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Consistently suboptimal quality of life parallels consistently poor asthma control in children with asthma

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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 (i.e., anxiety and depressive symptoms) causes poor asthma control.[3] The effects of impaired HRQoL domains (e.g.,

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fatigue, pain, mobility, and peer relationships) in addition to anxiety and depressive symptoms on subsequent asthma outcomes in pediatric populations has 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 three subsequent time points, with a meaningful threshold (e.g., 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 utilizing data collected from the longitudinal PROMIS Pediatric Asthma Study (PAS) designed to evaluate clinical validity for the PROMIS Pediatric measures based on the course of two 13-week windows across a two-year period.[4] Enrollment criteria for children/adolescents were ages 8-17.9 years; an asthma diagnosis (ICD-9-CM 493.1, 493.2, or 493.x); ≥ two medical encounters due to asthma in the last 12 months; and continuous enrollment in the Florida Medicaid for the previous six months. Asthma control and HRQoL were evaluated at four 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 Instrument (ACCI)[6] was used to assess asthma control status reported by parents through our research website. Based on the National Asthma Education Prevention Program Expert Panel Report-3 (NAEPP EPR-3), the five items from the asthma control domain of the ACCI were used to categorize asthma control status. If all five items indicated well-controlled asthma, a child/adolescent was classified as having good control; otherwise, he/she was classified as poor control.[6] PROMIS Pediatric Short-Forms[4,5] were administered to assess HRQoL, 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=50/SD=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 over four time points served as the main outcome variable. Children/adolescents with good asthma control for three or more time points were classified as “consistently good control;” otherwise, they were classified as “consistently poor control.” The status of HRQoL over four time points on each PROMIS domain served as the main independent variables. At each time point, a child/adolescent's HRQoL domain score that differed by five points from 50 (i.e., 0.5 SD from the PROMIS Pediatric calibration sample) was considered as a minimally important difference.[8] Specifically, a child/adolescent with scores >45 on asthma impact, pain interference, fatigue, depressive symptoms, and anxiety domains was classified as “fair/poor HRQoL” and ≤45 as “good HRQoL,” whereas scores <55 on mobility and peer relationships domains was classified as “fair/poor HRQoL” and ≥55 as “good HRQoL.” Children/adolescents with good HRQoL at three or more time points were classified as having “consistently good HRQoL;” otherwise, they were classified as “consistently fair/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 utilizing fewer time points (i.e., two and three time points).

There were 148 participant dyads that had complete HRQoL and asthma control data across all four time points eligible for this analysis. Among children/adolescents, the mean age was 12.0 (SD 2.4) years old; 43.2% were female; most were non-white (64.2%); and almost half were overweight (46.2%). Among parents, the mean age was 41.7 (SD 9.0) years old; the majority were female (89.9%) and non-white (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/poor HRQoL was significantly associated with an increased odds of consistently poor asthma control (ORs=2.58-3.28, p's ≤0.05), except for mobility (OR=2.05, p >0.05). Additional multivariable analyses (see Online Supplement) suggest that, except for the asthma impact and mobility domains, the use of four 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 as 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 as physicians can identify subgroups of patients at risk of adverse asthmatic outcomes (e.g., consistently poor asthma control). The use of electronic systems and mobile technology, e.g., 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-/symptom-based management during office visits to one where patients and families routinely report information, will give providers an opportunity to determine risk of exacerbation and consistently poor asthma control in the absence of more frequent clinic visits. Further, utilizing 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. Additionally, identifying an appropriate HRQoL reporting period[10] and incentivizing individuals to report HRQoL over time becomes an emerging issue to address in future studies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Centers for Disease Control and Prevention. [Accessed August 30, 2017] National Current Asthma Prevalence. 2015. http://www.cdc.gov/asthma/most_recent_data.htm
2. Everhart RS, Fiese BH. Asthma severity and child quality of life in pediatric asthma: a systematic review. Patient Educ Couns. 2009; 75:162–8. [PubMed: 19036553]
3. Bender BG. Risk taking, depression, adherence, and symptom control in adolescents and young adults with asthma. Am J Respir Crit Care Med. 2006; 173:953–7. [PubMed: 16424441]
4. Howell CR, Thompson LA, Gross HE, et al. Responsiveness to change in PROMIS® Measures among children with asthma: a report from the PROMIS® Pediatric Asthma Study. Value Health. 2016; 19:192–201. [PubMed: 27021753]
5. Irwin DE, Varni JW, Yeatts K, DeWalt DA. Cognitive interviewing methodology in the development of a pediatric item bank: a patient reported outcomes measurement information system (PROMIS) study. Health Qual Life Outcomes. 2009; 7:3. [PubMed: 19166601]
6. Patino CM, Okelo SO, Rand CS, et al. The Asthma Control and Communication Instrument: a clinical tool developed for ethnically diverse populations. J Allergy Clin Immunol. 2008; 122:936–43 e6. [PubMed: 18848721]
7. Irwin DE, Stucky BD, Thissen D, et al. Sampling plan and patient characteristics of the PROMIS pediatrics large-scale survey. Qual Life Res. 2010; 19:585–94. [PubMed: 20204706]
8. Norman GR, Sloan JA, Wyrwich KW. Interpretation of changes in health-related quality of life: the remarkable universality of half a standard deviation. Med Care. 2003; 41:582–92. [PubMed: 12719681]
9. Anand V, Carroll AE, Downs SM. Automated primary care screening in pediatric waiting rooms. Pediatrics. 2012; 129:e1275–81. [PubMed: 22508925]
10. Huang IC, Revicki DA, Schwartz CE. Measuring pediatric patient-reported outcomes: good progress but a long way to go. Qual Life Res. 2014; 23:747–50. [PubMed: 24362765]

Table 1

Multivariable association between HRQoL status over time and asthma control status over time

	Consistently Poor Asthma Control, Odds Ratio [a]	95% Confidence Interval	p-value
Asthma Impact			
Consistently fair/poor HRQoL [b]	3.24	1.52-6.90	< 0.01
Child Age	0.93	0.78-1.11	0.40
Overweight [c]	1.36	0.63-2.92	0.43
Parent Age	0.98	0.94-1.02	0.33
Marital Status [d]			
Never Married	2.82	0.92-8.63	0.07
Divorced	1.82	0.62-5.40	0.06
Other	2.63	0.95-7.34	0.30
Pain Interference			
Consistently fair/poor HRQoL [b]	2.84	1.36-5.92	< 0.01
Child Age	0.94	0.79-1.12	0.51
Overweight [c]	1.54	0.73-3.25	0.25
Parent Age	0.98	0.94-1.02	0.33
Marital Status [d]			
Never Married	1.99	0.68-5.77	0.21
Divorced	3.11	1.12-8.65	< 0.05
Other	1.86	0.65-5.32	0.25
Fatigue			
Consistently fair/poor HRQoL [b]	2.80	1.33-5.90	< 0.01
Child Age	0.96	0.81-1.14	0.64
Overweight [c]	1.51	0.72-3.16	0.27
Parent Age	0.97	0.93-1.01	0.19
Marital Status [d]			
Never Married	2.34	0.81-6.73	0.11
Divorced	2.90	1.05-8.01	< 0.05
Other	1.62	0.57-4.60	0.36
Depressive Symptoms			
Consistently fair/poor HRQoL [b]	2.78	1.28-6.01	< 0.01
Child Age	0.95	0.80-1.13	0.56
Overweight [c]	1.81	0.86-3.80	0.12
Parent Age	0.98	0.94-1.02	0.27

	Consistently Poor Asthma Control, Odds Ratio [a]	95% Confidence Interval	p-value
Marital Status [d]			
Never Married	2.82	0.97-8.23	0.06
Divorced	2.77	1.00-7.66	0.05
Other	1.51	0.54-4.22	0.43
Anxiety			
Consistently fair/poor HRQoL [b]	2.58	1.25-5.35	0.01
Child Age	0.93	0.78-1.11	0.41
Overweight [c]	1.54	0.73-3.22	0.25
Parent Age	0.98	0.94-1.02	0.36
Marital Status [d]			
Never Married	2.26	0.79-6.50	0.13
Divorced	2.60	0.92-7.15	0.07
Other	1.39	0.50-3.88	0.53
Mobility			
Consistently fair/poor HRQoL [b]	2.05	0.77-5.44	0.15
Child Age	0.96	0.81-1.13	0.61
Overweight [c]	1.49	0.72-3.08	0.29
Parent Age	0.98	0.94-1.02	0.23
Marital Status [d]			
Never Married	2.19	0.77-6.21	0.14
Divorced	2.85	1.05-7.74	< 0.05
Other	1.65	0.58-4.70	0.35
Peer Relationships			
Consistently fair/poor HRQoL [b]	3.28	1.25-8.61	0.01
Child Age	1.00	0.84-1.19	0.98
Overweight [c]	1.63	0.78-3.41	0.20
Parent Age	0.98	0.93-1.02	0.22
Marital Status [d]			
Never Married	2.41	0.83-6.94	0.10
Divorced	2.53	0.92-7.01	0.07
Other	1.38	0.49-3.88	0.54

[a] Consistently good asthma control status is the reference group

[b] Mean scores < 55 for mobility or peer relationships domain and mean scores > 45 for other domains

[c] Not overweight is the reference group

[d] Married is the reference group