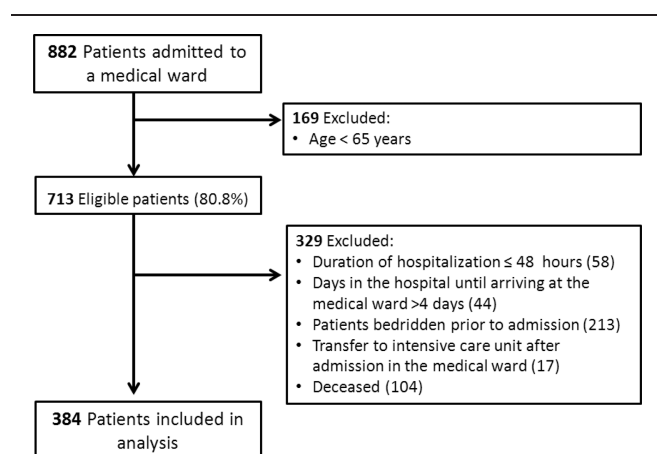


Figure 1. Patient recruitment.

(29.4%, 24.0%, and 20.3%, respectively). The 3 age groups showed significant differences in gender, length of stay, and reasons for admission (Table 1). Young-old patients had shorter hospital stay, are more men than women, and most are admitted for respiratory condition.

Changes in basic self-care between admission and discharge

Changes in all basic self-care activities between admission and discharge were statistically significant ($P < .001$). Overall, there were a much higher percentage of patients whose basic self-care activities improved, recording from 16.7% in hygiene and personal care to 24.5% in movement; while 4.2%, 7.0%, 5.7%, and 4.2% had a decline at discharge, for self-care, hygiene and personal care, eating, toilet use, and movement, respectively, compared to the state in admission (Table 2).

For each basic self-care, 7.2% to 10.7% of patients who were independent at admission declined their capacity (partial or totally) at discharge and 21.8% to 34.5% of patients who were partial dependents at admission were discharged as independent. Similarly, patients who were total dependent at admission showed improvements between 15.4% and 39.8% in basic self-care activities, and it was in eating that the best results were recorded.

Table 1

Characteristics of subjects (N=384)

Variable age groups	Number of patients, n (%)				P value
	All ages (n=384)	65–74 (n=107)	75–84 (n=158)	≥ 85 (n=119)	
Age (mean–SD)	79.93–7.49	70.18–2.66	80.14–2.58	88.44–2.75	
Age (median)	81	71	80	88	
Length of stay (median)	9	8	10	10	.008*
Gender					.018†
Female (%)	220 (57.3)	49 (45.8)	97 (61.4)	74 (62.2)	
Male (%)	164 (42.7)	58 (54.2)	61 (38.9)	45 (37.8)	
Reason for admission					.002†
Respiratory	113 (29.4)	42 (39.3)	33 (20.9)	38 (31.9)	
Circulatory	101 (24.0)	16 (15.0)	48 (30.4)	37 (31.1)	
Infectious	78 (20.3)	19 (17.8)	33 (20.9)	26 (21.8)	
Other	92 (24.0)	30 (28.0)	44 (27.8)	18 (15.1)	

* Kruskal–Wallis test.

† Chi-squared test.

Table 2**Changes in basic self-care activities between admission and discharge (N=384)**

Hygiene and personal care									
Admission	Discharge				Variation between admission and discharge				
	Independent	Partial aid	Total aid	Total at admission, n (%)	Maintain	Improve	Decline	P value*	
Independent	25	1	2	28 (7.3)	25	—	3	<.001	
Partial aid	31	98	13	142 (37.0)	98	31	13		
Total aid	4	29	181	214 (55.7)	181	33	—		
Total at discharge, n (%)	60 (15.6)	128 (33.3)	196 (51.0)	384	304 (79.2)	64 (16.7)	16 (4.2)		
Eating									
Admission	Discharge				Variation between admission and discharge				
	Independent	Partial aid	Total aid	Total at admission, n (%)	Maintain	Improve	Decline	P value*	
Independent	119	11	2	132 (34.4)	119	—	13	<.001	
Partial aid	48	77	14	139 (36.2)	77	48	14		
Total aid	4	41	68	113 (29.4)	68	45	—		
Total at discharge, n (%)	171 (44.5)	129 (33.6)	84 (21.9)	384	264 (68.8)	93 (24.2)	27 (7.0)		
Toilet use									
Admission	Discharge				Variation between admission and discharge				
	Independent	Partial aid	Total aid	Total at admission, n (%)	Maintain	Improve	Decline	P value*	
Independent	55	6	0	61 (15.9)	55	—	6	<.001	
Partial aid	47	79	16	142 (37.0)	79	47	16		
Total aid	9	30	142	181 (47.1)	142	39	—		
Total at discharge, n (%)	111 (28.9)	115 (29.9)	158 (41.1)	384	276 (71.9)	86 (22.4)	22 (5.7)		
Movement									
Admission	Discharge				Variation between admission and discharge				
	Independent	Partial aid	Total aid	Total at admission, n (%)	Maintain	Improve	Decline	P value*	
Independent	64	4	1	68 (18.0)	64	—	5	<.001	
Partial aid	53	101	11	165 (43.0)	101	53	11		
Total aid	1	40	109	150 (39.1)	109	41	—		
Total at discharge, n (%)	118 (30.7)	145 (37.8)	121 (31.5)	384	274 (71.4)	94 (24.5)	16 (4.2)		

* McNemar–Bowker test.

Hygiene and personal care

At admission, 214 (55.7%) patients need total aid to perform hygiene and personal care. Of these 214 patients, 33 (15.4%) improved at the time of discharge: 29 (13.6%) were discharged as partial dependents and 4 (1.9%) as independent. Of the 142 (37.0%) partial dependent patients, 31 (21.8%) improved and were discharged as independent and 13 (9.2%) were discharged as total dependent.

The capacity for hygiene and personal care of 123 (90.6%) of the 170 independent or partial dependent patients on admission did not decline upon discharge. In summary, in relation to basic self-care hygiene and personal care, of the 384 patients, 64 (16.7%) improved their capacity between admission and discharge, 304 (79.2%) presented no changes and 16 (4.2%) declined.

Comparing the remaining basic self-care, hygiene and personal care was the basic self-care with the lowest percentage of independent patients 28 (7.3%) and the highest percentage of totally dependent patients 214 (55.7%) at admission. Simultaneously, hygiene and personal care presents the highest percentage of patients who need total aid at discharge (51.0%).

Eating

Basic self-care eating was the one that registered the largest number of patients able to eat independently at the time of admission 132 (34.4%). Of the remaining patients, at admission,

139 (36.2%) needed partial aid and 113 (29.4%) were totally dependent.

Despite the higher number of independent patients and patients who need partial aid at admission 271 (70.1%), 27 (10.0%) of these declined between admission and discharge. For example, of the 132 patients who were independent 13 (9.8%) declined: 11 were discharged as partial dependent and 2 as total dependent.

The group of patients who needed total aid at admission for eating was the one who improved the most at discharge. Of the 113 patients who needed total aid for eating at admission, 41 (34.5%) improved their condition and were discharged as partial aid and 4 (10.1%) were discharged as independent. Of the 139 patients who needed partial aid for eating at admission, 48 (34.5%) improved their condition and were discharged as independent and 14 (10.1%) declined and were discharged with the need for total aid for eating.

Toilet use

At admission, 181 (47.1%) patients need total aid to use the toilet. Of these 181 patients, 39 (21.5%) improved at the time of discharge: 30 (16.6%) were discharged as partial dependents and 9 (5.0%) as independent. Of the 142 patients who needed partial aid for toilet use at admission, 47 (33.1%) improved and were discharged as independent and 16 (11.3%) were discharged with the need for total aid. Of the independent and who need partial

Table 3**Variation in basic self-care between admission and discharge by age group**

Basic self-care	Age group	Level of basic self-care at admission, n (%)			Level of basic self-care at discharge, n (%)			Variation in basic self-care between admission and discharge by age group Number of patients, n (%)			P value*
		Independent	Partial aid	Total aid	Independent	Partial aid	Total aid	Maintain	Improve	Decline	
Hygiene and personal care	65–74	18 (16.8)	56 (52.3)	33 (30.8)	35 (32.7)	41 (38.3)	31 (29.0)	75 (70.1)	26 (24.3)	6 (5.6)	<.001
	75–84	8 (5.1)	65 (41.1)	85 (53.8)	21 (13.3)	55 (34.8)	82 (51.9)	126 (79.7)	23 (14.6)	9 (5.7)	.010
	≥85	2 (1.7)	21 (17.6)	96 (80.7)	4 (3.4)	32 (26.9)	83 (69.7)	103 (86.6)	15 (12.6)	1 (0.8)	.006
Eating	65–74	62 (57.9)	33 (30.8)	12 (11.2)	72 (67.3)	24 (22.4)	11 (10.3)	71 (66.4)	24 (24.2)	12 (11.2)	.129
	75–84	57 (36.1)	54 (34.2)	47 (29.7)	72 (45.6)	54 (34.2)	32 (20.3)	117 (74.1)	35 (22.2)	6 (3.8)	<.001
	≥85	13 (10.9)	52 (43.7)	54 (45.4)	27 (22.7)	51 (42.9)	41 (34.5)	76 (63.9)	34 (28.6)	9 (7.6)	.001
Toilet use	65–74	33 (30.8)	45 (42.1)	29 (27.1)	55 (51.4)	31 (29.0)	21 (19.6)	67 (62.6)	33 (30.8)	7 (6.5)	<.001
	75–84	24 (15.2)	63 (39.9)	71 (44.9)	43 (27.2)	51 (32.3)	64 (40.5)	117 (74.1)	33 (20.9)	8 (5.1)	.001
	≥85	4 (3.4)	34 (28.6)	81 (68.1)	13 (10.9)	33 (27.7)	73 (61.3)	92 (77.3)	20 (16.8)	7 (5.9)	.036
Movement	65–74	39 (36.4)	48 (44.9)	20 (18.7)	56 (52.3)	36 (33.6)	15 (14.0)	72 (67.3)	29 (27.1)	6 (5.6)	<.001
	75–84	24 (15.2)	73 (46.2)	61 (38.6)	45 (28.5)	63 (39.9)	50 (31.6)	116 (73.4)	37 (23.4)	5 (3.2)	<.001
	≥85	6 (5.0)	44 (37.0)	69 (58.0)	17 (14.3)	46 (38.7)	56 (47.1)	86 (72.3)	28 (23.5)	5 (4.2)	.001

* McNemar–Bowker test.

aid at admission 203 (52.9%), 22 (10.8%) of these declined in their capacity to toilet use upon discharge.

Movement

At admission, 165 (43.0%) patients need partial aid, that is, they need encouragement or to be assisted in movement. Of these 165 patients, 53 (32.1%) improved and were discharged as independent and 11 (6.7%) declined and at discharged they were unable to move or require the nurse's continued presence to perform it. Of the 150 patients who needed total aid for movement at admission, 41 (27.3%) improved: 40 (26.7%) were discharged as partial dependent and 1 (0.7%) as independent.

Variation in basic self-care between admission and discharge by age group

Table 3 shows the variation in basic self-care between admission and discharge by age group. For all age groups, changes in basic self-care activities between admission and discharge were statistically significant, except in eating for young-old patients (65–74 years).

Young-old patients, aged 65 to 74 years, were more independent in basic self-care, both at admission and at discharge. At admission, of the 107 young-old patients, 18 (16.8%), 62 (57.9%), 33 (30.8%), and 39 (36.4%) were independent for hygiene and personal care, eating, toilet use, and movement, respectively. Of these young-old patients, 26 (24.3%), 24 (24.2%), 33 (30.8%), and 29 (27.1%) improved their capacity for hygiene and personal care, eating, toilet use, and movement, between admission and discharge, respectively. In eating, for example, of the 12 young-old patients who needed total help at admission, 5 (41.6%) were discharged with the need for partial aid and 1 (8.3%) as independent; of the 33 young-old patients who needed partial aid at admission, 18 (54.5%) were discharged as independent and 3 (9.1%) as total dependent.

Young-old patients recorded greater improvement between admission and discharge for hygiene and personal care, toilet use, and movement (24.3%, 30.8%, and 27.1%, respectively). Young-old patients also recorded highest deterioration between

admission and discharge for eating, toilet use, and movement (11.2%, 6.5%, and 5.6%, respectively). For self-care eating, oldest-old patients are the ones with a greater improvement from admission to discharge.

Oldest-old patients (≥85 years) presented the higher percentages of total dependence on basic self-care activities, both at admission and at discharge. At admission, of the 119 oldest-old patients, 96 (80.7%), 54 (45.4%), 81 (68.1%), and 69 (58.0%) were totally dependent for hygiene and personal care, eating, toilet use, and movement, respectively. Of the 119 oldest-old patients, 15 (12.6%) improved in hygiene and personal care between admission and discharge.

Discussion

Basic self-care hygiene and personal care recorded the lowest percentage of patients with improvement 64 (16.7%) and the highest percentage of patients with no change 304 (79.2%) between admission and discharge. The complexity of this self-care compared to the others coupled with its close relationship with the capacity to move may justify these results and corroborates the theory of the hierarchy of the ADL which points that the early loss function is hygiene.¹⁹

Self-care eating recorded the highest improvement between admission and discharge. The group of patients who needed total aid at admission for eating was the one who improved the most at discharge 45 (39.8%). These results confirm what Zelada et al observed: a greater deterioration in the most complex basic self-care activities (bathing, dressing, and mobility) than in the most basic ones (eating).²⁴

A limitation of the study is the lack of characterization of patients' level of independence in self-care before the onset of the illness that precipitated hospitalization. The level of dependency in self-care at hospital admission for acute illness may be increased compared to the patients' usual level of dependence.¹⁸ An important argument for considering pre-morbid functioning is the evidence that many acutely hospitalized patients declined in the short period prior to admission.^{11,12,25}

Therefore, this lack of characterization may explain the high number of patients needing total aid for complex basic self-care at

admission namely, hygiene and personal care, movement, and toilet use²⁴ and, simultaneously does not allow us to determine the number of patients who had an increased needs at admission to the hospital due to the installation of the acute disease, when compared to their previous state.

Despite the above limitation, our results support previous evidence indicating that hospital admission due to acute illness leads to deterioration of the capacity for basic self-care.^{11–15,18} At discharge, approximately 8% of patients had declined in basic self-care compared with admission. These results are similar to those described by Volpato et al and are lower than the 17.5% reported by D’Onofrio et al.

Limitations

As mentioned above, one missing element in this study is lack of characterization of patient’s basic self-care before hospitalization, in order to determine the real role of a hospital stay in recovery, maintenance, or loss of capacity for basic self-care.

Conclusion

Our findings reinforce the message that functional status of older hospitalized patients should closely monitored. Use NPCS to track basic self-care changes between admission and discharge is innovative, and this study proves that this methodology can be used for this purpose. Based on nursing care needs daily registered in NPCS, we were able to characterize older patients’ needs and achieve health outcomes. With the use of 3 clear and unambiguous levels of dependency (independent, partial dependent, and total dependent), it was possible to get a perceptible characterization of the patient’s health outcomes. Our findings are in agreement with those described in other studies that used different instruments to measure functioning: older acute medical patients are vulnerable to decline in basic self-care during a hospital stay.

This study points NPCS as a valid alternative in the monitoring of health outcomes in patients, namely, basic self-care changes in acutely hospitalized older medical patients between admission and discharge. However, more research is needed to consolidate this awareness.

Acknowledgments

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author contributions

All authors participated in developing the design of the study and contributed to and critically appraised the manuscript. The authors have given final approval of the version to be published and they confirm that there are no other persons who satisfied the criteria for authorship.

Conflicts of interest

The authors declare no conflicts of interest.

References

[1] Buurman BM, van Munster BC, Korevaar JC, et al. Variability in measuring (instrumental) activities of daily living functioning and

functional decline in hospitalized older medical patients: a systematic review. *J Clin Epidemiol.* 2011;64:619–627.

- [2] White DK, Wilson JC, Keysor JJ. Measures of adult general functional status: SF-36 Physical Functioning Subscale (PF-10), Health Assessment Questionnaire (HAQ), Modified Health Assessment Questionnaire (MHAQ), Katz Index of Independence in activities of daily living, Functional Independence Measure (FIM), and Osteoarthritis-Function-Computer Adaptive Test (OA-Function-CAT). *Arthritis Care Res (Hoboken).* 2011;63 (suppl 11):S297–S307.
- [3] Kosse NM, Dutmer AL, Dasenbrock L, et al. Effectiveness and feasibility of early physical rehabilitation programs for geriatric hospitalized patients: a systematic review. *BMC Geriatr.* 2013;13:107.
- [4] Malloch K, Meisel M. Patient classification systems: state of the science 2013. *Nurse Leader.* 2013;11:35–37.
- [5] Perroca MG, Ek AC. Utilization of patient classification systems in Swedish hospitals and the degree of satisfaction among nursing staff. *J Nurs Manag.* 2007;15:472–480.
- [6] Aschan H, Junntila K, Fagerstrom L, et al. RAFAELA patient classification system as a tool for management. *Stud Health Technol Inform.* 2009;146:478–482.
- [7] Junntila JK, Koivu A, Fagerstrom L, et al. Hospital mortality and optimality of nursing workload: a study on the predictive validity of the RAFAELA nursing intensity and staffing system. *Int J Nurs Stud.* 2016;60:46–53.
- [8] Kontio E, Airola A, Pahikkala T, et al. Predicting patient acuity from electronic patient records. *J Biomed Inform.* 2014;51:35–40.
- [9] Fasoli DR, Haddock KS. Results of an integrative review of patient classification systems. *Annu Rev Nurs Res.* 2010;28:295–316.
- [10] Malloch K. Measurement of nursing’s complex health care work: evolution of the science for determining the required staffing for safe and effective patient care. *Nurs Econ.* 2015;33:20–25.
- [11] Covinsky KE, Palmer RM, Fortinsky RH, et al. Loss of independence in activities of daily living in older adults hospitalized with medical illnesses: increased vulnerability with age. *J Am Geriatr Soc.* 2003;51:451–458.
- [12] Zisberg A, Shadmi E, Sinoff G, et al. Low mobility during hospitalization and functional decline in older adults. *J Am Geriatr Soc.* 2011;59:266–273.
- [13] Ehlenbach WJ, Larson EB, Curtis JR, Hough CL. Physical function and disability after acute care and critical illness hospitalizations in a prospective cohort of older adults. *J Am Geriatr Soc.* 2015;63:2061–2069.
- [14] Sonnenblick M, Raveh D, Gratch L, Yinnon A. Clinical and demographic characteristics of elderly patients hospitalised in an internal medicine department in Israel. *Int J Clin Pract.* 2007;61:247–254.
- [15] Sager MA, Franke T, Inouye SK, et al. Functional outcomes of acute medical illness and hospitalization in older persons. *Arch Intern Med.* 1996;156:645–652.
- [16] Admi H, Shadmi E, Baruch H, Zisberg A. From research to reality: minimizing the effects of hospitalization on older adults. *Rambam Maimonides Med J.* 2015;6:e0017.
- [17] Volpato S, Onder G, Cavalieri M, et al. Characteristics of nondisabled older patients developing new disability associated with medical illnesses and hospitalization. *J Gen Intern Med.* 2007;22:668–674.
- [18] D’Onofrio A, Bula C, Rubli E, et al. Functional trajectories of older patients admitted to an acute care unit for elders. *Int J Older People Nurs.* 2017;13:e12164.
- [19] Morris JN, Berg K, Fries BE, et al. Scaling functional status within the interRAI suite of assessment instruments. *BMC Geriatr.* 2013;13:128.
- [20] von Elm E, Altman DG, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *J Clin Epidemiol.* 2008;61:344–349.
- [21] Mota H, Paulino CD, Simões MH. Patient Classification System based on Dependency of Nursing Care (PCS/N). In: 24th PCSI Working Conference—Casemix beyond funding—Contributions for health policy, Lisboa, 2008.
- [22] OE. Norma para o Cálculo de Dotações Seguras dos Cuidados de Enfermagem. Lisboa: Ordem dos Enfermeiros, 2014.
- [23] ACSS. Manual de conceitos básicos para a definição de níveis de dependência de cuidados de enfermagem em cirurgia e medicina. In: Saúde ACDs, ed. Lisboa: ACSS, 2011.
- [24] Zelada MA, Salinas R, Baztan JJ. Reduction of functional deterioration during hospitalization in an acute geriatric unit. *Arch Gerontol Geriatr.* 2009;48:35–39.
- [25] Carlson JE, Zocchi KA, Bettencourt DM, et al. Measuring frailty in the hospitalized elderly: concept of functional homeostasis. *Am J Phys Med Rehabil.* 1998;77:252–257.