Published in final edited form as:

JAMA Otolaryngol Head Neck Surg. 2017 January 01; 143(1): 46–54. doi:10.1001/jamaoto.2016.2681.

Stakeholder-engaged measure development for pediatric obstructive sleep-disordered breathing: *The oSDB and AT knowledge scale for parents*

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Abstract

Importance—Parental decision-making about adenotonsillectomy (AT) for obstructive sleep-disordered breathing (oSDB) is associated with decisional conflict that may be alleviated with improved knowledge about symptoms and treatments.

Objective—To develop a measure of parental knowledge about oSDB and AT.

Design—A sequential design was used for scale development. A prototype measure containing 9 oSDB/AT themes and 85 items was administered to oSDB experts and laymen. Quantitative and qualitative responses were used to modify the measure and create the knowledge scale. Content validity of the scale was established through expert feedback and evaluation. Criterion validity was established with t-test comparisons of experts to laymen. Reliability of responses was assessed with Cronbach's alpha.

Setting—Scale administered in survey format via online (Qualtrics) platform.

Participants—Clinician experts (otolaryngologists, pediatricians; n=19) and laymen (parents of children who snore, do not snore, and other adults; n=13).

Main outcomes and measures—85-item prototype measure and 39-item modified measure, evaluated for consensus/approval and psychometric integrity.

Results—Content analysis and qualitative feedback were largely positive, although there were several suggestions for rewording and/or addition of response options. Experts identified themes most important for assessing oSDB (symptoms) and AT (experiences: risks; benefits) knowledge.

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Author Contributions:

Anne Links: Ms. Links contributed to the conception and design of the study, developed the oSDB and AT Knowledge scale, conducted analysis and interpretation of the data, drafted and revised the manuscript, approved the final version of the manuscript to be published, and agrees to be accountable for all work.

David Tunkel: Dr. Tunkel contributed to the design and development of the scale, drafted and revised the manuscript, approved the final version of the manuscript to be published, and agrees to be accountable for all work.

Emily Boss: Dr. Boss contributed to the conception and design of the study, developed the oSDB and AT Knowledge scale, revised the manuscript, approved the final manuscript to be published, and agrees to be accountable for all work.

Author access to data: Ms. Links and Dr. Boss had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Conflicts of interest: No authors have any conflicts of interest relevant to this study

These qualitative comments were used to modify the scale, and items >2 reported as misleading or <85% of clinicians answered correctly were eliminated. 5 themes (oSDB symptoms, treatment options, AT risks, anesthesia, and AT benefits) and 39 items comprised the final scale. Experts scored higher than laymen on the *oSDB and AT Knowledge scale* overall (94% vs. 67%; $d = 1.96$, 95% CI [1.05, 2.86]) and within all themes [“Experiences of children with oSDB” (88% vs. 62%; $d = 1.53$, 95% CI [.71, 2.32]), “treatment options” (97% vs. 68%; $d = 1.74$, 95% CI [.88, 2.57]), “AT risks” (97% vs. 59%; $d = 1.94$, 95% CI [1.03, 2.83]), “anesthesia” (97% vs. 79%; $d = 1.09$, 95% CI [.29, 1.88]), “AT benefits” (95% vs. 67%; $d = 1.28$, 95% CI [.46, 2.09])], demonstrating criterion validity. All responses demonstrated high reliability ($\alpha = .93$).

Conclusions and relevance—The *oSDB and AT Knowledge scale* is psychometrically sound for use in assessment of parental knowledge.

Introduction

In recent years there has been focus on improving the quality and impact of patient and family decisions about diagnosis and treatment. Decision quality, “the extent to which treatments reflect the considered preferences of well-informed patients and are implemented,”¹ includes specific facets of decision-making such as patient information and knowledge, concordance with patient goals and preferences, and patient engagement by providers in the decision process². Measurement of knowledge or “the extent to which patients are informed,”² of health conditions and the risks and benefits of treatment options is being increasingly implemented into patient-centered outcomes research to ensure that patients, parents and families are able to make high quality decisions about their care². Patient knowledge measures for conditions, including HIV³, Diabetes⁴, cancer⁵, nutrition⁶, cardiovascular⁷, smoking⁸, and lifestyle/activity,⁹ have been developed and validated, but few exist for conditions in pediatric surgical care.

The emphasis on enhancing patient and family decision quality is particularly significant in areas where there is clinical equipoise, or insufficient evidence to support superiority of two or more treatment alternatives, often seen with elective surgical procedures. Obstructive sleep-disordered breathing (oSDB) occurs in 6–12% of children^{10, 11} and may have significant physical, behavioral, and neurocognitive sequelae^{11–13}. The most common treatment for pediatric oSDB is adenotonsillectomy surgery (AT)¹³. While often effective for improving quality of life and sleep habits¹⁴, AT may also be equivalent to watchful waiting with supportive care in reducing symptoms (i.e., behavioral, neurocognitive)^{14, 15} for patients with mild-moderate oSDB. With more than 500,000 cases performed annually on children in the U.S., AT has been charged with potential overuse.^{16–19} Moreover, surgery with AT bears inherent risks for the child, including painful recovery, dehydration, or postoperative hemorrhage. Parental decision for AT has been associated with significant conflict, or uncertainty about choice of treatment^{20,21,22}; likewise, parents have been shown to have little understanding of potential consequences of adenotonsillar hypertrophy and oSDB²³. Despite the high prevalence of this condition, frequency of surgery, and impact on patients and families, no measure yet exists to assess parental knowledge of oSDB or surgery with AT.

Because assessment of parental knowledge may increase our ability to provide healthcare consistent with family preferences and values, thereby yielding high quality treatment decisions and reducing overuse of elective surgeries, we engaged oSDB stakeholders, inclusive of physicians, parents, and laymen, to develop a measure to assess parent knowledge about oSDB and preparation for AT surgery, titled “the oSDB and AT knowledge scale.”

Methods

This project was approved by the Johns Hopkins Institutional Review Board. The scale was developed based on a sequential development process²⁴, which included steps of construct definition, scale construction, administration, content evaluation, psychometric evaluation, and scale modification (Figure 1)²⁴.

Scale development

Initial scale construction was informed by established techniques for knowledge scale development surrounding other conditions and procedures^{3, 6, 25}. First, we conducted a comprehensive literature review for key studies and research evidence on oSDB, AT, and development of knowledge scales for use in patient-centered outcomes research.^{3, 26} We synthesized findings from the literature review with key themes identified during previously-conducted parent and clinician stakeholder analyses on decision-making for parents of children with SDB²¹. We created a comprehensive pool of potential items related to key elements of parent oSDB and AT questions about treatment of oSDB. These items were categorized into principal themes of: 1) causes of SDB^{21, 27}, 2) symptoms of SDB^{21, 27, 28}, 3) Diagnosis²⁹, 4) treatment options^{14, 15, 21, 30}, 5) consequences of not treating SDB^{14, 31}, 6) anesthesia^{21, 28}, 7) experiences after AT^{14, 15, 32}, 8) risks of AT^{21, 32, 33}, and 9) benefits of AT^{14, 15, 21, 34}. (Table 1).

We subsequently developed a prototype measure containing 85 items in 9 themes, formatted based on the Ottawa Hospital Research Institute’s (OHRI) framework³⁵. OHRI was selected as a model based on its clear organization and accordance with the purpose and scope of the *oSDB and AT Knowledge scale*. According to this framework, a knowledge questionnaire should measure “cognizance of a clinical problem, its alternatives, main benefits, risks and side effects”³⁵. Based on a categorical format dividing true/false statements into overarching themes, the framework specifies a focus on factors important for patient and family decision-making.

Content evaluation—Purposive and snowball sampling was employed. Participants were recruited through professional and parent networks, and subsequently invited additional physicians and laymen to participate³⁶. Feedback was solicited from physician oSDB experts (including both community and academic otolaryngologists in the American Society of Pediatric Otolaryngology’s oSDB interest group), pediatricians, pediatric anesthesiologists, and laymen parents and adults. The scale was posted online via Qualtrics software³⁷ containing 1) the knowledge measure, 2) open-ended, qualitative evaluation questions, and 3) a brief post-survey assessment. In order to maintain anonymity of participants in this small sample and waive consent through the internet-based testing

platform, demographic information was not collected. Although authors recognize this as a limitation in assessing educational and multicultural differentiations, it was considered pertinent to ethically protect participant privacy of the small, non-random sample.

Qualitative evaluation questions asked participants to provide “*comments or suggestions about the questions asked above*” after responding to items on each themes. Participants who did not elaborate on suggest modifications were considered to have found items in applicable themes satisfactory.

Quantitative post-survey evaluations contained multiple choice questions about content (“*Which categories do you believe to be necessary for measuring knowledge?*”) and quality (e.g., clarity of items; organization).

Quantitative post-survey evaluations were analyzed using frequency analysis to verify a majority agreement. Pile sorting methods were used to thematically analyze qualitative feedback for individual items. Responses from laymen participants were evaluated for usability and readability, while expert qualitative evaluation was considered for content modification. Changes proposed by more than one participant led to appropriate edit. Changes brought up by only one participant were evaluated by investigators well-versed in the content matter who reached a consensus in implementing changes. Percent agreement (percent of experts who answered a knowledge item correctly) was used to identify problematic items, and items with less than 85% agreement were eliminated.⁷

Psychometric evaluation

Content validity was established based on previously described evaluations. Criterion validity was established through t-test comparisons of expert and laymen scores on the knowledge measure, testing the hypothesis that experts would yield significantly higher scores. Cohen’s d effect sizes were computed to assess the magnitude of the differences between expert and laymen scores. Cronbach’s alpha was used to assess reliability of responses.

Analyses were first computed for the prototype measure (i.e., all 85 items), and subsequently the final modified measure (i.e., the 33 original items from the prototype, present in the modified *oSDB and AT Knowledge scale*), to assure that psychometric properties would remain consistent after the measure was modified. The score for the final, modified scale included all items of the *oSDB and AT Knowledge scale* except for 6 “false” responses (i.e., untrue statements added to the scale to provide variety in correct responses and improve accurate assessment of knowledge) that had been added following content evaluation, to improve upon previous items (e.g. ringing in ears, heat/cold tolerance; heartburn). Participants received scores for both the cumulative measure (overall knowledge score), and the individual themes (e.g., treatment options). Theme scores were computed for all participants who answered each item in a given category (e.g., “Causes of SDB,” n = 32), and full knowledge scores were computed for participants who answered at least 90% of items and responded to each theme in the cumulative measure (n = 30). Mean substitution was employed for missing data when participants met criteria (i.e., 10% or less of items left

unanswered), such that the mean group (e.g., clinician) response would be substituted for a missing value.

Modification

We abbreviated the final *oSDB and AT Knowledge scale* based on expert evaluation. It contains items considered most important for evaluating knowledge of oSDB and AT, divided into 5 major themes (Table 1). The Flesch-Kincaid test³⁸ confirmed that the measure is under an 8th grade reading level (F-K = 7.7), applicable to parents of diverse educational backgrounds.

Results

Sample

Of 45 identified potential participants, 32 responded to the electronically distributed scale, yielding an estimated response rate of 71% and a final sample of 19 experts and 13 laymen (parents of children who snore, n=8; parents of children who do not snore, n=2; other non-medical health professionals, n=3) overall, and 17 experts and 13 laymen who addressed all 9 themes on the knowledge measure, answering a minimum of 90%. As participants who did not answer every item tended to leave the last three themes unanswered, attrition may have resulted from a scale that seemed too long (85 items subsequently condensed to 39 items). Given the relatively small number of participants, a post hoc sensitivity analysis was conducted to show that the sample size was sufficient and results were valid and reliable to evaluate the *oSDB and AT knowledge scale*. Results demonstrated that a Cohen's d effect size of a minimum of 1.1 would be necessary for a sample of 17 experts and 13 laymen ($\alpha = .05$, Power = .9).

Content validity—The quality of the measure was rated positively: 84% felt it was a good evaluation of knowledge, 94% felt the items were clear, and 97% approved of its organization.

Overall, experts felt the identified themes were important for defining oSDB/AT, illustrating construct validity. The categories valued most highly were outcomes of not treating SDB (95%), experiences after AT (95%), benefits of AT (95%), and possible risks of AT (100%). Causes of SDB were also emphasized (84%), with adequate ratings on symptoms of SDB (79%). Fewer experts emphasized risks of anesthesia (74%), which was retained and justified due to laymen ratings (92%), previous stakeholder analysis emphasizing the role of anesthesia in decision-making²¹, and investigator experience. Themes such as experiences after AT and risks of AT were combined in order to create a shorter measure.

Overall, experts and laymen felt that the items within each themes had appropriate content, with some suggested modifications. Primary changes included rewording the construct (distinguishing between “*snoring*” and “*SDB*”), and removing unnecessary or unrepresentative items (e.g., “*changes in personality or temperament*”). For the most part, laymen felt the readability and usability of the measure was sound, with some suggestions and clarifications of responses (“*is nasal tone of voice short or long term?*”).

A small sample of items fell below the 85% expert agreement threshold, including *weight gain* as a symptom, *personality change* as an experience after surgery, and *monitoring daytime activity* as a diagnostic strategy. A majority of the items experts disagreed on were intended to be “false” responses which had been implemented to provide contrast and accurately assess knowledge (e.g. *chest pain*, *genetics*). All items with <85% consensus were eliminated.

Criterion validity was established through a comparison of knowledge scores of experts and laymen. Experts were hypothesized to have significantly higher knowledge levels on 1) the full prototype, 2) each of the 9 original categories, 3) the full modified *oSDB and AT Knowledge scale*, and 4) each of the 5 themes of the modified scale. All hypotheses were supported.

T-test analyses were performed using a .05 alpha level. Experts scored significantly higher on the prototype knowledge measure than laymen (86% vs. 57%; $d = 2.16$, 95% CI [1.21, 3.09]) and within all themes [“causes” (78% vs. 49%; $d = 1.45$, 95% CI [.65, 2.24]), “symptoms” (85% vs. 52%; $d = 2.05$, 95% CI [1.17, 2.91]), “treatment options” (86% vs. 57%; $d = 1.63$, 95% CI [.79, 2.46]), “diagnosis” (75% vs. 46%; $d = 1.64$, 95% CI [.79, 2.46]), “outcomes without treatment” (79% vs. 48%; $d = 1.69$, 95% CI [.82, 2.53]), “experiences after AT” (86% vs. 58%; $d = 1.37$, 95% CI [.54, 2.18]), “AT risks” (90% vs. 53%; $d = 1.71$, 95% CI [.84, 2.55]), “anesthesia” (98% vs. 82%; $d = 1.10$, 95% CI [.31, 1.88]), and “AT benefits” (90% vs. 53%; $d = 1.93$, 95% CI [1.02, 2.82])]. These differences were repeated and confirmed in the final 39-item *oSDB and AT Knowledge scale*, with experts scoring higher on the knowledge measure than laymen (94% vs. 67%; $d = 1.96$, 95% CI [1.05, 2.86]) and within all themes [“Experiences of children with oSDB” (88% vs. 62%; $d = 1.53$, 95% CI [.71, 2.32]), “treatment options” (97% vs. 68%; $d = 1.74$, 95% CI [.88, 2.57]), “AT risks” (97% vs. 59%; $d = 1.94$, 95% CI [1.03, 2.83]), “anesthesia” (97% vs. 79%; $d = 1.09$, 95% CI [.29, 1.88]), and “AT benefits” (95% vs. 67%; $d = 1.28$, 95% CI [.46, 2.09])]. Analysis results for both the prototype and final measure is presented in Table 2.

Reliability—Reliability was assessed to determine consistency of responses, via Cronbach’s alpha coefficients. Responses from this sample yielded very high reliability on both the prototype measure ($\alpha = .964$) and the modified *oSDB and AT Knowledge scale* ($\alpha = .938$). Reliability was adequate across themes as well (Symptoms: $\alpha = .82$, Treatment Options: $\alpha = .74$, Risks: $\alpha = .82$, Benefits: $\alpha = .84$). The sole exception was anesthesia ($\alpha = .66$). The individual themes were expected to have somewhat lowered alphas, as they each had 5–9 items, as distinct from the 39-item *oSDB and AT Knowledge scale*. Typically, a measure with a greater number of items is more likely to have a higher Cronbach’s alpha³⁹.

Discussion

The *oSDB and AT Knowledge scale* is comprised of 39 items, classified in 5 themes (symptoms of SDB, treatment, risks of AT, anesthesia, benefits of AT; Table 3). Correct answers are summed to attain an overall percentage score representing degree of parent knowledge level. Parents require evidence-based knowledge about the consequences of their child’s condition, the risks and benefits of treatment options inclusive of surgery, and the

conditions under which surgery is performed, to make a high quality decision^{40, 41}. As such, researchers have supported the practicality of measures to assess knowledge of health conditions, and have stressed the importance of promoting patient knowledge overall⁵. These measures have been noted for their capability to a) help the patient understand both the condition itself and the risks and benefits of treatment options, and b) provide them with the tools to participate in decision-making with a full understanding of that decision.⁵ Guides such as the OHRI³⁵ have been established to support the availability of these knowledge assessments, allowing for development of knowledge questionnaires for any condition (e.g., Tamoxifen treatment for breast cancer⁴²; hormone replacement therapy⁴³.

To provide high quality care, clinicians must provide adequate information and ensure parental retention and understanding before decisions are made. To that end, *oSDB and AT Knowledge scale* was developed through a combination of current literature and stakeholder (clinician and parent) analysis. This scale will assist parent experience in decision-making for children with SDB, and will be a useful tool for patient centered outcomes research of AT and oSDB. Several measures have been created to assess the experience and status of children with oSDB, such as measures to evaluate quality of life in children with oSDB (OSA-18⁴⁴) and assist in diagnosis of pediatric oSDB (CAS-15⁴⁵). Another prior measure, the Obstructive Sleep Apnea Knowledge and Attitudes⁴⁶, assesses physician knowledge about OSA. Likewise, measures such as the Epworth Sleepiness Scale⁴⁷, Sleep Disorders Questionnaire⁴⁸, and Pediatric Sleep Questionnaire⁴⁹, evaluate and screen oSDB symptoms and sequelae. To our knowledge, no measure has been developed to inclusively measure parental knowledge of oSDB and AT surgery.

The *oSDB and AT Knowledge scale* may therefore be used in both research and practice to engage parents. Components will further support development and implementation of a decision aid (i.e., material containing scientific information about oSDB and AT to use during medical decision-making) that might assist parents in decision-making for AT. This scale presents the first validated measure to test knowledge of sleep-disordered breathing and adenotonsillectomy for these purposes.

Prior research has demonstrated the importance of patient and family knowledge and preparation in improving satisfaction and care experience and reducing anxiety prior to surgery. Measures which assess knowledge about a specific condition/procedure aid in the development and evaluation of family-centered educational materials, identify gaps in parent or patient knowledge, and guide communication strategies for physicians.⁵⁰ Patient knowledge measures, such as the HIV Treatment Knowledge Scale³ or an unnamed measure to assess knowledge of stroke for high risk patients²⁵ have asserted their use both as an outcome measure and also a clinical teaching tool²⁵. Several multimodal informational programs about general anesthesia for children, including materials which “test” parents to apply knowledge provided by their physicians such as a “drawMD app” or the ADVANCE program, have been described^{51–53}.

In considering validity evaluation, it is noted that the theme of anesthesia contained some discrepancy in expert evaluation and reliability analysis. We retained anesthesia in the *oSDB and AT Knowledge scale* given our prior parent stakeholder analysis that indicated

anesthesia risks were significant issues in parental decision-making²¹. It is possible that less reliability was attained for this themes given that the clinician group was composed primarily of otolaryngologists as opposed to anesthesiologists, who would therefore have more consistent and well-rounded knowledge of oSDB and AT outcomes. Furthermore, reliability analysis for a measure such as the *oSDB and AT Knowledge scale* may have some nuances, as correct responses are reliant on select information provided by physicians or other sources, which may not be consistent for each item. Indeed, the reliability of anesthesia themes suggests that individuals' knowledge and information about anesthesia is more variable than for other aspects of SDB (e.g., symptoms). Reliability analysis of this measure is helpful in supporting the consistency of included items, but validation of the measure was more reliant on content and criterion validity to establish its purpose and use for further studies and contexts. All content evaluations performed for this study are considered to support the integrity and further use of the *oSDB and AT Knowledge scale*.

Limitations and future directions

Although our sample size was adequate for this presented analysis, a larger and more heterogeneous sample may have aided quantitative evaluation. Further, the distribution of the laymen sub-samples (n = 8; 2; 3) might be improved upon: a sample that was better distributed across groups would have been useful for determining between-group differences. Additionally, the laymen sub-sample did not wholly represent the target population of parents of children with SDB deciding on treatment. Due to sampling strategy and size, demographic and background information was not collected from participants. As such it is possible that personal characteristics, including ethnicity, education level or practice setting, may have impacted responses. The authors are currently conducting a prospective study, which includes parents and children of a wide demographic spectrum, where the knowledge scale is used as one outcome measure. The primary purpose of the current paper was to develop and evaluate a usable tool to assess knowledge of oSDB and AT. Staged user testing and analysis which adjusts for specific demographics of parent participants is forthcoming for further validation. It is further noted that evaluation of the psychometric properties of the modified *oSDB and AT Knowledge scale* was performed through a rescoring of responses to the prototype measure, taking only those items present in the final scale into account. In the future, the modified scale should be administered to a new population in isolation, and results should be verified.

Conclusion

The *oSDB and AT Knowledge scale* is considered an operational measure of parental knowledge about sleep-disordered breathing and treatment with adenotonsillectomy. It will be a useful tool in otolaryngic practice and research. Ultimately, the scale will be used to aid patient-centered outcomes research investigating parental perceptions of decision-making in pediatric SDB and associated treatment. Some or all of the scale could also be incorporated into decision support tools for parents of children with SDB when considering treatment options.

Acknowledgements

Sources of Funding: Dr. Boss is supported by grant number K08HS022932 from the Agency for Healthcare Research and Quality. The content is solely the responsibility of the authors and does not necessarily represent the official views of the Agency for Healthcare Research and Quality. Dr. Boss is also supported by the Johns Hopkins Clinician-Scientist Award and the American Society of Pediatric Otolaryngology Career Development Award.

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Figure 1: Steps of oSDB & AT knowledge scale development

A flow chart indicating steps of scale development. To the left of the flow chart, overall purpose for each step of development is presented. To the right of the flow chart, the actions taken at each step are specified.

Table 1:Themes and sample items of prototype measure and final *oSDB and AT Knowledge scale*

<i>Prototype^a</i>		<i>oSDB & AT Knowledge Scale^b</i>	
Theme	Sample Items	Theme	Sample Items
Causes of SDB	<ul style="list-style-type: none"> • Large tonsils • Large adenoids • Low thyroid 	Children who have SDB may have:	<ul style="list-style-type: none"> • Large tonsils and/or adenoids • Bedwetting at night • Gasping or pausing in breathing during sleep
Symptoms of SDB	<ul style="list-style-type: none"> • Bedwetting • Aggressive behavior • Weight gain 		
Diagnosis of SDB	<ul style="list-style-type: none"> • No testing needed • Sleep study • Daytime activity 		
Treatment of SDB	<ul style="list-style-type: none"> • Observation with no active treatment • Tonsillectomy • Adenoidectomy alone 	Some treatment options include:	<ul style="list-style-type: none"> • Monitoring with no medical treatment or surgery • Tonsillectomy and/or adenoidectomy • Nasal steroid spray
Outcomes of not treating SDB	<ul style="list-style-type: none"> • Snoring may get better • Child may have problems at school • Child may behave badly 		
Experiences after surgery	<ul style="list-style-type: none"> • Dehydration • Pain for up to 2 weeks • Bad breath 		
Anesthesia	<ul style="list-style-type: none"> • Nausea or vomiting • Breathing tube • Difficulty waking up 	Concerning anesthesia:	<ul style="list-style-type: none"> • Child will have a breathing tube placed • Serious reactions to anesthesia are very rare • Confusion and agitation upon awakening
Risks of tonsillectomy	<ul style="list-style-type: none"> • Bleeding • Weight gain • Nasal tone of voice 	Problems that children might experience:	<ul style="list-style-type: none"> • Pain for up to 2 weeks • Dehydration • Persistent snoring despite surgery
Benefits of tonsillectomy	<ul style="list-style-type: none"> • Eliminate sleep apnea • Improve behavior • Improve school performance 	Possible benefits include:	<ul style="list-style-type: none"> • Eliminate sleep apnea • Improve behavior • Improvement in grades at school

^aPrototype measure: Causes (n=9), Symptoms (n=13), Diagnosis options (n=6), Treatment options (n = 11), No treatment (n=7), After surgery (n=13), Anesthesia (n=9), Risks (n=8) Benefits (n=9 items)

^bFinal measure: Symptoms (n=9), Treatment options (n=6), Anesthesia (n=5), Risks (n=10), Benefits (n=9)

Table 2:

Comparison of expert and laymen mean scores on prototype measure and final *oSDB and AT Knowledge scale*, for evaluation of criterion validity (n = 32)^a

Theme	Expert score	Laymen score	Effect size (Cohen's <i>d</i>) ^b	95% Confidence Interval
Prototype				
Knowledge score	86%	57%	2.16	1.21, 3.09
Causes	78%	49%	1.45	.65, 2.24
Symptoms	85%	52%	2.05	1.17, 2.91
Diagnosis	75%	46%	1.64	.79, 2.46
Treatment	86%	57%	1.63	.79, 2.46
No treatment^c	79%	48%	1.69	.82, 2.53
After surgery^d	86%	58%	1.37	.54, 2.18
Anesthesia	98%	82%	1.10	.31, 1.88
Risks	90%	53%	1.71	.84, 2.55
Benefits	90%	53%	1.93	1.02, 2.82
Final oSDB & AT				
Knowledge score	94%	67%	1.96	1.05, 2.86
Children with SDB may:	88%	62%	1.53	.71, 2.32
Treatment	97%	68%	1.74	.88, 2.57
Anesthesia	97%	79%	1.09	.29, 1.88
Risks	97%	59%	1.94	1.03, 2.83
Benefits	95%	67%	1.28	.46, 2.09

^a all analyses significant at < .05 alpha level

^b Cohen's *d* effect size is used to demonstrate the magnitude of the difference between expert and laymen scores. Typically .2 is considered a small effect size, .5 a medium effect size, and .8 or greater a large effect size⁵⁴.

^c consequences if SDB goes untreated

^d what child may experience after surgery; with items retained for modified survey

Table 3:The final *oSDB and AT Knowledge Scale*

1) Children who have oSDB may have:			
a) Large tonsils and/or adenoids	True	False	Unsure
b) Difficulty paying attention	True	False	Unsure
c) Trouble learning or poor school performance	True	False	Unsure
d) Bedwetting at night	True	False	Unsure
e) Ringing in ears *	True	False	Unsure
f) Tiredness during the day	True	False	Unsure
g) Overweight or obesity	True	False	Unsure
h) Gasping or pausing in breath during night	True	False	Unsure
i) Low blood pressure *	True	False	Unsure
2) Some treatment options for oSDB in children include:			
a) Monitoring with no medical treatment or surgery	True	False	Unsure
b) Vitamin supplements *	True	False	Unsure
c) Tonsillectomy with/without adenoidectomy	True	False	Unsure
d) Nasal steroid spray or other allergy medications	True	False	Unsure
e) Losing weight	True	False	Unsure
f) Medications that treat anxiety *	True	False	Unsure
3) Problems (risks) that children might experience after adenotonsillectomy surgery include:			
a) Pain for up to 2 weeks, then improvement	True	False	Unsure
b) Missed school during time of recovery	True	False	Unsure
c) Temporary numbness of tongue	True	False	Unsure
d) Heartburn *	True	False	Unsure
e) Bleeding from mouth during first 2 weeks after surgery	True	False	Unsure
f) Dehydration and need to return to the hospital during the first 2 weeks of surgery	True	False	Unsure
g) Long term nasal tone of voice	True	False	Unsure
h) Long term weight gain	True	False	Unsure
i) Temporary or permanent pain in fingers/toes *	True	False	Unsure
j) Persistent snoring or OSA despite surgery	True	False	Unsure
4) Concerning anesthesia given during adenotonsillectomy surgery:			
a) Child will have a breathing tube placed during surgery	True	False	Unsure
b) Child may experience swollen joints *	True	False	Unsure
c) Child could have confusion and agitation on awakening	True	False	Unsure
d) Serious reactions to anesthesia are very rare in healthy children	True	False	Unsure
e) Child could become addicted to pain medicine *	True	False	Unsure
5) Possible benefits of adenotonsillectomy to treat my child's oSDB include:			
a) Less or no snoring	True	False	Unsure
b) May eliminate/cure sleep apnea	True	False	Unsure
c) Child may be more tolerant to heat or cold *	True	False	Unsure
d) Child may have an improvement in grades at school	True	False	Unsure

e) May have improved behavior (less hyperactivity, improved attention)	True	False	Unsure
f) Improvement in bowel habits	True	False	Unsure
g) May have less bed wetting	True	False	Unsure
h) May eliminate seasonal allergies *	True	False	Unsure
i) Child may be less likely to develop heart and lung problems	True	False	Unsure

* To be reversed scored; marked for emphasis: "False items (i.e., untrue statements) will not be asterisked when the scale is administered to participants.