



Letter

Association of consistently suboptimal quality of life with consistently poor asthma control in children with asthma

Asthma is one of the most prevalent chronic conditions in children, affecting 8.4% of American children and adolescents (approximately 6.2 million) in 2015.¹ Although previous studies have found that poor asthma control is associated with impaired physical, psychological, and social aspects of health-related quality of life (HRQoL),² some studies have suggested that impaired psychological aspects of HRQoL (ie, anxiety and depressive symptoms) cause poor asthma control.³ The effects of impaired HRQoL domains (eg, fatigue, pain, mobility, and peer relationships) in addition to anxiety and depressive symptoms on subsequent asthma outcomes in

pediatric populations have been inadequately studied. This study aimed to test the usefulness of HRQoL assessed by the Patient-Reported Outcomes Measurement Information System (PROMIS) pediatric measures^{4,5} collected at baseline and 3 subsequent time points, with a meaningful threshold (eg, good or poor HRQoL), to indicate the asthma control status over time among children with asthma from low-income families.

This study is a secondary analysis that used data collected from the longitudinal PROMIS Pediatric Asthma Study designed to evaluate clinical validity for the PROMIS pediatric measures based on the course of two 13-week windows across a 2-year period.⁴ Enrollment criteria for children and adolescents were ages 8 to 17.9 years, an asthma diagnosis (*International Classification of Diseases, Ninth Revision, Clinical Modification* codes 493.1, 493.2, or 493.x), 2 or more medical encounters attributable to asthma in the last 12 months, and continuous enrollment in the Florida Medicaid for the previous 6 months. Asthma control and HRQoL were evaluated at 4 time points: baseline in the first year, a follow-up in the first year, baseline in the second year, and a follow-up in the second year.

The Asthma Control and Communication Instrument⁶ was used to assess asthma control status reported by parents through our research website. On the basis of the National Asthma Education Prevention Program Expert Panel Report 3, the 5 items from the asthma control domain of the Asthma Control and Communication Instrument were used to categorize asthma control status. If all 5 items indicated well-controlled asthma, a child or adolescent was classified as having good control; otherwise, he or she was classified as having poor control.⁶ PROMIS Pediatric Short-Forms^{4,5} were administered to assess HRQoL reported by children through telephone interviews, including asthma impact, pain interference, fatigue, depressive symptoms, anxiety, mobility, and peer relationships domains. Domain scores were calculated and converted to a T-metric (mean [SD], 50 [10]).⁷ Higher scores on asthma impact, pain interference, fatigue, depressive symptoms, and anxiety domains represented worse HRQoL; lower scores on mobility and peer relationships domains represented worse HRQoL.

The status of asthma control during 4 time points served as the main outcome variable. Children and adolescents with good asthma control for 3 or more time points were classified as having consistently good control; otherwise, they were classified as having consistently poor control. The status of HRQoL during 4 time points on each PROMIS domain served as the main independent variables. At each time point, a child's or adolescent's HRQoL domain score that differed by 5 points from 50 (ie, 0.5 SD from the PROMIS pediatric calibration sample) was considered as a minimally important difference.⁸ Specifically, a child or adolescent with scores greater than 45 on asthma impact, pain interference, fatigue, depressive symptoms, and anxiety domains was classified

Disclosures: Authors have nothing to disclose.

Disclaimer: The contents of this article used data developed under PROMIS. These contents do not necessarily represent an endorsement by the US federal government or PROMIS. See www.nihpromis.org for additional information on the PROMIS initiative.

Funding Sources: This work was supported by grants U01 AR052181 and K23 HD057146 from the National Institutes of Health and American Lebanese Syrian Associated Charities. Patient-Reported Outcomes Measurement Information System (PROMIS) was funded with cooperative agreements from the National Institutes of Health Common Fund Initiative (Northwestern University, principal investigator: David Cella, PhD, U54AR057951, U01AR052177; Northwestern University, principal investigator: Richard C. Gershon, PhD, U54AR057943; American Institutes for Research, principal investigator: Susan (San) D. Keller, PhD, U54AR057926; State University of New York, Stony Brook, principal investigators: Joan E. Broderick, PhD, and Arthur A. Stone, PhD, U01AR057948, U01AR052170; University of Washington, Seattle, principal investigators: Heidi M. Crane, MD, MPH, Paul K. Crane, MD, MPH, and Donald L. Patrick, PhD, U01AR057954; University of Washington, Seattle, principal investigator: Dagmar Amtmann, PhD, U01AR052171; University of North Carolina, Chapel Hill, principal investigator: Harry A. Guess, MD, PhD (deceased), Darren A. DeWalt, MD, MPH, U01AR052181; Children's Hospital of Philadelphia, principal investigator: Christopher B. Forrest, MD, PhD, U01AR057956; Stanford University, principal investigator: James F. Fries, MD, U01AR052158; Boston University, principal investigators: Alan Jette, PT, PhD, Stephen M. Haley, PhD (deceased), and David Scott Tulskey, PhD (University of Michigan, Ann Arbor), U01AR057929; University of California, Los Angeles, principal investigators: Dinesh Khanna, MD (University of Michigan, Ann Arbor) and Brennan Spiegel, MD, MSHS, U01AR057936; University of Pittsburgh, principal investigator: Paul A. Pilkonis, PhD, U01AR052155; Georgetown University, principal investigators: Carol M. Moinpour, PhD (Fred Hutchinson Cancer Research Center, Seattle), and Arnold L. Potosky, PhD, U01AR057971; Children's Hospital Medical Center, Cincinnati, principal investigator: Esi M. Morgan DeWitt, MD, MSCE, U01AR057940; University of Maryland, Baltimore, principal investigator: Lisa M. Shulman, MD, U01AR057967; and Duke University, PI: Kevin P. Weinfurt, PhD, U01AR052186). National Institutes of Health science officers on this project have included Deborah Ader, PhD, Vanessa Ameen, MD (deceased), Susan Czajkowski, PhD, Basil Eldadah, MD, PhD, Lawrence Fine, MD, DrPH, Lawrence Fox, MD, PhD, Lynne Haverkos, MD, MPH, Thomas Hilton, PhD, Laura Lee Johnson, PhD, Michael Kozak, PhD, Peter Lyster, PhD, Donald Mattison, MD, Claudia Moy, PhD, Louis Quatrano, PhD, Bryce Reeve, PhD, William Riley, PhD, Peter Scheidt, MD, Ashley Wilder Smith, PhD, MPH, Susana Serrate-Sztejn, MD, William Phillip Tonkins, DrPH, Ellen Werner, PhD, Tisha Wiley, PhD, and James Witter, MD, PhD. The funding source had no involvement in the study design; in the collection, analysis, and interpretation of data; in the writing of the report; and the decision to submit the article for publication.

Table 1
Multivariable Association Between HRQoL Status Over Time and Asthma Control Status Over Time

Variable	Consistently poor asthma control	
	Odds ratio ^a (95% confidence interval)	P value
Asthma impact		
Consistently fair or poor HRQoL ^b	3.24 (1.52–6.90)	<.01
Child age	0.93 (0.78–1.11)	.40
Overweight ^c	1.36 (0.63–2.92)	.43
Parent age	0.98 (0.94–1.02)	.33
Marital status ^d		
Never married	2.82 (0.92–8.63)	.07
Divorced	1.82 (0.62–5.40)	.06
Other	2.63 (0.95–7.34)	.30
Pain interference		
Consistently fair or poor HRQoL ^b	2.84 (1.36–5.92)	<.01
Child age	0.94 (0.79–1.12)	.51
Overweight ^c	1.54 (0.73–3.25)	.25
Parent age	0.98 (0.94–1.02)	.33
Marital status ^d		
Never married	1.99 (0.68–5.77)	.21
Divorced	3.11 (1.12–8.65)	<.05
Other	1.86 (0.65–5.32)	.25
Fatigue		
Consistently fair or poor HRQoL ^b	2.80 (1.33–5.90)	<.01
Child age	0.96 (0.81–1.14)	.64
Overweight ^c	1.51 (0.72–3.16)	.27
Parent age	0.97 (0.93–1.01)	.19
Marital status ^d		
Never married	2.34 (0.81–6.73)	.11
Divorced	2.90 (1.05–8.01)	<.05
Other	1.62 (0.57–4.60)	.36
Depressive symptoms		
Consistently fair or poor HRQoL ^b	2.78 (1.28–6.01)	<.01
Child age	0.95 (0.80–1.13)	.56
Overweight ^c	1.81 (0.86–3.80)	.12
Parent age	0.98 (0.94–1.02)	.27
Marital status ^d		
Never married	2.82 (0.97–8.23)	.06
Divorced	2.77 (1.00–7.66)	.05
Other	1.51 (0.54–4.22)	.43
Anxiety		
Consistently fair or poor HRQoL ^b	2.58 (1.25–5.35)	.01
Child age	0.93 (0.78–1.11)	.41
Overweight ^c	1.54 (0.73–3.22)	.25
Parent age	0.98 (0.94–1.02)	.36
Marital status ^d		
Never married	2.26 (0.79–6.50)	.13
Divorced	2.60 (0.92–7.15)	.07
Other	1.39 (0.50–3.88)	.53
Mobility		
Consistently fair or poor HRQoL ^b	2.05 (0.77–5.44)	.15
Child age	0.96 (0.81–1.13)	.61
Overweight ^c	1.49 (0.72–3.08)	.29
Parent age	0.98 (0.94–1.02)	.23
Marital status ^d		
Never married	2.19 (0.77–6.21)	.14
Divorced	2.85 (1.05–7.74)	<.05
Other	1.65 (0.58–4.70)	.35
Peer relationships		
Consistently fair or poor HRQoL ^b	3.28 (1.25–8.61)	.01
Child age	1.00 (0.84–1.19)	.98
Overweight ^c	1.63 (0.78–3.41)	.20
Parent age	0.98 (0.93–1.02)	.22
Marital status ^d		
Never married	2.41 (0.83–6.94)	.10
Divorced	2.53 (0.92–7.01)	.07
Other	1.38 (0.49–3.88)	.54

Abbreviation: HRQoL, health-related quality of life.

^aConsistently good asthma control status is the reference group.^bMean scores less than 55 for mobility or peer relationships domain and mean scores greater than 45 for other domains.^cNot overweight is the reference group.^dMarried is the reference group.

as fair or poor HRQoL and scores of 45 or less as good HRQoL, whereas scores less than 55 on mobility and peer relationships domains were classified as fair or poor HRQoL and scores of 55 or greater as good HRQoL. Children or adolescents with good HRQoL at 3 or more time points were classified as having consistently good HRQoL; otherwise, they were classified as having consistently fair or poor HRQoL.

Multivariable logistic regression was performed to test associations between the status of HRQoL over time in each domain and the status of asthma control over time, adjusting for covariates (the child's age and overweight status and the parental age and marital status). Additional multivariable logistic analyses were conducted to test associations of HRQoL status over time with asthma control status over time using fewer time points (ie, 2 and 3 time points).

There were 148 participant dyads that had complete HRQoL and asthma control data across all 4 time points eligible for this analysis. Among children and adolescents, the mean (SD) age was 12.0 (2.4) years, 43.2% were female, most were nonwhite (64.2%), and almost half were overweight (46.2%). Among parents, the mean (SD) age was 41.7 (9.0) years; most were female (89.9%) and nonwhite (58.8%). Multivariable associations between HRQoL status of each domain over time and asthma control status over time are presented in Table 1. For all HRQoL domains, consistently fair or poor HRQoL was significantly associated with an increased odds of consistently poor asthma control (odds ratio, 2.58–3.28; $P \leq .05$ for all), except for mobility (odds ratio, 2.05; $P > .05$). Additional multivariable analyses (see eTable 1) suggest that, except for the asthma impact and mobility domains, the use of 4 time points to classify HRQoL status produced the most significant correlation with asthma control status.

These findings demonstrate that it is clinically important to monitor HRQoL over time in pediatric asthma because consistently poor HRQoL across 4 time points is associated with poorly controlled asthma. This knowledge can facilitate clinical decision making to minimize risk and guide medication adjustments in pediatric asthma because physicians can identify subgroups of patients at risk of adverse asthmatic outcomes (eg, consistently poor asthma control). The use of electronic systems and mobile technology (eg, cell phones and tablet apps or well-child check planners)⁹ may offer a low-cost approach to continuously collect HRQoL data. This paradigm shift, from interval disease- and symptom-based management during office visits to one where patients and families routinely report information, will give practitioners an opportunity to determine risk of exacerbation and consistently poor asthma control in the absence of more frequent clinic visits. Furthermore, using remote reporting of HRQoL in conjunction with asthma-specific home visits implemented by community health workers for vulnerable, high-risk children may help physicians identify when more intensive interventions are needed. In addition, identifying an appropriate HRQoL reporting period¹⁰ and incentivizing individuals to report HRQoL over time become emerging issues to address in future studies.

Acknowledgments

We thank Elizabeth Shenkman, PhD, and Caprice Knapp, PhD, who assisted with study design and Pey-Shen Wen, PhD and Nammi Ketheeswaran, MPH, who assisted with data collection and project coordination for the PROMIS Pediatric Asthma Study.

Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.anai.2017.09.053>.

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eTable 1

Multivariable Association Between HRQoL Status and Asthma Control Status by the Use of Different Time Points

Consistently fair/poor HRQoL	Odds ratio (<i>P</i> value) of consistently poor asthma control ^a			
	3 time points of HRQoL (T1, T2, T4) ^b	3 time points of HRQoL (T1, T3, T4) ^b	2 time points of HRQoL (T1, T4) ^c	1 time point of HRQoL (T1 – Baseline)
Asthma impact	4.39 (<.001)	4.20 (<.001)	3.87 (<.01)	3.10 (<.01)
Pain interference	2.67 (<.05)	2.54 (<.05)	2.27 (<.05)	1.36 (.41)
Fatigue	2.50 (<.05)	2.17 (<.05)	1.77 (.14)	1.33 (.44)
Depressive symptoms	2.26 (<.05)	2.75 (<.01)	2.39 (<.01)	3.40 (<.01)
Anxiety	1.82 (.10)	2.32 (<.05)	1.57 (.26)	2.32 (<.05)
Mobility	3.35 (<.01)	3.07 (<.01)	4.69 (<.001)	2.34 (.07)
Peer relationships	2.46 (<.05)	2.68 (<.05)	1.91 (.08)	1.56 (.33)

Abbreviation: HRQoL, health-related quality of life.

^aControlling for child age, overweight, parent's age, and marital status.^bClassifying consistently good HRQoL across 3 time points (T1, T2, T4 or T1, T3, T4) as good, good, good; good, good, fair/poor; good, fair/poor, good; and fair/poor, good, good as well as consistently fair/poor HRQoL as fair/poor, good, fair/poor; fair/poor, fair/poor, good; good, fair/poor, fair/poor; and fair/poor, fair/poor, fair/poor.^cClassifying good HRQoL across 2 time points (T1, T4) as good, good; good, fair/poor; and fair/poor, good as well as fair/poor HRQoL as fair/poor, fair/poor.