Development of a Measure of Knowledge and Attitudes About Obstructive Sleep Apnea in Children (OSAKA-KIDS)

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Background: Primary care physicians play an important role in screening for childhood obstructive sleep apnea syndrome (OSAS) that, if untreated, can result in serious complications.

Objective: To describe the development of the Obstructive Sleep Apnea Knowledge and Attitudes in Children (OSAKA-KIDS) questionnaire for use in measuring physicians’ knowledge and attitudes about childhood OSAS and its treatment.

Design: Cross-sectional survey to pilot administration of the 23-item OSAKA-KIDS questionnaire, mailed to 1195 community- and academic-based physicians in Louisville, Ky; Philadelphia, Pa; and St Louis, Mo.

Main Outcome Measures: Analysis of variance measured differences in knowledge and attitudes between academic- and community-based physicians and between pediatricians and family practitioners. Using stepwise multiple linear regression, we analyzed the associations between various predictors (including specialty, practice setting, and years since medical school graduation) and each item of knowledge and attitudes. All tests were 2-tailed.

Results: Questionnaires for 497 respondents (44% female; mean [SD] age, 45.7 [10.5] years; and mean [SD] number of years since medical school graduation, 18.7 [11.0] years) were analyzed. The mean (SD) knowledge score (percentage of 18 possible) was 69.6% (14.6%). In regression analyses, more knowledge was associated with more positive attitudes overall and more recent graduation from medical school; having a more positive attitude was associated with having completed a pediatrics residency and more knowledge about OSAS.

Conclusions: Deficits in basic knowledge about childhood OSAS were observed regardless of physician practice setting and specialty training. More education focusing on the diagnosis and treatment of childhood OSAS and identifying children at risk for OSAS is recommended.

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Obstructive Sleep Apnea syndrome (OSAS) occurs in 1% to 3% of children.1-3 Compared with adult OSAS, the cause and characteristics of childhood OSAS are different,4-6 although its consequences are as grave. Obstructive sleep apnea syndrome in children can result in serious complications, including failure to thrive,7,9 pulmonary hypertension and cor pulmonale,10-12 systemic hypertension,13 neurocognitive deficits,14,15 and neurobehavioral dysfunction.1,16 Untreated OSAS has also been shown to have a negative effect on health-related quality of life,18 and imposes a substantial health care burden along with recurrent primary care physician contacts.19

Primary care physicians play an important role in screening for OSAS. Recent surveys have shown a 12-fold increase in the diagnosis of adult OSAS among primary care physicians’ practices from 1990 to 1998.20 While encouraging, gaps in knowledge continue to be reported.21 Rosen et al22 found low recognition rates of OSAS among both community-based primary care physicians and those in academic settings (0.1% and 3.1%, respectively) compared with national prevalence estimates (9% for women and 24% for men).23

Education about sleep disorders is necessary to ensure accurate diagnosis and treatment of OSAS in adults and children. A knowledge-based questionnaire may be used to provide assessment prior to and following specific educational interventions. The Assessing Sleep Knowledge in Medical Education (ASKME) Survey24 and the Obstructive Sleep Apnea
Knowledge and Attitudes (OSAKA) questionnaire\textsuperscript{25} were developed and successfully used in educational research about OSAS in adults. Obstructive sleep apnea syndrome in children, however, differs from the condition in adults and little is known about the level of awareness of primary care physicians regarding recognition and appropriate management of OSAS in children. A Pediatric Sleep Survey\textsuperscript{26} has been developed to assess physicians’ knowledge, treatment practices, and attitudes about pediatric sleep disorders in general. Yet only 4 of the 30 items in the survey were devoted to OSAS. The Obstructive Sleep Apnea Knowledge and Attitudes in Children (OSAKA-KIDS) questionnaire, presented herein, was developed specifically to assess physicians’ knowledge about childhood OSAS. In this article, we describe the development of the OSAKA-KIDS questionnaire and the results of a pilot administration of the survey to pediatricians and family practitioners in community-based practices and academic medicine settings.

**METHODS**

**PARTICIPANTS AND PROCEDURE**

The OSAKA-KIDS questionnaire and a cover letter were mailed to a convenience sample of 1195 family physicians and pediatricians at 3 sites between November 1, 2002, and March 31, 2003—academic-based pediatricians at St Louis Children’s Hospital, St Louis, Mo, and Children’s Hospital of Philadelphia, Philadelphia, Pa, and community-based family physicians and pediatricians in Louisville, Ky. A second mailing was sent 12 weeks after the initial mailing to increase response rates. The study was approved by the institutional review boards at all 3 sites; return of the questionnaire implied consent. Questionnaires were also were shown to be correlated.\textsuperscript{25} For each significant predictor of attitudes in the respective regression models because physician's knowledge and attitudes about OSAS in adults also were shown to be correlated.\textsuperscript{25} For each significant predictor, we report the unstandardized coefficient (B), standard error, \( P \) value, and 95% confidence interval (CI) for B.

**MEASUREMENT OF KNOWLEDGE AND ATTITUDES**

The OSAKA-KIDS questionnaire is a self-administered, 23-item questionnaire that assesses physicians’ knowledge and attitudes regarding childhood OSAS. The OSAKA-KIDS questionnaire followed development of the OSAKA questionnaire,\textsuperscript{25} which measures physician knowledge and attitudes about OSAS in adults, although we referred to other instruments and experts in the field during the design of the pediatric knowledge questions.\textsuperscript{24,26,27}

To establish face validity of the knowledge items, 5 experts in pediatric sleep medicine were consulted. The experts were asked to rate each of 30 knowledge items for relevance using a 4-point scale (1, not relevant; 2, slightly relevant; 3, relevant; and 4, extremely relevant). Items were considered for inclusion in the final questionnaire if at least 80% of the expert panel members gave the individual items a score of 3 or 4. Modifications were made based on the experts’ feedback.

The final questionnaire included 18 knowledge items and 5 attitude items. The knowledge domains include epidemiology, pathophysiology, symptoms, diagnosis, and complications and treatment of childhood OSAS. Items were presented in a true-or-false format. “Don’t know” was included as a third response choice to minimize the effect of guessing and was scored as an incorrect response.

In addition, 5 attitude items were included pertaining to (1) the importance of OSAS as a clinical disorder in children and the identification of children at risk for OSAS, and (2) physicians’ confidence in their ability to identify children at risk for and treat children with OSAS as well as to manage children receiving continuous positive airway pressure therapy. These items, drawn from the attitude items on the adult OSAKA questionnaire,\textsuperscript{25} were reworded to inquire specifically about childhood OSAS. Physicians were asked to rate the extent of their agreement with each of the 5 items using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Mean attitude scores were computed for each of the 2-item importance and 3-item confidence subscales as well as for the 5-item overall attitudes scale.

**RESULTS**

Completed questionnaires were returned by 517 physicians, with an overall response rate of 43%. Respondents included 338 community-based physicians (pediatricians and family practitioners) in Louisville (43% of the 783 surveyed), 82 pediatricians at Children’s Hospital of Philadelphia (46% of 177 surveyed), and 97 pediatricians at St Louis Children’s Hospital (41% of 235 surveyed). Four physicians who trained in other specialties and 16 who did not indicate their specialty or year of medical school graduation were excluded from further analysis. The final sample included 497 respondents (96% of 517 and 42% of 1195). Respondents ranged in age from 28 to 86 years. Characteristics of the sample are given in Table 1.

**KNOWLEDGE**

The mean (SD) total knowledge score (percentage of 18 possible) was 69.6% (14.6%). Responses to individual items are listed in Table 2. At least three quarters of the respondents correctly answered the items pertaining to
the complications and usual clinical signs and symptoms of OSAS (items 1, 4, 8, 9, 10, and 15 on the OSAKA-KIDS questionnaire). Questions regarding the prevalence of OSAS, frequency of snoring, and populations at risk for OSAS (items 6, 11, 13, 14, 16, and 17) were answered correctly by fewer than two thirds of the respondents. Only 14% of the respondents answered the item concerning sickle cell disease and OSAS correctly (item 13). Total knowledge scores were normally distributed, ranging from 17% to 100% correct.

Only small differences were observed in average knowledge scores between community- and academic-based physicians (69% vs 71%, respectively; 95% CI of the difference, −0.4% to 4.7%) and between pediatricians and family practitioners (70% vs 68%, respectively; 95% CI of the difference, −0.7% to 5.6%).

In the regression of knowledge on residency training, practice setting, time since graduation, and attitudes toward childhood OSAS and its treatment, having higher knowledge scores was associated with more positive attitudes (B = 0.064, SE = 0.011; P < .001; 95% CI for B, 0.043-0.085) and more recent graduation from medical school (B = −0.001, SE = 0.001; P = .039; 95% CI for B, −0.002 to 0.000). Attitudes accounted for 6.8% of the variance of knowledge scores at entry into the model at step 1, whereas the number of years since graduation accounted for only an additional 0.8% of the variance when entered at step 2.

**ATTITUDES**

An attitudes-toward-OSA scale score was computed using the mean of all 5 items, which could range from 1 to

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. (%) of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>277 (55.7)</td>
</tr>
<tr>
<td>Women</td>
<td>219 (44.1)</td>
</tr>
<tr>
<td>Unspecified</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Recruitment sites</td>
<td></td>
</tr>
<tr>
<td>St Louis Children’s Hospital, St Louis, Mo</td>
<td>96 (19.3)</td>
</tr>
<tr>
<td>Children’s Hospital of Philadelphia, Philadelphia, Pa</td>
<td>82 (16.5)</td>
</tr>
<tr>
<td>Community practices in Louisville, Ky</td>
<td>319 (64.2)</td>
</tr>
<tr>
<td>Specialty training</td>
<td></td>
</tr>
<tr>
<td>Pediatrics</td>
<td>365 (73.4)</td>
</tr>
<tr>
<td>Family practice</td>
<td>132 (26.6)</td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>45.7 (10.5)</td>
</tr>
<tr>
<td>Range</td>
<td>28-86</td>
</tr>
<tr>
<td>Time since medical school graduation, mean (SD), y</td>
<td>18.7 (11.0)</td>
</tr>
<tr>
<td>Range</td>
<td>3-60</td>
</tr>
<tr>
<td>Knowledge score</td>
<td></td>
</tr>
<tr>
<td>Mean percentage correct (mean score/18)</td>
<td>69.6 (12.53/18)</td>
</tr>
<tr>
<td>Median</td>
<td>72.2</td>
</tr>
<tr>
<td>Range</td>
<td>17-100</td>
</tr>
<tr>
<td>Attitudes, mean (SD), score</td>
<td>3.2 (0.6)</td>
</tr>
<tr>
<td>Range</td>
<td>1.4-5.0</td>
</tr>
</tbody>
</table>

*A total of 497 participants were included in the study analyses.†Includes a total of 495 respondents as 2 respondents neglected to enter their age.

The distribution of responses on the 5-item attitude scale was normally distributed. In addition, 2 subscale scores were computed using the 2 items pertaining to the importance of OSAS and its diagnosis in children and the 3 items pertaining to physicians’ confidence in identifying and treating children with OSAS.

Although small, the difference in mean attitudes by practice setting was statistically significant, with physicians in academic settings reporting better attitudes overall compared with physicians practicing in the community (mean [SD], 3.3 [0.5] vs 3.1 [0.6], respectively; 93%...
Pediatricians and family practitioners showed deficits in knowledge about childhood OSAS and its treatment. This was true for both academic- and community-based physicians, emphasizing the need for more education about childhood OSAS for physicians in both practice settings. Further analysis of our data using multiple regression indicated that neither practice setting nor residency specialty (pediatrics vs family practice) were significant predictors of knowledge about OSAS, but more positive attitudes and being a more recent medical school graduate, rather, were independently associated with knowledge in this model.

Although respondents who had graduated from medical school in more recent years tended to have higher knowledge scores overall, more focused education seems to be needed in particular areas of care as illustrated in Table 2. For example, the American Academy of Pediatrics has recommended that all children should be screened for snoring. Yet, physicians might not routinely screen children for snoring if they do not consider symptoms of snoring to be common (item 2). In a community survey of pediatricians, fewer than 30% of practitioners routinely screened school-aged children and toddlers for snoring—the age groups in which OSAS is most prevalent.

 Barely half of all respondents knew that failure to thrive was a complication of OSAS (item 16). The item, however, may need to be rephrased to state that “failure to thrive can be an associated finding suggesting OSAS in infants and young children” rather than a “frequent” complication. In addition, only 14% of respondents knew that children with sickle cell disease are at increased risk for OSAS, although this association as well as complications of sickle cell disease, including stroke, have been reported.

While adenotonsillectomy remains the treatment of choice for most cases of childhood OSAS, more education is needed to help physicians identify groups of children at risk for operative complications and persistent OSAS. Risk factors include young age, failure to thrive, cor pulmonale, the presence of neuromotor disease, craniofacial anomalies, chromosomal abnormalities, a history of prematurity, and obesity. Although 86% of respondents recognized adenotonsillar hypertrophy as a frequent cause of OSAS (item 8), only 61% knew that transient worsening of respiratory symptoms can occur after surgery (item 17) and that children younger than 2 years are particularly vulnerable to postsurgical complications (item 14).

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Table 3. Frequencies of Responses to Attitude Items*  

<table>
<thead>
<tr>
<th>Importance Questions</th>
<th>Not Important</th>
<th>Somewhat Important</th>
<th>Important</th>
<th>Very Important</th>
<th>Extremely Important</th>
<th>No Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. As a clinical disorder, OSA is:</td>
<td>0 (0.0)</td>
<td>39 (7.8)</td>
<td>174 (35.0)</td>
<td>195 (39.2)</td>
<td>87 (17.5)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>20. Identifying children with possible OSA is:</td>
<td>0 (0.0)</td>
<td>14 (2.8)</td>
<td>141 (28.4)</td>
<td>232 (46.7)</td>
<td>108 (21.7)</td>
<td>1 (0.4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Confidence Questions</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree</th>
<th>Strongly Agree</th>
<th>No Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. I feel confident identifying children at risk for OSA.</td>
<td>11 (2.2)</td>
<td>110 (22.1)</td>
<td>130 (26.2)</td>
<td>232 (46.7)</td>
<td>14 (2.8)</td>
</tr>
<tr>
<td>22. I am confident in my ability to manage children with OSA.</td>
<td>20 (4.0)</td>
<td>195 (39.2)</td>
<td>136 (27.4)</td>
<td>139 (28.0)</td>
<td>6 (1.2)</td>
</tr>
<tr>
<td>23. I am confident in my ability to manage children receiving CPAP therapy.</td>
<td>69 (13.9)</td>
<td>295 (59.4)</td>
<td>76 (15.3)</td>
<td>49 (9.9)</td>
<td>5 (1.0)</td>
</tr>
</tbody>
</table>

Abbreviations: CPAP, continuous positive airway pressure; OSA, obstructive sleep apnea.
*A total of 497 participants were included in this study. All data are given as the number (percentage) of respondents.
While more than half of all respondents considered childhood OSAS as a clinical disorder and identification of children with OSAS to be at least important (Table 3), fewer respondents reported confidence in their abilities to treat children with OSAS. This finding is similar to observations made by previous investigators. 

This lack of confidence was particularly true for managing children on continuous positive airway pressure therapy, which the American Academy of Pediatrics has recommended as an option for children with OSAS who are not candidates for, or do not respond to, surgery. A greater emphasis on treating children with OSAS in medical education is clearly needed.

Whereas attitudes and the number of years since medical school graduation were predictors of knowledge in the multivariate analysis, residency specialty and knowledge predicted respondents’ attitudes toward OSAS and its treatment. In univariate tests, we noted that between-groups differences in the overall attitudes score seemed to be driven by differences in the confidence subscale score, since no statistically significant differences were observed for the importance subscale. Thus, academic-based physicians were more confident in identifying and treating childhood OSAS compared with community-based physicians. While this may be related to proximity of academic physicians to university sleep facilities and specialists, it also may be related to specialty training rather than practice setting, since pediatricians also reported higher confidence compared with family practitioners and all the family practitioners were practicing in the community. Regardless of any between-groups difference in confidence, an emphasis on treating children with OSAS in medical education would help boost physicians’ confidence in these abilities.

There are several limitations to the study. The cross-sectional design limits our ability to make causal inferences about the associations reported herein. This study was a first step in developing and pilot testing a new measure of physicians’ knowledge and attitudes toward OSAS in children. As such, the questionnaire was administered to a convenience sample of physicians at 3 collaborating sites, and the results may not be representative of the knowledge and attitudes of pediatricians in other areas of the country. In addition, although there were pediatricians at all 3 sites, only the Louisville site included physicians who were not pediatricians, and all the community-based physicians were from the Louisville site. Thus, regardless of the large sample size, the sample was not a representative, population-based sample of pediatricians and family practitioners. Moreover, the survey response rate was only 43%, which further limits the generalizability of our findings owing to selection bias.

Despite these limitations, this study demonstrated that more education in sleep is needed, both in the undergraduate and postgraduate medical education settings. In 1978, the American Sleep Disorders Association reported that less than 10% of medical schools provided adequate education in the area of sleep medicine. 

Fifteen years later, a national survey of US medical schools found less than 2 hours of total teaching time allocated to sleep and sleep disorders. The American Sleep Disorders Association Taskforce 2000 reported that physicians received, on average, 2.1 hours of education about sleep medicine after 4 years of medical education. 

Even less attention is given to pediatric sleep during medical school, with an average of 0.38 clinical teaching hours devoted to the area of pediatric sleep disorders—the least of any topic surveyed. Mindell et al reported that 46% of pediatric residency training programs surveyed did not offer instruction in pediatric sleep disorders and that pediatricians seemed most informed about sleep issues related to development and sleep hygiene but lacked knowledge about the diagnosis of specific sleep disorders.

Finally, knowledge did not differ significantly by type of residency training or practice setting. Perhaps the knowledge scores of both pediatricians and family practitioners reflected similar training (or lack thereof) in pediatric OSAS. Comparisons with physicians having residency training in a specialty very different from pediatric primary care (eg, in surgery or radiology) would contribute to the variance in knowledge scores to better discriminate between pediatricians and other specialists. Future research should include administration of the OSAKAS-KIDS in addition to other questionnaires, for example, measures about other sleep disorders and the OSAKAS questionnaire, which measures knowledge and attitudes toward OSAS in adult patients, to determine the discriminant validity of the OSAKAS-KIDS measure. Additionally, the predictor variables included in our multivariate regression analyses accounted for only a small proportion of the variance of knowledge and attitudes in the respective regression models. Variables not measured herein account for the large, unexplained part of the variance of knowledge and attitudes, and identifying these factors could be explored in future research. Further study also might include the OSAKAS-KIDS measure to evaluate the effectiveness of educational interventions focusing on OSAS in children to change physicians’ knowledge and attitudes toward childhood OSAS.

CONCLUSIONS

Despite recent advances and improving educational trends in pediatric sleep medicine, this study demonstrated deficits in pediatricians’ and family practitioners’ basic knowledge about childhood OSAS regardless of practice setting. More focused education regarding diagnosis and treatment of childhood OSAS and the identification of particular groups at risk for OSAS seems warranted. Improving physician knowledge will be needed to improve childhood OSA–related screening and subsequent treatment practices. To our knowledge, no childhood OSA educational programs for primary care providers or medical trainees have been developed, implemented, and evaluated longitudinally. We believe that the OSAKAS-KIDS questionnaire could be useful in evaluations of the effectiveness of educational interventions to improve physicians’ knowledge and attitudes about OSAS in children.

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REFERENCES