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A multi-institutional, hospital-based assessment of clinical, functional, sociofamilial and health-care characteristics of polypathological patients (PP)

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ABSTRACT

Little is known about the main features of the emergent population of PP. Our objective was to determine the clinical, care and social characteristics of a multi-institutional population of PP, by means of a cross-sectional study including a reference population of hospital-based PP from 36 hospitals. The main clinical, functional, mental and social features and their associated factors were assessed: 1632 PP (53% males, mean age 77.9 ± 9.8 years) were included. An informal caregiver was required by 52% (78% of caregivers were close female relatives). The mean inclusion criteria (Cat): were 2.7 ± 0.8 (49.5% presented ≥3 Cat). The most frequent inclusion Cat were heart (77.5%), lung (45.6%), neurological (38.2%), and kidney diseases (32.2%), whereas the mean of other comorbidities was 4.5 ± 2.7 per PP. The mean Charlson comorbidity index (CCI) was 4; 47.6%, and 52.4% presented dyspnea ≥3 on the NYHA, and on the MRC, respectively; nearly 19% required home oxygen therapy, 19% had suffered >1 fall in previous year, and 11% suffered an active neoplasia. The mean hospital admissions in last 12/3 months, and chronically prescribed drugs were 2/1, and 8 ± 3, respectively. More than 70% presented obesity, while 60% had hypoalbuminemia. The basal/inclusion Barthel index (BI) score was 69 ± 31/58 ± 34 (BI score < 60 was present in 31.5%/44%, respectively); and the mean Pfeiffer score was 2.94 ± 3.2 (43% answered with ≥3 errors). More than half of the subjects were at risk or already had established social problems. This emergent population is considerably homogeneous, highly complex, clinically vulnerable, functionally impaired, dependent on caregivers and socially fragile. They need to receive more attention in clinical research and more support in health interventions based on comprehensive attention and continuity of care.

1. Introduction

The worldwide progressive aging of the population has come with an increase in the prevalence of chronic diseases, many of which are progressive and complex. These diseases co-exist with more and more frequency in individual patients, making them difficult to manage for both primary and specialized care, making hospitalization and healthcare facility use more frequent and worsening both objective and subjective health (Gijsen et al., 2001; Menotti et al., 2001; Westert et al., 2001; Inouye et al., 2003; Atlas of Health in Europe, 2008; Europe in figures, 2009).

Within the population of patients having multiple chronic diseases, PP stand out. The main clinical and developmental characteristics of PP have been profiled and characterized since the term PP, which is more transversal and centered more on the patients rather than on their diseases and the professional treating them, first came into use (García-Morillo et al., 2005; Ollero-Baturone et al., 2007; Ramírez-Duque et al., 2008). This has made it possible to establish that PP make up a significantly homogenous population in terms of complexity, clinical vulnerability, high mortality rate during hospitalization, limited functionality, poor perception of health-related quality of life, and continued need to recur to all levels of the healthcare system (García-Morillo et al., 2007a; Moreno-Gaviño et al., 2008; Bernabeu-Wittel et al., 2010). However, these results are based on studies from individual centers, making it difficult to determine if these characteristics are similar in other environments.

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On the other hand, although this population is clearly "emerging", interest in patients with multiple chronic diseases and in PP in particular has remained low in both academic and scientific medicine (Fillenbaum et al., 2000; Tinetti et al., 2004). Moreover, despite the fact that it has been demonstrated to be beneficial for this population an optimal coordination at the different healthcare levels, health care systems have yet to adapt to this new epidemiological reality even though this reorientation has been demonstrated to show improvements in health-related results and the perception of health care received (Supporting People with Long term Conditions, 2005; Rincón-Gómez et al., 2010).

For all of the above-mentioned reasons, and with the aim of organizing future strategies and homogeneous lines of intervention toward this population, we proposed to study the clinical, health care, functional, mental, and socio-familial characteristics of a multi-institutional PP population in a hospital setting.

2. Patients and methods

This was an observational, cross-sectional, multi-institutional study carried out by researchers from the Polypathological Patient and Advanced Age Study Group of the Spanish Internal Medicine Society. The study inclusion period ranged from February 2007 to June 2008 (17 months).

2.1. Reference population

All PP treated in the internal medicine and geriatric areas (in-hospital, as well as in outpatient clinics, and at-home patients) from the 36 Spanish hospitals (19 tertiary teaching centers and 17 secondary/basic general hospitals), participating in the study (all participant centers are listed on the PROFUND Researchers list: Appendix A).

Table 1
Functional definition of PP: the patient who suffers chronic diseases included in two or more of the following clinical categories.

Category A
A.1 Chronic heart failure with past/present stage II dyspnea of NYHA[a]
A.2 Coronary heart disease
Category B
B.1 Vasculitides and/or systemic autoimmune diseases
B.2 Chronic renal disease (creatininaemia >1.4/1.3 mg/dl in men/women or proteinuria[b], during ≥3 months)
Category C
Chronic lung disease with past/present stage 2 dyspnea of MRC[c], or FEV1 < 65%, or basal Sat. O_2 ≤ 90%
Category D
D.1 Chronic inflammatory bowel disease
D.2 Chronic liver disease with evidence of portal hypertension[d]
Category E
E.1 Stroke
E.2 Neurological disease with permanent motor deficit, leading to severe impairment of basic activities of daily living (BI < 60)
E.3 Neurological disease with permanent moderate-severe cognitive impairment (Pfeiffer's test with ≥5 errors)
Category F
F.1 Symptomatic peripheral artery disease
F.2 Diabetes mellitus with proliferate retinopathy or symptomatic neuropathy
Category G
G.1 Chronic anemia (Hb < 10 g/dl during ≥3 months) due to digestive-tract losses or acquired hemopathy not tributary of treatment with curative intention
G.2 Solid-organ or hematological active neoplasia not tributary of treatment with curative intention
Category H
Chronic osteoarticular disease, leading to severe impairment of basic activities of daily living (BI < 60)

[a] Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue, palpitation, or dyspnea.
[b] Albumin/creatinine index > 300 mg/g, microalbuminuria > 3 mg/dl in urine, albumin > 300 mg/day in 24-h urine, or albuminuria/min > 200 μg/min.
[c] Short of breath when hurrying or walking up a slight hill.
[d] Presence of clinical, analytical, echographic, or endoscopic data of portal hypertension.

2.2. Inclusion criteria

Patients ≥18 year-old, who met criteria of PP were consecutively included (Table 1) (Ollero-Baturone et al., 2007), after providing their written informed consent. In-hospital patients were included at discharge, and those identified at outpatient clinics (internal medicine outpatient clinics, day hospital, and/or hospital at-home patients) were included during any one of their visits. Patients who died during their hospital stay, and those who did not agree to enter the study were excluded.

2.3. Development of the study and data collection

After receiving informed consent, a complete set of demographical, clinical, analytical, pharmacological, as well as socio-familial data was collected from all included patients.

Demographic data included age, gender, residence, employment data, and the main caregiver's profile; clinical data included the different diseases, the fulfillment of polypathology criteria detailed in Table 1, stage of different diseases (NYHA and MRC dyspnea rates (Bestall et al., 1999; Hunt et al., 2005), and Child-Pugh stage (Pugh et al., 1973)), assessment of CCI (Charlson et al., 1987), different symptoms and signs, body mass index (BMI), assessment of basal as well as inclusion ability in performing activities of daily living (ADL) and instrumental ADL (IADL) by means of BI, and Lawton–Brody indexes (LBI) (Mahoney and Barthel, 1965; Lawton and Brody, 1969), assessment of basal cognitive impairment using the Spanish validated version of Pfeiffer's questionnaire (PQ) (Martínez de la Iglesia et al., 2001), and number of hospital admissions in the last 12 and 3 months, respectively; analytical data included plasma creatinin (CR, mg/dl), hemoglobin (HB, g/dl), albumin (ALB, g/dl), glycated hemoglobin (HbA1c, %), and ultrasensitive C-reactive protein (us-CRP, mg/l). Pharmacological data included number and type of chronically prescribed drugs at basal status; and socio-familial data included socio-familial risk determined using the Gijón Scale (GS) (Alarcón and González-Montalvo, 1998). The GS is a validated scale which assesses the overall socio-familial situation exploring 5 specific dimensions (family, economics, housing, social relations and social network support) in a 1–5 Likert scale (score rank 5–25 points); a score <10 confers low social risk, 10–16 confers risk of social claudication, and >16 points defines an established social problem.

2.4. Definitions

Nutritional status was categorized by means of WHO criteria for BMI values (overweight-obesity = BMI >24.9; normal weight = BMI 18.5–24.9, under-weight = BMI < 18.5) (WHO, 2000). Hypoalbuminemia was defined as ALB levels <3.5 g/dl (severe hypoalbuminemia when values were <1.8 g/dl, moderate when values were between 1.8–2.69 g/dl, and slight hypoalbuminemia when values were between 2.7 and 3.5 g/dl). Polypharmacy was defined as the chronic prescription of ≥5 drugs. Dependence in functional status for ADL and IADL was defined by a BI <60 points and by an LBI <8 for females, <5 for males, respectively; cognitive impairment was defined by 3 or more errors on the PQ (4 or more if the patient had not completed elementary school and 2 or more if the patient had a college education); this was categorized as mild-moderate impairment (between 3 and 7 errors), and (8 or more errors); and finally socio-familial risk/problem was defined as a GS score ≥10.

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2.5. Statistical analysis

The dichotomous variables were described as whole numbers and percentages, and the continuous variables as mean ± S.D. (or median and rank in those with no criteria of normal distribution). The distribution of continuous variables was analyzed with the Kolmorogov–Smirnov test.

Possible factors associated to malnutrition, hypoalbuminemia, presence of more than one fall in last year, functional dependence for ADL and IADL, and socio-familial risk, were investigated performing the χ^2-test (with the Yates correction and, when possible, the Fisher's exact test), the Student's *t*, ANOVA (and Tukey's and Dunett's post hoc tests) for normal distribution quantitative variables, and Mann–Whitney's *U* and the Kruskal–Wallis test in the case of quantitative variables that were not normally distributed. Finally, a multivariate analysis of the factors associated to all the dependent variables previously mentioned was performed using backward stepwise logistic regression. All statistics were performed using the SPSS 16.0 computer pack. A $p < 0.05$ was considered to be statistically significant.

3. Results

A total of 1632 PP (75% hospitalized, 17.5% outpatient, and 7.5% hospital-at-home patients) were included (53% males), with a mean age of 77.9 ± 9.8 years. Ninety-three percent were living at home and only 6.5% were institutionalized. Only 4.8% were still employed. Geographical distribution of included PP was as follows: 58.5% (*n* = 955) were included from hospitals from the South of Spain, followed by the East (18.9%, *n* = 309), Northwest (12.8%, *n* = 209), Northeast (7.2%, *n* = 118), and the central area of Spain (2.5%, *n* = 41). Mean included patients per participant center were 46 ± 75 (ranging from 2 to 389 patients).

The main clinical features of PP are detailed in Table 2. Succinctly, the mean CAT per patient were 2.7 ± 0.8 (49.5% presented 3 or more CAT); while the mean of other comorbidities was 4.5 ± 2.7. There were 188 PP (11.5%) who presented active concomitant neoplasia (37.2% of them with metastasis). Specific comorbidities most frequently associated to the 5 most prevalent CAT are detailed in Table 3. With regards to functional class, 47.6% of the PP with chronic heart failure presented dyspnea ≥3 on the NYHA, and

Table 2
Main clinical features of PP included in a multi-institutional cross-sectional study in Spain.

Clinical features	Mean ± S.D., *n* (%) or median [IQR]
No of defining categories/patient	2.7 ± 0.8
Patients with ≥ 3 categories	808 (49.5)
Prevalence of defining categories	
Category A (heart diseases)	1264 (77.5)
Category C (lung diseases)	744 (45.6)
Category E (neurological diseases)	624 (38.2)
Category B (kidney/autoimmune diseases)	526 (32.2)
Category G (chronic neoplasia/anemia)	418 (25.6)
Category F (peripheral arterial disease/diabetes with neuropathy)	411 (25.2)
Category H (degen. osteoarticular disease)	271 (16.6)
Category D (liver disease)	112 (6.9)
Number of other comorbidities/patient	4.5 ± 2.7
Cardiovascular	2.25 ± 1.5
Endocrine and metabolic	1.17 ± 1
Neurological-psychiatric	0.46 ± 0.7
Digestive	0.3 ± 0.2
Most frequent other comorbidities	
Hypertension	1170 (71.7)
Arrhythmias	603 (36.9)
Atrial fibrillation	575 (35.2)
Other arrhythmias	28 (1.7)
Diabetes with no visceral involvement	478 (29.3)
Dyslipemia	473 (29)
Anxiety and depressive disorders	179 (11)
Benign prostate hyperplasia	170 (10.4)
Osteoporosis	114 (7)
Mean plasmatic creatinin (mg/d)/hemoglobin(g/dl)/albumin (g/dl)	1.34 ± 0.9/11.3 ± 2.8/3.3 [0.9]
Mean HbA1c (%)/us-CRP (mg/dl)	7.2% ± 1.7/5.95 [19]
CCI/CCI adjusted by age	4 [2]/6.3 [2.4]
Patients with basal III-IV class of NYHA//III-IV class of MRC	777 (47.6)/855 (52.4)
Patients with active neoplasia at inclusion/metastatic disease	188 (11.2)/70 (37.5)
Hospitalizations in last 12 months/3 months	1.9 ± 1.2/1 ± 0.9
Patients with delirium in last hospital admission/falls in last 12 months	196 (12)/310 (19)
Basal BI/LBI/inclusion Pfeiffer scale	69 ± 31/female = 2 [4]; male = 3 [5]/2 [5]
Number of prescribed drugs at inclusion/patients with polypharmacy	8 ± 3/1397 (85.6)

Table 3
Comorbidities most frequently associated to the most prevalent inclusion categories among the PP in a multi-institutional cross-sectional study in Spain.

The most prevalent categories/associated comorbidities	*n* or *n* (%)
Category A (heart diseases)	1264
Hypertension/obesity[a]	950 (75.2)/828 (65.5)
Diabetes/chronic lung diseases	583 (46.1)/574 (45.4)
Atrial fibrillation/chronic neurological diseases	521 (41.2)/417 (33)
Dyslipemia/chronic renal failure	404 (32)/392 (31)
Active neoplasia/progressive polyarthrosis	202 (16)/186 (14.7)
Peripheral arteriopathy/benign prostate hyperplasia	169 (13.4)/148 (11.7)
Depression	129 (10.2)
Category C (lung diseases)	744
Heart diseases/hypertension	575 (77.3)/536 (72)
Obesity/diabetes	466 (62.6)/300 (40.3)
Atrial fibrillation/dyslipemia	254 (34.2)/205 (27.6)
Chronic renal failure/chronic neurological diseases	183 (24.6)/176 (23.7)
Benign prostate hyperplasia/progressive polyarthrosis	109 (14.7)/92 (12.4)
Active neoplasia/pulmonary arterial hypertension	86 (11.6)/82 (11)
Category E (neurological diseases)	624
Hypertension/heart diseases	434 (69.6)/416 (66.7)
Obesity/diabetes	368 (59)/292 (46.8)
Atrial fibrillation/dyslipemia	216 (34.6)/180 (28.8)
Chronic lung diseases/chronic renal failure	176 (28.2)/154 (24.7)
Progressive polyarthrosis/active neoplasia	100 (16)/81 (13)
Depression/peripheral arteriopathy	72 (11.5)/71 (11.4)
Category B (kidney/autoimmune/both diseases)	526 (491)/22/(13)
Associated to kidney diseases	
Hypertension/heart diseases	396 (78.6)/392 (77.8)
Obesity/diabetes	317 (63)/254 (50.4)
Atrial fibrillation/chronic lung diseases	189 (37.5)/182 (36.2)
Dyslipemia/chronic neurological diseases	156 (31)/148 (29.4)
Active neoplasia/peripheral arteriopathy	116 (23)/72 (14.3)
Benign prostate hyperplasia/progressive polyarthrosis	57 (11.3)/55 (11)
Depression	53 (10.5)
Category G (active neoplasia/anemia/both)	418
Associated to active neoplasia	
Heart diseases/hypertension	138 (73.6)/130 (69)
Obesity/diabetes	94 (50)/81 (43)
Chronic renal failure/atrial fibrillation	79 (42)/68 (36.2)
Chronic lung diseases/dyslipemia	58 (31)/55 (29.4)
Chronic neurological diseases/progressive polyarthrosis	43 (23)/27 (14.3)
Chronic anemia/peripheral arteriopathy	23 (12.3)/21 (11.2)
Benign prostate hyperplasia/peptic ulcer	20 (10.7)/19 (10.1)
Depression	19 (10.1)

[a] Degree ≥2 of WHO classification for BMI.

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52.4% of the PP with COPD, dyspnea ≥3 on the MRC. There were 18.6% patients on home oxygen therapy, 12% had presented delirium during their latest hospital admission, and 19% had suffered more than one fall in the previous year. The prevalence of polypharmacy was 85.6% (21% of PP took ≥10 drugs). We found no significant differences in clinical features of PP included after discharge, at outpatient clinics, or hospital-at-home, but in inclusion BI, which was higher in outpatients (65.6 ± 33) with respect the other two subgroups (58 ± 33, and 54 ± 34; $p = 0.01$, and $p = 0.008$, respectively). Additionally no significant differences in the main clinical, functional, cognitive, and sociofamilial features were detected among patients included in the five different geographical areas already detailed.

More than half of the included PP ($n = 850$, 51.9%) required a personal caregiver (the definition for requiring a personal caregiver was determined by a basal BI <60 and/or a PS >5 errors). Overall 1186 PP (72.4%) had personal caregivers who were females in 80.9% of the cases, with a mean age of 57.6 ± 15 years. The most frequent relationship to the PP was daughter in 43.2% ($n = 455$), followed by spouse in 40% ($n = 421$), hired employee in 9.1% ($n = 96$), and finally second-degree family member in 7.7% ($n = 81$). In the case of the PP who required a personal caregiver, 93.3% ($n = 793$) actually had one; the mean age was very similar to the global personal caregiver age (57.1 ± 15.2), the majority being females (78%, $n = 670$). The PP who lived at home ($n = 1523$) were assisted by a hired employee in only 6.4% ($n = 98$) of the cases, however, among those living in an assisted living facility ($n = 107$) hired employees represented 47.7% ($n = 51$). The variables associated independently to the absence of a personal caregiver were not requiring one ($p < 0.0001$, OR = 6.3, 95% CI = 3.6–10.8), a higher independence for IADL ($p < 0.0001$, OR = 1.32, 95% CI = 1.2–1.45), and a higher socio-familial risk on the GS ($p = 0.008$, OR = 1.09, 95% CI = 1.02–1.15).

The median BMI was 27.24 (interquartile range = IQR = 7); by WHO categories 2.2% were underweight, 27.3% were normal weight and the remaining 70.5% presented varying degrees of obesity (37.7% class 1, 27.4% class 2, and 5.4% class 3, or morbid obesity). Overweight-obesity was independently associated to males ($p < 0.0001$, OR = 1.76, 95% CI = 1.34–2.31), hypertension ($p < 0.0001$, OR = 1.85, 95% CI = 1.36–2.5), diabetes ($p = 0.009$, OR = 1.45, 95% CI = 1.1–1.91), number of prescribed drugs ($p = 0.013$, OR = 1.06, 95% CI = 1.01–1.1), and negatively to the presence of active neoplasia ($p < 0.002$, OR = 0.62, 95% CI = 0.46–0.83), delirium during the most recent hospital stay ($p < 0.04$, OR = 0.65, 95% CI = 0.43–0.97), history of peptic ulcer ($p < 0.048$, OR = 0.6, 95% CI = 0.4–0.99), cognitive decline on the Pfeiffer Index ($p < 0.015$, OR = 0.95, 95% CI = 0.9–0.99), and a higher number of hospital admittances over the past 12 months ($p < 0.01$, OR = 0.9, 95% CI = 0.83–0.97). The median plasma albumin level was 3.3 (IQR = 0.9); 60%, 13.2%, and 0.3% presented values lower than 3.5, 2.7, and 1.8 g/dl, respectively. Factors that were positively associated to hypoalbuminemia were liver diseases ($p = 0.011$, OR = 1.95, 95% CI = 1.16–3.2), active neoplasia ($p < 0.0001$, OR = 1.8, 95% CI = 1.3–2.4), need for home oxygen therapy ($p = 0.01$, OR = 1.55, 95% CI = 1.1–2.2), delirium during the most recent hospital stay ($p = 0.008$, OR = 1.85, 95% CI = 1.2–2.2), having suffered a fall within the past year ($p = 0.03$, OR = 1.4, 95% CI = 1.02–2.02), and functional impairment for daily activities at inclusion ($p < 0.0001$, OR = 1.025, 95% CI = 1.012–1.02). A total of 468 PPP (28.7%) presented concomitant obesity and hypoalbumi-

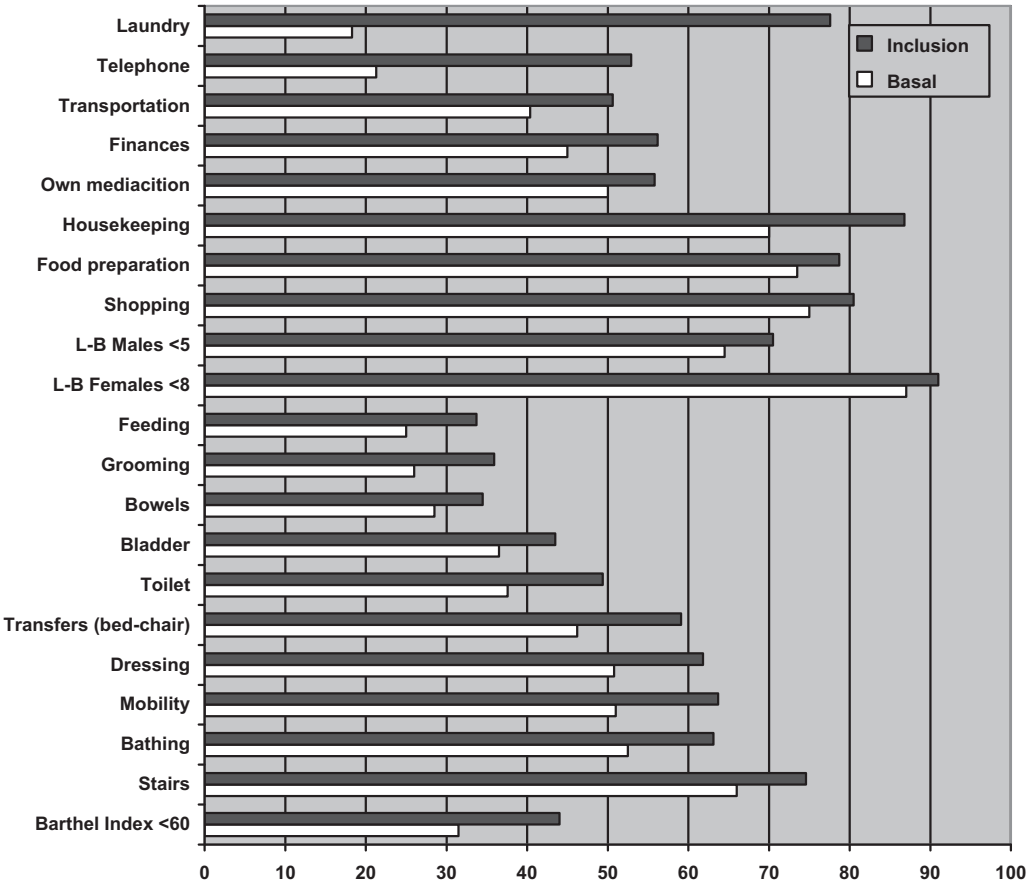

Fig. 1. Functional impairment of a multi-institutional population of PP from Spain, by percentage of patients with any dependence level. Telephone: ability to use telephone; transportation: mode of transportation; finances: ability to handle finances; own medication: responsibility for own medications; L-B: percentage of dependence by means of LBI; toilet: toilet use; mobility: mobility on level surfaces; BI: percentage of patients with dependence in activities of daily living by means of BI (<60 points).

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nemia. Factors associated to this finding were, male gender ($p = 0.005$, OR = 1.4, 95% CI = 1.1–1.8), active neoplasia ($p = 0.009$, OR = 1.44, 95% CI = 1.1–1.9), need for home oxygen therapy ($p = 0.001$, OR = 1.7, 95% CI = 1.25–2.3), and having suffered more than one fall over the previous year ($p = 0.005$, OR = 1.5, 95% CI = 1.1–2.0).

Functional assessment in performing ADL, as well as IADL, is detailed in Fig. 1. The factors independently associated to baseline functional impairment for ADL were degenerative osteoarticular disease ($p < 0.0001$, OR = 3.8, 95% CI = 2.5–5.6), neurological disease ($p < 0.0001$, OR = 2.2, 95% CI = 1.5–3.0), the need for home oxygen therapy ($p < 0.0001$, OR = 2.1, 95% CI = 1.5–3.1), number of errors on the Pfeiffer questionnaire ($p < 0.0001$, OR = 1.17, 95% CI = 1.11–1.24), higher comorbidity on CCI ($p < 0.0001$, OR = 1.2, 95% CI = 1.11–1.29), socio-familial risk on the GS ($p < 0.0001$, OR = 1.1, 95% CI = 1.05–1.16), female gender ($p < 0.01$, OR = 1.5, 95% CI = 1.08–2.04), and advanced age ($p < 0.01$, OR = 1.02, 95% CI = 1.005–1.04), and those independently associated to baseline functional impairment for IADL were female gender ($p < 0.0001$, OR = 5.8, 95% CI = 3.9–8.6), advanced age ($p < 0.0001$, OR = 1.04, 95% CI = 1.02–1.05), socio-familial risk on the GS ($p < 0.0001$, OR = 1.2, 95% CI = 1.11–1.26), number of errors on the PS ($p = 0.001$, OR = 1.14, 95% CI = 1.06–1.2), higher comorbidity on the CCI ($p < 0.005$, OR = 1.13, 95% CI = 1.04–1.2), degenerative osteoarticular disease ($p = 0.008$, OR = 2.9, 95% CI = 1.3–6.5), need for home oxygen therapy ($p = 0.0001$, OR = 1.73, 95% CI = 1.1–2.7), and having suffered more than one fall within the previous twelve months ($p = 0.016$, OR = 1.9, 95% CI = 1.13–3.2).

The median social risk score on the GS was 10 (IQR = 5). The different risk strata as well as the five socio-familial assessed dimensions are detailed in Fig. 2. The variables associated independently to social risk/problems (GS $\geq$ 10) were male gender ($p < 0.001$, OR = 1.8, 95% CI = 1.3–2.5), having more cognitive errors ($p = 0.006$, OR = 1.1, 95% CI = 1.02–1.16), baseline functional

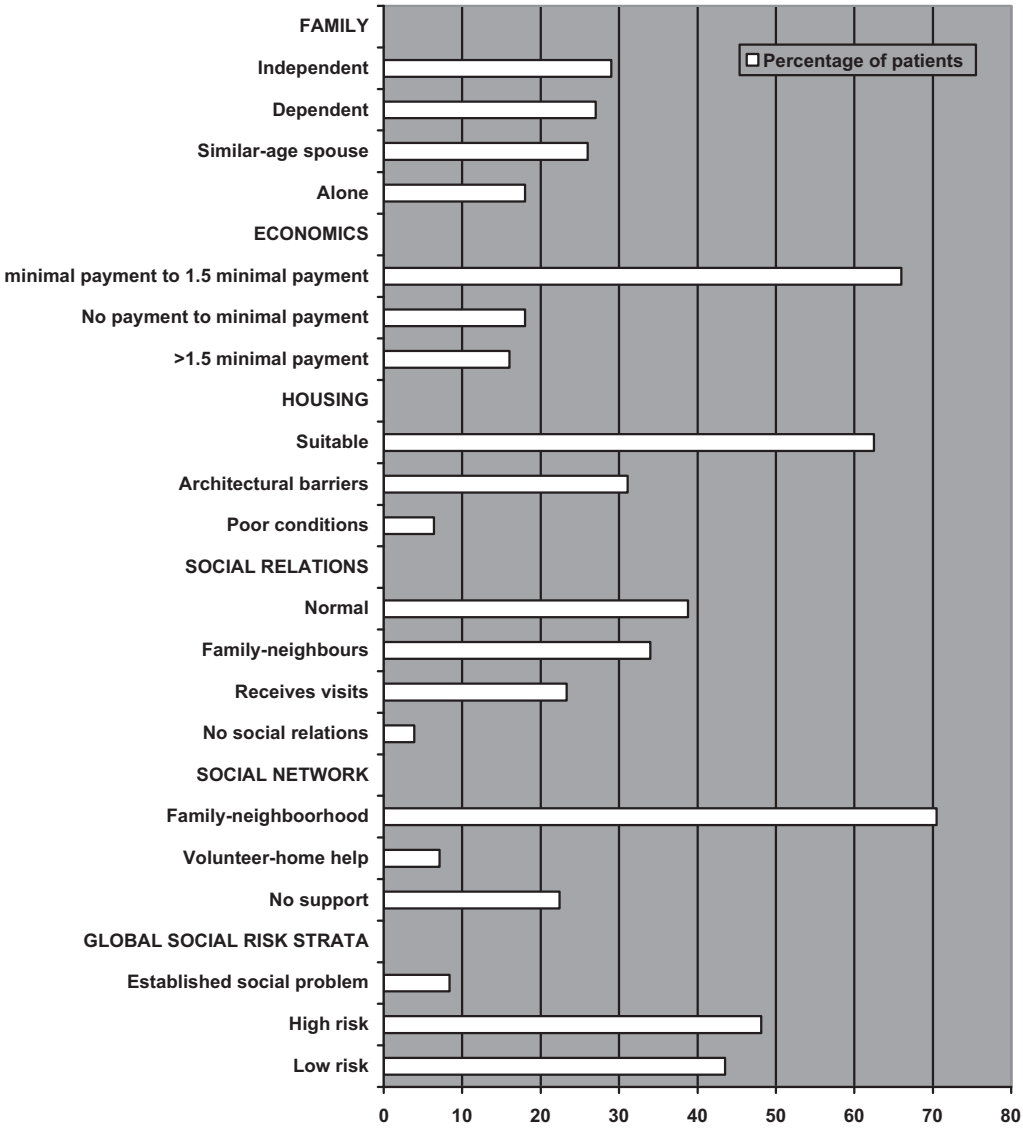

Fig. 2. Socio-familial assessment of a multi-institutional population of PP from Spain, by percentage of patients within any of the global risk strata, as well as the detailed strata, in the five dimensions evaluated by the Gijón Scale. Independent: living with independent family members; dependent: living with dependent family members; similar-age spouse: living with a similarly aged spouse; minimal payment to 1.5 minimal payment: receiving between minimal social security/retirement payments to 1.5 times the minimal salary; architectural barriers: such as stairs, narrow doors. . .; poor conditions: dampness, or poor hygienic conditions, lack of elevator/telephone, or lack of minimal installations; receives visits: never leaves home but does receive visits; no social relations: never leaves home and does not receive visits; family–neighborhood: adequate social support by family and/or neighbors; family–home help: social support received by volunteers and/or social home help; established social problem: Gijón Scale score >16; high risk: risk of social problem (Gijón Scale score between 10 and 16 points); low risk: Gijón Scale score <10 points.

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dependence ($p = 0.018$, OR = 0.991, 95% CI = 0.98–0.998), and having a caregiver who was not an immediate member of the family ($p < 0.0001$, OR = 3.7, 95% CI = 1.8–7.5).

4. Discussion

The clinical criteria used to define PP were useful in this multi-institutional setting for selecting a homogenous patient population which was fragile and showed notable clinical complexity, clinical vulnerability, high incidence of loss of functionality, polymedication and high prevalence of dependence-disability. The similarity between these characteristics and the data collected in previous preliminary studies in individual hospitals makes it clear that this new patient-centered notion of PP is solid and will make it possible to establish comprehensive intervention strategies designed for the main PP healthcare problems (García-Morillo et al., 2005; Zambrana et al., 2005; Ramírez-Duque et al., 2008; Bernabeu-Wittel et al., 2010). The impact of this population is not only qualitative, but quantitative as well. In fact, the incidence of PP was recently analyzed in medical areas in a tertiary hospital and was found to be between 22 and 39%, while in primary care was found to be 1.4% of the general population (García-Morillo et al., 2005; Ramírez-Duque et al., 2008; Bernabeu-Wittel et al., 2010). It is clear that we will witness an increase in PP in the upcoming years as a result of an aging population, a higher prevalence of chronic diseases and advancing diagnostic and therapeutic techniques. In the era of hypertechnology, and other advances, we face with this emergent real world of patients, with unsolved basic health problems.

When analyzing the clinical characteristics of PP a few things are worth of note: advanced age (77.9 ± 9.8 years), degree of complexity (the sum of categories and non-defining associated comorbidities showed a mean of 7 chronic diseases per patient), and the notable role of cardiovascular diseases, cardiovascular risk factors, and associated conditions (García-Morillo et al., 2007b). We feel that this fact is of great relevance since it reflects how polypathology may constitute the end of the road for a population exposed to hyperalimentation, sedentary lifestyles and toxic habits such as smoking. This leads us to the possibility of early intervention, so promoting healthy lifestyles for the entire population pyramid, as well as early prevention and treatment of cardiovascular disease, would probably be the best measure for decreasing the prevalence of polypathology in the future.

Additional relevant results from the recruited PP included their high symptom load and their vulnerability and need for frequent hospitalization. Almost half of the patients with heart/lung diseases were in advanced stages (NYHA/MRC class III–IV dyspnea), 18.6% required home oxygen therapy, and the average of hospitalizations over the past few months was high. All of these variables are not only predictors of short-term mortality, but also indicate the need to include these patients in individualized multidisciplinary programs following the case management strategy in order to improve health results (Dickstein et al., 2008).

The high degree of functional impairment found for ADL, as well as for IADL, is similar to preliminary studies. This may be the expression of advanced age accompanied by the disease load and comorbidities that we see in PP when we look at them from this perspective (García-Morillo et al., 2005; Ramírez-Duque et al., 2008). Moreover, the presence of functional impairment becomes a prognostic factor per se as can be seen in a growing number of publications (Davis et al., 1995; Inouye et al., 1998; Torres et al., 2004; Marrie and Wu, 2005; Mody et al., 2006; Cabré et al., 2008). Thus, it is easy for PP to enter into a downward spiral where advanced age and comorbidity result in progressive disability, which in itself worsens the vital prognosis and evolution of chronic diseases. Therefore, we believe that evaluation of functional status should be a required working tool when treating PP. This is closely related to the fact that approximately half of the PP population requires a caregiver. This task is performed by a female who is a close family member (daughter or spouse) in over 80% of the cases. This is one of the most relevant findings of the study and it confirms the key social role that women perform. There are profound socio-economic implications and personal burden, often barely recognized or even supported by social and healthcare networks. Recognition of this reality is the first step toward implementing all kinds of future intervention measures for the patient–caregiver.

Another interesting finding was the high prevalence of hypoalbuminemia as a protein malnutrition marker, despite the fact that two-thirds of the PP were overweight-obese to some degree. In fact, what we now refer to as concomitant presence of hypoalbuminemia and obesity in the same patient was detected in over one quarter of the patient population. Although the detrimental impacts of obesity and hypoalbuminemia are well-known when they occur separately (35–38), the effects of suffering from this double obesity–hypoalbuminemia are still unknown, and may quite probably be doubled or even synergistic. It is likely that this frequent association is a result of the overlapping of two epidemic phenomena from our times. The first is a social phenomenon: the sedentary lifestyle and hypercaloric diet to which we are exposed in industrialized society, and the second a health-related issue: secondary to multiple factors, but especially to the scarce attention we pay to nutritional status and early malnutrition that our most vulnerable patients develop in hospital settings (McWhirter and Pennington, 1994; Cederholm et al., 1995; Sullivan et al., 1999; Guigoz et al., 2002). Another additional explanation could be the frequent association of edema of different causes in these patients. Implementing prevention strategies, early detection and proper treatment in the different environments where these phenomena occur will more than likely lead to improved health results for PP.

In conclusion, PP of this multi-institutional sample were characterized by their high complexity, symptom load, clinical vulnerability, high prevalence of functional impairment, dependence on their caregivers and social frailty.

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Appendix A. List of researchers in the PROFUND project

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