



Retrospective Assessment of Early Growth Characteristics in Cerebral Palsy Subtypes

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Introduction

Children with quadriplegic cerebral palsy (CP) have growth rates that differ from those of normally developing children, and a separate growth chart has been developed for clinical evaluation in this subtype of CP. It currently is unknown whether growth patterns in hemiplegic and diplegic CP differ from quadriplegic CP or from the established childhood growth curves. The purpose of this study was to compare the growth rates of children with quadriplegic, hemiplegic, and diplegic CP. If differences in growth rates are observed, additional research will be conducted to assess the need for new growth curves for hemiplegic and diplegic diagnostic categories.

Methods

Retrospective data including age, weight, and height were collected from the electronic medical record of 478 patients with CP treated in a multidisciplinary CP clinic at University of Missouri Healthcare. The data were reviewed to eliminate errors as well as exclude patients with confounding growth co-morbidities. Sufficient data were available for estimation of growth rates for ages 3-12 years. Linear mixed models were used to examine how growth varied by diagnosis. ICD-9 diagnosis codes used in the final analysis included 343.0 (diplegia), 343.1 (hemiplegia), and 343.2 (quadriplegia).

Table 1

Sample Characteristics: Number of Individuals (Number of Measurements)

CP Subtype	Height Data		Weight Data	
	Females	Males	Females	Males
Diplegia	21 (68)	28 (139)	24 (105)	35 (217)
Hemiplegia	20 (109)	35 (147)	21 (135)	36 (212)
Quadriplegia	47 (165)	67 (227)	62 (298)	88 (488)
Totals	88 (342)	130 (513)	107 (538)	159 (917)

Mean age at first included record was 5.6 years, standard deviation (sd) = 3.0, for diagnoses 343.0 and 343.1 and mean age of 6.6, sd = 3.1, for diagnosis 343.2.

Table 2

Percentiles Compared to Normal Growth: Median Percentile (Number Subjects)

Age	CP Subtype	Height Data		Weight Data	
		Females	Males	Females	Males
3	Diplegia	14 (5)	58 (13)	31 (6)	56 (18)
	Hemiplegia	55 (7)	32 (10)	60 (7)	69 (12)
	Quadriplegia	18 (8)	20 (17)	26 (13)	28 (22)
12	Diplegia	36 (5)	41 (4)	23 (7)	68 (5)
	Hemiplegia	27 (4)	60 (7)	63 (4)	82 (8)
	Quadriplegia	4 (10)	7 (12)	4 (22)	12 (18)

Regression Results: Raw Data, Fitted Lines, and Confidence Regions

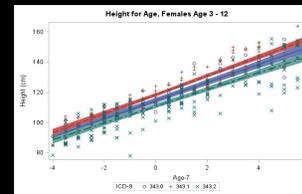
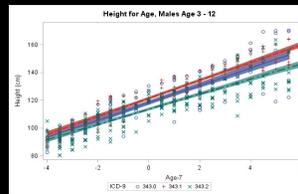
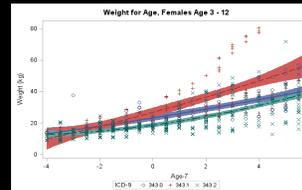
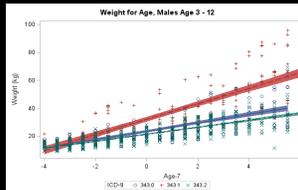


Chart Key: Diplegia O Hemiplegia + Quadriplegia x



Results

- Heights and weights of children with quadriplegic CP were consistently lower than those with hemiplegic or diplegic CP.
- Children with hemiplegic CP had greater heights and weights than the other subtypes of CP.
- There were statistically significant differences in weight gain curves among the three diagnoses for males ($p < 0.05$).

Conclusions

- Our study revealed differences in growth rates between hemiplegic, diplegic, and quadriplegic CP subtypes.
- Growth rates for children with quadriplegic, diplegic, or hemiplegic CP differ from those of normally developing children.
- Additional research with a larger number of subjects is needed to construct growth charts that will more accurately represent growth rates for children with diplegic and hemiplegic CP.
- Future work will involve fitting nonlinear models to a wider age span and comparing the three diagnoses with respect to growth velocity and acceleration.

Reference

Krick J, Murphy-Miller P, Zeger S, Wright E (1996). Pattern of Growth in Children with Cerebral Palsy. *Journal of the American Dietetic Association*, 96 (7): 680-685.