Avoiding Pitfalls of Delayed Recovery and Discharge in the Pediatric Ambulatory Patient

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Children's National Hospital
Washington, DC

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Disclosures

- no relevant financial relationships with commercial interests

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Learning Objectives

Upon completion, participants will:

- understand common issues that prevent efficient discharge in pediatric ambulatory patients.
- be able to develop a framework to assess pediatric patients for ambulatory surgery.
- be able to develop strategies to approach common pediatric discharge barriers in the ambulatory setting.

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Why ASC's?

- In 2020 41% of all surgical procedures were performed in ambulatory surgery centers (ASCs).*
- With exceptional outcomes and exceedingly high patient satisfaction scores at substantially lower costs, ambulatory surgery centers (ASCs) are considered a great value medicine.
- This drive toward outpatient surgery can be attributed to several factors:
  - 1) Improvements in anesthetic care, including innovations such as shorter-acting anesthetic agents and improved cardiopulmonary monitoring, have allowed for fewer adverse anesthetic effects;
  - 2) Innovations in minimally invasive surgical techniques have decreased the need for inpatient hospitalization;
  - 3) Economic pressures have also influenced increased adoption of outpatient surgery.

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- The Obese Child
- Opioid-Free techniques
- Dexmedetomidine in the Ambulatory Setting
- URI symptoms
- Tonsillectomy and Adenoidectomy in the ASC without a Sleep Study

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The Obese Ambulatory Patient: A "Big" Problem

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Defining Obesity

8


BMC Pediatrics

RESEARCH ARTICLE Open Access

BMI is a poor predictor of adiposity in young overweight and obese children

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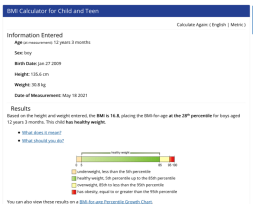
BMI Calculator for Child and Teen

CDC Centers for Disease Control and Prevention

> 85th percentile = overweight
> 95th percentile = obese
> 99th morbidly obese

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Anesthesiology 2008; 108:575–80

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.

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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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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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Opioid Free Anesthesia: Trend?

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OFA: Opioid Free Anesthesia

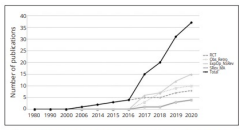

Figure 1.—Number of PubMed Indexed publications on OFA per year, according to the type of paper. RCT: randomized clinical trial; Obs_Retro: observational and retrospective studies; ExpOp_NSRev: expert's opinions and non-systematic reviews; SRev_MA: systematic reviews and meta-analyses.

2021 Bugada et al, Edizioni Minerva Medica

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OFA

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

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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, Beloeil

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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 Bellevue Clinic and Surgery Center's Most Common Surgeries as of December 2017 and June 2015

Procedure		Opioid-Inclusive Protocols (2017)	Opioid-Free Protocols (2019)
Otolaryngology	Myringotomy with tympanostomy tubes	Fentanyl 1 µg/kg intranasal (intraoperatively)	Ibuprofen 10 mg/kg oral (preoperatively)
	Tonsillectomy and adenoidectomy/tonsillectomy	Morphine 0.1 mg/kg Acetaminophen 15 mg/kg Dexamethasone 0.15 mg/kg (max 4 mg)	Dexmedetomidine 1 µg/kg Ketorolac 0.5 mg/kg (max 30 mg) Dexamethasone 0.5 mg/kg (max 8 mg)
	Adenoidectomy	Morphine 0.05 mg/kg Acetaminophen 15 mg/kg Dexamethasone 0.15 mg/kg (max 4 mg)	Dexmedetomidine 0.5 µg/kg Ketorolac 0.5 mg/kg (max 30 mg) Dexamethasone 0.5 mg/kg (max 8 mg)

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Decreased Delerium vs. Discharge Delay…. Should I Use the Dex?

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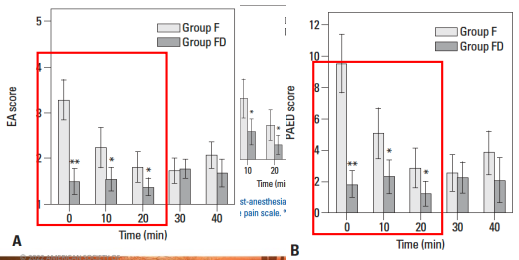
Reduction in emergence agitation



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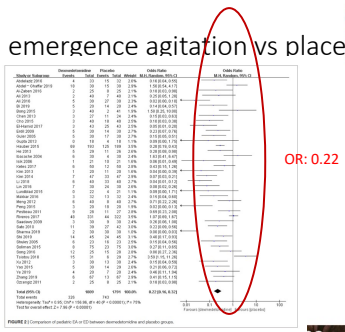
Reduction in emergence agitation vs placebo



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Reduction in emergence agitation vs midazolam

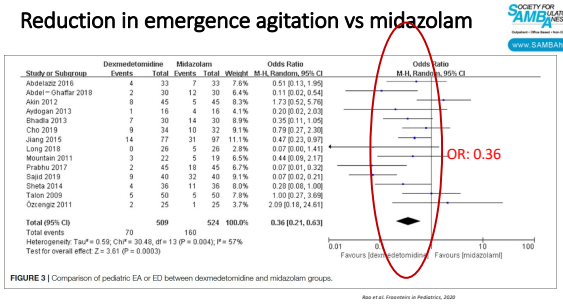

FIGURE 3 | Comparison of pediatric EA or ED between dexmedetomidine and midazolam groups.

Xiao et al. Frontiers in Pediatrics, 2020

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Reduction in emergence agitation vs opioids

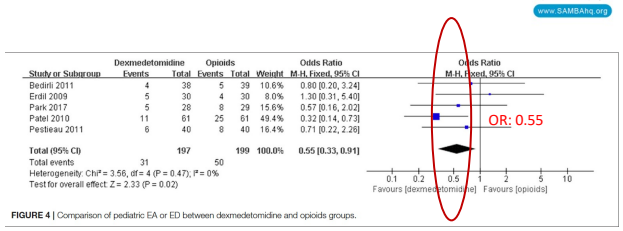

FIGURE 4 | Comparison of pediatric EA or ED between dexmedetomidine and opioids groups.

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Reduction in emergence agitation vs propofol

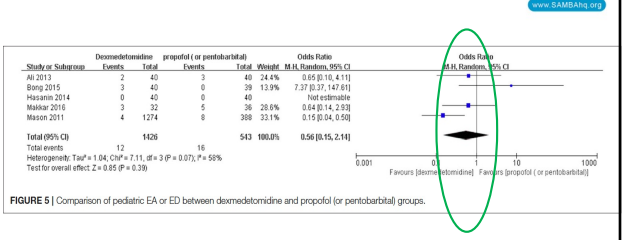

FIGURE 5 | Comparison of pediatric EA or ED between dexmedetomidine and propofol (or pentobarbital) groups.

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Reduction in emergence agitation vs propofol, ketamine

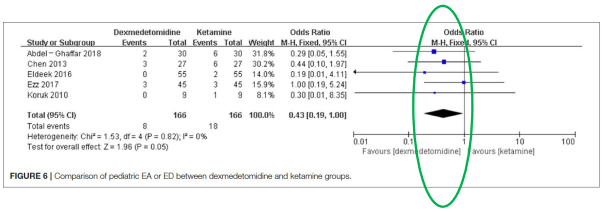

FIGURE 6 | Comparison of pediatric EA or ED between dexmedetomidine and ketamine groups.

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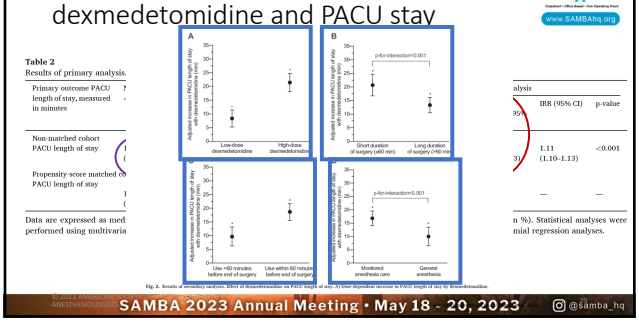
dexmedetomidine and PACU stay



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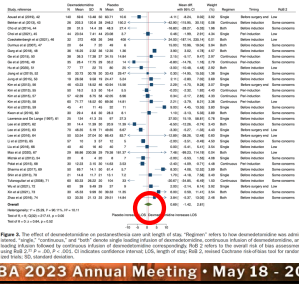

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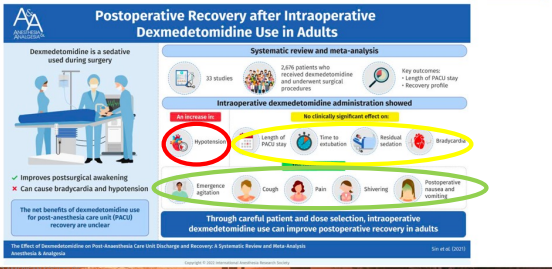
statistical vs clinical significance



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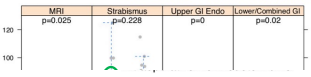
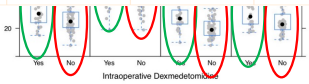
dexmedetomidine and PACU stay



	MRI	Strabismus	Upper GI Endoscopy	Combined Upper/Lower GI Endoscopy
Median Difference (95% CI)	6 (1 – 11) min	5 (-3 – 15) min	7 (3 – 10) min	5 (1 – 12) min



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PERIOPERATIVE MEDICINE

Inhalational *versus* Intravenous Induction of Anesthesia in Children with a High Risk of Perioperative Respiratory Adverse Events

A Randomized Controlled Trial

Anoop Ramgolam, Ph.D., Graham L. Hall, Ph.D., Guicheng Zhang, Ph.D., Mary Hegarty, M.D., Britta S. von Ungern-Sternberg, Ph.D.

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Table 1. Brief Definition of the Risk Factors Used as Inclusion Criteria in This Trial

Risk Factors	Brief Definition Applied in This Study
Cold ≤ 2 weeks	Signs of runny nose, cough and/or fever (> 38°C) but deemed fit for anesthesia by independent consultant anesthesiologist
Wheezing ≤ 12 months	More than three episodes of wheezing experienced during the past year
Wheezing at exercise	Parentally reported wheezing during exercise
Nocturnal dry cough	A persistent dry night cough observed
Past/Present eczema	Persistent eczema observed in past or currently
Passive smoking	Child exposed to parents/caretakers smoking independent of location, *e.g.*, inside or outside of house
Family history of hay fever/asthma/eczema	At least two family members (any two of parents/siblings/grandparents) with a history of either hay fever or asthma or eczema.

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Table 2. Definition Used for Respiratory Complications Recorded

Perioperative Respiratory Adverse Events	Definition
Laryngospasm	Complete airway obstruction with associated muscle rigidity of the abdominal and chest walls.
Bronchospasm	Increased respiratory effort, particularly during expiration and wheeze on auscultation.
Desaturation < 95%	Less than 95%. The limit of 95% is chosen in line with institutional guidelines based on PACU discharge criteria.
Airway obstruction	Presence of airway obstruction in combination with a snoring noise and/or respiratory efforts.
Severe coughing	A series of pronounced, persistent severe coughs lasting more than 10 s.
Postoperative stridor	High-pitched sound during breathing in the postoperative period

PACU = postanesthesia care unit.

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Perioperative Respiratory Adverse Events	IV (N = 149)	Inhalation (N = 149)	RR	95% CI	*P* Value
Any – unadjusted	39 (26%)	64 (43.0%)	1.64	1.18–2.27	0.003
Any – adjusted			1.68	1.21–2.33	0.002
I. Bronchospasm	0 (0%)	2 (1%)	-	-	-
II. Laryngospasm	3 (2%)	15 (10%)	5.00	1.48–16.91	0.01
Serious (I & II)	3 (2%)	16 (11%)	5.33	1.59–17.92	0.007
III. Coughing	17 (11%)	36 (24%)	2.12	1.25–3.60	0.006
IV. Desaturation	26 (17%)	38 (26%)	1.46	0.94–2.28	0.094
V. Airway obstruction	7 (5%)	25 (17%)	3.57	1.59–8.00	0.002
VI. Stridor (recovery)	2 (1%)	4 (3%)	2.00	0.37–10.75	0.419
Minor (III-VI)	37 (25%)	63 (42%)	1.70	1.22–2.38	0.002

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SYSTEMATIC REVIEW

Pediatric Anesthesia WILEY

Respiratory and hemodynamic perioperative adverse events in intravenous versus inhalational induction in pediatric anesthesia: A systematic review and meta-analysis

Lucy L. Porter | Sophia M. Blaauwendraad | Barbe M. Pieters

Porter, Blaauwendraad, S. M., & Pieters, B. M. (2020). Respiratory and hemodynamic perioperative adverse events in intravenous versus inhalational induction in pediatric anesthesia: A systematic review and meta-analysis. *Pediatric Anesthesia*, *30*(8), 859–866.

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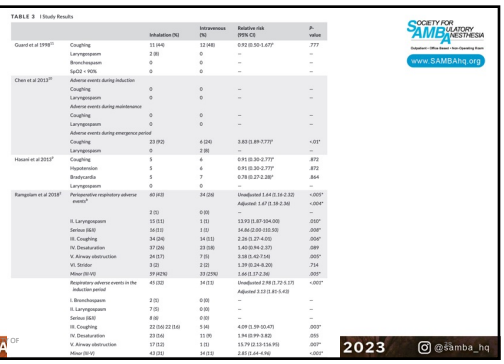

TABLE 3 | Study Results

		Inhalation (%)	Intravenous (%)	Relative risk (95% CI)	P-value
Guard et al 1998[17]	Coughing	11 (44)	12 (48)	0.92 (0.50-1.67)*	.777
	Laryngospasm	2 (8)	0	--	--
	Bronchospasm	0	0	--	--
	SpO2 < 90%	0	0	--	--
Chen et al 2013[19]	Adverse events during induction				
	Coughing	0	0	--	--
	Laryngospasm	0	0	--	--
	Adverse events during maintenance				
	Coughing	0	0	--	--
	Laryngospasm	0	0	--	--
	Adverse events during emergence period				
	Coughing	23 (92)	6 (24)	3.83 (1.89-7.77)*	<.01*
	Laryngospasm	0	2 (8)	--	--
Hasani et al 2013[7]	Coughing	5	6	0.91 (0.30-2.77)*	.872
	Hypotension	5	6	0.91 (0.30-2.77)*	.872
	Bradycardia	5	7	0.78 (0.27-2.28)*	.864
	Laryngospasm	0	0	--	--
Ramgolam et al 2018[9]	Perioperative respiratory adverse events[b]	60 (43)	34 (26)	Unadjusted 1.64 (1.16-2.32) Adjusted: 1.67 (1.18-2.36)	<.005* <.004*
		2 (1)	0 (0)	--	--
	II. Laryngospasm	15 (11)	1 (1)	13.93 (1.87-104.00)	.010*
	Serious (I&II)	16 (11)	1 (1)	14.86 (2.00-110.50)	.008*
	III. Coughing	34 (24)	14 (11)	2.26 (1.27-4.01)	.006*
	IV. Desaturation	37 (26)	23 (18)	1.40 (0.94-2.37)	.089
	V. Airway obstruction	24 (17)	7 (5)	3.18 (1.42-7.14)	.005*
	VI. Stridor	3 (2)	2 (2)	1.39 (0.24-8.20)	.714
	Minor (III-VI)	59 (42%)	33 (25%)	1.66 (1.17-2.36)	.005*
	Respiratory adverse events in the induction period	45 (32)	14 (11)	Unadjusted 2.98 (1.72-5.17) Adjusted 3.13 (1.81-5.43)	<.001*
	I. Bronchospasm	2 (1)	0 (0)	--	--
	II. Laryngospasm	7 (5)	0 (0)	--	--
	Serious (I&II)	8 (6)	0 (0)	--	--
	III. Coughing	22 (16) 22 (16)	5 (4)	4.09 (1.59-10.47)	.003*
	IV. Desaturation	23 (16)	11 (9)	1.94 (0.99-3.82)	.055
	V. Airway obstruction	17 (12)	1 (1)	15.79 (2.13-116.95)	.007*
	Minor (III-V)	43 (31)	14 (11)	2.85 (1.64-4.96)	<.001*

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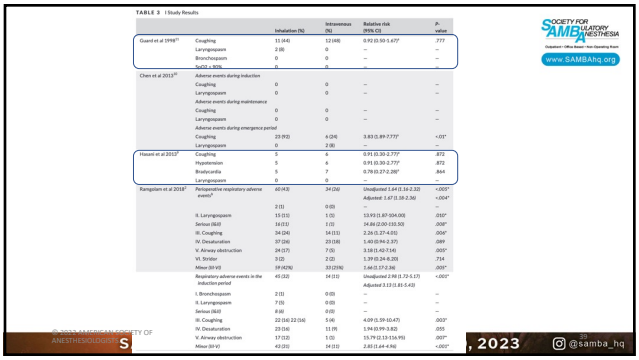

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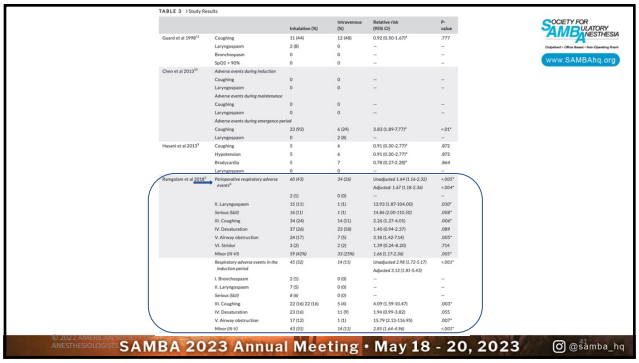

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Guard et al 1998[17]	Coughing	11 (44)	12 (48)	0.92 (0.50-1.67)*	.777
	Laryngospasm	2 (8)	0	--	--
	Bronchospasm	0	0	--	--
	SpO2 < 90%	0	0	--	--
Chen et al 2013[19]	Adverse events during induction				
	Coughing	0	0	--	--
	Laryngospasm	0	0	--	--
	Adverse events during maintenance				
	Coughing	0	0	--	--
	Laryngospasm	0	0	--	--
	Adverse events during emergence period				
	Coughing	23 (92)	6 (24)	3.83 (1.89-7.77)*	<.01*
	Laryngospasm	0	2 (8)	--	--
Hasani et al 2013[7]	Coughing	5	6	0.91 (0.30-2.77)*	.872
	Hypotension	5	6	0.91 (0.30-2.77)*	.872
	Bradycardia	5	7	0.78 (0.27-2.28)*	.864
	Laryngospasm	0	0	--	--
Ramgolam et al 2018[9]	Perioperative respiratory adverse events[b]	60 (43)	34 (26)	Unadjusted 1.64 (1.16-2.32) Adjusted: 1.67 (1.18-2.36)	<.005* <.004*
		2 (1)	0 (0)	--	--
	II. Laryngospasm	15 (11)	1 (1)	13.93 (1.87-104.00)	.010*
	Serious (I&II)	16 (11)	1 (1)	14.86 (2.00-110.50)	.008*
	III. Coughing	34 (24)	14 (11)	2.26 (1.27-4.01)	.006*
	IV. Desaturation	37 (26)	23 (18)	1.40 (0.94-2.37)	.089
	V. Airway obstruction	24 (17)	7 (5)	3.18 (1.42-7.14)	.005*
	VI. Stridor	3 (2)	2 (2)	1.39 (0.24-8.20)	.714
	Minor (III-VI)	59 (42%)	33 (25%)	1.66 (1.17-2.36)	.005*
	Respiratory adverse events in the induction period	45 (32)	14 (11)	Unadjusted 2.98 (1.72-5.17) Adjusted 3.13 (1.81-5.43)	<.001*
	I. Bronchospasm	2 (1)	0 (0)	--	--
	II. Laryngospasm	7 (5)	0 (0)	--	--
	Serious (I&II)	8 (6)	0 (0)	--	--
	III. Coughing	22 (16) 22 (16)	5 (4)	4.09 (1.59-10.47)	.003*
	IV. Desaturation	23 (16)	11 (9)	1.94 (0.99-3.82)	.055
	V. Airway obstruction	17 (12)	1 (1)	15.79 (2.13-116.95)	.007*
	Minor (III-V)	43 (31)	14 (11)	2.85 (1.64-4.96)	<.001*

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- Patient for adenotonsillectomy without a sleep study

Multiple attempts to measure OSA without PSG

- STBUR (Snoring, Trouble Breathing, Un-Refreshed)scale
- Pediatric Sleep Questionnaire
- STOP-Bang
- McGill Oximetry Score

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Who should have polysomnography fefore tonsillectomy and adenoidectomy?

- <2 years of age
- obesity,
- Down syndrome,
- craniofacial abnormalities,
- neuromuscular disorders,
- sickle cell disease
- mucopolysaccharidoses.

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- When polysomnography is not available, clinicians should obtain a thorough history from parents and consider incorporating the STBUR questions in the preoperative screening phone call.
- Ask the otolaryngologist if they have clinical information to add
- Practice conservatively including developing BMI guidelines for excluding patients.

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Culture of Safety

- Culture of safety in an organization is the way safety is perceived, prioritized, and integrated into daily activities. It reflects the real commitment by all staff to safety at all levels.

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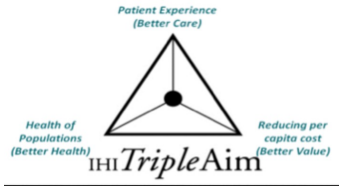

Triple Aim

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Culture of Safety

There are many factors contributing to a culture that values safety, but at the core is a commitment to:

- 1) assess current processes
- 2)implement protocols for safety initiatives
- 3)educate staff
- 4) evaluate safety culture
- 5) foster a culture that values safety as a shared responsibility

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Limitations of a Free-standing ASC

- The lack of a diverse group of physicians to consult in the case of an urgent or emergent situation. It is not uncommon for ASCs to only have one anesthesiologist on site with multiple OR's running at the same time. This can result in serious consequences if an emergency situation arises.
- If a patient requires urgent transfer to a higher acuity healthcare facility, the only option may be to call 911.
- Unavailability of certain types of emergency medications or equipment.
- Inadequate nursing /support staff to assist in the case of an emergency.
- A lack of laboratory and radiological services in the case of an emergency.
- Lack of blood bank or transfusion capabilities.

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Culture of Safety

Communication Gaps

- Effective communication is a cornerstone of providing safe and effective patient care.
- Communication breakdowns are the second most common cause of surgical errors and adverse events after technical errors.*
- The Joint Commission has previously concluded that failures of communication are the root cause of nearly every reported unexpected death and catastrophic injury.**

*Arriaga. Ann Surg. 2011 May;253(5):849-54

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Culture of Safety

- Handoff protocols enhance communication while decreasing errors among nurses, anesthesiologists and surgeons during the transfer of patients from the operating room to the PACU. Handover improvements and smooth transitions between care settings should be tailored to the specific ASC.
- Communication:
  - Anesthesia to nursing staff
  - Attending to resident
  - Caregiver to family

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Summary

- ASCs are a great example of a successful transformation in health care delivery
- 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 and may have prolonged stay or require admission

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Summary

- The role of the patient information screening team at an ASC is extremely important developing and enforcing patient selection guidelines.
- Culture of safety must be prioritized and integrated into daily activities
- A cohesive team fosters a culture of safety, improves patient outcomes and patient satisfaction

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