

Supplementary Table 1. Definitions and measurement characteristics of study variables			
Variable	Definition/measurement	Scale or coding	Mean ± SD/n (%)
GMFCS	Gross motor function classification system, levels I-V	Ordinal (1-5)	Level I-II: 80 (37%), III: 60 (28%), IV-V: 78 (35%)
PedsQL	Pediatric quality of life inventory, parent-proxy total score	Continuous (0-100)	61.4±17.6
PEDI	Pediatric evaluation of disability inventory, total score	Continuous (0-100)	54.2±18.7
PSQI	Pittsburgh sleep quality index, total score	Continuous (0-21)	8.7±3.5
Epilepsy	Clinical diagnosis confirmed by EEG	Dichotomous (0=no, 1=yes)	87 (40%)
Malnutrition	BMI-for-age <-2 SD or clinician-confirmed nutritional deficiency in children aged 6-18 years	Dichotomous (0=no, 1=yes)	95 (43.6%)
Intellectual disability	Based on psychometric or adaptive testing	Dichotomous	83 (38%)
Feeding difficulty	Presence of oropharyngeal dysphagia or enteral feeding	Dichotomous	70 (32.1%)
Orthopedic complication	Hip subluxation/dislocation, contracture, scoliosis	Dichotomous	66 (30.3%)
Pain	Persistent pain reported by caregiver	Dichotomous	Not systematically recorded
Behavioral problems	Documented behavioral or emotional disorder	Dichotomous	Not systematically recorded
SD: Standard deviation, BMI: Body mass index, EEG: Electroencephalography, GMFCS: Gross motor function classification system, PSQI: Pittsburgh sleep quality index, PedsQL: Pediatric quality of life inventory, PEDI: Pediatric evaluation of disability inventory			

Supplementary Table 2. Model fit indices and clinical characteristics of the three-class latent class analysis (LCA) solution						
Number of classes	AIC	BIC	Adj. BIC	Entropy	BLRT (p)	Interpretation
1-class	4987.2	5033.1	4991.5	-	*	Homogeneous cohort
2-class	4715.4	4799.3	4728.0	0.81	<0.001	Low vs. high comorbidity
3-class	4598.7	4693.2	4615.8	0.86	<0.001	Optimal (entropy >0.80)
4-class	4590.1	4712.6	4605.2	0.79	0.12	Overfitting trend
5-class	4587.9	4729.8	4595.1	0.74	0.18	Not stable
Class		Size (n, %)	Core features		Mean PedsQL	Mean PSQI
Class 1: low-burden		94 (43%)	Few comorbidities, mild GMFCS		74.8±12.5	6.1±2.7
Class 2: moderate-burden		72 (33%)	Epilepsy or pain, moderate GMFCS		59.2±14.8	8.5±3.1
Class 3: high-burden		52 (24%)	Epilepsy+malnutrition+sleep disturbance		43.0±11.9	11.1±3.4
Weighted class proportions (43%, 33%, and 24%) represent posterior probability-adjusted estimates derived from the final LCA model						
*: BLRT is not applicable to the one-class model because no model with fewer classes is available for comparison, AIC: Akaike information criterion, BIC: Bayesian information criterion, BLRT: Bootstrap likelihood ratio test, GMFCS: Gross motor function classification system, PSQI: Pittsburgh sleep quality index, PedsQL: Pediatric quality of life inventory						

Supplementary Table 3. Mediation analysis of sleep quality (PSQI) in the association between comorbidities and HRQoL				
Predictor→mediator→outcome	Direct effect (β, 95% CI)	Indirect effect (β, 95% CI)	Total effect (β)	Proportion mediated (%)
Epilepsy→PSQI→PedsQL	-0.18 (-0.30 to -0.06)*	-0.07 (-0.12 to -0.03)*	-0.25	28%
Malnutrition→PSQI→PedsQL	-0.15 (-0.26 to -0.04)*	-0.05 (-0.10 to -0.02)*	-0.20	25%
GMFCS→PedsQL (covariate)	-0.58 (-0.64 to -0.47)*	–	–	–
Bootstrap, 5000 resamples; bias-corrected 95% confidence intervals (CI). All β standardized; p<0.05				
*: p<0.05, GMFCS: Gross motor function classification system, PedsQL: Pediatric quality of life inventory, HRQoL: Health-related quality of life				