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Developing the PEDIS Pediatric Obstructive Sleep Apnea Screening Tool

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Introduction of the Problem

Obstructive sleep apnea (OSA) is the most common type of apnea in both adults and children. The pediatric prevalence of OSA is 0.7%-3.0% of all children (Garcia et al., 2016). Although a lower prevalence is seen within the pediatric population, when compared to adults, there is a relevant need for an adequate screening tool within the perioperative area because anesthesia resembles a state of sleeping, relaxes the airway, and requires more intense monitoring of a child's airway.

This project was aimed to increase the identification of children who were at risk for obstructive sleep apnea (OSA) in the perioperative period. I was approached by a key stakeholder from a tertiary hospital in central Illinois. The stakeholder stated an adult obstructive sleep apnea screening tool, the widely-used STOP-BANG Questionnaire, was already in use at the hospital, but the institution was lacking a screening tool for OSA within the pediatric population.

Realizing the need for a screening tool in the pediatric population was important because the comorbidities of childhood OSA include increased risk for developing neurocognitive impairment, behavioral problems, failure to thrive, hypertension, cardiac dysfunction, systemic inflammation, and increased health care costs (Kothare et al., 2015). After completing a literature review of all existing pediatric OSA screening tools, the author compiled the data to create a concise, yet evidence-based screening tool for use within the designated hospital.

Literature Review

A literature review of pediatric OSA and screening tools was carried out by searching multiple online journal databases. Polysomnography (PSG) was indicated as the gold standard

for diagnosis of OSA. Many studies based their acceptability of OSA screening tool parameters with reference to a concomitant diagnosis by PSG. These parameters included the detection of enlarged adenoid and tonsil size (Hwang et al., 2013), snoring, and additional manifestations of OSA inclusive of witnessed apneas, nocturnal enuresis, attention deficit disorder, behavioral problems, and inability to concentrate in school (Lerman, 2013). Other characteristics which can increase the likelihood of OSA include obstruction of the retropalatal and retroglossal regions of the oropharynx, craniofacial abnormalities, excess soft tissue, and congenital abnormalities. These congenital abnormalities consist of Pierre-Robin syndrome, Down syndrome, achondroplasia, Prader-Willi syndrome, Klippel-Feil syndrome, Arnold-Chiari malformation type II, maxillary hypoplasia, micrognathia, retrognathia, tracheomalacia, and laryngomalacia (Hines & Marschall, 2018).

A study from East Tennessee State University concluded that if a child's body mass index (BMI) is either less than the fifth percentile or greater than the ninety-fifth percentile, the child should be properly tested for OSA using PSG (Keene et al., 2010). Patients in the outer 10^{th} percentile showed a significantly increased chance of OSA symptoms while at rest and made extreme relaxation, such as during times of anesthesia, challenging.

Within the literature, eight different types of pediatric OSA screening methods were found. These included the Pediatric Sleep Questionnaire (the most common), the OSA-18, and six other screening methods specific to the studies in which they were implicated. Overall, each screening tool had its own strengths and weaknesses. Therefore, multiple segments from many accurate screening tools could potentially be combined in order to build an evidence-based screening tool.

Project Methods

Project Goals

The review of literature revealed that generally screening tools for pediatric OSA contained many questions. Numerous preoperative screening questions may decrease providers' efficiency or willingness when assessing risk factors. The author developed a brief, efficient, and evidence-based screening tool – the PEDIS screening tool – to alert anesthesia providers preoperatively of a child at risk of developing respiratory concerns during the perioperative phase.

Settings

The implementation of the project used a non-experimental design involving the presentation of the constructed PEDIS screening tool to key healthcare providers and stakeholders at the participating tertiary care hospital. The hospital has over thirty rooms for surgical interventions and anesthesia needs. Information during the presentation was delivered in an educational, audiovisual format using a PowerPoint presentation in a meeting room to six key stakeholders within the anesthesia department. The presentation lasted between 15 to 20 minutes long and included time for questions. Following the presentation, an eleven-question survey was distributed for participant completion.

Institutional Review Board

This project involved only the development of the pediatric OSA screening tool and did not involve direct patient interaction. SIUE's Institutional Review Board (IRB) for the protection of human participants and the hospital's Review Committee designated IRB approved the project prior to the presentation. Following approval, the findings of the literature review

along with the PEDIS pediatric OSA screening tool were presented. Results of the survey were analyzed after the presentation.

Evaluation

The PEDIS screening tool was presented to hospital stakeholders. They were educated on literature review findings, development of the PEDIS tool, and asked for comments or approaches for improving the tool. An eleven-question post-presentation survey was distributed to the stakeholders following the educational PowerPoint presentation. The surveys consisted of two sections: section A focusing on demographic information, and section B focusing on the application of the screening tool. The post-presentation survey data was confidentially collected and analyzed. Stakeholders present during presentation consisted of six Certified Registered Nurse Anesthetists (CRNAs), although physicians, registered nurses, and others were invited as well. The results and feedback from the survey participants underscored what is most important to the healthcare providers who may use this very screening tool in the foreseeable future. Their feedback and suggestions were necessary and may allow for future improvements and revisions of the screening tool.

Although the post-education surveys were important and collected important information, some limitations of the screening tool were discovered. Questions three through five are easily discernible and include having a congenital abnormality; displaying daytime irritability, tiredness, or fatigue; or snoring while sleeping. Survey participants did not indicate an issue with those questions. However, participants did identify questions one and two may require supplemental references for the healthcare provider to discern the BMI percentile and Brodsky tonsillar grading. If the BMI chart available from the CDC is the only standard BMI percentile

chart nationally available, it was indicated the PEDIS screening tool can only be used for children two years old and greater.

Possibly the largest limitation during implementation was the small sample size of those who returned post-implementation surveys. All who received the survey returned a completed survey. However, these six anesthesia providers represented a small sample size (10.7%) relative to the 56 total anesthesia providers in the unit – 38 CRNAs and 18 anesthesiologists. All participants present during education showed great interest in the screening tool and were eager to help improve the tool and identify possible barriers to its use. The results of the survey showed promise for the PEDIS pediatric OSA screening tool. All six (100%) of the participants answered "yes" to question eleven, indicating they support adoption of the PEDIS OSA screening tool. Evaluation criteria before implementation predicted a positive evaluation if greater than 80% of key stakeholders in attendance supported adoption of the screening tool. This goal was surpassed with 100% of the participants supporting adoption.

Impact on Practice

The PEDIS screening tool has had no immediate impact on practice at its implementation hospital. Short-term support was shown by all stakeholders and participants during the educational presentation of the screening tool. However, for it to be implemented on a hospital-wide, long-term basis, more stakeholders need to be contacted in order to gauge whether long-term support will be demonstrated. These stakeholders include physician department heads, hospital administrators, and physician anesthesiologists. Many in this group were invited to the educational presentation but were unable to attend. The lead physician anesthesiologist of the operating room department attended the presentation for a few minutes, but quickly received a phone call and had to leave.

A formal follow-up, which evaluates and analyzes statistical data post implementation of the tool, is out of the scope of this project due to time constraints. However, the predicted long-term impact on the hospital is the full implementation and appropriate use of the PEDIS screening tool as the hospital's primary perioperative screening tool for pediatric OSA. Any revisions should be made carefully using suggestions from the post-presentation surveys along with continued evidence-based literature support.

Conclusions

The implementation of the PEDIS screening tool has the potential for adoption. Support for the initial screening tool was demonstrated by all participants in attendance during the educational presentation. Approval from certain department heads, physician anesthesiologists, and hospital administrators will be required before final approval.

The prospective hospital has not yet agreed upon implementation of the screening tool in daily practice. A future student, who would be willing to follow and build upon the research presented, may be able to continue this project. This may include implementing the screening tool, collecting initial data, and analyzing the collected data.

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