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MAY 11 – 14, 2022



Controversies in Pediatric Anesthesia

Marjorie P. Brennan MD, MPH
Children's National Hospital

1

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- no relevant financial relationships with commercial interests

Disclosures

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2

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Learning Objectives

- Discuss challenges of obesity in the freestanding ASC versus a hospital ambulatory department
- Debate if narcotic free practice is a goal and discuss steps to minimize opioids at an ambulatory surgery center
- Discuss efficacy of parental presence in reducing anxiety of pediatric Patients During Anesthesia induction

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4

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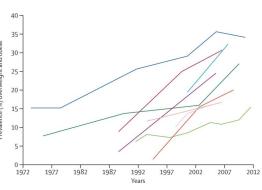
A “Big” Problem

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5

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Year	USA	Mexico	Brazil	United Arab Emirates	Iran	South Africa	United Kingdom	Hong Kong	China
1972	15	5	5	5	5	5	5	5	5
1977	15	5	5	5	5	5	5	5	5
1982	18	5	5	5	5	5	5	5	5
1987	22	5	5	5	5	5	5	5	5
1992	25	5	5	5	5	5	5	5	5
1997	28	5	5	5	5	5	5	5	5
2002	32	5	5	5	5	5	5	5	5
2007	35	5	5	5	5	5	5	5	5
2012	38	5	5	5	5	5	5	5	5

Lobstein, et al. Lancet. 2015;385(9986):2510-20.

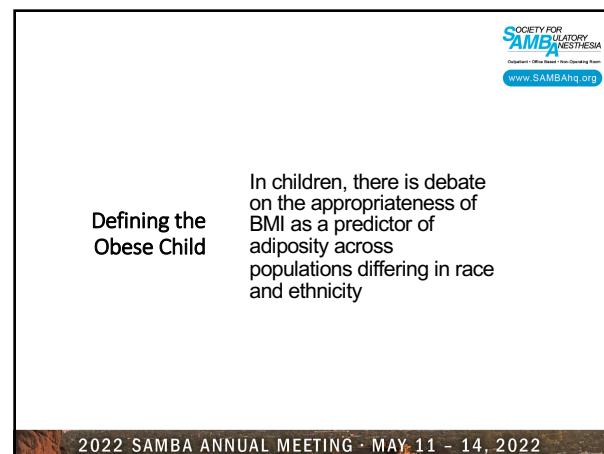
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6



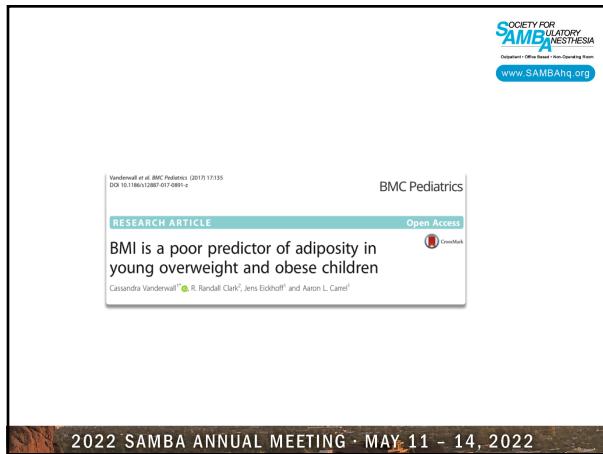
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7



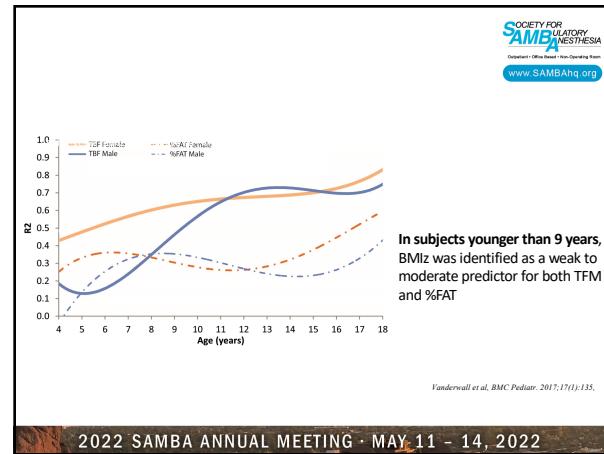
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8

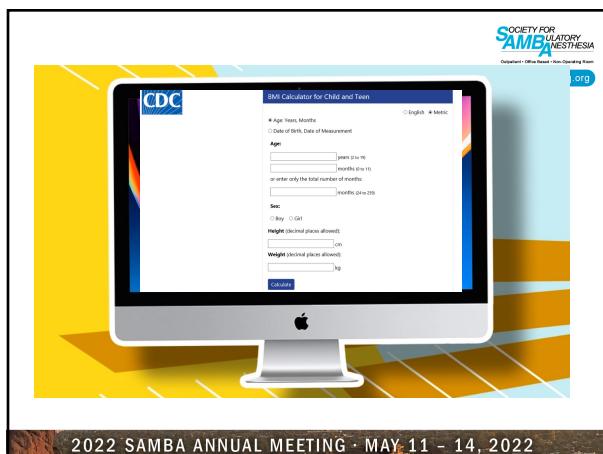


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9

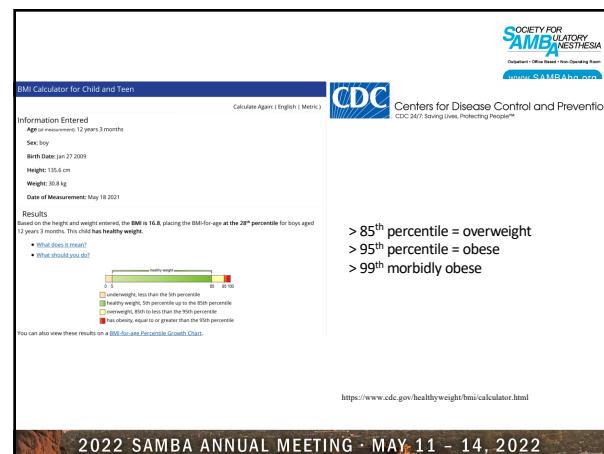


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11



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12

Date	Age	Value	Centile
01/27/2020	7 years	23.42 kg/m ²	98.90
09/23/2020	8 years	27.09 kg/m ²	99.34
04/21/2021	8 years	26.92 kg/m ²	99.15
05/03/2021	8 years	26.28 kg/m ²	99.00
07/14/2021	9 years	26.72 kg/m²	99.02

13

The slide features a central image of a child's skeleton. Various medical conditions are labeled around the skeleton:

- Pulmonary:** Obstructive sleep apnea, Asthma, Exercise intolerance
- Endocrine:** Insulin resistance, PCOS, Pubertal advancement
- Gastrointestinal:** Nonalcoholic fatty liver disease, Gastroesophageal reflux, constipation, Iron deficiency, Vitamin D deficiency
- CNS/psychosocial:** Attention deficit disorder, Decreased quality of life
- Cardiovascular:** Hypertension, Lipid profile, Dyslipidemia, Chronic inflammation, Congenital heart disease
- Renal:** Hyperfiltration, Glomerulopathy
- Orthopedic:** Lower limb malalignment, Osteoarthritis

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14

Respiratory changes in obese children

Reduction of:

- Lung volumes
- Functional residual capacity
- Vital capacity
- Forced expiratory volume
- Diffusion capacity
- Reduction of alveolar surface: lung volume ratio
- Total pulmonary compliance
- Auxiliary respiratory muscle strength

Increase of:

- Breathing work
- Upper airway obstruction
 - High incidence of obstructive sleep apnea
- Lower airway obstruction
- Increased prevalence of asthma
- Atelectasis

15

Current Definitions and ASA-Approved Examples					
ASA PS Classification	Definition	Adult Examples, Including, but not Limited to:	Pediatric Examples, Including but not Limited to:	Obstetric Examples, Including but not Limited to:	
ASA I	A normal healthy patient	Healthy, non-smoking, no or minimal alcohol use	Healthy (no acute or chronic disease), normal BME percentile for age	Normal pregnancy, well-controlled gestational DM	
ASA II	A patient with mild systemic disease	Mild disease only, without substantial functional limitation. Common: social alcohol drinker, pregnancy, obesity, ≥ 20 pack-year smoking history, well-controlled DM/HHT, mild lung disease	Asymptomatic, no cardiac disease, well controlled hypertension, well-controlled asthma, well controlled epilepsy, non-insulin dependent diabetes mellitus, abnormal BME percentile for age, mild-moderate OSA, overweight child in otherwise, well-maintained condition	Normal pregnancy, well-controlled gestational DM, controlled preeclampsia without severe features, controlled gestational DM	
ASA III	A patient with severe systemic disease	Substractive functional limitations. One or more severe comorbidities. Common: poorly controlled DM or HTN, active mental illness (MDD, etc.), active neuropsychiatric disease (e.g., chronic implanted pacemaker, moderate reduction of ejection fraction, ESRD undergoing dialysis, severe cognitive dysasia, history >3 months of MI, CVA, TIA, or CADs/rx.	Uncontrolled or congenital cardiovascular disease, asthma with frequent exacerbations, well-controlled hypertension, severe OSA, oncologic state, renal failure, muscular dystrophy, severe cognitive impairment, severe neurodegenerative disease, brainstem/cord malformation, symptomatic hydrocephalus, premature infant PICA ≤ 400 cm, active seizures, severe cognitive impairment in difficult areas, long term parenteral nutrition. Full term infants <4 weeks of age.	Precipitated with severe comorbidities, controlled preeclampsia or high insulin requirements, a thromboembolic disease, requiring preoperative monitoring.	

16

Anesthesiology 2008; 108:375-80

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Incidence and Risk Factors for Perioperative Adverse Respiratory Events in Children Who Are Obese

Alan R. Tait, Ph.D., Terri Voepel-Lewis, M.S.N., R.N.,† Constance Burke, B.S.N., R.N.,‡ Amy Kostrzewa, M.D.,§
Ian Lewis, M.B.B.S., M.R.C.P., F.R.C.A.||

- Perioperative respiratory adverse events (PRAE) occur more commonly in obese children
- Significant associations between obesity and PRAE for hypoxemia, upper airway obstruction and difficult bag-mask ventilation
- Obesity and BMI were significant predictors for overall PRAE, whereas difficult laryngoscopy, laryngospasm, bronchospasm, major coughing and the need for supplemental oxygen were identified but not statistically significantly associated with PRAE in this series
- Adverse respiratory events can occur even if the airway was not instrumented or manipulated.

17

Pediatric Anesthesiology
Section Editor: Peter J. Davis

Overweight/Obesity and Gastric Fluid Characteristics in Pediatric Day Surgery: Implications for Fasting Guidelines and Pulmonary Aspiration Risk

Gastric Fluid Volume and BMI in Pediatric Same Day Surgery Patients

Box plot showing Gastric Fluid Volume (mL/kg) and BMI (kg/m²) for Lean/Normal, Over-weight, and Obesity groups. The y-axis for BMI ranges from 0.0 to 4.0, and for GSV from 0.0 to 4.0. The x-axis shows Body Mass Index categories: Lean/Normal (25th-75th), Over-weight (85th-95th), and Obesity (>95th).

Legend: □ GSV (mL/kg) □ BMI (kg/m²)

Approximate data from box plot:

Body Mass Index Category	Median GSV (mL/kg)	Median BMI (kg/m²)
Lean/Normal (25th-75th)	~0.8	~1.0
Over-weight (85th-95th)	~0.7	~1.8
Obesity (>95th)	~0.5	~2.5

Cook-Sather SD, et al. Anesth Analg. 2009;109:727-36

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18

Technical Challenges

- Airway Management



Mask Airway:
-Challenging

Intubation:
-Usually OK

Supraglottic Airway:
-Usually OK

Moon TS, et al. J Anesth (2019) 33: 96
Tian Y, et al. Arch Med Sci 2017;13:183-190
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19

Children's National ASC Guidelines for Obese Children



- Young children (< 9 yr.)
< 98 BMI %ile-for-age
- < 95 BMI %ile-for-age for airway
- Adolescents (> 8 yr.)
BMI < 30 for airway surgery
BMI < 35 for non-airway surgery
- No co-morbidities / OSAS
- Exceptions by consultation

Note that these are *not* national standards.
BMI: body mass index; OSAS: obstructive sleep apnea syndrome.

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20

Children's National ASC Guidelines for Obese Children



- ASA Class 2
- No co-morbidity
 - No reactive airway disease
 - No syndromes
 - No OSA

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21



OFA: The Latest Trend

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OFA: Opioid Free Anesthesia

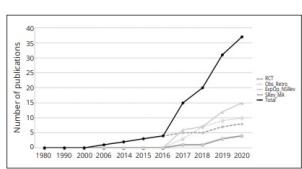


Figure 1—Number of PubMed-indexed publications on OFA per year, according to the type of paper.
RCT: randomized clinical trial; Obs: observational and retrospective studies; ExpOp: expert's opinions and non-systematic reviews; NSRev: expert's opinions and non-systematic reviews; SRev_MA: systematic reviews and meta-analyses.

2021 Bugada et al, Edizioni Minerva Medica

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23

OFA

- What is the rationale for opioid-free techniques?
- Is there evidence that OFA can improve perioperative outcomes?

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Rationale for OFA

• Limits of Opioids

- Dose-dependent side effects
- Dose-dependent hyperalgesia
- Opioid crisis

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OFA-defined

- The association of drugs and /or techniques that allow good quality general anesthesia with no need for opioids
 - NMDA antagonists: ketamine, lidocaine, magnesium sulfate
 - Sodium channel blockers: local anesthetics
 - Anti-inflammatory drugs (NSAID, dexamethasone)
 - Alpha-2 antagonists (dexmedetomidine, clonidine)

2019, Beloel

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25

26

Pediatric Anesthesiology

■ ORIGINAL CLINICAL RESEARCH REPORT

In Pursuit of an Opioid-Free Pediatric Ambulatory Surgery Center: A Quality Improvement Initiative

Amber M. Franz, MD, MEng, Lynn D. Martin, MD, MBA, David E. Liston, MD, MPH, Gregory J. Latham, MD, Michael J. Richards, BM, and Daniel K. Low, BM, BS

Anesthesia and Analgesia March 2021

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Table 1. Standardized Intraoperative Anesthesia Protocols for Believe Clinic and Surgery Center's Most Common Surgeries as of December 2017 and June 2019

Procedure	Opioid-Induction Protocols (2019)	Opioid-Free Protocols (2019)
Otolaryngology	Mivacurium 0.1 mg/kg	Ibuprofen 10 mg/kg oral (preoperative)
Myringotomy with tympanostomy tubes	Aacetaminophen 15 mg/kg	Dexmedetomidine 1 µg/kg
Tonsillectomy and adenotonsillectomy	Dexamethasone 0.15 mg/kg (max 4 mg)	Ketorolac 0.5 mg/kg (max 30 mg)
Adenoidectomy	Mivacurium 0.05 mg/kg	Dexamethasone 0.5 mg/kg (max 8 mg)
	Aacetaminophen 15 mg/kg	Dexmedetomidine 0.5 µg/kg
	Dexamethasone 0.15 mg/kg (max 4 mg)	Ketorolac 0.5 mg/kg (max 30 mg)
		Dexamethasone 0.5 mg/kg (max 8 mg)

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27

28

Dexmedetomidine

The effect of intraoperative dexmedetomidine administration on length of stay in the post-anesthesia care unit in ambulatory surgery: A hospital registry study

Haibo Ma,¹ Lucy J. Hochberg,¹ Peter Sarter,² Marcelline S. Schreier,⁴ Debbie Friedrich,⁵ Sarah Nelson,⁶ Satya Krishna Ramisetty,⁷ Chengyu Shen,⁸ Eswar Sundar,⁹ Marissa Elmerman,¹⁰

Effect of Dexmedetomidine on Sevoflurane Requirements and Emergency Agitation in Children Undergoing Ambulatory Surgery

Na Young Kim,¹¹ So Nae Kim,¹² Hyo Jin Yoo,¹³ and Hae Keum Ki¹²

Effect of single-dose dexmedetomidine on emergence agitation and recovery profiles after sevoflurane anesthesia in pediatric ambulatory surgery

Meenakshi Sridharan,¹⁴ Meenal Tewari-Nimbark,¹⁵ Shopp Mitalwala,¹⁶ Yell Telesh,¹⁴ and Kaushik Palit,¹⁴

Emergence agitation prevention in paediatric ambulatory surgery: A comparison between intranasal Dexmedetomidine and Clonidine

Anindya Mukherjee,¹⁷ Anjali Das,¹⁸ Sandip Roy Basu,¹⁹ Surajit Chatterjee,²⁰ Ritu Kundu,²¹ and Raghunath Bhattacharya,²²

No Delay to Discharge

Delay

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Opioid-Free Techniques

- Disadvantages: no alternatives have been discovered or synthesized that are as potent analgesics or generally effective to treat pain. Techniques are complicated and expose children to multiple medications
- Advantages: Reducing opioids facilitates postoperative recovery. Perioperative opioids increase the risk of chronic opioid use and the excessive prescription of opioids produces home reservoirs resulting in accidental intake, diversion, misuse, and abuse

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29

30

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J Am Coll Surg. 2018 October ; 227(4): 411–418. doi:10.1016/j.jamcollsurg.2018.07.659.

Opioid-Prescribing Guidelines for Common Surgical Procedures: An Expert Panel Consensus

Heidi N. Overton, MD[#]
Department of Surgery, Johns Hopkins University School of Medicine, Baltimore, MD.

- When alternatives exist for opioid analgesia, such as regional nerve blocks, of course the alternatives should be used, and in cases that are not appropriate for opioid analgesia, opioids should not be used, but in many instances there are no practical or effective alternatives.,
- Use multimodal analgesia, limit narcotic prescriptions in teenagers and use recommended prescriptions

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What do you mean I can't be there when he goes to sleep?

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Parental Presence

- Not all operating suites allow parents to be present for the anesthetic induction
- Of those that do, some children and parents are either transported to the operating room directly or into a preop induction area

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Preoperative parental anxiety predicts behavioural and emotional responses to induction of anaesthesia in children

Joan C. Bevan MD DRCOG FFARCS,
Celeste Johnston RN DPA, Margaret J. Haig MD FRCP,
Guy Toussignant MD FRCP, Simon Lucy MD FRCP,
Vanessa Kirton BA, Irene K. Assimes MD,
Ruben Carranza MD

Children of anxious parents were more anxious if their parents were present during induction of anaesthesia

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Anesthesiology 2003; 98:58–64
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Parental Presence during Induction of Anesthesia

Physiological Effects on Parents

Zeer N. Kain, M.D.,* Alison A. Caldwell-Andrews, Ph.D.,† Linda C. Mayes, M.D.,‡ Shu-Ming Wang, M.D.,§ Dawn M. Krivitz, M.A.,|| Megan E. LoDolce, M.A.,||

Pediatric Anesthesia 2006 16: 627–634 doi:10.1111/j.1460-9992.2006.01843.x

Predicting which children benefit most from parental presence during induction of anesthesia

ZEEV N. KAIN MD MBA*, LINDA C. MAYES MD*,†, ALISON A. CALDWELL-ANDREWS PhD§, HALEH SAADAT MD*, BRENDAN M. WANG MD,‡ AND MARGARET V. G. WIDP§
*Department of Anesthesiology, Center for Assessment of Psychiatric Function,
†Department of Pediatrics, ‡Department of Child Psychiatry and §Department of Psychiatry,
Yale University School of Medicine, New Haven, CT, USA

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Parental Presence

Who benefits?

- Older children (greater than 4 years)
- Low levels of activity in their temperament
- Parents who were calm and who value preparation and coping skills

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36

Parental Presence



- Orientation to the new environment for parents is important
- Support and instruction should be provided when in the induction area to understand the sequence of events and how they can best support their child

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37

Summary

- Well-defined evidence-based selection criteria for pediatric patients undergoing surgery in a free-standing ASC will ensure safety of ambulatory surgery.
- Very obese children pose logistical and medical challenges
- Some teenagers with high BMI may simply have a high muscle mass, however, and may be considered on an individual basis.
- The role of the patient information screening team at an ASC is extremely important developing and enforcing patient selection guidelines.

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38

Summary



- Appropriate selection may allow some children to be efficiently and safely managed with an opioid-free intraoperative and postoperative analgesic regimen.
- Parental presence is beneficial in appropriately selected patients

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39

Thank you!



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40