Validity of Subsyndromic Classification of Cerebral Palsy (CP)®

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PART I

Subsyndromic Classification of Cerebral Palsy (CP)®

Introduction

Health care systems require measurement and prognosis of the disease and its outcome, as well as the results of its therapeutic approaches in terms of health, functionality or wellbeing *(1)*.

The problem of nomenclature has been a constant in CP *(2)*.

We are referring to the definition agreed upon in 1959 in Edinburgh, compiled and introduced by Bax *(3)* and later reviewed in 1990 at the International Meeting in Brioni and by The Surveillance of Cerebral Palsy in Europe (SCPE 2000) *(4)*: "an umbrella term covering a group of non-progressive, but often changing, motor impairment syndromes secondary to lesions or anomalies of the brain arising in the early stages of development".

According to the reviewed bibliography, there are various classifications referring to topographic distribution and motor types. However, not always has there been consensus in either the different definitions of the motor types or the criteria used in their classifications *(5)*, *(6)*, *(7)*, *(8)*, *(9)*, *(10)* and *(11)*. This creates prognosis and results that cannot be compared since they involve different syndromes.

Comparisons can only be made under standard definitions. It is essential to give a description together with prediction, comparison and evaluation of changes (SCPE 2000).

We have been using a classification of CP *(12)* based on documented clinical observations since the 80's, which has led to the hypothesis that, within the major classic syndromes, there are different subsyndromes (SS), which present their own range of functional performance. This gives them an identity that involves not only the type and distribution of neurological impairment, but also other aspects such as intelligence, fine and gross motor skills and independence, which behave like epiphenomena of each corresponding SS. This complementary aspect will be developed in Part II.

As Physical Medicine and Rehabilitation (PM&R) doctors, facing this condition, we want to contribute to an accurate and early diagnosis and prognosis of the functional profile of the different CP presentations. In this way through the health care network, we aim to achieve a sensible therapeutic approach and a family guidance adjusted to each reality and its needs.

The Subsyndromic Classification is based on excluding variables:

- Distribution of compromise and symmetry,
- Prevalent and dominant tone,
- Balance sit control,
- Manual ability,
- Balance and coordination.

With these elements, 5 syndromes and 8 subsyndromes are described in table 1.

Syndrome	Classification	Cases	Percentage
1 Quadriparesis	1A Spastic	50	15.2%
	1B Dyskinetic / Dystonic	22	6.7%
2 Diparesis	2A With upper limbs involvement	55	16.8%
	2B Without upper limb involvement	44	13.4%
3 Hemiparesis	3A A mild spastic	71	21.6%
	3B Dyskinetic / Dystonic	3	0.9%
	3C Severely spastic	11	3.4%
	3D Double	41	12.5%
4 Minor Dystonias and Dyskinesis		14	4.3%
5 Ataxis		17	5.2%
Total		**328**	**100%**

Table 1

The syndrome rate differences, found in the bibliography, compared with ours are understood as an example of the discrepancy among the syndrome definitions.

Material and Method

A retrospective cohort study was done in 328 cases (145 girls and 183 boys), assisted at the Rehabilitation Service of the Interzonal Children's Hospital of La Plata, Buenos Aires, Argentina, from 1984 to 1994. After analyzing only those medical records with enough data, we gave a syndrome/subsyndrome to each case during 36 months old, though in some of them, there were earlier evidences. Each case was re-examined at the age of 6 years old.

Impairment distribution was assessed through an ordinary neurological and neuromotor examination. Tipification was made according to the physical areas affected, focusing mainly on the upper limbs (UL) impairment.

The tone was assesed through Tardieu and Ashworth tests.

The trunk balance control was examined with the child sitting on the stretcher edge and his/her mother by his/her side.

Hand ability is considered *normal* when the child can oppose his/her thumb and little finger, after observing how to do it. This is an arbitrary decision even when the children can achieve the other fine motor skills according to their maturity age. There is *functional* hand ability when the opening and closure are voluntary and enable one or more specific activities related to their maturity age. Hand ability is *null* when there is no functional grasp.

Balance and coordination are assessed, with the child sitting or standing, using specific static and dynamic tests according to their ages.

Syndromes and Subsyndromes definitions

Syndrome 1. *Quadriparesis*

Total body, symmetric involvement, with upper limbs (UL) predominance over the lower ones. There is neither head nor trunk control sitting on the stretcher. Hand ability is null.

Subsyndrome 1A
Presents spastic tone with 4 and 5 Ashworth levels.

Subsyndrome 1B
Is dyskinetic and/or dystonic, with different degrees with or without involuntary movement, or hypokinesis with tension.

Syndrome 2. *Diparetic*

It presents mainly lower limbs (LL) involvement with various degrees of severity. There is sit trunk control before the age of 36 months old.

Subsyndrome 2A
Presents, in addition, mild impairment in UL principally in hands which are functional and may be assymmetric. The test of facing the thumb and little finger tips failed in one or both hands.

Subsyndrome 2B
Without UL involvement.

Syndrome 3. *Hemiparesis*

It is an unilateral involvement syndrome in the mild presentation (3A), in the dyskinetic/dystonic (3B) -which was not included in the statistics due to its low incidence rate- , and in the severely spastic presentation (3C). The double hemiparesis subsyndrome involves both sides in a functionally asymmetric fashion.

Subsyndrome 3A
Mild spastic hemiparesis. Spastic upper limb with levels ranging from 1 to 2 in the Ashworth scale. At the age of 36 months old, patients present functional hand ability.

Subsyndrome 3B
It presents dyskinesis. There are involuntary movements. Although it is a very distinctive subsyndrome, its low incidence has not enabled us to obtain statistical data.

Subsyndrome 3C

The upper limb has no voluntary activity and hand spasticity can range from 4 to 5 levels in the Ashworth scale.

Subsyndrome 3D

Both sides are asymmetrically affected. This asymmetry is assessed in the upper limbs. One side can present functional but no normal hand ability levels. It differs from Quadriparesis for its asymmetry, and from Diparesis, for the lack of trunk control at the age of 36 months old, though in some cases, this can be much later achieved.

Syndrome 4. *Minor Dyskinesias / Dystonias*

They are cases of total body involvement with dyskinetic-dystonic characteristics, in which trunk control is attained during the 36 months old, always assesed in the same way, which differs from the Quadriparesis 1B SS.

Syndrome 5. *Ataxis*

Children present two or more of the following symptoms: head tremor, hypotonia, dysmetria, upper limbs tremor. When attempting gait, they present compensatory lifting of the upper limbs, sidewards or forwards, or they look for support in furniture or walls. If they achieve an independent gait, they can do it with a supportive base increase, but without being able to maintain a straight line movement.

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Conclusions

This classification is used in different Rehabilitation Services in our country where the professionals have attended, at least, a training workshop for using it. In all these workshops, there was an 87% inter observation and a 98.3% of test - re test.

Our Subsyndromic Classification allows us to predict the functional profile range of children with CP from the age of three. This will be further developed in Part 2. This improves the therapeutic approach of the patients, their families and the healthcare system,

We are carrying out a sample with adults with this condition to contrast these results in this life stage.

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PART II

Functional profile of children with the different Subsyndromes (SS) of Cerebral Palsy (CP)®

Introduction

In this second part we will analyze the functional behaviour of each SS in our classification through certain chosen attributes and set the performance in four domains: Mobility, Hands Ability, Intelligence and Autonomy, tested during the ages of 3 and 6. Besides, we used The Gross Motor Functional Classification System (GMFCS) *(3 and 4)* as a reliable tool of gross motor definition.

In other papers *(1 and 2)*, we observed the problem of variability as well as the importance of non motor aspects in prognosis, but our purpose is to demonstrate the existence of sub syndromes within the described classical syndromes.

Material and Method

In the first part of our paper we described the composition of the sample: 328 cases (145 girls and 183 boys), which have already received a therapeutic approach.

Mobility: it was defined as *1) Without gait*, *2) Some kind of gait (SKG)* when it is assisted with a walker in less than 10 metres of domestic mobility, *3) Gait*, when it is longer with or without technical assistance.

Hands Ability: it was graded in *Normal*, *Functional* and *Null*, described in the first part of the paper.

Intelligence: it was assessed according to maturity age and intelligence quotient (IQ). *Borderline* was considered from IQ of 70, and *Normal* from IQ of 83.

Autonomy: it was defined by Wee FIM *(5)* as *Independent* (7 and 6), *Semi dependent* (5, 4 y 3) and *Dependent* (2 and 1).

A **score (Sc)** was created based in the performance of the different domains. It was calculated for each case in the first and second evaluation (3 and 6 years of age respectively).

The **Sc** values of each sub syndrome in the first and second evaluation is seen in the Box-Plot *(Graphic 10)*, graded in four stages with an equivalence of clinic involvement.

0 - 2.50	**Mild to moderate** involvement
2.50 - 5	**Moderate** involvement
5 - 7.50	**Moderate to severe** involvement
7.50 - 10	**Severe** involvement

Statistical Analysis: The Mann Whitney Test was used to compare each SS. The comparison between the first and the second evaluations was performed under the Wilcoxon Test. Categorical variables were compared among each SS with the Chi-square Test and both evaluations with the Mc Nemar Test.

Results

The distribution of SS are displayed in table 1.

Syndromes / Subsyndromes	Frequency	Percentage
1A Spastic Quadriparesis	50	15,2%
1B D. D. Quadriparesis	22	6,7%
2A Spastic Diparesis with upper limbs (UL) involvement	55	16,8%
2B Spastic Diparesis without upper limbs (UL) involvement	44	13,4%
3A Mild Spastic Hemiparesis	71	21,6%
3B D. D. Hemiparesis	3	0,9%
3C Severe Spastic Hemiparesis	11	3,4%
3D Double Hemiparesis	41	12,5%
4 Minor Diskinesis / Distonia	14	4,3%
5 Ataxis	17	5,2%
Total	**328**	**100%**

Table 1: *Frequency in Syndromes / SS distribution*

In our sample 94 children (28, 6%) had epilepsy *(Table 2)*.

Subsyndrome	Epilepsy	
	Frequency	Percentage
1A Spastic Quadriparesis	33	66.0%
1B D. D. Quadriparesis	9	40.9%
2A Spastic Diparesis with UL involment	12	21.8%
2B Spastic Diparesis without UL involment	3	6.8%
3A Mild Spastic Hemiparesis	19	26.8%
3C Severe Spastic Hemiparesis	3	27,3%
3D Double Hemiparesis	12	29,3%
4 Minor Diskinesis / Distonia	1	7.1%
5 Ataxis	2	11.8%
Total	**94**	**100%**

Table 2: *Frequency of epilepsy in each SS of the sample*

The global distribution of IQ is shown in the following table *(Table 3)*.

IQ	Frequency	Percentage
Normal	104	31,7%
Borderline	29	8,8%
Mild	61	18,6%
Moderate	39	11,9%
Severe	95	29,0%
Total	**328**	**100%**

Table 3: *General distribution of IQ*

Characteristics of the Syndromes and SS by the four domains assessed

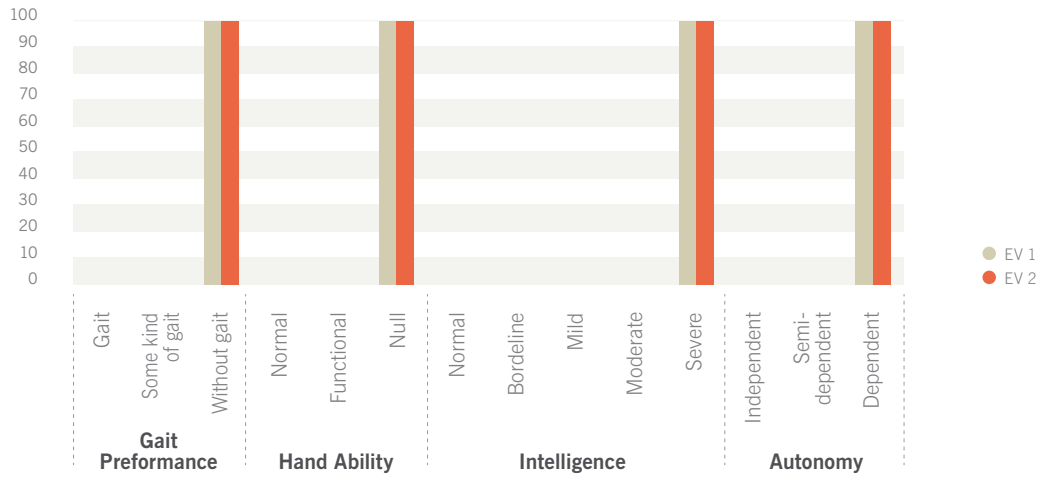
Every syndrome and SS was described in the first part of the paper.

S1. *Quadriparesis*

SS1A. *Spastic Quadriparesis*

It is the most severe form of our classification. Each assessed domain showed severe involvement in the first and the second evaluations, presenting no changes between them. The Sc was **10** in every case *(Box-Plot)*.

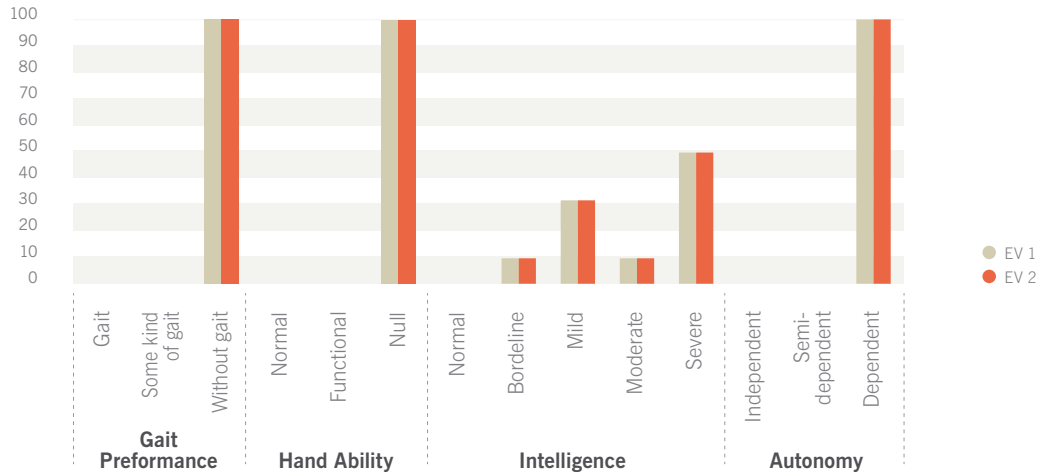
Graphic 1: *Attributes distribution in SS1A*



SS1B. *D. D. Quadriparesis*

This form of quadriparesis presents better results in the intelligence area: only 50% of the cases have shown severe involvement and the rest is distributed among moderate, mild and borderline levels, which offers the possibility of using augmentative or alternative devices for communication or electronic wheel chair. The rest of the variables presents severe involvement. The median Sc is **9.75** *(Box-Plot)*.

Graphic 2: *Attributes distribution in SS1B*

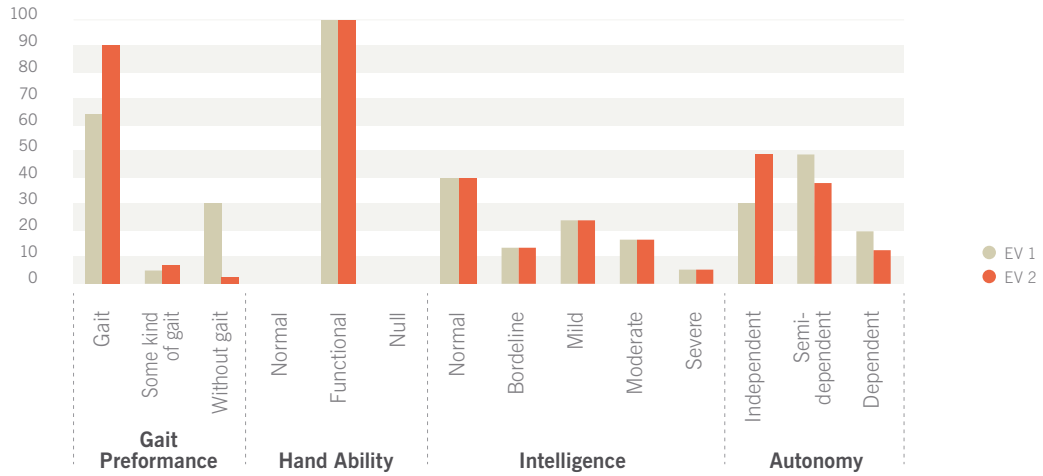


S2. *Diparesis*

SS2A. *Spastic Diparesis with UL involment*

This is a mild to moderate SS. Gait is achieved in 90.9% of the cases in the second evaluation. Hand ability was functional in every case. Intelligence was normal in 40% of the cases, borderline in 12.7%, mild in 25.5%, moderate in 16.4% and severe in 5.4%. In the second evaluation autonomy was dependent in 12.7% of the cases, semi dependent in 38.2% and independent in 49.1% of them *(See graphic 3)*. The median Sc was **2.5**, which means that 50% of the cases present Sc values from mild to moderate. It has also been noted that there is a wide dispersion around that median score *(Box-Plot)*.

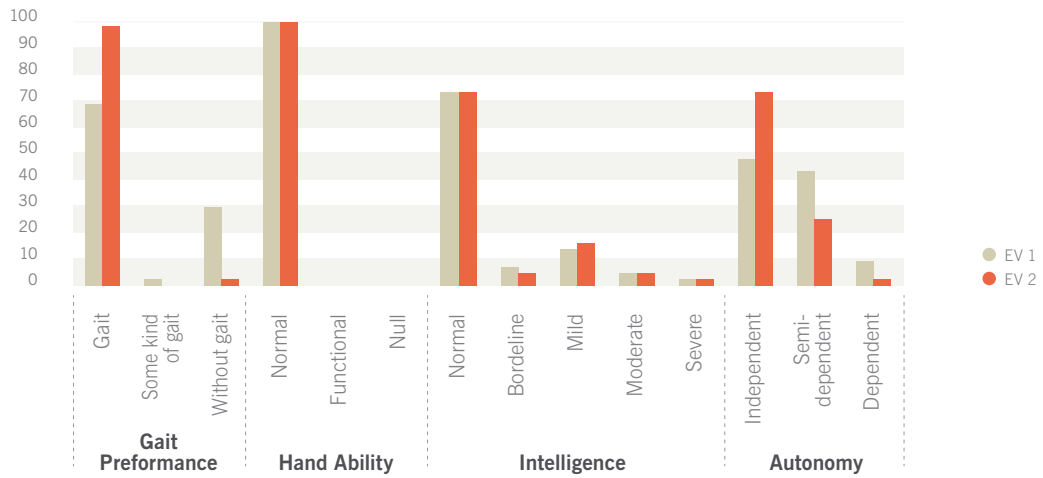
Graphic 3: *Attributes distribution in SS2A*



SS2B. *Spastic Diparesis without UL involvement*

This SS presents a better performance in relation to SS2A having a mild to moderate involvement, especially in intelligence and autonomy. In the second evaluation, 97.7% achieved gait but 2.3% did not. Hand ability was normal in all of them. IQ was normal in 72.7% of the cases, borderline in 4.5%, mild in 15.9%, moderate in 4.5% and severe in 2.3%. In the second evaluation, autonomy was dependent in 2.3%, semi dependent in 25% and independent in 72.7%. The median Sc was **0.5** in the second evaluation *(Box-Plot)*.

Graphic 4: *Attributes distribution in SS2B*

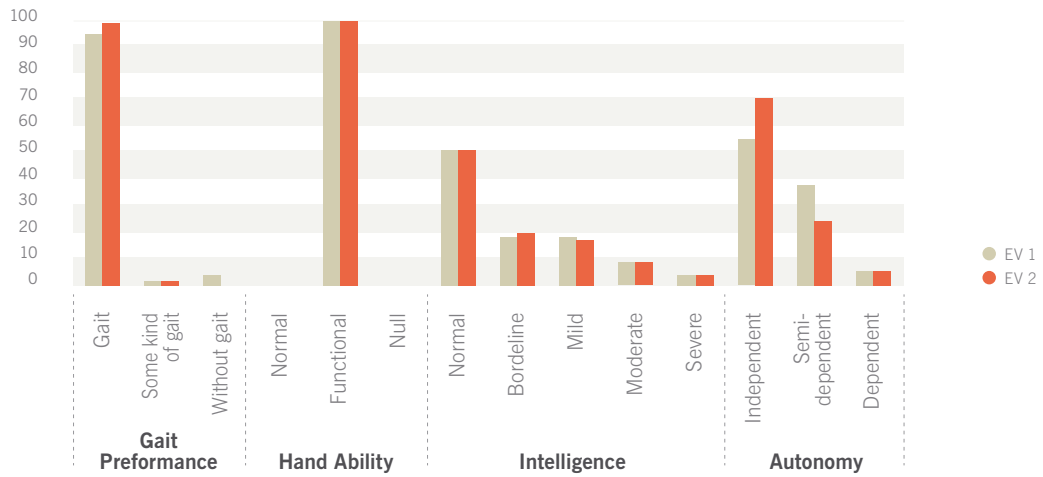


S3. *Hemiparesis*

SS3A. *Mild Hemiparesis*

It presents a mild to moderate involvement. 98.6% of the cases achieved gait. The only case without gait was due to surgery at the moment of evaluation. Hand ability was functional in 100% of the cases. As regards intelligence, 71% showed an IQ between normal and borderline. Only 4% were severe. In the second evaluation of autonomy 70.4% showed independence according to age. The median Sc in the second evaluation was **2** *(Box-Plot)*.

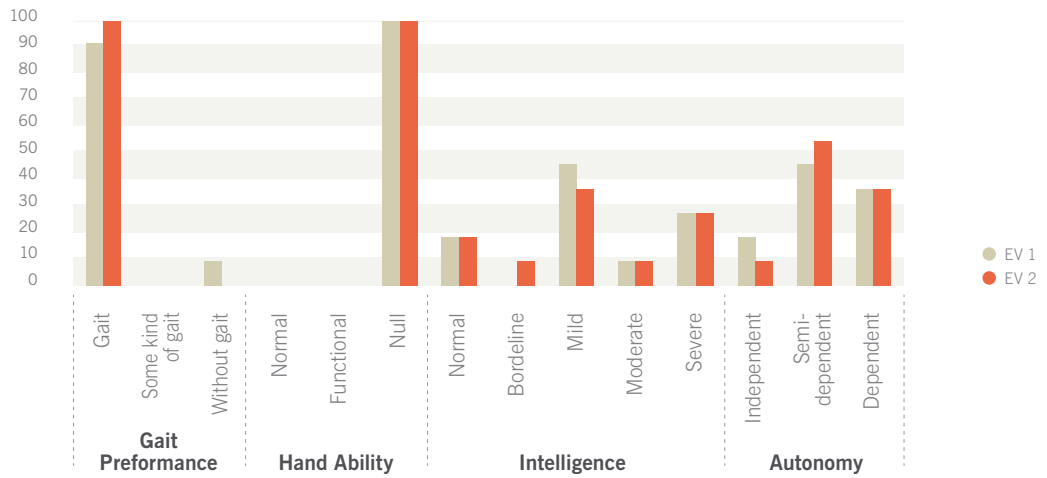
Graphic 5: *Attributes distribution in SS3A*



SS3C. *Severe Spastic Hemiparesis*

The gait was achieved in 100% of the cases. Hand ability was null also in the 100% of them. 18.2% showed normal IQ, 9.1% of them were borderline, 36.4% presented mild retardation, 9,1% moderate and 27.3% severe. In autonomy, 9.1% were independent, 54.5% were semi dependent and 36.4% were dependent. The median value was moderate with a Sc of **4.5** in the second evaluation *(Box-Plot)*.

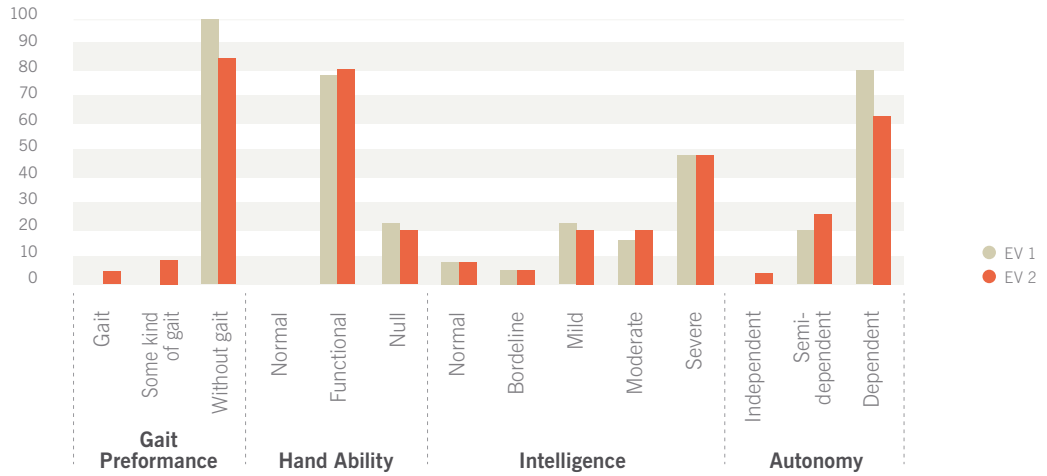
Graphic 6: *Attributes distribution in SS3C*



SS3D. *Double Hemiparesis*

Double hemiparesis presents a moderate to severe involvement. Gait was achieved in 4.9% of the cases, there was no gait in 85.4% while SKG was possible in 9.8%. Hand ability was functional in 80.5% and null in 19.5%. Intelligence was normal in 7.3%, borderline in 4.9%, mild in 19.5%, moderate in 19.5% and severe in 48.8%. Autonomy was dependent in 72.5%, semi dependent in 25% and independent in 2.5%. The median value of Sc was **6.75** with a significant dispersion around it *(Box-Plot)*.

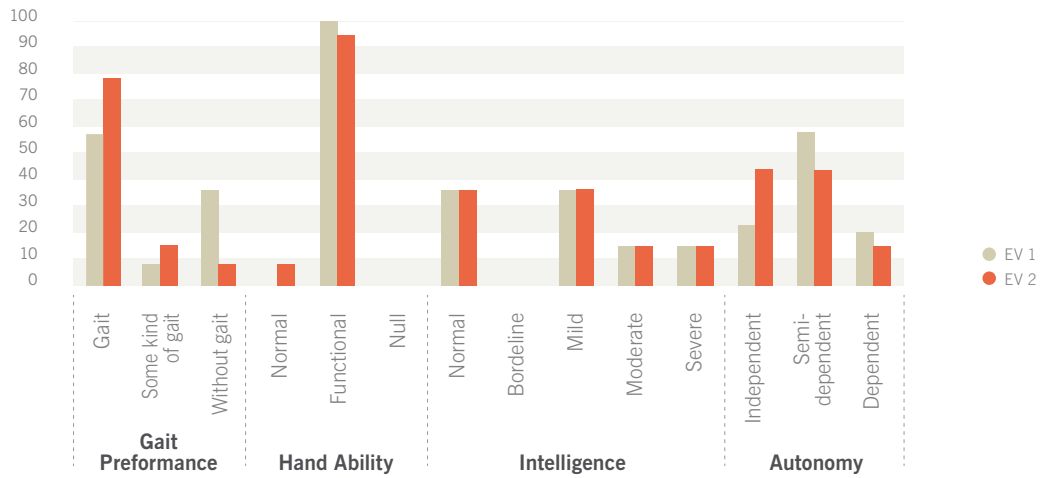
Graphic 7: *Attributes distribution in SS3D*



S4. *Minor Dyskinesias / Dystonias*

This is a syndrome of mild - moderate involvement. The gait was achieved in 78.6%, there was no gait in 7.1% and there was SKG in 14.3%. Hand ability was normal in 7.1% of the cases and functional in 92.9% of them. Intelligence performance was normal in 35.7%, mild in 35.7%, moderate in 14.3%, and severe in 14.3% As for autonomy, 14.3% were dependent, 42.9% semi dependent and 42.9 independent. The median Sc was **3** in the second evaluation *(Box-Plot)*.

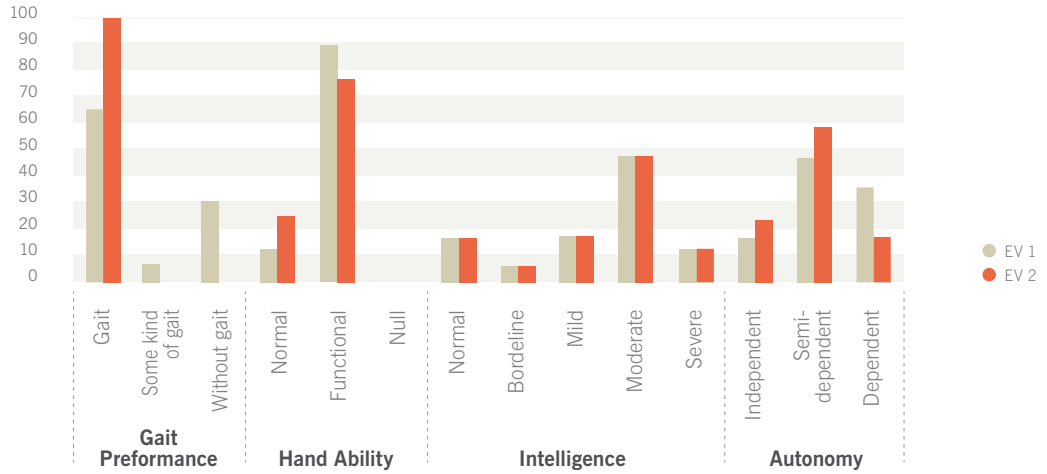
Graphic 8: *Attributes distribution in S4*



S5. *Ataxis*

It presents a predominantly moderate functional involvement. Gait was achieved in 100% of the cases in the second evaluation. Hand ability was normal in 23.5%, and functional in 76.5%. IQ was normal in 17.6% of the individuals, borderline in 5.9%, mild in 17.6%, moderate in 47.1% and severe in 11.8% of them. As regards autonomy, 23.5% of the cases were independent, 58.8% semi dependent and 17.6% dependent. The median Sc was **3.5** *(Box-Plot)*.

Graphic 9: *Attributes distribution in S5*



GMFCS results

			GMFCS					Total
			1	2	3	4	5	
Syndromes and SS	SS1A	Counting	0	0	0	0	50	**50**
		% within the SS	0%	0%	0%	0%	100,0%	**100%**
	SS1B	Counting	0	0	0	6	16	**22**
		% within the SS	0%	0%	0%	27,3%	72,7%	**100%**
	SS2A	Counting	26	17	12	0	0	**55**
		% within the SS	47,3%	30,9%	21,8%	0%	0%	**100%**
	SS2B	Counting	26	12	6	0	0	**44**
		% within the SS	59,1%	27,3%	13,6%	0%	0%	**100%**
	SS3A	Counting	65	5	1	0	0	**71**
		% within the SS	91,5%	7,0%	1,4%	0%	0%	**100%**
	SS3C	Counting	8	3	0	0	0	**11**
		% within the SS	72,7%	27,3%	0%	0%	0%	**100%**
	SS3D	Counting	0	0	3	31	7	**41**
		% within the SS	0%	0%	7,3%	75,6%	17,1%	**100%**
	S4	Counting	2	8	4	0	0	**14**
		% within the SS	14,3%	57,1%	28,6%	0%	0%	**100%**
	S5	Counting	9	8	0	0	0	**17**
		% within the SS	52,9%	47,1%	0%	0%	0%	**100%**
Total		Counting	**139**	**53**	**26**	**37**	**73**	**328**

TablE 4: *GMFSC in the different syndromes and sub syndromes*

In our research comparison with GMFCS expressed that 100% of the cases with quadriparesis A (SS1A) were in level 5; 72.7% with quadriparesis B (SS1B) were in 5, and 27.3% in 4. Diparesis A and B are within 1, 2 and 3 GMFCS levels. In most of the cases hemiparesis A and C were in level 1, while 17.1% of the hemiparesis D were in level 5, 75.6 % in level 4 and 7.3 % in level 3 (p<o,oo1) *(See Table 4)*.

Despite the characteristics of our classification, the gross motor performance of our cases groups matches the different levels of GMFCS classification, slightly less in group III. Anyway, we agree with Howard's work *(6)* about the differences in the syndrome classification. Within the great three groups, the proportion is also coincident. In Gorter et al *(7)*, as regards limbs distribution, there is coincidence between the distribution of GMFCS levels and the Hemiparesis and Diparesis of our sample. However, there is no coincidence with Quadriparesis A and B, since in our investigation they refer to level 4 and 5 which must be due to the presence of Double Hemiparesis which are in levels 3, 4 and 5 in our classification.

Comparison between Double Hemiparesis and Quadriparesis

In the first assessment the children with these three SS (1A, 1B and 3D), did not achieve gait but in the second evaluation 4.9% of the cases with SS3D achieved gait and 9.8% of them, S KG (p=0, 06).

In Quadriparesis, 100% of the cases presented null hand ability and were dependent while in Double Hemiparesis (SS3D), 80.5% had functional hand ability and 25% were semi dependent (p<o.oo1 and p=0.007).

In intelligence, Quadriparesis A (SS1A) presented severe retardation while in Quadriparesis B (SS1B) only 50% of the cases had severe retardation and the rest showed moderate, mild and borderline performance (p<o.oo1). The distribution of intelligence in double hemiparesis (SS3D) was not significantly different from quadriparesis B (SS1B), though there were 3 cases with normal IQ.

These differences are reflected in punctuation: every case of Quadriparesis A had a Sc of **10**, Quadriparesis B had a **9.75** Sc and for Double Hemiparesis the median Sc was **6.75**. These differences were statistically significant (p<0.001).

In other words, SS3D is far from the Quadriparesis profile, despite presenting a total body involvement. From our point of view, bringing all these cases together generates considerable prognostic variations, since they are different subsyndromes.

Hemiparesis comparison

We disagree with the publication that makes reference to the absence of mental retardation in hemiparesis, since there is evidence of different degrees of involvement according to each SS (8).

In mobility, hemiparesis A and C (SS3A and SS3C) had a similar distribution, while Double Hemiparesis (SS3D) did not achieve gait in 85.4% of the cases (p<0.001).

Hemiparesis A presented normal IQ in 51% of the cases and the rest was mainly distributed between borderline and mild, as for hemiparesis C, 18.2% of the cases showed normal IQ, while it was severe in 27.3% of them. In SS3D, it was normal in 7.3%, borderline in 4.9%, severe in 48, 8% and the rest, between mild and moderate.

Hand ability was functional in 100% of the cases with hemiparesis A, while in hemiparesis C it was 100% null. As for hemiparesis D, it was functional in 80.5% of the cases ($p<0.001$).

In autonomy, 70.4% of the cases with hemiparesis A were independent and 5.6% of them were dependent. Hemiparesis C presented 54.5% of the cases with semi independent autonomy, 36.4% were dependent and only one case was independent. When it comes to hemiparesis D 72.5% were dependent and 25% semi dependent ($p<0.001$).

The median Sc was **2** for SS3A, **4.5** for SS3C and **6.75** for SS3D.

All the differences were statistically significant ($p<0.001$).

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Comparison between the first and the second evaluation

Quadriparesis A: Present no modifications between both evaluations.

Quadriparesis B: Present no modifications between both evaluations.

Diparesis A: There is some progress in mobility and autonomy which is demonstrated by some differences in the median Sc which goes from of **3.5** in the first evaluation to **2.5** in the second evaluation ($p<0.001$).

Diparesis B: There is a slight progress in mobility and autonomy shown in the median Sc which goes from **1.5** in the first assessment to **0.5** in the second one ($p<0.001$).

Hemiparesis A: The median Sc went slightly better in autonomy from **2.5** to **2** ($p<0.001$).

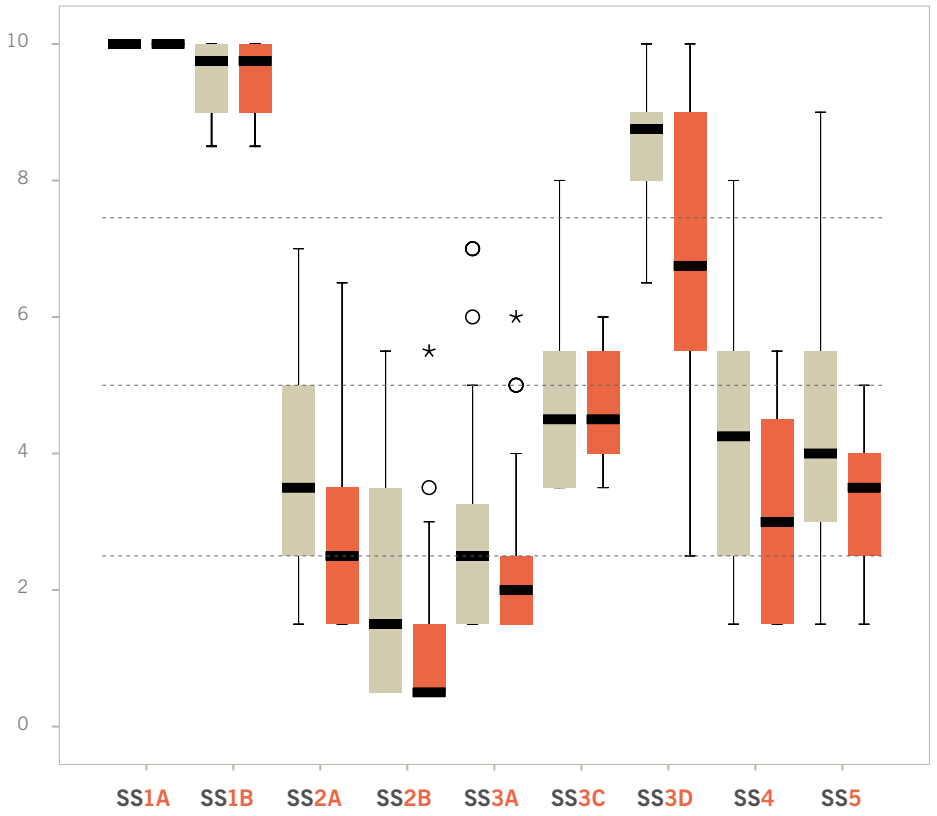
Hemiparesis C: There is no change between both evaluations.

Hemiparesis D: The median has a better performance in gait and autonomy from **8.75** to **6.75** ($p<0.001$).

Minor Diskinesis / Distonia: The median also had a better performance in gait, hand ability and autonomy from **4.25** to **3** ($p=0,011$).

Ataxis: There is a much better performance in mobility, but a bit less progress in autonomy. The median Sc goes from **4** in the first assessment to **3.5** in the second one ($p=0,012$).

All in all, Quadriparesis shows no improvement in the score, the differences in Hemiparesis C are not significant. The other SS improve the median Sc in the second evaluation. The most relevant changes are seen in the Diparesis and Minor Diskinesis / Distonia.



Graphic 10. *Box-Plot (Sc) according to oscillation between Syndrome/subsyndrome in both evaluations*

Discussion

The percentages of the syndromes in the reviewed literature have no coincidence among each other due to the different classification criteria,used by the different authors.

As Shapiro has said *(9)*, the motor deficit may not be the most important functional limitation. Many authors agree that Diparesis is the most frequent form of presentation. Sankar and Mundkur *(10)* have found it in 30-40% of the cases, hemiparesis in 20-30% and Quadriparesis 10-15% which is far closer to our observation *(See table 1)*.

For Sankar and Mundkur, epilepsy frequency varied from 35% to 62%, being more common in Spastic Quadriparesis: 50-94%; only 30% in Hemiparesis, and less frequent in Diparesis, Diskinesis and Ataxis. Our cases are shown in Table 2.

According to Liptack, 50% of the individuals with CP present mental retardation. Together with learning disorders, that figure rises to 75%, which is closer to our results.

In our sample, IQ was normal in 31.7% of the cases, coinciding with Wichers *(11)*. We have concluded that there is a direct relationship between the SS with the highest scores and the most serious mental deficiencies.

We agree with Wichers that clinical patterns are held quite constant in time.

• • • •

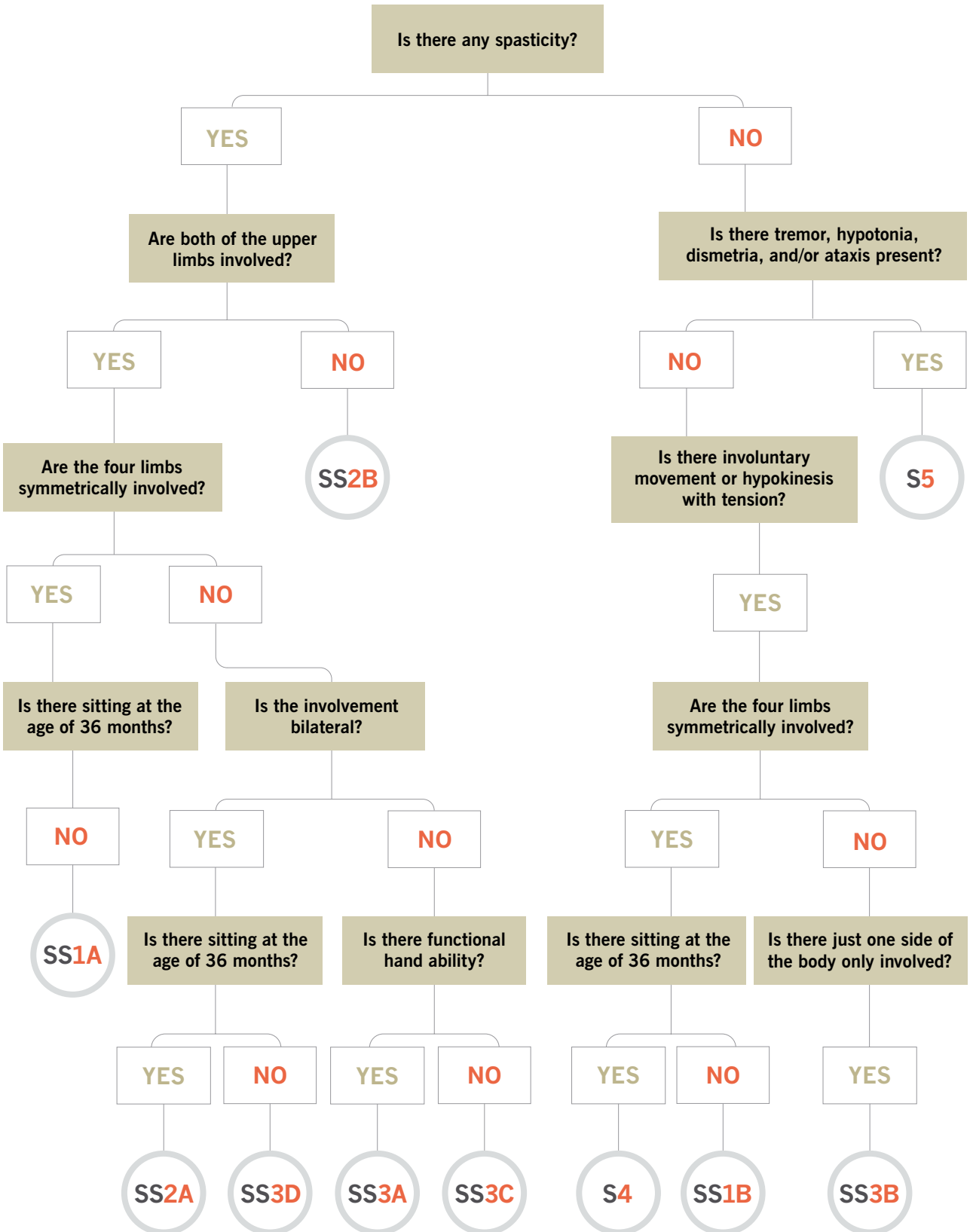
Conclusions

In our opinion, within the classical CP syndromes, there exist subsyndromes with their own entities which have been identified and described in the first part of the paper. This concept makes it difficult to make a comparison with the vast bibliography in existence, but the intra syndromic differences allow a range of functional prognosis based on four attributes. This ensures all the early possible therapeutic perspectives as well as the ever difficult task of measuring their results, the correct family orientation and the contribution to the planning of the health system demand.

We consider that it is very important to conduct population studies for several years and analyze the functional behaviour and the related CP involvements over time *(12)*, as well as the association of different reliable measurements due to the polymorphism condition. We think that this should be analysed under the subsyndromic approach.

We are working with a sample of adults with CP to both analyse the long-term outcomes and link the evolution of each child's health with their subsyndromes and syndromes through their adolescence and adulthood to shed some light on our experience.

Diagnosis diagram:



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Academic background

Dra. Irma Graciela Giglio de Guerrini

- MD graduated from School of Medical Sciences of the La Plata National University (UNLP), 1965.
- Fellow in Anna Torregiani Center of Cerebral Palsy, Florence, Italy. 1970. Director Professor Adriano Milani Comparetti, MD.
- President of the Argentinean Society of Physical Medicine and Rehabilitation, Bs. As. 1977.
- Physiatrist MD in the Rehabilitation Service of the Interzonal Children's Hospital of La Plata, Buenos Aires, Argentina, from 1969 to 1983, by tender.
- Chief of the Rehabilitation Service of the Interzonal Children's Hospital of La Plata, Buenos Aires, Argentina, from 1983 to 2000, by tender.
- Associate member in the Neurology Department of the National University of La Plata, from 1978.
- "Ricardo Caritat" Physical Medicine and Rehabilitation award. Argentinean Academy of Pediatrics. Argentinean Chapter. 12th District. Bs. As., November 1981.
- Fendim Honorary Distinction Recognition. Bs. As., 1988.
- Obligado Foundation Award to the best scientific paper on Cerebral Palsy. Bs.As., August 1991.
- Foreign corresponding member of the American Academy of Cerebral Palsy and Developmental Medicine. USA, 1993.
- Consultant Specialist in Physical Medicine and Rehabilitation. College of Physicians of Buenos Aires.
- Member of the Experts Committee to Cuba. 1994.
- Coordinator and member of the Argentine chapter of Pediatric Rehabilitation Argentina Society of Physical Medicine and Rehabilitation.
- Publications in books, lectures, stories and delivering courses and workshops.
- Master of Argentinean Physical Medicine appointed by the Argentinean Society of Physical Medicine and Rehabilitation.

María del Carmen Alarcón

- Resident of Physical Medicine and Rehabilitation Service of the Interzonal Children's Hospital of La Plata, Buenos Aires, Argentina. From 1996 to 1999.
- Chief of Residents of Physical Medicine and Rehabilitation Service. From 1999 to 2000.
- Specialist in Physiatry. Degree granted by the National Health Ministry.
- Physiatry MD at the Sanatorio La Plata. From 2000 to 2003, 2009 and 2011.
- Medical Director of APRILP. From 2003 to 2010.
- Physiatry MD at the A. Korn Hospital in the pediatrics Physical Medicine and Rehabilitation Service. From April 2011 to this day.

María del Carmen Apesteguía

- Mathematics degree. UNLP.

Validity of Subsyndromic Classification of Cerebral Palsy (cp)®

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