MPOG Pediatric Subcommittee Meeting

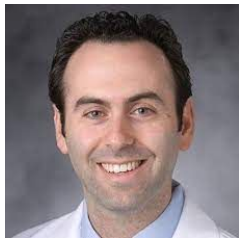
November 30, 2022

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Pediatric Subcommittee Leadership

MPOG is pleased to announce Drs. Brad Taicher (Duke University) and Vikas O'Reilly-Shah (Seattle Children's) as the new pediatric subcommittee leadership team.

Chair



Vice Chair

THANK YOU Dr. Haydar for your many contributions over the past two years as chair and for your continued participation as a member of the MPOG pediatric subcommittee!

May Meeting Recap

- Review of new MPOG pediatric blood management measures
  - TRAN-03: Transfusion vigilance
  - TRAN-04: Overtransfusion
- Pediatric sustainability workgroup update and measure proposals
- Unblinded data review - Benchmark across MPOG pediatric sites
  - TEMP-03: Postoperative Hypothermia
  - TEMP-04: Intraoperative Normothermia

Agenda

Announcements & State of MPOG Pediatrics
Dr. Brad Taicher, Duke University

Evaluation of PONV Consensus Guidelines in Pediatrics using MPOG data
Dr. Lucy Everett, Mass General Hospital

Pediatric Postoperative Mortality Project
Dr. Ruchika Sharma, University of Virginia

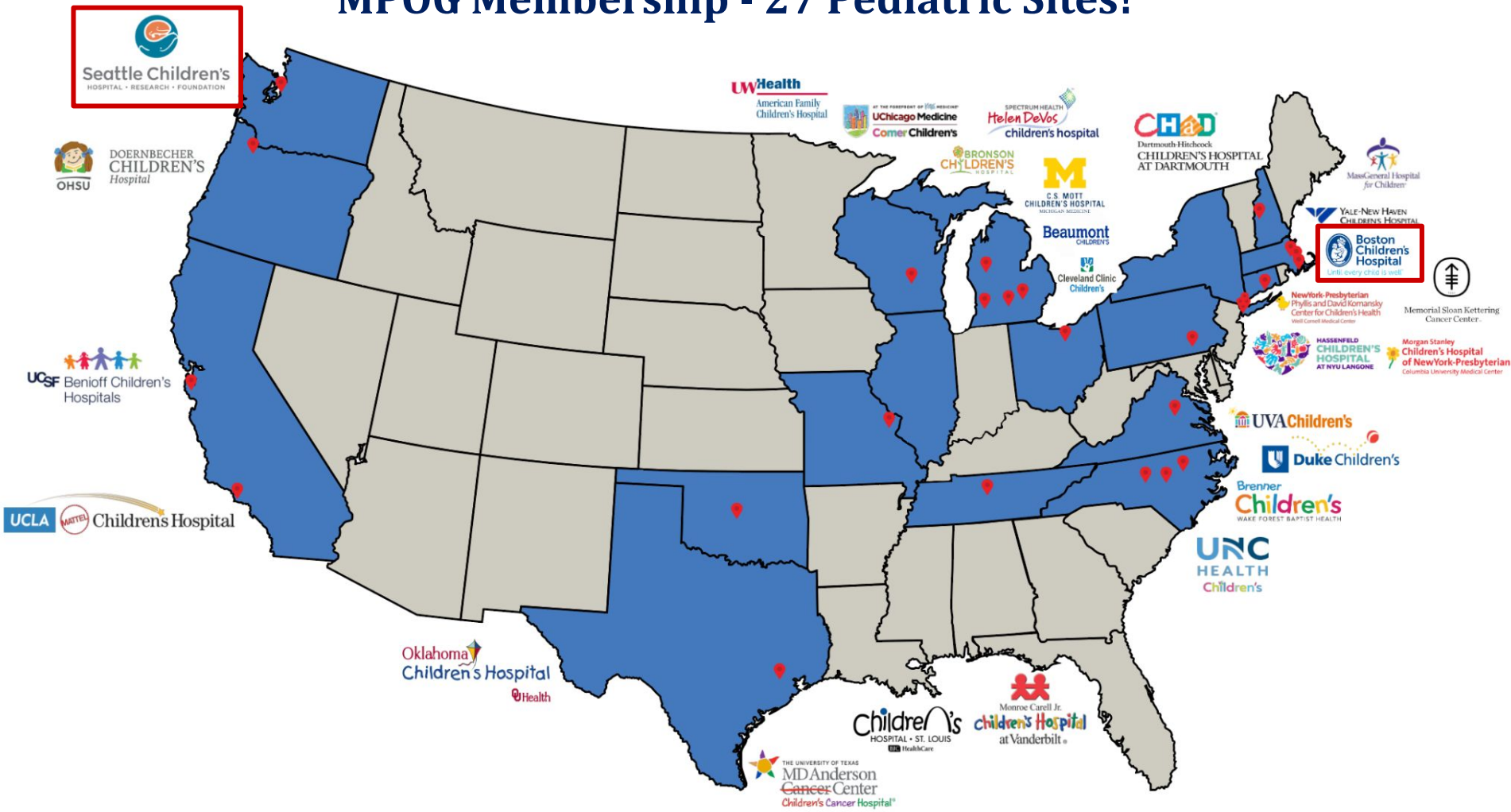
Open Discussion: Hot Topics in Pediatric Anesthesia
Dr. Vikas O'Reilly-Shah, Seattle Children's

2023 Meetings

- **Pediatric Subcommittee Meetings**
  - March
  - June
  - December
- **MPOG Updates at SPA Q&S**
  - March & October
- **MPOG Annual Retreat 2023**
  - October (San Francisco, CA)

State of MPOG
Pediatrics

MPOG Membership - 27 Pediatric Sites!



Pediatric Cases in MPOG

2,311,506

Age	Group	Case Count
--	Preterm Neonate	5,583
0 - 27d	Term Neonate	37,746
28d - 12mo.	Infant	253,672
13 mo. - 23mo.	Toddler	173,475
2 - 5y	Child (Early)	582,180
6-11y	Child (Middle)	531,513
12-18y	Adolescent (Early)	727,337

5 Pediatric Measures Published in 2022!

Measure ID	Description	Published Date
PONV-02-PED	PONV Prophylaxis, Pediatrics (2017 Guidelines)	03/01/2018
OME	Oral Morphine Equivalents	07/01/2018
TEMP-04-PED	Normothermia Intraop	04/17/2020
PAIN-01-PED	Multimodal Analgesia	12/11/2020
PONV-04-PED	PONV Prophylaxis, Pediatrics (2020 Guidelines)	08/31/2021
NMB-03-PED	NMB Dosing, Infants	04/06/2022
TRAN-03-PED	Transfusion Vigilance, Pediatrics	04/29/2022
TRAN-04-PED	Overtransfusion, Pediatrics	04/29/2022
SUS-05-PED	Nitrous used, Induction	10/17/2022
FLUID-02-PED	Minimizing Colloids, Intraop	11/04/2022

FLUID-02-Peds (cardiac and non-cardiac)

Minimizing Colloid Use

Description: Percentage of pediatric cases where colloids were avoided intraoperatively

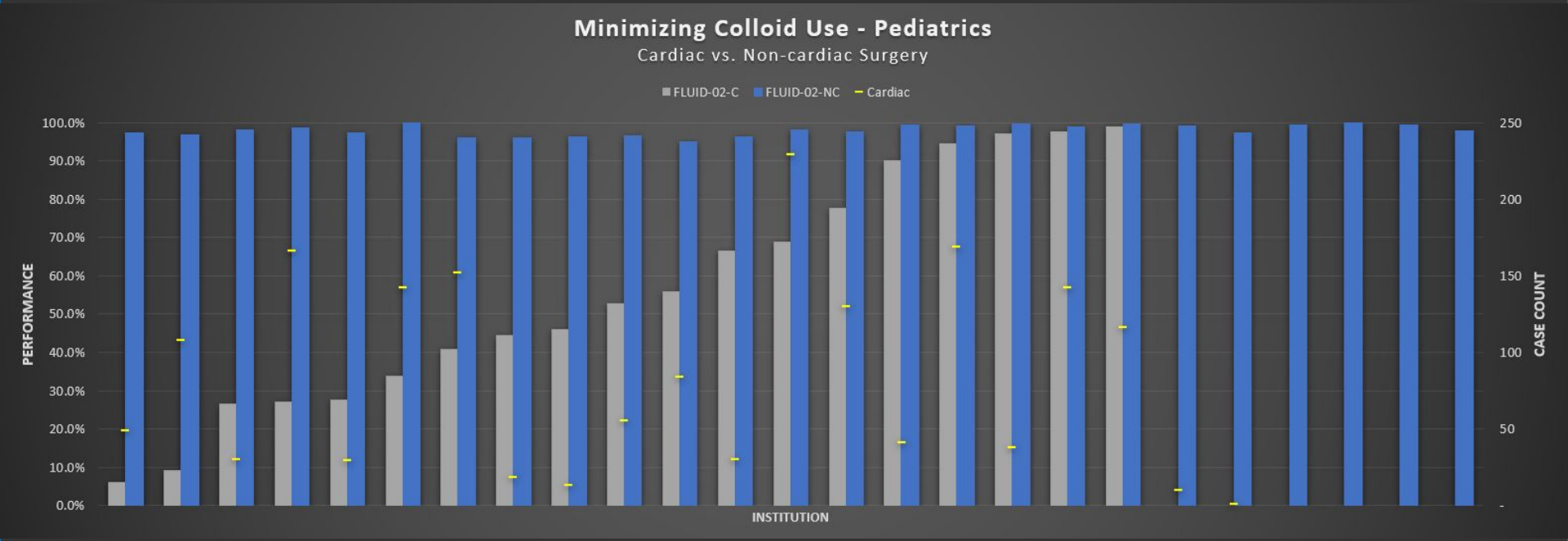
Measure Time Period: Patient in room to Patient out of room

Inclusions:

- **FLUID-02-NC:** Patients < 18y who undergo a non-cardiac procedure
- **FLUID-02-C:** Patients < 18y who undergo an open cardiac procedure (as defined by the MPOG Cardiac phenotype)

Exclusions:

- Patients ≥ 18 years of age
- ASA 5 & 6
- Massive Transfusion or blood loss: Defined as volume of 40 mL/kg
- Patients that are in prone or trendelenburg position for ≥ 4 hours
- Patients with ascites


Minimizing Colloid Use - Pediatrics
Cardiac vs. Non-cardiac Surgery
FLUID-02-C
FLUID-02-NC
Cardiac
PERFORMANCE
CASE COUNT
INSTITUTION
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
250
200
150
100
50
-

SUS-05-Peds

Nitrous utilization during induction

Description: Percentage of pediatric cases where nitrous oxide gas was used during induction of anesthesia.

Measure Time Period: Induction Start to Intubation. If not available, then Induction End

Inclusions: Patients < 18yo who undergo general anesthesia

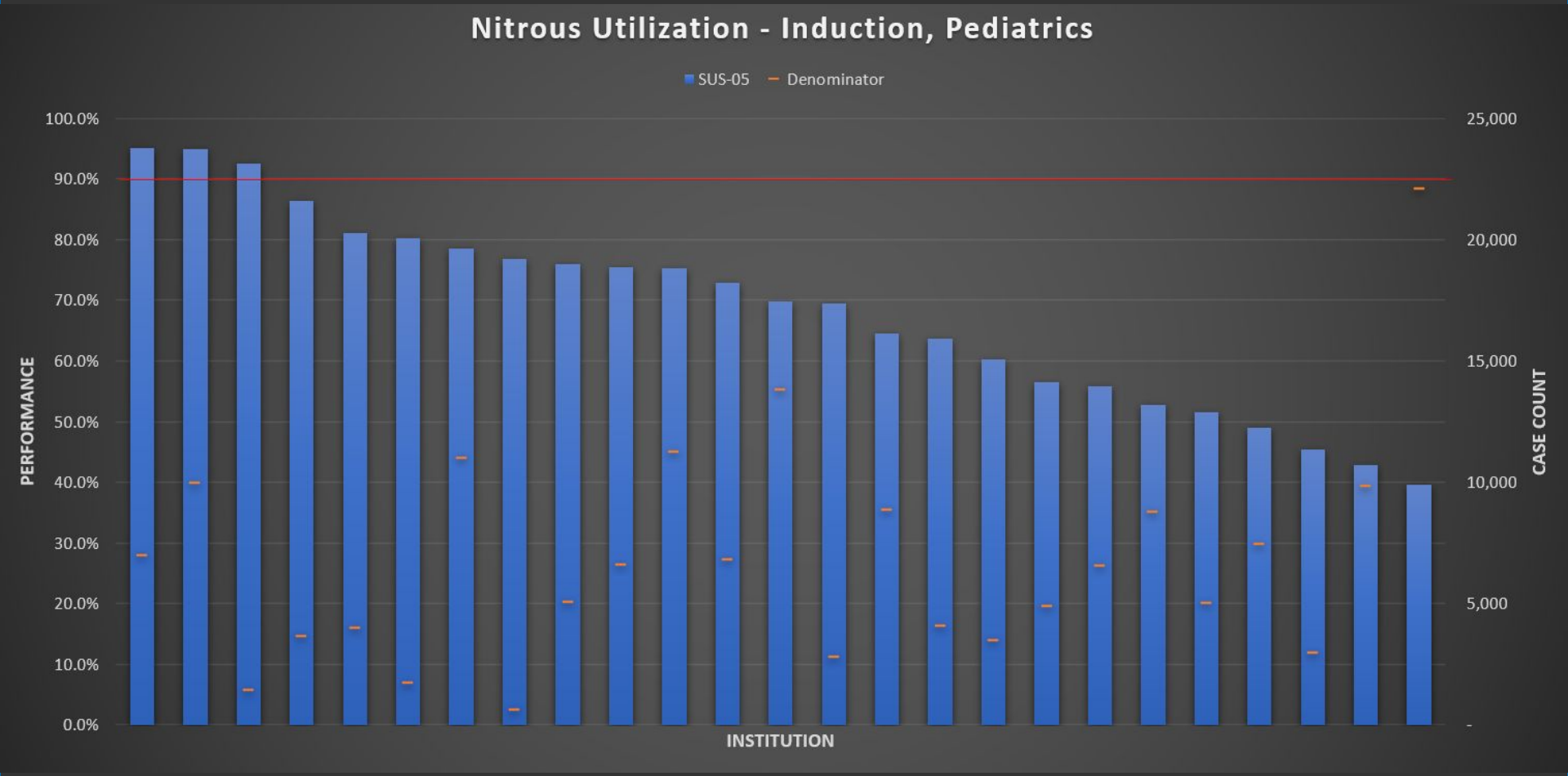
Exclusions: Patients > 18yo

Success Criteria: Nitrous oxide was not administered during the induction period of anesthesia

Other Measure Details:

Values for flows and inhalational agents will be assessed and considered as artifact if inside the following ranges:

- Nitrous Oxide Flows: <0.2 L/min
- Nitrous Oxide Insp % <20%


Nitrous Utilization - Induction, Pediatrics
SUS-05
Denominator
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
PERFORMANCE
25,000
20,000
15,000
10,000
5,000
-
CASE COUNT
INSTITUTION

Plans for 2023…

Measures In Progress

SUS-06: Weight based, Low fresh gas flow during induction

ABX-02: Antibiotic Timing, intraop

Other Measures of interest?

Published Measures - Due for Review

Measure ID	Description	Next Review	Last Review	Published Date
AKI-01	Acute Kidney Injury	2023	Sep-2020	06/01/2016
GLU-01	High Glucose Check/Treated, Intraop	2023		07/01/2015
GLU-02	Low Glucose Check/Treated, Intraop	2023		07/01/2017
GLU-03	High Glucose Check/Treated, Periop	2023		03/01/2020
GLU-04	Low Glucose Check/Treated, Periop	2023		03/01/2020
MED-01	Avoiding Medication Overdose	2023		11/01/2015
OME	Oral Morphine Equivalents	2023		07/01/2018
PAIN-01-PED	Multimodal Analgesia	2023		12/11/2020
TEMP-04-PED	Normothermia Intraop	2023		04/17/2020
TOC-02	PACU Handoff	2023		05/01/2017
TOC-03	ICU Handoff	2023		05/01/2017

Call for MPOG Pediatric Research

PCRC Date Presented	Institution	First Author	Research Proposal	Status
02/2020	Wake Forest	Miller	An Assessment of Procedural and Patient Risk Factors for Hypoxemia in Pediatric Patients Less than 3 years of age Undergoing One-Lung Ventilation and Thoracic Surgery Using the MPOG Database	Published in Anesthesiology
11/2017	U. Michigan	Riegger	Risk Factors for Perioperative Hypoglycemia in Children and Adults: A Report From the Multicenter Perioperative Outcomes Group (MPOG)	Published in A&A
02/2014	Utrecht	de Graaff	Development of reference ranges for vital signs for children during anesthesia	Published in Anesthesiology

Evaluation of Pediatric PONV Prophylaxis Using the MPOG Database

Dr. Lucy Everett (Mass General Hospital)

Pediatric POV/PONV Management Rx

1 RISK FACTORS

Preoperative

- Age≥ 3 years
- History of POV/PONV/motion sickness
- Family history of POV/PONV
- Post-pubertal female

Intraoperative

- Strabismus surgery
- Adenotonsillectomy
- Otoplasty
- Surgery ≥ 30 mins
- Volatile anesthetics
- Anticholinesterases

Postoperative

- Long-acting opioids

2 RISK STRATIFICATION

**Consider multimodal analgesia to minimize opioid use*

- No Risk Factors → LOW RISK
- 1-2 Risk Factors → MEDIUM RISK
- ≥ 3 Risk Factors → HIGH RISK

3 PROPHYLAXIS

LOW RISK

None or 5HT3 antagonist or dexamethasone

MEDIUM RISK

5HT3 antagonist + dexamethasone

HIGH RISK

5HT3 antagonist + dexamethasone + consider TIVA

4 RESCUE TREATMENT

Use anti-emetic from different class than prophylactic drug - droperidol, promethazine, dimenhydrinate, metoclopramide; May also consider accupuncture/accupressure

PONV-04 (Pediatric Prophylaxis)

Inclusion	Ages 3 - 17 Patients with 1+ risk factors for PONV
Risk Factors	Age ≥ 3 years Female ≥ 12 years Hx PONV in patient, parent, sibling High-risk Surgery (Strabismus, T&A, tympanoplasty) Volatile ≥ 30 minutes Administration of long-acting opioid in OR or PACU
Exclusion	ICU admit; ASA 5 or 6 Labor epidural Radiology/radiation oncology procedures ECT Sedation/MAC
Success	Antiemetic matched to number of risks (1, 2, or 3 if >2 risks). Propofol infusion is an antiemetic.

The Development and Validation of a Risk Score to Predict the Probability of Postoperative Vomiting in Pediatric Patients

Anesth Analg 2004;99:1630–7

Risk Factors	Points
Surgery ≥ 30 minutes	1
Age ≥ 3 years	1
Strabismus surgery	1
History of POV or family history of PONV	1
Sum of points	0-4

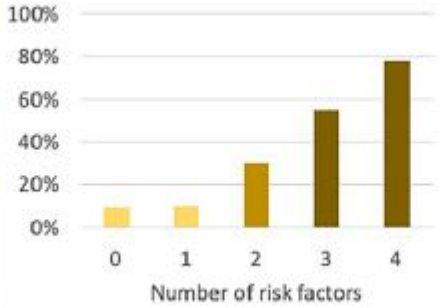


Figure 5. Risk score for POV in children. Simplified risk score from Eberhart et al[62] to predict the risk for POV in children. 0, 1, 2, 3, or 4 risk factors correspond to POV risks of approximately 10%, 10%, 30%, 50%, or 70%, respectively. PONV indicates postoperative nausea and vomiting; POV, postoperative vomiting. The Figure reused with permission from the American Society for Enhanced Recovery. For permission requests, contact info@aserhq.org.

Anesthetic technique not comparable to current (thiopental, neostigmine, all premedicated)

Minimal numbers for diagnostic procedures/endoscopy

We had questions….

Lucy Everett	MGH
Brad Taicher	Duke
Lisa Vitale	Michigan Medicine
Meridith Bailey	MPOG
Vikas O'Reilly-Shah	Seattle Children's
Wes Templeton	Wake Forest
Ben Andrew	Duke
Tim Houle (statistician)	MGH
Arielle Mueller	MGH

Are the findings generalizable?

How much does provider bias impact practice?

Should the factors have equal weight?

Can we build a better score?

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Research Proposal Process

The following steps outline the process for submitting a research proposal:

- **STEP 1: BEFORE YOU BEGIN**
- **STEP 2: DETERMINE FEASIBILITY AND SUBMIT COVER SHEET**
- **STEP 3: WRITE RESEARCH PROJECT SPECIFIC IRB AND DRAFT PCRC PROPOSAL**
- **STEP 4: DATA QUERY SPECIFICATION**
- **STEP 5: INSTITUTIONAL PI PREVIEW AND TEST DATA DOWNLOAD**
- **STEP 6: SUBMIT PROPOSAL TO COORDINATING CENTER**
- **STEP 7: PCRC REVIEW**
- **STEP 8: INSPECT AND CLEAN DATA, REGISTER STUDY AND PERFORM ANALYSES**

Once you have completed the data analysis, and have written your manuscript, please review the last steps required by MPOG before you can submit your manuscript for publication.

Pedi PONV Research Proposals

PCRC 0145: Pedi PONV Descriptive

Aims to evaluate pediatric practice related to recommendations for PONV prophylaxis in the recent Consensus Guidelines (used to construct PONV-04).

We hypothesize that prophylaxis practice varies depending on case type and specific risk factors rather than just the number of risk factors.

PCRC 0180: Pedi PONV Outcomes

Aims to evaluate the correlation between compliance with PONV prophylaxis and outcomes.

We hypothesize that outcome as measured by the surrogate endpoint of rescue med in PACU does not correlate with compliance with prophylaxis recommendations.

Aspirational Questions (possible secondary analysis):

- Can we validate the previously identified risk factors
- Can we validate the inclusions/exclusions (case type, etc)?
- Can we assign any weight based on the MPOG data?
- Can we identify other specific risk factors that impact outcome?

Potential Data Limitations

- Incomplete identification of risk factors (personal/family hx of PONV and motion sickness)
- Incomplete documentation of PACU PONV
- Inability to tease out multiple factors that impact PONV
- Impact of feedback emails
- Impact of using measure for compensation

Pilot Data - Descriptive

	Center A	Center B
Site description	Large academic hospital with all peds except ENT/ophth	Large academic hospital with all peds
Variability by provider	77.5 - 93.8% success	46.2-73.3% success
Impact of emails/comp measure	PONV-04 success improved from 73% to 87%	N/A
Observations All patients have age 3-17 Majority had volatiles > 30 min	Additional risk of hx PONV much more likely to pass than second risk of female gender (≥12)	For 1 risk factor, compliance 82% For 2 or 3 risks, higher success if risks were surgical procedure or hx PONV

Pilot Data - Outcomes

- Success on the prophylaxis measure did not correlate with success on the outcome measure at either pilot center.

- At Center A, data was examined before and after feedback emails. Although prophylaxis rates improved, the incidence of documented PACU vomiting also rose between the two periods (likely related to efforts to improve documentation) and the incidence of rescue antiemetic administration rose a small amount.

Discussion

Pediatric Postoperative Mortality

Dr. Ruchika Sharma (University of Virginia)

MORT-01

30 Day In-Hospital Mortality

Description: Percentage of patients with in hospital death reported within 30 days after procedure

Exclusions: ASA 6

Numerator: Flagged cases

Denominator:

- Passed - No known death or known death > 30 days
- Excluded - Death within 30 days, Not index case
- Flagged - Death within 30 days, Index case

Mortality Project

Part A: Raw POMR

- UVA Pilot study of unadjusted 24h, 30d POMR in 2019, 2020, 2021
- Descriptive analysis of our individual cases

*abstract submitted to SPA 2023

Part B: Risk Adjusted POMR

- STS-CCAS database: participating program outcomes are open to public.
- O/E ratios for benchmarking
- 4 surgical risk categories (STAT 1-5)

Papers used for this project…

Perioperative hospital mortality at a tertiary paediatric institution (de Bruin et al, *BJA*, 2015)

- Identified causes of death (2A, 2S)- attributability
- 45,182 anesthetics over 7 yrs (2006-2012 @ Netherlands)
- 30d POMR : 41.6/10,000
- Highest POMR in under 1 yr, ASA 3/4, Cardiac surgery, Emergency.

Table 6 Number of death (with mortality per 10 000 anaesthesia's, and 95% confidence interval) in which the anaesthesia or surgery, or factors under the control of the anaesthesiologist or surgeon (in combination with the preoperative condition of the patient) are more likely than not, influenced the timing of death.

	Total	Cardiac surgery	Non-cardiac surgery	0–30 days neonate	31 day <1 yr infant	1 <4 yr	4–10 yr	10–18 yr
Anaesthesia related death	5 (1.1; 0.4–2.6)	2 (5.7; 0.5–20.8)	3 (0.7; 0.1–2.1)	1 (5.4; 0.1–29.9)	4 (5.7; 1.5–14.5)	0 (0; 0–3.3)	0 (0; 0–2.8)	0 (0; 0–3.1)
Surgery related death	4 (0.9; 0.2–2.3)	1 (2.9; 0.1–16.0)	3 (0.7; 0.1–2.1)	1 (5.4; 0.1–29.9)	1 (1.4; 0–7.9)	0 (0; 0–3.3)	2 (1.5; 0.4–5.5)	0 (0; 0–3.1)
Total	9 (0.2; 0.9–3.8)	3479	41 703	1862	7052	11 036	13 193	12 032

MPOG

Development of a Pediatric Risk Assessment Score to Predict Perioperative Mortality in Children Undergoing Noncardiac Surgery (Nasr et al, *Anesth Analg*, 2017)

Derivation cohort: n=115,229 (2012,2013 NSQIP peds)

0.5% mortality

Validation cohort: n=68,194 (2014 NSQIP peds)

0.4% mortality

Multivariable Regression modelling for in-hospital mortality

PRAm score : Pediatric Risk Assessment of Mortality

PRAm >= 6 increasing POMR

Variables	Definition	Value
Urgent	Urgent surgical procedure	+1
Comorbidity	The presence of at least 1 comorbidity among the following: respiratory disease, congenital heart disease, preoperative acute or chronic kidney disease, neurologic disease, hematologic disease	+2
Critically ill	The presence of at least 1 of the following characteristics of critical illness: preoperative mechanical ventilation, inotropic support, preoperative cardiopulmonary resuscitation	+3
Age <12 mo	Age at the time of the surgical procedure <12 mo	+3
Neoplasm	Surgical procedure in a patient with a neoplasm with or without preoperative chemotherapy	+4

Abbreviation: PRAm, Pediatric Risk Assessment.

Prospective external validation of the pediatric risk assessment score in predicting perioperative mortality in children undergoing noncardiac surgery (Valencia et al, *Anesth Analg*, 2019)

A PRAm score was prospectively assigned by the primary anesthesia team to children ≤18 years of age undergoing noncardiac surgery between July 2017 and July 2018 at a tertiary care pediatric hospital. The primary outcome was the PRAm score's ability to predict 30-day mortality.

13,530 cases included in the external validation cohort, the incidence of 30-day mortality was **0.21%** (29/13,530)

Among the surgical encounters with a **PRAm score ≥6, mortality was 2.62%** (20/762) as compared to 0.07% (9/12,768) among the encounters with a PRAm score <6 (P < .001).

PRAm scores of ≥6 and ≤3 are the optimal cutoff points for determining at which threshold a child's risk of mortality markedly increases and decreases, respectively

Pediatric Risk Stratification Is Improved by Integrating Both Patient Comorbidities and Intrinsic Surgical Risk (Nasr et al, Anesthesiology, 2019)

Predicted risk of 30-day mortality ranges from 0% with no comorbidities to 4.7% when all comorbidities* are present among low-risk surgical procedures and from 0.07 to 46.7% among high-risk surgical procedures.

Low Risk Surgery:	Risk quartile 1 (hypospadias)
	Risk quartile 2 (appendicectomy)
High Risk Surgery:	Risk quartile 3 (Laparoscopic gastrostomy)
	Risk quartile 4 (ex lap, PD cath, trach)

*The 5 Comorbidities: weight <5 kg, ASA 3+, preop vent support, preop inotrope, preop sepsis

Perioperative Mortality in Pediatric Patients: A Systematic Review of Risk Assessment Tools for use in the Preoperative Setting

No preop risk score is dominating the landscape…

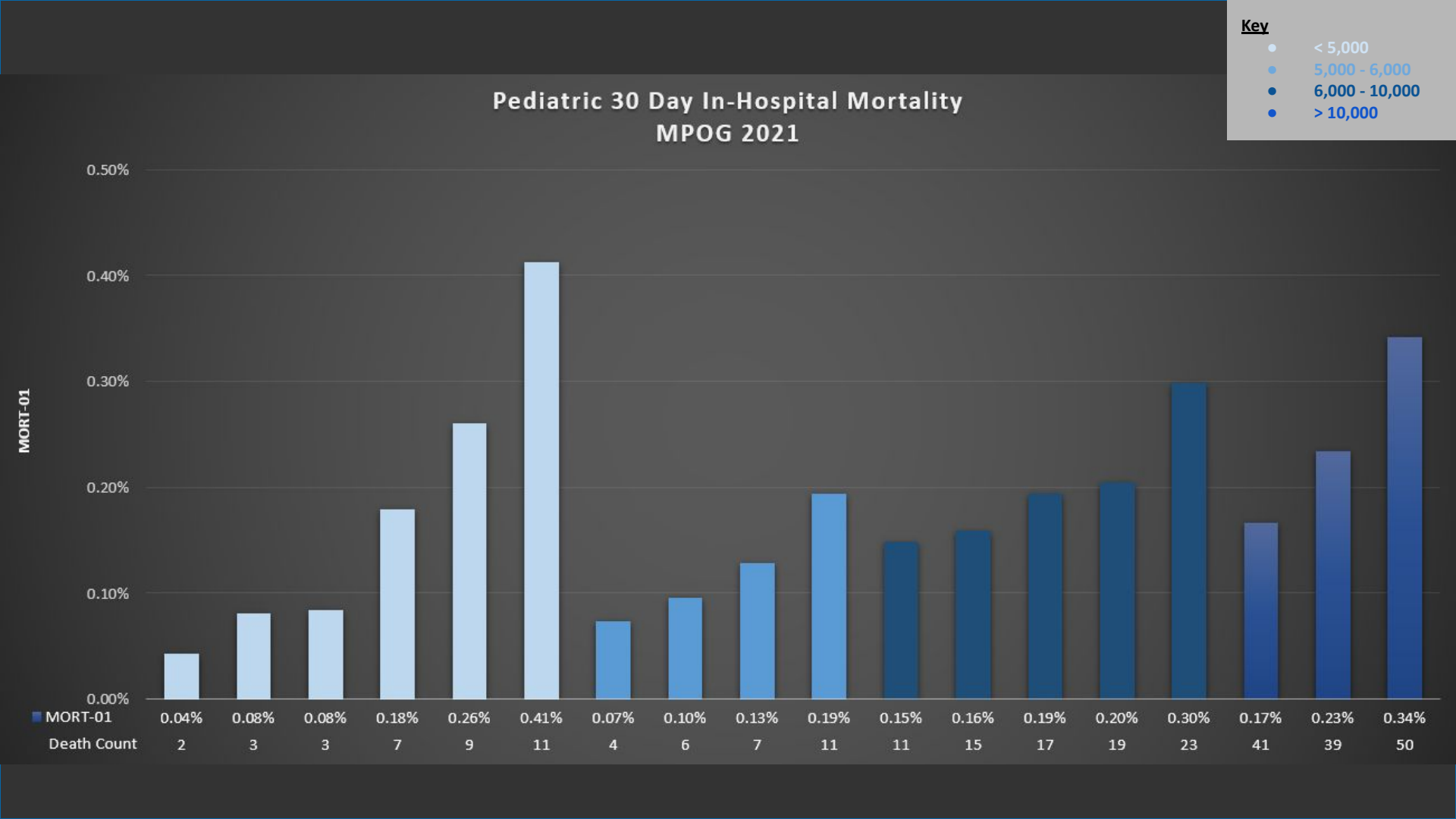
What score does your institution use?

Table 1. Characteristics of Studies Describing the Creation and/or Validation of Risk Scores for 30-Day Mortality in Pediatric Patients

Study	Shorthand Name of Risk Score	Development (with or without Validation) or Validation-only Study?	Country	Setting/Population	Included Surgical Procedures
Akbilgic *et al.*[14]	Race-specific risk models	Development and validation	United States (majority)	NSQIP-Pediatric of African American and white children < 18 yr old from 2012 to 2014	Sampling of all surgical procedures across specialties (general, neurosurgery, urology, otolaryngology, plastic, orthopedic) from included hospitals
Akbilgic *et al.*[15]	Novel classification system	Development and validation	United States (majority)	NSQIP-Pediatric from 2012 to 2014	Sampling of all surgical procedures across specialties (general, neurosurgery, urology, otolaryngology, plastic, orthopedic) from included hospitals
Cooper *et al.*[16]	Superlearner model	Development and validation	United States (majority)	NSQIP-Pediatric from 2012 to 2013	Sampling of all surgical procedures from included hospitals performed on neonates
Kraemer *et al.*[17]	ACS NSQIP Pediatric Surgical Risk Calculator	Development and validation	United States (majority)	NSQIP-Pediatric from 2012 to 2014	Sampling of all current procedural terminology codes with at least 25 cases (general, cardiothoracic, neurosurgery, orthopedics, otolaryngology, gynecology, urology, plastic surgery) from included hospitals
Langham *et al.*[18]	Single-center model	Development and validation	United States	Single pediatric hospital for 2010 to 2012 for development	Sampling of all surgical procedures across specialties (general, neurosurgery, urology, otolaryngology, plastic, orthopedic) from included hospitals
Nasr *et al.*[19]	PRAm	Development and validation	United States (majority)	NSQIP-Pediatric from 2012 to 2013	Sampling of all noncardiac surgical procedures across specialties (general, neurosurgery, urology, otolaryngology, plastic, orthopedic) from included hospitals
Nasr *et al.*[20]	Intrinsic surgical risk score	Development and validation	United States (majority)	NSQIP-Pediatric from 2012 to 2016	Sampling of all noncardiac surgical procedures across specialties (general, neurosurgery, urology, otolaryngology, plastic, orthopedic) from included hospitals
Rhee *et al.*[21]	Novel multispecialty surgical risk score	Development and validation	United States	General pediatric surgical population from Nationwide Inpatient Sample and Kids' Inpatient Database from 1998 to 2005 and Kids' Inpatient Database 2006 for first validation; second validation includes California data from 2005 to 2007	All inpatient operative procedures
Terui *et al.*[22]	Risk model of mortality	Development and validation	Japan	National Clinical Database (national registry) for 12 major surgical procedures from 2015; records from 2016 from same data set are validation	Surgery for gastrointestinal perforation, fundoplication, total/subtotal resection of malignant tumor, Hirschsprung disease, funnel chest, anorectal malformation, intestinal obstruction, midgut volvulus, choledochal cyst, pneumonectomy, biliary atresia, tracheoplasty
Valencia *et al.*[23]	External validation of PRAm	Validation only	United States	All noncardiac surgical encounters from July 2017 to July 2018 at a single pediatric hospital	All noncardiac surgical encounters

ACS, American College of Surgeons; NSQIP, National Surgical Quality Improvement Program; PRAm, Pediatric Risk Assessment score.

Tangel et al, *Anesthesiology*, 2022


Key
< 5,000
5,000 - 6,000
6,000 - 10,000
> 10,000
Pediatric 30 Day In-Hospital Mortality
MPOG 2021
MORT-01
0.50%
0.40%
0.30%
0.20%
0.10%
0.00%
MORT-01 0.04% 0.08% 0.08% 0.18% 0.26% 0.41% 0.07% 0.10% 0.13% 0.19% 0.15% 0.16% 0.19% 0.20% 0.30% 0.17% 0.23% 0.34%
Death Count 2 3 3 7 9 11 4 6 7 11 11 15 17 19 23 41 39 50

Hot Topics in Pediatric Anesthesia

Received: 2 March 2022 | Revised: 13 April 2022 | Accepted: 25 April 2022

DOI: 10.1111/pan.14474

PERSPECTIVE

Pediatric Anesthesia WILEY

Setting a universal standard: Should we benchmark quality outcomes for pediatric anesthesia care?

http://dx.doi.org/10.1111/pan.14474

SAFETY

- Intraoperative Cardiac Arrest
- Unplanned reintubation within 24hrs
- Unplanned ICU admission within 24hrs
- Unplanned Hospital readmission for outpatient surgery
- Activation of rapid response team within 24hrs
- Death within 72hrs of anesthesia (MORT-02?)
- Medication Error

EFFECTIVENESS

- PACU length of stay ≥ 120 min
- PONV requiring rescue antiemetic (PONV-03)
- Failed Regional anesthetic
- Duration of postop intubation (cardiac surgery, neonates)

EFFICIENCY

- % On time 1st case starts
- Delayed case start ≥60 min
- Emergence Duration: Surgery end --> extubation
- OR turnover time
- % Same day case cancellation

EQUITY

Consistent outcomes regardless of

- Race
- Ethnicity
- Gender
- Socioeconomic status

TIMELINESS

- % Emergent cases arriving to OR within 60 min

PATIENT-CENTERED

- Patient Satisfaction survey scores *(via MPOG's survey app - MQUARK)*

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Thank You!