SAOS en anestesia pediátrica

Belén De José María
bdejosemaria@gmail.com
Departament d'Anestesiologia pediàtrica

24 de Enero de 2017

SAOS

- Síndrome de la apnea obstructiva del sueño:
  - episodios recurrentes
  - obstrucción parcial o completa vía aérea
  - durante el sueño
    - hipoxemia
    - hipercapnia
    - alteración del sueño

Review Article

CME Perioperative Management of Children with Obstructive Sleep Apnea

Deborah A. Schwengel, MD*†

Laura M. Sterni, MD†

David E. Tunkel, MD*†‡

Eugenie S. Heitmiller, MD*†

Obstructive sleep apnea syndrome (OSA) affects 1%–3% of children. Children with OSA can present for all types of surgical and diagnostic procedures requiring anesthesia, with adenotonsillectomy being the most common surgical treatment for OSA in the pediatric age group. Thus, it is imperative that the anesthesiologist be familiar with the potential anesthetic complications and immediate postoperative problems associated with OSA. The significant implications that the presence of OSA imposes on perioperative care have been recognized by national medical professional societies. The American Academy of Pediatrics published a clinical practice guideline for pediatric OSA in 2002, and cited an increased risk of anesthetic complications, though specific anesthetic issues were not addressed. In 2006, the American Society of Anesthesiologists published a practice guideline for perioperative management of patients with OSA that noted the pediatric-related risk factor of obesity, and the increased perioperative risk associated with adenotonsillectomy in children younger than 3 yr. However, management of OSA in children younger than 1 yr-of-age was excluded from the guideline, as were other issues related specifically to the pediatric patient. Hence, many questions remain regarding the perioperative care of the child with OSA.

In this review, we examine the literature on pediatric OSA, discuss its pathophysiology, current treatment options, and recognized approaches to perioperative management of these young and potentially high-risk patients.

(Anesth Analg 2009;109:60–75)

Diferencias niños / adultos

Table 1. Childhood Versus Adult Obstructive Sleep Apnea Syndrome Features

	Children	Adults
Presentation		
Age	2–6-yr peak	Increased elderly
Gender	Male = female	Males > females
Obesity	Few	Most
Tonsils and adenoids	Often enlarged	Rarely enlarged
Daytime sleepiness	Less common than in adults but can be seen	Common
Sleep		
Obstruction	Obstructive apnea or hypoventilation	Obstructive apnea
Sleep architecture	Usually normal	Decreased delta and REM
Arousals with obstruction	May not be seen	At end of each apnea
Treatment		
Surgical	Definitive therapy in most patients	Minority of cases with inconsistent results
Medical (positive airway pressure)	Selected patients	Most common therapy

Adapted from Stemi and Tunkel, Pediatr Clin North Am 2003;50:427–43.
REM = rapid eye movement.

Obstrucciones durante fase REM

REM

- Respiración irregular
- Hipotonia musculatura vía aérea
- Disminución respuesta a
  - Hipercapnia
  - Hipoxia
  - Obstrucción de via aérea
- Los padres a veces no detectan la apnea

Gold standard DX= polysomnography

Table 3. Respiratory Events that can be Seen During Polysomnography

Event	Definition
Central apnea	Pause in airflow with absent respiratory effort, scored when >20 s or two missed breaths and a >3% drop in oxygen saturation
Obstructive apnea	>90% reduction of airflow despite continuing respiratory effort, scored when event lasts at least two missed breaths in children
Obstructive hypopnea	>50% reduction of airflow with associated with respiratory effort, scored when at least two missed breaths and >3% drop in oxygen saturation or arousal
Mixed apneas	≥90% reduction in airflow, lasting at least two missed breaths, and containing absent respiratory effort initially (a central apneic pause), followed by resumption of respiratory effort without a resumption of airflow (an obstructive apnea)
Obstructive hypoventilation	End-tidal CO_2 >50 mm Hg for >25% of the total sleep time with paradoxical respirations, snoring, and no baseline lung disease

Se requiere experiencia en la realización e interpretación en pacientes pediátricos

Dx

- AHI: apnea-hypopnea index
- RDI: respiratory distress index

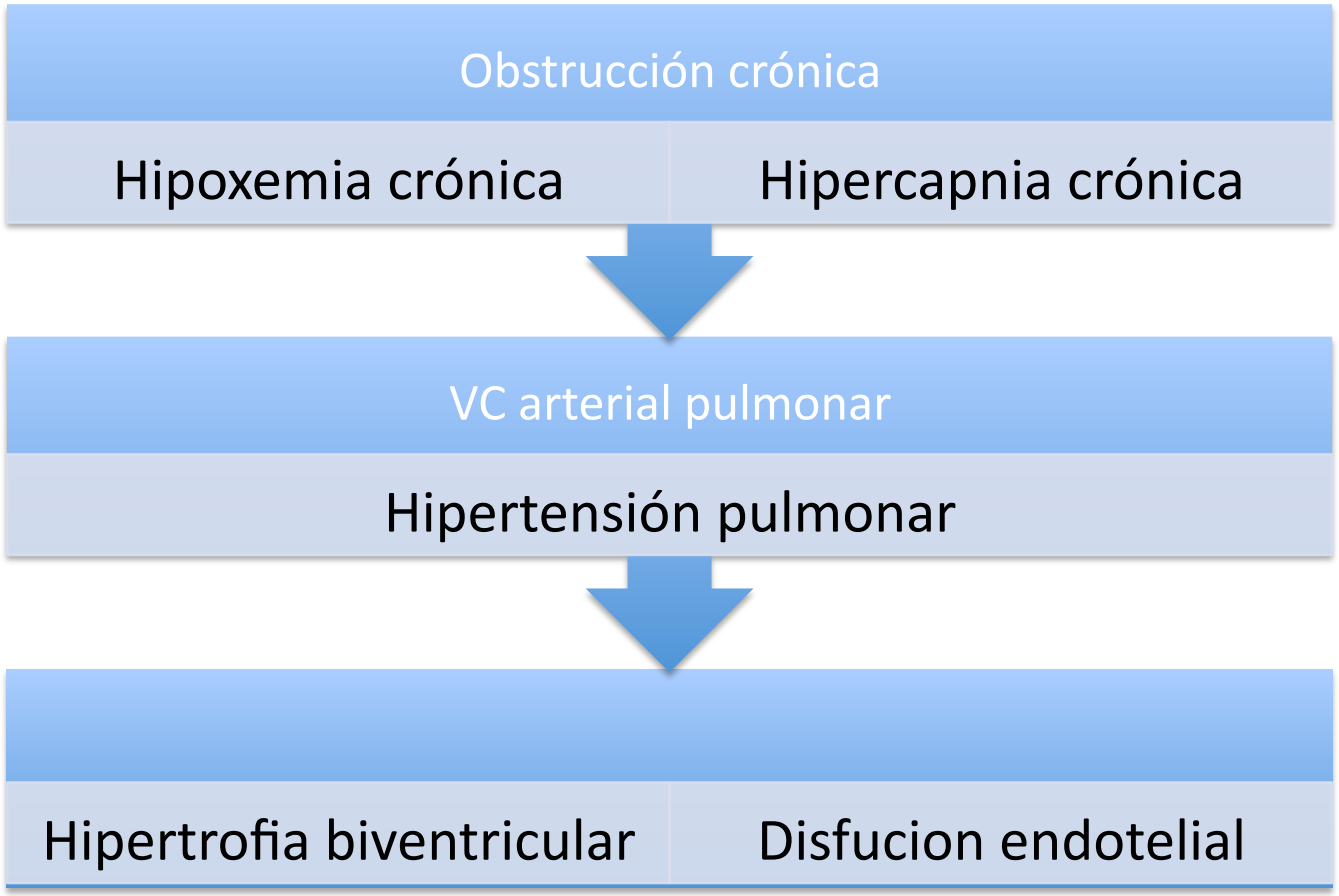
- Solo eventos obstructivos, no apneas centrales

- Impresión clínica global
- nº obstrucciones/hora
- Duración de ETCO2 elevado
- Frecuencia y severidad desaturaciones

Fisiopatología

- ORL:
  - Hipertrofia adenoamigdalar
  - Rinitis alérgica
  - Desviación septal
- Malformaciones craniofaciales, macroglosia
- Genética: sdme muerte súbita, raza
- Obesidad
- Hipotonía neuromuscular

Fisiopatología



Edema pulmonar agudo postobstrucción VA

Tratamiento

- Adeno-amigdalotomia
  - Reducción amigdalar con radiofrecuencia
  - Amigdalectomia intracapsular

- Uvulopalatofaringoplastia
- Reduccion lingual, glosopexia
- Distracción mandibular
- CPAP / BiPAP

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European Annals of Otorhinolaryngology, Head and Neck diseases (2012) 129, 264–271

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SFORL GUIDELINES

Pediatric tonsillectomy: Clinical practice guidelines

E. Lescanne*, B. Chiron, I. Constant, V. Couloigner, B. Fauroux, Y. Hassani, L. Jouffroy, V. Lesage, M. Mondain, C. Nowak, G. Orliaguet, A. Viot , French Society of ENT (SFORL)French Association for Ambulatory Surgery (AFCA), French Society for Anaesthesia, Intensive Care (SFAR),

Sant Joan de Déu
Barcelona · Hospital

European Annals of Otorhinolaryngology, Head and Neck diseases (2012) 129, 264–271

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Method: The French Society of ENT (SFORL), in partnership with the French Association for Ambulatory Surgery (AFCA) and French Society for Anaesthesia and Intensive Care (SFAR), set up a representative panel in the fields of anesthesiology, ENT and head-and-neck surgery, pediatrics, sleep medicine and general medicine. Following the literature analysis reported in the Presentation of the Guidelines, recommendations were drawn up taking account of risk/benefit ratios, levels of evidence, feasibility in pediatric tonsillectomy and baseline risk assessment in the relevant population.

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Question 1: What are the indications for tonsillectomy?

Question 2: What pre-operative assessment is needed?

Question 3: What are the technical principles?

Question 4: What are the selection criteria for ambulatory management?

Question 5: How should follow-up be organized?

Question 6: How should complications be managed?

Question 2: What pre-operative assessment is needed?

Assessment of respiratory risk

Clinical assessment of peri-operative respiratory risk. In tonsillectomy, especially for obstructive tonsillar hypertrophy, it is recommended to explore for signs of obstruction severity.

Tonsillectomy with or potentially with associated respiratory risk is defined by the presence of ≥ 1 of the following criteria:

- age < 3 years (high level of evidence);
- craniofacial or UA malformation (high level of evidence);
- neuromuscular disease with pharyngeal hypotonia (high level of evidence);
- signs of right heart failure and elevated pulmonary arterial pressure (high level of evidence);
- morbid obesity (high level of evidence);
- metabolic disease with UA submucosal conjunctive tissue infiltration (medium level of evidence);
- respiratory disease following recent upper or lower respiratory tract infection with bronchial hyper-reactivity (very low level of evidence).

Question 4: What are the selection criteria for ambulatory management?

Medical criteria
Ambulatory tonsillectomy is feasible if the child:

- is aged more than 3 years;
- is ASA class I or II;
- is free of comorbidity liable to exacerbate the respiratory risks;
- is free of hemostasis abnormality.

In-patient admission is recommended in case of 1 or more of the following criteria:

- clinical criteria for peri-operative respiratory risk;
- hemostasis abnormality;
- respiratory difficulty on anesthesia induction or at awakening in the recovery room: cross-over from ambulatory to in-patient surgery is then recommended.

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Society for Pediatric Anesthesia

(Anesth Analg 2014;118:1276–83)

Section Editor: Peter J. Davis

CME

Death or Neurologic Injury after Tonsillectomy in Children with a Focus on Obstructive Sleep Apnea: Houston, We Have a Problem!

Charles J. Coté, MD,* Karen L. Posner, PhD,† and Karen B. Domino, MD, MPH†

Sant Joan de Déu
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RESULTS: A total of 129 cases were identified from the 731 replies to the survey, with 92 meeting inclusion criteria for having adequate data. Another 19 cases with adequate data were identified from the 45 from the American Society of Anesthesiologists Closed Claims Project. A total of 111 cases were included in the final analysis. Death and permanent neurologic injury occurred in 86 (77%) cases and were reported in the operating room, postanesthesia care unit, on the ward, and at home. Sixty-three (57%) children fulfilled American Society of Anesthesiologists criteria to be at risk for OSA. Children categorized as at risk for OSA were more likely than other children to be obese and to have comorbidities ($P < 0.0001$). A larger proportion of at risk children had the event attributed to apnea ($P = 0.016$), whereas all others had a larger proportion of events attributed to hemorrhage ($P = 0.006$).

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CME

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Charles J. Coté, MD,* Karen L. Posner, PhD,† and Karen B. Domino, MD, MPH†

CONCLUSIONS: Deaths or neurologic injury after tonsillectomy due to apparent apnea in children suggest that at least 16 children could have been rescued had respiratory monitoring been continued throughout first- and second-stage recovery, as well as on the ward during the first postoperative night. A validated pediatric-specific risk assessment scoring system is needed to assist with identifying children at risk for OSA who are not appropriate to be cared for on an outpatient basis. (Anesth Analg 2014;118:1276–83)

REVIEW

CURRENT OPINION

Anesthesiological considerations for children with obstructive sleep apnea

Volume 28 • Number 3 • June 2015

Charles J. Coté

SJD Sant Joan de Déu Barcelona · Hospital

REVIEW

CURRENT OPINION

Anesthesiological considerations for children with obstructive sleep apnea

Volume 28 • Number 3 • June 2015

Charles J. Coté

Sensitividad a opioides x variabilidad en
citocromo CYP 2D6
conversión de codeína a morfina
de hidrocodona a hidromorfona

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REVIEW

CURRENT OPINION

Anesthesiological considerations for children with obstructive sleep apnea

Volume 28 • Number 3 • June 2015

Charles J. Coté

Summary

Perioperative deaths in children with OSA occur at a low frequency. Hypoxia-induced opioid sensitivity combined with an approximate 1–2% incidence of rapid conversion of codeine to morphine suggest the need for new approaches for providing preoperative assessment of risk, extended postoperative observation and the need for alternative opioids to codeine. Additionally, new less painful surgical approaches may help to reduce postoperative opioid requirements and therefore perhaps less risk for opiate-induced apnea in this vulnerable population.

Published in final edited form as:

Otolaryngol Head Neck Surg. 2014 December ; 151(6): 1046–1054. doi:10.1177/0194599814552059.

Predictors of Perioperative Complications in Higher Risk Children after Adenotonsillectomy for Obstructive Sleep Apnea: A Prospective Study

Anchana Thongyam, MD[1,2,3], **Carole L. Marcus, MBBCh**[1], **Justin L. Lockman, MD**[4], **Mary Anne Cornaglia**[1], **Aviva Caroff**[5], **Paul R. Gallagher, MA**[6], **Justine Shults, PhD**[6], **Joel T. Traylor, RPSGT**[1], **Mark D. Rizzi, MD**[5], and **Lisa Elden, MD**[5]

Published in final edited form as:

Otolaryngol Head Neck Surg. 2014 December ; 151(6): 1046–1054. doi:10.1177/0194599814552059.

Predictors of Perioperative Complications in Higher Risk Children after Adenotonsillectomy for Obstructive Sleep Apnea: A Prospective Study

Objective—Retrospective studies have limitations in predicting perioperative risk following adenotonsillectomy in children with obstructive sleep apnea syndrome (OSAS). Few prospective studies exist. We hypothesized that demographic and polysomnographic (PSG) variables would predict respiratory and general perioperative complications.

Study Design—Prospective, observational cohort study.

Setting—Pediatric tertiary center.

Subjects and Methods—Consecutive children undergoing adenotonsillectomy for OSAS within 12 months of PSG were evaluated for complications occurring within 2 weeks of surgery.

Published in final edited form as:

Otolaryngol Head Neck Surg. 2014 December ; 151(6): 1046–1054. doi:10.1177/0194599814552059.

Predictors of Perioperative Complications in Higher Risk Children after Adenotonsillectomy for Obstructive Sleep Apnea: A Prospective Study

Conclusion—Thus, PSG predicted perioperative respiratory, but not nonrespiratory, complications in children with OSAS. Age <3 years or black race are high-risk factors. Present guidelines have limitations in determining the need for postoperative admission.

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Pediatric Anesthesia

Pediatric Anesthesia **26** (2016) 831–837

RESEARCH REPORT

Predictors of unanticipated admission following ambulatory surgery in the pediatric population: a retrospective case–control study

Amanda Whippey, Gregory Kostandoff, Heung K. Ma, Ji Cheng, Lehana Thabane & James Paul

Department of Anesthesia, McMaster University, Hamilton, ON, Canada

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Barcelona · Hospital

Pediatric Anesthesia

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Department of Anesthesia, McMaster University, Hamilton, ON, Canada

Background: Ambulatory surgery plays an important role in pediatric anesthesia. However, it is difficult to predict which patients will experience complications. Age >80, ASA class 3 or 4, duration of surgery >3 h, and BMI 30–35 are independent predictors of unanticipated admission in adults. In this study, we retrospectively evaluate risk factors for unanticipated admission, following ambulatory surgery in children.

Methods: All ambulatory patients requiring unanticipated admission between 2005 and 2013 were compared to a random sample of patients not requiring admission in this case–control study. Demographic data, surgical information, medications, intraoperative events, and patient comorbidities were collected from both groups. The reason for admission was classified according to five subtypes. Multiple conditional logistic regression was used to assess factors associated with unanticipated admissions.

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Pediatric Anesthesia

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Department of Anesthesia, McMaster University, Hamilton, ON, Canada

Conclusion: The incidence of unanticipated admission in children following ambulatory surgery is low. Age, ASA class, duration, and time of completion of surgery are predictors common to pediatrics and adults. Interestingly, intraoperative complications, OSA, and type of surgery (ENT, orthopedic, dental) are specific to pediatrics.

The Laryngoscope

***Laryngoscope*, 126:270–284, 2016**

Systematic Review

The Effects of Anesthesia and Opioids on the Upper Airway: A Systematic Review

Zarmina Ehsan, MD; Mohamed Mahmoud, MD; Sally R. Shott, MD; Raouf S. Amin, MD; Stacey L. Ishman, MD, MPH

The Laryngoscope

***Laryngoscope*, 126:270–284, 2016**

Systematic Review

The Effects of Anesthesia and Opioids on the Upper Airway: A Systematic Review

Zarmina Ehsan, MD; Mohamed Mahmoud, MD; Sally R. Shott, MD; Raouf S. Amin, MD; Stacey L. Ishman, MD, MPH

Objectives/Hypothesis: Drug-induced sleep endoscopy (DISE) is used to determine surgical therapy for obstructive sleep apnea (OSA); however, the effects of anesthesia on the upper airway are poorly understood. Our aim was to systematically review existing literature on the effects of anesthetic agents on the upper airway.

The Laryngoscope

***Laryngoscope*, 126:270–284, 2016**

Systematic Review

The Effects of Anesthesia and Opioids on the Upper Airway: A Systematic Review

Zarmina Ehsan, MD; Mohamed Mahmoud, MD; Sally R. Shott, MD; Raouf S. Amin, MD; Stacey L. Ishman, MD, MPH

Conclusions: Studies assessing the effect of anesthesia on the upper airway in patients with and without OSA are limited, and few compare effects between agents. Medications with minimal effect on respiratory control (e.g., dexmedetomidine) may work best for DISE.

Pediatric Anesthesia

Pediatric Anesthesia 2010 **20**: 506–515 doi:10.1111/j.1460-9592.2010.03311.x

Effect of increasing depth of dexmedetomidine anesthesia on upper airway morphology in children

MOHAMED MAHMOUD MD*, RUPA RADHAKRISHMAN MBBS†, JOEL GUNTER MD*, SENTHILKUMAR SADHASIVAM MD, MPH*, ANDREW SCHAPIRO BS†, JOHN McAULIFFE MD, MBA*, DEAN KURTH MD*, YU WANG MS‡, TODD G. NICK PhD‡ AND LANE F. DONNELLY MD†

*Departments of *Anesthesiology and †Radiology and ‡Division of Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA*

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Barcelona · Hospital

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*Departments of *Anesthesiology and †Radiology and ‡Division of Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA*

Aim: To determine the effect of increasing doses of dexmedetomidine on static and dynamic magnetic resonance (MR) images of the upper airway in spontaneously breathing children with no OSA.

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Pediatric Anesthesia

Pediatric Anesthesia 2010 **20**: 506–515 doi:10.1111/j.1460-9592.2010.03311.x

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*Departments of *Anesthesiology and †Radiology and ‡Division of Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA*

Conclusion: Upper airway changes associated with increasing doses of dexmedetomidine in children with no OSA are small in magnitude and do not appear to be associated with clinical signs of airway obstruction. Even though these changes are small, all precautions to manage airway obstruction should be taken when dexmedetomidine is used for sedation.

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Pediatric Anesthesia

Pediatric Anesthesia 26 (2016) 742–751

RESEARCH REPORT

Comparison of the combination of dexmedetomidine and ketamine to propofol or propofol/sevoflurane for drug-induced sleep endoscopy in children

Ali Kandil[1], Rajeev Subramanyam[1], Mohamed Monir Hossain[2], Stacey Ishman[3,4,5], Sally Shott[3,4], Anurag Tewari[1] & Mohamed Mahmoud[1]

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Pediatric Anesthesia

Pediatric Anesthesia 26 (2016) 742–751

RESEARCH REPORT

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Aim: Examination of dynamic airway collapse in patients with obstructive sleep apnea (OSA) during drug-induced sleep endoscopy (DISE) can help identify the anatomic causes of airway obstruction. We hypothesized that a combination of dexmedetomidine and ketamine (Group DK) would result in fewer oxygen desaturations and a higher successful completion rate during DISE in children with OSA when compared to propofol (Group P) or sevoflurane/propofol (Group SP).

Methods: In this retrospective study, we reviewed the records of 59 children who presented for DISE between October 2013 and March 2015. Data analyzed included demographics, OSA severity, and hemodynamics (heart rate and blood pressure). The primary outcomes were airway desaturation during DISE to <85% and successful completion of DISE; these were compared between the three groups: DK, P, and SP.

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Pediatric Anesthesia

Pediatric Anesthesia 26 (2016) 742–751

RESEARCH REPORT

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Ali Kandil[1], Rajeev Subramanyam[1], Mohamed Monir Hossain[2], Stacey Ishman[3,4,5], Sally Shott[3,4], Anurag Tewari[1] & Mohamed Mahmoud[1]

Conclusions: These results suggest that the described dose regimen of propofol used alone or in combination with sevoflurane appears to be associated with more oxygen desaturations and a lower rate of successful completion than a combination of dexmedetomidine and ketamine during DISE in children with OSA.

REVIEW

CURRENT OPINION

Sleep, sleep studies and sleep-disordered breathing: basic knowledge for the anesthesiologist

Curr Opin Anesthesiol 2017, 30:163–167

Andrew P. Hall[a,b]

SJD Sant Joan de Déu Barcelona · Hospital

REVIEW

Sleep, sleep studies and sleep-disordered breathing: basic knowledge for the anesthesiologist

Curr Opin Anesthesiol 2017, 30:163–167

Andrew P. Hall[a,b]

Purpose of review

To provide a basic understanding of sleep physiology, the pathophysiology of sleep-disordered breathing and the processes applied in undertaking and assessing sleep studies.

Summary

This review describes the physiology of sleep including sleep stages, sleep monitoring, the normal hypnogram and investigation from simple overnight pulse oximetry to full polysomnography. The pathophysiology of sleep-disordered breathing is discussed; from simple snoring through obstructive sleep apnoea to obesity hypoventilation syndrome. The relationship to metabolic syndrome is explored. Salient points in the interpretation of sleep study reports are presented.

REVIEW

CURRENT OPINION

Sleep, sleep studies and sleep-disordered breathing: basic knowledge for the anesthesiologist

Curr Opin Anesthesiol 2017, 30:163–167

Andrew P. Hall[a,b]

CONCLUSION

Finally it should be remembered that AHI/ODI and mean pulse oximetry saturation figures alone provide only an indication of possible problems. Variation in comorbid conditions along with the nature of intended surgery and the range of healthcare facilities available mean that there is no mathematical assessment to clearly predict difficulty and dictate care requirements. It remains important that each individual is fully assessed by an experienced anaesthetist when planning perioperative care management [3,4].

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SCIENTIFIC INVESTIGATIONS

JCSM
Journal of Clinical Sleep Medicine

J Clin Sleep Med 2015;11(7):751–755.

Screening for Pediatric Obstructive Sleep Apnea before Ambulatory Surgery

Stacey L. Ishman, MD, MPH[1,2,3,*]; Kareem O. Tawfik, MD[3,*]; David F. Smith, MD, PhD[1]; Kristin Cheung, MD[4]; Lauren M. Pringle, MD[5]; Matthew J. Stephen, BS[6]; Tiffany L. Everett, MPH[6]; Tracey L. Stierer, MD[4]

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SCIENTIFIC INVESTIGATIONS

JCSM
Journal of Clinical Sleep Medicine

J Clin Sleep Med 2015;11(7):751–755.

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Purpose: The American Society of Anesthesia practice guidelines recommend that pediatric and adult patients who undergo ambulatory surgery be screened for obstructive sleep apnea (OSA). With this in mind, our objective was to assess the frequency of screening by anesthesia providers for the signs and symptoms of OSA in children undergoing surgery in an ambulatory setting.

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SCIENTIFIC INVESTIGATIONS

JCSM
Journal of Clinical Sleep Medicine

J Clin Sleep Med 2015;11(7):751–755.

Screening for Pediatric Obstructive Sleep Apnea before Ambulatory Surgery

Stacey L. Ishman, MD, MPH[1,2,3,*]; Kareem O. Tawfik, MD[3,*]; David F. Smith, MD, PhD[1]; Kristin Cheung, MD[4]; Lauren M. Pringle, MD[5]; Matthew J. Stephen, BS[6]; Tiffany L. Everett, MPH[6]; Tracey L. Stierer, MD[4]

Conclusion: OSA was not routinely screened for by anesthesia providers prior to ambulatory pediatric surgery. When screening did occur, "snoring" was the most commonly recorded symptom. Paradoxically, patients with undiagnosed OSA who would benefit the most from screening were the least likely to be screened.

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A Matched Cohort Study of Postoperative Outcomes in Obstructive Sleep Apnea

Could Preoperative Diagnosis and Treatment Prevent Complications?

Thomas C. Mutter, M.D., F.R.C.P.C., M.Sc., Dan Chateau, Ph.D., Michael Moffatt, M.D., F.R.C.P.C., M.Sc., Clare Ramsey, M.D., F.R.C.P.C., M.S., Leslie L. Roos, Ph.D., Meir Kryger, M.D., F.R.C.P.C.

Background: Obstructive sleep apnea (OSA) is associated with increased risk of postoperative complications. The authors investigated whether preoperative diagnosis and prescription of continuous positive airway pressure therapy reduces these risks.

Conclusions: Diagnosis of OSA and prescription of continuous positive airway pressure therapy were associated with a reduction in postoperative cardiovascular complications. Despite limitations in the data, these results could be used to justify and inform large efficacy trials of perioperative continuous positive airway pressure therapy in OSA patients.
(ANESTHESIOLOGY 2014; 121:707-18)

REVIEW

CURRENT OPINION

Obesity hypoventilation syndrome, sleep apnea, overlap syndrome: perioperative management to prevent complications

Volume 29 • Number 00 • Month 2016

Raviraj Raveendran[a], *Jean Wong*[b], *Mandeep Singh*[b], *David T. Wong*[b], *and Frances Chung*[b]

Sant Joan de Déu
Barcelona · Hospital

REVIEW

CURRENT OPINION

Obesity hypoventilation syndrome, sleep apnea, overlap syndrome: perioperative management to prevent complications

Volume 29 • Number 00 • Month 2016

Raviraj Raveendran[a], *Jean Wong*[b], *Mandeep Singh*[b], *David T. Wong*[b], *and Frances Chung*[b]

Recent findings

OHS and overlap syndrome are associated with significant comorbid conditions and more perioperative morbidity than OSA alone. Similar to OSA, most of the OHS patients are undiagnosed. An increase in serum bicarbonate level is a surrogate marker of hypercapnia. Because 90% of OHS patients have OSA, preoperative screening for OSA combined with estimation of serum bicarbonate level may detect the majority of the patients with OHS. In patients with OSA, OHS, and overlap syndrome, improvement in the perioperative outcome has been shown by initiating positive airway pressure therapy.

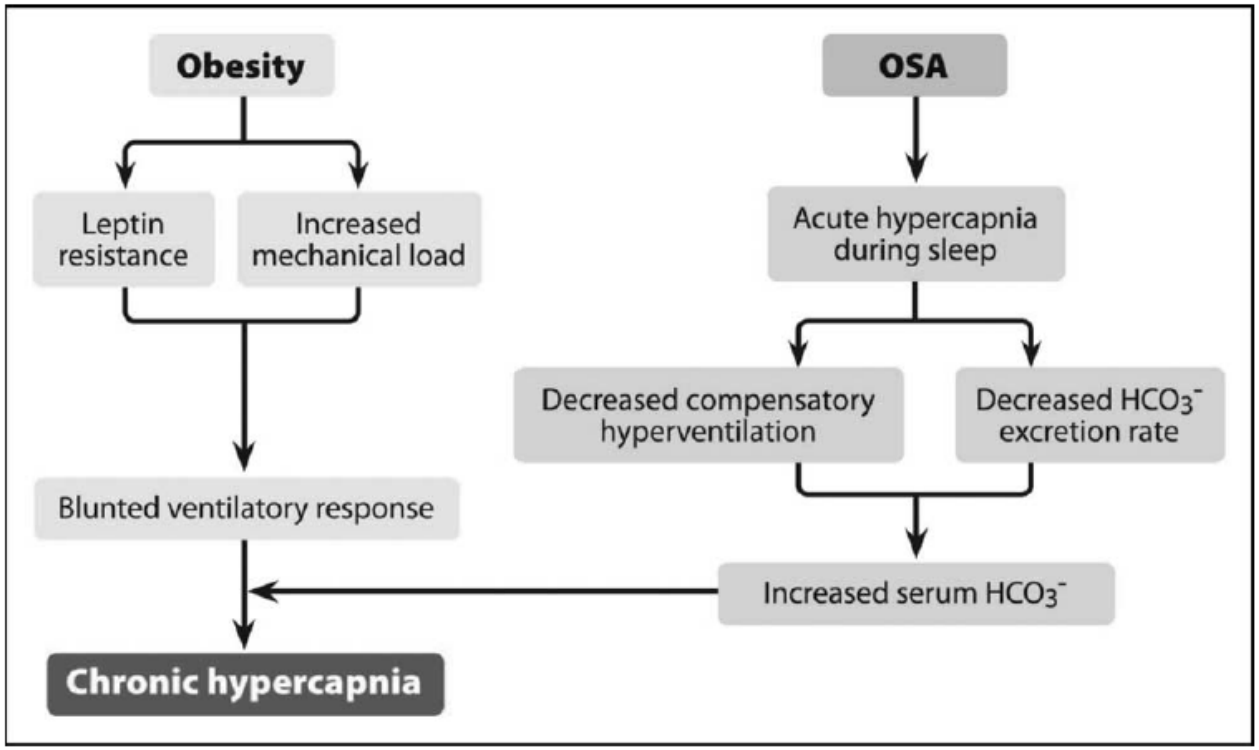

FIGURE 1. Mechanisms by which obesity and OSA result in chronic hypercapnia. OSA, obstructive sleep apnea.

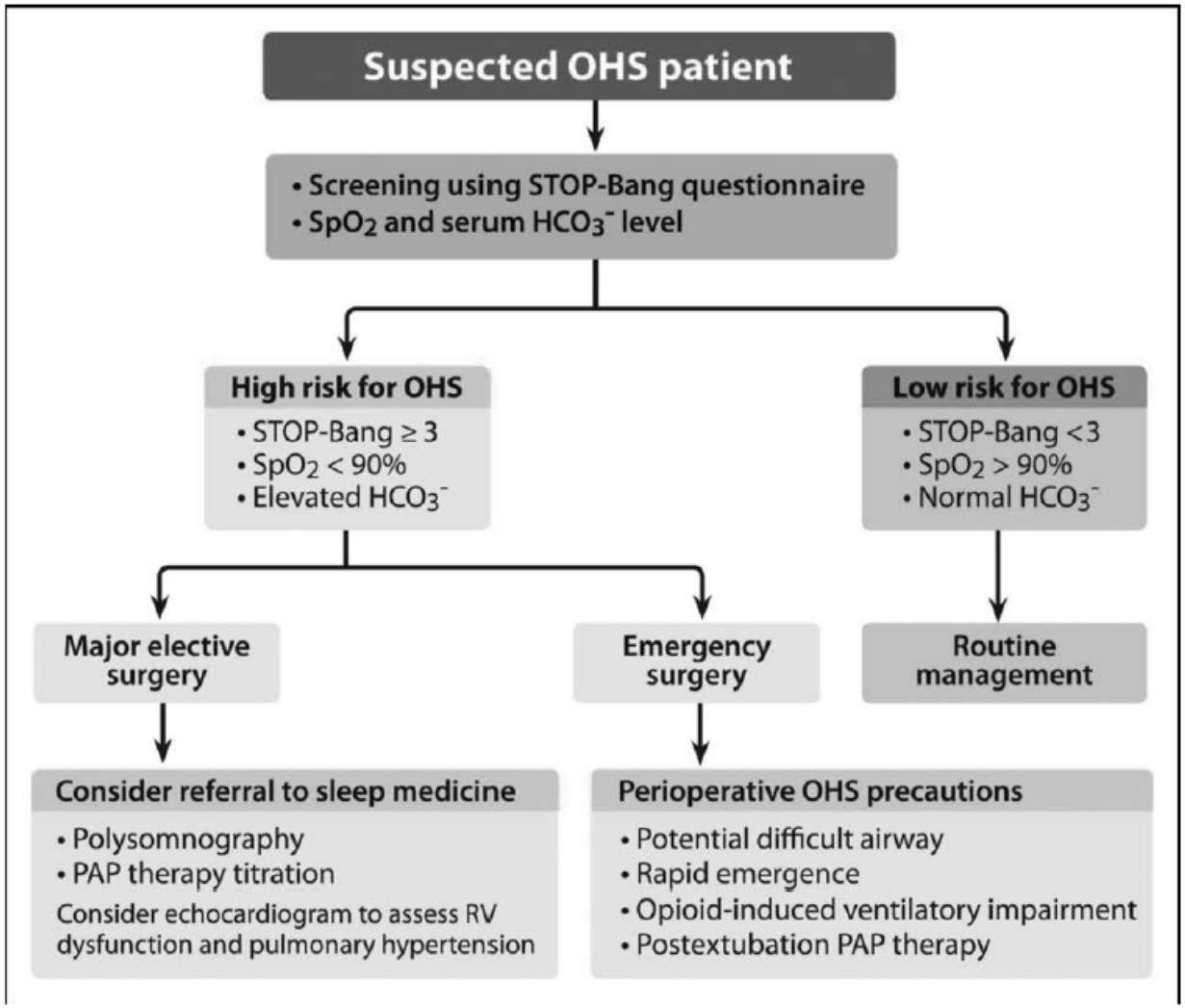

FIGURE 2. Perioperative management of the patient suspected to have OHS. OHS, obesity hypoventilation syndrome; PAP, positive airway pressure.

Table 2. STOP-Bang Questionnaire

		Snoring?
Yes	No	Do you snore loudly (loud enough to be heard through closed doors or your bed-partner elbows you for snoring at night)?
		Tired?
Yes	No	Do you often feel tired, fatigued, or sleepy during the daytime (such as falling asleep during driving)?
		Observed?
Yes	No	Has anyone observed you stop breathing or choking/gasping during your sleep?
		Pressure?
Yes	No	Do you have or are being treated for high blood pressure?
Yes	No	BMI more than 35 kg/m^2?
Yes	No	Age older than 50 years old?
		Neck size large? (measured around Adams apple)
Yes	No	For male, is your shirt collar 17 inches or larger?
		For female, is your shirt collar 16 inches or larger?
Yes	No	Gender = male?

Scoring criteria.
For general population:
Low risk of OSA: Yes to 0–2 questions
Intermediate risk of OSA: Yes to 3–4 questions
High risk of OSA: Yes to 5–8 questions
Yes to 2 of 4 STOP questions + individual's gender is male
Yes to 2 of 4 STOP questions + BMI > 35 kg/m^2
Yes to 2 of 4 STOP questions + neck circumference male 17″ Female 16″
www.stopbang.ca
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CLINICAL REVIEW

Obstructive Sleep Apnea: Preoperative Screening and Postoperative Care

Robert M. Wolfe, MD, Jonathan Pomerantz, MD, Deborah E. Miller, MD, MACM, Rebecca Weiss-Coleman, MD, and Tony Solomonides, PhD

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CLINICAL REVIEW

Obstructive Sleep Apnea: Preoperative Screening and Postoperative Care

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The incidence of obstructive sleep apnea (OSA) has reached epidemic proportions, and it is an often unrecognized cause of perioperative morbidity and mortality. Profound hypoxic injury from apnea during the postoperative period is often misdiagnosed as cardiac arrest due to other causes. Almost a quarter of patients entering a hospital for elective surgery have OSA, and >80% of these cases are undiagnosed at the time of surgery. The perioperative period puts patients at high risk of apneic episodes because of drug effects from sedatives, narcotics, and general anesthesia, as well as from the effects of postoperative rapid eye movement sleep changes and postoperative positioning in the hospital bed. For adults, preoperative screening using the STOP or STOP-Bang questionnaires can help to identify adult patients at increased risk of OSA. In the pediatric setting, a question about snoring should be part of every preoperative examination. For patients with known OSA, continuous positive airway pressure should be continued postoperatively. Continuous pulse oximetry monitoring with an alarm system can help to prevent apneic catastrophes caused by OSA in the postoperative period. (J Am Board Fam Med 2016;29:263–275.)

Table 1. Definitions of Sleep-Disordered Breathing in Adults and Children

Apnea	Adult: ≥90% drop in airflow from baseline lasting ≥10 seconds*		
	Children: ≥90% reduction of airflow from the pre-event baseline for ≥2 breaths with respiratory effort throughout this period		
Hypopnea	Adult: abnormal respiratory event lasting at least 10 seconds with ≥30% reduction in thoracoabdominal movement or airflow compared with baseline, and with at least a 4% oxygen desaturation[18]		
	Children: ≥30% reduction of nasal airflow from the pre-event baseline for at least 2 breaths, and with at least a 3% oxygen desaturation		
AHI	Number of apneas plus hypopneas per hour of sleep Based on the AHI, the severity of OSA is classified as follows[7,19]:		
	OSA severity	Adult criteria (AHI/hour)†	Pediatric criteria (AHI/hour)
	None/minimal	<5	0
	Mild	5–14	1–5
	Moderate	15–29	6–10
	Severe	≥30	>10
Oxygen Desaturation Index	Hourly average number of desaturation episodes, defined as ≥4% decrease in saturation from the average saturation in the preceding 120 seconds, and lasting >10 seconds		
Central apnea	Reduction in flow is mainly caused by a reduction in ventilatory effort		
Obstructive apnea	Reduction in airflow is mainly caused by increased upper airway resistance		
OSA syndrome	Adults: AHI score ≥15 events/hour or ≥5 events/hour with symptoms (such as daytime somnolence, fatigue, and cognitive impairment; or cardiovascular comorbid conditions, such as hypertension, ischemic heart disease, or prior stroke)‡		
	Children: disorder of breathing during sleep characterized by prolonged partial upper airway obstruction and/or intermittent complete obstruction (obstructive apnea) that disrupts normal ventilation during sleep and normal sleep patterns, accompanied by symptoms or signs§		

*The American Academy of Sleep Medicine (AASM) definition; Centers for Medicare & Medicaid Services (CMS) uses *cessation of airflow*.

†Most studies use these criteria. Because of a lack of a uniform definition of obstructive sleep apnea (OSA) severity, the American Society of Anesthesiologists' latest guideline on perioperative management of OSA uses the terms *mild*, *moderate*, and *severe* "as defined by the laboratory where the sleep study was performed." If overall severity is not indicated by the sleep laboratory, they classify OSA severity from Apnea-Hypopnea Index (AHI) as none (0–5), mild (6–20), moderate (21–40), severe (>40).[7]

‡Criteria for OSA diagnosis of both AASM and the CMS.[19]
Also see Berry et al.[20]

§As listed in Table 2, right column, "Symptoms and Signs of Pediatric OSAS."[16]

Table 2. Adult versus Pediatric Obstructive Sleep Apnea

Clinical Features of Adult OSAS	Symptoms and Signs of Pediatric OSAS
Breathing disturbances during sleep	Nocturnal Symptoms
Habitual, socially disruptive snoring	Snoring
Witnessed apneas	Gasping
Gasping or choking	Noisy breathing (typically inspiratory)
Difficulties maintaining sleep	Paradoxical breathing
Snort arousals	Retractions (cervical or costal)
Dyspnea spells	Witnessed apneas
Restlessness	Restless sleep
Nocturia	Neck hyperextension
Diaphoresis	Mouth breathing
Gastroesophageal reflux	Nocturnal sweating
Daytime dysfunction	Enuresis (after 6 mo continence)
Nonrestorative sleep	Parasomnia (walking, talking, terrors) Bruxism
Excessive daytime sleepiness in a nonstimulating environment (eg, watching TV, reading, riding in/driving a car)	Mouth breathing
Motor vehicle accidents, especially a history of "falling asleep at the wheel"	Daytime Symptoms
Impaired concentration, cognition, or memory	Difficulty waking Unrefreshed on waking
Headaches upon arising	Excessive sleepiness
Mood lability	Hyperactivity
Weakened libido	Aggression/moodiness
Risk factors	Mouth breathing
Obesity	Poor appetite
Smoking	Dysphagia
Nasal congestion	Difficulty in school
Alcohol	Signs/Findings
Sedative/hypnotics	Tonsil hypertrophy
Opioid analgesics	High/large tongue position
Supine (on the back) sleep positioning	Growth disturbance
Comorbidities	Obesity
Hypertension	Failure to thrive
Myocardial infarction	Pulmonary hypertension
Congestive heart failure	Systemic hypertension
Stroke	Craniofacial abnormalities
Pulmonary hypertension	Laryngomalacia
Diabetes/metabolic syndrome	Nasal airway obstruction
	HypotoniaGastroesophageal reflux

Column 1 (adult) adapted from Ref. 23. Column 2 (pediatric) reprinted from Ref. 16.
OSAS, obstructive sleep apnea syndrome.

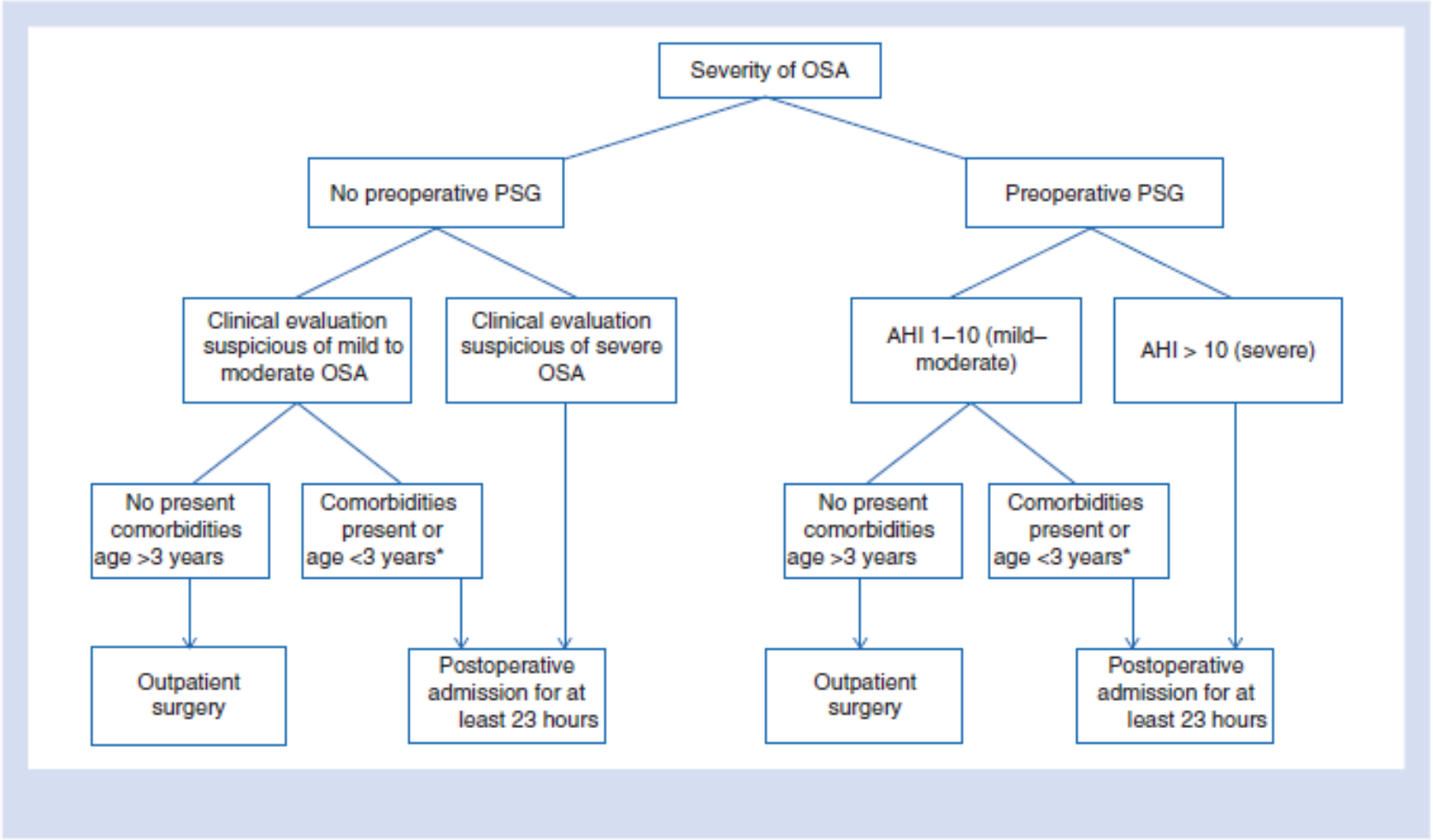
Table 5. Pediatric Obstructive Sleep Apnea Screening: "I'M SLEEPY" Questionnaire (Parent Version)*

I: Is your child often irritated or angry during the day?	□Yes □No
M: Body mass index >85%?	□Yes □No
S: Does your child usually snore?	□Yes □No
L: Does your child sometimes have labored breathing at night?	□Yes □No
E: Ever noticed a stop in your child's breathing at night?	□Yes □No
E: Does your child have enlarged tonsils and/or adenoids?	□Yes □No
P: Does your child have problems with concentration?	□Yes □No
Y: Does your child often yawn or is he or she often tired/sleepy during the day?	□Yes □No

*A score of 0 to 2 indicates a low risk of obstructive sleep apnea (OSA); high risk is indicated by a score ≥3 (sensitivity, 82%; specificity, 50%; negative predictive value, 85%). This questionnaire has not yet been validated in larger studies

From Ref. 59.

Figure 2. Post-adenotonsillectomy disposition of children with obstructive sleep apnea (OSA). *Comorbidities in children <3 years old include severe OSA documented by polysomnography (PSG), failure to thrive, obesity, cardiac involvement (right ventricular hypertrophy), Down syndrome, history of prematurity, craniofacial abnormalities, neuromuscular diseases, chronic lung disease, and sickle cell disease (comorbidities are taken from Table 3 in Ref. [65]). AHI, Apnea-Hypopnea Index. From Patino et al.[65]



REVIEW

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CURRENT OPINION

An update on the various practical applications of the STOP-Bang questionnaire in anesthesia, surgery, and perioperative medicine

Volume 30 • Number 1 • February 2017

Mahesh Nagappa[a], *Jean Wong*[b,c], *Mandeep Singh*[b,c], *David T. Wong*[b,c], *and Frances Chung*[b,c]

SJD Sant Joan de Déu Barcelona · Hospital

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Recent findings

The STOP-Bang questionnaire was originally validated as a screening tool to identify surgical patients who are at high-risk of obstructive sleep apnea (OSA). A recent meta-analysis confirmed that STOP-Bang is validated for use in the sleep clinic, surgical, and general population. Patients with a STOP-Bang score of 0–2 can be classified as low-risk for moderate-to-severe OSA. Those with a score of 5–8 can be classified as high-risk for moderate-to-severe OSA. In patients with a score of 3 or 4, a specific combination of a STOP score at least 2 + BMI more than 35 kg/m^2 or STOP score at least 2 + male or STOP score at least 2 + neck circumference more than 40 cm indicates higher risk for moderate-to-severe OSA. Further, patients with a STOP-Bang score at least 3 can be classified as high risk for moderate-to-severe OSA if the serum HCO_3^- at least 28 mmol/l. STOP-Bang can be used as a novel tool for perioperative risk stratification because it easily identifies patients who are at increased risk of perioperative complications.

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Updated STOP-Bang Questionnaire:

1. **Snoring?**
   Do you **Snore Loudly** (loud enough to be heard through closed doors or your bed-partner elbows you for snoring at night)?
   - Yes/No

2. **Tired?**
   Do you often feel **Tired, Fatigued,** or **Sleepy** during the daytime (such as falling asleep during driving or talking to someone)?
   - Yes/No

3. **Observed?**
   Has anyone **Observed** you **Stop Breathing** or **Choking/Gasping** during your sleep?
   - Yes/No

4. **Pressure?**
   Do you have or are you being treated for high blood pressure?
   - Yes/No

5. **Body Mass Index more than 35 kg/m^2?**
   - Yes/No

6. **Age older than 50?**
   - Yes/No

7. **Neck size large? (Measured around Adams apple)**
   For male, is your shirt collar 17 inches/43 cm or larger?
   For female, is your shirt collar 16 inches/41 cm or larger?
   - Yes/No

8. **Gender: male?**
   - Yes/No

Scoring criteria:

Low-risk OSA: Score: 0,1,2

Intermediate-risk OSA: Score 3,4

High-risk OSA: Score 5,6,7,8

- or a STOP score ≥ 2 + male gender
- or a STOP score ≥ 2 + BMI > 35 kg/m^2
- or a STOP score ≥ 2 + neck circumference (Male: 17"/43cm; Female 16"/41cm)

CONCLUSION

STOP-Bang is the most convenient, validated, and effective screening tool in surgical patients because of its variety of practical applications during the perioperative period. The updated STOP-Bang questionnaire adds clinical value to the preoperative assessment as it provides a relatively easy method to risk stratify patients into high-risk or low-risk OSA. The probability of moderate-to-severe OSA increases proportionally to the STOP-Bang score. Patients with a score 0, 1 or 2 can be classified as low-risk for moderate-to-severe OSA. Those with a score of 5, 6, 7 or 8 can be classified as high-risk for moderate-to-severe OSA. In patients with a STOP-Bang score of 3 or 4, a second step using a combination of a STOP score at least 2 + BMI more than 35 kg/m^2 or STOP score at least 2 + male or STOP score at least 2 + neck circumference more than 40 cm indicates a higher risk of moderate-to-severe OSA. Further, patients with STOP-Bang score at least 3 can be classified as high-risk for moderate-to-severe OSA if the serum HCO_3^- at least 28 mmol/l. This step-wise approach is recommended for better stratification of OSA patients during the perioperative period.

Preoperatorio

- Anamnesis dirigida: ronca, hace apneas, I'M sleepy, videos….
- EF: Valoración morfología de la vía aérea, respiración y manejo secreciones
- Expl. compl: HCO_3^-, Hb, PSG….
- CPAP / BiPAP en espera ORL y si patología CV

A TODOS, no solo en ORL

Inducción

- Inhalatoria vs IV (EMLA)
- Posición
- En la VA ha de estar el más experto
- ML / CPAP nasal para manejo de la vía aérea difícil
- BiPAP con MF

Mantenimiento

- TT
- Fentanilo: reducir dosis si polysomnografia con SpO2<85%
- Fraccionar dosis según respuesta
- NVPO:
  - ondansetron 0,1mg/kg
  - dexamethasona 0,0625mg/kg
- ATB

Extubación

- Despierto vs profundo

- Tiempo anestesia en programación quirófano
- Evitar obstrucción aguda-edema pulmonar
- BiPAP x MF
- Monitorización contínua x 2h
- Despertar con padres si no hemorragia
- Ambulatoria / ingresado

Conclusiones

- Screening
- CPAP / BiPAP
- VA para el experto
- Intubación y extubación
- Programación quirúrgica con tiempo anestésico
- Monitorización postop / alta

Gracias!