

Costs variation related to illness severity and motor and non-motor symptoms in patients with Parkinson's disease

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INTRODUCTION

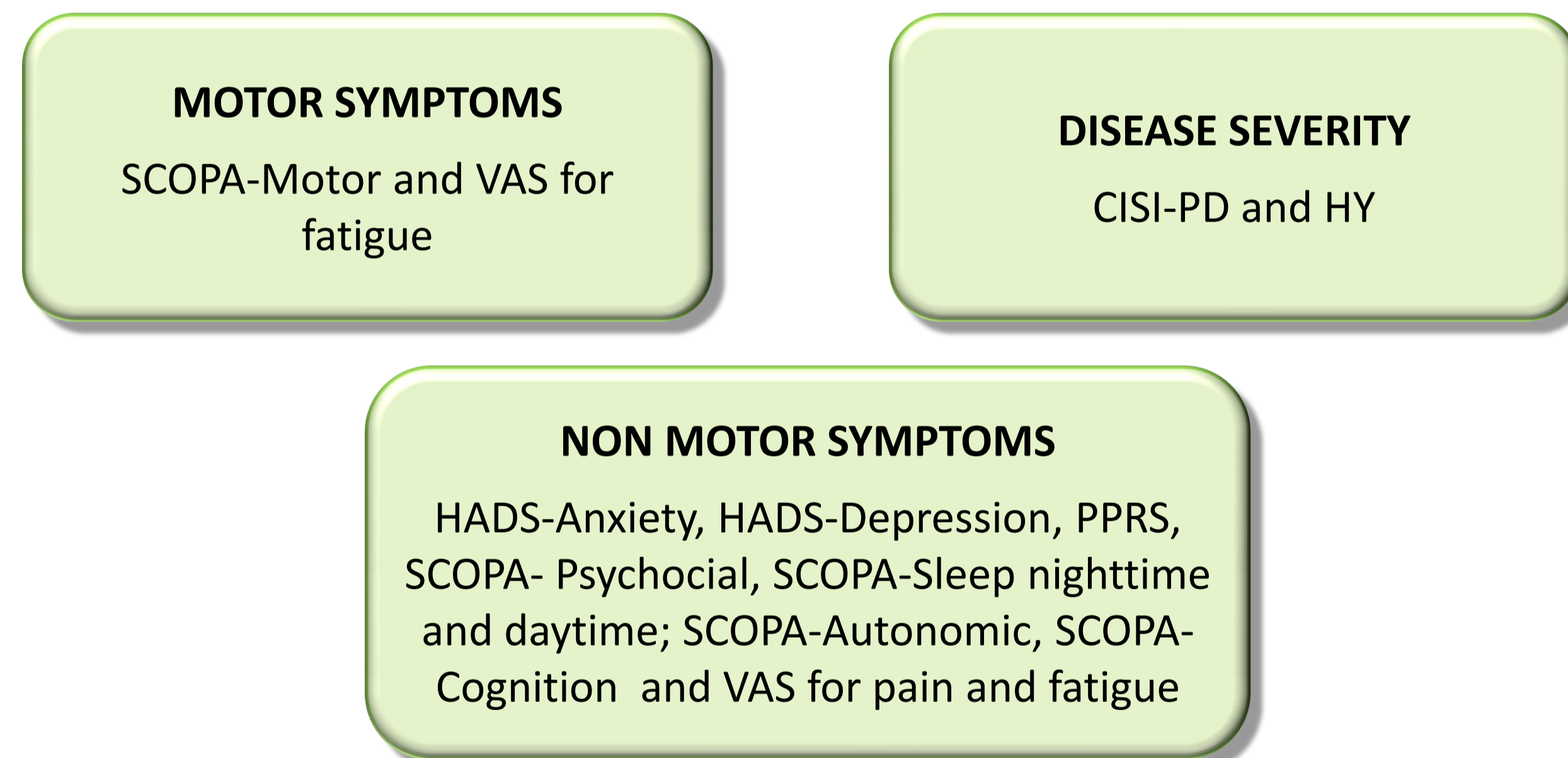
Parkinson disease (PD) is the second most common neurodegenerative disorder worldwide implying an important burden for society and health systems^{1,2}. The consequences of the disease affects not only the patients but also the caregivers, as the motor and cognitive function get worse³.

OBJECTIVES

To analyze the effect of disease severity, motor and non motor symptoms over costs in PD patients in the Spanish National Health System.

METHODS

► Observational, longitudinal, 4 years follow-up study of PD patients from ELEP study based on clinical assessment of motor and non-motor symptoms and disease severity by means of scores obtained in validated scales [SCOPA-Motor, HADS, PPRS, SCOPA-Autonomic, SCOPA-Sleep, SCOPA-Psychosocial, SCOPA-Cognition, visual analogue scale (VAS) for pain and fatigue, CISI-PD, Hoehn and Yahr (HY)]. Evaluation scales were classified into three groups regarding to the type of symptom evaluated:



► Costs of PD management were estimated from resource use (direct cost) and loss of productivity (indirect cost) extracted from data collected in a period of 3 months in each year of study. The prices corresponding to each resource were obtained from Oblikue and Bot Plus Web databases, and official prices. Loss of productivity estimation were obtained applying the national minimum wage in Spain 2012. All the costs were updated to Euro 2012.

► 8 linear mixed models analyzed the relationship between PD severity, MS and NMS on the direct and indirect costs (response variables). HY and CISI-PD were included in separated models and HY I and CISI-PD mild were the reference stages. The correlation intra-patient was considered as random effect and the scores of the scales as fixed effects. These models were carried out with the nlme package from the R statistical software⁴.

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- Toulouse A, Sullivan AM. Prog Neurobiol 2008; 85(4):376-92;
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RESULTS

Sociodemographic data

► 174 patients were included in the analysis. 50% were men, 65% had primary or basic studies with a mean of age 63 (DE: 11) years and mean disease duration of 8 (DE: 6) years at inclusion.

► The main patients' sociodemographic characteristics in the 4 years were: married status, living in an urban habitat in their own home, not driving and non being membership of a PD patients's association.

Scales evaluation

► Generally, patients showed mild PD severity and motor and non-motor dysfunction by means of the scores of the scales along the 4 years follow-up (Table 1) (Figures 1-2).

Table 1. Statistics of scores from patients evaluation scales in each year of study

	YEAR 1		YEAR 2		YEAR 3		YEAR 4	
	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n
SCOPA-Motor	14.6 (8.0)	174	15.8 (8.2)	174	16.3 (8.7)	173	18.1 (9.3)	174
SCOPA-Cognition	24.9 (6.2)	173	24.6 (6.9)	174	24.3 (7.3)	174	24.4 (7.4)	174
SCOPA-Sleep nighttime	5.5 (4.0)	173	5.1 (3.8)	174	5.1 (3.7)	174	4.8 (3.5)	174
SCOPA-Sleep daytime	3.8 (3.2)	174	3.7 (3.0)	174	3.9 (3.0)	173	3.8 (3.0)	174
HADS-Anxiety	7.3 (4.1)	174	7.1 (4.1)	173	7.2 (4.0)	174	7.1 (4.3)	174
HADS-Depression	5.4 (3.5)	174	5.9 (3.9)	173	6.1 (4.1)	174	5.9 (3.9)	174
PPRS	1.0 (1.3)	174	0.8 (1.2)	173	1.1 (1.4)	172	1.2 (1.5)	173
SCOPA-Autonomic	20.3 (11.3)	120	27.5 (14.7)	169	27.5 (13.8)	165	22.0 (10.1)	102
SCOPA-Psychosocial	6.9 (5.7)	174	8.0 (5.9)	174	8.2 (5.8)	174	8.2 (5.8)	173
VAS Pain	19.2 (21.4)	173	18.1 (21.9)	174	19.3 (23.0)	171	22.9 (23.7)	174
VAS Fatigue	25.3 (27.9)	173	29.6 (27.6)	171	32.4 (28.6)	171	33.7 (29.4)	174

Figure 1. Distribution of patients according to severity stages of HY in each year of study.

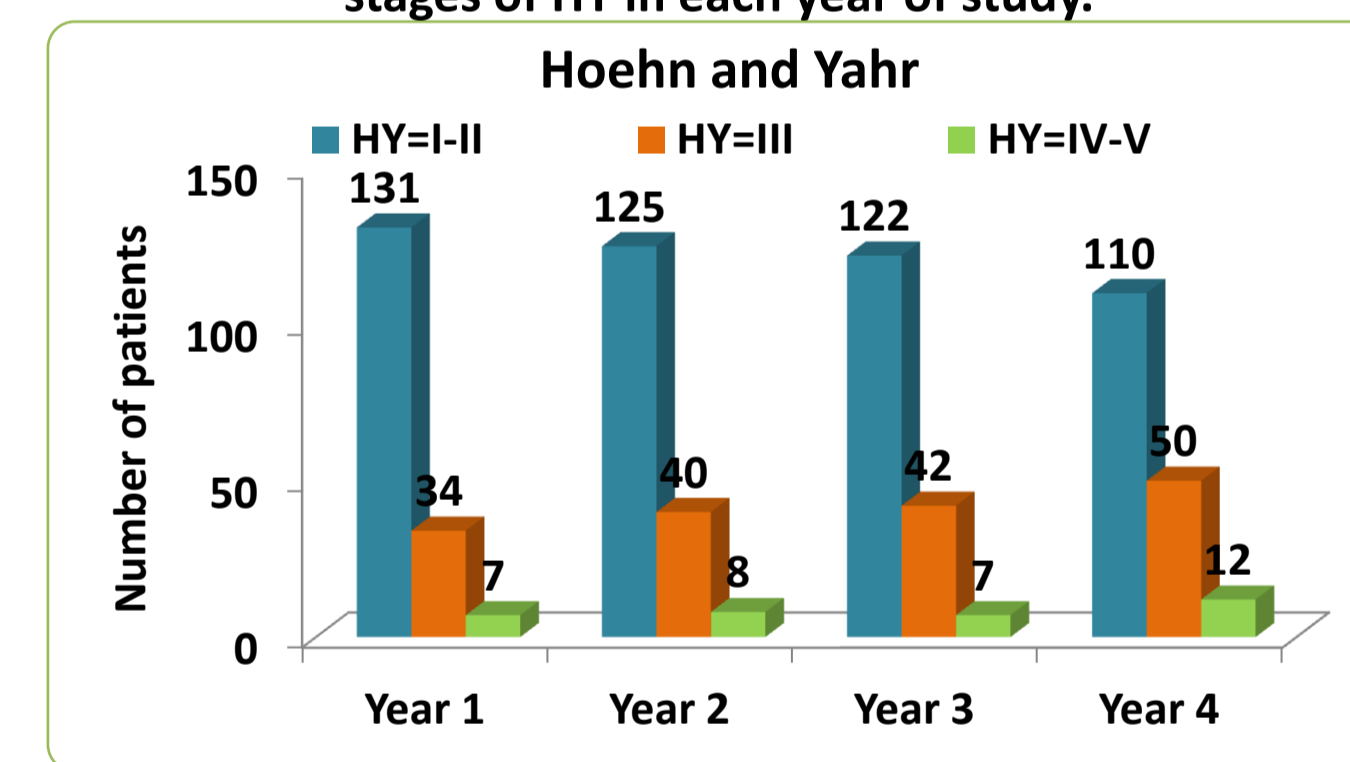
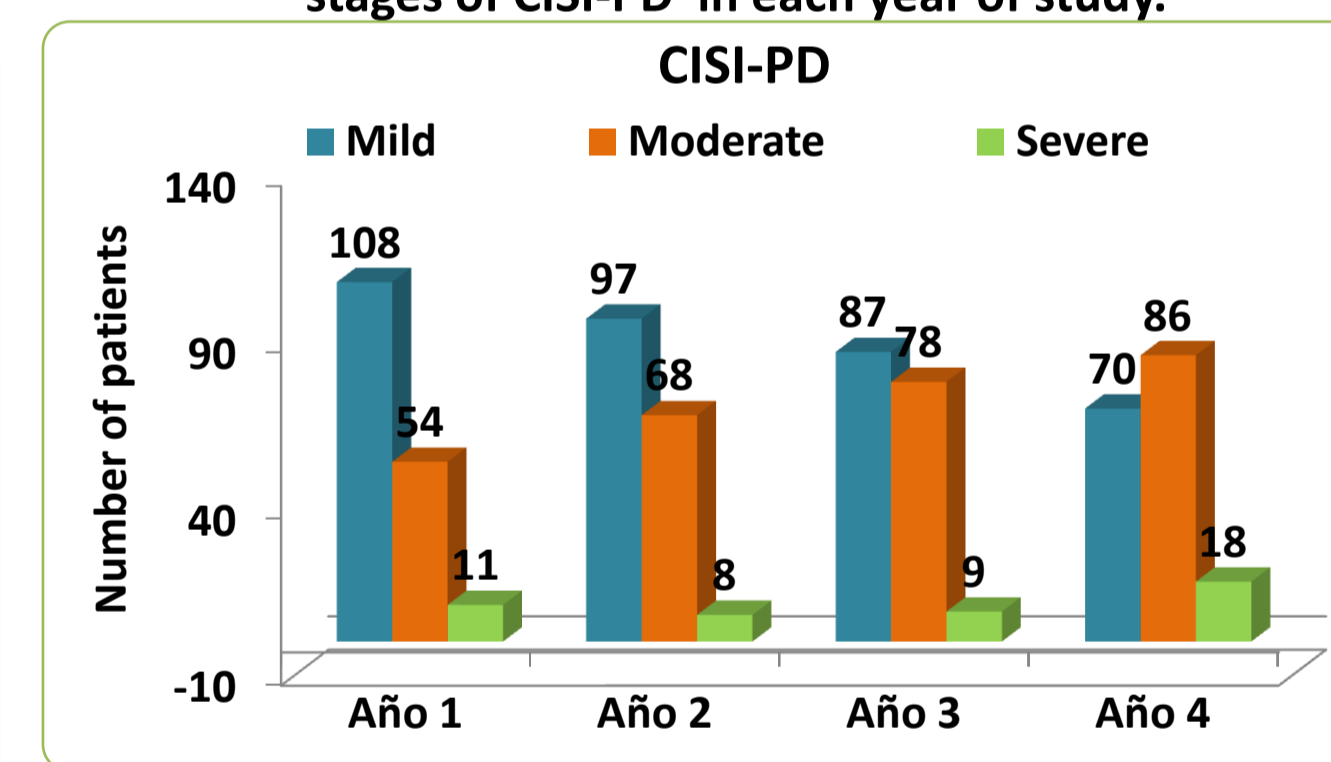


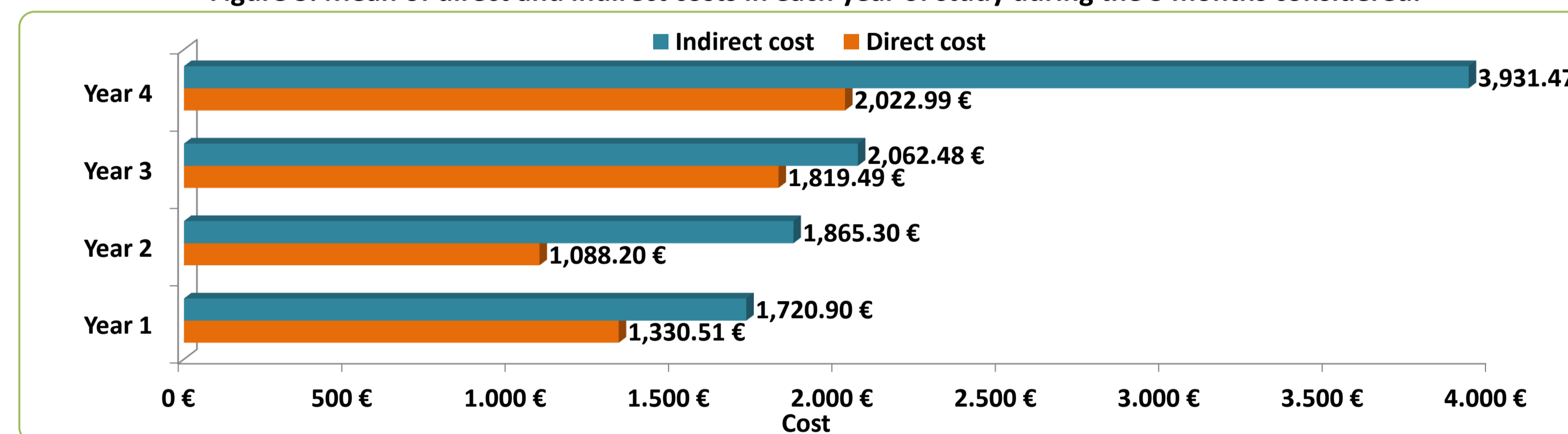
Figure 2. Distribution of patients according to severity stages of CISI-PD in each year of study.



PD cost estimation

► An increased of 57% of the direct cost per patient was observed between the first and fourth year. Higher increase for indirect costs was observed during the 3 months considered in each year of the study (128%) (Figure 3).

Figure 3. Mean of direct and indirect costs in each year of study during the 3 months considered.



Direct cost models as function of motor, non motor symptoms and disease severity

► Motor dysfunction and fatigue as motor component had a significative influence on direct costs (p<0,05). For every extra point obtained in SCOPA-Motor, direct costs would increase between 106.82 and 118.94€ per patient when HY and CISI-PD were considered. An inverse relationship between VAS Fatigue score and direct cost was observed (Tables 2-3). The high direct costs estimated in a small percentage of patients with a VAS fatigue score below 20 points seems to have a great influence on that relationship and this results have to be carefully considered.

Table 2. Linear mixed model of direct costs in the three months studied as a function of motor symptoms and severity by HY

Response variable: Direct cost	Coefficient	SE	p-value
Intercept	1,005.83	919.11	0.2763
SCOPA-Motor	106.82	49.99	0.0353
VAS Fatigue	-30.04	11.63	0.0114
HY=III	-118.23	740.16	0.8734
HY=IV-V	3,056.99	1,429.04	0.0351

Table 3. Linear mixed model of direct costs in the three months studied as a function of motor symptoms and severity by CISI-PD

Response variable: Direct cost	Coefficient	SE	p-value
Intercept	874.58	908.40	0.3379
SCOPA-Motor	118.94	54.48	0.0316
VAS Fatigue	-28.50	11.70	0.0168
CISI-PD=moderate	-238.51	795.73	0.7651
CISI-PD=severe	2,483.68	1,514.63	0.1045

► Autonomic function as self-reported by PD patient and severe stages of the disease were the significant variables in both models (p<0.05). For every extra point of increase in SCOPA-Autonomic score direct cost would increase between 104.59€ and 107.28€, while that the patient were in severe stages of the disease represented an increase of approximately 4,000€ in relation to patients in mild stages of the disease (Tables 4-5).

Table 4. Linear mixed model of direct costs in the three months studied as a function of non motor symptoms and severity by HY

Response variable: Direct cost	Coefficient	SE	p-value
Intercept	706.61	1,923.78	0.7141
HADS Anxiety	-204.48	112.70	0.0732
HADS Depression	12.67	121.72	0.9174
PPRS	-229.44	245.64	0.3530
SCOPA Psychosocial	3.91	87.21	0.9643
SCOPA-Sleep nighttime	-52.32	88.29	0.5551
SCOPA-Sleep daytime	-45.80	106.73	0.6689
SCOPA-Autonomic	107.28	32.82	0.0016
VAS Pain	-3.28	15.83	0.8364
SCOPA-Cognition	57.72	56.01	0.3058
VAS Fatigue	-27.52	13.05	0.038
HY=III	254.75	717.91	0.7236
HY=IV-V	4,018.52	1,351.56	0.0039

Table 5. Linear mixed model of direct costs in the three months studied as a function of non motor symptoms and severity by CISI-PD

Response variable: Direct cost	Coefficient	SE	p-value
Intercept	1,120.34	1,940.84	0.5650
HADS Anxiety	-217.38	111.98	0.0556
HADS Depression	9.87	120.45	0.9349
PPRS	-331.22	244.48	0.1792
SCOPA Psychosocial	11.51	86.75	0.8948
SCOPA-Sleep nighttime	-58.76	87.37	0.5031
SCOPA-Sleep daytime	-32.72	107.14	0.7608
SCOPA-Autonomic	104.59	32.91	0.0021
VAS Pain	-6.07	15.76	0.7012
SCOPA-Cognition	43.72	55.83	0.4358
VAS Fatigue	-24.61	12.93	0.0604
CISI-PD=moderate	435.69	699.09	0.5348
CISI-PD=severe	4,176.51	1,342.45	0.0026

Indirect cost models

► None of the variables included in motor symptoms had a significant influence on indirect costs (p<0.05), while only intermediate stages of the disease had a significant repercussion on indirect cost. PD patients in intermediate stages of severity had an economic impact between 1,758€ and 2,368€ more than those in mild stages of the disease considering CISI-PD and HY, respectively (Tables 6-7). Patients in intermediate PD severity stages had higher indirect costs associated to productivity loss than patients in other stages of the disease as they were in active working status.

Table 6. Linear mixed model of indirect costs in the three months studied as a function of non-motor symptoms and severity by HY

Response variable: Indirect cost	Coefficient	SE	p-value
Intercept	-783.73	1812.38	0.6663
HADS Anxiety	-66.00	118.92	0.5804
HADS Depression	81.35	127.35	0.5247
PPRS	-136.70	251.13	0.5877
SCOPA Psychosocial	-114.53	85.44	0.1837
SCOPA-Sleep nighttime	-10.26	89.60	0.9091
SCOPA-Sleep daytime	86.73	109.63	0.4311
SCOPA-Autonomic	44.18	31.78	0.1682
VAS Pain	1.59	16.70	0.9246
SCOPA-Cognition	65.14	53.74	0.2289
VAS Fatigue	4.58	14.16	0.7469
HY=III	2,368.28	784.90	0.0034
HY=IV-V	1,760.96	1381.57	0.206

Table 7. Linear mixed model of direct costs in the three months studied as a function of non-motor symptoms and severity by CISI-PD

Response variable: Indirect cost	Coefficient	SE	p-value
Intercept	-1,463.91	1,867.47	0.4348
HADS Anxiety	-54.04	121.45	0.6575
HADS Depression	105.61	128.00	0.4117
PPRS	-147.35	255.04	0.5650
SCOPA Psychosocial	-114.56	88.13	0.1972
SCOPA-Sleep nighttime	-17.69	90.25	0.8451
SCOPA-Sleep daytime	104.04	111.35	0.3529
SCOPA-Autonomic	50.97	31.79	0.1126
VAS Pain	-2.24	16.84	0.8943
SCOPA-Cognition	71.62	54.14	0.1895
VAS Fatigue	6.37	14.31	0.6574
CISI-PD=moderate	1,758.69	751.09	0.0216
CISI-PD=severe	1,751.98	1,522.54	0.2532

CONCLUSION

Direct costs raised in those PD patients with major motor and autonomic dysfunction while intermediate stages of disease severity had significative influence on indirect costs. These preliminary results, interpreted in the context of the study, allow observing that optimal control of motor and non-motor PD symptoms would aid containing disease costs in the study sample. Further global analysis are required in order to obtain more definitive conclusions.