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Pediatrics 2004;114;e541
DOI: 10.1542/peds.2004-0844

Health-Related Quality of Life in Children and Adolescents Who Have a Diagnosis of Attention-Deficit/Hyperactivity Disorder

Anne F. Klassen, DPhil*; Anton Miller, MB, ChB, FRCPC*; and Stuart Fine, MB, FRCPC‡

ABSTRACT. *Objective.* **The aim of treatment for attention-deficit/hyperactivity disorder (ADHD) is to decrease symptoms, enhance functionality, and improve well-being for the child and his or her close contacts. However, the measurement of treatment response is often limited to measuring symptoms using behavior rating scales and checklists completed by teachers and parents. Because so much of the focus has been on symptom reduction, less is known about other possible health problems, which can be measured easily using health-related quality-of-life (HRQL) questionnaires, which are designed to gather information across a range of health domains. The aim of our study was to measure HRQL in a clinic-based sample of children who had a diagnosis of ADHD and consider the impact of 2 clinical factors, symptom severity and comorbidity, on HRQL. Our specific hypotheses were that parent-reported HRQL would be poorer in children with ADHD than in normative US and Australian pediatric samples, in children with increasing severity of ADHD symptoms, and in children who had diagnoses of comorbid psychiatric disorders.**

Methods. **Cross-sectional survey was conducted in British Columbia, Canada. The sample included 165 respondents of 259 eligible children (63.7% response rate) who were referred to the ADHD Clinic in British Columbia between November 2001 and October 2002. Children who are seen in this clinic come from all parts of the province and are diverse in terms of socioeconomic status and case mix. ADHD was diagnosed in 131 children, 68.7% of whom had a comorbid psychiatric disorder. Some children had >1 comorbidity: 23 had 2, 5 had 3, and 1 had 4. Fifty-one children had a comorbid learning disorder (LD), 45 had oppositional defiant disorder or conduct disorder (ODD/CD), and 27 had some other comorbid diagnosis. The mean age of children was 10 years (standard deviation: 2.8). Boys composed 80.9% ($N = 106$) of the sample. We used the 50-item parent version of the Child Health Questionnaire to measure physical and psychosocial health. Physical domains include the following: physical functioning (PF), role/social limitations as a result of physical health (RP), bodily pain/discomfort (BP), and general health perception (GH). Psychosocial domains include the following: role/social limitations as a result of emotional-behavioral problems (REB), self-esteem (SE), mental health (MH), general behavior (BE), emotional impact on parent (PTE), and time impact on parents (PTT). A separate domain measures limitations in family activities (FA). There is also a single-item measure of family cohesion (FC). Individual scale scores and summary scores for physical (PhS) and psychosocial health (PsS) can be computed. Symptom severity data (parent and teacher) came from the Child/Adolescent Symptom Inventory 4. These checklists provide information on symptoms for the 3 ADHD subtypes (inattentive, hyperactive, and combined). Each child underwent a comprehensive psychiatric assessment by 1 of 4 child psychiatrists. Documentation included a full 5-axis *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* diagnosis on the basis of a comprehensive assessment. Clinical information for each child was extracted from hospital notes.**

Results. **Compared with both population samples, children with ADHD had comparable physical health but clinically important deficits in HRQL in all psychosocial domains, FA, FC, and PsS, with effect sizes as follows: FC = −0.66, SE = −0.90, MH = −0.97, PTT = −1.07, REB = −1.60, BE = −1.73, PTE = −1.87, FA = −1.95, and PsS = −1.98. Poorer HRQL for all domains of psychosocial health, FA, and PsS correlated significantly with more parent-reported inattentive, hyperactive, and combined symptoms of ADHD. Children with ≥2 comorbid disorders differed significantly from those with no comorbidity in most areas, including RP, GH, REB, BE, MH, SE, PTT, FA, and PsS, and from those with 1 comorbid disorder in 3 domains, including BE, MH, and FA and the PsS. The mean PsS score for children in the ODD/CD group (mean difference: −12.9; effect size = −1.11) and children in the other comorbidity group (−9.0; effect size = −.77) but not children in the LD group were significantly lower than children with no comorbid disorder. Predictors of physical health in a multiple regression model included child's gender ($\beta = .177$) and number of comorbid conditions ($\beta = -.197$). These 2 variables explained very little variation in the PhS. Predictors of psychosocial health included the number of comorbid conditions ($\beta = -.374$) and parent-rated combined ADHD symptoms ($\beta = -.362$). These 2 variables explained 31% of the variation in the PsS.**

Conclusions. **Our study shows that ADHD has a significant impact on multiple domains of HRQL in children and adolescents. In support of our hypotheses, compared with normative data, children with ADHD had more parent-reported problems in terms of emotional-behavioral role function, behavior, mental health, and self-esteem. In addition, the problems of children with ADHD had a significant impact on the parents' emotional health and parents' time to meet their own needs, and they interfered with family activities and family cohesion. The differences that we found represent clini-**

From the *Department of Pediatrics, University of British Columbia, and Center for Community Child Health Research, Children's and Women's Health Center of British Columbia, Vancouver, British Columbia, Canada; and ‡ADHD Clinic, Department of Psychiatry, Children's and Women's Health Center of British Columbia, and University of British Columbia, Vancouver, British Columbia, Canada.

Accepted for publication Jun 30, 2004.
doi:10.1542/peds.2004-0844

Reprint requests to (A.K.) Center for Community Child Health Research, Children's and Women's Health Center of British Columbia, 4480 Oak St, Vancouver, British Columbia, Canada V6H 3V4. E-mail: afk@interchange.ubc.ca

cally important differences in HRQL. Our study adds new information about the HRQL of children with ADHD in relation to symptom severity and comorbidity. Children with more symptoms of ADHD had worse psychosocial HRQL. Children with multiple comorbid disorders had poorer psychosocial HRQL across a range of domains compared with children with none and 1 comorbid disorder. In addition, compared with children with no comorbidity, psychosocial HRQL was significantly lower in children with ODD/CD and children in the other comorbidity group but not in children with an LD. The demonstration of a differential impact of ADHD on health and well-being in relation to symptom severity and comorbidity has important implications for policies around eligibility for special educational and other supportive services. Because the impact of ADHD is not uniform, decisions about needed supports should incorporate a broader range of relevant indicators of outcome, including HRQL. Although many studies focus on measuring symptoms using rating scales and checklists, in our study, using a multidimensional questionnaire, we were able to show that many areas of health are affected in children with ADHD. We therefore argue that research studies of children with ADHD should include measurement of these broader domains of family impact and child health. *Pediatrics* 2004;114:e541–e547. URL: www.pediatrics.org/cgi/doi/10.1542/peds.2004-0844; *attention-deficit/hyperactivity disorder, quality of life, comorbidity, children.*

ABBREVIATIONS. ADHD, attention-deficit/hyperactivity disorder; DSM-IV, *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*; ODD, oppositional defiant disorder; CD, conduct disorder; LD, learning disability; HRQL, health-related quality of life; CHQ, Child Health Questionnaire; CSI, Child/Adolescent Symptom Inventory 4; CHQ-PF50, 50-item parent-completed CHQ.

Attention-deficit/hyperactivity disorder (ADHD), one of the most common childhood psychiatric disorders, affects between 3% and 5% of children, according to the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV).[1] Boys are 3 times more likely to have ADHD than girls and 6 to 9 times more likely than girls to be seen with ADHD among clinic-referred children.[2] ADHD is a condition characterized by different levels of inattention, hyperactivity, and impulsivity and gives rise to significant academic, social, and emotional problems at home and at school.[2] Academically, children with ADHD often underachieve or fail in school. Socially, they have poor relationships with peers, teachers, and parents. Emotionally, they often have poor self-esteem and are at considerably increased risk for depression, anxiety, and/or delinquent behavior. The extent of comorbidity in children with ADHD is high, as it commonly occurs in association with oppositional defiant disorder (ODD), conduct disorder (CD), learning disabilities (LDs), and other psychiatric conditions such as anxiety disorders and depression.[2,3]

As with most mental health disorders in children, the aim of treatment for ADHD is to decrease symptoms, enhance functionality, and improve well-being for the child and his or her close contacts. However, measurement of treatment response is often limited to measuring a reduction in symptoms using behavior rating scales completed by teachers and parents. In fact, current guidelines recommend the use of such scales to evaluate and monitor treatment effects.[4] Because so much focus has been on measuring symptom reduction, little research has studied the effects of ADHD on other aspects of a child's health. However, the development of an increasing number of multidimensional health-related quality-of-life (HRQL) questionnaires now afford the opportunity to measure the health of children with ADHD more comprehensively.[5–8]

In the research literature, we are aware of 5 studies that have measured HRQL in children with ADHD.[9–13] Although these studies provide some information about the level of HRQL experienced by children with ADHD, none have considered the relationship between HRQL and key clinical factors, which we hypothesize will have an important effect on HRQL. The aim of our study was to measure HRQL in a clinic-based sample of children who have a diagnosis of ADHD and consider the impact of 2 clinical factors on HRQL. Our specific hypotheses were that parent-reported HRQL would be poorer in children with ADHD than the general pediatric population, in children with increasing severity of ADHD symptoms, and in children who have diagnoses of comorbid psychiatric disorders.

METHODS

Participants

The sample was recruited from the ADHD clinic at British Columbia Children's Hospital, which is a specialist clinic located at the only tertiary care pediatric facility in the province of British Columbia (Canada). Children who are seen in this clinic come from all parts of the province and are diverse in terms of socioeconomic status and case mix. Although many referred cases have complex diagnostic or management problems, approximately one third of cases are newly identified by family doctors and are not necessarily complex.

A total of 335 children were referred to the ADHD clinic during our 12-month recruitment period (November 2001 to October 2002). Of these, 59 referrals were canceled, 8 parents could not communicate in English, 5 children were redirected to a different clinic within the hospital, 3 children were involved in a different research project, and 1 child died. Of the remaining 259 children, 165 (63.7%) parents completed a study questionnaire. The final study sample included 131 children who had a diagnosis of ADHD (33 did not have ADHD, and for 1, the hospital notes were missing). ADHD subtypes included the following: combined type ($n = 88$); inattentive type ($n = 35$); hyperactive ($n = 2$); and not otherwise specified ($n = 6$). Family and child characteristics for the sample appear in Table 1. Our study questionnaire was completed by 116 (93.5%) biological parents, most commonly the child's mother ($n = 102$; 82.3%). The mean age of children in the study sample was 10 years (SD: 2.8). Boys composed 80.9% ($n = 106$) of the sample.

Materials

Before a child's appointment, parents are routinely sent a package of questionnaires to complete. For the purposes of our study, the Child Health Questionnaire (CHQ; described below) was included in the package. Symptom severity data came from the Child/Adolescent Symptom Inventory 4 (CSI), one of the questionnaires sent routinely to parents (described below).

CHQ

The CHQ is a multidimensional generic measure of HRQL that can be used with children as young as 5 years.[9] We used the 50-item parent-completed CHQ (CHQ-PF50), which measures 11 domains of health. Physical domains include the following: physical functioning, role/social limitations as a result of physical

TABLE 1. Demographic, Socioeconomic, and Clinical Characteristics of the Family and the Child

Characteristic	*n*	%
Relationship to child		
Biological parent	116	93.5
Foster parent	4	3.2
Adoptive parent	3	2.4
Guardians	1	0.8
Marital status		
Married	80	61.5
Common law	9	6.9
Single	11	8.5
Separated	13	10.0
Divorced	17	13.1
Education		
Some high school	15	11.5
High school diploma	22	16.9
Some postsecondary	21	16.2
Diploma from trade school or college or some university education	48	36.9
University degree	24	18.5
Household income, *n* (%)		
<$20 000	23	18.7
$20 000–$40 000	32	26.0
$40 000–$60 000	27	21.9
$60 000–$80 000	12	9.8
>$80 000	29	23.6
Gender		
Male	106	80.9
Female	25	19.1
Child age		
6–7	31	23.7
8–9	36	27.5
10–11	24	18.3
12–13	21	16.0
14–15	14	10.7
16–17	5	3.8
Type of ADHD		
Combined	88	67.2
Inattentive	35	26.7
Not otherwise specified	8	6.1
Type of comorbid psychiatric diagnosis		
LD	51	38.9
ODD/CD	45	34.4
Other	27	20.6
Psychosocial stressors	48	36.6

health, bodily pain/discomfort, and general health perception. Psychosocial domains include the following: role/social limitations as a result of emotional-behavioral problems, self-esteem, mental health, general behavior, emotional impact on parent, and time impact on parents. A separate domain measures limitations in family activities. There is also a single-item measure of family cohesion. Scores for the domains and single item range from 0 to 100, with higher scores indicating better HRQL. In addition, summary scores can be derived to measure physical and psychosocial health. The summary scores have a mean of 50 and an SD of 10. The CHQ-PF50 has undergone extensive validation, and normative data are available.[9,14]

CSI

These checklists provide information on symptoms for the 3 ADHD subtypes: 9 inattentive and 9 hyperactivity/impulsivity symptoms are listed in 2 separate scales, and both scales together form the combined subtype.[15–18] The symptom severity approach sums the values of the items ("never" = 0, "sometimes" = 1, "often" = 2, "very often" = 3). The instrument has moderate to high sensitivity for DSM-IV disorders and correlates well with dimensional rating scales such as the Achenbach[19] and semistructured interviews.[20]

Procedure

Ethical approval was obtained from the University of British Columbia and the participating children's hospital. A letter from the head of the ADHD clinic describing the study, a consent form, and the study questionnaire were sent to all new referrals over a 12-month period. A reminder letter and up to 2 additional copies of the questionnaires were sent to nonrespondents. Remaining nonrespondents were contacted by telephone to confirm response status. Each child underwent a comprehensive psychiatric assessment by 1 of 4 child psychiatrists, all of whom have a minimum of 10 years of clinical and research experience with ADHD. Diagnosis was based on LEAD (longitudinal, expert, all data) criteria.[21] Psychoeducational and occupational therapy testing was done as needed. Documentation included a full 5-axis DSM-IV diagnosis based on a comprehensive assessment. Clinical information for each child was extracted from hospital notes.

Data Analysis

To explore relationships between symptom severity scores and comorbidity by gender and age, we used χ^2 tests, *t* tests, and Mann-Whitney *U* tests. Interclass correlation coefficients and paired *t* tests were computed to examine agreement between parent and teacher CSI data. Mean scores for the CHQ-PF50 were computed and compared with published population norms. Because no population norms are available for Canadian children, comparisons were made with US[9] and Australian[14] norms. *Z* tests were used to estimate statistical significance, and effect sizes were computed to explore the clinical importance of differences between the ADHD sample and the US norms (Australian SDs were not available). Effect sizes were computed by dividing the mean difference in scores by the population SD. Cohen's guidelines for interpretation (0.2 is small, 0.5 is medium, 0.8 is large) were used.[22] Spearman correlation coefficients were used to examine the relationship between HRQL and ADHD symptom severity. A *t* test, Mann Whitney *U* test, or analysis of variance was used to compare mean CHQ-PF50 scores by gender and comorbidity. Effect sizes for these were computed, using the pooled SD. Pearson correlation coefficients identified significant relationships between CHQ-PF50 summary scores and the following variables: annual household income, caregiver education, marital status, child age, child gender, type of ADHD, the presence of comorbidity, type of comorbidity, number of comorbid diagnoses, and parent- and teacher-reported ADHD symptoms. Variables that were significantly related to the summary scores were entered into multiple regression models to examine the proportion of variation explained in HRQL summary scores.

RESULTS

Treatment History

A history of stimulant medication was noted for 59 (45%) children. Ritalin had been prescribed to 54 and Dexedrine to 20 (16 of whom had also had Ritalin). At the time of their appointment, 92 (70.2%) children were not on medication, 36 (27.5%) were receiving medication, and for 3 (2.3%) children, the medication status was unknown. Just over half of the children on medication for ADHD had their medication changed or adjusted by the psychiatrist.

Comorbid Diagnoses

Ninety (68.7%) children had at least 1 comorbid psychiatric diagnosis. Some children ($n = 29$; 22.2%) had >1 comorbidity: 23 (17.6%) had 2, 5 (3.8%) had 3, and 1 (0.8%) had 4. Fifty-one (38.9%) children had a comorbid LD, 45 (34.4%) had ODD/CD, and 27 (20.6%) had some other comorbid diagnosis (eg, Tourette's syndrome, sleep disorder, depression, anxiety disorder, communication disorder). The proportion of children with versus without a comorbid diagnosis did not vary by gender and was not related to age.

ADHD Symptom Severity

Parent-reported CSI data were available for 122 (93.1%) children, and teacher-reported CSI data were

available for 119 (90.8%) children. Interclass correlation coefficients computed for parent- and teacher-reported CSI scores were moderate to low in magnitude for ADHD inattentive subtype (0.34; $P = .027$; $n = 92$), ADHD hyperactive subtype (0.39; $P = .011$; $n = 87$), and ADHD combined subtype (0.30; $P = .069$; $n = 72$). Parents rated ADHD symptoms significantly higher than teachers for ADHD inattentive subtype (6.63 vs 5.89; $t = 2.034$, $df = 91$, $P = .045$) and ADHD combined subtype (11.60 vs 9.86; $t = 2.433$, $df = 71$, $P = .018$).

HRQL of Children With ADHD Compared With Population Norms

Mean CHQ-PF50 scores for the ADHD sample and Australian and US population norms appear in Fig 1. The physical health domains for children with ADHD did not vary from either normative sample. All psychosocial health domains, family activities, family cohesion, and the psychosocial summary score were substantially lower in children with ADHD compared with the 2 population samples (all ADHD vs US; $P < .0001$).

To estimate the clinical importance of these differences, effect sizes were computed between the ADHD and US samples. The results indicate clinically important deficits in HRQL in all psychosocial domains, family activities, family cohesion, and the psychosocial summary score and in order of magnitude were as follows: family-cohesion = −0.66, self-esteem = −0.90, mental health = −0.97, parental impact-time = −1.07, role/social limitations emotional-behavioral = −1.60, general behavior = −1.73, parental impact-emotional = −1.87, family activities = −1.95, and psychosocial summary score = −1.98.

Correlations Between HRQL and Symptoms of ADHD

Spearman correlations between parent-reported CSI scores and HRQL physical health domains were not significant. Higher ADHD symptom severity was associated with poorer HRQL for all domains of psychosocial health, family activities, and the psychosocial summary score (see Table 2). Similar correlations between teacher-reported scores (CSI) and the psychosocial HRQL scores were not statistically significant (all correlations below $r = 0.14$).

HRQL by Number of Comorbid Psychiatric Diagnoses

Table 3 shows the mean CHQ-PF50 item, domain and summary scores, and 95% confidence intervals by number of comorbid disorders (0, 1, ≥2). Poorer health for those with more comorbidity was apparent for 5 domains of psychosocial health, 2 domains of physical health, family activities, and the psychosocial summary score. The differences in mean scores comparing those with ≥2 comorbidities and those with no comorbidity resulted in large effect sizes (see Table 3). No differences were detected when the group with no comorbidity was compared with the group with 1 comorbid disorder. Those with ≥2 comorbid disorders differed significantly from those with no comorbidity in most areas, including role physical, general health, role emotion/behavioral, behavior, mental health, self-esteem, parental impact-time, family activities, and the psychosocial summary score, and from those with 1 comorbid disorder in 3 domains, including behavior, mental health, family activities, and the psychosocial summary score.

HRQL by Type of Comorbid Psychiatric Diagnoses

The physical and psychosocial CHQ-PF50 summary scores for children with no comorbid diagnoses were compared with children with an LD, ODD/CD, or other comorbid disorder. Although no differences were found for physical health, the mean score for psychosocial health for children in the ODD/CD group (mean difference: −12.9; $P < .001$; effect size = −1.11) and children in the other comorbidity group (−9.0; $P = .005$; effect size = −.77) but not children in

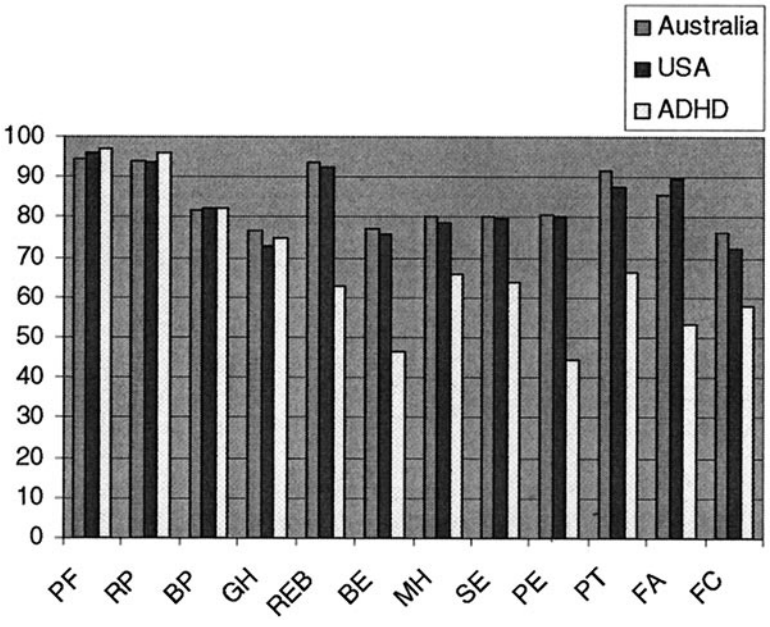

Fig 1. Mean CHQ-PF50 item and domain scores comparing Australian and US population norms with ADHD children. PF indicates physical function; RP, role physical; BP, bodily pain; GH, general health; REB, role emotional-behavioral; BE, behavior; MH, mental health; SE, self-esteem; PE, parental impact-emotional; PT, parental impact-time; FA, family activities; FC, family cohesion.

TABLE 2. Spearman Correlations Between Parent-Reported CSI Symptom Severity Score Scales and CHQ-PF50 Item, Domain, and Summary Scores

	ADHD Inattentive Subtype	ADHD Hyperactive Subtype	ADHD Combined Subtype
Physical function	−.09	−.16	−.13
Role physical	−.01	−.17	−.12
Bodily pain	−.14	−.06	−.13
General health	−.10	−.04	−.11
Role emotional-behavioral	−.28*	−.31*	−.35*
Behavior	−.34*	−.39*	−.48*
Mental health	−.26*	−.23†	−.31*
Self-esteem	−.34*	−.06	−.21†
Parental impact-emotional	−.39*	−.28*	−.42*
Parental impact-time	−.32*	−.33*	−.37*
Family activities	−.35*	−.32*	−.38*
Family cohesion	−.17	−.02	−.09
Physical summary score	−.05	−.02	−.00
Psychosocial summary score	−.47*	−.35*	−.48*

* Correlation is significant at the 0.01 level (2-tailed).
† Correlation is significant at the 0.05 level (2-tailed).

TABLE 3. Mean CHQ-PF50 Item, Domain and Summary Scores, 95% Confidence Intervals, *P* Values, and Effect Sizes for Children by Number of Comorbid Psychiatric Diagnoses

	0, Mean (SD; n = 41)	1, Mean (SD; n = 61)	≥2, Mean (SD; n = 29)	*P* Value	Effect Size
Physical function	96.8 (11.0)	98.1 (5.6)	94.0 (17.9)	.313	−.25
Role physical	97.1 (9.2)	98.9 (4.2)	88.5 (24.4)	.030	−.64
Bodily pain	84.8 (22.2)	83.8 (17.0)	75.9 (26.9)	.299	−.42
General health	78.3 (15.1)	76.8 (15.6)	65.9 (14.4)	.002	−.79
Role emotional-behavioral	71.9 (30.1)	63.2 (34.4)	49.0 (35.9)	.022	−.67
Behavior	52.4 (17.8)	48.6 (20.8)	34.5 (16.6)	<.001	−.90
Mental health	71.2 (14.5)	66.3 (17.2)	56.7 (19.9)	.003	−.82
Self-esteem	71.6 (16.3)	63.7 (23.9)	54.4 (16.5)	.003	−.82
Parental impact-emotional	48.6 (20.7)	44.9 (20.0)	37.9 (20.6)	.101	−.52
Parental impact-time	73.1 (22.8)	66.7 (22.3)	57.1 (27.5)	.029	−.66
Family activities	63.2 (26.4)	55.4 (28.1)	35.6 (26.9)	<.001	−.95
Family cohesion	62.9 (26.6)	58.3 (28.9)	50.5 (26.0)	.182	−.45
Physical summary score	56.6 (5.8)	57.1 (5.1)	52.8 (11.6)	.262	−.51
Psychosocial summary score	38.2 (9.1)	33.4 (12.9)	26.4 (10.4)	<.001	−.98

the LD group were significantly lower than children with no comorbid disorder.

Some children in each of the above groups had >1 type of comorbid disorder. We therefore compared the psychosocial summary score for smaller groups of children with specific patterns of comorbid disorders to examine the relationship with HRQL. The subgroups included children with only an ODD/CD (n = 21); only an LD (n = 28); only 1 of the other comorbidities (n = 12); both an ODD/CD and an LD (n = 14); and the remaining children (n = 15), who had a mix of 2 or more psychiatric disorders. Children with an ODD/CD scored lower than children with no comorbidity (mean difference: −13.0; P < .001) and those with an LD (−13.4; P = .001). Children with ODD/CD and an LD had lower mean scores than those with no comorbidity (−10.2; P = .024) and those with an LD (−10.6; P = .025). Finally, children in the mixed group had lower mean scores than those with no comorbidity (−13.4; P = .001) and those with an LD (−13.9; P = .002).

Predictors of HRQL

Predictors that were significant in the final model (n = 121) for physical health containing only the significant bivariate predictors included child's gender (β = .177; P = .049) and number of comorbid conditions (β = −.197; P = .028). These 2 variables explained very little variation in physical health.

Predictors that were significant in the final model (n = 93) for psychosocial health included the number of comorbid conditions (β = −.374; P < .001) and parent-rated combined ADHD symptoms (β = −.362; P < .001). In the final model, the adjusted R^2 was .31 (F = 32.051, df = 2,90, P < .0001).

DISCUSSION

In agreement with previous research,[9–12] our study shows that ADHD has a significant impact on multiple domains of HRQL in children and adolescents. Specifically, in support of our first hypothesis, compared with normative data, children with ADHD had more parent-reported problems in terms of emotional-behavioral role function, behavior, mental health, and self-esteem. In addition, the problems of children with ADHD had a significant impact on the parents' emotional health and parents' time to meet their own needs, and they interfered with family activities and family cohesion. No differences were found for aspects of physical health. Researchers have reached a consensus that a minimally important difference in HRQL is close to one half of an SD.[23] The differences that we found (eg, effect size of −1.98 for the psychosocial summary score) were sub-

stantially larger and therefore represent clinically important differences in HRQL.

Our study adds new information about the HRQL of children with ADHD for 2 clinical characteristics. First, as hypothesized, HRQL was correlated with parent-reported ADHD symptom severity: children with more ADHD symptoms had poorer HRQL. Parent-reported ADHD symptoms were an important predictor of psychosocial health in the regression model. These findings are a graphic illustration of how ADHD affects health for the child and the family in ways that are broader than is apparent from symptoms alone and that are measurable with appropriate instruments. Although many treatment studies focus simply on measuring a reduction in symptoms using rating scales and checklists, we argue that measurement of these broader domains of family impact and child health be included in clinical and research studies of children with ADHD. In our study, using a multidimensional questionnaire, we were able to show that ADHD symptoms are related to many areas of health of children and their family.

The finding that parent and teacher ratings of ADHD symptoms were poorly correlated is in agreement with other research on this topic. Many researchers have noted that parents and teachers frequently disagree on their assessment of behavioral/emotional problems in children.[19,24–26] Such differences do not mean that either reporter is inaccurate, because parents and teachers see the child in different situations and ratings may be affected by many different factors. Often teachers see the children only when they are medicated (in Canada, long-acting stimulants have been available only recently), which could help to account for the finding that HRQL was related to parent-reported symptoms but not teacher-reported symptoms. It is also possible that parents may have exaggerated both their child's ADHD symptoms and HRQL in an attempt to secure an appointment.

Second, in support of our hypothesis, an important predictor of psychosocial HRQL was the presence of comorbid psychiatric disorders. We found that children with ≥2 comorbid disorders had poorer psychosocial HRQL in a range of domains compared with children with none and 1 comorbid disorder. Furthermore, at the bivariate level, HRQL was related to the particular type of comorbidity. Compared with children with no comorbidity, psychosocial HRQL was significantly lower in children with an ODD/CD and children in the other comorbidity group but not children with an LD. The effect sizes for these differences were large, indicating clinically important deficits in health. When we separated children into 6 subgroups by comorbidity, we found that compared with children with no comorbidity and children with an LD, psychosocial HRQL was lower in children with only ODD/CD, ODD/CD and LD, and a mix of comorbidity conditions.

Given that comorbidity is common with ADHD[2,3,27] and comorbidity is an important predictor of HRQL in ADHD, the effectiveness of interventions in ADHD, if they are aimed at improving overall health and functioning, should be evaluated using outcome measures that are sensitive to the impact that symptom severity and comorbid disorders have on the overall health and well-being of children. The collection of such information could provide useful information to parents and children who may want to know the likely impact that their child's psychiatric diagnoses will have on his or her health, function, and family life. Our results suggest that whereas the addition of an LD will not make much difference, the addition of an ODD/CD will have clinically important implications for the child and his or her family.

The demonstration in our findings of a differential impact of ADHD on health and well-being in relation to symptom severity and comorbidity has important implications for policies around eligibility for special educational and other supportive services to children and youths with developmental and behavioral disorders. Our findings illustrate a serious flaw in tying service provision to specific medical diagnosis, as happens in many parts of Canada and the United States. It is clear that the impact of ADHD is not uniform, and, hence, decisions about needed supports should incorporate a broader range of functionally relevant indicators.

There are certain limitations to this study. We were not able to compare participants and nonparticipants in terms of clinical variables and therefore do not know the possible direction of bias, if any. We cannot discount the possibility that the low level of HRQL that we found could be attributable to a poorer level of HRQL in our clinic-based sample of children compared with children with ADHD in the general community. Our comparisons with population norms for the CHQ were limited by not having Canadian norms, and we recognize that cross-country comparisons are limited by differences between samples in factors such as socioeconomic status, age, gender, and health care system. Non–English-speaking families were excluded from the study, although our numbers of these were small. HRQL and ADHD symptom data both were provided by parents and therefore represent only 1 perspective. This may account for the strong correlation between HRQL and parent- but not teacher-rated symptoms. Parents were used as proxies, although research shows that parent and child often differ in their ratings of child HRQL.[28,29] Given the nature of ADHD (ie, children are inattentive, hyperactive, and impulsive, and their parents have a higher prevalence of psychopathology[30,31]), research into the validity of self- and proxy report is called for. Finally, because so little is known about the HRQL of children with ADHD, we have provided a comprehensive description of the study sample. Because this necessitated multiple statistical comparisons, the possibility of an α error cannot be discounted.

CONCLUSION

Children with ADHD were found to have substantially lower HRQL compared with normative data. Psychosocial health was related to ADHD symptoms and number of comorbid disorders. HRQL is an important outcome that has received little attention in children with ADHD. The use of tools such as the

CHQ shows how additional and useful information that is relevant to the life of the patient and his or her family can be obtained.

ACKNOWLEDGMENTS

This study was funded by a grant from the British Columbia Medical Services Foundation. Dr Klassen holds a Senior Research Fellowship from the Canadian Institutes of Health Research.

REFERENCES

1. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington, DC: American Psychiatric Association; 1994
2. Barkley RA. *Attention-Deficit Hyperactivity Disorder. A Handbook for Diagnosis and Treatment*. 2nd ed. New York, NY: Guilford Press; 1998
3. Biederman J, Newcorn J, Sprich S. Comorbidity of attention deficit hyperactivity disorder with conduct, depressive, anxiety, and other disorders. *Am J Psychiatry.* 1991;148:564–577
4. Committee on Quality Improvement, Subcommittee on Attention-Deficit/Hyperactivity Disorder. Clinical practice guideline: diagnosis and evaluation of the child with attention-deficit/hyperactivity disorder. *Pediatrics.* 2000;105:1158–1170
5. Eiser C, Morse R. A review of measures of quality of life for children with chronic illness. *Arch Dis Child.* 2001;84:205–211
6. Schmidt LJ, Garrat AM, Fitzpatrick R. Child/parent-assessed population health outcome measures: a structured review. *Child Care Health Dev.* 2002;28:227–237
7. Spieth LE, Harris CV. Assessment of health related quality of life in children and adolescents: an integrative review. *J Pediatr Psychol.* 1996; 21:175–193
8. Connolly MA, Johnson JA. Measuring quality of life in paediatric patients. *Pharmacoeconomics.* 1999;16:605–625
9. Landgraf JM, Abetz L, Ware JE. *The CHQ User's Manual*. Boston, MA: Health Act; 1999
10. Sawyer MG, Whaites L, Rey JM, Hazell PL, Graetz BW, Baghurst P. Health-related quality of life of children and adolescents with mental disorders. *J Am Acad Child Adolesc Psychiatry.* 2002;41:530–537
11. DeVeaugh-Geiss J, Conners CK, Sarkis EH, et al. GW320659 for the treatment of attention-deficit/hyperactivity disorder in children. *J Am Acad Child Adolesc Psychiatry.* 2002;41:914–920
12. Bastiaansen D, Koot HM, Ferdinand RF, Verhulst FC. Quality of life in children with psychiatric disorders; self-, parent, and clinician report. *J Am Acad Child Adolesc Psychiatry.* 2004;43:221–230
13. Landgraf JM, Rich M, Rappaport L. Measuring quality of life in children with attention-deficit/hyperactivity disorder and their families: development and evaluation of a new tool. *Arch Pediatr Adolesc Med.* 2002; 156:384–391
14. Waters E, Salmon L, Wake M. The parent-form Child Health Questionnaire in Australia: comparison of reliability, validity, structure, and norms. *J Pediatr Psychol.* 2000;25:381–391
15. Gadow KD, Sprafkin J. *Child Symptom Inventory 4 Norms Manual*. Stony Brook, NY: Checkmate Plus LTD; 1997
16. Gadow KD, Sprafkin J. *Child Symptom Inventory 4 Screening Manual*. Stony Brook, NY: Checkmate Plus LTD; 1998
17. Gadow KD, Sprafkin J. *Adolescent Symptom Inventory 4 Norms Manual*. Stony Brook, NY: Checkmate Plus LTD; 1998
18. Gadow KD, Sprafkin J. *Adolescent Symptom Inventory 4 Screening Manual*. Stony Brook, NY: Checkmate Plus LTD; 1997
19. Achenbach TM, McConaughy SH, Howell CT. Child/adolescent behavioral and emotional problems: implications of cross-informant correlations for situational specificity. *Psychol Bull.* 1987;101:213–232
20. Grayson P, Carlson GA. The utility of a DSMIIIR based checklist in screening child psychiatric patients. *J Am Acad Child Adolesc Psychiatry.* 1991;30:669–673
21. Spitzer RL. Psychiatric diagnosis: are clinicians still necessary? *Compr Psychiatry.* 1983;24:399–411
22. Cohen J. *Statistical Power for the Behavioural Sciences*. New York, NY: Academic Press; 1977
23. 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;41:582–592
24. Kolko DJ, Kazdin AE. Emotional/behavioral problems in clinic and nonclinic children: correspondence among child, parent and teacher report. *J Child Psychol Psychiatry.* 1993;34:991–1006
25. Kumpulainen K, Rasanen E, Henttonen I, et al. Children's behavioral/emotional problems: a comparison of parents' and teachers' reports for elementary school-aged children. *Eur Child Adolesc Psychiatry.* 1999; 8(suppl 4):41–47
26. Mitsis EM, McKay KE, Schulz KP, Newcorn JH, Halperin JM. Parent-teacher concordance for DSM-IV attention-deficit/hyperactivity disorder in a clinic-referred sample. *J Am Acad Child Adolesc Psychiatry.* 2000;39:308–313
27. Kutcher S, Aman M, Brooks SJ, et al. International consensus statement on attention-deficit/hyperactivity disorder (ADHD) and ODD/CDs (DBDs): clinical implications and treatment practice suggestions. *Eur Neuropsychopharmacol.* 2004;14:11–28
28. Eiser C, Morse R. Quality-of-life measures in chronic diseases of childhood. *Health Technol Assess.* 2001;5:55–62
29. Waters E, Stewart-Brown S, Fitzpatrick R. Agreement between adolescent self-report and parent reports of health and well-being: results of an epidemiological study. *Child Care Health Dev.* 2003;29:501–509
30. Barkley RA, DuPaul GJ, McMurray MB. Comprehensive evaluation of attention deficit disorder with and without hyperactivity as defined by research criteria. *J Consult Clin Psychol.* 1990;58:775–789
31. Biederman J, Faraone SV, Keenan K, et al. Further evidence for family-genetic risk factors in attention deficit hyperactivity disorder. Patterns of comorbidity in probands and relatives psychiatrically and pediatrically referred samples. *Arch Gen Psychiatry.* 1992;49:728–738

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Anne F. Klassen, Anton Miller and Stuart Fine

Pediatrics 2004;114;e541
DOI: 10.1542/peds.2004-0844