The Effect of Medical Comorbidities on subdomain scores of the Early Onset Scoliosis Questionnaire (EOSQ) Before Treatment

Brandon Ramo, Anna McClung, Chan-Hee Jo , Paul Sponseller, Firoz Miyanji,
Matt Oetgen, Pediatric Spine Study Group

UT Southwestern Medical Center

PEDIATRIC SPINE STUDY GROUP

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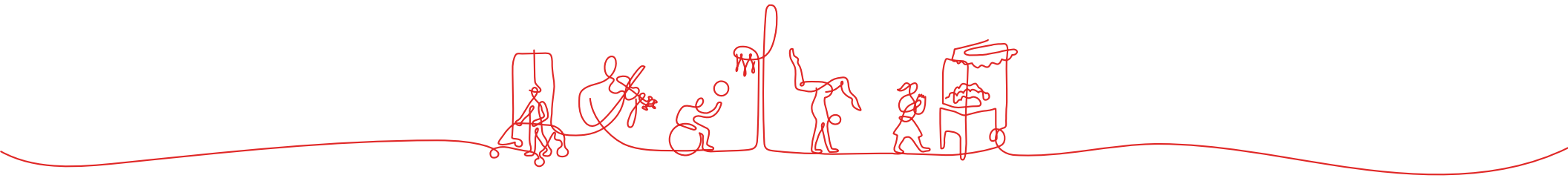

Disclosures

- Brandon Ramo: Speaker's Bureau: Nuvasive, Inc; Orthopediatrics
- Anna McClung: none
- Chan-Hee Jo: none
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  Orthopaediatrics- other support
- Firoz Miyanji:
- Matt Oetgen: none
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Background

- HRQOL 8 domains:
  - General Health
  - Pain/Discomfort
  - Pulmonary Function
  - Transfer
  - Physical Function
  - Daily Living
  - Fatigue/Energy Level
  - Emotion
- Family Burden 2 domains:
  - Parental Impact
  - Financial Impact
- Satisfaction
  - Child Satisfaction
  - Parent Satisfaction

ORIGINAL ARTICLE

Measuring Quality of Life in Children With Early Onset Scoliosis: Development and Initial Validation of the Early Onset Scoliosis Questionnaire

Jacqueline Corona, MD,† Hiroko Matsumoto, MA,*† David P. Roye, Jr, MD,*† and Michael G. Vitale, MD, MPH*†*

(*J Pediatr Orthop* 2011;31:180–185)

Background

- First Disease Specific Patient (Parent)-Reported Outcomes Questionnaire for EOS

- **Validity**
  - **Criterion Validity (pulm) (n=10)**
  - Construct Validity (n=95)
- Reliability
  - n=15
- Responsiveness
  - n=25 pre and post-operative
- Normative Reference Data (cross-sectional)
  - 150 norms (benign orthopaedic dx's)

Criterion Validity = measures how well one measure predicts an outcome for another measure. A test has this type of validity if it is useful for predicting performance or behavior in another situation (past, present, or future).

The Final 24-Item Early Onset Scoliosis Questionnaires (EOSQ-24): Validity, Reliability and Responsiveness

Hiroko Matsumoto, MA,† Brendan Williams, MD,‡ Howard Y. Park, MD,§ Julie Y. Yoshimachi, BA,* Benjamin D. Roye, MD, MPH,* David P. Roye, Jr, MD,* Behrooz A. Akbarnia, MD,‖ John Emans, MD,¶ David Skaggs, MD,§# John T. Smith, MD,** and Michael G. Vitale, MD, MPH**

(*J Pediatr Orthop* 2018;38:144–151)

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Background

- First Disease Specific Patient (Parent)-Reported Outcomes Questionnaire for EOS
- **Validity**
  - Criterion Validity (pulm) (n=10)
  - **Construct Validity (n=95)**

Idiopathic	Congenital	Neuromuscular	Syndromic
n = 29	n = 15	n = 28	n = 18

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- Hypothesis: If the EOSQ has good construct validity, then medical co-morbidities should be a factor which is responsible for EOSQ subdomain score variation

- Purpose: If this is true, future studies using EOSQ as an outcome will have to control for these co-morbidities when reporting outcomes.

Methods

- Retrospective comparative analysis of prospectively collected data
- Large multi-center cohort
- 610 patients who had pre-treatment EOSQ questionnaires
  - 119 congenital
  - 201 idiopathic
  - 156 neuromuscular
  - 184 syndromic
- Patients were analyzed for ambulatory status, presence of pulmonary, cardiac, renal, GI, developmental delay, and neurologic disabilities.
- EOSQ domain scores were then calculated prior to any surgical or nonoperative intervention of their EOS deformity and compared with univariate and multivariate analyses based on presence of medical comorbidities and C-EOS designation.

Baseline Characteristics

C-EOS Etiology					
	All n=610	Congenital n=119	Idiopathic n=201	Neuromuscular n=156	Syndromic n=134
Age at Baseline/Pre-Treatment EOSQ	6.1 ± 3.8	4.5 ± 3.2	6.3 ± 4.7	7.0 ± 2.7	6.2 ± 3.4
Coronal Cobb Angle	63 ± 25	56 ± 23	54 ± 22	76 ± 26	67 ± 23
Max Sagittal Kyphosis	49 ± 25	41 ± 19	41 ± 22	57 ± 27	52 ± 26

Neuromuscular patients were slightly older.
Neuromuscular and Syndromic Patients had slightly larger coronal and sagittal Cobbs

Results

- Univariate and multivariate

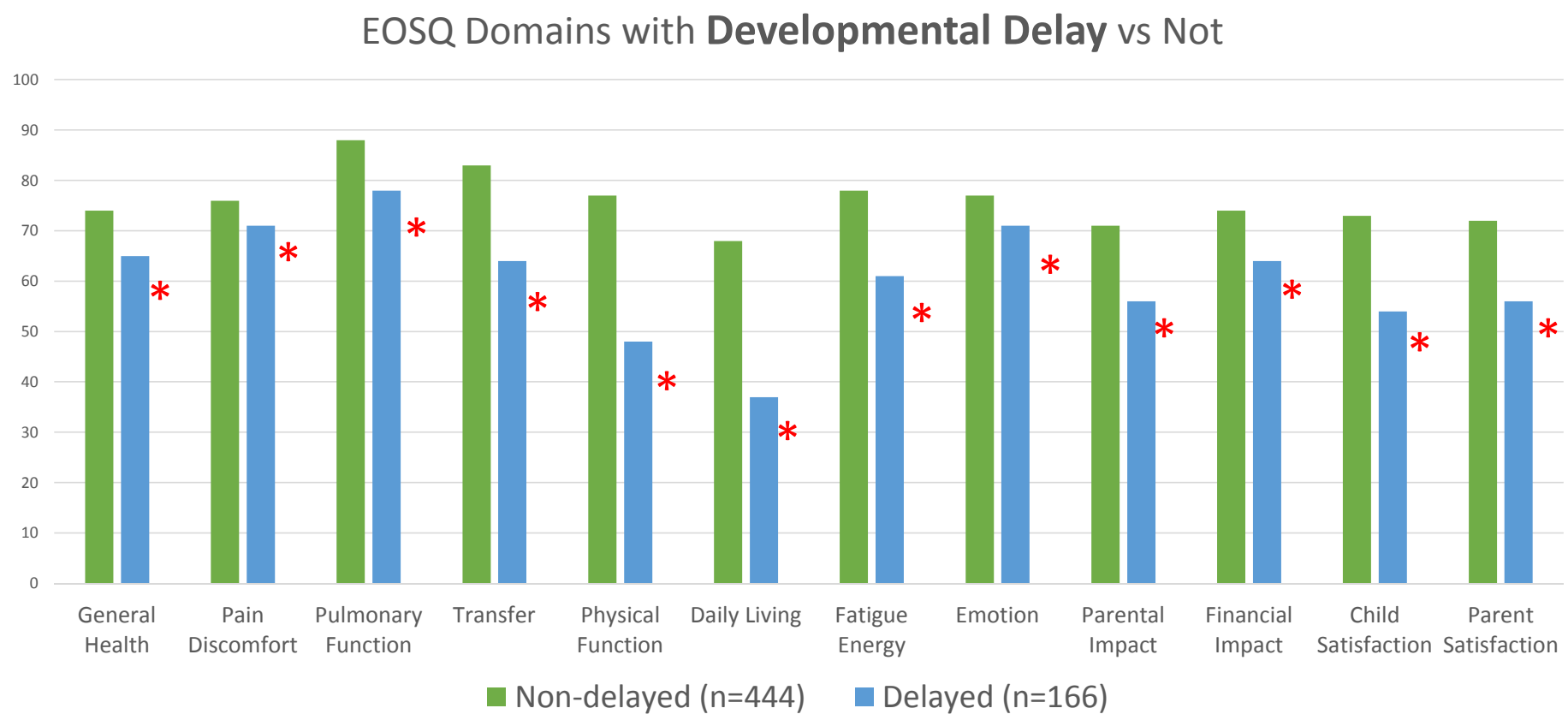
Results - Univariate

- Tracheostomy,
- Supplemental nutrition needs, non-ambulatory status, or developmental delay led to **lower EOSQ scores in all domains** (General Health, Pain, Pulmonary Function, Transfers, Physical Function, Daily Living, Fatigue, Emotion, Financial Impact, Parent and Patient Satisfaction).
- Multivariate modeling was performed to identify which variables had the strongest influences within each EOSQ domain score (Table 1).
- In multivariate analysis, C-EOS etiology was consistently an independent predictor of these differences in domain scores.

Univariate Results

- Morbidities which scored lower in ALL domains
  - Developmental Delay (n = 166 vs n = 444)
  - Supplemental Nutrition (n = 86 vs n = 226)
  - Tracheostomy (n = 44 vs n = 500)
  - Ambulatory status (n = 139 vs n = 366)

Differences Based on Presence of Individual Co-Morbidities



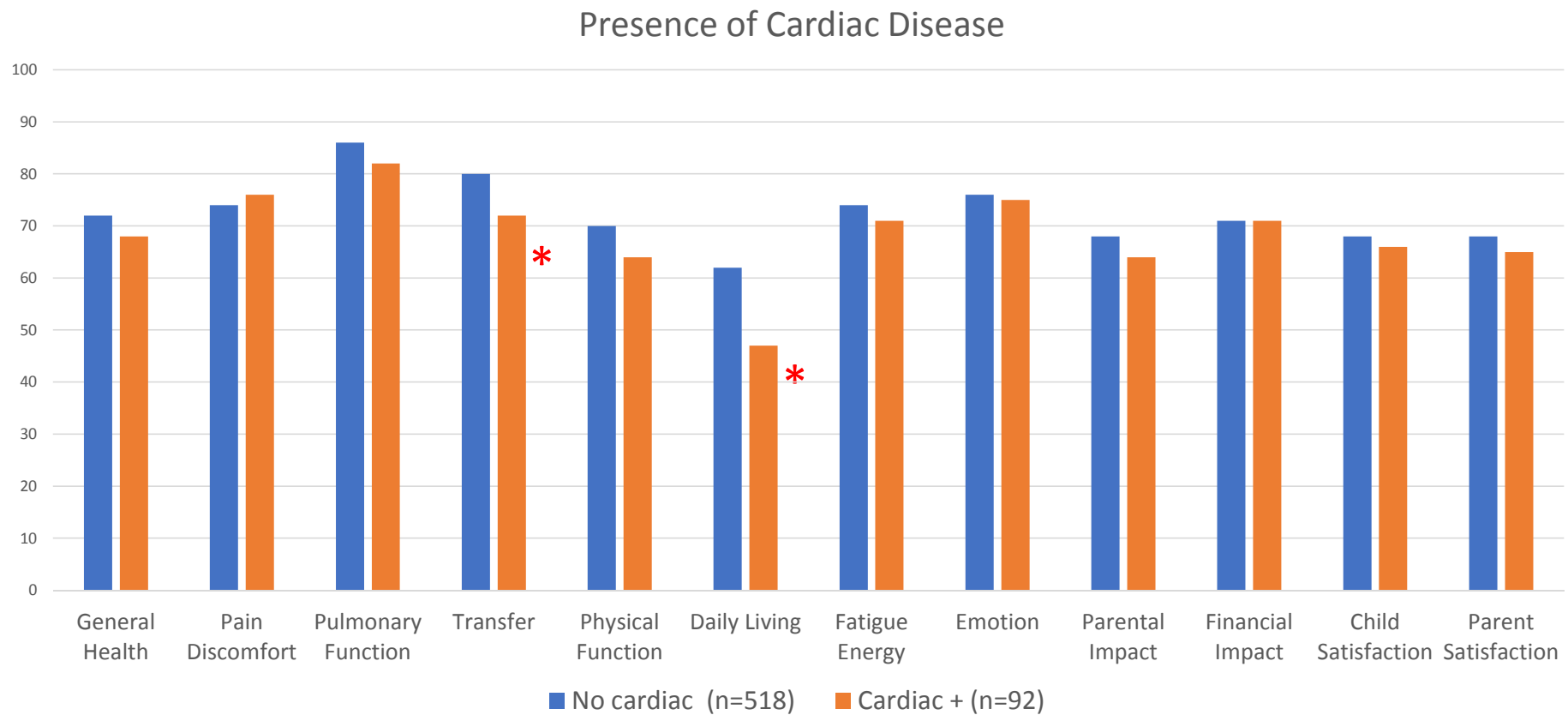
Univariate Results

- Morbidities which scored lower in MOST domains
  - GI condition (n=129 vs 481) ALL except financial impact
  - Neurologic non-spine (n = 117 vs 493) ALL except financial impact
  - Pulmonary system (n=149 vs 486) all domains but financial and parent satisfaction

Univariate Results

- Morbidities which scored lower in SELECT domains
  - Renal involvement (n=41 vs 569) lower in general health and transfers
  - Cardiac condition (n=92 vs 581) *lower in transfer and daily living only.*

Differences Based on Presence of Individual Co-Morbidities

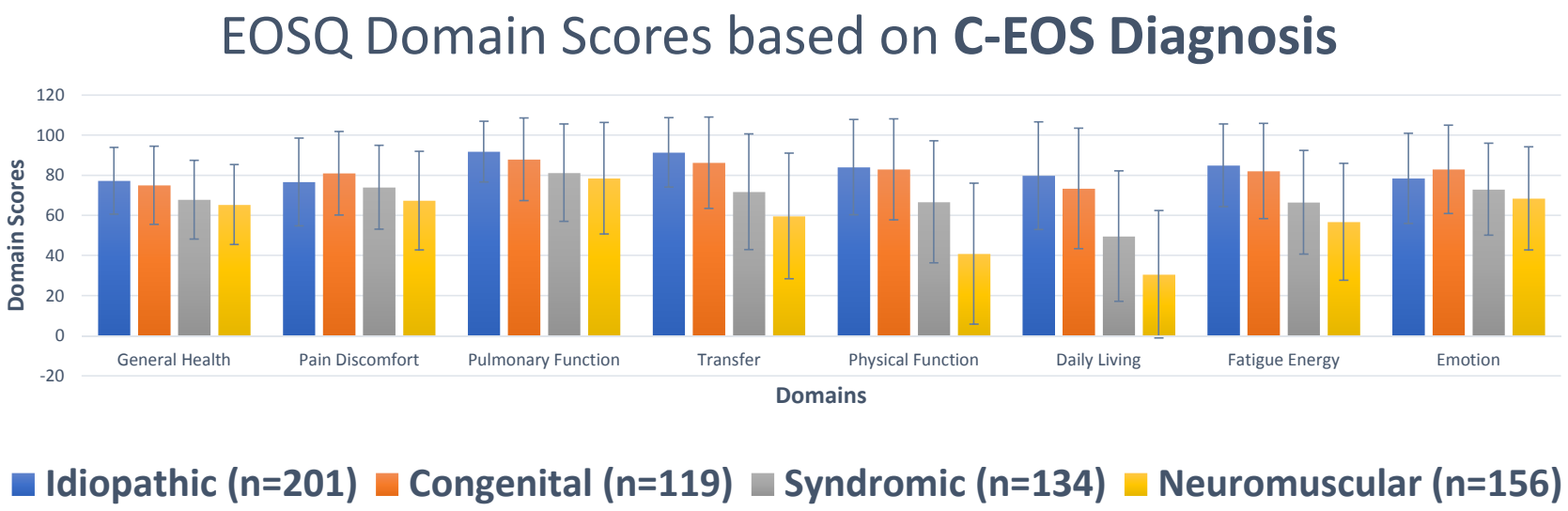


Univariate Results

- **Total number of comorbidities** showed modest inverted correlation
  - Transfer -0.408
  - Physical function -0.482
  - Daily living -0.525
  - Fatigue -0.351
  - Parental impact -0.365
  - Child Satisfaction -0.357
- **ASA class** showed inverse modest correlation with
  - Transfer -0.393
  - Physical function -0.448
  - Daily living -0.495
  - Parental impact -0.331

C-EOS Classification (next talk)

- C-EOS (Congenital, Idiopathic, Syndromic, Neuromuscular) played a role in influencing all domain scores *except* pain and financial impact.



Results – Multivariate Summary

Variables affecting EOSQ Domain Scores in Multivariate Modeling												
	General Health	Pain	Pulmonary Function	Transfer	Physical Function	Daily Living	Fatigue/ Energy	Emotion	Parental Impact	Financial impact	Parent Satisfaction	Child Satisfaction
Age		(-)			(+)	(+)		(-)				
C-EOS	C > S,NM		I>S	C, I > NM, S	C > NM	C, I > NM, S	C, I > NM, S	C,I > NM,S	C > S		C >NM	C > NM,S
Ambulatory Status		(+)		(+)	(+)	(+)	(+)		(+)			
Cardiac Condition												
Pulmonary Condition	(-)		(-)									
Tracheostomy			(-)									
Supplemental nutrition						(-)						
Developmental Delay					(-)	(-)					(-)	
GI condition						(-)						

(+) implies positive correlation with subdomain score, (-) implies negative correlation with subdomain score

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Ambulatory Status		(+)		(+)	(+)	(+)	(+)		(+)			
Cardiac Condition												
Pulmonary Condition	(-)		(-)									
Tracheostomy			(-)									
Supplemental nutrition						(-)						
Developmental Delay					(-)	(-)					(-)	
GI condition						(-)						

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Ambulatory Status		(+)		(+)	(+)	(+)	(+)		(+)			
Cardiac Condition												
Pulmonary Condition	(-)		(-)									
Tracheostomy			(-)									
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Developmental Delay					(-)	(-)					(-)	
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Ambulatory Status		(+)		(+)	(+)	(+)	(+)		(+)			
Cardiac Condition												
Pulmonary Condition	(-)		(-)									
Tracheostomy			(-)									
Supplemental nutrition						(-)						
Developmental Delay					(-)	(-)					(-)	
GI condition						(-)						

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Limitations

- Inherent to large multi-center database

- Still heterogeneity within groups:
  - Cardiac disease = small ASD not requiring treatment or multiply operated Tetralogy?
  - Pulmonary disease = asthma or vent dependence?

Conclusions

- EOS patients are a heterogeneous group and many patients have medical co-morbidities.
- Presence of co-morbidities leads to lower EOSQ scores in some domains *before* treatment
- Multivariate findings indicate C-EOS etiology accounts for significant variation in EOSQ domain scores.
- EOSQ seems to have good construct validity: the presence of certain medical co-morbidities is clearly reflected in the pertinent domain scores.

Conclusions

- Hypothesis: If the EOSQ has good construct validity, then medical co-morbidities should be a factor which is responsible for EOSQ subdomain score variation

Yes, Presence of co-morbidities leads to lower EOSQ scores in some domains *before* treatment
This is true in both univariate and multivariate analysis
Can conclude that the EOSQ *does have* good construct validity

- Purpose: If this is true, future studies using EOSQ as an outcome will have to control for these co-morbidities when reporting outcomes.

Conclusions

Multivariate findings indicated:

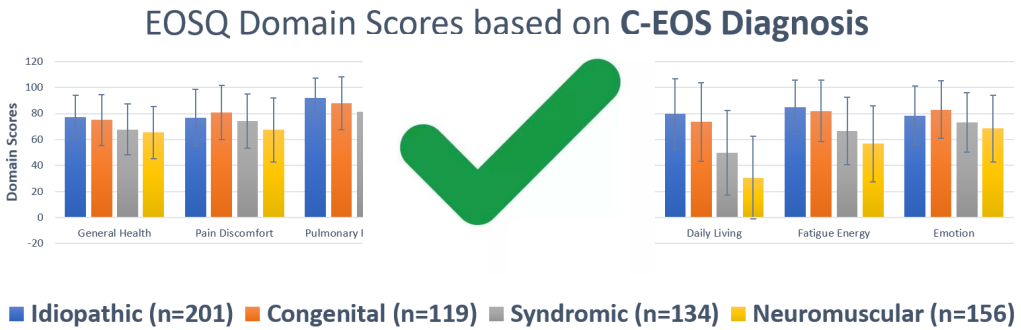
1) Effects of several co-morbidities influenced only a few EOSQ domains

2) C-EOS etiology accounted much of the variation in most EOSQ domain scores.

- Purpose: If this is true, future studies using EOSQ as an outcome will have to control for these co-morbidities when reporting outcomes.

Variables affecting EOSQ Domain Scores in Multivariate Modeling

	General Health	Pain	Pulmonary Function	Transfer	Physical Function	Daily Living	Fatigue/ Energy	Emotion	Parental Impact	Financial impact	Parent Satisfaction	Child Satisfaction
Age		(-)						(-)				
C-EOS	C > S,NM		I>S	C, I > NM, S				C,I > NM,S	C > S		C >NM	C > NM,S
Ambulatory Status		(+)		(+)					(+)			
Cardiac Condition												
Pulmonary Condition	(-)		(-)									
Tracheostomy			(-)									
Supplemental nutrition												
Developmental Delay											(-)	
GI condition												



Thank You

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