Pediatric Pre-Operative Screening in Five Questions

David Robinowitz, MD MHS MS
Assistant Professor of Clinical Anesthesiology
UCSF
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The Challenge

- As a resident in pediatric anesthesia: I’m in the MRI Suite with 10 outpatients scheduled for MRIs under anesthesia.
- “Pre-op next patient – you can ask 5 questions.”
  (justification for assignment: as a former pediatrician, I was averaging 30 minutes to perform H&P)

The Setting

- Pediatric Anesthetics for Radiology and Other Studies Common
- Predominantly outpatients
- Often receive primary care (as well as referral care) elsewhere – requisition may be only source of medical data
- Pre-op nurse may acquire some data

Assumptions

- These screening questions supplement
  - Information already available
  - History obtained/provided by someone else (e.g. resident, pre-op clinic, parental screening form)
  - If there’s a “hit,” expect many more questions to characterize the issue.
  - They may help to prevent significant issues from falling through the cracks (or getting through the “Swiss cheese”).
Assumptions

- You have
  - Consent form and/or documentation of planned procedure/operation
  - NPO status
  - Allergies
  - Meds
  - (appropriate) Vital Signs and Weight
  - Additional documentation (helpful)
    - Primary care records
    - Specialist records
    - Laboratory, radiologic, other tests
    - Prior anesthetic records
- Plan a thorough (but targeted) physical examination
  - General appearance, hydration
  - Airway exam
  - CV
  - Pulmonary
  - Neurologic

The Five Questions: Preamble


Hi, my name is David Robinowitz. I’m a pediatric anesthesiologist, and I’d like to verify the information I have about Tyler, take a look at him, and then talk with you about the plan for anesthesia. Who’s who?

<Family introduces themselves and roles, sometimes asks questions>

I understand Tyler is here today for an MRI scan of his brain because of recent headaches – as order by Dr. Jones. He is currently taking occasional Tylenol and Motrin, and has an apparent allergy to amoxicillin – characterized by a rash.

Nurse Judy wrote that Tyler last ate at 10pm last night, and had a glass of apple juice about 6 hours ago, at 6:00am; his birthday is 01/01/2005, he weighs 25 KG, and he doesn’t have a fever today.

The Five Questions

1. (to the child) “Did you have a good breakfast?” (to parent) “Is he feeding well today?”

Having just verified NPO status, this question is designed to be silly – and assess reaction from older patient and/or parents.

Preparation for Case

- Preparation of patient and family for anesthetic
  - Preoperative anxiety is associated with adverse postoperative outcomes. (Kain, Z. N., L. C. Mayes, et al. (2006))
    - Premedication? (still some controversy)
    - Family presence and preparation? (may help, may hurt)
    - Non pharmacologic interventions

Preparation for Case

The Five Questions

2. Is your child well enough today to participate in PE/Gym class in school today? *

This question is designed to assess (a) functional status in general – “no he’s excused from PE because of his heart condition” and (b) acute illnesses.

URIs

• Traditional model is to postpone all elective procedure when s/s of URI present.
• Modern approach is more selective
  - Most respiratory complications associated with URIs are manageable without long term sequelae.
  - Identification of risk factors for more serious complications makes patient selection possible.

URIs

(Tait, A. R. (2005))

The Five Questions

2. Is your child well enough today to participate in PE/Gym class in school today? *

Question two helps identify those patients for whom care should be postponed due to URI or other acute illness. (stay at home criteria according to AAP – http://www.aap.org/sections/media/HomefromSchool.htm -- and “clued-in” parents are similar)

Parents may be better at identifying risky URI than symptoms. (Schreiner, M. S., I. O’Hara, et al. (1996))

The DCA Phenomenon

- DCA – Reagan National Airport
- Short runway, long visual approach along Potomac
- Noise abatement procedures
- Known as “dangerous.”
- Yet no higher rate of accidents
The Immunization Phenomenon: Victims of Our Own Success

Pediatric Anesthetic Risks: Mortality

- Melbourne Children’s Hospital:
  - 10 deaths in 101,885 anesthetics (1 in 10,188)
  - Analysis of these 10 cases revealed pre-existent conditions thought to be related to mortality
  - Anesthesia for otherwise healthy children is very safe.
  
  van der Griend, B. F., N. A. Lister, et al. (2011)

Pediatric Anesthetic Risks: Mortality

- Institutional Studies
  - Factors Associated with Increased Risk
    - Infants > pediatric patients
    - ASA PS 3, 4, or 5 patients
    - Severe complications often associated with respiratory issues
    - Older children have increased risk of PONV.
    - Murat, 2004: 24,165 pts – no anesthetic mortality; cardiac arrest in 11:10,000 infants; 3:10,000 children; 0.8:10,000 attributed to anesthesia.
  - Closed Claims Analysis
    - Morray et al 1993: 43% of claims associated with respiratory events; risk factors include age 0-3 years old; (Morray, J. P., J. M. Geldushek, et al. (1993)
    - Jimenez et al 2006: decreasing proportion of respiratory events (51% → 23% 1970s – 1990s); Risk factors: Age 0-3 years old; ASA 3-5. (Jimenez, N., K. L. Posner, et al. (2007))

Paterson, N. and P. Waterhouse (2011)

Pediatric Anesthetic Risks: Serious Morbidity

<table>
<thead>
<tr>
<th>Table 2: Frequency of Perioperative Cardiac Arrests by Age</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
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<tr>
<td>---------</td>
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<tr>
<td>0 to 30 days</td>
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<td>31 days to 1 yr</td>
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<td>6 to &lt; 10 yr</td>
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<tr>
<td>10 to &lt; 10 yr</td>
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<tr>
<td>Total</td>
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Estimates after "with cardiac rhythm" were excluded. Numbers report overall incidence of cardiac arrest (CA) for infants under 1 yr and for the entire pediatric population. CI: confidence interval.

Pediatric Anesthetic Risks: Serious Morbidity

Safety of Pediatric Anesthesia in Radiology Settings

- Anesthesia outside of the OR presents challenges. (Cauldwell, C. (2011))
- A series of 11,700 pediatric anesthetics at a university medical center for MRI included 3 deaths (1 out of 3,900) – twice the rate of mortality for pediatric patients in their ORs.
  - However all 3 patients were considered high risk (< 6 Kg, ASA PS Score >= III) (Girshin, M., V. Shapiro, et al. (2009))
- Compared to risk for population of (mostly) adults of 5.3 deaths per 1 million anesthetics in the MRI suite: (~ 50 times less likely).

  (MK-WC, S. and D. L. Williams)

Pre-Operative Evaluation as a Test

- Outcome Measures
  - Reduce peri-operative mortality
    - However, difficult to evaluate as events tend to be rare (e.g. difference between a 10 fold rate of mortality would be 1:10,000 vs 1:100,000 cases)
  - Reduce peri-operative morbidity
    - Minor complications more common – uncertain whether preoperative evaluation can have significant impact on many (e.g. PONV other than for patient with extensive history)
  - Increased patient/family satisfaction

Pediatric Anesthetic Risks

- Respiratory Physiology
- Decreased apneic oxygenation time
- Difficult Airway
- Risk of Asthma
- Rate of URIs
- Passive Smoking
- Lung disease a/w prematurity
- CF
- Obstructive sleep apnea (congenital a/w issues; increased weight for age or BMI for age)
- Cardiac Disease (including need for bacterial endocarditis prophylaxis)
- Pulmonary Hypertension
- Diabetes
- Steroid Use
- Metabolic syndromes
- Chronic renal failure
- Congenital syndromes/anomalies (e.g. Trisomy 21)
- Allergies
- Immunizations

Table 2: Frequency of Perioperative Cardiac Arrest by Age

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Pre-Operative Evaluation as Screening Test

- Optimize sensitivity
  - Don’t miss a patient who needs more evaluation or medical optimization prior to anesthetic
- Specificity is also welcome
  - Most pediatric patients are healthy
    - False positives lead to potentially unnecessary testing, delays, or postponement of (needed) case
- Optimize resource allocation

Interventions following Preoperative Evaluation

- Go/Postpone/Cancel
- Proceed Elsewhere
  - Transfer patient to pediatric peri-operative environment (e.g., a children’s hospital)
    - Departmental policy regarding pediatric anesthesia privileges
    - AAP Guidelines for pediatric periop environment
      - Pediatric environment NOT defined only by presence of pediatric anesthesiologist (Hackel, A., J. M. Badgwell, et al. (1999))
    - Complications in patients with complex special health care needs are more likely in PACU than in OR. (Graham, R. J., M. T. Wachendorf, et al. (2009).)
- Change in Anesthetic Plan

The Five Questions

3. Has your child ever been referred to a specialist (other than today’s surgeon/procedure provider)?
   (such as a heart doctor, lung doctor, neurologist, GI doctor?)

4. Since birth, has your child ever been admitted to a hospital overnight?

These questions help capture majority of pediatric co-morbidities that can affect anesthetic risk, such as significant asthma, congenital heart disease, chronic conditions.

5. Has your child, or anyone else in the family, ever have any significant problems with anesthesia?

Required to detect heritable conditions, such as MH, pseudocholinesterase deficiency; also to know h/o operations, anesthetics, and possible difficulties.
The Successful Pre-Op

• What parts of pre-op H&P helpful?
  – Seems self-evident, however, that certain information is necessary, helpful, and …. 

The Successful Pre-Op

• Required elements

The American Academy of Pediatrics Guidelines

– HPI
– Past and current medical history
– Medications (including taken in past, OTC, adherence)
– Allergies
– Prior anesthetic experience
– Family history
– NPO

The Successful Pre-Op

• Required elements

CMS

At a minimum, the pre-operative anesthetic evaluation of the patient should include:
• Notation of anesthesia risk;
• Anesthesia, drug and allergy history;
• Any potential anesthesia problems identified;
• Patient’s condition prior to induction of anesthesia.
The Successful Pre-Op

- Required elements of pre-op according to ASA Guidelines
  - Pt. Interview
    - Confirm patient identity and procedure
  - In-patient/outpatient status
  - Medical History
  - Anesthetic History
  - Medication/Allergy History
  - NPO Status
  - Appropriate Physical Examination
    - Include vital signs, airway
  - Review of Labs/Results/“Available” Medical Records
  - Consultations (if needed)
  - Determine ASA PS
  - Anesthetic Plan
  - Risks and benefits, informed consent
  - Premedication if indicated


The Successful Pre-Op: H&P is necessary but not sufficient

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Duration of Patient Encounter

- A study of patient-centered communication during a model pre-anesthesia visits (Zollo, et al 2009)
  - to complete interview (including opening and closing interview; and gaining patient’s perspective)
    - 17.4 vs 14.5 minutes depending on standardized patient type.

Production Pressure

So much to do; so little time!

- Cost containment, resource limitation
  - Specialized (and expensive) providers and equipment – turnover time results in inefficiencies
  - E.g. eye exams under anesthesia
    - “3.8 minute mean turnover” [really] with effective pre-op. (Vigoda, M. M., S. Gayer, et al. (2008))
  - For 18 case day (e.g. pedi dermatologic laser treatments): each additional 10 minutes = 3 hours!
  - Other settings: production pressure may be different
A voice of reason

“Most importantly, we have to do a better job with our history taking and preoperative assessments. If a child is obese, can be heard snoring in the next room (the parents might even notice respiratory pauses), and has daytime somnolence, this child is not an appropriate candidate for outpatient surgery and needs to be admitted overnight. We should not allow ‘busy’ surgeons, insurance companies, or hospital administrators to make us change our practice for convenience or cost reduction. **We need to do what is right for our children, even if it means a poor bundle fee and less money in our own pocket.**”


Efficiency

- Efficiency is not the same as effectiveness or efficacy –
  - Can be defined as effectiveness/cost
  - One definition: *useful* work/energy
  - Doing the same (good!) job with less cost


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The Pre-Pre-op Pipeline

Requesting provider (e.g. surgeon, neurologist) determines operation/procedure/study is needed and anesthesia must be provided

Patient Arrives in Pre-op to be seen by Anesthesiologist
Preanesthesia Clinics in Peds

- Selective referral to pediatric preanesthetic evaluation clinic
  - At UCSF, the “Prepare Clinic”
  - At Cincinnati Children’s, The APC.

(A few more) Questions

6. Is there anything about her medical history we didn’t cover? Something you or her pediatrician is concerned about?

7. Does your child snore?

<Completion of physical Exam, Review of anesthetic plan and expectations, risks and benefits>

8. Do you have any questions? <Obtain informed consent>

Conclusions

Anesthetics for pediatric outpatients undergoing studies are generally very safe, given appropriate patient selection and peri-operative environment. Risks are greater for younger children/infants and those with co-morbidities, and for procedures performed outside of the OR.

A preoperative evaluation routine can help to screen for significant issues that may have missed detection by other means.

Certain processes, such as appropriate preoperative clinic referral, involvement of PCP, and questionnaires, can improve efficiency.

When in doubt, ASK MORE QUESTIONS!