

## Multidimensional and nutritional evaluation in post-acute long-term care setting

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### Abstract

Since 2011 the Unit of Post Acute Long-Term Care started the activity in Sassari, Sardinia region, initially as Local Health Care Public Service and currently integrated in the University Hospital.

The purpose of this paper was to describe the main care methods based on a comprehensive geriatric approach and the multidimensional prognostic index to stratify the risk of mortality and other negative outcomes. With a strong emphasis on nutritional problems, we analyzed the correlations among malnutrition and motility, cognitive impairment, comorbidity and major diseases, and psychosocial determinants.

### Introduction

The Unit of Post-Acute Long-Term Care (LPA) offers assistance in the field of internal medicine or rehabilitation with a predefined goal reachable within a predictable and/or limited time.<sup>1</sup> Our division includes 26 beds, and hosts patients admitted from 750 beds for acute patients, from both internal medicine and surgical departments. The typical patient admitted in our facility is an older subject, but he can also be under the age of 65. The main goal of our Unit is to obtain, as far as possible, a clinical stabilization and facilitate the discharge at home or in protected care at home (home care services) or in institution (assisted healthcare facility). Due to their complexity, all admitted older patients underwent a comprehensive geriatric assessment (CGA), in order to detect functional parameters related to self-sufficiency in the basic activities of daily living (ADL)<sup>2</sup> and in the instrumental activities daily living (IADL).<sup>3</sup> Cognitive status, by means of the short portable mental status questionnaire (SPMSQ),<sup>4</sup> risk of bed-sores, by mean of

the Exton Smith scale<sup>5</sup> and the nutritional status, by means of the mini nutritional assessment (MNA)<sup>6</sup> are also included in the CGA. Finally, comorbidities by the cumulative illness rating scale (CIRS),<sup>7</sup> number of drugs taken and co-habitation status (whether the patient lives alone, with family or in an institution) are also recorded at admission. All these measurements are included in the procedure to calculate the multidimensional prognostic index (MPI),<sup>8</sup> which allows the stratification of patients according to their risk of mortality at one year into three groups of risk, *i.e.* low risk (MPI <0.33 or MPI 1), moderate risk (MPI between 0.34 and 0.66 or MPI 2) and high risk (MPI >0.66 or MPI 3).

Aim of this study was to properly assess the admitted population, and to record the clinical and social characteristics, with a special emphasis on nutritional state and any correlations between specific diseases and/or conditions of life.

### Materials and Methods

The study was conducted on 1555 patients out of the 1779 patients admitted from January 01, 2013 to September 30, 2016 to the Unit of LPA of Sassari. All included patients were 65 years and older (Table 1); 224 patients aged below 65 years were excluded from the analysis.

Within 24 hours from the admission all patients underwent to the CGA with the calculation of the MPI to evaluate the risk of 1-year mortality, through a computerized numerical calculation according to the numerical parameters detected by the 8 domains reported above, *i.e.* ADL, IADL, SPMSQ, Exton Smith scale, CIRS, MNA, number of medications taken and cohabitation status). The calculation was obtained from the software of the MPI system as proposed by the Authors, with printing of results and links to the integrated medical-nursing clinical records. All measured values, together with the date of admission, the main cause of hospitalization, previous acute care department, social status, discharge setting and mobility have been included in Microsoft Excel software for statistical analysis and comparisons.

### Results

#### Study population characteristics

The mean age of patients included in the analyses was 82 years, with a predominance of the female sex. Patients had a

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reduced independency in the ADL and IADL and manage to perform just over one action (dressing, toileting, use the phone, *etc.*) out of 14 possible.

The mean cognitive state was moderately impaired at SPMSQ, even if at least 1/4 of patients suffer from dementia with a high degree of cognitive impairment and not able to answer any question in the test. The risk of pressure ulcers was of medium grade, with 45% of patients included in the high-risk class.<sup>9</sup> These data were particularly relevant given that 88% of cases of patients was bedridden and/or suffering from severely impaired mobility.

The CIRS suggested an average of 4.6 diseases per person, while the mean number of medications was almost 9 drugs per person/day.

Nutritional status as assessed by MNA was particularly impaired, with detection of severe malnutrition in over 70% of patients. Moreover, 26.7% of patients were at high risk of malnutrition, while only 2% of patients were considered well nourished.

When considering the co-habitation status, the majority of patients (74%) were living in a family with wife, children, or relatives; 13% of patients were living in institution, while the remaining 13% were living alone before admission.

The stratification of the mortality risk by the MPI suggested that approximately 70% of subjects were at high risk for one-year mortality; considering that the mean age of the study population was over 82 years old, the survival beyond 1 year was expected to occur only in less than 4% of cases. These findings suggested a therapeutic approach mainly geared towards a support or palliative care, while still devoting

resources to follow-up or screening elderly patients in *good conditions* and with a better life expectancy (Table 2).

Over 77% of patients were discharge to their home from the hospital, including 9% of patients discharged with an integrated home care services. Only patients in socially critical conditions were transferred to assisted homes (5.9%) or protected homes (2.6%), while there was a need for further admission to acute care hospital in 1.6% of cases. The percentage of deaths during hospitalization was less than 11%.

As expected, patients were admitted mainly from internal medicine department (Geriatrics Units, Internal Medicine and Emergency Units, Gastroenterology, Cardiology, Stroke Units) which together accounts for 90% of hospitalizations. The reception from surgical department and Intensive Care Unit, albeit in lower percentage, entails the need for high care activities for particularly complex patients.

Most patients suffered from diseases of the central nervous system (ischemic and/or bleeding stroke, dementia, cerebrovascular diseases), pulmonary diseases (pneumonia, exacerbation of chronic obstructive pulmonary disease-COPD), dehydration, or cardiovascular diseases (heart failure, endocarditis, lower limb arterial disease). Complications arising from oncological and hematological cancers are also well represented in about 8% of cases. From the surgery department, there was a high prevalence of orthopedic trauma (hip fracture) and neurosurgical complications of head trauma and/or spinal injuries (Figure 1).

### Nutritional status and multidimensional impairment

At admission (Table 3), over 77% of patients were unable to perform any activity in the ADL (ADL 0-1); in this group, 86% of patients were malnourished according to MNA values. Conversely, just 22% of totally self-sufficient patients, *i.e.* 7% of the total population with ADL=6, were malnourished. Moreover, low ADL skills resulted in a significant extensive use of resources and procedures including total parenteral nutrition and enteral nutrition including PEG. Therefore, it appears crucial to quickly address and correct the poor nutritional status if the aim is to improve individual motor functions, by increasing the ADL score.

Malnutrition was prevalent in about 50% of subjects with high cognitive impairment at SPMSQ, in more than 30% of patients with mild cognitive impairment and in 16% of subjects without cognitive impairment.

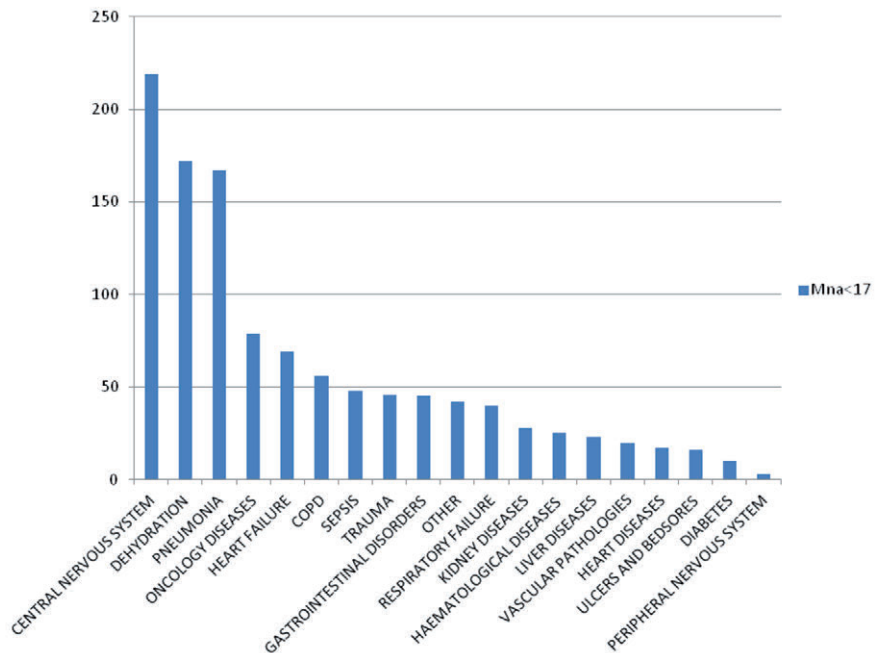


Figure 1. Relationship between illness at admission and severe malnourished patient.

Table 1. Long-term care post acute.

Patients admitted in Long Term Care Unit		
Timing	45 months	From 01-01-13 to 30-09-16
Participants	1779	
Inclusion	Age >65 years	1555
Exclusion	Age <65 years	224
Mean age	Var. +/- 16 years	82 years
Female	895	57.60%
Male	660	42.40%

Table 2. Multidimensional geriatric evaluation.

Patients assessed			
ADL	Mean value (6 item)	1.1	
IADL	Mean value (8 item)	1.2	
SPMSQ	From 0 to 10	5.9	
Exton Smith	Low risk (16-20)	Mean value 10.24	
	Medium risk (10-15)		
	High risk (5-9)		
CIRS	Diseases	4.6	
	Well nourished (=>24)	N. 33	2.10%
	Malnourished (24<x>17)	N. 415	27.70%
MNA	Severe malnourished (=<17)	N. 1107	71.20%
	Drugs (polypharmacy)	Daily	8.7
	MPI	Low (0-0.33)	N. 57
Medium (0.34-0.66)		N. 415	26.80%
High (0.67-1.0)		N. 1083	69.60%
Bedridden	Yes	1378	88.70%
	No	177	11.30%

### Nutritional status and comorbidities

The presence of more than 3 co-morbidities was correlated with a poor nutritional status in 94% of cases. The analysis of individual diseases showed that the older patients admitted with *dehydration* (most common diagnosis in case of acute care hospitalization) were suffering from malnutrition in over 85% of cases (Figure 1). On this regard, it was interesting to observe how neither a poor nutritional status nor dehydration were immediately detected at admission by the emergency department. Patients admitted to the hospital for neurological diseases were malnourished, *i.e.* a MNA <17, in about 80% of cases. A relevant factor to malnutrition was the high prevalence of dementia which, as already described in previous observational studies in long-term care of Sassari, was present in a numerically relevant sample of malnourished individuals.

Even patients with pneumonia showed a high degree of malnutrition in about 70% of cases, while patients suffering from COPD were malnourished in 65% of cases. In 60% of cases even patients with heart diseases, especially subjects suffering from heart failure, were in poor nutritional conditions. The proportion of patients with malignant tumors and sepsis showed an even more severe nutritional deficit in 85% and in 80% of cases, respectively.

### Nutritional and co-habitation status

Most of hospitalized older patients, *i.e.* 82% of cases, which were living in institution (protected homes, nursing homes)

demonstrated a severe nutritional deficiencies while the remaining 18% were at risk of malnutrition. Patients living alone or those who come from home with no family support were moderately malnourished in 61% of cases, while malnutrition was detected in 73% of patients living in a family setting (Table 4).

## Discussion

The activity in the Unit of LPA is characterized by the reception of patients from many internal medicine departments or surgical areas, with high heterogeneity of clinical conditions. The population included in the study, however, derives from a substantially homogenous territory for lifestyle and social conditions, *i.e.* Sassari city in Northern Sardinia Island, with about 336,000 inhabitants. The post-acute care can therefore be considered a sort of *clinical-epidemiological observatory* on the health status of the general hospitalized population.

Through the multidimensional assessment, we can consider that at the time of admission the patients are mostly frail, suffering from comorbidities that affect the ADLs, with special medical and nursing care needs. In this population, patients were usually assisted by family members, but in a fair percentage, they lived alone and can be considered self-sufficient, at least prior to the latest hospitalization. Upon dis-

charge, patients were generally sent back home, in some cases with home care services. Patients are often suffering from disorders of the central nervous system, respiratory and cardiovascular system, they are mostly bedridden and therefore at risk of pressure sores.

The risk of mortality at one year, evaluated by using the MPI score, was high (70% of patient in MPI 3 group), with the consequent need of treatment plans aimed at palliative care and/or social support, both at home and in nursing homes.

The main goal of our study was to identify the nutritional status of patients and any specific correlations with functional and clinical conditions. Data showed that basal and instrumental ADLs were closely related to nutrition: a strong degree of malnutrition is almost always present in older subjects unable to perform any activity. It could be argued that if malnutrition leads to reduced functional skills, the latter can very likely lead to further insufficient nutrition in a frail older individual. In contrast, from our study, the mental state detected with SPMSQ did not show a significant correlation with malnutrition, since malnutrition was identified only in 50% of patients with severe cognitive impairment. This figure could, however, be affected by well-fed patients following an acute event (such as stroke or cardiac hemorrhage), and therefore with no chronic debilitating disease.

Undoubtedly, the presence of comorbidity significantly impaired the nutritional status, as the latter is strongly negatively

**Table 3. Correlation ADL and MNA.**

ADL score	MNA<17	%	MNA 17-24	%	MNA >24	%	Total	%
0	812	52.21865	128	8.231511	4	0.257235	944	60.70
1	172	11.06109	80	5.144695	4	0.257235	256	16.46
2	53	3.40836	38	2.44373	5	0.321543	96	6.17
3	36	2.315113	25	1.607717	2	0.128617	63	4.05
4	14	0.900322	20	1.286174	1	0.064309	35	2.25
5	12	0.771704	34	2.186495	6	0.385852	52	3.34
6	25	1.607717	72	4.630225	12	0.771704	109	7.00
Total	1124	72.28296	397	25.53055	34	2.186495	-	-

**Table 4. Correlation nutritional status and social status.**

Social status	Patients admitted in Long Term Care Unit							
	Mna >24	%	Mna 17-24	%	Mna<17	%	Total	%
Family	23	1.47909968	296	19.0353698	833	53.56913183	1152	74.08
Alone	11	0.7073955	65	4.18006431	123	7.909967846	199	12.79
Nursing home	0	0	35	2.25080386	169	12.60450161	204	13.11

affected (94% of cases) when there were more than three concomitant diseases. It could be expected, in this case, to find a positive correlation between nutrition and the aging phenomenon in general, with a consequent loss of functionality in different apparatuses. It was not possible, however, to assess if the initial factor was the nutritional deficit or the actual disease. There was, however, a strong evidence for a significant association between a low MNA <17 and admissions for dehydration, diseases of the central nervous system and related complications (e.g., dementia), respiratory disease, malignant tumors and/or septic conditions.

Co-habitation status prior to admission appeared to be an important factor for malnutrition: no patient arriving from institutions (RSA, Protected Homes and Nursing Homes) appeared to be in a satisfactory nutritional status (MNA>24). Several factors may explain this finding: chronic diseases, lack of sufficient intake of nutrients, and/or insufficient assisted nutrition. In patients living in a family setting, the percentage of malnutrition was also very high (73%); even in these cases, uncorrelated factors to the disease may play a role, such as poor socio-economic and cultural conditions.

Unsurprisingly, loneliness is rather less correlated (61%) to malnutrition, probably due to the fact that older subject who lived alone might have greater autonomy than older subject who are living in a family setting or in institution.

Preliminary data in the study highlight the need for greater attention to detecting a frail nutritional status, with scheduled and periodic evaluation, especially in the physi-

cal, social, and emotional context in which the older subject live. Hospitalization is often the first opportunity to identify malnutrition, which by then has become extremely serious and correlated to comorbidities that make any correction increasingly difficult.

## Conclusions

The analysis shows most of patients admitted in the Unit of Post Acute Long-Term Care were malnourished. A strong degree of malnutrition is almost always present in older subjects unable to perform any activity. Most of hospitalized older patients demonstrated severe nutritional deficiencies. Patients living alone or those who come from home with no family support were moderately malnourished. The role of Unit of Post Acute Long-Term is crucial in assessment and treatment of these patients.

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